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A MINERAL INVENTORY OF THE NEVADA TEST SITE, AND PORTIONS OF NELLIS BOMBING AND GUNNERY RANGE SOUTHERN NYE COUNTY, NEVADA

Prepared by Jack Quade, Senior Geologist
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Prepared for:

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA
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NELLIS BOMBING AND GUNNERY RANGE SOUTHERN NYE COUNTY, NEVADA

FINAL REPORT

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United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada
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Summary of Worked Performed
A Mineral Inventory of Nellis Bombing and
Gunnery Range, Southern Nye County, Nevada
Contract DE-AS08-82NV10295
United States Department of Energy

This project was initiated by the U.S. Geological Survey, and was funded by the U.S. Department of Energy through its Nevada Operations Office as part of the Nevada Nuclear Waste Storage Investigations (NNWSI) project.

Work was done by the Nevada Bureau of Mines and Geology under the direction of G.L. Dixon and Florian Maldonado of the U.S. Geological Survey.

The Nevada Test Site Mineral Inventory was completed in two stages. First, a search of the literature was made, and data on mineral occurrences within the project area were compiled on short form Nevada CRIB forms. Mining activity in the area was plotted on maps for field use. Folios were then prepared for each mining district or area which included CRIB forms, geologic data, and pertinent references. This material was used for planning the field examinations.

During the field phase of the project, every accessible mining district within the study area was examined. All important properties in each district as well as many outlying prospects were examined and described in order to provide more complete and accurate information beyond that provided in the literature. During the field examination, emphasis was placed on collecting geologic information on mineral occurrences and on noting past activity. In addition, samples showing typical mineralization were collected from most properties visited. All of the samples were high-graded from dumps, ore piles, outcrops, and from subsurface mine workings where access was possible. In some areas, samples of nearby intrusive rock or altered material were collected for comparison purposes.

Samples collected for this project were prepared for analysis by the Nevada Mining Analytical Laboratory, UNR, Reno and analyzed for 31 elements (semi-quantitative spectrographic technique) by the Branch of Exploration Geochemistry U.S. Geological Survey, Denver, Colorado. We would like to express our gratitude to these laboratories, for without their cooperation, important information on elements, interrelationships within mining districts and between the various districts, would not be provided. In addition to spectragraphic analysis, selected samples were analyzed by Atomic Absorption or by fire assay or were examined on a microprobe to better evaluate different deposits.

Information collected in the field was compiled on prospect forms, and CRIB sheets were prepared for all new properties examined.

The information collected and compiled during the course of the Test-Site project has been transmitted in the following form:

Summary Report:

a) brief report including location, history, comments based on field observation and some comments on geochemical results. Maps showing sample location are included in the text.

b) Sample decription sheets arranged in numerical sequence.

c) Analysis sheets arranged in numerical sequence.

2) Mining District folios: (given to U.S.G.S. project monitors)

a) Prospect forms describing each property examined in the field.
Sample descriptions and analysis sheets accompany forms of sampled properties

b) Completed CRIB forms

3) Maps: (given to U.S.G.S. project monitors)

a) USGS 7 1/2' and 15' topographic maps showing sample locations and prospect names.

b) Maps of underground workings complete with sample site locations, and sketch maps from brunton and tape surveys with sample site locations.

In addition to this information, topographic field sheets and field notes are on file at the Nevada Bureau of Mines and Geology. Also, splits of all the samples taken as well as selected hand specimens have been retained at the Nevada Bureau of Mines and Geology. This material may be useful for additional studies in selected areas.

In reporting on this project, no attempt has been made to compile detailed geologic information on the districts. Since this project was a mineral inventory, our efforts were confined to acquiring geological and geochemical data on individual mines and prospects. Since no project time was available to collect new regional geologic data, local and regional geologic interpretations were derived from published geologic maps, unpublished subsurface maps and other pertinent literature sources. Good quality geologic maps at 1:24,000 scale are available for most of the test site while a regional overview can be obtained from the Nevada bureau of Mines and Geology Bulletin 77, Geology and Mineral Deposits of Southern Nye County, Nevada by Henry R. Cornwall (1972). A series of unpublished maps and reports on the Oak Spring tungsten deposits by H.H. Witt (1938), D.G. Wyant (1941) and G.G. Gentry and H.K. Stager (1958) were especially helpful in understanding the history and geology of tungsten deposits associated with the Climax Stock. Description of the adjacent mining districts in Nye County, outside the project

area to the west, can be found in N.B.M.G. Open-File Report, 83-11, a Mineral Inventory of the Esmeralda-Stateline Resource Area, and Open-File Report 83-12, Results of geochemical sampling within the Esmeralda-Stateline Resource area.

NEVADA TEST SITE

CALICO HILLS AREA

The Calico Hills area is located north of Jackass Flats approximately 6 miles north of the Cane Springs road on the Nevada Test Site. Most of the surface exposures within the hills are composed of highly altered and brightly colored tuffs that have been bleached and iron stained leaving vivid shades of orange and red. According to Maldonado and others (1979) the Calico Hills are part of a dome, elongate in a northeastern direction. The extensive radial fracturing along the margins are attributed to the doming and to high angle basin-and-range faulting. The oldest rocks within the structure are Devonian dolomites (Devils Gate Formation) that were thrust over argillites and quartzites of the Mississippian Eleana Formation. This assemblage is overlain unconformably by rhyolite flows and tuffs of Miocene age. The central core of the structure has been intruded by small rhyolite plugs that form small resistant knobs of brecciated and or highly silicified material (Orkild 1970, and McKay 1964).

Three shafts and five prospects are located on the western margin of the dome structure and all are in limestones and dolomites of the Devonian Devils Gate Formation. These upper plate rocks are highly fractured and are crosscut by quartz and calcite veins. The mine workings are along vein filled fractures. These veins display gossans on outcrop and consist of quartz which carries chalcopyrite, pyrite, malachite, azurite and other minor sulfides. No buildings or mine structures in this area are intact and the underground workings are not accessible. The complete absence of roads may be a measure of the age of these mines.

Prospects in the central and southeastern parts of Calico Hills area are associated with brucite and minor barite mineralization and are along contact zones. Surface examinations and assays from these sites revealed no anomalous mineralization. A 2500 foot hole was drilled in 1978 along the southwestern side of the dome. The drilling was done in an attempt to characterize an intrusive that had been delineated by geologic, aeromagnetic, and regional gravity data. The principal objective of this project was to identify a large homogeneous rock mass having the right characteristics for a high level nuclear repository. The drill hole penetrated argillites for the first 1360 feet and was in marble thereafter. Both units were determined to be in Mississippian Eleana Formation. The intrusive was not found.

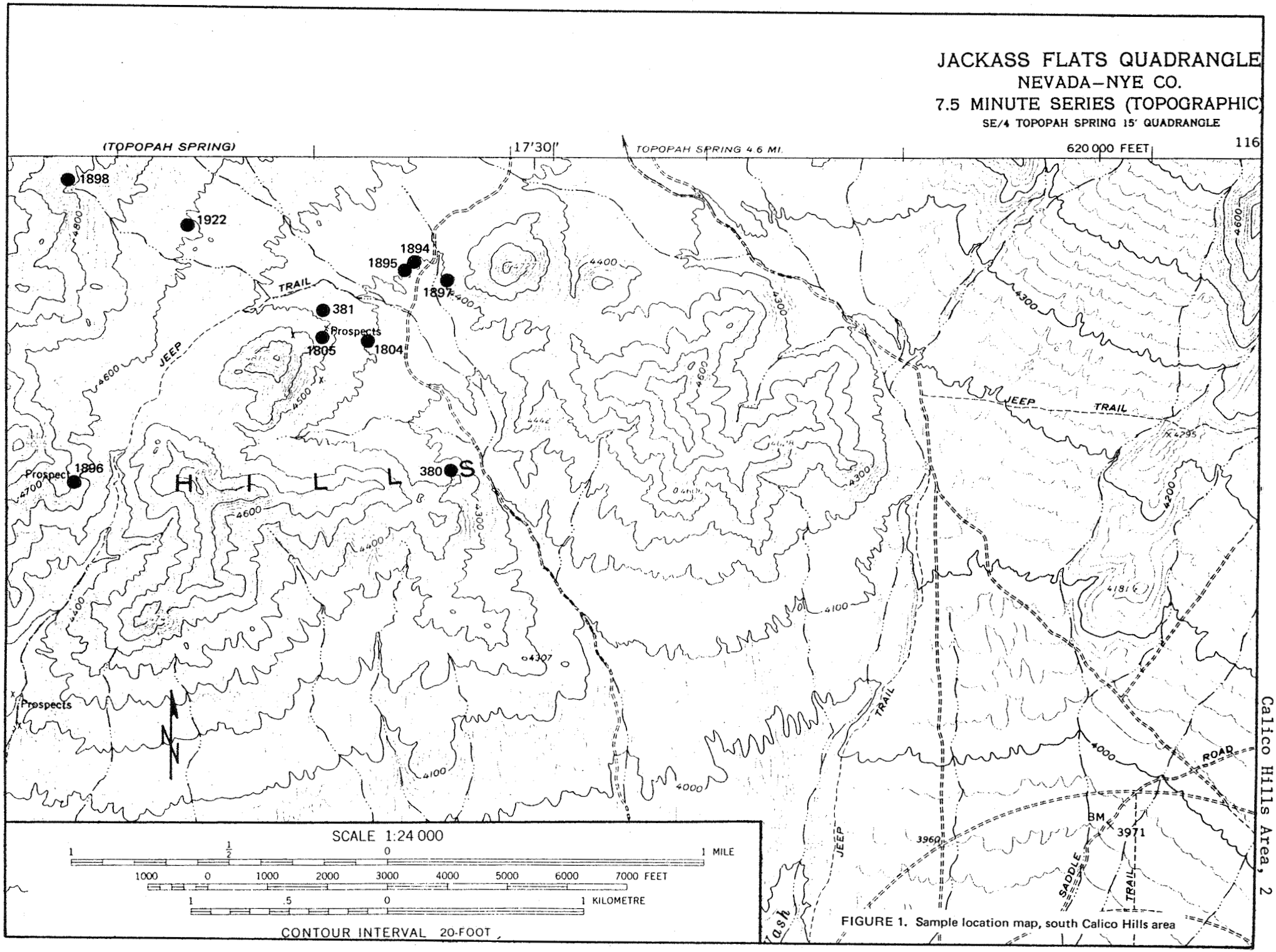


FIGURE 1. Sample location map, south Calico Hills area

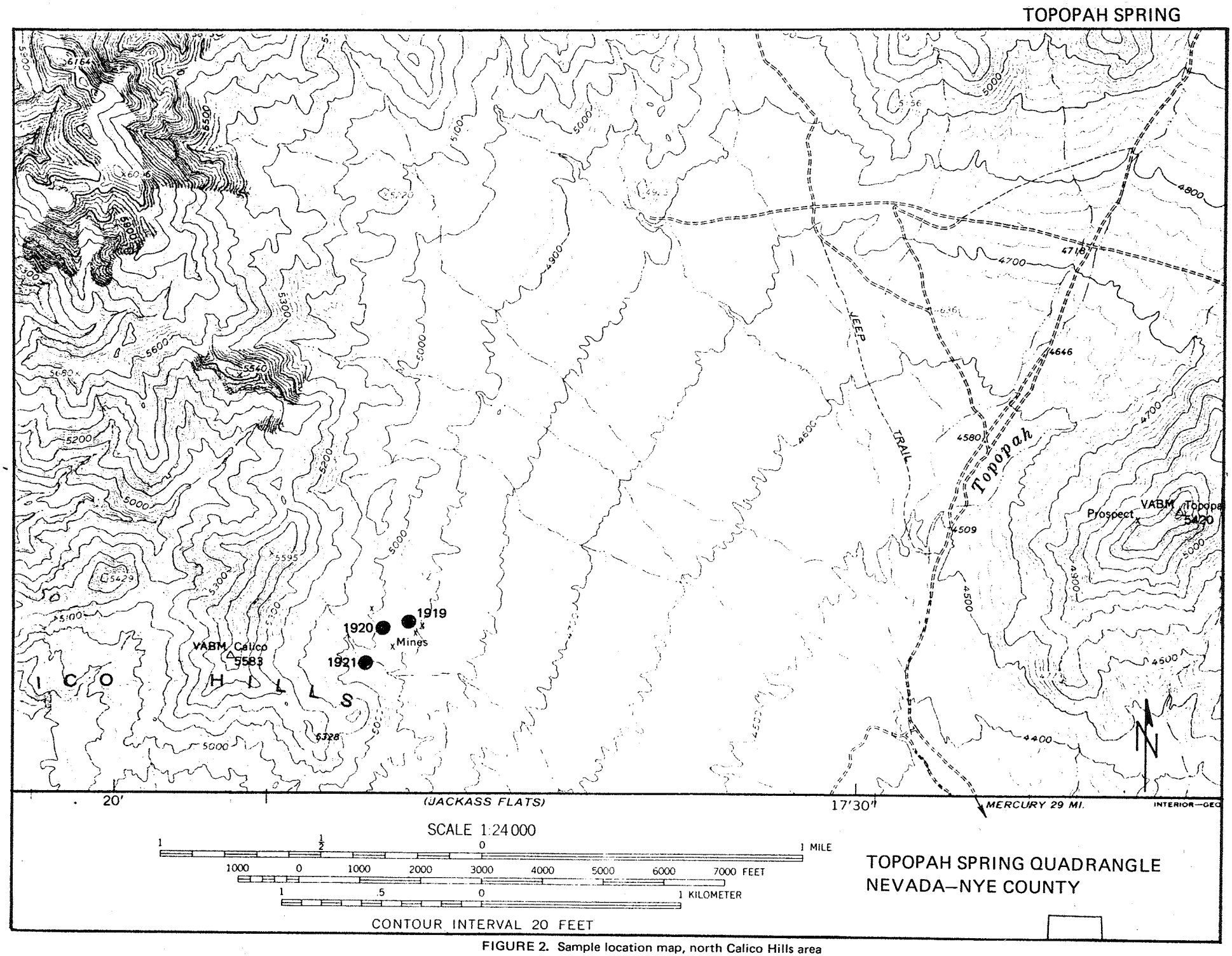


FIGURE 2. Sample location map, north Calico Hills area

Selected References

Cornwall, H.R. (1972) Geology and Mineral Deposits of Southern Nye County, Nevada: Bull. 77.

Maldonado, F., et al. (1979) Preliminary geologic and geophysical date of the UE 25a-3 exploratory drill hole, Nevada Test Site, Nevada: USGS Open-File Report 81-522.

McKay, E. J., et al. (1964) Geology of the Jackass Flats Quadrangle, Nye County, Nevada: USGS Map GQ 368, scale 7 1/2'.

Orkild, P.P., et al. (1970) Geologic map of the Topopah Spring quadrangle, Nye County, Nevada: USGS Map GQ849, scale 7 1/2".

MINE MOUNTAIN AREA

The Mine Mountain area is located approximately 7 miles west of Yucca Flat on the Nevada Test Site. The area straddles Mine Mountain from east to west at an average elevation near 5300 feet. Old claim notices found by earlier workers indicate exploration in the district began around 1928 (Cornwall, 1972).

On its crest, Mine Mountain consists of the Devonian Devils Gate and Nevada Formations which have been thrust over argillites and quartizites of the Mississippian Eleana Formation. At this location, the upper-plate rocks are highly fractured and faulted, and are limestones and dolomites with minor sandstone (Orkild, 1968).

The mine workings on Mine Mountain consist of four shallow shafts, four adits, and several groups of prospect-pits and trenches. The remains of two mercury retorts are also located on the eastern slopes of the mountain. One of these retorts is a make-shift arrangement below one of the eastern adits, the second is a masonry and pipe job, close to the main road into the district on the east side of mountain. The presence of retorts suggest an attempt was made to mine and process mercury ore at some earlier time. There is however no record of mercury production from the district.

Nearly all of the mining activity in this area has been restricted to vein systems along high angle faults in the upper-plate rocks. The veins are commonly composed of brecciated quartzite, silicified dolomite, quartz, barite and sulfides. A group of aligned prospects on the eastern side of the mountain follows a N10^{o}W, 65°N, shear. Exposed within these prospects is a 5 foot vein of white barite, some quartz cemented breccia, and minor sulfides. the vein is exposed along its strike for over 300 hundred feet. Four samples from within the system were very high in barite, two contained close to a half ounce of silver and one was high in lead and zinc.

All four shafts and the associated vein are aligned along the crest of the mountain in an approximate N50^{o}E direction. The shafts are open holes without timbers so sampling was limited to the adjoining dumps. Dump materials consisted of silicified breccia, crystalline barite, quartz with fine-grained crystals of unidentified dark metallic minerals, and traces of cinnabar. The vein material from the westernmost shaft was a gossan-like iron stained breccia.

Two northeast trending adits and several adjacent prospects are on the western side of Mine Mountain. The upper adit follows a N45^{o}E, 35°NW shear zone in a section dominated by silicified dolomite with minor quartzite. The two prospect pits located above the upper adit expose a 3 foot wide vein in the shear zone. The lower 135 foot adit explores the same shear lower in the structure, that bears N40^{o}E and dips at a steep NE inclination. The wall rock along the structure is mostly quartzite. About 30

feet from the portal, some low angle faulting that may be the Mine Mountain thrust follows the ceiling of the adit. The central adit is along a N30°E 60°SE shear zone with several crosscuts that explores a vein parallel to the main breccia zone. The eastern adit is on a N20°W steeply dipping shear in silty dolomite. The structure crosscuts another fault at a N60°E direction. In general, the aditis have followed vein within shears and have little or no lateral exploration.

Samples were collected from adits, dumps, and adjoining prospects in this district. The materials sampled were limestone, dolomite and quartz breccias with barite, quartz vein material with fine-grained crystalline barite and minor quartz.

Assays showed barium to be anomalous throughout the district. A combination of sulfides of lead, antimony, zinc, mercury, arsenic and silver accounted for most of the dark-gray metallics seen throughout the vein systems. Mercury was not analysed directly but was identified in samples examined on the microprobe. Lead, antimony, and arsenic were close to or above dection limits on the spectrograph for seven samples. Twelve samples were analyzed by fire assay or atomic absorption. Although present in trace amounts in some samples, gold did not exceed .03 ounces per ton for any of these twelve samples. Three of the silver assays exceeded a half ounce per ton, one was greater than 4 ounces, and two samples from the south central adits assayed 16.89 and 20.37 ounces of silver per ton. Lead, mercury, antimony and silver dominated the mineral assemblage in the two selected samples examined on the microprobe.

Cornwall (1972) reported that Harley Barnes and others of the USGS had examined the workings in 1963 and had collected a number of samples. Only one sample, a brecciated quartzite, contained significant amounts of ore minerals. It assayed 10 percent significant amounts of ore minerals. It assayed 10 percent lead, .05 percent mercury, and 0.07 percent silver.

Summary

Although gold was not anomalous in the limited sample set, a general model for a disseminated gold deposit clearly fits the lithologies, structures and geochemistry of Mine Mountain. Expanding the size of the study area in the same environment is strongly indicated.

Selected References

Cornwall, H.R. (1972) Geology and Mineral Deposits of Southern Nye County, Nevada: NBMG Bull. 77.

Orkild, P.P. (1968) Geologic Map of the Mine Mountain Quadrangle, Nye County, Nevada: USGS Map GQ-746, scale 7 1/2".

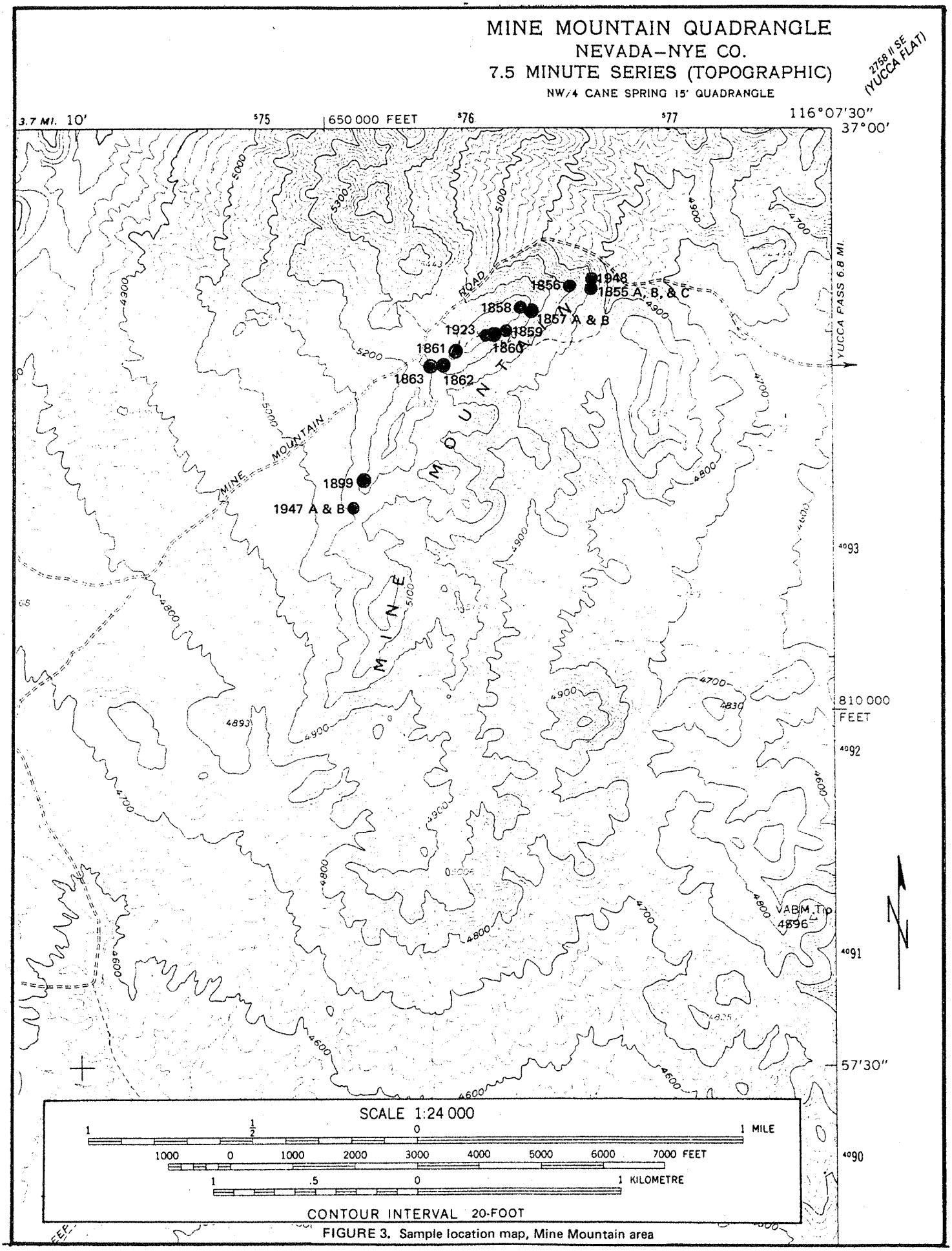


FIGURE 3. Sample location map, Mine Mountain area

OAK SPRING DISTRICT

The main part of the Oak Spring mining district is on the southern edge of the Belted Range, just north of Yucca Flat on the Nevada Test Site. Mineral deposits in this area are in Paleozoic and Precambrian sediments that have been intruded by granites and then covered, unconformably, by Tertiary vocanics. The Paleozoics are mostly limestones and dolomites of the Ordovician Pogonip Formation while the Precambrian rocks are predominately quartzites, shales, siltstones, and limestones of the Wood Canyon Formation and Sterling Quartzite. The geology of the Oak Spring and Jangle Ridge 7 1/2' quadrangles were mapped by Barnes, et al. (1963 and 1965). These two quadrangles cover most of the Oak Spring district.

Mineralization within the sediments in the district is related to Mesozoic intrusive granites that crop out near Oak Spring and six miles to the southeast at Twinridge Hill. Using extensive geologic and geophysical data Maldonado (1981) offers convincing evidence that the Climax Stock and Twinridge Pluton form a continuous crystalline body at depth. An associated zone of mineralization and alteration approximately 3 1/2 miles long extends to the southeast from the Climax Stock. Included within and along this alteration zone are the mines contiguous to the Climax Stock and the Michigan Boy and Rainstorm Mines to the southeast near the Twinridge Pluton. In addition to these main properties, there are many smaller properties within the district where shallow shafts, adits, prospect pits and trenches explore mineralization associated with tactite or with quartz vein systems.

West Side of District:

The initial activity in this district began about 1905 in the general vicinity of Oak Spring on the northwest side of the Climax Stock. These early efforts were directed at developing quartz veins reported to be carrying gold values, some silver, and gem quality chrysocolla (Ball, 1906). Lincoln (1923) reported that a shipment of copper ore containing a little silver was made from the area in 1917 but no other production was reported. The only structure now still standing from the early mining period is a stone cabin, below Oak Spring, that was later reoccuppied by George Tamney in the 1930's. This then became known as Tamney's Camp (Witt, 1938).

The area above the Tamney's Camp is shaped like an amphitheater and the mine workings within it are found along an arcuate shaped contact between limestones and granodiorite at approximately the 5900 foot elevation. Here the granodiorite of the Climax Stock has been highly fractured and shows local zones of argillic, chloritic and silicic alteration. Included within the large granitic mass are lens-shaped dikes of fine-grained feldspathic igneous rock that are commonly red from iron staining. Up slope, above the mine workings is a highly visable skarn zone of dark-brown garnetiferous ledges.

The major mine workings in this part of the district are two inclines that are partially caved and three adits, only two of which are accessible. The easternmost adit has an M-9 designation on the entrance, and has the most extensive underground workings. The other accessible adit is located at sample site 1827 (see enclosed maps).

Selected dump samples from this area contained galena, chalcopyrite, bornite, sphalerite, wulfenite, pyrrhotite, malachite, azurite, as well as copper, iron, and manganese oxides and unidentified sulfides. Most of this mineralization occurs in quartz. The quartz occurs as veins along shears in bedding planes along the contact zone and as quartz replacement in limestone. Some of the veins display boxworks or open spaced cockade structures, others were brecciated.

Five of the six dump samples assayed were anomalous in silver, three contained close to an ounce or more silver and two had over 8 ounces silver. All of the samples had high values for copper, lead zinc, and molybdenum, and three were high in antimony. Gold was detected in all of the samples but the values were very low.

The M-9 adit had some minor caving at the entrance, but even without timbering the ground stands well because so much of the contact zone is silicified. The main M-9 adit bears N20^{o}E for approximately 240 feet. At this point, near the face, a sample was taken of marble rock containing small flecks of scheelite and powellite. The sample assayed high in molybdenum, lead zinc, and tungsten. Another sample from the southeast bearing drift, off the main adit, was anomalous in copper with minor molybdenum. The 195 foot, north-trending adit at sample site 1728 was sampled along a fault and near the face. Assays from both samples showed low concentrations of tungsten and molybdenum. Clearly, there has been postdepositional movement along the fault as there are coarse, ghost-like blebs of scheelite smeared on slickensides on the fault trace.

Wyant (1924) reported "The tunnels and prospects in the vicinity of Tamney's Camp have been dug for silver and do not contain scheelite according to George Tamney". Oddly enough, this seems to have been an accepted conclusion, as none of the previous workers reported tungsten in this part of the district. However, our samples and UV traverses in two of the older adits showed the presence of scheelite (and probably powellite) in both. If there was an awareness by earlier workers of this tungsten mineralization it is clear from our examinations that no attempt was ever made to mine or develop it.

Our samples 1872 thru 1876 were taken from veins and outcrops in an area of intense silicic alteration that caps the north end of the Climax Stock. The altered area was identified by Houser and Poole (1960) and is outlined on their geologic map of the area (Map I-328). A sample of reddish-purple iron stained quartz vein material from this area was high in molybdenum but was generally low in other elements. The only other anomalous sample in the silicic zone was a hematitie stained, partially brecciated vein outcrop that was high in arsenic and molybdenum and contained lesser amounts of lead, antimony and tungsten. The sample

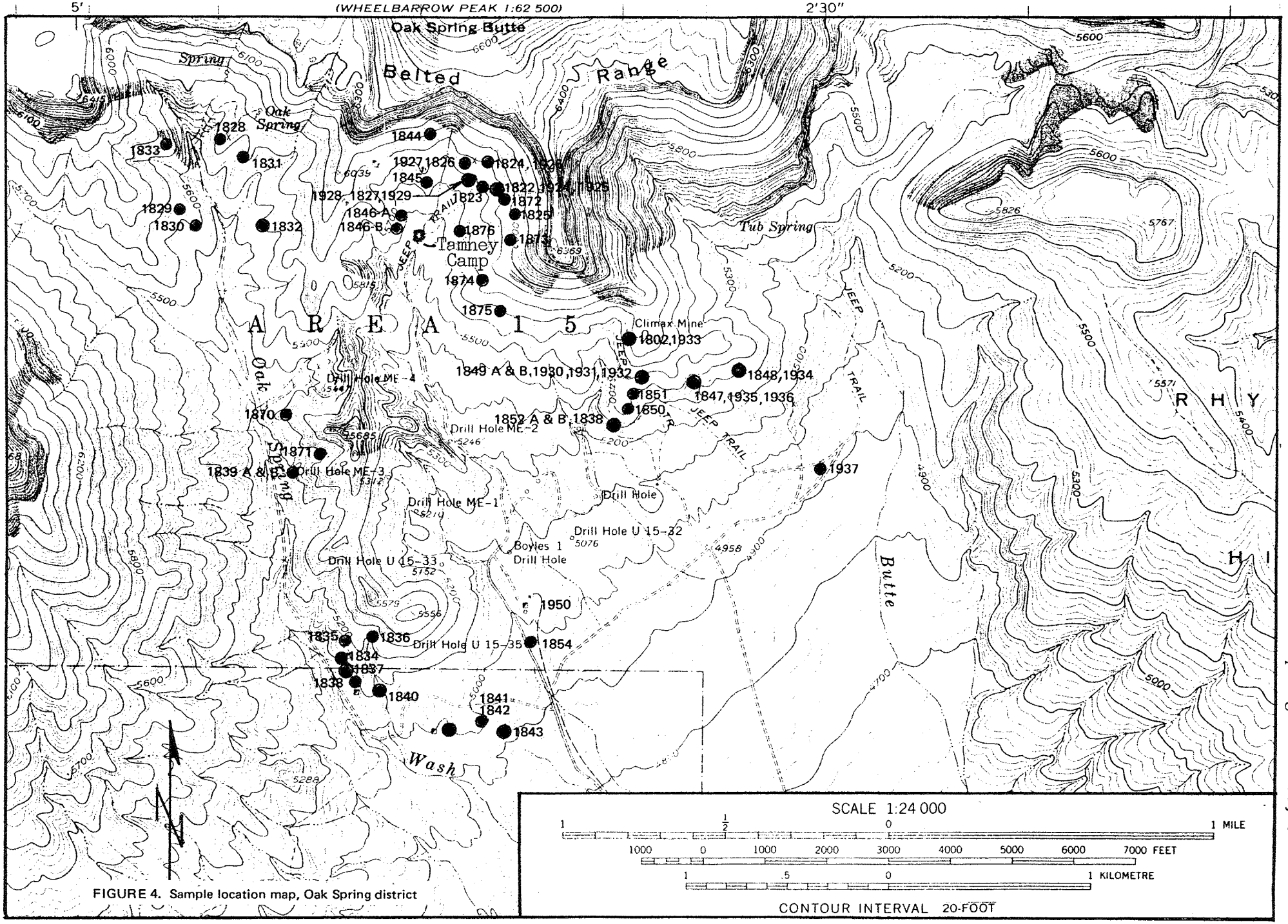
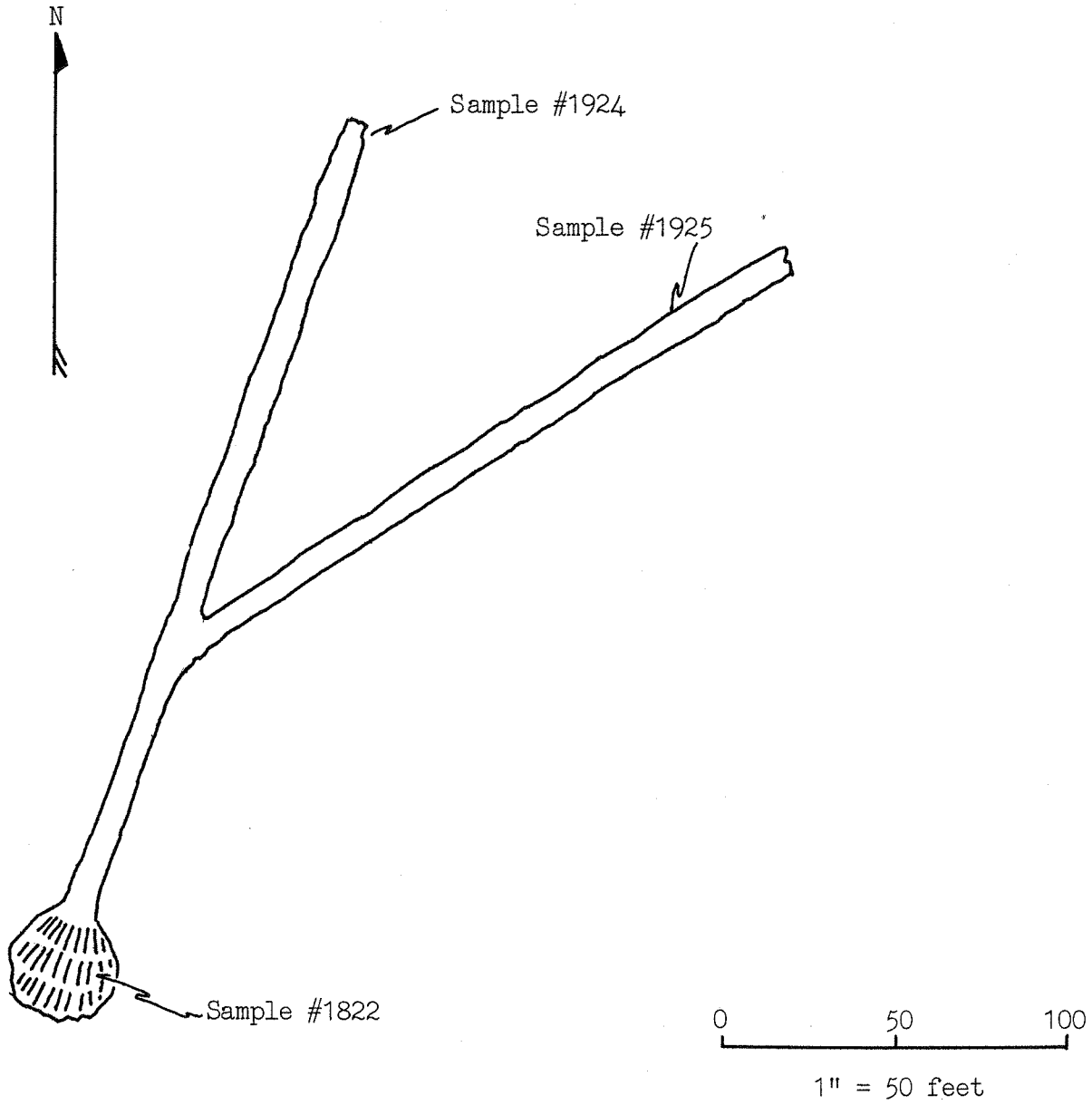


FIGURE 4. Sample location map, Oak Spring district

M - 9 ADIT
Oak Spring District
(Older, West Section of the District)
Nye county, Nevada

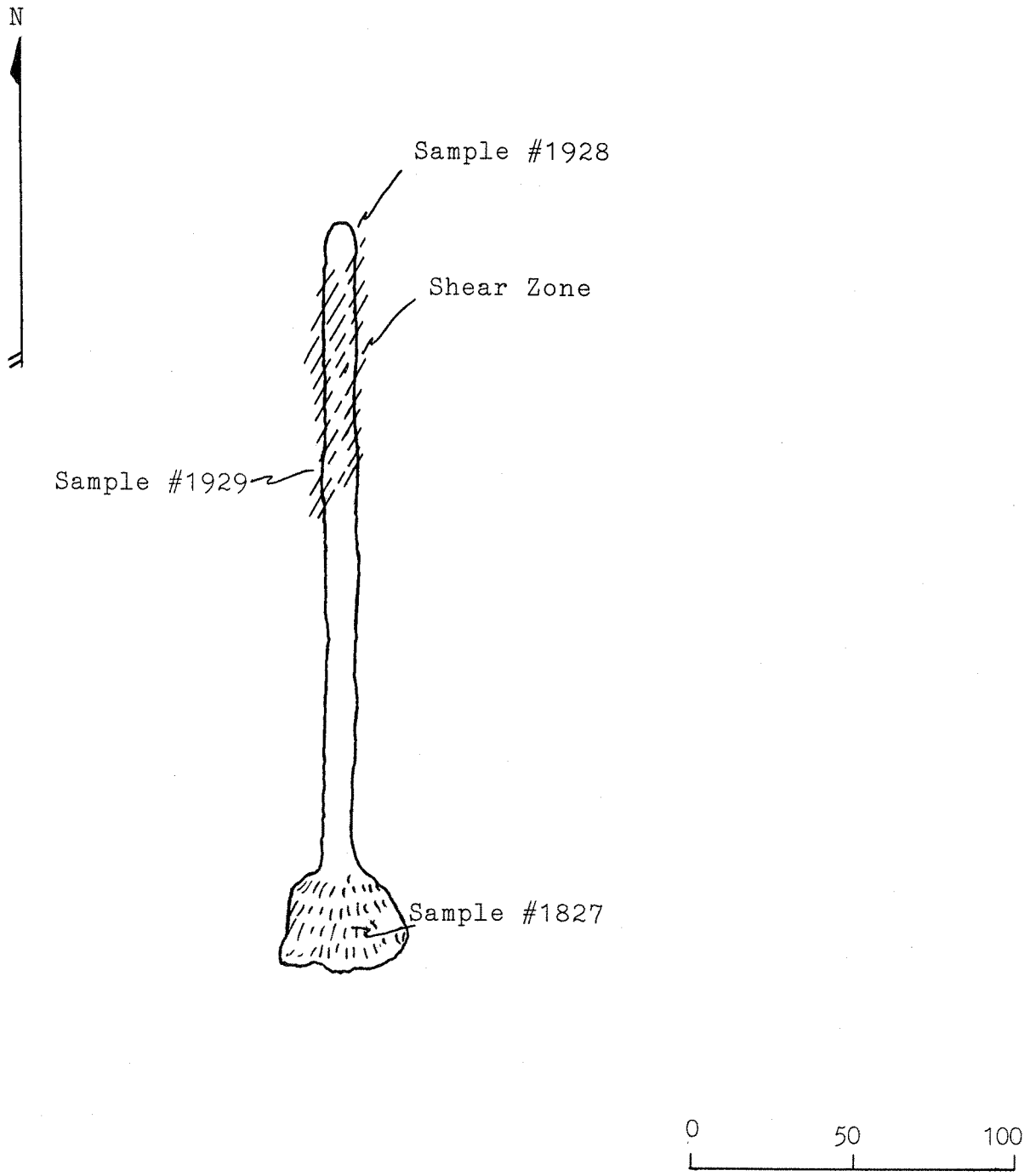


Map by Jack Quade 1983

FIGURE 5.

Sample Locations 1827, 1928 and 1929

Oak Spring District
(Older, West Section of the District)
Nye County, Nevada

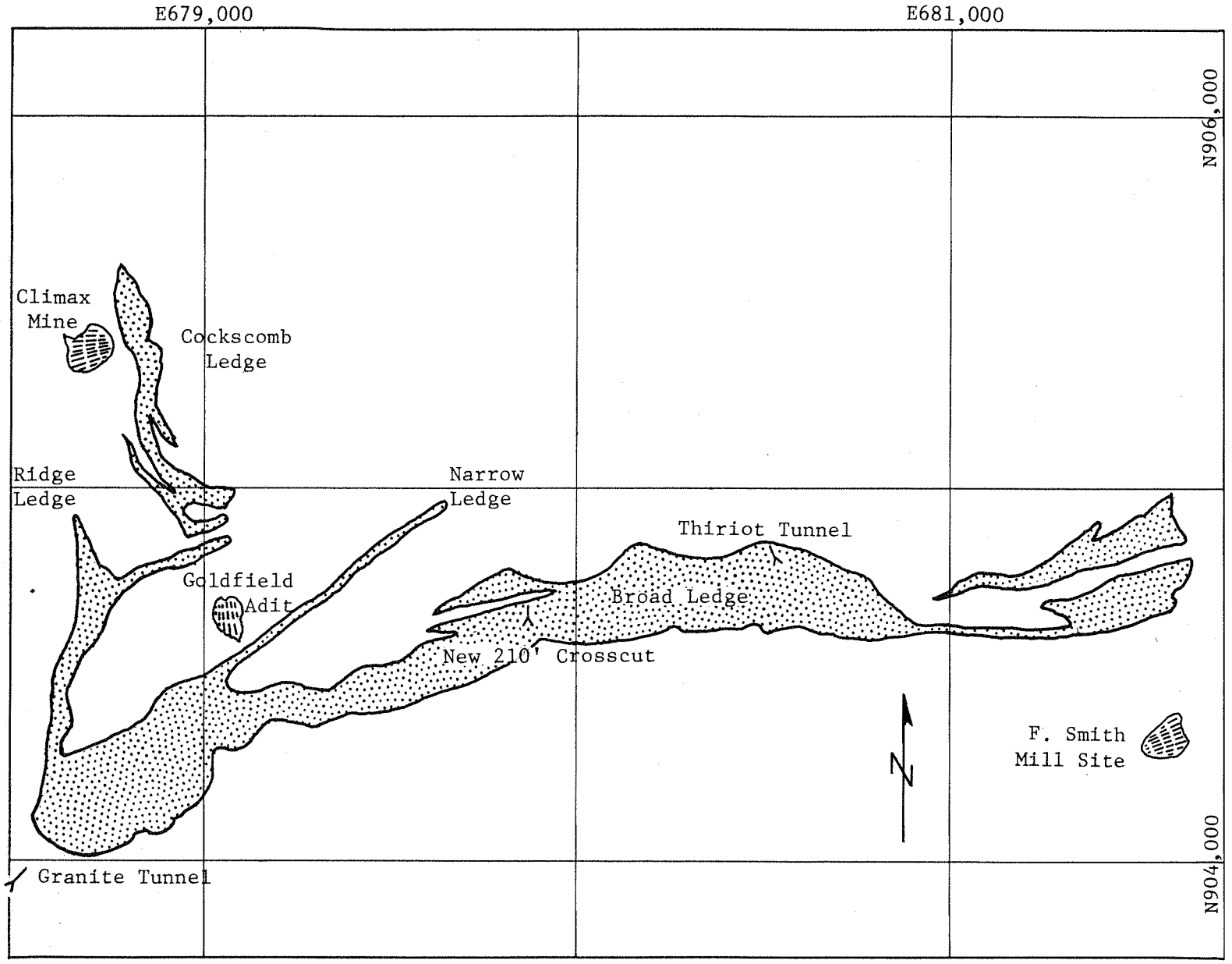


Map by Jack Quade 1983

FIGURE 6.

TAMNEY PROPERTIES

showing location of
Tunnels and Ledges
Oak Spring District (East Portion)
Nye county, Nevada



tactite-modified from outline shown on map GQ-328, Houser and Poole, 1960.

0 400 800
1" = 400 ft.

Base map from Dept. of Interior and
U.S. Geological Survey map I-328,1960

Jack Quade, 1983

FIGURE 7.

also assayed nearly one ounce of silver.

The gem quality chrysocolla reported by Ball (1906) came from three shallow shafts and numerous prospects along the north half of Oak Spring Wash. The chrysocolla was in veins along fractures in the limestones and tactites. Many of the veins had a strong hematite or gossan-like alteration and the secondary mineralization oxides associated with them included malachite, jaspery chrysocolla, quartz, azurite, manganese oxides and calcite. Samples 1828 thru 1833 and 1871 were from chrysocolla properties. With the exception of a sharp decrease in molybdenum, the results were very similar to the Tamney Camp samples; high copper, lead and zinc values, lesser antimony and silver values.

A small shaft about 800 feet southwest of Oak Spring yielded an exceptional sample. It was anomalous in copper, lead zinc, arsenic, bismuth, nickel, tin, molybdenum and silver. It had the highest nickel value detected on the Test Site by our sampling and values were above the dection limits for copper and bismuth. The silver content was 8.75 ounces. The high degree of oxidation and iron staining masked the metal content of these samples in the field.

East Side of the District:

A second period of activity in the district began in 1936 when George Tamney and son staked the northeast portion of the Climax Stock for tungsten. The Tamney's were acting on information supplied by Wesley Koyen and George Thiriot and Tamney acknowledged the favor by staking claims for Koyen and Thiriot as well as for himself.

The Tamneys leased their property to the Goldfield Mining Company in 1937, who, in turn subleased the property to the U.S. Vanadium Corp. The Vanadium Corp. did an extensive sampling of the outcrops and decided the tungsten grade was too low for an open-pit operation and dropped their option. Apparently, Goldfield Mining liked the the assays and dug several adits to explore the main tactitle bodies, the Cockscomb and Broad Ledges. Goldfields' efforts were discontinued in 1940 and the property reverted to the Tamneys who then leased it to Howard Melaney, a former Goldfield employee. Mr. Melaney interested the Pacific Bridge Company in the property and they drove the Carlisle Adit which intersected the main Cockscomb orebody. The mine then produced about 1000 tons of ore that averaged .54 percent WO_3. Most of this ore came from the Gould Stope developed off the Carlisle Adit. Shortly thereafter, the area was incorporated into the Air Force Gunnery Range and was closed to mining.

Operations at the eastside tungsten properties were resumed in 1956 when George Tamney and his partners W.A. Kinney and A.J. Wright, co-owners of the Climax Tungsten Corp., entered into a co-use agreement with the A.E.C. The company started work under a DMEA contract on December 11, 1956 but discontinued operations on May 8, 1957 due to nuclear testing. Work did not resume thereafter and the contract was terminated in December 1957. During the contract the company operated entirely from the Carlisle Adit, drifting and winzing 237 feet and drilling 190 feet of test holes. The work was along and below the adit level and within the

Cockscomb ledge. No ore was produced during the contract nor was any new ore developed (Gentry and Stager, 1958).

In December, 1982, permission was obtained to enter the Climax Mine and adjacent underground workings as part of our evaluation effort. During these examinations a UV lamp was employed and samples were taken. A set of maps and sketchs (some original and some modified) of the underground workings was available from Wyant and Byers (1941).

The Carlisle Adit bears N80°E for a distance of 180 feet to a wooden bulkhead which completely blocks the passage way. The first 30 feet of the adit is in limestone that is in fault contact with a tactite body that extends the remaining 150 feet to the bulkhead. The bulkhead is near a granodiortie intrusive which is itself cut by an oxidized vein with strong tungsten shows. The vein also follows a contact between the grandoiorite and a marble. Sample 1933 is from the vein system and assayed high in tungsten as well as in copper and zinc.

According to a map by Wyant (1941) the wooden bulkhead is very near the orebody that the Pacific Bridge Company intercepted when they drove the adit in 1941. At this point the adit level is only 75 feet below the surface and crosscuts the orebody at an angle close to 90 degrees. The north-south trending orebody divides at depth into three parts with a total length of 135 feet and a width of 6 feet and an average grade of 1 percent WO_3. (See enclosed maps)

The Goldfield Adit is approximately 250 feet below the Climax Mine at an elevation of 5475 feet. It was dug in Pogonip limestone by the Goldfield Mining Company in 1939. The 900 feet of workings were intended to explore the north-south trending main Cockscomb Ledge at depth but failed to do so. Later workers suggest the orebody may be 10-15 feet beyond the face of the east drift (Wyant, 1941). The adit trends north for about 450 feet then splits with one drift going to the northeast and another to the northwest. Several 50-foot drifts trend to the east of the west drift. A 60-foot raise was dug off the main adit about 400 feet north of the portal. (See enclosed maps)

Three tactite zones were encountered when the adit was dug, all of them were along faults. The first is a coarse garnetiferous-tactite-scheelite vein system about 140 feet north of the portal. The 7-foot vein bears E-W at a high angle and was sampled across its width. The second tactite was cut by the adit about 430 feet north of the portal. The zone is about 25-30 feet wide and has low-grade scheelite dispersed throughout. The third zone is parallel to the west bearing drift starting at the intersection and extending 50-60-feet to the northwest. The tungsten mineralization appeared to be unevenly dispersed throughout the zone and would probably average out as low-grade. Both of the tactote zones assayed high tungsten, zinc and cadmium. No attempt has been made to mine and or to develop this exposed tungsten mineralization. Because a quartz vein in the marble carried visible sulfides it was sampled (1930) but the assays showed only minor copper, lead and zinc.

Considering how long the adit has been here and the fact that it has no timbers and is within a few miles of Yucca Flat, it is

CARLISLE ADIT
CLIMAX MINE
Oak Spring District
Nye County, Nevada

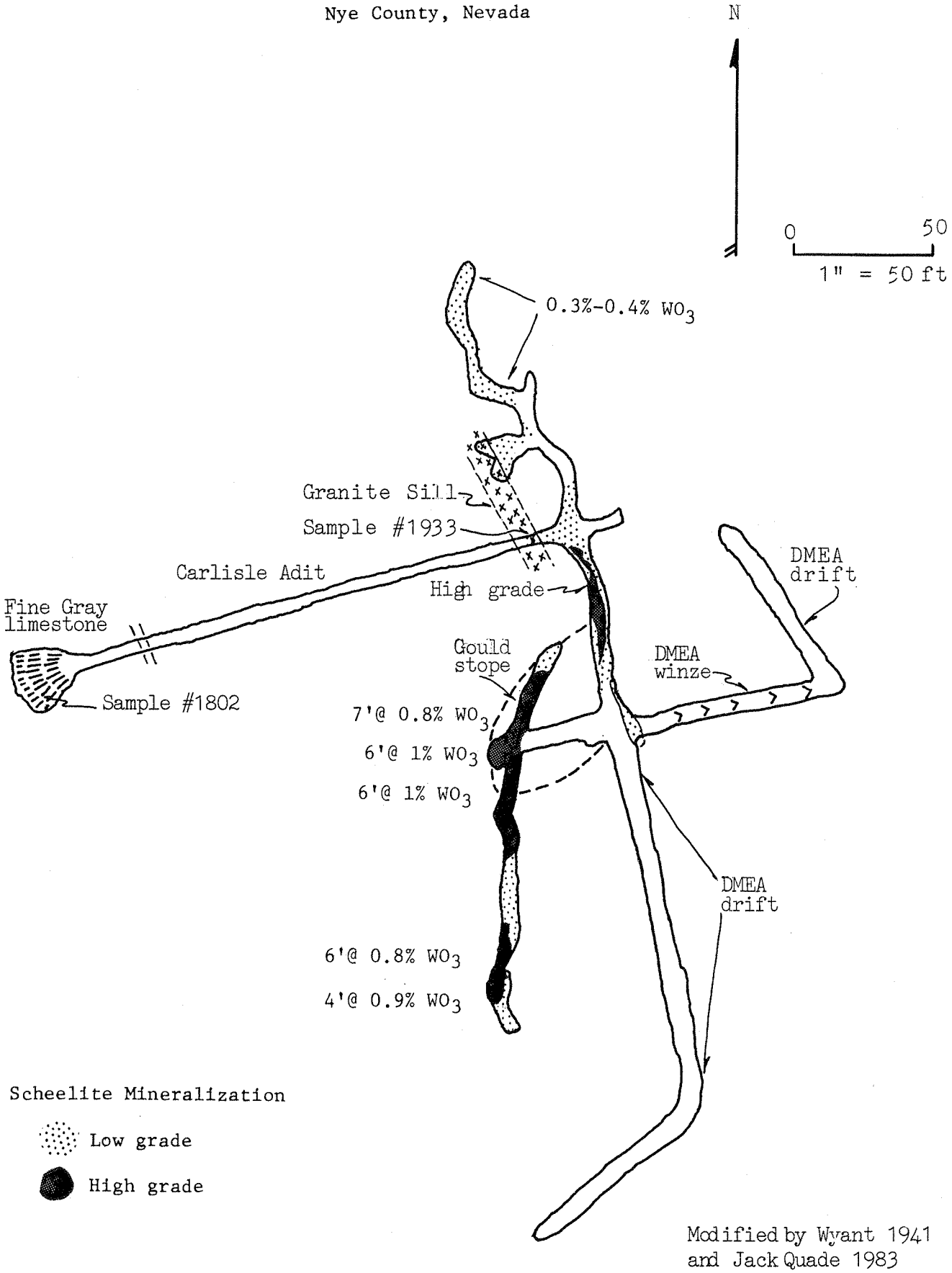
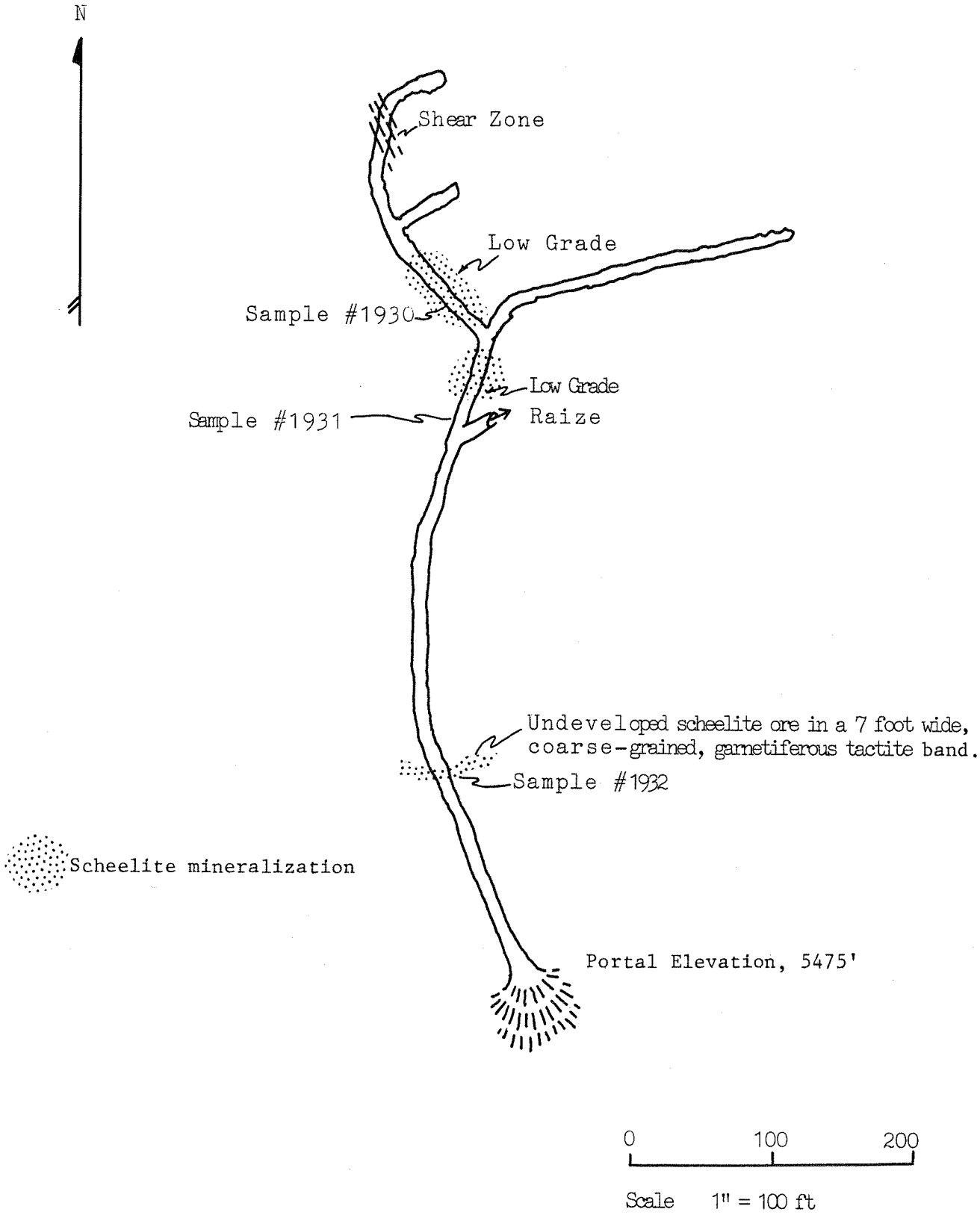


FIGURE 8.

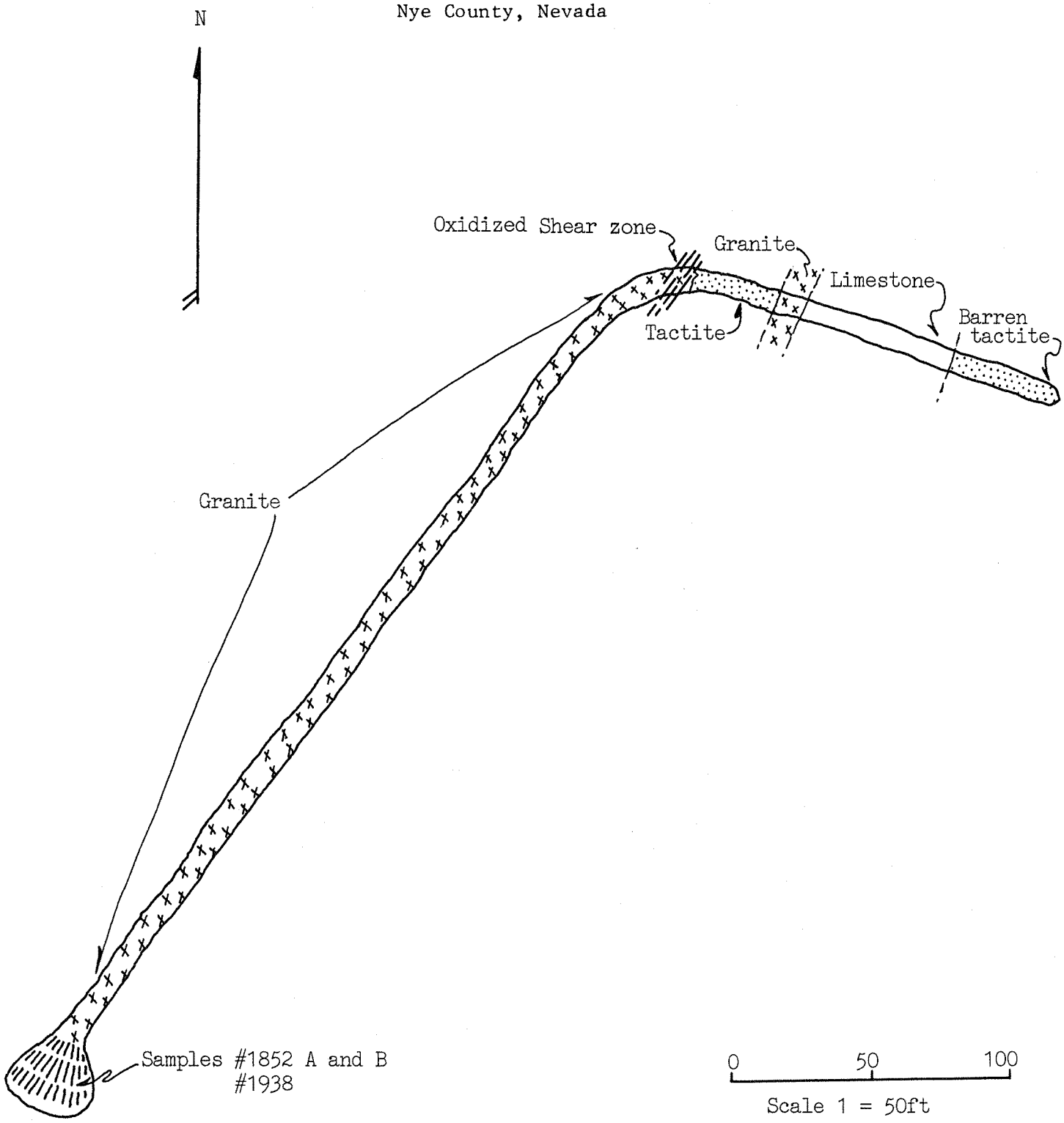
GOLDFIELD ADIT
(Goldfield Tunnel)
Oak Spring District
Nye County, Nevada



Map by Jack Quade 1983

FIGURE 9.

GRANITE TUNNEL
Oak Spring District
Nye County, Nevada



Map by D. G. Wyant and F. M. Byers, 1941

FIGURE 10.

in remarkable condition. The minor caving that has occurred is within the fault zones.

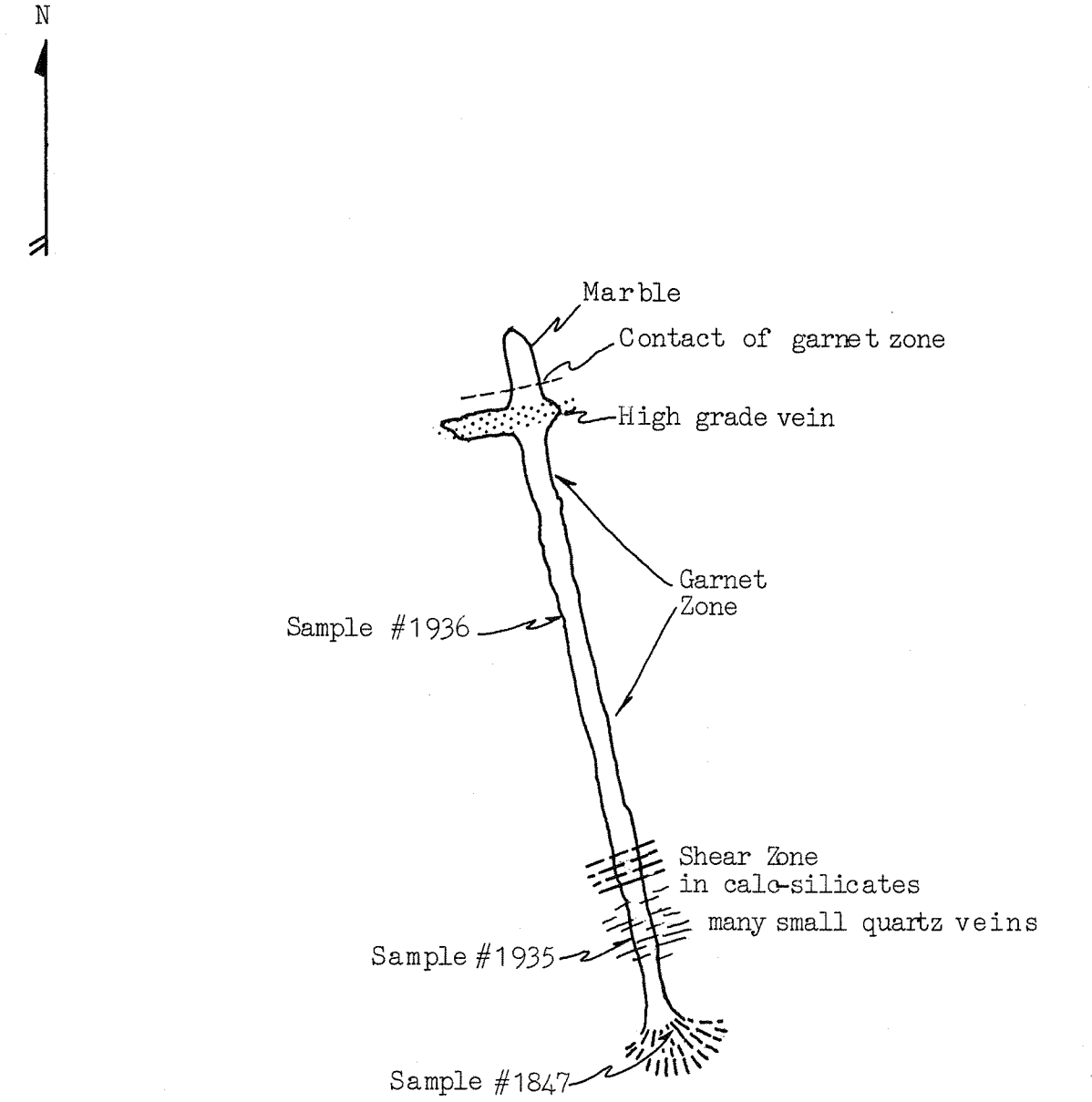
Below the Goldfield adit the sediments and granodiorite form a near ninety degree contact. This corner is also the intersection between the south trending Ridge Ledge and the western end of the Broad Ledge. It was in the direction of this junction that the Granite Tunnel was dug. The workings were started in 1939 by the Goldfield Mining Company and finished in 1941. The portal is now completely caved but a subsurface map by Wyant and Byers (1947) was available and was used to provide information on the property. (See enclosed map) The portal is in granodiorite below the contact at an elevation of 5280 feet. It was driven N35^{o}E for 350 feet in the granodiorite before contact was made with the sediments. At approximately 340 feet, the tunnel makes a gradual turn to about 75 degrees to the southeast. It continues another 200 plus feet in tactite and limestone through a granitic dike and minor displacements. Mineralization was limited to abundant pyrite near the turn and to minor shows of scheelite and powellite. Assay results from three dump samples were all low.

The New 210' Crosscut is another of the north trending adits dug in the early forties to test the potential of the Broad Ledge, a bedding plane replacement of limestone that forms a prominent reddish-brown cliff of garnetiferous tactite which has an outcrop about 175 feet wide and about 2400 feet in length. The adit crosscuts the east-west trending tactite zone about 350 feet north of the granite contact at an elevation of 5380 feet. The adit starts in fractured tactite cut by quartz and calcite veins, passes through a garnetiferous zone with low-grade scheelite and passes into a marble for about the last ten feet. There is a 20-foot long west-bearing crosscut about 190 feet north of the portal that was dug on a 5 to 6 foot vein of good looking scheelite mineralization. (See enclosed map) A representative sample of the garnet-tactite zones assayed as low-grade tungsten. The quartz-calcite-tactite zone assayed a little higher in tungsten and was moderately anomalous in zinc and copper. A selected sample from the dump assayed high in tin and zinc, fair in tungsten and low in copper and lead. In addition there was almost one ounce of silver, which turned out to be the highest precious metal value on the eastern side of the Climax Stock.

Another small adit to the east, known as the Thiriot Prospect or Garnetyte Lode Claims, explores the Broad Ledge starting at 5300 feet elevation. The workings are a northwest-bearing 20 foot long adit with a west bearing drift of another 20 feet and open trench cut about 25 feet long in front of the portal. The mine is reported to have produced about 2500 tons of 0.3 percent WO_3. (Stager, in prep.). The mineralization looks to be low-grade scheelite that occurs along seams in reddish-brown garnet rich tactite with lesser quartz and calcite veining. Samples from the mine and the open-cut confirmed the presence of low-grade tungsten mineralization.

In 1940, I.F. Smith leased the property from Dean Thiriot and Wesley Koyen and built a small dry concentrator southeast of the mine on the west side of Butte wash. Smith treated a small tonnage of ore from the Thiriot, Nevada Massachusetts Co. and W.A.

THE NEW 210' TUNNEL
(D.O.E. Site Designation M-7)
Oak Spring District
Nye County, Nevada



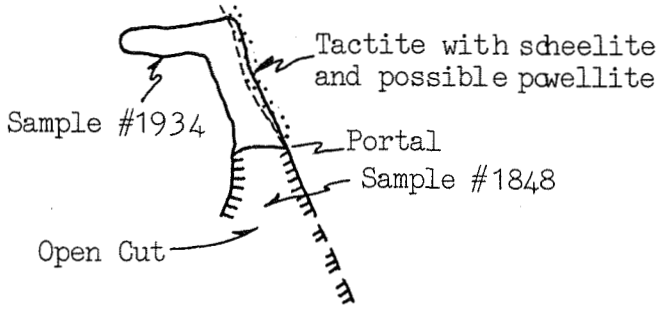
Scheelite Mineralization

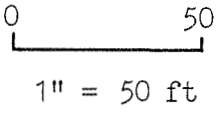
0 50 100
1" = 50 feet

Map by D.G. Wyant 1941
modified by Jack Quade 1983

FIGURE 11.

THIRIOT PROSPECT
GARNETYTE LODE CLAIM
Oak Spring District
Nye County, Nevada

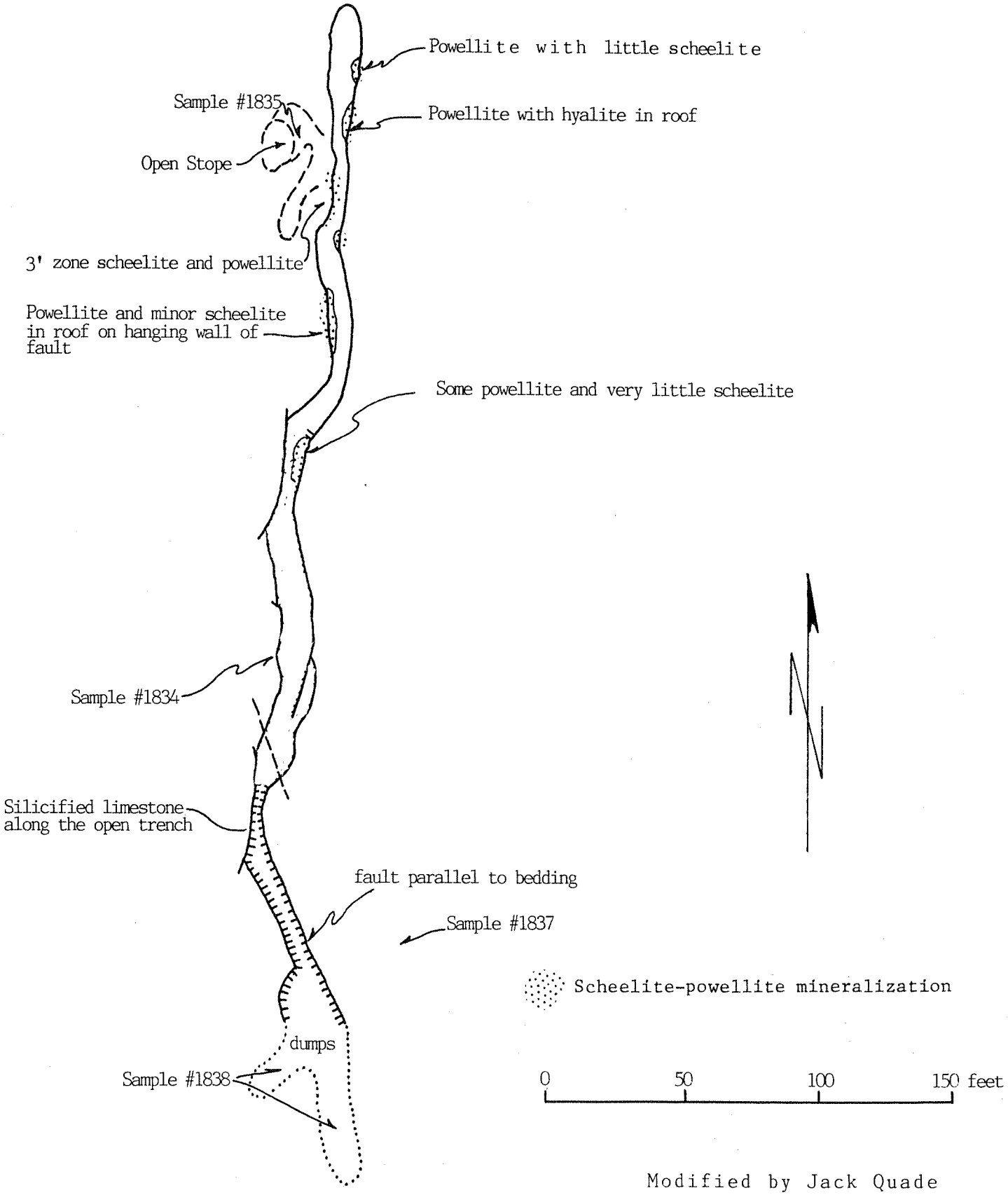




Map by D. G. Wyant 1941
modified by Jack Quade 1983

FIGURE 12.

NEVADA-MASSACHUSETTS ADIT-TRENCH
CRYSTAL PROSPECT
Oak Spring District
Nye County, Nevada



Modified by Jack Quade
from a map by F. M. Byers

FIGURE 13.

Smith claims before dismantling the mill in 1941.

The Crystal Prospect or Nevada Massachusetts Prospect is on the southwest side of the Climax Stock near the mouth of Oak Spring Wash at an elevation of 5100 feet. The site is thought to have been mined for precious metals as early as 1905. Scheelite, molybdenite and powellite were found here in 1908 (Stager, in prep.). the Nevada Massachusetts Company acquired the property in 1936 and is responsible for the 100 foot long north trending trench that continues underground for another 250 feet as a now inaccessible adit. When Wyant (1941) visited the property the workings were open and he and F.M. Byers produced much of the enclosed map.

The Crystal workings are entirely within a highly fractured and faulted coarse-grained, garnetiferous-tactite that is hosted in Pogonip limestone. The mineralization occurs as scheelite and powellite in small irregular bodies of tactite along the shear zone. Some of the tactite zone is crosscut by quartz stringers which contain minor sulfides. Most of the tactite zone is a mixture of oxidized materials including gouge, iron stained garnet rich tactite and silicified and broken limestone. Very little high-grade ore was seen along the zone or in the dump. Samples 1834, 1835, 1837 and 1838 were all taken from along and within the mine workings. Assay results showed some samples had fair grades of molybdenum and tungsten but most were low. One sample had nearly one ounce of silver, another had more than 4 ounces. No gold was detected. An estimated 200 units of WO_3 were produced from several hundred tons of ore mined before 1940.

Sample site 1840 is 500 feet to the east of the Crystal Prospect next to a small shaft on the contact between the Pogonip limestone and the quartz monzonite. The contact zone is filled with gossan-like material in silicified marble, and the quartz monzonite is coated with Cu-Fe oxides. Assay results from the mine sample were above the detection limit for copper, zinc, cadmium, and bismuth, with lesser amounts of tin and tungsten, and an ounce and a half of silver. The other three shafts and prospects at the mouth of the wash were sampled but the assay results were low.

A small adit and prospect pits on the east side of Oak Spring Wash, two-thirds of a mile north of the Crystal Prospect is the probable location of the W.A. Smith property. I.A. Smith (no relation) is reported to have hauled tungsten ore from this property to his mill near Butte Wash in 1941. The property contains a narrow, highly altered tactite zone which strikes north and dips close to vertical. The tactite zone has a strong dark-brown gossan-like outcrop stained with abundant copper oxides. Samples taken from dumps and prospects assayed high in copper with lesser values for lead, zinc, molybdenum and tungsten.

The Indian Trail Prospect or O.R. Spiers property starts about 500 feet northwest of drill hole ME-4 on the east side of Oak Spring Wash. The mine workings consist of a line north trending prospect pits in a narrow tactite lense that is hosted in Pogonip limestone. In 1940 about 110 tons of ore, containing 0.94 percent WO_3, were mined from 3 prospects and milled at a dry concentrator in the district, yielding a net worth of 1150 dollars

(Stager, in prep.). Apparently this milling did not take place at I.F. Smith's mill near Butte Wash.

The tungsten exploration at the Tamney properties has historically followed a pattern of surface sampling to identify anomalies, and then drifting from below at a projected intercept. For such a technique to work, the mineralization and vein (ledge) systems must have continuity from the surface to the projected levels and faulting, which may offset the veins, must be accounted for. In the case of the main Cockscomb ledge, early workers were able to project the mineralized tactite outcrops down 75 feet to the level of the Carlisle Adit, but even at that level, the ledge had split into three smaller veins. The later DMEA work was unable to project or develop these veins at depth, and the same veins, when projected to the level of the Goldfield adit have disappeared. Whether or not the vein systems are too erratic or have been offset by faulting or both are questions that need to be answered before the mining potential of this area can be determined.

A possible course of action might be to resample the surface anomalies to confirm the 1938 data that everyone used to identify the orebodies, re-map the structures using the underground workings and existing surface maps, and then from these data, form a drilling plan.

Using this data base, the area could be expanded to include the mines in Oak Spring Wash and the area north of Tamney Camp, and might also be projected to areas where the contact zone is not exposed.

Climax Stock:

The Pile Driver, Tiny Tot and Hard Hat complex has been the biggest mining project to take place in the Climax Stock and has been the only one to be located totally within the quartz monzonite. This facility was dug for the testing of nuclear systems and is now in use as a high level nuclear storage facility. During the digging of the 1367 foot Pile Driver shaft and adjacent adits, minor mineralization was encountered consisting of chalcopyrite, pyrite, and molybdenite. Some of this mineralization is along fractures, some is in pink potassic alteration envelopes an some is disseminated through the matrix of monzonite. Much of the coarse-grained pyrite, chalcopyrite and molybdenite was associated with the pink potassic envelopes and with minor quartz veins, although some of the mineralization was disseminated in the matrix. Besides the quartz and potassic alteration, some chloriric alteration of biotite was in evidence. Similar mineralization can be seen in the dumps. There has been no attempt made to assess the size and grade of the mineralization. Assays from samples collected in the Pile driver adit and dumps generally had very low metal values.

Michigan Boy Mine:

The Michigan Boy Mine is located in a low swale 2 miles northeast of Yucca Flat and approximately 4 miles southeast of the Climax Stock. The old mine workings are at 4500 feet elevation and occur entirely within the laminated quartzites, siltstones and

shales of the Wood Canyon Formation of lower Cambrian age.

The 50 foot, inclined Michigan Boy shaft, eight prospects pits and another shallow shaft are aligned along a N40°E quartz vein system. Within this system, 6 to 12 inch veins are inclined as much as 60 degrees to the northwest in the southern prospects but appear to flatten out to the north. The veins have been emplaced along and within fault structures evidenced by drag folds in sediments adjacent to the fault. The vein material is vuggy white quartz with abundant copper-iron-manganese oxides, (malachite), pyrite and other sulfides. Alteration products along the brecciated vein-fault zone include limonite, hematite, jasperoid, and silica.

A brunton and tape survey was made of the area around the Michigan Boy shaft (see enclosed map). Assays from the eleven Michigan Boy samples averaged a little over 3 ounces of silver per sample and most had very high values for lead. However, none of the argentiferous galena reported by Kral (1951), was observed in the dumps or mine workings. Most of the samples had high copper values and seven were high in arsenic, barium and antimony.

About a half mile northeast of the Michigan Boy Mine is a group of prospects that were identified by old claim notices as the Prince Claims. All of these claims are located within the Precambrian Sterling Quartzite. The three major prospects that were sampled are in a N55°W alignment along brecciated quartz veins that range in width from 6 inches to 3 feet. In addition to being brecciated, the vein is cut by brown or tan jasper and opaline quartz. Mineralization consists of clots and streaks of malachite, azurite, and hematite after pyrite. Assays for three samples taken here were high in copper, lead and zinc and averaged a little over one ounce of silver per sample.

The mineral potential of the Michigan Boy Mine and area could be better understood by a program of trenching, sampling, and mapping and then drilling if the results were positive. These results might then be expanded to include adjacent prospects.

Twinridge Pluton Area:

The Twinridge Pluton is a quartz monzonite that crops out on the eastern side of Twinridge Hill in the Halfpint Range about 4 miles southeast of the Climax Stock. Maldonado (1981) offered a convincing line of evidence that the pluton may be genetically related to and possibly coalesce with Climax Stock at depth. The pluton intrudes quartzite and siltstone of the Precambrian Johnnie Formation. A zone of contact metamorphism exists along the margins of the pluton where it is in close proximity with sediments of the Rainstorm member of the Johnnie Formation. The exposed contact zone is about one mile in circumference.

A traverse was made of the exposed monzonite and breccia and dike material. No visible mineralization was found along, above, or below the contact zone or within the altered or unaltered monzonite. Assay values were generally low for metal in all three samples but were moderately high for barium.

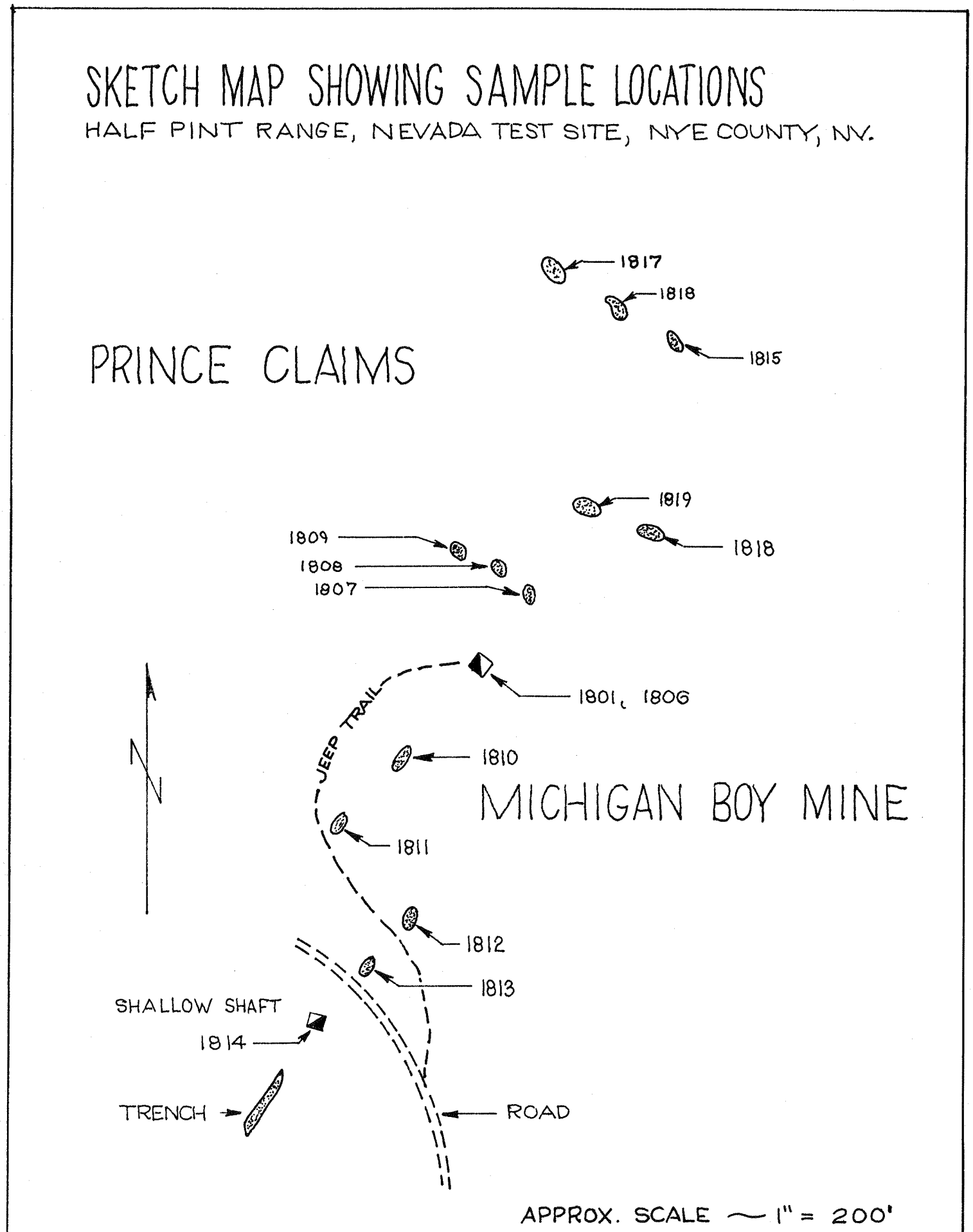


FIGURE 14. Sample location map, Michigan Boy Mine area

Rainstorm Mine Area:

The Rainstorm Mine is about 7 miles southeast of the Climax Stock on the northeast corner of the Test Site. The only access possible is via the Groom Lake Road, 1.4 miles east of Gate 700; then south 3 miles around the Hump to the mine. The mine workings consist of a 220 foot shaft, a 220 foot adit and a 210 foot drift off the main adit four large propsect pits, (see enclosed map) At the mine, the sediments have been identified as Precambrian Johnnie Formation and are composed of interbedded siltstone and some quartzite. The formation is badly fractured and faulted. Brecciatio is common in outcrop and along the highly oxidized and silicified vein system.

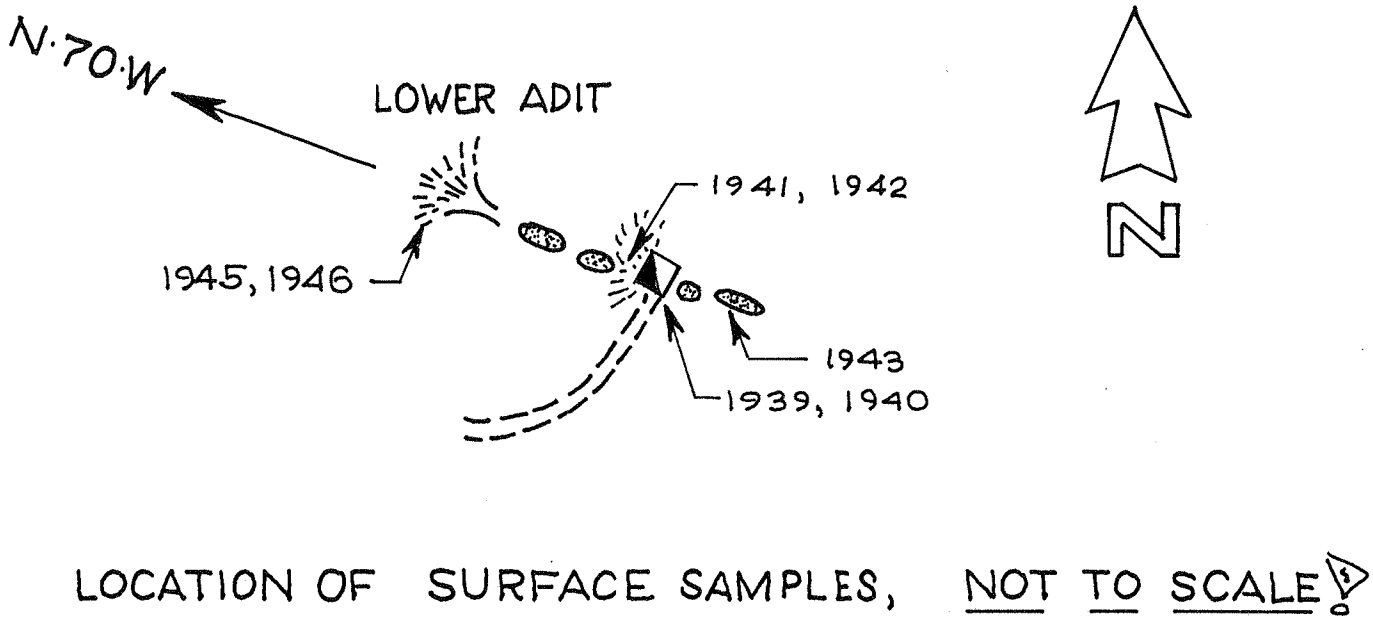
The Rainstorm Mine workings are aligned along a nearly vertical vein system that strikes N70^{o}W. The biggest dump is next to the shaft which is reported to be 220 feet deep. The shaft was sampled at 40 and 100 feet respectively. Both of these smaples were taken from brecciated veins that were highly silicified and contained galena, copper oxides and unidentified sulfides. Two more samples were taken from the dump and a third was collected from the prospect pits above the shaft which exposed a highly oxidized and brecciated vein that was over 2 feet wide in places.

The large adit is below the shaft at the bottom of the hill but the two workings do not connect at depth even though they are both on the same vein, and very near one another. The entrance to the adit is partially caved but access is possible. The adit follows the vein in an irregular fashion but maintains a N70^{o}W heading for a distance of approximately 220 feet. Forty-six feet from the entrance the low dipping sediments (N5^{o}E-22°SW) are cut by a high angle fault, N5^{o}E, 75°SE. At approximately 190 feet from the entrance a lateral trends N25^{o}E for a distance of 210 feet. The heading at the end of the drift is N3^{o}W and is terminated in a fault. A sample was taken from the N70^{o}W vein system at the face in the main adit. Two more samples were taken from the dumps. The main adit and the lateral meandor over their full length apparently following the vein system. Neither of the workings show any appreciable lateral mining activity and the mineralization appears limited to the N70^{o}W vein.

The best looking mineralization at the mine came from the large shaft. Shaft samples were mainly brecciated vein material with visable galena and unidentified dark metallics. Lower adit samples were similar but with more pyrite. Outcrop and prospect samples were highly oxidized breccias cemented with silica.

Assays from the four shaft samples were high in lead and silver with lesser amounts of copper. Silver ranged from 20 to 58 ounces of silver in the four samples. The prospect up the hill, but along the vein, assayed 1.5 ounces of silver from a silicified breccia. The assay results from the lower adit and dump were high in lead with lesser amounts of silver and copper. The highest silver value was 4 ounces. Gold was detected in all the samples but the values were low.

About 1.5 miles to the southeast, several small prospects and a shaft explored highly oxidized and brecciated veins in the Precambrian Johnnie Formation. The workings and the shaft are along a series of veins that strike N70^{o}W and are nearly vertical.



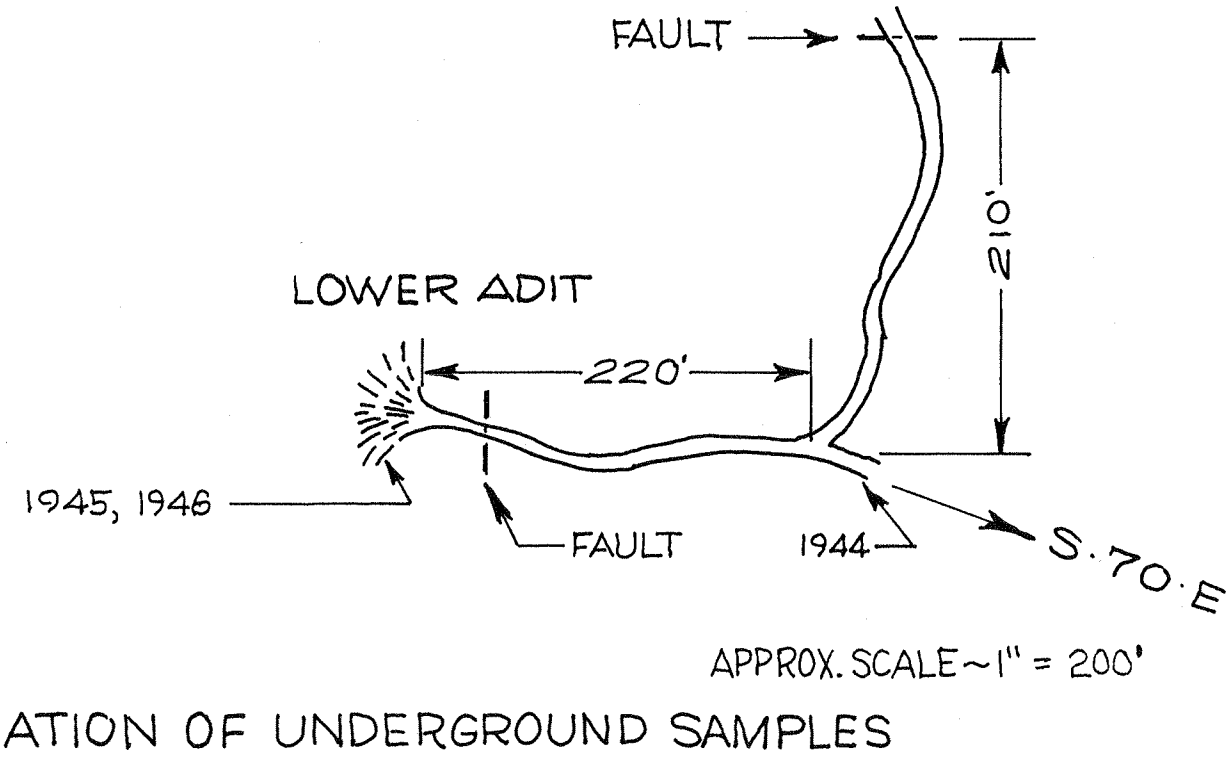


FIGURE 15. Sample location map, Rainstorm Mine area

The veins are highly oxidized iron-stained quartz that are partially brecciated. Alteration is entensive but most intense within 3-4 feet of the vein. Assays from samples collected near the shaft and prospects were generally very low with only one sample having trace amounts of gold and silver.

Within the area of the Rainstorm Mine and extending several miles to the southeast are numerous highly oxidized, brecciated and silicified veins that crop out along faults or appear as float in the drainages. Most of the veins are similar to those seen at the Rainstorm Mine and carry visible mineralization, but nothing is known of their potential. Mapping and sampling may identify areas of potential that would merit further development.

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WAHMONIE MINING DISTRICT

The Wahmonie Mining district is east of Jackass Flats and north of Skull Mountain on the Nevada Test Site. The exact dimensions of the district are not clearly defined but earlier references describe possible limits as the north-side of Skull Mountain, four miles north of the Wingfield Shaft and Kane Springs which is four miles to the east of the main camp. The official record shows the district at its peak of activity had been staked for an area of six by seven miles (Tonopah Daily Times, February 22, 1928, p. 1).

Ball (1906) visited the Hornsilver Mine but did not elaborate on his findings. Kral (1951) reported that the district was rediscovered by McRea and Lefler in 1928 with a strike of high-grade gold silver ore, but with only minor shipments.

The published information on the district is very limited in scope. However, the Tonopah Daily Times (1928) fairly burst its seams with information on the camp. The 1928 newspaper accounts of the original discovery in 1847 (or 1853), include complete details on Lefler and McRea's discovery and activites, the people who had claims or owned interest in the camp (such as Governors James Scrugham and Joe Hutchison, Senators Key Pittman and George Wingfield), a detailed accounting during the sinking of the Wingfield shaft, a running account of activities on other properties, reports from most of the mining companies in Tonopah and their engineers, and elaborate geological and mineralogical descriptions as well as certified assays.

When Lefler and McRea rediscovered Wahmonie in 1928 they, along with others, were apparently aware that "The old Hornsilver Mine had been worked by Mormons in 1853". In fact, their initial 1928 discovery was described as being "very near several old holes dug by Mormons in 1853 from which very rich horn-silver was extracted" (Tonopah Daily Times, February 14, 1928, p.1). Wahmonie is on the old Mormon Trail from Salt Lake City to San Bernardino, California. Part of the route traveled included Groom, Oak Spring, Tippipah Spring, Kane (Cane) Springs and Wahmonie to the Amaragosa Desert, Death Valley and into San Bernardino.

Another account from the same paper, dated February 24, 1928, described a stone location monument found in a fireplace wall in a cabin above Kane Springs: "The stone bears the inscription F.O. Byers, 1847 and the lower left-hand corner has a clearly defined skull and cross bones chisled an inch deep". The newspaper had the stone on display and invited those skeptical about the primitive location notice, to drop by the office and examine the carving. This seems to confirm Wahmonie as a gold camp before gold was discovered at Sutter's Mill in California. The inscription stone found its way north to Reno where it now can be seen displayed in the Mackay School of Mines museum on the UNR campus.

Rocks exposed within the district are mainly andesites, dacites, and latites along with intrusive granites. rhyolites, and breccia (Ekren and Sargent, 1965). The surface exposures of one of the intrusives is restricted to a zone of hydothermal alteration

along a northeast trending fault that follows the eastern boundary of a horst. Based on geophysical data, the center of this intrusive is thought to be 300 meters below the area of the Wingfieldd shaft. The edge of the intrusive is said to be in good correspondence with the south and west side of the alteration halo, but due to a lack of data the remaining boundaries were not well defined. The halo is elliptically shaped and can be traced for over four miles to the southwest and several miles to the northeast of the Wingfield shaft. Another inference made by the geophysicist from the geophysical data is that disseminated sulfied mineralization is present in the intrusive. This conclusion is based on an IP survey that showed 2% or more sulfides may be present within the intrusive but below the water table (Hoover, D.B., et al., 1957).

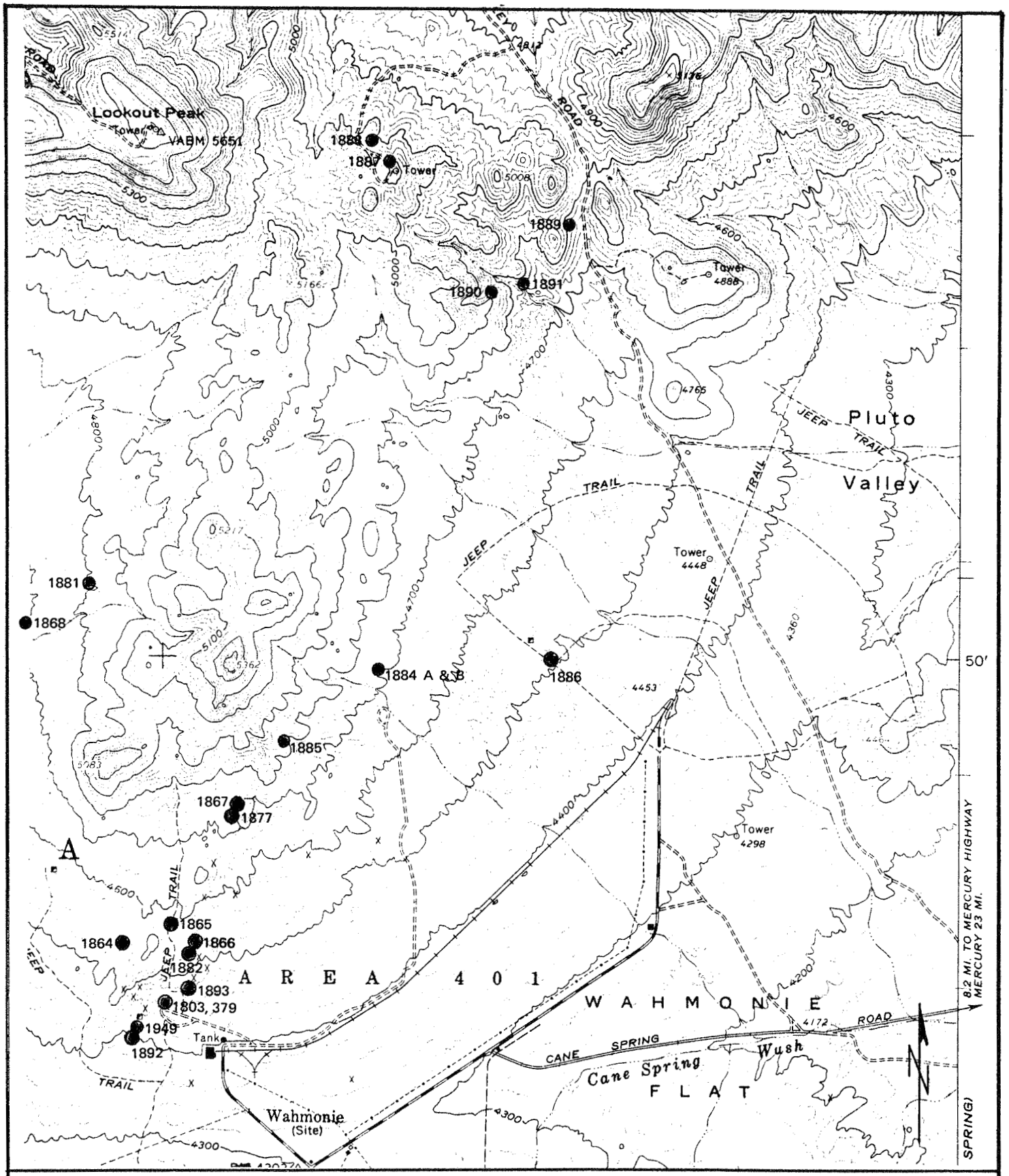
Alteration at Wahmonie includes argillization, silicification and strong oxidation. Much of the quartz vein material present contains brecciated volcanic fragments cemented with opaline quartz which fills vugs and forms cockade structures. Sulfides occur as wispy gray streaks within the quartz. Visible mineralization from samples collected in dumps and prospect pits consists of cerargyrite, free gold, sulfides, alunite, iron and manganese oxides and gypsum. On the surface, the vein system follows a N30^{o}E structure that can be traced for nearly three miles under the alluvium and is thought to follow the zone of alteration for another four miles.

The Wahmonie mine workings consist of the Wingfield shaft, is now radioactively contaminated (unknown amounts and types of debris were dumped there) and is therfore inaccessible. The other six shallow shafts are accessible but are without timbers. There are no buildings and the road access is poor.

Sample 1949 from the Wingfield dump fire assayed at 29.68 oz/ton silver and 0.67. oz/ton gold. This sample was examined on a microprobe and found to contain cerargyrite, argentite and hessite with anomalous amounts of mercury, bromine, bismuth, and tellurium. Sample 1867 was quartz vein material collected from a dump near a shallow shaft about 3/4 of a mile north of the main camp. Fire assay results from this sample showed 49.89 oz/ton silver and 0.65 oz/ton gold.

Another six Wahmonie samples, historic relics of the 1928 era mining boom, were located in the Mackay School of Mines Museum. Museum sample 1708 was a gift of A.H. Lawry who was George Wingfield's engineer, and I assume (though there is no record) that the sample came from the Wingfield shaft. This specimen contained visible gold and cerargyrite in a matrix of highly oxidized quartz breccia along with minor sulfides. No values were reported, but it was said to be rich ore. Museum sample 1902 from the Wingfield shaft, looked like sample 1702 and was reported to be a "gold-silver telluride ore worth $3400/ton". The sample was highly oxidized and brecciated quartz vein material with visible gold and cerargyrite. Another similar sample, 1185, was donated by Governor Joe Hutchison. The sample was reported to be gold-silver ore worth $800/ton. Sample 1951 was a highly oxidized quartz vein material reported worth $1500/ton from the New Strike claims. An arrangement was made with the Museum whereby a 15 gram chip sample

SKULL MOUNTAIN QUADRANGLE
NEVADA–NYE COUNTY



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETRE

CONTOUR INTERVAL 20-FOOT

FIGURE 16. Sample location map, Wahmonie district

was removed from the least conspicuous place on samples 1902 and 1185. Both samples were examined on a microprobe before fire-assaying the remainder of the sample.

The microprobe examination of sample 1902 revealed the presence of cerargyrite, some argentite, hessite and free gold with lesser amounts of mercury. A probe examination of chip sample 1185 showed cerargyrite to be the dominate mineral with lesser amounts of argentite, minor hessite and free gold also present.

Fire assay results showed the following: Sample 1185 had 35.08 oz/ton gold and 1271.72 oz/ton silver, while sample 1902 had 42.08 oz/ton gold and 1129.49 oz/ton silver.

Summary

High-grade gold silver mineralization associated with a zone of alteration can be traced on the surface for three miles to the northeast and five miles to the southwest of the Wingfield shaft. Geophysical, geological, and geochemical data, as well as historical background, make Wahomine a prime exploration target for precious metals. Drilling is the next logical step necessary to determine the true potential of this highly mineralized area.

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NELLIS BOMBING AND GUNNERY RANGE

TOLICHA DISTRICT

The Tolicha district is about 22 miles north and 6 miles northeast of Beatty on the Nellis Bombing and Gunnery Range and is within an area where travel is restricted. The district is about 10 miles across and is divided with Clarksdale on the west and Quartz Mountain on the east. The major activity in the district is along the western and northeastern flanks of Tolicha peak between elevations 4800 and 5900 feet. Prospecting followed a gold discovery at Quartz Mountain in 1905 according to Lincoln (1923), but most of the activity came after the 1917 gold discovery at the Landmark-Life Preserver properties. An active period of leasing in the thirties produced about $750,000, mostly in gold, from the Landmark Group. Recorded production from the district was negligible according to Kral (1951).

All of the properties visited at Tolicha are epithermal gold-silver deposits. Mineralization is associated with quartz veins in and along faults and fractures, as replacement along shear zones, and as fissure fillings in stockworks. Most of the vein systems have north-south orientation and cut rhyolites, rhyolite tuffs and sediments of late Miocene age. Ekren and others (1971) have identified three cooling units associated with the Tolicha Peak volcanics intercalated with a thick sequence of lacustrine sedimentary rocks. Some of the sediments were observed in the Yellow Gold, Clarksdale area, but none were associated with mineralization. Another 400 feet of younger ryholite lavas and tuffs overlie the Tolicha Peak volcanics at Quartz Mountain. The source of the volcanics is not known with certainty but it is thought that they may have come from a caldera south of Mount Helen.

Located in the western part of the district are the Yellow Gold, Wyoming Scorpian, and Clarksdale mines, several shallow inclines and twenty or more prospect pits and trenches. Access to this part of the district is from the west via Tolicha Wash approximately four miles east of Highway 395. The road to the mines is bad and is impassable east of Clarksdale.

The Yellow Gold Mine is on the western side of a swale, between two prominent hills just north of Tolicha Wash. The workings consist of two adits, two shafts, several prospect pits, some trenches and one glory-hole. Both shafts were inaccessible but the adits were open at the time of our examination. No structures were standing. The mine is in altered rhyolite and rhyolite tuff of Miocene age (Cornwall, 1972). The mine workings explored a vein system that strikes N15°W and dips 65°W. One glory-hole has been sunk along the vein trace approximately 50 feet east of the north shaft. The stockworks vein system carries some sulfides, including pyrite, with limonite and hematite fillings vugs and cavities. Silicification is pervasive in and around brecciated volcanic fragments.

An underground examination of the southern part of the vein system was made via a 150 foot adit. Samples were collected from the adit face, from the shaft dumps and from the glory-hole. The

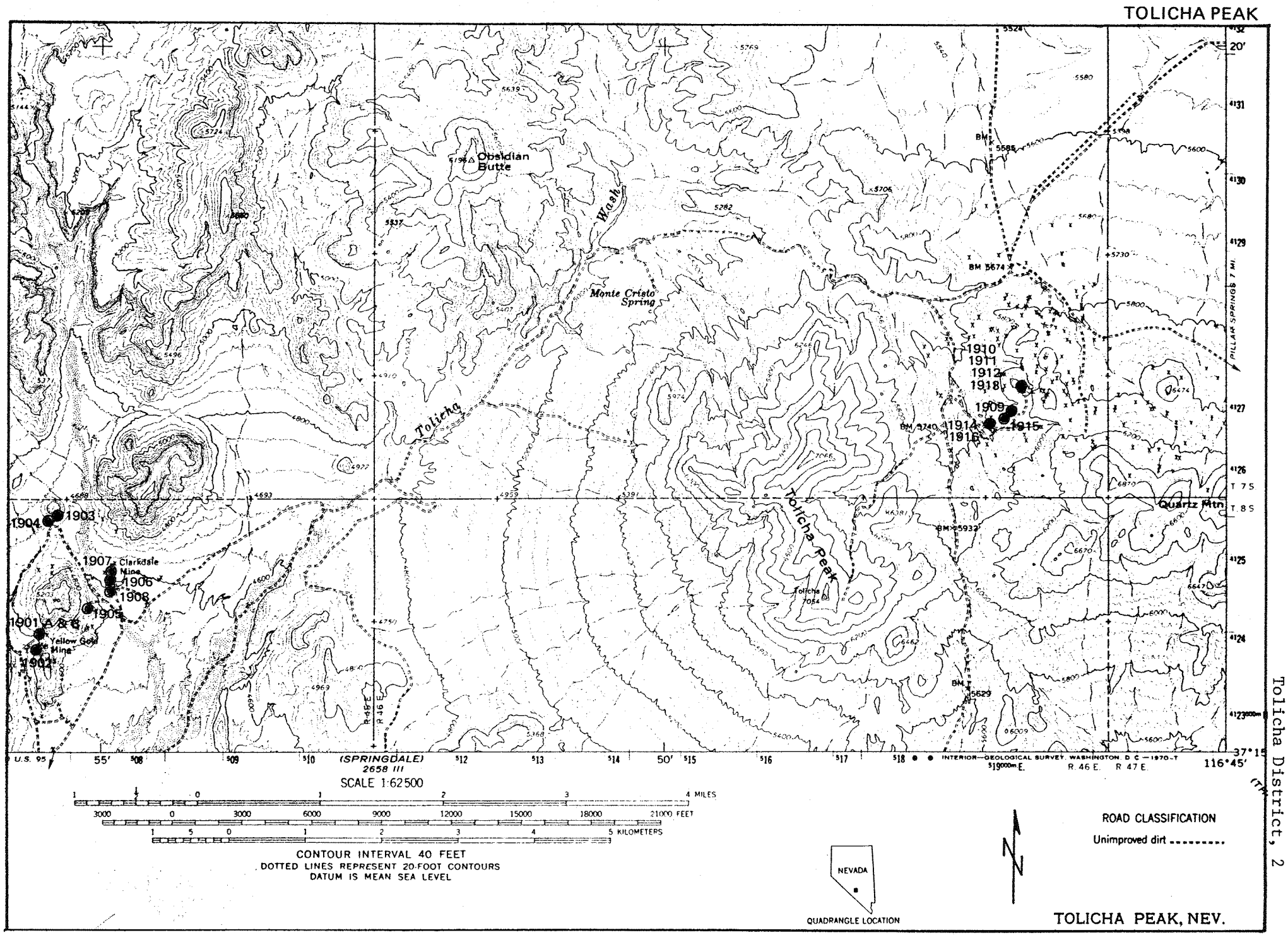

FIGURE 17. Sample location map, Tolicha district

materials were similar; silicified rhyolite and tuff, breccia, strong oxidation producing abundant Fe-oxides filling vugs in a quartz matrix, with minor sulfides. Assays showed trace amounts of gold and less than one ounce of silver from the samples. Kral (1951) reported, "fine gold occurred in a brecciated rhyolite which had been highly kaolinized and in places silicified with opaline silica". He also reported the values to be very erratically distributed. The actual production from the mine is unknown, but the main activity was in the early thirties.

The Wyoming Scorpion Mine is about a mile north of the Yellow Gold and consists of a now inaccessable shaft reported by Kral to be "100 feet deep with 40 feet of drifting". Five dollar gold values were reported from a vein at the 40 foot level, but no production records exist. Another 30 foot inclined shaft 50 yards to northeast of the main shaft was not mentioned. Both workings are in an altered rhyolite tuff which has been cut by quartz veins containing minor sulfides. Vein material from the dump of the main shaft and from a 12" quartz vein in the incline assayed only trace amounts gold and no silver.

The Clarksdale Mine is about a mile east of the Yellow Gold Mine. The workings consist of five closely spaced shafts on a north-south trending rib of highly silicified and very resistant volcanic rock in the middle of a stream wash. The shafts were sunk on a 3 foot wide vein bearing N10^{o}E and dipping 67°SE and consisting of silicified rhyolite breccia in a quartz matrix. All five shafts are within a 700 foot span which Kral thought was the result of working the property on a block lease system. All of the mine structures are in bad condition. The head frames are down and the underground workings are not accessible.

Samples from the dumps contained vein material of silicified breccia and opaline quartz with minor sulfides that assayed only trace amounts of gold and silver. Earlier production from the mines included a 1000 dollar shipment in 1933 and 238 tons of ore, yielding 45 ounces of gold and 32 ounces of silver, shipped between 1936 and 1938.

A small 40 foot incline between Clarksdale and the Yellow Gold yielded the highest values from this part of the district. Samples from a vein at the bottom of the shaft reported 7.3 ppm (.21 oz/ton) and 70 ppm (2 oz/ton) silver.

The properties in the eastern part of the district include the Landmark-Life Preserver Group, located about 1.5 miles east of Tolicha Peak, and the Quartz Mountain workings, located 3 miles further to the southeast. All of the properties are within a mile of the main road into the area where access is restricted by the Air Force.

The Landmark-Life Preserver Group was the most productive in the district and was recurrently active from their discovery in 1917 to 1940. USBM records indicated mine production at 391 tons of ore containing 482 ounces of gold and 735 ounces of silver between 1923 and 1940 (Norberg, 1977). Kral reported that lessees shipped $750,000 during the late thirties however, there is no official record of such production.

The Landmark workings include a 140 foot inclined shaft, a lower connecting adit and several lateral drifts and adits. Three

other inclines and several prospects to the northeast are along the same structure. Less than a half mile to the southwest the Life-Preserver, properties consisting of several shafts and reported thousand feet of subsurface workings are found, but these are no longer accessible. The mines are all in an area of high relief with poor roads, no surface structures and limited access.

Locally, the rocks are rhyolite flows and tuffs of Miocene age (Cornwall, 1972). Most of the mining activity is along a vein system that strikes N30°E and dips 60°SE and for over a half mile, the vein system consists of massive quartz and breccia recemented by a cherty and very hard opaline quartz. Areas of intense hydrothermal alteration along the vein and adjacent faults are marked by iron-oxides, breccia and pervasive silicification. Post mineralization movement along the main vein system was evident in the northermost inclines where slickensides and gouge filled the easternmost contact between the quartz vein and the altered volcanics.

At the Landmark shaft the vein is over 5 feet wide and is bounded by a zone of silicifed volcanics that exceeds fifty feet in places. The lower adit cross-cuts a continuous zone of breccia from its entrance to the intercept with the inclined shaft. Samples were taken from a raise 110 feet into the adit, from a shallow winze 60 feet from the portal. From the face in the main adit and from the dumps. Selected samples were also taken from other workings where access was possible and from prospect pits and outcrops along the strike length of the major vein system.

Four samples carried more than a half ounce of silver while gold values ranged from .15 to 3.5 ppm. (004 to .102 oz/ton). Several of the samples from the Landmark adit were also anomalous in lead and zinc. In 1921, cut samples were taken from the vein system off the main adit and from ore piles outside the mine from this same vein. The vein samples ranged in value from .16 to .52 ounces of gold while the dump samples averaged close to 1.5 ounces of gold and 1.0 ounces of silver per ton (Carper, 1921).

Another three miles to the southeast, the Quartz Mountain workings mark the site of the original gold discovery in 1905. Several shafts with adjacent stopes to the surface and extensive trenching are from recurrent work done between 1910 and 1930's. The two caved adits further up the hill are part of the older workings.

The older adits explored part of a north-south vein up to 20 feet wide that outcrops at the surface for approximately 2000 feet along strike. The vein is solid at the surface but fragments at depth, and consists of very hard, white jaspery quartz (Burgess, 1910). Burgess reported: "In some places within the vein there were small irregular streaks of hard, greenish quartz that carried high values in gold and that occassionally showed visible gold". He also collected samples from one of the northern shafts 20 feet below the colar that assayed $13.03, and a 20-foot cut sample from a crosscut 50 feet below the collar that assayed $8.14/ton. There were also samples of float collected near the vein that assayed over $100/ton that had to be discounted because they could not be found in place (Burgess, 1910). A description of the underground

workings was not available nor are there any production records.

Summary

Almost every sample taken during our study of the Tolicha district was found to contain detectable gold. exploration in the district, however, has been limited tho shallow mines and prospect-pits dug by hand. Extensive areas along known mineralized vein systems remain unexplored. A logical program at the Landmark Group would be to explore, by mapping, sampling, and drilling the vein system. This system, 20-50 feet wide and with close to a mile of surface exposure, could contain undeveloped gold resources. Similar exploration opportunities exist on a somewhat smaller scale for the Clarksdale and Quartz Mountain areas and very probably for some lesser known prospects in the district.

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Appendix A

Sample Descriptions

Sample Description

Sample Number	Location	Description
379	Quad: Skull Mt. 7 1/2' Sec: T: R: UTM: 4074890 N 0574350 E Horn Silver Mine Wahmonie District	Brecciated andesite, kaolinized, silicified, FeOx stain.
380	Quad: Jackass Flats 7 1/2' Sec: T: R: UTM: 4079450 N 0562720 E Calico Hills Area	Calico Hills Tuff, tuff and tuff breccia dull red hematite, jasperoid, massive, fine-grained tourmaline.
381	Quad: Jackass Flats 7 1/2' Sec: T: R: UTM: 4080230 N 0562060 E Calico Hills Area	Silicated argillite of Eleana Fm., disseminated magnetite, epidote-garnet "skarn veins", small hydrothermal(?) breccia.
	Quad: Sec: T: R: UTM: N E	
	Quad: Sec: T: R: UTM: N E	
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	Quad: Sec: T: R: UTM: N E	

Sample Description

Sample Number	Location	Description
1801	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4115600 N 0588000 E Michigan Boy Mine Oak Spring District	Quartz vein material Fe Mn Oxides Cu oxides tetrahedrite.
1802	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121230 N 0584060 E Climax Mine Oak Spring District	Tactite possible Tungsten composed of brown garnet epidote, calcite - from dump.
1803	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4074880 N 0574340 E Hornsilver Mine Wahmonie District	Altered andesite and rhyodacite, silication, brecciated, quartz vein in volcanic, argillic, highly oxidized-possible sulfides alunite(?) Epithermal Ag, Au(?)
1804	Quad: Jackass Flats 7 1/2 Sec: Unsurveyed T: R: UTM: 4080080 N 0562280 E Calico Hills Calico Hills District	From outcrop breccia vein containing fragments of silica. Argillite in a chlorite garnet matrix. Some magnetite.
1805	Quad: Jackass Flats 7 1/2' Sec: Unsurveyed T: R: UTM: 4080100 N 0562080 E Calico Hills - Mg Prospect Calico Hills District	White marble plus vein in marble breccia - vein filled with white radiating mineral hydromagnesite.
1806	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4115600 N 0588000 E Michigan Boy Mine Oak Spring District	Quartz veins material/quartzite. Limonite staining abundant Fe Mn oxides, vuggy Cu oxides -pyrite ghosts.
1807	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4115700 N 0588000 E MB# 1 Michigan Boy Mine Oak Spring District	Quartzite - Fe alteration pyrite ghosts - boxworks - Sericite - fine-grained quartz - sulfide (tetrahedrite)?
1808	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4115750 N 0587900 E MB# Michigan Boy Mine Oak Spring District	Quartzite/jasperoid, Fractured - coated with Fe oxides with dark gray jasperoid, sulfides.
1809	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4115800 N 0587870 E MB# 3 Michigan Boy Mine Oak Spring District	Jasperoid zone, some gossan, silicification, some quartz - chalcedony, pyrite ghosts, Fe oxides, sulfides.

Sample Description

Sample Number	Location	Description
1810	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4114970 N 0587950 E MB# 4 Michigan Boy Mine Oak Spring District	Quartz vein breccia, Fe oxide staining, silicification, malachite, sulfides.
1811	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4114850 N 0587630 E MB#5 Michigan Boy Mine Oak Spring District	Quartz vein, brecciation, silicification, seritization, vuggy-pyrite, no visible mineralization.
1812	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4113860 N 0587540 E MB#6 Michigan Boy Mine Oak Spring District	Quartz vein highly fractured, Fe oxide: pyrite ghosts, boxworks, malachite-pyrite.
1813	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 411380 N 058748 E MB#7 Michigan Boy Mine Oak Spring District	Quartz vein highly Fe & Mn oxides. White quartz vein. Vuggy with minor crystalline pyrite, sulfides.
1814	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4113600 N 0587400 E MB#8 Michigan Boy Mine Oak Spring District	Quartz vein - fractured, vuggy, Fe Mn oxides, boxworks, Fine-grained yellow mineral?
1815	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4116100 N 0588350 E Prince Claims Oak Spring District	Quartz vein 6" 18", brecciated silicification, clots & streaks of malachite & azurite, vein cut by brown jasperoid, opaline quartz-hematite after pyrite.
1816	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4116200 N 0588200 E Prince Claims Oak Spring District	Quartz vein 2' - 3' brecciated specks azurite, malachite, vein cemented with jasperoid, opaline silica.
1817	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4116250 N 0588100 E Prince Claims Oak Spring District	Quartz vein brecciated, cemented with tan jasperoid, white opaline silica. Minor malachite-azurite staining.
1818	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4115800 N 0588300 E UNR Property Michigan Boy Mine Oak Spring District	Quartz vein in white quartzite, Fe staining, minor pyrite, x-cutting relationship.

Sample Description

Sample Number	Location	Description
1819	Quad: Tippipah Spring 15' Sec: Unsurveyed T: R: UTM: 4115950 N 0588100 E UNR Property E. Michigan Boy Mine Oak Spring District	Quartz vein - massive milky white to vitreous gray. Veins shows abundant Fe & Mn staining vugs - Fe oxides.
1820	Quad: Papoose Lake 15' Sec: Unsurveyed T: R: UTM: 4115250 N 0592000 E Twinridge Pluton Oak Spring District	Altered quartz prophyry chloritic propylitic Fe oxide.
1821	Quad: Papoose Lake 15' Sec: Unsurveyed T: R: UTM: 4115400 N 0592000 E Twinridge Hill Pluton (area) Oak Spring District	Quartzite breccia from fault zone cemented with silica cross-cutting Twinridge Pluton.
1822	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121960 N 0583390 E Older Mine Camp Oak Spring District	Quartz vein material from dump vitreous gray to white banded vuggy - Fe stained - pyrite galena, chalcopyrite. Skarn above workings.
1823	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122000 N 0583320 E Older Mine Camp Oak Spring District	Banded quartz veins from dump in front of adit. Fe Cu oxides abundant on surface galena, chalcopyrite below skarn zone.
1824	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122100 N 0583340 E Older Mine Camp Oak Spring District	White gray quartz vein material from dump. Galena, pyrite, chalcopyrite, sphalerite, bornite Fe Cu oxides. Similar to 1823.
1825	Quad: Oak Spring 71/2' Sec: Unsurveyed T: R: UTM: 4121960 N 0583390 E Older Mine Camp Oak Spring District	Random chip from outcrop porphyry-intrusive, hematite Mn Oxides - quartz crystals following fissures. Sulfides.
1826	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122100 N 0583230 E Older Mine Camp Oak Spring District	Quartz vein material from dump near older adit. Wulfenite occurs on vein selvages and fractures,Cu oxides malachite, Azurite pyrite.
1827	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122020 N 0583250 E Older Mine Camp Oak Spring District	Massive pyrrhotite and vein material from dump near lower adit.

Sample Description

Sample Number	Location	Description
1837	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119580 N 0582690 E Oak Spring Wash Oak Spring District	Skarn (tactite) selected from a prospect silicified - contains fine sulfide possibly Tungsten.
1838	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119560 N 0582760 E Oak Spring Wash Oak Spring District	Skarn selected from dump - a silicified garnet calcite, tactite. Very dense contains moly & blebs of pyrite.
1839	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120600 N 0582420 E Oak Spring Wash Oak Spring District	(A) Massive garnet skarn N.W. trending band Cu Wo_3 (?) (B)
1840	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119490 N 0582870 E Oak Spring Wash Oak Spring District	Granular marble, streaks and clots, green Cu Ox, Fe Ox, melaconite, gossan material.
1841	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119290 N 0583200 E Oak Spring Wash Oak Spring District	Dark dioritic material derived from a dike? Highly altered along a N25W fault structure.
1842	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119350 N 0583360 E Oak Spring Wash Oak Spring District	Quartz vein material vuggy, Fe stained, possible sulfides.
1843	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119290 N 0583470 E Oak Spring Wash Oak Spring District	Brecciated quartz vein, material from dump near shallow shaft. Highly oxidized, Fe stained.
1844	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122240 N 0583060 E Older Mine Camp Oak Spring District	Silty, Fe oxide, sediments grab, from dump near small prospect.
1845	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122000 N 0583060 E Older Mine Camp Oak Spring District	Skarn material from a small prospect near contact with granite Garnetiferous - Tungsten?

Sample Description

Sample Number	Location	Description
1846	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121840 N 0582940 E Older Mine Camp Oak Spring District	(A) Gossan material from dump and wall of prospect. (B) Silicified limestone, cut by quartz filled fractures - pyrite and chalcopyrite.
1847	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121040 N 0584380 E Southeast portion of stock Oak Spring District	Massive garnet, tactite, some quartz, calcite veinlets - highly silicified. Tungsten-moly(?)
1848	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120100 N 0584610 E Southeast portion of Stock Oak Spring District	Massive red-brown garnet tactite, tungsten? calcite some quartz veinlets and pods - silicified.
1849	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121040 N 0584140 E South Portal dump Oak Spring District	(A) Tactite - Tungsten(?) (B) Marble - fine-grained sulfide along fractures and disseminated in host rock.
1850	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120950 N 0584080 E Southwest of South Portal Oak Spring District	Tactite - breccia silicification, oxidization, turquois -, Cu oxide quartz and calcite vein.
1851	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120880 N 0584050 E Southwest of South Portal Oak Spring District	Tactite - Fe oxides, moly? tungsten? garnet quartz veinlets.
1852	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120820 N 0583970 E Southern adit. Oak Spring District	(A) Tactite - minor sulfide mineralization. (B) Fractured marble with finely disseminated sulfides.
1853	Quad: Papoose Lake 15' Sec: Unsurveyed T: R: UTM: 415000 N 0591900 E Twinridge Hill Oak Spring District	Another phase of intrusive fine-grained granitic silicified - very hard.
1854	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119760 N 0583600 E Near Piledriver Oak Spring District	Porphyritic quartz monzonite from dump near repository chalcopyrite, pyrite molybdenite.

Sample Description

Sample Number	Location	Description
1855	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4094230 N 0576700 E East side of Mine Mt. Mine Mountain District	(A) Quartz vein - white barite, dark mineral flecks along NE fault. (B) Gouge breccia, Fe oxides, vugs with barite crystals. (C) Barite vein.
1856	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4094160 N 0576390 E East side of Mine Mt. Mine Mountain District	White barite vein, fractured some brecciation, gray alteration products on metallic gray mineralization
1857	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4094080 N 0576390 E East side of Mine Mt. Mine Mountain District	(A) Vein material from structure vuggy, drusy quartz, yellow oxides along fractures. (B) Calcareous, hematite stained, vuggy with Mn O_2.
1858	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4094080 N 0576390 E NE side of Mine Mt. Mine Mountain District	From dump near small shaft, abundant Fe oxide, bleached alteration. Host rock was a dolomitic limestone.
1859	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4093940 N 0576340 E Southside of Mine Mt. Mine Mountain District	Vein quartz 1-1/2 inches wide in silicified zone, pale yellow stain, black metallic mineral, traces of Cinnabar and barite crystals in vugs.
1860	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4094000 N 0576210 E Southside of Mine Mt. Mine Mountain District	(A) Taken from west adit dark/gray metallic mineral, soft with yellow alteration, cinnabar, hematite(?) (B) Taken from above adit a simular mineral assemblage.
1861	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4093910 N 0576040 E N.W. side of Mine Mt. Mine Mountain District	Chip sample from outcrop of highly silicified, hematite stained breccia, Barite(?) breccia fragments are quartz limestone.
1862	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4093820 N 057940 E Westside of Mine Mt. Mine Mountain District	Brecciated, fractured, silicified sediment, abundant Mn O_2. Some barite - mostly limestone and quartzite.
1863	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4093840 N 0575880 E West side of Mine Mt. Mine Mountain District	Limestone - quartzite breccia hematite stained, and gossan alteration.

Sample Description

Sample Number	Location	Description
1864	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4075160 N 0574140 E Near Hornsilver Mine Wahmonie District	Random grab from small shear zone-mafic intrusive, bleached argillic-Fe and Mn oxidized. No mineralization.
1865	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4075250 N 0574360 E Near Hornsilver Mine Wahmonie District	Random chip from outcrop quartz vein cutting, altered andesite, Fe and Mn oxides Possible sulfides.
1866	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4075180 N 0574470 E Near Hornsilver Mine Wahmonie District	Quartz breccia - highly silicified Fe - Mn oxides, cockcomb quartz selected - grab from dump. Possible sulfides and Au.
1867	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4075810 N 0574660 E Near Hornsilver Mine Wahmonie District	Vein quartz from dump near a small inaccessable shaft N.E. of Hornsilver Mine. Along strike of major fault. Ag silver sulfides(?)
1868	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4076660 N 0573640 E NW side of horst block Wahmonie District	Silicified vein material with Fe sulfides - Sample from dump near small prospect.
1869	Quad: Bullfrog 15' Sec: 10 T: 12S R: 45E UTM: 4083750 N 0507625 E Westside of District Bullfrog District	Selected from dump - intrusive? mixed with fine pebbles, quartz, feldspar, silicified, Fe-stained, volcanic.
1870	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120840 N 0582400 E Oak Spring Wash Oak Spring District	Quartz-siltstone, fault gouge Fe-chlorite, argillite, near skarn contact.
1871	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120840 N 058520 E Oak Spring Wash Oak Spring District	From dump-highly oxidized Fe-stained, reddish-purple hematite-chrysocolla.
1872	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120920 N 0583480 E Highly silicified zone North Climax Oak Spring District	Quartz vein from outcrop hematite-limonite, sulfides-highly silicified fractures.

Sample Description

Sample Number	Location	Description
1873	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121720 N 0583450 E Highly silicified zone No. Climax Oak Spring District	Vein system in outcrop psedomorphs-silicication purple-red-hematite, Sulfide.
1874	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121520 N 0583360 E Highly silicified zone No. Climax Oak Spring District	Granodiorite - highly silicified very hard, fractured, Ag, Au, sulfides?
1875	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121360 N 0583400 E Highly silicified zone No. Climax Oak Spring District	Granodiorite -highly silicified Fe oxides - some sulfides.
1876	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121740 N 0583180 E Old Mine Camp Oak Spring District	From outcrop - quartz vein system highly oxidized - highly silicified, reddish - purple hematite.
1877	Quad: Skull Mt. 7 1/2' Sec: Unsurveyeed T: R: UTM: 4075750 N 0574640 E On fault NE of Hornsilver Mine Wahmonie District	Vein quartz material cross-cutting volcanic matrix - cockade structure Oxidized material argillic - sulfides(?) From dump near shaft.
1878	Quad: Bullfrog 15' Sec: 12 T: 12S R: 45E UTM: 4085000 N 0510400 E North of Bullfrog Mtn. Bullfrog District	Selected from dump. Altered rhyodacite ash flow tuff. Some silication oxidized, pyrite and other sulfides.
1879	Quad: Bullfrog 15' Sec: 2 T: 12E R: 45E UTM: 4086200 N 0508300 E S.W. of Gold Bar Bullfrog District	Quartzite, breccia, or quartzite conglomerate, highly silicified, Fe-stained along fractured from dump near a shaft.
1880	Quad: Bullfrog 15' Sec: 15 T: 12S R: 43# UTM: 4083225 N 0507200 E Western part of District Bullfrog District	Selected from dump - quartz cemented, altered volcanic intrusive - pyrite, silica vein cut matrix of intrusive.
1881	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4076840 N 0573980 E NW side of Horst block Wahmonie District	From an outcrop of breccia cross-cutting an andesite - breccia fragments highly altered. No mineralization observed.

Sample Description

Sample Number	Location	Description
1882	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4075090 N 0574480 E Near Hornsilver Mine Wahmonie District	From small prospects along N.E. fault zone. Quartz vein in altered andesite argillic, silicified. Possible sulfides.
1883	Quad: Bullfrog 15' Sec: 15 T: 12S R: 45E UTM: 4083100 N 0506800 E Western part of District Bullfrog District	Selected from dump - irregular quartz veins, with vugs in an altered volcanic breccia silicified, Fe oxides, Au, Ag(?)
1884	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4076440 N 0575320 E NE of Hornsilver Mine along NE (fault zone Wahmonie District	(A) Gray-green coarse grained granodiorite/chloritic. (B) Fe-stained, highly silicified quartz vein in altered igneous intrusive brecciated & recemented.
1885	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4076140 N 0574900 E NE of Hornsilver Mine along fault zone Wahmonie District	From outcrop of highly oxidized brecciated intrusive from near contact with N.E. fault. Fe-stained mafics altered to limonite.
1886	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4076500 N 0576140 E Slightly East of fault zone. Wahmonie District	Silicified andesite, vuggy, banded white quartz vein - fine-grained pyrite dispersed throughout andesite from dump near shaft collared in alluvium.
1887	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4078840 N 0575350 E North end of Horst block Wahmonie District	From small prospect pit altered volcanics with Fe oxides, gypsum coating fractures and veins.
1888	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4078900 N 0575280 E North end of horst block Wahmonie District	Sample from outcrop of andesite intrusive shown on geologic map.
1889	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4078510 N 0576160 E NE side of horst block Wahmonie District	Example of K.-gr. a coarse grained granodiorite some mafics altered to Fe and chlorite.
1890	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4078220 N 0575800 E NE side of horst block Wahmonie District	Outcrop and float grab - light green calcareous, fine-grained sandstone and limey siltstone weakly silicified skarn material from near contact fine-grain.

Sample Description

Sample Number	Location	Description
1891	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4078260 N 0575980 E NE side of horst block Wahmonie District	Small prospect vein bearing N25E silicified intrusive Fe oxides, vugs filled with prismatic quartz.
1892	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4074810 N 0574220 E Near Hornsilver Mine Wahmonie District	From dump of small mine quartz vein cutting silicified andesite, some brecciation, sulfides in vein as fragments.
1893	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4074940 N 0574450 E Near Hornsilver Mine Wahmonie District	From dump near shallow prospect silicified andesite breccia with argillic alteration - No mineralization observed.
1894	Quad: Jackass Flats 7 1/2' Sec: Unsurveyed T: R: UTM: 4080500 N 0562520 E Calico Hills Calico Hills District	From outcrop opalized rhyolite (pink) and rhyolite breccia, with cracks and veinlets filled with Fe and Mn silicification.
1895	Quad: Jackass Flats 7 1/2' Sec: Unsurveyed T: R: UTM: 4080450 N 0562480 E Calico Hills Calico Hills District	From outcrop Whitish rhyolite dacite(?) volcanic rock with brown vein material No obvious mineralization - some slickensides.
1896	Quad: Jackass Flats 7 1/2' Sec: Unsurveyed T: R: UTM: 4079360 N 0560830 E Calico Hills Calico Hills District	Vein material from within a prospect Fe-stained airfall tuff-silication-oxidation.
1897	Quad: Jackass Flats 7 1/2' Sec: Unsurveyed T: R: UTM: 4080380 N 0561700 E Calico Hills Calico Hills District	From dump - barite vein & silicified barite, vein and fault gouge Some gossany clots of Fe & Mn possible sulfides.
1898	Quad: Jackass Flats 7 1/2' Sec: Unsurveyed T: R: UTM: 4080870 N 0560780 E Calico Hills Calico Hills District	From dump - Hematite gossan, quartz vein, marbelized limestone possible-white barite crystals.
1899	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4093280 N 0575560 E Westside of Mine Mt. Mine Mountain	From dump near shaft. Replacement (gossan) horizon in limestone. Highly silicified fault breccia (?). Some barite(?)

Sample Description

Sample Number	Location	Description
1900	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 41124240 N 0597540 E One mile S.E. of Rainstorm Mine Oak Spring District	Highly oxidized - Fe-stained quartz vein material from dump near shaft and adjacent prospect pits. Brecciation Au(?)
1901	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4123950 N 0506600 E Yellow Gold Mine Tolicha Mining District	N. shaft along fault, silicified rhyolite-tuff breccia, stockworks of quartz veinlets, abundant Fe Ox pods of limonite may contain gold (?)
1902	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4123825 N 0506600 E Yellow Gold Mine Tolicha Mining District	So. adit - opaline silica, veins slightly vuggy, abundant pyrite in dark opaline quartz. Some breccia extensive hydrothermal alteration. Sample 150 feet into adit.
1903	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4125525 N 0506800 E Wyoming - Scorpin Group Tolicha Mining District	From a small unmarked 30 ft. shaft which was sunk on a 12' quartz vein, cemented conglomerate rhyolite breccia Some sulfides.
1904	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4125450 N 0506700 E Wyoming - Scorpin Group Tolicha Mining District	From dump above shaft - silica bleached rhyolite tuff fine vitreous quartz vein argillized, bleaching. Minor sulfides.
1905	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4124300 N 0507200 E Unnamed Mine Tolicha Mining District	(a) From shallow inclined shaft sunk on quartz vein system, brecciated silicified. (b) Sample taken from N-striking 1 ft. wide vein exposed in shaft.
1906	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4124700 N 0507525 E Clarksdale Mine Tolicha Mining District	Quartz vein cemented, silica breccia, banded, fissure large clots of pyrite.
1907	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4124750 N 0507550 E Clarksdale Mine Tolicha Mining District	Vein up to 3 feet wide. Highly silicified, hydrothermally altered in a brecciated sediment, which maybe fluvial(?)
1908	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4124550 N 0507550 E Clarksdale Mine Tolicha Mining District	Pink and beige silic and quartz cemented vein, rhyolite breccia, alunite? Selected from dump near Northern most shaft.

Sample Description

Sample Number	Location	Description
1909	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4126900 N 0519325 E So. of Landmark Mine Tolicha Mining District	Small inclined prospect on strike with Landmark Mine. Quartz vein breccia, in rhyolite tuff sulfides pyrite.
1910	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4127125 N 0519450 E Landmark Mine Tolicha Mining District	Sample taken from ore-bin 110 feet into main adit. Free gold was observed.in a piece of very strongly silicified vein material, pyrite.
1911	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4127125 N 0519450 E Landmark Mine Tolicha Mining District	Gouge and hydrothermally altered vein material from a drift on strike of main vein Au, Ag(?) Fe oxides.
1912	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4127125 N 0519450 E Landmark MIne Tolicha Mining District	Sample from gouge, including breccia material at bottom of 30 foot incline 75 feet into main adit. Au, Ag? silica breccia Fe-oxide.
1913	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4127225 N 0519600 E Across drainage from Landmark Tolicha Mining District	Selected from dump-massive gray opaline quartz vein brecciated with rhyolite clasts - pyrite indense vein material. Sulfides. Au(?)
1914	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4126700 N 0519050 E Life Preserver Group Tolicha Mining District	From dump near 50 foot shaft - quartz vein material, breccia, grey sugary to vitreous very hard. No mineralization observed - Au(?)
1915	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4126750 N 0519225 E Life Preserver Group Tolicha Mining District	Outcrop next to largest shaft - Quartz breccia and quartz vein intruding flow banded rhyolite. Fine disseminated sulfides.
1916	Quad: Tolicha Peak 15' Sec: Unsurveyed T: R: UTM: 4126750 N 0519000 E Life Preserver Group Tolicha Mining District	From dump near shallow prospect. Fine pebble quartz vein also rhyolite quartz breccia sulfides and possible Au?
1917	Quad: Black Mtn. 15' Sec: Unsurveyed T: R: UTM: 4127150 N 0523500 E Quartz Mtn. Mining Workings Tolicha Mining District	From dump selectively, Quartz vein material in matrix of silicified rhyolite - possible sulfides - Au(?)

Sample Description

Sample Number	Location	Description
1918	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4112720 N 0597410 E Prospect east of Rainstorm Mine Oak Spring District	Brecciated white quartz vein and quartzite breccia, from wall in prospect pit. Pyrite and Fe Oxides. Vein is 3-4 feet wide along fault.
1919	Quad: Topopah Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4081840 N 0560760 E Calico Hills Calico Hills District	Shallow shaft and dump - silicified dolomite - quartz vein replacement azurite, malachite, pyrite, chalcopyrite black sulfides, possible arsenopyrite.
1920	Quad: Topopah Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4081840 N 0560760 E Calico Hills Calico Hills District	Selected from dump near shaft. Gray silicified dolomite-vein replacement Cu, plus possible finely disseminated sulfides. Old inaccessable workings.
1921	Quad: Topopah Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4081660 N 0560680 E Calico Hills Calico Hills District	Selected from dump near shallow inaccessable shaft. Cu oxides in steeply inclined vein -coarse-silicifiec gossan like Fe-oxides.
1922	Quad: Jackass Flats 7 1/2' Sec: Unsurveyed T: R: UTM: 4080640 N 0561360 E Calico Hills Calico Hills District	Light-tan rhyolite intrusive a small plug - matrix is slightly oxidized no mineralization observed.
1923	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4093990 N 0576180 E Near ridge, center of Mine Mt. Mine Mountain District	Retort located below sample-site silicified dolomite, barite, some sulfides, cinnabar (?). Part of sample is silicified boxworks.
1924	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121960 N 0583390 E Old Mine Camp Oak Spring DIstrict	Sample from face in main adit. Marble - contact - metamorphosed. Tungsten - scheelite - lamped.
1925	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121960 N 0583390 E Old Mine Camp Oak Spring DIstrict	Sample from drift off main adit - NSSE. Marble - some fracture filling calcite and Fe-small flecks of Tungsten lamped -Marble host in fault zone.
1926	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122100 N 0583340 E Old Mine Camp Oak Spring District	Chip sample from altered zone inside

Sample Description

Sample Number	Location	Description
1927	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122100 N 0583230 E Old Mine Camp Oak Spring District	Marble quartz vein contact inside badly caved adit. Wulfenite and tungsten occur along bedding plane of calc-sillicate
1928	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122020 N 0583250 E Old Mine Camp Oak Spring District	Sample taken 195 ft. into adit near face-adit trends north along a fault. Rocks are highly altered. Tungsten ghost-like blebs in fault gouge material.
1929	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122020 N 0583250 E Old Mine Camp Oak Spring District	From fault zone 150 feet into main adit Oxidized-clay like gouge - slickensides, some coated with tungsten blebs, tungsten also with matrix.
1930	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121040 N 0584140 E South Portal Oak Spring District	From 200 ft. into N65E adit near face near a fault zone -tactite, scheelite, disseminated in the matrix along a block of garnet.
1931	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121040 N 0584140 E South Portal Oak Spring District	Sulfides occur in thin veins within marble near a raise 505 ft. into the main adit of the South Portal.
1932	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121040 N 0584140 E South Portal Oak Spring District	Tactite - oxidized, silicified, vein with abundantsheelite blebs - vein occurs within garnet tactite horizon.
1933	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121230 N 0584060 E South Portal Oak Spring District	Oxidized vein within intrusive, tungsten (scheelite) occurs as coarse garnet zone 180 feet into South Portal.
1934	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121100 N 0584610 E M-4 Adit on S.E. Side of Stock Oak Spring Adit	M-4 adit-bears norht 20 ft. and west 20 ft. - sample from face garnet tactite with irregular quartz lenses scheelite occurs as coarse fleck along sediment?
1935	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121040 N 0584380 E M-7 Adit on S.E. side of Stock Oak Spring Adit	M-7 chip from west wall of N-striking adit. Approx. 50 ft. from Portal quartz vein plus vein selvage material sulfides.

Sample Description

Sample Number	Location	Description
1936	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121040 N 0584380 E M-7 Adit on SE side of Stock Oak Spring District	From a vein system 120 feet into main adit. Garnet-tactite with flecks of scheelite.
1937	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120600 N 0585020 E S.E. millsite Oak Spring District	Garnet-tactite, irregular shaped quartz vein material Tungsten - Cu around dump site.
1938	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4120820 N 0583970 E Southside of Stock Oak Spring District	Selected from dump - white granular marble with fine seams of sulfides- Cu?
1939	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113210 N 0595280 E Rainstorm Mine (Main Shaft) Oak Spring District	From sidewall of shaft at 40 foot level - vein system brecciated, silicified, some galena, anglesite(?) and other sulfides Au, Ag(?)
1940	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113210 N 0595280 E Rainstorm Mine (Main Shaft) Oak Spring District	From sidewall at 100-110 feet chips from small veinlets and stringers Silicification, Fe Oxides, brecciation galena, anglesite, antimony, Cu oxides. Ag(?)
1941	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113210 N 0595280 E Rainstorm Mine Oak Spring District	Selected from dump, near shaft. Brecciated quartz vein material - oxidized, silicified galena, Ag(?) anglesite, Cu oxide yellow & blue coating (?)
1942	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113210 N 0595280 E Rainstorm Mine Oak Spring District	Selected from dump near shaft oxidized vein material - replacement-ore yellow-black coatings Pb(ag)? galena, anglesite.
1943	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113160 N 0595320 E Rainstorm Mine Oak Spring District	From prospect pit above shaft along vein system - quartz breccia silicified, oxidized, Fe oxides cropping out along N75E fault - (?) trend.
1944	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113200 N 0595220 E Rainstorm Mine Oak Spring District	Chipped from face 225 feet into main adit. vein material - brecciated oxidized - Cu & Fe oxides pyrite and fine stringers of sulfides(?) in quartz vein.

Sample Description

Sample Number	Location	Description
~~1945~~	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113200 N 0595220 E Rainstorm Mine Oak Spring District	From dump in front of lower adit. Brecciated vein material yellow-black coatings, galena, Ag(?) anglesite, pyrite, Au? Pb (ag)?
1946	Quad: Jangle Ridge 7 1/2' Sec: Unsurveyed T: R: UTM: 4113200 N 0595220 E Rainstorm Mine Oak Spring District	Selected from dump near lower adit. Quartz breccia, galena Pb(ag)? Oxidized Fe- almost entire matrix is composed of quartz sulfide, pyrite.
1947	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4093180 N 057550 E Westside of Mine Mt. Mine Mountain District	(A) Breccia, highly oxidized, hematite stained, breccia-fragments are, quartzite and siltstone. (B) A more highly oxidized fine-grained quartz breccia.
1948	Quad: Mine Mountain 7 1/2' Sec: Unsurveyed T: R: UTM: 4094230 N 0576700 E East side of Mine Mt. Mine Mountain District	From a hydrothermal barite vein cropping out of a north striking near vertical fault sulfides(?)
1949	Quad: Skull Mt. 7 1/2' Sec: Unsurveyed T: R: UTM: 4075900 N 0574480 E Dump of Hornsilver Mine Wahmonie District	Highly oxidized volcanics cut by quartz vein material sample is highly silicified, brecciated with stringers of silver haloids.
1950	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 41 N E Pile Driver adit Oak Spring District	From 215 ft. into pile driver left adit. From mineralized zone along fractures and disseminated. Potassic envelopes containing moly - pyrite - porphyritic Monzonite.
	Quad: Sec: T: R: UTM: N E	
	Quad: Sec: T: R: UTM: N E	
	Quad: Sec: T: R: UTM: N E	

Appendix B

Analytical Results

Semi Quantitative Spectrographic Analysis

Atomic Adsorbtion Analysis

Fire Assay Results

Semi-Quantitative Spectrographic Analysis

lement	Sample Number								
	379	380	381						
Fe %(.05)	5	20	10						
Mg %(.02)	.2	1	3						
Ca %(.05)	10	1	3						
Ti %(.002)	.2	.5	1						
Mn(10)	G(5000)	300	700						
Ag(.5)	100	.7	.5						
As(200)	N	1000	N						
Au(10)	N	N	N						
B(10)	30	G(2000)	500						
Ba(20)	700	700	700						
Be(1)	1	7	7						
Bi(10)	10	500	N						
Cd(20)	N	N	N						
Co(5)	5	50	20						
Cr(10)	10	150	20						
Cu(5)	20	100	5						
La(20)	50	100	50						
Mo(5)	15	20	100						
Nb(20)	N	20	20						
Ni(5)	5	100	100						
Pb(10)	70	200	100						
Sb(100)	N	200	N						
Sc(5)	7	20	20						
Sn(10)	N	50	N						
Sr(100)	150	L	200						
V(10)	100	300	200						
W(50)	N	N	N						
Y(10)	20	70	50						
Zn(200)	N	N	N						
Zr(10)	70	300	200						
Th(100)	N	N	N						

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1801	1802	1803	1804	1805	1806	1807	1808	1809
Fe %(.05)	5	10	3	15	15	2	5	5	3
Mg %(.02)	.1	2	.1	1.5	5	.07	.5	.7	.03
Ca %(.05)	.3	20	.3	10	3	.05	.3	2	.7
Ti %(.002)	.03	.2	.2	.3	.1	.01	.3	.2	.2
Mn(10)	1500	G(5000)	1000	1000	100	200	3000	3000	5000
Ag(.5)	200	10	10	100	N	150	200	30	5
As(200)	2000	N	N	N	N	700	2000	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	30	L	15	200	200	10	100	50	70
Ba(20)	50	L	1000	1000	100	30	300	20	500
Be(1)	N	10	1	5	N	N	2	3	15
Bi(10)	100	100	N	N	N	150	150	N	N
Cd(20)	150	50	N	N	N	N	50	30	N
Co(5)	15	15	10	70	7	N	10	5	15
Cr(10)	300	100	50	150	50	30	1500	50	50
Cu(5)	10000	50	50	15	15	300	20000	300	200
La(20)	N	30	30	30	20	N	50	20	L
Mo(5)	300	30	N	10	N	N	70	L	10
Nb(20)	N	N	N	20	N	N	N	N	N
Ni(5)	20	20	15	100	30	10	100	10	7
Pb(10)	5000	1000	50	20	50	5000	20000	3000	5000
Sb(100)	5000	N	N	N	N	2000	1500	N	N
Sc(5)	5	7	5	20	5	L	10	10	7
Sn(10)	100	150	N	N	15	100	100	N	N
Sr(100)	N	L	200	200	N	N	L	L	L
V(10)	150	200	100	150	30	100	100	150	150
W(50)	N	200	N	N	N	N	N	N	N
Y(10)	20	20	15	50	15	L	50	15	15
Zn(200)	700	2000	N	N	N	N	3000	1500	700
Zr(10)	10	100	200	200	20	10	200	100	150
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1810	1811	1812	1813	1814	1815	1816	1817	1818
Fe %(.05)	3	3	1.5	1.5	5	5	7	3	2
Mg %(.02)	.07	.03	.05	.03	.07	.15	.15	.05	.2
Ca %(.05)	.05	.05	.07	.05	.05	.05	.7	L	.05
Ti %(.002)	.2	.3	.02	.01	.05	.1	.015	.02	.2
Mn(10)	1500	50	200	100	1000	1000	500	100	20
Ag(.5)	100	70	100	30	50	10	50	50	10
As(200)	500	500	500	200	500	N	N	300	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	30	20	30	20	15	70	50	30	100
Ba(20)	300	200	1000	300	20	300	20	200	150
Be(1)	3	N	N	N	N	2	2	L	N
Bi(10)	150	20	100	10	150	200	200	30	L
Cd(20)	N	N	N	N	N	50	20	N	N
Co(5)	5	5	10	7	10	10	10	N	N
Cr(10)	70	50	20	20	30	500	300	30	20
Cu(5)	2000	200	10000	150	1000	15000	5000	7000	100
La(20)	20	30	L	N	L	L	L	N	L
Mo(5)	N	N	N	N	20	70	70	15	N
Nb(20)	N	N	N	N	N	N	N	N	N
Ni(5)	15	5	7	10	15	20	20	7	5
Pb(10)	5000	2000	5000	1000	10000	7000	15000	2000	100
Sb(100)	500	200	2000	1000	100	N	L	200	N
Sc(5)	15	5	L	L	5	7	L	L	7
Sn(10)	10	20	10	N	50	150	70	70	N
Sr(100)	100	L	N	N	N	N	L	N	N
V(10)	70	150	200	30	30	1500	500	150	50
W(50)	N	N	N	N	N	N	N	L	N
Y(10)	100	20	L	L	10	20	20	15	20
Zn(200)	N	N	N	N	N	2000	7000	200	N
Zr(10)	70	200	10	N	15	100	N	200	500
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1819	1820	1821	1822	1823	1824	1825	1826	1827
Fe %(.05)	.7	3	1	7	5	1.5	1.5	3	20
Mg %(.02)	L	.3	.3	5	.2	2	.15	.7	1.5
Ca %(.05)	.05	.5	10	10	.5	3	.1	.3	2
Ti %(.002)	.005	.5	.3	.05	.01	.02	.2	.01	.07
Mn(10)	10	700	500	5000	700	2000	70	700	1000
Ag(.5)	70	5	1	30	100	300	20	300	7
As(200)	N	N	N	N	L	1500	N	1500	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	L	100	20	20	10	15	500	50	N
Ba(20)	150	1000	1000	L	100	L	300	L	30
Be(1)	N	2	1.5	2	1.5	L	3	1.5	2
Bi(10)	150	N	N	L	N	L	L	20	15
Cd(20)	N	N	N	N	N	G500	N	G500	N
Co(5)	L	7	N	5	N	L	N	5	10
Cr(10)	10	L	70	L	10	L	10	L	20
Cu(5)	20	30	7	1000	3000	7000	100	20000	5000
La(20)	L	30	30	20	20	20	20	20	L
Mo(5)	N	15	N	1000	2000	200	300	2000	100
Nb(20)	N	N	N	N	N	N	L	N	N
Ni(5)	L	5	L	L	L	5	L	5	7
Pb(10)	150	50	70	2000	10000	20000	500	20000	150
Sb(100)	500	N	N	N	300	300	L	7000	L
Sc(5)	N	7	5	N	L	N	5	N	L
Sn(10)	10	N	N	20	N	10	N	10	N
Sr(100)	N	200	200	N	N	N	L	N	N
V(10)	10	100	50	150	70	15	50	20	50
W(50)	N	N	N	70	L	70	N	L	N
Y(10)	N	20	30	10	10	N	L	N	10
Zn(200)	N	N	N	500	700	G10000	700	G10000	300
Zr(10)	10	150	300	N	10	L	100	N	L
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

lement — Sample Number

	1828	1829	1830	1831	1832	1833A	1833B	1834	1835
Fe %(.05)	7	.5	3	.5	2	3	15	5	3
Mg %(.02)	.15	.02	.3	.15	.7	.07	.7	1	2
Ca %(.05)	1.5	.5	G20	.3	.3	.3	1.5	G20	20
Ti %(.002)	.005	.015	.5	.005	.5	.005	.3	.2	.1
Mn(10)	300	70	5000	1000	200	300	300	G5000	G5000
Ag(.5)	300	3	20	20	20	1	15	7	30
As(200)	1000	N	N	N	L	200	1500	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	30	N	N	15	150	15	10	N	N
Ba(20)	L	100	200	150	2000	L	500	20	20
Be(1)	7	L	N	L	L	7	7	L	1.5
Bi(10)	G1000	300	100	300	50	30	20	N	100
Cd(20)	50	N	50	N	N	N	N	N	N
Co(5)	30	7	7	5	L	30	50	L	L
Cr(10)	50	70	70	N	100	15	70	20	20
Cu(5)	G20000	500	3000	G20000	1000	1500	G20000	150	20
La(20)	30	20	20	20	20	L	500	L	L
Mo(5)	100	15	N	10	7	5	50	15	70
Nb(20)	N	N	N	N	L	N	N	N	N
Ni(5)	200	20	50	30	5	150	150	L	5
Pb(10)	15000	150	1000	700	200	500	2000	100	700
Sb(100)	L	100	N	100	500	100	1000	N	N
Sc(5)	5	N	75	N	7	L	7	5	5
Sn(10)	200	N	70	N	N	N	N	100	50
Sr(100)	N	N	N	N	L	N	N	N	N
V(10)	500	150	700	100	300	100	1000	100	50
W(50)	100	N	70	N	N	N	70	100	N
Y(10)	150	N	150	N	20	20	200	20	20
Zn(200)	7000	N	700	700	N	3000	G10000	N	200
Zr(10)	N	50	500	N	150	15	100	20	15
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

lement	Sample Number								
	1836	1837	1838	1839 A	1839 B	1840	1841	1842	1843
Fe %(.05)	2	3	10	7	7	3	5	5	1.5
Mg %(.02)	1	10	1.5	1	5	5	5	.3	.03
Ca %(.05)	15	15	20	15	G20	5	15	1	.1
Ti %(.002)	.3	.007	.3	.1	.2	.005	.03	.3	.005
Mn(10)	1000	5000	5000	G5000	G5000	700	3000	150	70
Ag(.5)	15	N	150	N	L	50	3	5	5
As(200)	N	N	N	N	N	N	N	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	15	10	N	N	30	30	N	20	10
Ba(20)	2000	N	200	L	300	L	500	1500	100
Be(1)	2	2	1	1.5	20	L	L	L	L
Bi(10)	L	N	50	50	15	G1000	10	200	150
Cd(20)	N	N	N	N	N	G500	70	N	N
Co(5)	L	10	20	7	70	7	10	N	N
Cr(10)	10	10	20	20	30	10	10	20	L
Cu(5)	30	150	150	200	G20000	G20000	700	70	30
La(20)	30	L	N	N	L	N	N	20	L
Mo(5)	N	70	150	70	20	N	N	70	10
Nb(20)	N	N	N	N	N	N	N	L	N
Ni(5)	L	5	15	15	50	L	5	L	5
Pb(10)	150	30	200	150	70	200	20	500	200
Sb(100)	N	N	N	N	N	N	N	N	N
Sc(5)	5	N	L	5	7	N	N	L	N
Sn(10)	N	N	70	50	10	200	15	N	N
Sr(100)	5000	N	150	N	100	N	200	500	N
V(10)	70	50	100	300	150	20	50	150	30
W(50)	N	150	500	L	150	200	N	150	L
Y(10)	20	N	20	10	30	N	L	15	N
Zn(200)	500	700	300	300	700	G10000	700	N	N
Zr(10)	100	N	50	30	150	N	10	70	N
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1844	1845	1846 A	1846 B	1847	1848	1849 A	1849B	1850
Fe %(.05)	3	10	20	.7	10	5	3	.7	5
Mg %(.02)	.7	.5	1.5	7	.3	.3	.3	1.5	.5
Ca %(.05)	1.5	15	15	10	20	20	15	15	20
Ti %(.002)	.3	.2	.05	L	1	.03	.03	.1	.1
Mn(10)	500	G5000	3000	3000	G5000	5000	G5000	300	5000
Ag(.5)	N	10	N	N	30	N	N	N	L
As(200)	N	N	N	N	N	N	N	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	30	N	N	10	N	N	N	N	70
Ba(20)	1000	20	100	N	20	20	N	70	70
Be(1)	1	N	1.5	N	L	1.5	N	L	1
Bi(10)	N	N	N	N	10	70	N	N	20
Cd(20)	N	N	N	N	N	N	N	N	500
Co(5)	7	L	N	N	5	N	N	L	30
Cr(10)	50	50	30	L	20	L	10	50	50
Cu(5)	50	20	700	50	30	150	30	15	G20000
La(20)	30	N	L	L	N	N	N	20	20
Mo(5)	L	20	30	20	50	15	N	N	N
Nb(20)	N	N	N	N	N	N	N	N	N
Ni(5)	20	15	N	N	5	L	N	10	10
Pb(10)	30	L	70	20	150	50	15	20	50
Sb(100)	N	N	N	N	N	N	N	N	N
Sc(5)	7	7	5	N	N	N	N	L	7
Sn(10)	N	100	N	N	200	100	100	N	30
Sr(100)	300	N	N	N	N	N	N	200	L
V(10)	70	200	200	15	200	20	15	30	70
W(50)	N	N	L	N	200	150	N	N	200
Y(10)	30	10	10	N	10	L	L	10	30
Zn(200)	N	N	N	700	3000	L	500	N	G10000
Zr(10)	300	50	10	N	50	N	N	50	30
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1857 A	1857 B	1858	1859	1860 A	1860 B	1861	1862	1863 A
Fe % (.05)	.2	.7	.5	.1	.15	.1	3	.07	.3
Mg % (.02)	5	.07	.15	.03	.02	.02	.03	.02	.2
Ca % (.05)	7	.07	1	.1	.07	.2	L	.05	.2
Ti % (.002)	L	.05	.02	.01	.015	.01	.07	.01	.05
Mn (10)	200	10	500	10	20	L	20	15	20
Ag (.5)	.7	L	10	50	700	700	20	150	2
As (200)	N	200	N	300	2000	2000	L	200	N
Au (10)	N	N	N	N	N	N	N	N	N
B (10)	N	70	10	10	10	L	20	15	20
Ba (20)	700	150	5000	G5000	300	300	1500	100	150
Be (1)	N	L	L	N	N	N	N	1	1
Bi (10)	N	N	N	L	N	N	N	N	N
Cd (20)	G500	N	300	500	500	300	N	100	30
Co (5)	5	L	10	N	N	N	N	N	N
Cr (10)	L	10	10	L	L	L	15	L	10
Cu (5)	20	15	70	70	100	100	50	50	20
La (20)	20	L	20	N	20	20	L	20	20
Mo (5)	7	10	N	N	20	15	20	100	N
Nb (20)	N	N	N	N	N	N	N	N	N
Ni (5)	15	15	50	10	5	5	10	5	7
Pb (10)	300	20	5000	15000	G(20000)	G(20000)	3000	20000	700
Sb (100)	150	200	200	2000	G(10000)	G(10000)	700	2000	100
Sc (5)	N	N	N	N	L	L	L	L	L
Sn (10)	N	N	N	N	N	N	N	N	N
Sr (100)	N	N	N	100	L	100	N	N	N
V (10)	20	20	50	15	20	15	70	20	30
W (50)	N	N	N	N	N	N	N	N	N
Y (10)	L	N	L	N	N	N	L	N	L
Zn (200)	3000	200	G10000	5000	1500	1500	300	500	1500
Zr (10)	L	150	10	10	10	10	30	10	70
Th (100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Sample Description

Sample Number	Location	Description
1828	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122200 N 0582040 E Near Oak Spring Oak Spring District	Chrysocolla pod and veins replacement and along fractured - gossan, vugs with gray streaked quartz veins - from dump above a shaft.
1829	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121860 N 0581820 E Oak Spring Wash Oak Spring District	Sugary quartzite with minor shows of hematite, pyrite from a prospect.
1830	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121820 N 0581900 E Oak Spring Wash Oak Spring District	Limestone with minor Cu oxides and malachite - Fe oxide. Some quartz vein material prospect for chyrsocolla.
1831	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122120 N 0582160 E Oak Spring Wash Oak Spring District	Quartz vein material in Limestone Cu oxides in N-W striking vein system lower dump near small prospect.
1832	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4121780 N 0582240 E Oak Spring Wash Oak Spring District	Quartzite, argillite, silicification, Cinn-brown & red brown hematite limonite in quartzite zone white quartz along fractures.
1833	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4122140 N 0581800 E Oak Spring Wash Oak Spring District	(A) Selected from fault zone altered volcanic from gouge near prospect. (B) Brecciated congl. - some Cu which was found in dump.
1834	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119650 N 0582690 E Oak Spring Wash Oak Spring District	Tactite from mine dump with Tungsten and Moly? Garnet - calcite quartz vein cross-cutting from dump above shaft.
1835	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119720 N 0582680 E Oak Spring Wash Oak Spring District	Tactite from a small pit. A selected sample that was near the granitic contact - We thought it may contain moly and tungsten.
1836	Quad: Oak Spring 7 1/2' Sec: Unsurveyed T: R: UTM: 4119720 N 0582860 E Oak Spring Wash Oak Spring District	Porphyry granodiorite(?) strongly oxidized intrusive biotite rich porphyritic.

Semi-Quantitative Spectrographic Analysis

lement — Sample Number

	1863 B	1864	1865	1866	1867	1868	1869	1870	1871
Fe %(.05)	.5	3	2	2	.2	2	1.5	2	5
Mg %(.02)	.1	.15	.15	.15	.02	.05	.7	7	2
Ca %(.05)	.2	.1	.15	10	.07	.15	7	20	10
Ti %(.002)	.07	.3	.2	.1	.02	.5	.2	.3	.05
Mn(10)	20	50	500	1500	20	100	1000	1000	1500
Ag(.5)	2	10	3	2	2000	5	3	7	15
As(200)	N	N	N	N	N	N	N	N	N
Au(10)	N	N	N	N	20	N	N	N	N
B(10)	30	30	15	20	10	20	70	50	30
Ba(20)	1000	2000	700	700	100	2000	700	300	50
Be(1)	L	2	1	N	N	1	2	3	5
Bi(10)	N	N	30	N	700	N	N	30	N
Cd(20)	N	N	N	N	N	N	N	N	N
Co(5)	L	7	10	5	N	10	10	15	70
Cr(10)	10	20	10	10	10	10	20	150	50
Cu(5)	70	30	50	30	100	30	20	100	G(20000)
La(20)	20	70	30	30	30	20	70	50	L
Mo(5)	N	10	N	N	N	5	N	N	70
Nb(20)	N	L	N	N	N	N	N	N	N
Ni(5)	10	7	7	5	7	5	10	30	15
Pb(10)	300	300	150	150	200	50	150	200	50
Sb(100)	L	N	N	N	N	N	N	N	N
Sc(5)	L	10	7	7	L	7	7	10	5
Sn(10)	N	N	N	N	N	N	N	N	N
Sr(100)	L	500	100	200	100	300	500	200	N
V(10)	50	70	70	50	20	50	50	100	70
W(50)	N	N	N	N	N	N	N	50	300
Y(10)	N	15	10	20	N	15	30	30	10
Zn(200)	500	N	N	N	N	N	N	500	1000
Zr(10)	50	300	100	70	15	200	150	70	20
Th(100)	N	N	N	N	N	N	N	N	N

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Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

lement	Sample Number								
	1872	1873	1874	1875	1876	1877	1878	1879	1880
Fe %(.05)	1	5	.7	.7	3	.5	3	.5	1.5
Mg %(.02)	.1	.2	.05	.05	.1	.05	.15	1	.07
Ca %(.05)	.05	.15	.1	.2	.05	.3	.07	2	.15
Ti %(.002)	.05	.1	.1	.15	.1	.05	.15	.05	.07
Mn(10)	200	5000	50	50	300	500	150	30	3000
Ag(.5)	5	30	1	N	2	20	L	N	10
As(200)	L	1000	N	N	N	N	N	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	150	100	50	10	50	10	70	20	20
Ba(20)	200	1500	2000	1500	700	200	500	100	5000
Be(1)	L	3	L	L	1.5	N	7	N	1
Bi(10)	N	100	N	N	L	L	N	N	N
Cd(20)	N	N	N	N	N	N	N	N	N
Co(5)	10	100	10	N	10	10	5	10	N
Cr(10)	10	15	10	10	10	10	10	20	L
Cu(5)	150	500	70	50	100	20	15	15	100
La(20)	L	50	30	20	L	20	70	20	30
Mo(5)	70	1000	15	N	500	N	N	15	700
Nb(20)	N	N	N	N	N	N	30	N	N
Ni(5)	5	5	5	5	5	10	L	10	5
Pb(10)	50	700	150	50	100	50	150	50	2000
Sb(100)	N	200	N	N	N	N	N	N	N
Sc(5)	L	5	L	L	L	L	5	L	5
Sn(10)	N	N	N	N	N	N	N	N	N
Sr(100)	N	150	200	300	150	N	200	N	200
V(10)	20	100	30	30	50	20	20	20	20
W(50)	N	150	N	N	L	N	N	N	N
Y(10)	L	10	L	L	L	L	20	L	15
Zn(200)	N	N	N	N	N	N	N	N	1000
Zr(10)	10	50	30	70	30	20	300	100	100
Th(100)	N	N	N	N	N	N	N	N	N

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Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

lement	Sample Number								
	1881	1882	1883	1884 A	1884 B	1885	1886	1887	1888
Fe %(.05)	2	2	1.5	5	5	7	3	5	10
Mg %(.02)	.2	.1	.2	2	.2	.3	.05	.5	2
Ca %(.05)	.2	.05	5	1.5	.3	.3	.5	2	3
Ti %(.002)	.07	.2	.2	.3	.3	.5	.5	.5	.5
Mn(10)	300	50	2000	2000	3000	300	700	100	1000
Ag(.5)	L	2	1	N	N	N	N	N	N
As(200)	N	N	N	N	N	N	N	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	50	20	50	50	300	70	20	1500	150
Ba(20)	1500	1000	2000	1500	2000	1500	1000	700	2000
Be(1)	3	L	7	2	2	2	1	1.5	2
Bi(10)	N	L	N	N	N	N	N	N	N
Cd(20)	N	N	N	N	N	N	N	N	N
Co(5)	N	N	7	20	30	10	10	10	30
Cr(10)	10	15	20	50	30	50	10	150	150
Cu(5)	20	50	10	20	50	30	7	30	70
La(20)	50	70	20	70	70	50	20	70	100
Mo(5)	N	15	N	L	20	15	10	N	N
Nb(20)	N	N	N	N	N	N	N	N	N
Ni(5)	5	5	10	20	15	10	5	7	20
Pb(10)	70	100	70	70	150	50	20	50	50
Sb(100)	N	N	150	N	N	N	N	N	N
Sc(5)	7	10	7	15	15	20	7	20	30
Sn(10)	N	N	N	N	N	N	N	N	N
Sr(100)	300	300	200	500	300	300	150	500	700
V(10)	20	50	70	200	100	200	50	300	300
W(50)	N	N	N	N	N	N	N	N	N
Y(10)	20	15	10	30	15	20	20	20	50
Zn(200)	N	N	L	N	N	N	N	N	N
Zr(10)	100	300	50	200	300	200	300	200	300
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

lement	Sample Number								
	1889	1890	1891	1892	1893	1894	1895	1896	1897
Fe %(.05)	7	2	5	1	2	1	10	3	2
Mg %(.02)	1.5	2	.3	.07	.05	.1	.2	.05	.15
Ca %(.05)	2	20	.2	1	.05	.3	.3	.07	5
Ti %(.002)	.5	.1	.2	.1	.2	.1	.15	.07	.01
Mn(10)	1500	1000	70	700	200	150	300	50	1500
Ag(.5)	N	N	1.5	50	1	L	N	N	N
As(200)	N	N	200	N	N	N	L	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	200	150	1000	20	20	30	50	100	10
Ba(20)	2000	150	1000	700	1500	300	200	200	G(5000)
Be(1)	3	1.5	3	N	1.5	7	10	2	1
Bi(10)	N	N	20	N	N	N	N	N	N
Cd(20)	N	N	N	N	N	N	N	N	N
Co(5)	20	7	7	10	5	N	5	N	15
Cr(10)	30	10	50	20	20	L	20	7	15
Cu(5)	100	30	50	30	50	50	100	100	L
La(20)	5	N	30	N	N	N	50	N	N
Mo(5)	N	N	N	N	N	20	50	L	N
Nb(20)	N	N	N	N	N	20	50	L	N
Ni(5)	20	15	7	7	5	5	10	5	7
Pb(10)	100	50	70	20	30	50	70	70	15
Sb(100)	N	N	L	N	N	N	N	N	N
Sc(5)	20	5	10	5	7	5	7	5	L
Sn(10)	N	N	N	N	N	N	N	N	N
Sr(100)	500	100	100	100	200	100	L	L	3000
V(10)	200	70	150	70	50	20	70	50	70
W(50)	N	N	N	N	N	N	N	N	N
Y(10)	50	20	20	20	20	30	70	50	10
Zn(200)	N	N	N	N	N	N	200	N	N
Zr(10)	300	70	100	50	150	150	300	150	L
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

lement — Sample Number

	1898	1899	1900	1901	1902	1903	1904	1905A	
Fe %(.05)	20	20	5	3	5	3	.5	1.5	
Mg %(.02)	1.5	.07	.07	.5	.03	.05	.15	.15	
Ca %(.05)	7	2	.2	20	.07	.3	.07	.07	
Ti %(.002)	.01	.02	.3	.1	.1	.07	.1	.2	
Mn(10)	200	150	100	2000	150	50	100	500	
Ag(.5)	.5	.5	1.5	20	10	N	N	20	
As(200)	N	300	700	200	700	N	N	N	
Au(10)	N	N	N	N	N	N	N	N	
B(10)	30	20	50	20	15	20	70	70	
Ba(20)	1500	G(5000)	200	1000	500	2000	300	500	
Be(1)	1.5	N	L	30	10	5	5	50	
Bi(10)	N	N	L	N	N	N	N	N	
Cd(20)	N	N	N	N	N	N	N	N	
Co(5)	N	N	7	N	N	N	N	10	
Cr(10)	20	20	30	10	10	10	L	20	
Cu(5)	15	10	300	5	20	5	L	20	
La(20)	L	L	L	30	50	50	50	50	
Mo(5)	100	70	N	10	N	N	N	N	
Nb(20)	N	N	L	L	50	N	30	L	
Ni(5)	30	10	15	10	L	7	7	30	
Pb(10)	100	100	100	70	100	15	30	30	
Sb(100)	N	500	N	N	N	N	N	N	
Sc(5)	5	5	5	L	15	5	5	7	
Sn(10)	N	N	N	N	N	N	N	N	
Sr(100)	N	100	1000	200	150	500	N	200	
V(10)	300	100	100	30	150	50	20	50	
W(50)	N	N	L	N	N	N	N	N	
Y(10)	10	10	20	50	70	100	20	20	
Zn(200)	300	3000	N	N	N	N	N	L	
Zr(10)	L	20	300	100	300	30	150	100	
Th(100)	N	N	N	N	N	N	N	N	

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1905 B	1906	1907	1908	1909	1910	1911	1912	1912
Fe %(.05)	2	1.5	1.5	.7	15	.7	7	3	5
Mg %(.02)	.15	.1	.1	.03	.02	.02	.2	.15	.02
Ca %(.05)	.05	.1	.7	.05	.07	L	.1	.3	L
Ti %(.002)	.2	.15	.15	.05	.01	.05	.2	.07	.03
Mn(10)	700	300	300	100	150	300	1000	500	1000
Ag(.5)	70	30	5	.5	5	20	20	10	20
As(200)	N	N	N	N	N	N	300	200	N
Au(10)	L	N	N	N	N	N	N	N	N
B(10)	30	15	15	15	20	15	150	70	30
Ba(20)	500	500	300	200	150	300	300	300	300
Be(1)	70	70	50	5	20	10	15	10	50
Bi(10)	N	N	N	N	N	N	N	N	N
Cd(20)	N	N	N	N	N	N	N	N	N
Co(5)	15	N	5	N	N	N	N	N	N
Cr(10)	15	10	10	L	10	L	10	L	10
Cu(5)	50	100	5	5	L	10	15	50	50
La(20)	70	50	50	70	20	50	70	50	20
Mo(5)	N	N	N	N	N	10	50	100	200
Nb(20)	L	N	20	30	N	L	20	20	N
Ni(5)	30	7	7	5	7	5	5	5	5
Pb(10)	50	100	20	50	N	30	500	200	20
Sb(100)	N	N	N	N	N	N	N	N	100
Sc(5)	5	5	5	L	L	L	15	15	N
Sn(10)	N	N	N	N	N	N	10	N	N
Sr(100)	200	300	700	100	N	N	L	100	100
V(10)	30	30	30	15	20	15	100	50	100
W(50)	N	N	N	N	N	N	N	N	N
Y(10)	50	15	20	50	15	20	100	100	10
Zn(200)	200	N	N	N	N	N	300	500	N
Zr(10)	150	100	150	200	50	100	200	100	50
Th(100)	N	N	N	N	N	N	L	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

Element — Sample Number

	1914	1915	1916	1917	1918	1919	1920	1921	
Fe %(.05)	.5	.5	.5	1	.2	2	1	1	
Mg %(.02)	.07	.02	.1	.02	.03	.15	.3	.5	
Ca %(.05)	.07	.1	L	.05	L	.3	.2	20	
Ti %(.002)	.07	.02	.07	.1	.05	.015	.03	.05	
Mn(10)	200	50	70	150	20	50	20	300	
Ag(.5)	10	20	15	3	N	5	100	1	
As(200)	N	N	N	N	N	1000	200	N	
Au(10)	N	N	N	N	N	N	N	N	
B(10)	15	20	20	15	20	30	20	20	
Ba(20)	300	300	300	700	150	G(5000)	1000	50	
Be(1)	50	50	20	5	N	N	N	N	
Bi(10)	N	N	N	N	N	N	N	N	
Cd(20)	N	N	N	N	N	N	N	N	
Co(5)	N	N	N	N	N	N	N	N	
Cr(10)	L	10	10	L	20	20	20	30	
Cu(5)	L	10	5	15	10	20000	20000	100	
La(20)	50	30	70	70	50	N	N	N	
Mo(5)	70	50	50	N	N	50	N	N	
Nb(20)	L	N	20	L	N	N	N	N	
Ni(5)	5	7	5	5	5	20	10	10	
Pb(10)	20	50	70	30	15	2000	50	30	
Sb(100)	N	N	N	N	N	1000	2000	N	
Sc(5)	L	N	L	5	L	N	N	7	
Sn(10)	N	N	N	N	N	30	N	N	
Sr(100)	L	L	L	200	N	100	N	200	
V(10)	30	20	30	30	20	200	100	50	
W(50)	N	N	N	N	N	N	N	N	
Y(10)	15	50	20	20	10	10	10	50	
Zn(200)	N	N	N	N	N	700	N	N	
Zr(10)	100	50	150	150	100	10	30	15	
Th(100)	N	N	N	N	N	N	N	N	

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
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Semi-Quantitative Spectrographic Analysis

lement	Sample Number								
	1922	1923	1924	1925	1926	1927	1928	1929	1930
Fe %(.05)	1	.5	10	7	7	7	10	5	7
Mg %(.02)	.1	5	.7	7	5	7	7	7	3
Ca %(.05)	.5	7	2	20	20	20	15	20	15
Ti %(.002)	.2	.02	.1	.05	.07	.03	.03	.05	.1
Mn(10)	300	200	1500	3000	G(5000)	1000	3000	2000	G(5000)
Ag(.5)	N	20	.7	10	20	10	N	N	N
As(200)	N	N	N	N	N	N	N	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	30	15	20	30	30	70	30	15	15
Ba(20)	500	300	N	L	L	L	150	L	L
Be(1)	10	N	5	7	2	1.5	5	5	10
Bi(10)	N	N	N	20	70	10	N	N	15
Cd(20)	N	G(500)	N	N	500	30	N	20	G(500)
Co(5)	N	N	N	70	N	N	20	N	20
Cr(10)	L	10	20	30	50	20	15	15	50
Cu(5)	20	150	1000	700	300	3000	1500	300	100
La(20)	100	20	L	N	N	N	N	N	N
Mo(5)	N	20	100	1000	20	100	70	20	50
Nb(20)	50	N	N	N	N	N	N	N	N
Ni(5)	L	10	5	5	5	5	5	5	20
Pb(10)	50	10000	30	3000	5000	7000	300	50	50
Sb(100)	N	1500	N	N	L	N	N	N	N
Sc(5)	5	L	5	L	5	L	L	L	7
Sn(10)	10	N	30	20	100	N	N	N	200
Sr(100)	150	N	N	N	100	N	L	N	N
V(10)	20	30	100	70	150	30	100	70	300
W(50)	N	N	N	300	70	L	100	50	7000
Y(10)	50	L	10	15	10	10	10	10	20
Zn(200)	N	10000	N	1000	10000	3000	500	700	G(10000)
Zr(10)	300	10	100	30	30	10	50	20	50
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1940	1941	1942	1943	1944	1945	1946	1947 A	1947B
Fe %(.05)	.1	.05	1	3	3	.7	.7	7	2
Mg %(.02)	L	L	L	.02	.05	.02	.03	.02	.03
Ca %(.05)	L	L	L	L	L	L	L	.1	.07
Ti %(.002)	.002	L	.05	.1	.2	.03	,05	.07	.1
Mn(10)	15	15	L	20	15	10	50	70	30
Ag(.5)	2000	1000	700	50	10	150	70	1	1.5
As(200)	N	N	N	N	L	N	N	200	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	N	N	N	10	20	10	10	10	10
Ba(20)	1000	700	150	100	2000	150	300	G5000	G5000
Be(1)	L	N	N	N	N	N	N	N	N
Bi(10)	50	10	200	N	10	100	50	N	N
Cd(20)	N	N	N	N	N	100	N	N	N
Co(5)	N	N	N	L	L	N	N	N	N
Cr(10)	L	N	50	15	20	10	10	15	20
Cu(5)	7000	2000	300	5000	700	1500	2000	20	20
La(20)	L	L	L	L	L	L	L	N	N
Mo(5)	N	N	N	N	N	N	N	N	15
Nb(20)	N	N	N	N	L	N	N	N	L
Ni(5)	5	L	L	5	5	5	5	5	5
Pb(10)	G20000	G20000	G20000	G20000	1500	G20000	10000	150	700
Sb(100)	700	500	700	150	200	L	300	N	100
Sc(5)	N	N	L	L	N	N	N	N	N
Sn(10)	15	50	N	20	N	N	N	N	N
Sr(100)	N	N	N	N	N	N	N	N	N
V(10)	10	15	50	50	50	15	20	100	100
W(50)	N	N	N	N	N	N	N	N	N
Y(10)	N	N	N	N	30	N	N	N	N
Zn(200)	N	N	1500	N	N	N	700	1000	N
Zr(10)	N	N	50	70	150	70	50	30	50
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey. Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Semi-Quantitative Spectrographic Analysis

lement	Sample Number								
	1948	1949	1950						
Fe % (.05)	.05	3	1.5						
Mg % (.02)	.02	.15	.3						
Ca % (.05)	.05	20	2						
Ti % (.002)	.015	.01	.2						
Mn (10)	L	5000	500						
Ag (.5)	2	1000	2						
As (200)	L	N	N						
Au (10)	N	30	N						
B (10)	N	N	10						
Ba (20)	G5000	700	500						
Be (1)	N	1	5						
Bi (10)	N	70	N						
Cd (20)	N	N	N						
Co (5)	N	N	L						
Cr (10)	10	L	L						
Cu (5)	10	20	15						
La (20)	N	L	20						
Mo (5)	N	10	20						
Nb (20)	N	N	N						
Ni (5)	L	L	L						
Pb (10)	1500	100	150						
Sb (100)	500	N	N						
Sc (5)	N	N	L						
Sn (10)	N	N	N						
Sr (100)	500	N	500						
V (10)	50	30	50						
W (50)	N	N	N						
Y (10)	N	20	10						
Zn (200)	1000	N	N						
Zr (10)	N	N	100						
Th (100)	N	N	N						

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element	Sample Number								
	379	380	381						
As (5)	45	500	35						
Au (.05)	.70	N(.05)	N(.05)						
Sb (1)	55	100	2						
Zn (5)	40	50	45						
Hg (.2)	2.0	1.5	.55						

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1801	1802	1803	1804	1805	1806	1807	1808	1809
As (5)	G200	N(5)	50	5	G200	G200	G200	65	35
Au (.05)	.50	.05	N(.05)	N(.05)	.30	.45	.50	.25	.20
Sb (1)	G100	3	4	N(1)	20	G100	G100	4	9
Zn (5)	G200	G200	30	45	120	80	G200	G200	G200

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown

Atomic-Adsorbtion Analysis

Element — Sample Number

	1810	1811	1812	1813	1814	1815	1816	1817	1818
As (5)	G200	100	G200	120	G200	140	75	G200	20
Au (.05)	L(.05)	1.4	.15	L(.05)	.05	.05	.05	.05	N(.05)
Sb (1)	G100	11	G100	G100	57	24	27	G100	13
Zn (5)	110	50	80	25	170	G200	G200	G200	130

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1819	1820	1821	1822	1823	1824	1825	1826	1827
As (5)	35	10	L(5)	L(5)	100	G200	40	G200	N(5)
Au (.05)	.15	N(.05)	N(.05)	L(.05)	.15	.75	L(.05)	.60	.15
Sb (1)	G100	12	7	14	G100	G100	46	G100	N(1)
Zn (5)	10	55	15	G200	G200	G200	G200	G200	110

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown

Atomic-Adsorbtion Analysis

Element — Sample Number

	1828	1829	1830	1831	1832	1833A	1833B	1834	1835
As (5)	G200	95	95	55	190	G200	G200	N(5)	N(5)
Au (.05)	.60	.05	.35	.05	.85	N(.05)	N(.05)	N(.05)	N(.05)
Sb (1)	70	42	37	65	G100	100	G100	N(1)	N(1)
Zn (5)	120	140	G200	G200	30	G200	G200	150	150

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1836	1837	1838	1839A	1839B	1840	1841	1842	1843
As (5)	N(5)	N(5)	5	N(5)	N(5)	10	20	15	25
Au (.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)
Sb (1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)
Zn (5)	220	200	G200	G200	G200	G200	G200	30	15

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1844	1845	1846 A	1846B	1847	1848	1849A	1849B	1850
As (5)	10	N(5)	N(5)	L(5)	N(5)	N(5)	N(5)	N(5)	40
Au (.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	L(.05)
Sb (1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)	N(1)
Zn (5)	120	130	100	G200	G200	G200	G200	35	G200

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1851	1852A	1852B	1853	1854	1855A	1855B	1855C	1856
As (5)	25	N(5)	N(5)	N(5)	L	G	G	25	G200
Au (.05)	L(.05)	N(.05)	N(.05)	N(.05)	N(.05)	.10	.10	N(.05)	N(.05)
Sb (1)	N(1)	N(1)	N(1)	N(1)	N(1)	G100	G100	72	G100
Zn (5)	G200	130	150	30	50	G200	G200	15	120

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element	Sample Number								
	1857A	1857B	1858	1859					
As (5)	50	75	50	160					
Au (.05)	L(.05)	N(.05)	N(.05)	L(.05)					
Sb (1)	90	110	66	G100					
Zn (5)	G200	120	G200	G200					

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Semi-Quantitative Spectrographic Analysis

Element	Sample Number								
	1851	1852 A	1852 B	1853	1854	1855 A	1855 B	1855 C	1856
Fe %(.05)	7	5	3	.7	.7	.1	.5	.05	.1
Mg %(.02)	.5	3	5	.5	.2	.02	.05	.05	.05
Ca %(.05)	20	15	15	2	1	.05	.07	.15	.3
Ti %(.002)	.1	.07	.02	.2	.15	.015	.07	.002	.03
Mn(10)	G5000	G5000	1000	700	300	L	10	15	150
Ag(.5)	20	N	N	N	N	20	15	5	15
As(200)	N	N	N	N	N	300	1000	N	500
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	N	N	L	N	15	15	70	N	L
Ba(20)	100	20	L	500	700	G5000	G5000	G5000	G5000
Be(1)	3	2	N	2	2	N	N	N	N
Bi(10)	150	N	N	N	N	N	N	N	N
Cd(20)	150	N	N	N	N	500	L	N	N
Co(5)	10	5	5	L	L	L	N	N	N
Cr(10)	15	30	15	N	L	L	50	10	N
Cu(5)	5000	300	300	15	20	30	30	7	20
La(20)	L	N	N	100	20	N	20	20	20
Mo(5)	N	N	15	N	15	N	N	N	7
Nb(20)	N	N	N	N	N	N	N	N	N
Ni(5)	10	10	10	5	L	5	5	N	5
Pb(10)	200	15	20	30	20	3000	1500	500	10000
Sb(100)	N	N	N	N	N	1000	1000	200	2000
Sc(5)	L	7	N	L	L	N	L	L	N
Sn(10)	200	100	N	N	N	N	N	N	N
Sr(100)	N	N	150	300	300	700	150	G5000	5000
V(10)	70	70	20	30	30	15	70	10	100
W(50)	300	N	N	N	N	N	N	N	N
Y(10)	15	10	10	15	L	N	N	10	L
Zn(200)	G10000	200	N	N	N	5000	300	N	200
Zr(10)	30	30	N	100	70	L	20	N	10
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1860A	1860B	1861	1862	1863A	1863B	1864	1865	1866
As (5)	G200	G200	G200	G200	15	L(5)	40	30	30
Au (.05)	.15	.05	.05	.10	.10	N(.05)	.05	L(.05)	.15
Sb (1)	G100	G100	G100	G100	G100	24	10	6	6
Zn (5)	G200	G200	G200	G200	G200	G200	50	35	25

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1867	1868	1869	1870	1871	1872	1873	1874	1875
As (5)	N(5)	10	30	N(5)	5	20	G200	10	5
Au (.05)	17	.05	.05	N(.05)	.05	N(.05)	.10	L(.05)	N(.05)
Sb (1)	2	1	5	4	N(1)	5	G100	5	4
Zn (5)	10	5	35	G200	G200	25	100	10	10

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection. < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1876	1877	1878	1879	1880	1881	1882	1883	1884A
As (5)	25	5	30	15	20	5	60	30	5
Au (.05)	N(.05)	.55	L(.05)	N(.05)	.05	N(.05)	L(.05)	.15	N(.05)
Sb (1)	5	2	2	2	7	3	7	6	1
Zn (5)	10	40	60	60	G200	40	120	110	80

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1884B	1885	1886	1887	1888	1889	1890	1891	1892
As (5)	30	35	10	10	15	10	30	70	25
Au (.05)	N(.05)	N(.05)	L(.05)	N(.05)	N(.05)	N(.05)	N(.05)	.05	1.0
Sb (1)	2	1	1	2	1	1	2	4	3
Zn (5)	75	30	15	10	170	5	20	10	35

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1893	1894	1895	1896	1897	1898	1899	1900	1901
As (5)	35	10	65	20	25	G200	G200	600	110
Au (.05)	L(.05)	N(.05)	L(.05)	N(.05)	L(.05)	N(.05	N(.05)		.50
Sb (1)	5	N(1)	3	1	N(1)	11	G100	22	1
Zn (5)	45	5	180	50	10	G200	G200	60	45

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1902	1903	1904	1905A	1905B	1906	1907	1908	1909
As (5)	G200	30	20	55	30	40	60	10	15
Au (.05)	1.4	L(.05)	N(.05)	.50	7.3	1.6	.40	.85	3.6
Sb (1)	4	1	1	1	2	1	3	1	1
Zn (5)	10	20	20	120	140	60	60	40	25

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1910	1911	1912	1913	1914	1915	1916	1917	1918
As (5)	30	G200	G200	25	25	30	20	10	15
Au (.05)	.15	1.5	.15	1.4	.10	.30	.25	.55	.30
Sb (1)	2	11	15	1	2	3	3	1	2
Zn (5)	45	210	G200	45	15	25	10	30	5

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1919	1920	1921	1922	1923	1924	1925	1926	1927
As (5)	G200	120	20	10	180	20	10	55	30
Au (.05)	.05	L(.05)	N(.05)	N(.05)	.05	N(.05)	L(.05)	.05	.10
Sb (1)	G100	G100	6	2	G100	3	16	41	10
Zn (5)	G200	G200	50	50	G200	110	G200	G200	G200

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1928	1929	1930	1931	1932	1933	1934	1935	1936
As (5)	35	5	5	5	30	15	5	20	5
Au (.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)
Sb (1)	6	1	N(1)	12	N(1)	N(1)	N(1)	1	N(1)
Zn (5)	G200	G200	G200	G200	G200	G200	G200	G200	G200

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1937	1938	1939	1940	1941	1942	1943	1944	1945
As (5)	5	5	10	N(5)	N(5)	40	90	170	40
Au (.05)	N(.05)	N(.05)							
Sb (1)	N(1)	N(1)	42	270	210	26	16	50	30
Zn (5)	G200	95	L(5)	L(5)	L(5)	30	70	180	100

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.

Atomic-Adsorbtion Analysis

Element — Sample Number

	1946	1947A	1947B	1948	1949	1950			
As (5)	85	230	100	65	40	N(5)			
Au (.05)									
Sb (1)	150	8	68	110	2	N(2)			
Zn (5)	190	190	120	1400	40	35			

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown

NEVADA MINING ANALYTICAL LABORATORY

(Assay Report)

DATE: 8-22-84

CLIENT: Joe Tingley

SAMPLE	Au	Ag
1185-W	35.7	1270
1801	0.028	7.86
1803	<.002	0.28
1804	<.002	0.08
1807	0.014	2.93
1815	0.002	0.62
1824	0.016	4.74
1857A	<.002	<.05
1857B	<.002	<.05
1859	<.002	0.73
1860A	0.007	20.4
1860B	<.002	16.9
1866	0.002	0.10
1867	0.650	49.9
1897	<.002	<.05
1899	<.002	<.05
1900	0.201	0.06
1901	0.014	0.32
1902	0.045	0.30
1902-W	42.6	1130

SAMPLE	Au	Ag
1903	<.002	<.05
1905A	0.010	0.45
1905B	0.656	1.95
1906	0.062	0.84
1907	0.006	0.20
1909	0.003	0.24
1910	0.098	0.41
1911	0.041	0.22
1912	<.002	0.10
1913	0.063	0.34
1914	0.005	0.10
1915	<.002	0.34
1916	0.002	0.14
1917	0.002	<.05
1918	<.002	<.05
1919	0.005	0.12
1939	0.174	7.74
1940	0.016	12.7
1941	0.009	11.9
1942	0.078	9.65
1943	0.004	0.70
1944	0.014	0.16
1945	0.020	2.28
1946	0.015	1.19

SAMPLE	Au	Ag
1947A	<.002	<.05
1947B	<.002	<.05
1948	<.002	0.05
1949	0.673	29.7

(Reporting Units: Au = Oz/Ton)
Ag = Oz/Ton

P. Lechler

Paul J. Lechler
Chief Chemist, NMAL

Atomic-Adsorbtion Analysis

Element — Sample Number

84-2

	1933	1934	1935	1936	1937	1938	1939	1940	1941
As (5)	15	5	20	5	5	5	10	N(5)	N(5)
Au (.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)	N(.05)			
Sb (1)	N(1)	N(1)	1	N(1)	N(1)	N(1)	42	270	210
Zn (5)	G200	G200	G200	G200	G200	95	L(5)	L(5)	L(5)

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below

Atomic-Adsorbtion Analysis

Element — Sample Number

84-2

	1942	1943	1944	1945	1946	1947A	1947B	1948	1949
As (5)	40	90	170	40	85	230	100	65	40
Au (.05)									
Sb (1)	26	16	50	30	150	8	68	110	2
Zn (5)	30	70	180	100	190	190	120	1400	40
Hg(.2)									1.23
Te(.2)									330

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown. N = not detected at limit of detection. < detected, but below value shown

Atomic-Adsorbtion Analysis

84-2

lement	Sample Number								
	1950	~~1951~~	~~1952A~~	~~1952B~~	1953	~~1954~~	~~1955~~	1956	~~1957~~
As (5)	N(5)	~~140~~	~~1100~~	~~75~~	~~220~~	~~75~~	~~45~~	~~60~~	~~110~~
Au (.05)		~~L(.05)~~	~~N(.05)~~	~~N(.05)~~	2.1	~~9.0~~	~~60~~	~~3.5~~	~~1.2~~
Sb (1)	N(2)	~~1000~~	~~28~~	~~14~~	G1000	~~120~~	66	300	~~10~~
Zn (5)	35	~~G2000~~	~~100~~	~~10~~	~~1800~~	~~G2000~~	~~1500~~	~~500~~	~~G2000~~
Au Sw		~~10 g~~	~~10 g~~	10 g	10 g	~~10 g~~	~~10 g~~	10 g	~~10 g~~

Analysis by Branch Exploration Geochemistry, U.S. Geol. Survey, Denver, Colorado
All elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown

Semi-Quantitative Spectrographic Analysis

lement — Sample Number

	1931	1932	1933	1934	1935	1936	1937	1938	1939
Fe %(.05)	10	10	15	15	10	15	15	2	.07
Mg %(.02)	10	2	.7	.5	.5	1.5	2	10	L
Ca %(.05)	20	15	20	20	7	20	20	20	L
Ti %(.002)	.05	.15	.1	.07	.02	.03	.1	.03	.02
Mn(10)	2000	G(5000)	(5000)	5000	3000	G(5000)	5000	1000	100
Ag(.5)	2	7	10	N	3	N	1	N	1000
As(200)	N	N	N	N	N	N	N	N	N
Au(10)	N	N	N	N	N	N	N	N	N
B(10)	50	30	50	N	L	N	L	15	N
Ba(20)	L	L	N	N	L	N	30	L	200
Be(1)	5	15	7	2	7	10	3	N	N
Bi(10)	N	50	50	70	30	N	200	N	500
Cd(20)	N	G(500)	300	N	N	N	N	N	N
Co(5)	10	70	70	5	20	15	10	N	N
Cr(10)	20	100	50	50	20	20	100	20	L
Cu(5)	1500	500	1000	300	700	100	2000	150	1500
La(20)	N	L	L	L	N	N	N	N	N
Mo(5)	50	50	50	30	20	30	50	10	N
Nb(20)	N	N	N	N	N	N	N	N	N
Ni(5)	5	20	20	10	10	15	15	10	5
Pb(10)	300	200	150	100	50	10	500	50	G20000
Sb(100)	N	N	N	N	N	N	N	N	150
Sc(5)	L	10	L	L	L	L	5	L	N
Sn(10)	70	50	50	500	50	200	150	N	15
Sr(100)	N	L	N	N	N	N	N	L	N
V(10)	50	300	100	70	70	70	70	20	10
W(50)	N	3000	1500	300	500	300	300	N	N
Y(10)	15	20	20	20	L	10	15	10	N
Zn(200)	700	G(10000)	G(10000)	700	3000	500	500	N	N
Zr(10)	20	100	50	15	20	15	50	20	20
Th(100)	N	N	N	N	N	N	N	N	N

Analysis by Branch Exploration Research, U.S. Geol. Survey, Denver, Colorado
Fe, Mg, Ti reported in %, all other elements reported in ppm.
Lower limits of determination are in parentheses.
G = greater than value shown, N = not detected at limit of detection, < detected, but below value shown.