CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the JABA, Inc. Tombstone Mining Records

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

TOMBSTONE MINING DISTRICT

Cochise County, Arizona

Briscoe Report

Tombstone Silver Mines

November 15, 1985

GEOLOGIC REPORT

on the

TOMBSTONE MINING DISTRICT,

COCHISE COUNTY, ARIZONA

With Particular Emphasis on

and Exploration Recommendations for

THE STATE OF MAINE MINE AREA

Submitted to:

Tombstone Silver Mines, Inc.
Tombstone, Arizona

by:

James A. Briscoe
Registered Professional Geologist, Arizona

James A. Briscoe & Associates, Inc.
5701 E. Glenn St., #120
Tucson, Arizona 85712

November 15, 1985

CERTIFICATE

I, James A. Briscoe, Registered Professional Geologist, #9424, State of Arizona, President of James A. Briscoe & Associates, Inc., of Tucson, Arizona, hereby certify that:

1. I am a graduate of the University of Arizona, Tucson, Arizona, B.Sc., 1964, and M.Sc., 1967, and have been practicing my profession for 21 years.

2. I am a practicing Consulting Geologist, and reside at 5701 East Glenn St., #120, Tucson, Arizona 85712.

3. I have no direct or indirect interest whatsoever in Tombstone Silver Mines, Inc., or Charlou Corporation, nor any interest in the State of Maine area mining claims, nor do I expect any interest, direct or indirect, in this organization or property or any affiliate or any security of the company.

4. The findings of the accompanying report are based on my personal examination of the State of Maine mine area claims, Tombstone Mining District, Cochise County, Arizona, in June through September of 1985, and April through August, 1973, and 1978 through 1985.

Dated in Tucson, Arizona this 15th day of November, 1985.

James A. Briscoe
Registered Professional Geologist, AZ
President
James A. Briscoe & Associates, Inc.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURES

FIGURES

FIGURES

FIGURES

SUMMARY AND CONCLUSIONS

The mineralization and accompanying alteration in the Tombstone Mining District is part of a 72 m.y. to 63 m.y. old Laramide resurgent caldera complex. The first event in the development of the caldera complex was the extrusion of the Bronco volcanics, which included andesitic flows and flow breccias, and possibly lahars of Silverbell type. These were intruded and superposed by rhyolite flows and flow breccias - possibly occurring as coalescing rhyolite domes. The initial phases of the Uncle Sam quartz latite tuff were extruded as a series of nuee ardentes. Caldera collapse followed, and the Ajax fault with a stratigraphic throw of approximately 5,000 feet, formed the eastern boundary of the cauldron. Subsequent to cauldron subsidence, the caldera margin was intruded by additional eruptions of the Uncle Sam tuff, quartz latite porphyry, granophyre, and rhyodacite. Schieffelin Granodiorite - the probable plutonic source for the Uncle Sam tuff, rose and invaded the Cauldron fault; southwest of Tombstone, near the Charleston Crossing, near Fairbank, and on the Ft. Huachuca Military Reservation northwest of the Charleston Crossing. Northeasterly trending fractures, that have characterized the crust in the Arizona area since the Precambrian, re-opened, and andesite porphyry and porphyritic andesite dikes were intruded. Circulating geothermal convection cells around plutonic cupola or apophyses of Schieffelin Granodiorite and more acidic quartz monzonite intrusives that have not been exposed by erosion, altered both the volcanics and the underlying Bisbee Group and Paleozoic sediments, and silver, gold, lead, zinc and copper mineralization was implaced. At about 63 m.y., the Extension quartz monzonite was intruded in the Tombstone Extension area, and possibly the State of Maine and other areas, sending off rhyolite dikes and sills, which intruded the overlying sediments and volcanics. Steam explosions in the Robbers Roost area created fluidized breccia pipes at depth and phreatic explosions on the surface. At the end of the Laramide, mineralizing processes ceased.

During the mid-Tertiary, the Tombstone Hills, along with surrounding ranges in Arizona, were tilted approximately 40 degrees to the northeast, and oxidation of the mineralized veins and erosion of their enclosing volcanic rocks began. Precious and base metals were leached out of the non-reactive Uncle Sam tuff to be re-precipitated below the water table. Eventually, relatively thin distal portions of the tuff were completely eroded from the main part of the Tombstone District, and acidic supergene solutions were neutralized by the basal Bisbee Limestones and underlying Naco Limestone, and precious metals were deposited as secondary bonanza grade mineral zones along porous and chemically receptive horizons. In the State of Maine area, thicker Uncle Sam tuff within the caldera remains to the present time. Acid, supergene solutions removed most precious and base metals from the surface and re-deposited them below the water table to form enriched secondary deposits. Halides, leaching from fresh Uncle Sam tuff in unaltered wall rocks of the veins, acted to precipitate some silver as bromyrite along the hanging and footwall portions of the veins.

In 1877, Ed Schieffelin discovered the exposed bonanza silver-gold mineralization in the Bisbee Limestones, exposed by erosion in the main part of the district. These deposits were mined actively for the next 50 years, and then sporadically for the next 58 years. The silver mineralization in the interior part of the caldera layed hidden and out of reach of the early miners beneath the water table and the leached and uninteresting appearing Uncle Sam tuff. A few small operations mined, in a small way, the minor near-surface precipitations of bromyrite in the hanging and footwall portions of the larger veins in the State of Maine area.

The Clipper vein, averaging 79 feet in width over a 2,000+ foot length, and the other veins in the State of Maine area which average 29 feet in width, contain silver and gold values estimated to average 1.98 ounces and 0.017 ounces, respectively. Using a combination of selective open pit mining and non-selective bulk open pit mining and stripping, these veins can be mined to a depth of approximately 180 feet and heap leached, yielding a gross profit of approximately $9 million per year, over a projected four year life. Deeper enriched ore bodies below the water table are thought to exist in veins and saddle reefs in folded limestone units, as they do in the main part of the district. There is also potential for metal deposition in karsts (caves) in the upper portion of the Naco, and at deeper levels in the Escabrosa and Martin Limestones. At greater depths, near surface mineralization will probably grade into porphyry copper type mineralization, which may be economically attractive in the future.

The same types of targets as are envisioned at the State of Maine mine exist in other mineral centers within the Tombstone caldera, as well as ore bodies in the main part of the district that have not yet been mined out.

RECOMMENDATIONS

Geologic information compiled in this report suggests potential on the Tombstone Silver Mines, Inc. State of Maine area properties for an estimated four years of economically open pitable ore within 180 feet of the surface, at a stripping ratio of 1.72:1, which will yield a gross profit* of approximately $36 million over that period.

Precious metal values leached by supergene solutions from the veins in the Uncle Sam tuff should be precipitated below the water table in the State of Maine area, perhaps forming bonanza grade precious metal ore bodies, similar to those in the main part of the district, mineable by underground methods. Potential for similar open pitable ore as well as high grade ore bodies mineable by underground methods, remain untested in other areas in the district. Leases could probably be obtained from the various owners for small cash payments plus work commitment, at the present time, because of low metal prices.

To take advantage of the opportunities described above, it is recommended that Tombstone Silver Mines, Inc. raise $800,000 in capital for exploration, engineering and initial development. Once the proposed ore zones have been tested, and measured reserves delimited, mine construction financing should be available through lending institutions.

A phased exploration plan for the State of Maine area has been formulated. It is summarized below:

Phase	Objective	Phase Total	Cumm. Total
Phase I	Detailed surface geology mapping & logging & core board construction for existing holes	$ 74,440	$ 74,440
Phase II	Exploration drilling of the Clipper vein at 200' intervals	78,196	152,636
Phase III	Development drilling of the Clipper vein at 20' intervals	146,220	298,856
	Metallurgical testing	40,000	338,856

* Gross profit is defined as profit after deducting all operating costs, including repayment of capital, but not including interest, depletion, depreciation, taxes or royalties.

In all probability, objectives, as well as the exploration plan, will change as information is obtained as the exploration phases progress. Under ideal conditions an open pit mineable ore body on the Clipper vein will be developed after about six months of drilling. If this success is obtained, then remaining funds can be used for engineering and design work. The proforma mine plan suggests that $2 million in working capital and capital equipment will be required to construct and put the Clipper mine into production. Capital and construction costs are amortized over a one year period. Continued exploration for additional reserves is budgeted into the first year mine plan. The exploration may delimit another three years of near surface open pitable ore within the State of Maine area. Based on Tombstone Silver Mines, Inc.'s knowledge of the geology of other areas within the Tombstone district, it is anticipated that if lease-options are acquired on other target areas, that at least another four years of reserves at a similar scale of mining could be delimited by exploration funded by cash flow from the State of Maine area. Further, deeper drilling financed by internally generated funds, would be done to explore for bonanza grade ore mineable by underground methods on the State of Maine area veins. Similar underground potential probably exists on other targets within the district.

The following sequence of activities along with approximate costs is recommended:

Activity	Approximate Cost
* Raise $800,000 in exploration funds	
* Negotiate leases on other remaining exploration targets within the Tombstone district for one year	$200,000
* Initiate and complete Phases I, II, and III at the State of Maine Mine	340,000
* Adjust plans and objectives based on initial results of the above	
* Perform test work, engineering design & obtain financing for mine construction	260,000
	$800,000

Geologic factors at the Tombstone Silver Mines, Inc. property in the State of Maine area appear very favorable. Recognition of the area as a caldera feature, and attendant implications related to the surface geochemical environment, and probable supergene leaching and enrichment of silver bearing veins, suggest potential for the district that has not previously been recognized. By using the experienced personnel and the innovative Merrill-Crowe units and heap leaching technology of the State of Maine Mining Company, as well as contract mining services, geologically "Inferred" potential ore reserves appear to be profitable, even at currently depressed precious metal prices. Cash flow projections show that even at a price of $4.50 silver and $200 gold, the envisioned open pit on the Clipper vein would retire debt on the mine installation and generate a gross profit of $2.8 million.

The goodwill developed by the Escapule family, and in particular Charles and Louis Escapule, over the years, will be a definite asset in obtaining mining leases on surrounding properties. Using the Escapule's highly portable Merrill-Crowe units and some innovative exploration and mining techniques, it is also probable that with the management infrastructure headquartered at Tombstone, small surrounding precious metal properties can be explored and mined at a profit.

GEOLOGIC REPORT ON THE TOMBSTONE MINING DISTRICT,

COCHISE COUNTY, ARIZONA

with particular emphasis on

THE STATE OF MAINE MINE AREA

INTRODUCTION

In July of this year, the writer was engaged by Mr. Charles B. Escapule, Sr., Vice President & Manager of Operations, Tombstone Silver Mines, Inc., to examine and review geology and current mining operations and ore reserves in the State of Maine area and surrounding properties controlled by Tombstone Silver Mines, Inc. The intention of this study is to determine the potential for the discovery of additional mineralization, and to assess its mining potential. Tombstone Silver Mines, Inc., as of November 15, 1985, owns 8 patented mining claims, totaling 146.66 acres; holds 220.79 acres of state land under prospecting permit; and 68.06 acres of state mineral leases. They lease with option, 2,120.98 acres of federal lode claims, including 49 acres of patented claims. They have a verbal understanding on 130.7 acres of state land and 10 acres of patented ground, and are working on a formal lease agreement. They control a total of 2,766.49 acres, as described above. It is anticipated that Tombstone Silver Mines, Inc. will work toward consolidating the entire Tombstone district in order to facilitate exploration for and production of precious metals.

In 1973, the writer, then working under a contract with Sierra Mineral Management/1971 Minerals, Ltd., who had a lease on the land Tombstone Silver Mines, Inc. now owns, prepared a geologic map, report and exploration proposal. As a first step in the 1973 mapping program, a triangulation survey was put in, claim corners, section corners, etc. targeted, and the area flown using black and white and color aerial photography by Cooper Aerial Photography, Inc.

The area was mapped photogrammetrically, and a topographic map at the scale of 1" = 200' with a five foot contour intervals prepared. This was used as a geologic map base.

In the ensuing 12 years since that initial map and report was prepared, several important events have taken place. Sierra Mineral Management/1971 Minerals, Ltd. never did pursue the Exploration Proposal contained in the writers 1973 report. They did re-treat most of the mine dumps in the main part of the district by heap leaching methods, but a Counter Current Decantation plant moved from the Golden Sunlight Mine in Montana and installed at the State of Maine, failed to operate properly, and was abandoned. The leases reverted to the property owners, and Sierra/'71, Ltd. fell on hard times and is no longer an active entity. Subsequently, Louis and Charles Escapule developed the compact, inexpensive and efficient State of Maine Merrill-Crowe zinc precipitating unit, and began leaching the State of Maine mine dumps. In 1979, the process of agglomerating clay rich precious metal ores to make them permeable was discovered. The recognition of this process has probably been the most important development in precious metal recovery since discovery of the cyanide process in 1890. This technique is now used all over the world, and makes possible heap leaching of low grade, clay rich precious metal ores, and negates the necessity of cyanide aggitation plants, except for very high grade ores, those with unusual characteristics, or those located in very cold climates. The Escapules installed agglomeration at their State of Maine dump leach soon after its recognition. As a result of agglomeration, State of Maine silver recovery (for crushed and treated ore) is about 87%, and gold appears to be 100%. This was confirmed by Newmont Mining's Danbury metallurgical labs (Don Hammer, Newmont Exploration, 1982, pers. comm.).

In July of 1984, the State of Maine Mining Company properties were transferred to Tombstone Silver Mines, Inc., and plans for small tonnage production laid. From October, 1984, to December, 1984, one hundred seventy vertical drill holes were drilled using an Atlas Copco Roc 601 air track drill with a COP-42 down-hole hammer tool. A vacuum dust collector collected all the material from each drill interval. The maximum depth drilled was 120 feet. Total footage of 10,159 feet, an average of 59.8 feet per hole, was drilled. As a result of this drilling, 35,590 tons of low grade silver averaging 2.89 ounces per ton at a stripping ratio of 3.4:1 (Graves, A.J., December, 1984) were outlined. This was thought to be sufficient for a years profitable operation. Continued drilling was planned to sustain reserves a year in advance. Unfortunately, the price of silver dropped from about $9 per ounce, at the inception of the program, to its present price of about $6 per ounce. At $6 silver, the reserves are subeconomic.

The author was called in to evaluate the geology, check the reserves, and make suggestions on how the operation could be put on an economic footing.

Location, Culture and Transportation

The Tombstone Mining District (Figure 1) is located in southeastern Arizona, some twenty-five miles north of the International Boundary with Mexico. It is located in western Cochise County, and is covered by the Tombstone fifteen minute quadrangle sheet of the United States Geological Survey, which is bounded by meridians 110 degrees 15 minutes, and 110 degrees, and parallels 31 degrees 30 minutes, and 31 degrees, 45 minutes. These boundaries are shown on Figures 1, and 2, and Figures 3 through 17. The area controlled by Tombstone Silver Mines, Inc. includes all or parts of the following sections, as shown on Figure 4 and Figure 29: T. 19 S., R. 22 E., SE 1/4 section 33, T. 20S., R. 22 E., sections 4, 5, 8, 9, 10, 15, 16, 17, 18 and 20.

Tombstone is the only town within the quadrangle boundaries, but the bedroom community of Sierra Visa, which services the Army Electronic Proving Ground at Ft. Huachuca, lies just outside the quadrangle, and some 15 miles from Tombstone, via the Charleston Road. Tombstone is well serviced by major paved highways, including U. S. Highway 80, which goes through the center of town and Arizona State Highways 82 and 90. These are all paved, all-weather highways. Many types of supplies are available in Tombstone, and most types of supplies are available in Sierra Vista, a city of some 30,000 inhabitants, and the fastest growing city in Cochise County. A good supply of semi-skilled to skilled labor is available in Tombstone or Sierra Vista. The old mining camp of Bisbee lies about 30 miles south of Tombstone, where the underground copper mines, operated for the last 100 years, were shut down about two years ago. A core work force of skilled underground miners is probably available in Bisbee. The second largest city in Arizona, Tucson, is located approximately 60 miles by U. S. 80 and Interstate 10, to the northeast. Tucson is served by a large, all-weather, international airport, serviced by most of the large domestic carriers. The Tombstone Municipal Airport has a 5,000 foot dirt strip, adequate for light planes, but no fuel or other facilities. Tombstone, at one time, was serviced by a standard gauge branch line of the Southern Pacific Railway from Fairbank (7 miles west of Tombstone). This connection to Fairbank has been dismantled, though the Southern Pacific line which connects with Douglas, Arizona is currently in service.

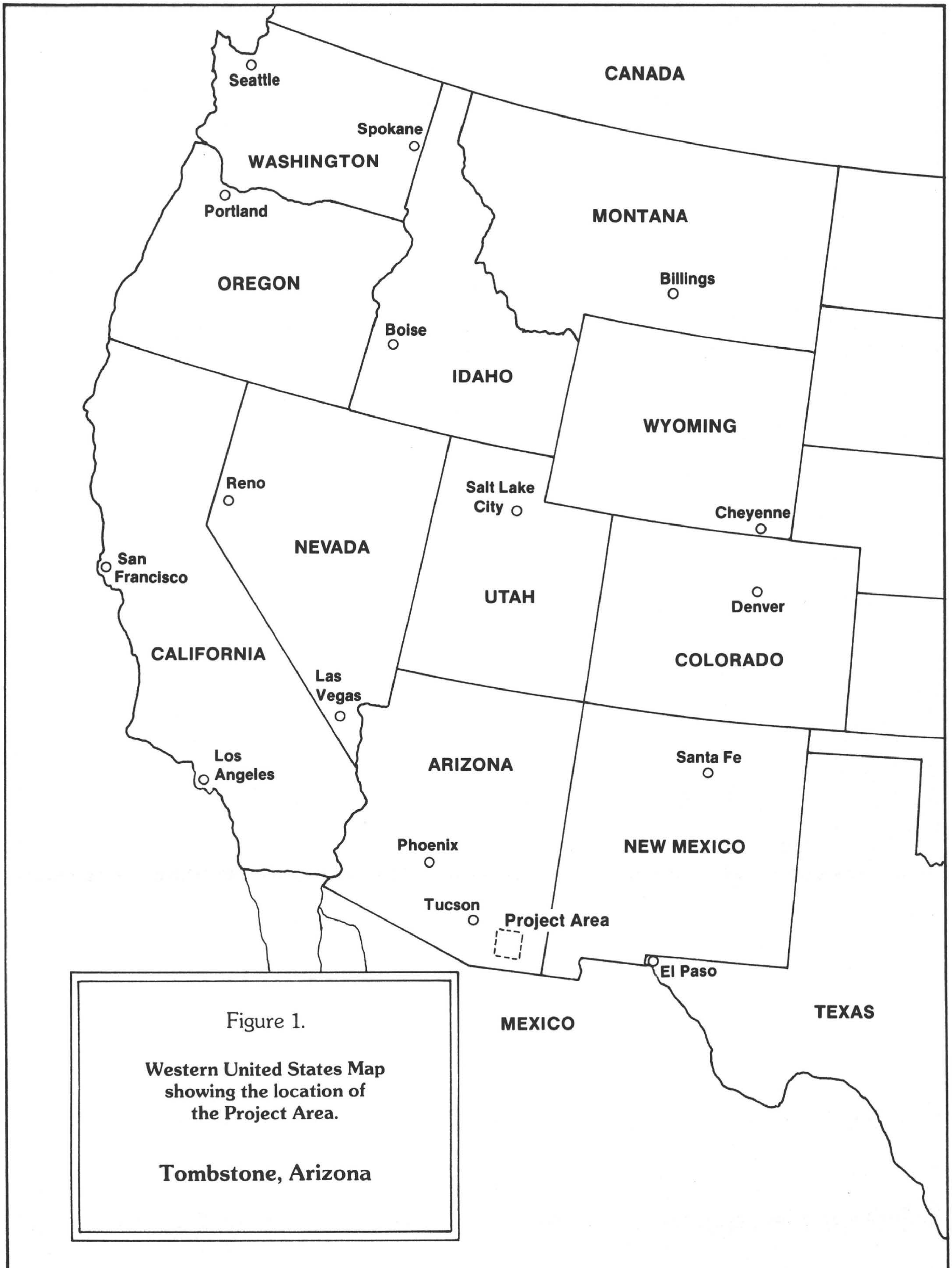


Figure 1.

Western United States Map showing the location of the Project Area.

Tombstone, Arizona

Physical Features

Physical features are quoted directly from Butler, B.S., Wilson, E. D., and Rasor, C. A., 1938:

> The Tombstone district is in the Tombstone Hills, a group of low, scattered mountains that extend northwestward from the Mule Mountains in which the Bisbee district is located. Tombstone is near the northwestern margin of the area, at an altitude of 4,530 feet or 670 feet above the San Pedro River at Fairbank. The Tombstone Hills rise to a maximum altitude of 5,339 feet or some 800 feet above the surrounding plain, which slopes westward to the San Pedro River. In the vicinity of the hills, this plain is a pediment, cut on hard rock.
>
> Even slopes and rounded contours characterize the northern half of the area in contrast to the steep-sided, linear ridges that prevail in the southern half.
>
> There are no perennial streams in the area. Drainage is westward to the San Pedro River through steep-sided gulches or arroyos that dissect the plain. Torrential rains flood these arroyos for short periods, but during most of the year no water flows at the surface.
>
> Water is encountered in the mines of the eastern part of the district at an elevation of 4,120 feet above sea level. This mine water has been used for concentration of ores, but, according to analyses by H. V. Smith, of the University of Arizona, its flourine content makes it unsuitable for drinking. Some water is obtained from shallow wells in the gulches, but the main supply for Tombstone is piped from springs in the Huachuca Mountains, about 25 miles southwest of the town.

Climate and Vegatation

Climate and vegetation is quoted directly from Butler, B.S., Wilson, E. D., and Rasor, C. A., 1938:

> The climate of Tombstone is that of the intermediate altitudes of southern Arizona. The winters are characterized by moderate temperatures and only a few light falls of snow. In summer the days are hot, but the nights are comfortably cool. The average range in temperature for a twenty-seven-year period, prior to 1928, is from an extreme maximum in June of 101.9 degrees to an extreme minimum of 20.8 degrees in January. The average annual precipitation for a thirty-one period prior to 1928 was 14.48 inches. The main rainy season is from July to September, and the driest months are April, May, and June.
>
> The vegetation of the district is likewise characteristic of the intermediate elevations of southern Arizona. It is above the altitudes favorable to abundant cacti and below those favorable to forest trees. Desert shrubs predominate. Cat's-claw and creosote or greasewood bush, together with some mesquite and ocotillo, form thickets on the foothill slopes and pediments. Several species of cacti are present, but prickly pear is most abundant. Mescal and yucca are sparingly present. Along gulches and arroyos mesquite, paloverde, and walnut are common. No trees in the district are suitable for lumber or for ordinary mine timber. On flats and slopes where soil and moisture are favorable, various grasses thrive.

Previous Work

Previous work is quoted directly from Newell, R. A., 1974

Previous Investigations

The geological and mining literature abounds with references to the Tombstone district, and attention will be limited to those which provide significant insight into the geology and the development of the area.

Between the years 1879 and 1886, E/MJ published numerous notes concerning the nature, extent, and progress of underground development work in the district. The interested reader is referred to these references, as many of them lie outside the scope of this dissertation. E/MJ (1881, v. 31, p. 316-317) stated the Tombstone silver ores were mostly of a carbonate or chloride nature, and that production was about 300 tons/day. Recoveries were about 80 percent, and the average yield was about $75/ton. E/MJ (1883, v. 35, p. 267-269) reported that on the third level of the Westside mine the ore was assaying about 40 oz/ton silver and about 0.5 oz/ton gold. Manganese ore from the Lucky Cuss mine at a depth of 100 ft, carried about 25 oz/ton of silver. E/MJ (1883, v. 36, p. 229-230) announced the discovery, between the third and fourth levels, in the Westside mine, of several tons of telluride ore that averaged $1200/ton.

Previous Geological Investigations

Blake (1882a, b, c, d) provided the earliest geologic descriptions of the district, and he recognized that the mineralization was closely associated with north-south trending dikes and cross-cutting northeast-southwest fissures. He also stated that, where either dikes or fissures crossed anticlinal structures, mineralization often developed along crests of the folds as bedded replacement deposits. Comstock (1900, p. 1045, 1089) confirmed that folds were important to ore deposition at Tombstone, and he apparently recognized a possible influence of volcanism in the genesis of the mineralization.

Church (1902) described the location of Tombstone relative to other mining districts in southeastern Arizona and adjacent Mexico. He later attempted the earliest comprehensive description of general geologic features in the district (Church, 1903). Church believed that dikes in the district exercised a relatively minor control on the mineralization, and that the major controls were anticlinal folds and cross-cutting fissures. Lakes (1904) followed the interpretation of Church (1903), and compared anticlinal structures at Tombstone with those at Bendigo, Australia.

Between 1904 and 1920, little was published that dealt with the geology in Tombstone. Clark (1914) published a water analysis from the 1000 ft level of the Contention mine. Ransome (1916) correlated some stratigraphic units with those at Bisbee, and Staunton (1918) described the effects and nature of a relatively severe earthquake he experienced while underground at Tombstone in 1887.

Ransome (1920) described the manganese mineralization at Tombstone. High concentrations of manganese were associated with the Prompter fault, and the principal manganese production was derived from the Oregon, Prompter, Lucky Cuss, Luck Sure, Bunker Hill, and Comet mines. Psilomelane, the major manganese mineral, typically occurred in pipes and chimneys in limestone horizons, and part of the manganese was believed to have been derived from the limestones. Ransome also thought that some of the manganese originally formed upper portions of the associated silver deposits. In either case, supergene processes were considered to have been respondible for forming the present manganese deposits. High grade mineralization contained between 70 and 80 percent MnO_2 after sorting, while low grade mineralization contained about 40 percent MnO_2. Ransome mentioned that in 1917 the manganese ore contained between 7 and 8 oz/ton silver. Wilson and Butler (1930) described many known manganese deposits in Arizona, and these authors simply referred to Ransome's work for their discussion of the Tombstone deposits.

The geology at Tombstone was investigated in more detail during the later 1930's. Butler and Wilson (1937) noted that the mineralization was associated with north-south dike fissures, faults, anticlines, and northeast-southwest fissures. Rasor (1937) investigated the mineralogy and petrography of the district, and he found hypogene silver-bearing minerals to include hessite, tetrahedrite, and galena. Alabandite was found to be the only definitely hypogene manganese mineral. Bromeyrite, embolite, cerargyrite, argentite (acanthite), stromeyrite, native silver (native gold - addition by Briscoe, 1985, see Butler et al. p. 51), and argentojarosite were identified as supergene ore minerals. The zone of oxidation was thought to be at least 600 ft deep (Rasor, 1937, p. 83), and bromeyrite was believed to be the most abundant supergene silver mineral. Butler, Wilson and Rasor (1938), and Butler and Wilson (1938) published detailed studies of the geology and ore deposits at Tombstone. These studies incorporated a considerable amount of previously unpublished data which were originally collected by Ransome. The investigations provided insight into a complex sequence of structural events in the district, and the authors also suggested a broad pattern of mineral zoning. Tenney (1938) reviewed and summarized the findings of Butler, Wilson and Rasor (1938), and noted that their efforts provided a welcome addition to the study of ore deposits. Butler and Wilson (1942), in addition to the above publications, again summarized their work at Tombstone in Newhouse (1942).

Ingerson (1939) measured joint and platy inclusion orientations within the Uncle Sam "porphyry". The Uncle Sam unit lies west of Tombstone, and Ingerson attempted to conform the presence of a suspected thrust fault below the "porphyry". He found that neither the joints nor the inclusions could be used as evidence to confirm a fault at depth. The emplacement of the Uncle Sam "porphyry" was discussed at length by Gilluly (1945), and he considered the body to be either laccolithic or sill-like in form. Furthermore, it was believed that the Uncle Sam unit had followed either a thrust fault plane or an unconformity during emplacement.

Gilluly, Cooper and Williams (1954) described the Late Paleozoic stratigraphy of central Cochise County. For the Tombstone portion of their study, these authors succeeded in subdividing a thick sequence of Pennsylvanian-Permian strata known as the Naco Limestone into six different formations. Later, Gilluly (1956) incorporated his earlier work on the Uncle Sam "porphyry", with the stratigraphy to provide an exhaustive description of the geology of central Cochise County.

In 1941 the United States Bureau of Mines began a study of the manganese deposits at Tombstone. The investigations involved underground sampling at a number of mines in the district, and about 2000 ft of underground drilling at the Oregon mine. Needham and Storms (1956) summarized much of this work, and concluded that only small and scattered deposits of manganese ore were present. Farnham, Stewart and Delong (1961) studied the manganese deposits in eastern Arizona and visited the deposits at Tombstone. They found that manganese concentrations were often between 10 and 30 percent MnO_2, and that silver in the manganese frequently ranged between 5 and 10 oz/ton.

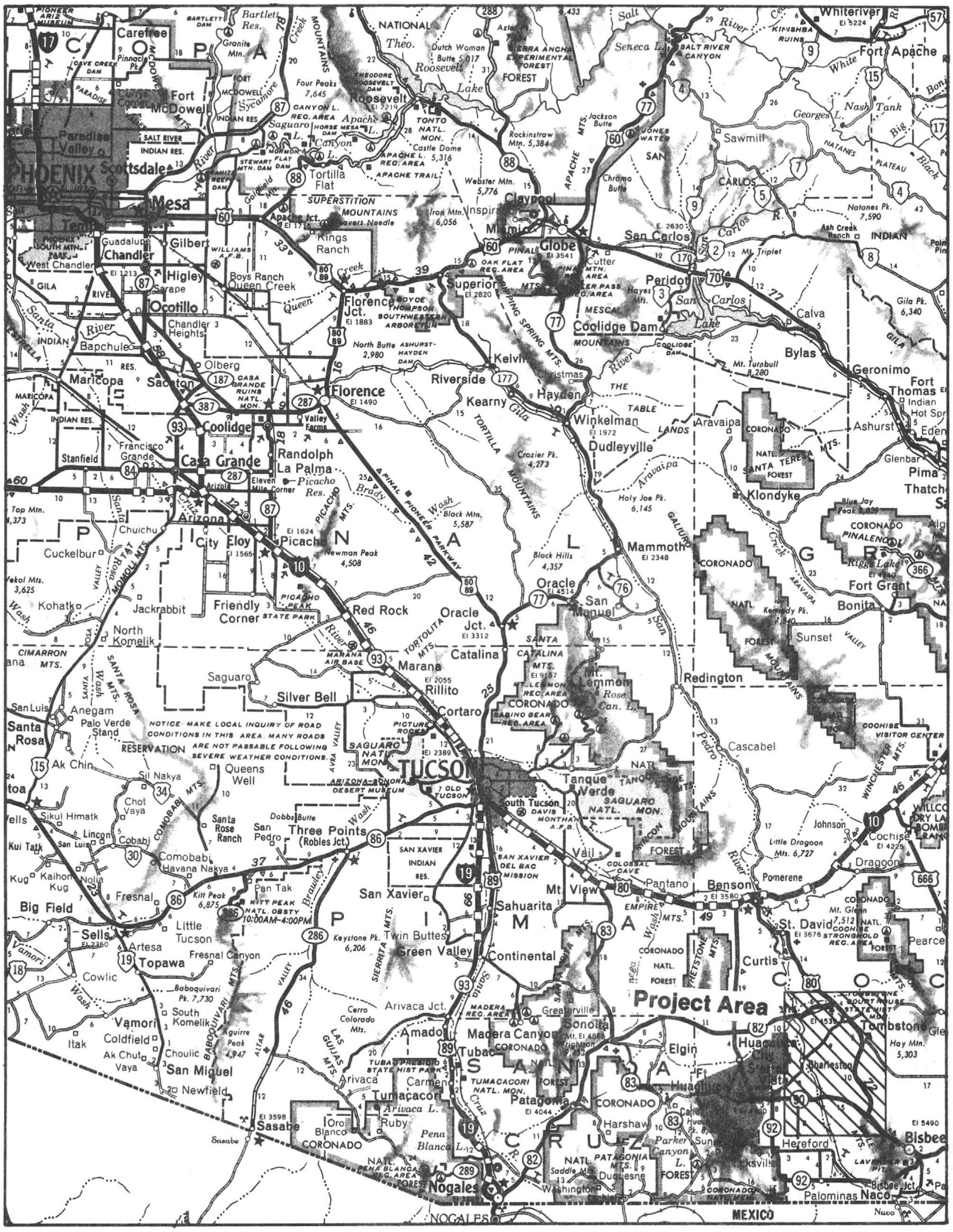


Figure 2. Highway map showing the location of the Project Area in relation to Tucson and Phoenix, Arizona

Burnham (1959) studied trace element abundances in sphalerites and chalcopyrites from many localities in the western United States and northern Mexico. The elements studied included silver, bismuth, cadmium, gallium, germanium, indium, manganese, antimony, and tin. The silver content in three sphalerite samples from Tombstone ranged between 1 and 300 ppm. Burnham (1959) found that all major silver mining districts studied could be idntified by relatively high silver concentrations in sphalerite and chalcopyrite.

Creasey and Kistler (1962) determined radiometric ages for an intrusive rhyolite and the Schieffelin Granodiorite by potassium-argon methods as 63 and 72 m.y. respectively.

Andreason, Mitchell and Tyson (1965) published an aeromagnetic map for the area around and including Tombstone. Background values at Tombstone were about 300 to 400 gammas, but the granodiorite was found to have values between 700 and 1000 gammas. Brant (1966) found the Schieffelin Granodiorite to have a magnetic susceptibility of 1800 x 10 (c.g.s. units). Brant assumed the Schieffelin to be of Tertiary age, and he stated that this relatively high susceptibility was typical for Tertiary intrusives in southern Arizona. In fact the Schieffelin is a Laramide intrusive (Drewes, 1971), and Brant (1966) stated that most Laramide intrusives in southern Arizona have an average susceptibility of only 100 x 10 . Thus, for a Laramide intrusive, the Schieffelin is anomalously magnetic.

Jones (1961, 1963, 1966) studied tectonic deformation patterns in southeastern Arizona. He concluded that the contribution of overthrusting had been greatly exaggerated, and that processes of differential vertical uplift were responsible for much of the observed deformation.

Lee (1967) described the geology of the area surrounding the Charleston and State of Maine mines, both of which lie southwest of Tombstone. He suggested that the mineralization at Charleston and the State of Maine was epithermal and that the mineralization closer to Tombstone was mesothermal.

Patch (1969, 1973) studied the petrology and stratigraphy of the Permian Epitaph Dolomite at Tombstone. She suggested that the Epitaph was most likely a dolomitized facies of the underlying Colina Limestone. Wilt (1969) studied the Colina Limestone, and she agreed with Gilluly et al. (1954) that the limestone ranged in age from Wolfcampian to Leonardian (lower Lower Permian to upper Lower Permian).

Ridge (1972) discussed the general geologic setting of Tombstone. He also speculated that the mineral deposits had formed in an environment which varied from xenothermal to epithermal conditions.

Previous Mineralogical Investigations

E/MJ (1881, v. 31, p. 316-317) reported that the Tombstone silver ores were mainly of chloride varieties, and that the ore contained a little lead. In 1883, E/MJ (v. 36, p. 229-230) reported the discovery of several tons of telluride ore between the third and fourth levels of the Westside mine.

The earliest scientific discussion of the mineralogy at Tombstone was that of Hillebrand (1886). He reported the presence of emmonsite, a hydrated ferric tellurite. Genth (1887) described hessite from the Westside mine. Hillebrand (1889) published an analysis of descloizite from the Lucky Cuss mine. Panrose (1890) noted the presence of manganiferous silver ore at Tombstone, and Moses and Laquer (1892) reported the existence of alabandite at the Lucky Cuss mine. Hewett and Rove (1930) discussed the occurrence of alabandite in the Lucky Cuss mine in association with calcite, quartz, and galena. Occurrences of silver-bearing manganese minerals in Arizona and New Mexico were studied by Hewett and Pardee (1933), and they found that silver was present as silver manganite. These authors observed that black calcite was commonly associated with the manganese deposits, and that the calcite had black manganese oxide intergrowths that could be manganite, but not hausmannite.

Rasor (1937) conducted the first detailed study of the mineralogy at Tombstone. He identified four main stages of hypogene mineralization, and his investigations were summarized by Butler, Wilson and Rasor (1938). Rasor (1938) apparently reported the first United States occurrence of bromeyrite at Tombstone. He specilated that earlier reports of "horn silver" from Tombstone may actually have been mistaken, and that the mineral was possibly bromeyrite. Rasor (1939) stated that psilomelane was the most abundant secondary manganese mineral, but that minor amounts of polianite, pyrolusite, manganite, hetaerolite, and wad were also presnt. He believed the secondary manganese minerals were derived entirely from alabandite; however, Hewett and Radtke (1967) suggested the main source of secondary manganese at Tombstone was black manganiferous calcite. Hewett (1972) reviewed the origin of the manganese minerals manganite, hausmannite, and braunite. He concaulded that hausmannite is a hypogene mineral, and that manganite and braunite are supergene minerals. Hewett also noted that neither hausmannite, manganite, nor braunite had been reported at Tombstone. For southern Arizona, Hewett observed that the minerals hollandite, psilomelane, and cryptomelane formed most of the manganese oxide deposits, and he assigned a hypogene origin to all of them. Ridge (1972) believed that sphalerite containing chalcopyrite blebs indicated possible xenothermal conditions, that tetrahedrite with silver-bearing galena suggested a krypto-thermal environment, and that hessite with stromeyerite designated epithermal conditions.

Previous Milling and Smelting Investigations

The earliest mention of milling procedures at Tombstone (E/MJ, 1879, v. 27, p. 468) indicated the successful operation of a 10 stamp mill, which yielded a recovery of about 77 percent. In 1881 about 120 stamps were in operation at Tombstone, treating about 300 tons/day (E/MJ, 1881, v. 31, p. 316-317). Austin (1883) described early milling methods and machinery at Tombstone. Church (1887a, b) discussed metallurgical problems which arose during the treatment of sulfide ores and tailing slimes. Goodale (1889, 1890) discussed the treatment of silver-bearing manganese ore. Free milliing methods recovered only 60 percent of the silver, and required more than 7 lb of quicksilver per ton of ore treated. By using a chloride roasting method the recovery increased to about 90 percent, and the amount of quicksilver required was reduced by half.

Thomas G. Chapman, later to become Dean and Dean Emeritus of the College of Mines at the University of Arizona wrote his masters thesis for the University of Arizona, entitled The Metallurgy of Silver Chloride Ore From the State of Maine Mine in the Tombstone District. Chapman stated that the State of Maine mine produced silver valued at between $100,000 and $150,000 from the time of its discovery to the year 1921 (p. 1). He described the genesis of hand coping and retaining gob underground, as well as the source of the State of Maine Mine dump, and pointed out that the ore was not treated at the mine site before 1921. Testing of the dump showed 35,000 tons, averaging 4.85 ounces of silver (p. 2). Chapman made various screen analyses and crushing tests, and compared gravity separation including tabling and jigs, with cyaniding. Chapman found that though gravity methods would work, cyaniding of the finer material after screening off the oversize and de-sliming, would result in the highest recovery. Cyanide consumption was about 3/4 lb. per ton and contact time under laboratory conditions for cyanide was about 48 hours. Screening on a one-half inch screen, rejecting the oversized and treating the undersized, gave the best economies.

Romslo and Ravitz (1947) reported the successful treatment of manganese-silver ore from Tombstone. Very poor results were obtained by direct cyanide and flotation methods, but a calcium dithionate process recovered 80 to 90 percent of the silver and 90 percent of the manganese.

Previous Hydrological Investigations

After water was first encountered in the Sulphurette mine in 1881, pumps with a capacity of 700 gpm were installed at the Contention and Grand Central mines in December 1883 (E/MJ, 1883, v. 36, p. 328, 400). The pumps worked successfully until 1886, when the Grand Central pumphouse burned (Dunning, 1959). E/MJ 1902, v. 73, p. 314-315) reported that new pumps, with a capacity of 1750 gpm, would be installed near the Contention mine. Blake (1904a, b) mentioned that the new pumps had successfully lowered the water level over 100 ft to near the 700 ft level of the Contention mine. E/MJ, 1904, v. 77, p. 334-338) reported that pumping activities at the Contention mine had lowered the water table over 80 ft in the Lucky Cuss mine, which was more than a mile away. The water temperature was reported to be about 80 degrees F.

Walker (1909) stated that water volumes of up to 4500 gpm were not uncommon. He also discussed the nature of the pumping facilities at Tombstone. On June 1, 1909, the pumps failed (Staunton, 1910; Butler, Wilson and Rasor, 1938, p. 47; Dunning, 1959, p. 187-189) on the 1000 ft level. For a period of 10 days prior to the accident the pumps were yielding 4600 gpm. In 1910 larger pumps and new boilers were installed, and operations were resumed on the 1000 ft level. High pumping costs coupled with a low silver price (about $.50/oz) forced abandoning the operations on January 19, 1911. The water pumps still remain on the 1000-, 800-, 700-, and 600-ft levels (Butler, Wilson and Rasor, 1938, p. 47).

Hollyday (1963) considered that mine waters at Tombstone could provide a long term source for moderate amounts of municipal water. The water supply was determined to be sufficient for a town about the size of Tombstone.

Wallace and Cooper (1970) studied the dispersion of calcium, chlorine, magnesium, and sodium in groundwater near Tombtsone. They found that most of the chlorine (10 to 40 ppm) was derived from the Schieffelin Granodiorite, and that sodium (20 to 70 ppm) was derived from granitic rocks at Tombstone as well as from similar rocks in the Dragoon Mountains to the east. Calcium and mangesium (30 to 80 ppm, and 10 to 25 ppm respectively) were derived from carbonate sedimentary rocks. The authors found calcium and magnesium to be excellent tracers of ground wter flow for the Tombstone area, and subsurface flow patterns were established by measuring the calcium and magnesium contents in the groundwater.

Non-technical Publications on History and Human Interest

In addition to the technical publications, the following books emphasize the history and human interest of this early mining camp of Arizona:

F. Becholdt,	When the West Was Young
Wm. M. Breckenridge,	Helldorado
W. N. Burns,	Tombstone
S. Lake,	Wyatt Earp, Frontier Marshal
A. H. Lewis,	Wolfville Days
L. D. Walters,	Tombstone's Yesterday
C. E. Wilson	Mimes and Miners

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klq — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

O€s — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

€s — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

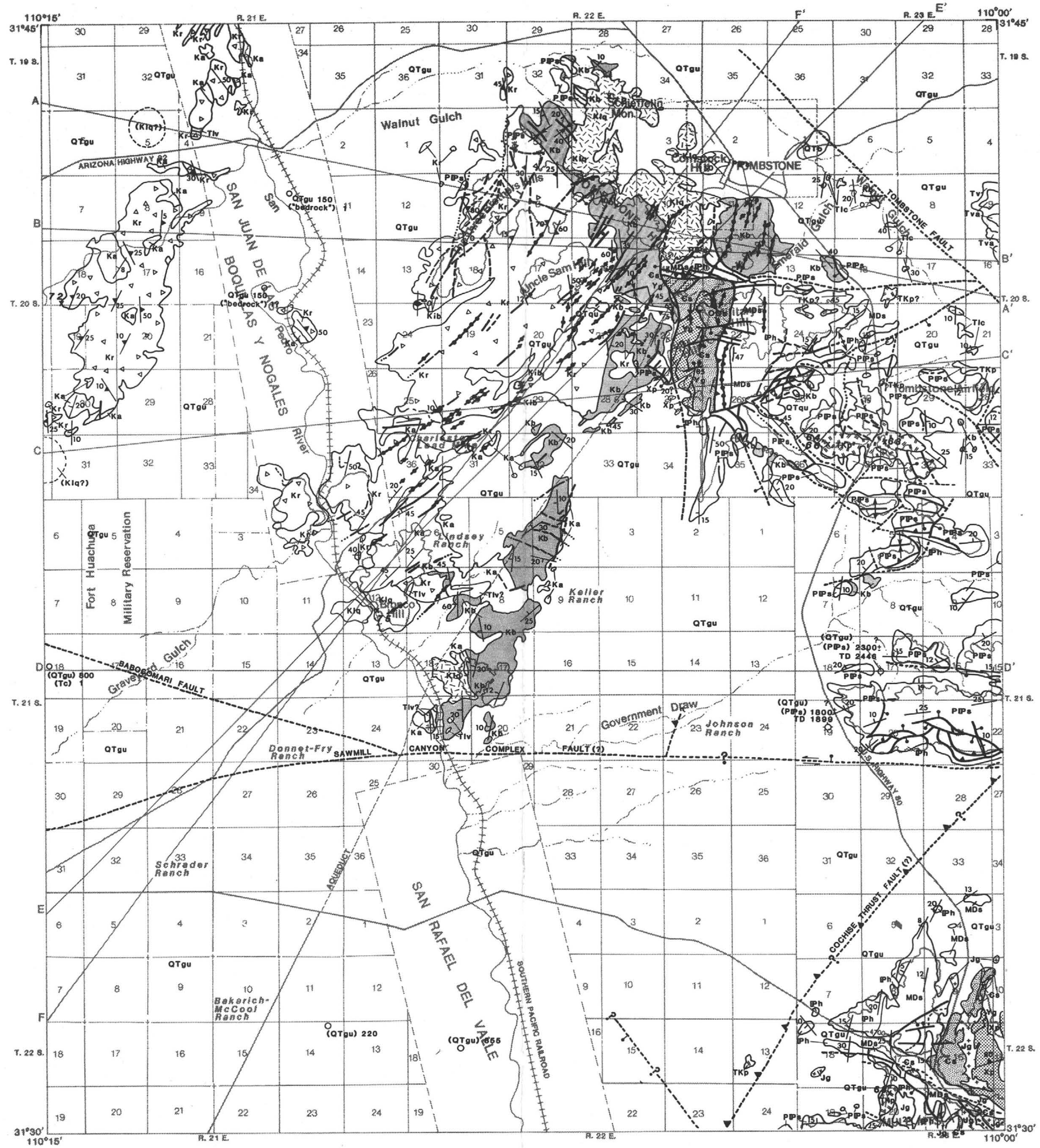
Dry wash

Southern Pacific Railroad

Government Reservation Boundary

Aqueduct

A——A′ Cross section line



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles

N

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 3. Generalized geological and structural map on screened topographic base.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Explanation

Land Status

Public Domain - Mineral and Surface owned by Federal Government.

State Domain - Mineral and Surface owned by State of Arizona.

Public Domain Mineral and Surface. Mineral owned by Federal Government; Surface owned by State of Arizona.

Fee Simple - Mineral and Surface privately owned.

Fee Simple Surface and Public Domain Mineral Private Surface ownership Mineral owned by Federal Government.

Spanish Land Grants - Fee Simple. Mineral and Surface privately owned; Reservation of Gold, Silver and Mercury to Federal Government.

Military Reservation - Restricted Mineral Entry. Not open to Mining.

Water & Power Resource Service & Various other Withdrawals - Not open to Mineral Entry or Mining.

Mineral and Surface owned by Federal Government. Mineral Rights privately claimed.

Mineral and Surface owned by State of Arizona. Mineral leases, prospecting permits or applications privately held.

Public Domain Mineral and State of Arizona Surface. Mineral rights privately claimed.

Public Domain Mineral and Fee Simple Surface. Mineral rights privately claimed.

Tombstone Development Company, Inc. Lands

Public Domain Mineral and Surface. Mineral rights claimed by Tombstone Development Company, Inc.

Mineral and Surface owned by State of Arizona. Prospecting permits or applications held by Tombstone Development Company.

Public Domain Mineral and Surface owned by State of Arizona. Mineral rights claimed by Tombstone Development Company, Inc.

Patented Mining Claims owned by Tombstone Development Company, Inc.

Public Domain Mineral and Fee Simple Surface. Mineral rights claimed by Tombstone Development Company, Inc.

Fee Simple Surface and State of Arizona Mineral. Prospecting Permit held by Tombstone Development Company, Inc.

Roads and Highways

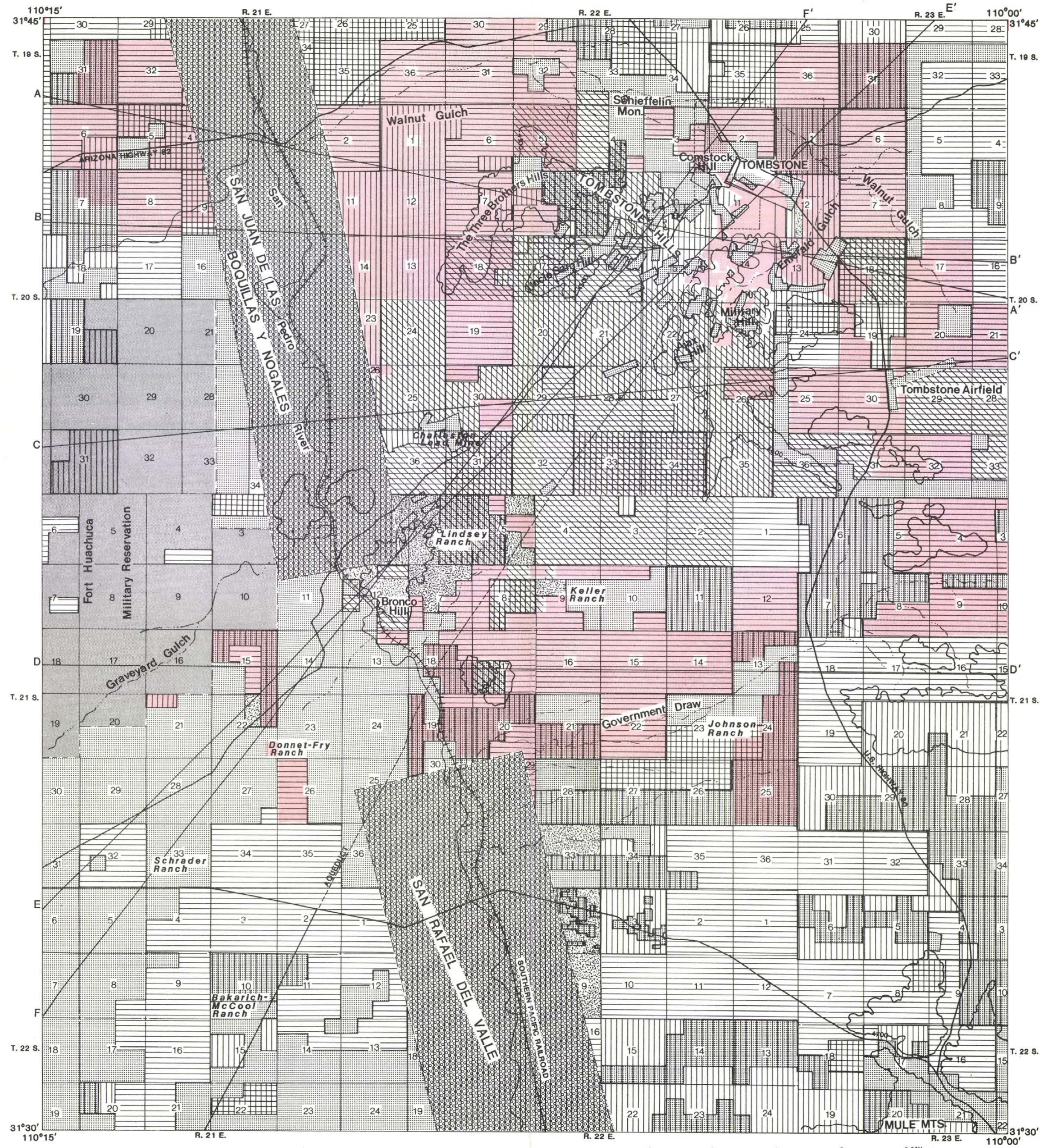
Dry wash

Southern Pacific Railroad

Government Reservation Boundary

Aqueduct

A——A′ Cross section line



Tombstone Development Company, Inc.

Tombstone, Arizona

Land Status Map, Tombstone
15 min. Quadrangle

By Thomas E. Waldrip, Jr.
James A. Briscoe and Associates
Tucson, Arizona

Figure 5. Property map showing ownership of major holdings of mineral rights in the Tombstone area. Red overprint shows state, federal and private land and lands with mineral rights held by the Tombstone Development Company as of October 15, 1981.

1 0 1 2 3 Miles

N

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klg — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

OCs — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

Cs — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

70

Normal

45

Reverse

45

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30

Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72_x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

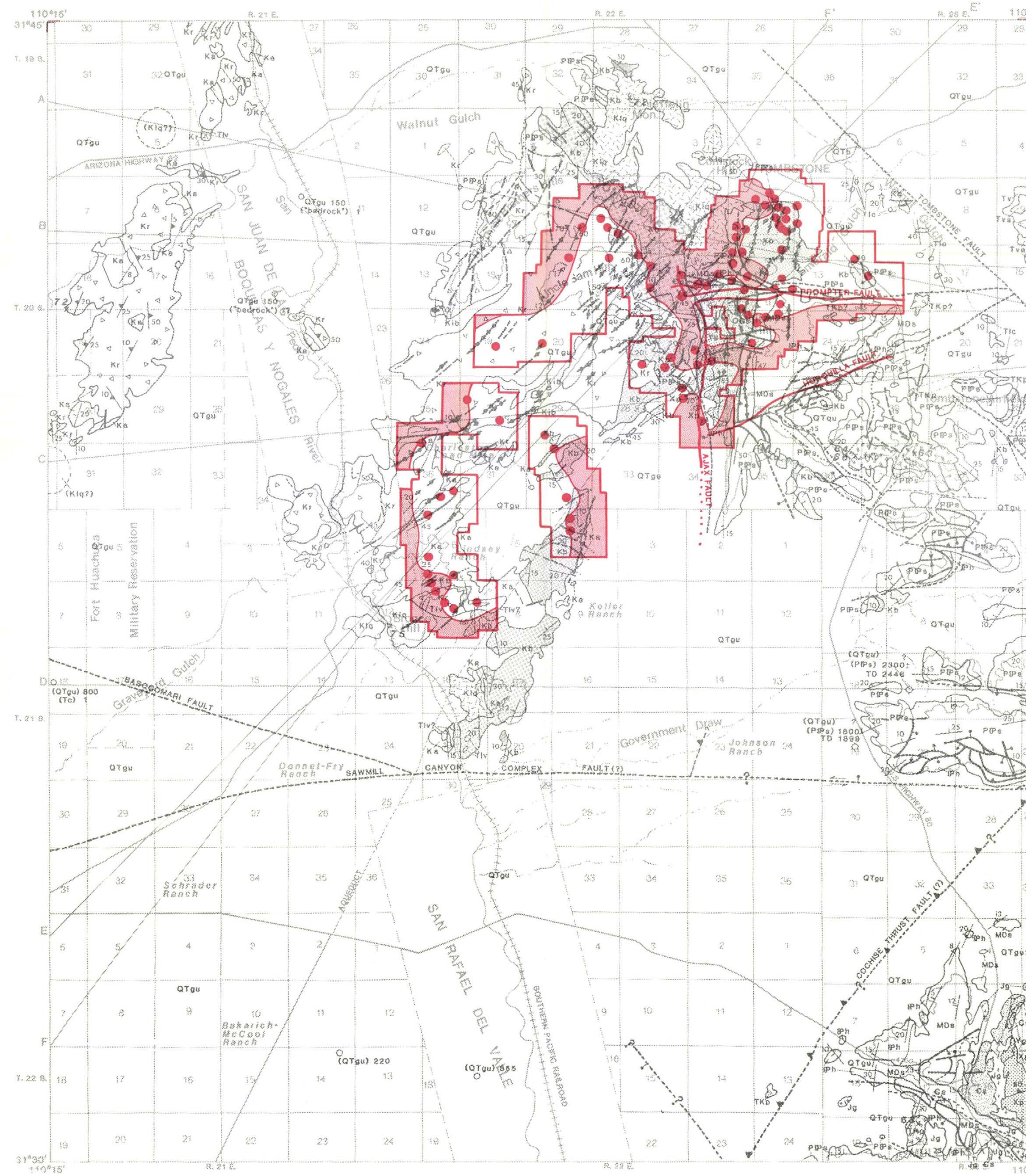
Government Reservation Boundary

Aqueduct

A——A' Cross section line

Dump sample location

Silver



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles

N

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 6. Dump sample location map showing area of influence boundaries and the Ajax, Prompter, and Horquilla faults, from Newell, R.A., 1973.

Distribution pattern for high silver ratios in dump samples (in red).

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKg — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia – exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff. –Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klq — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

O€s — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

€s — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

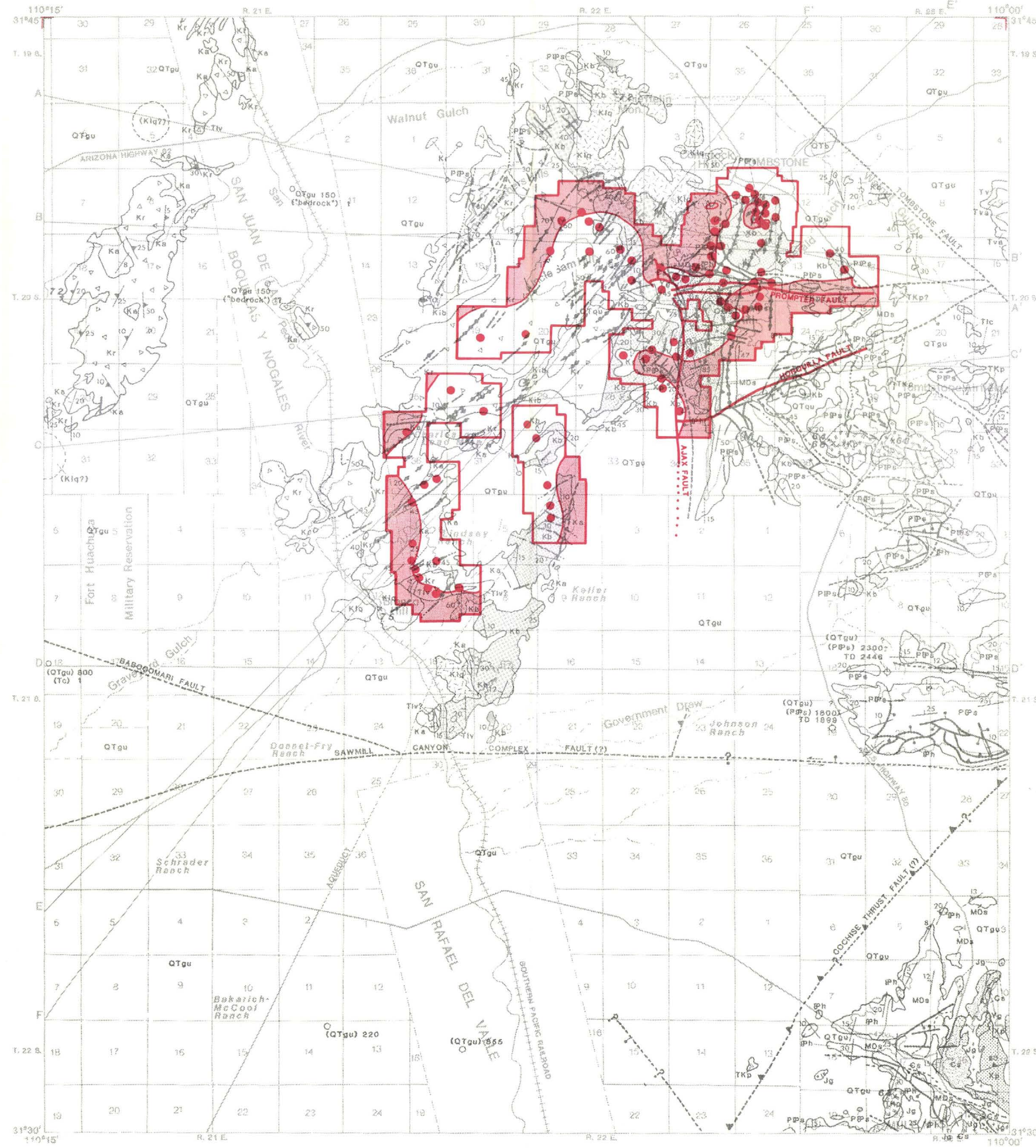
Government Reservation Boundary

Aqueduct

A——A' Cross section line

Dump sample location

Zinc



Tombstone Development Company, Inc.
Tombstone, Arizona

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Figure 7. Dump sample location map showing area of influence boundaries and the Ajax, Prompter, and Horquilla faults, from Newell, R.A., 1973.

Distribution pattern for high zinc ratio in dump samples (in red).

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKR — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia – exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff. –Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klg — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

OЄs — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

Єs — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

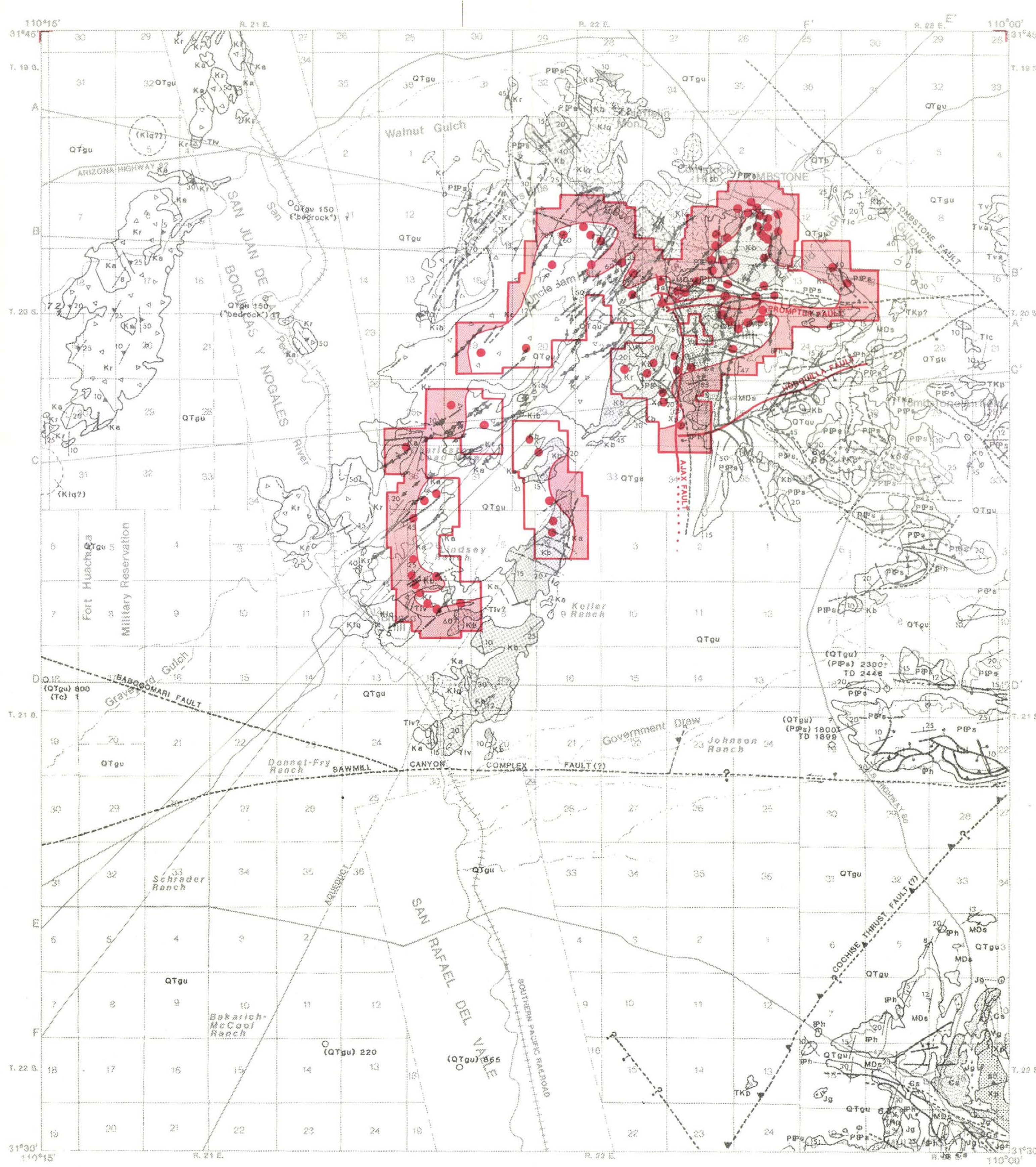
Government Reservation Boundary

Aqueduct

A——A′ Cross section line

● Dump sample location

Lead



Tombstone Development Company, Inc.
Tombstone, Arizona

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 8. Dump sample location map showing area of influence boundaries and the Ajax, Prompter, and Horquilla faults, from Newell, R.A., 1973.

Distribution pattern for high lead ratios in dump samples (in red).

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klq — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

O€s — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

€s — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

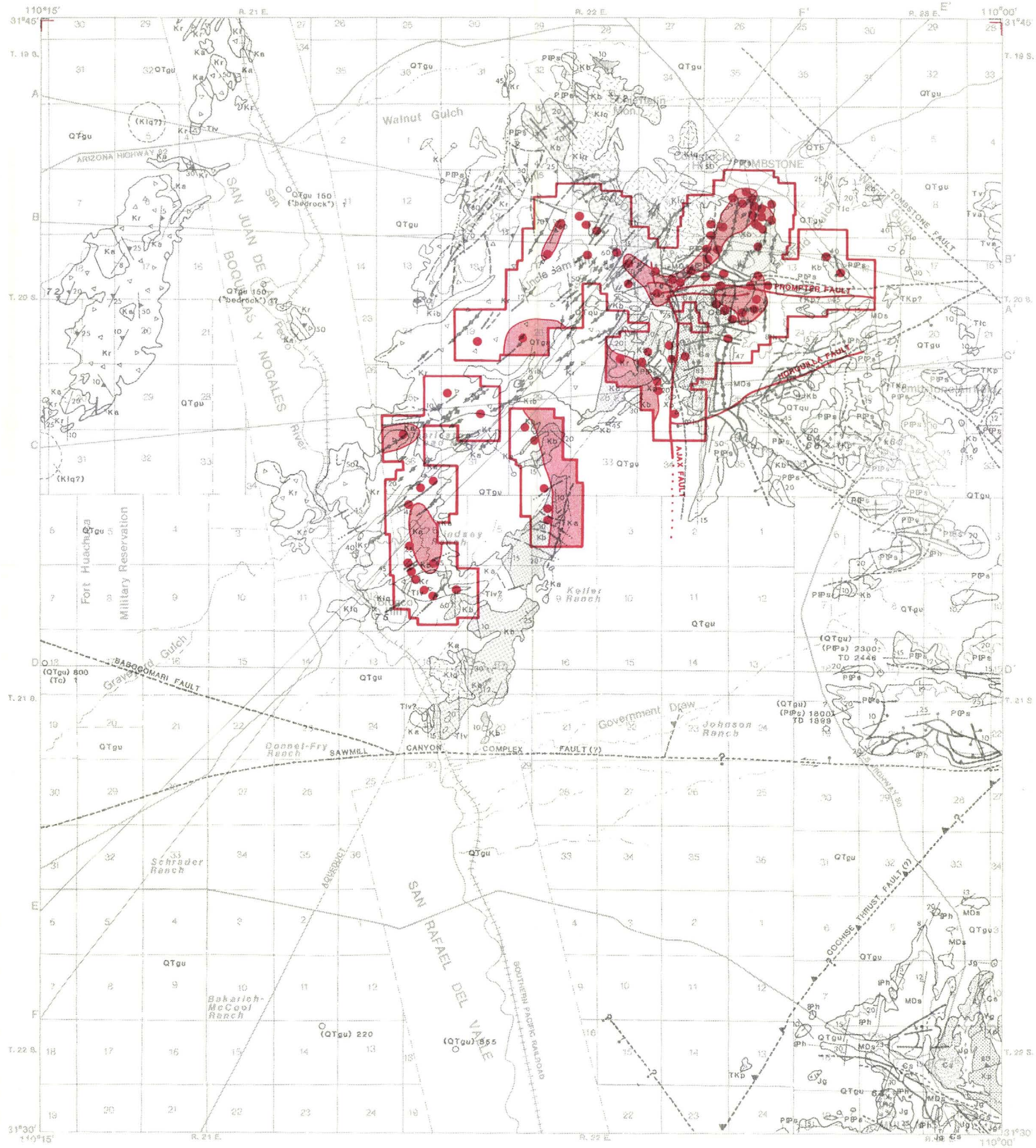
Government Reservation Boundary

Aqueduct

A———A' Cross section line

Dump sample location

Copper



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles

N

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Figure 9. Dump sample location map showing area of influence boundaries and the Ajax, Prompter, and Horquilla faults, from Newell, R.A., 1973.

Distribution pattern for high copper ratios in dump samples (in red).

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klg — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

OЄs — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

Єs — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

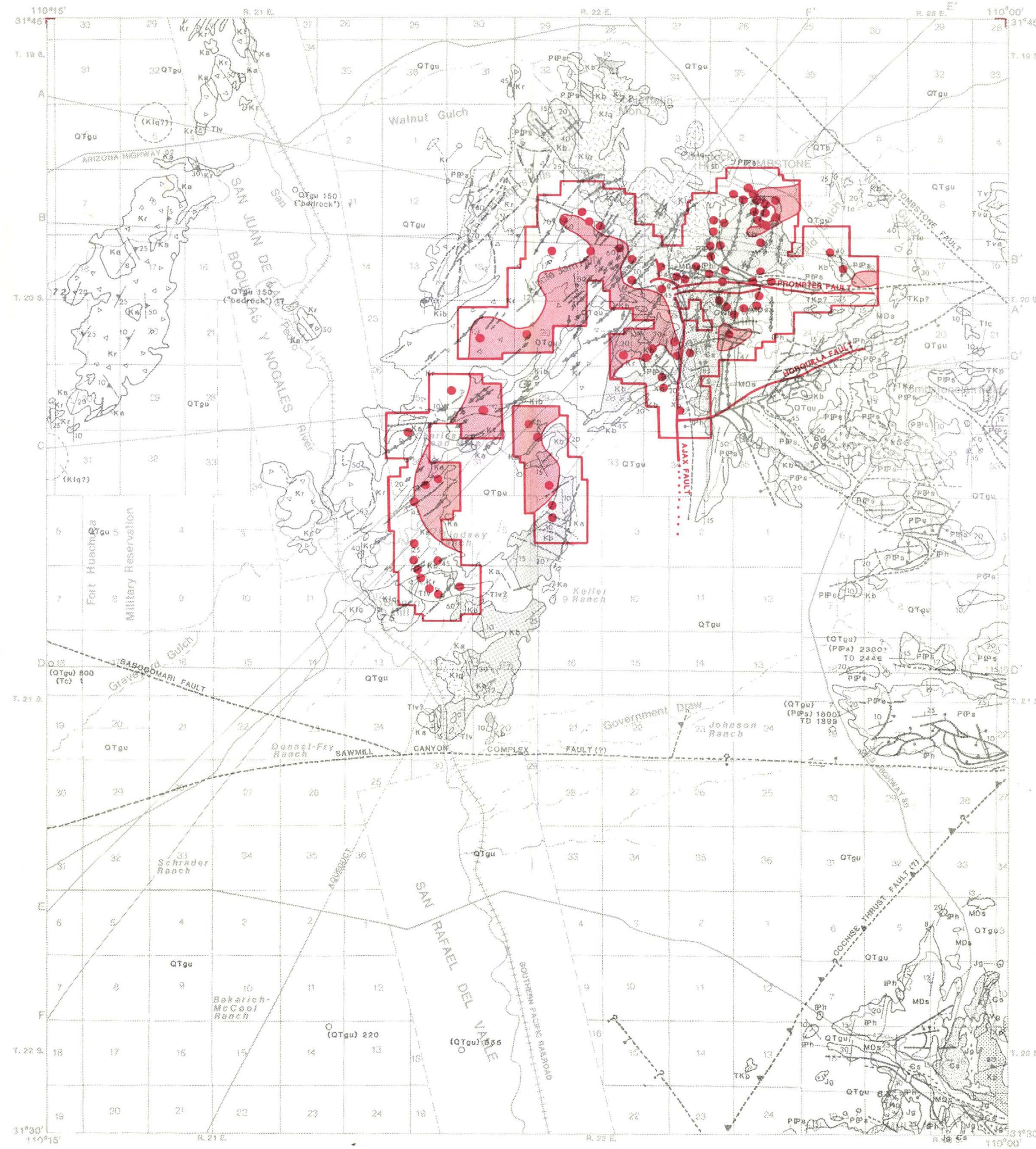
Government Reservation Boundary

Aqueduct

A———A' Cross section line

Dump sample location

Molybdenum



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles

N

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

By James A. Briscoe

James A. Briscoe and Associates
Tucson, Arizona

Figure 10. Dump sample location map showing area of influence boundaries and the Ajax, Prompter, and Horquilla faults, from Newell, R.A., 1973.

Distribution pattern for high molybdenum ratios in dump samples (in red).

Explanation

Geology

QTgu OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKg MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib Fluidized intrusive breccia – exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr Rhyodacite tuff and welded tuff. –Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klq Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

OCs SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

Cs Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 Normal

45 Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

Government Reservation Boundary

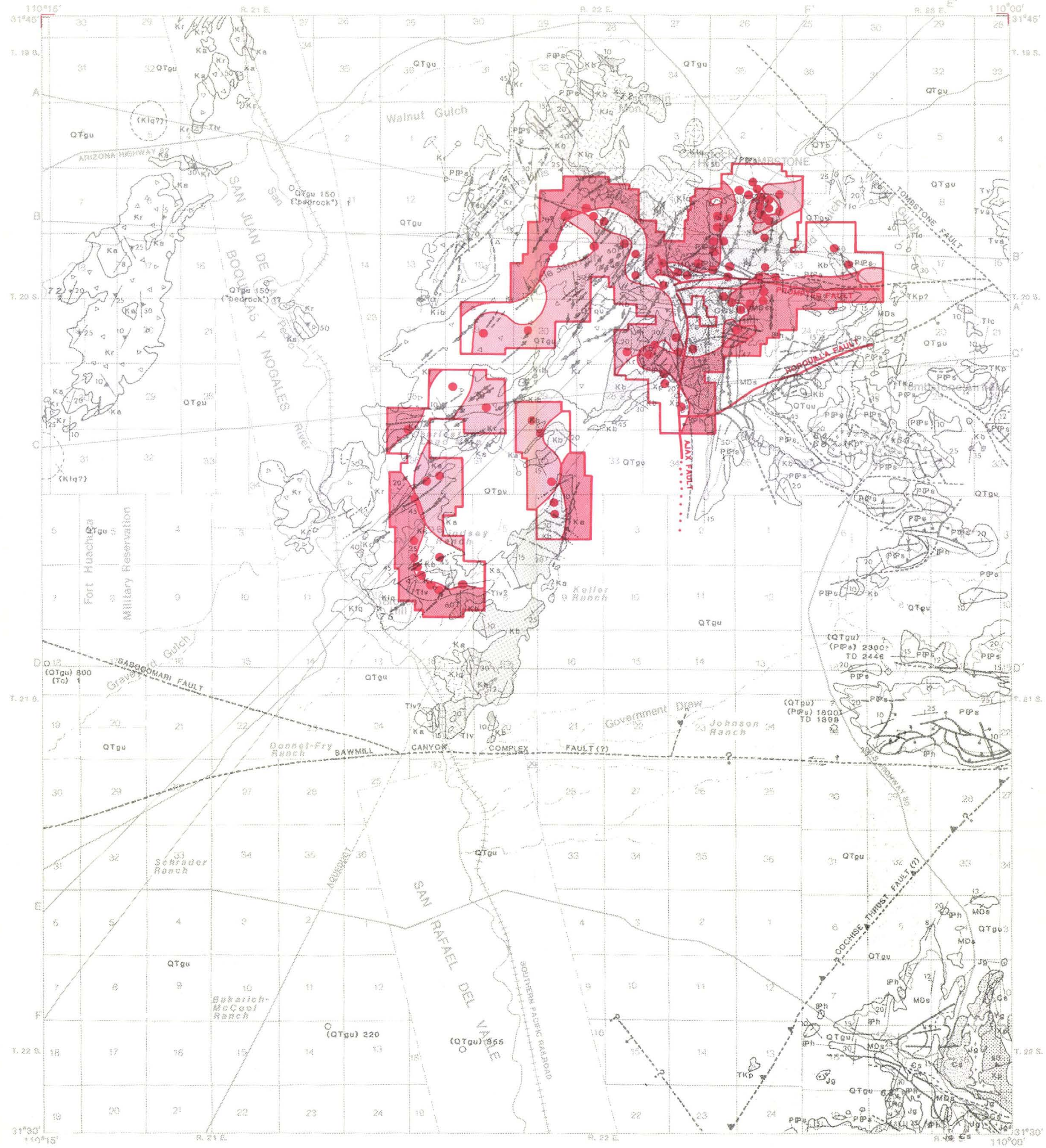
Aqueduct

A—A' Cross section line

Dump sample location

Molybdenum

Zinc



Tombstone Development Company, Inc.
Tombstone, Arizona

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Figure 11. Dump sample location map showing area of influence boundaries and the Ajax, Prompter, and Horquilla faults, from Newell, R.A., 1973.

Distribution pattern for high molybdenum and zinc ratios in dump samples (in red).

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klq — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

OЄs — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

Єs — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

70

Normal

45

Reverse

45

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30

Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157

Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x

COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

Government Reservation Boundary

Aqueduct

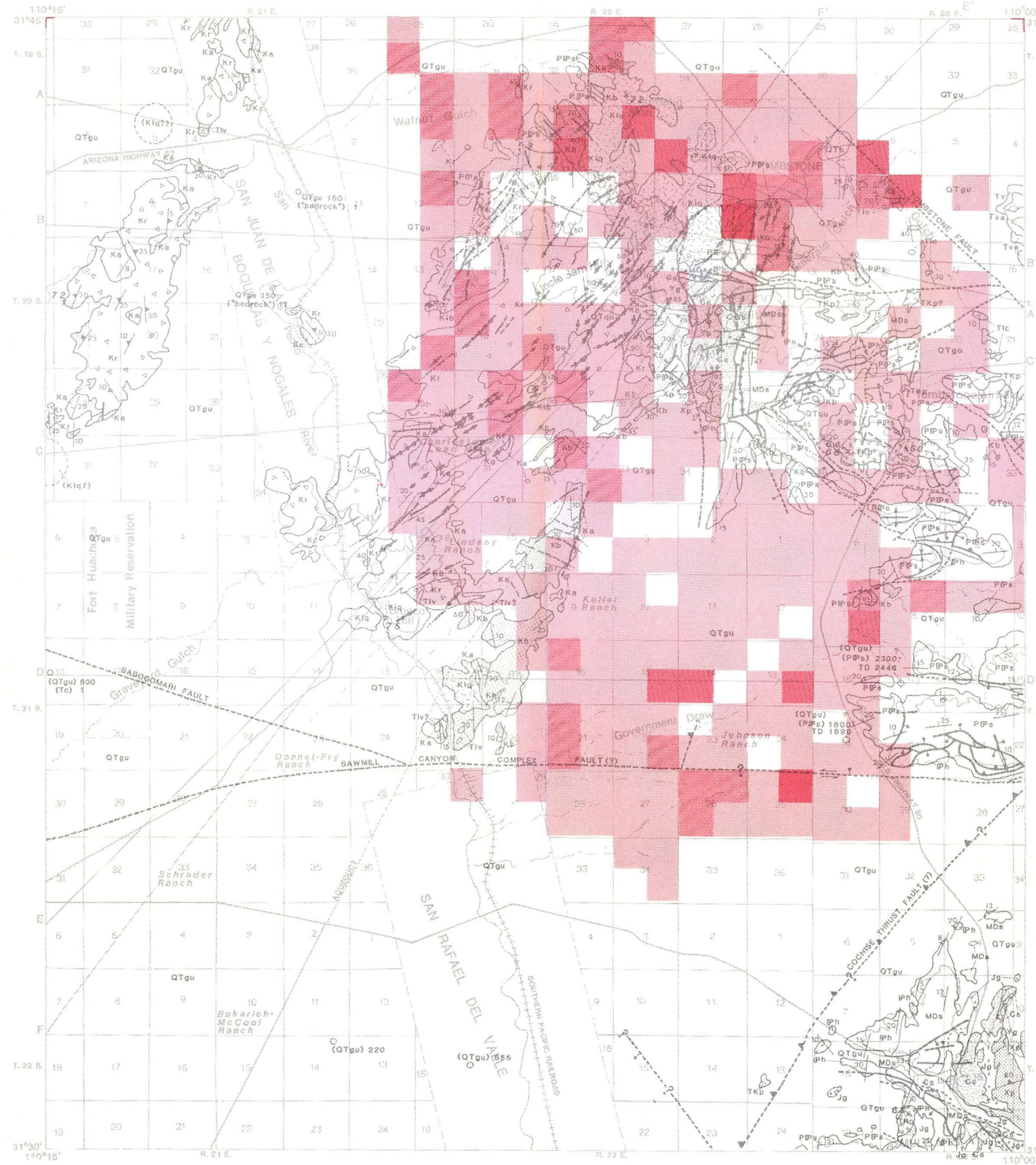
A———A' Cross section line

≤ 1 ppm

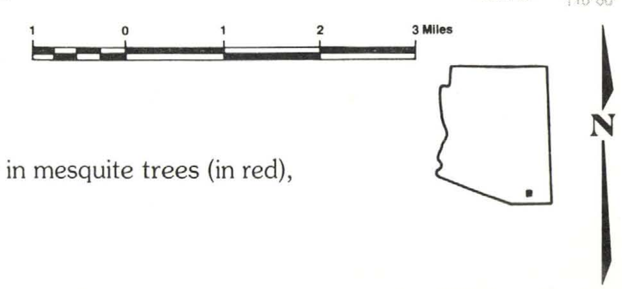
1.1 - 2 ppm

2.1 - 3 ppm

≥ 3 ppm



Tombstone Development Company, Inc.
Tombstone, Arizona



Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 12. Distribution pattern of silver in mesquite trees (in red), from Newell, R.A., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Explanation

Geology

- **QTgu** — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.
- **QTb** — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old
- **Tva** — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.
- **Tv** — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.
- **Tlc** — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.
- **Tiv** — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.
- **TKp** — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.
- **Kib** — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.
- **Kr** — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.
- **Ka** — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.
- **Klq** — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.
- **Kb** — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick
- **Jg** — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.
- **PIPs** — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.
- **IPh** — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.
- **MDs** — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.
- **OCs** — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.
- **Cs** — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.
- **Yg** — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.
- **Xp** — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

Government Reservation Boundary

Aqueduct

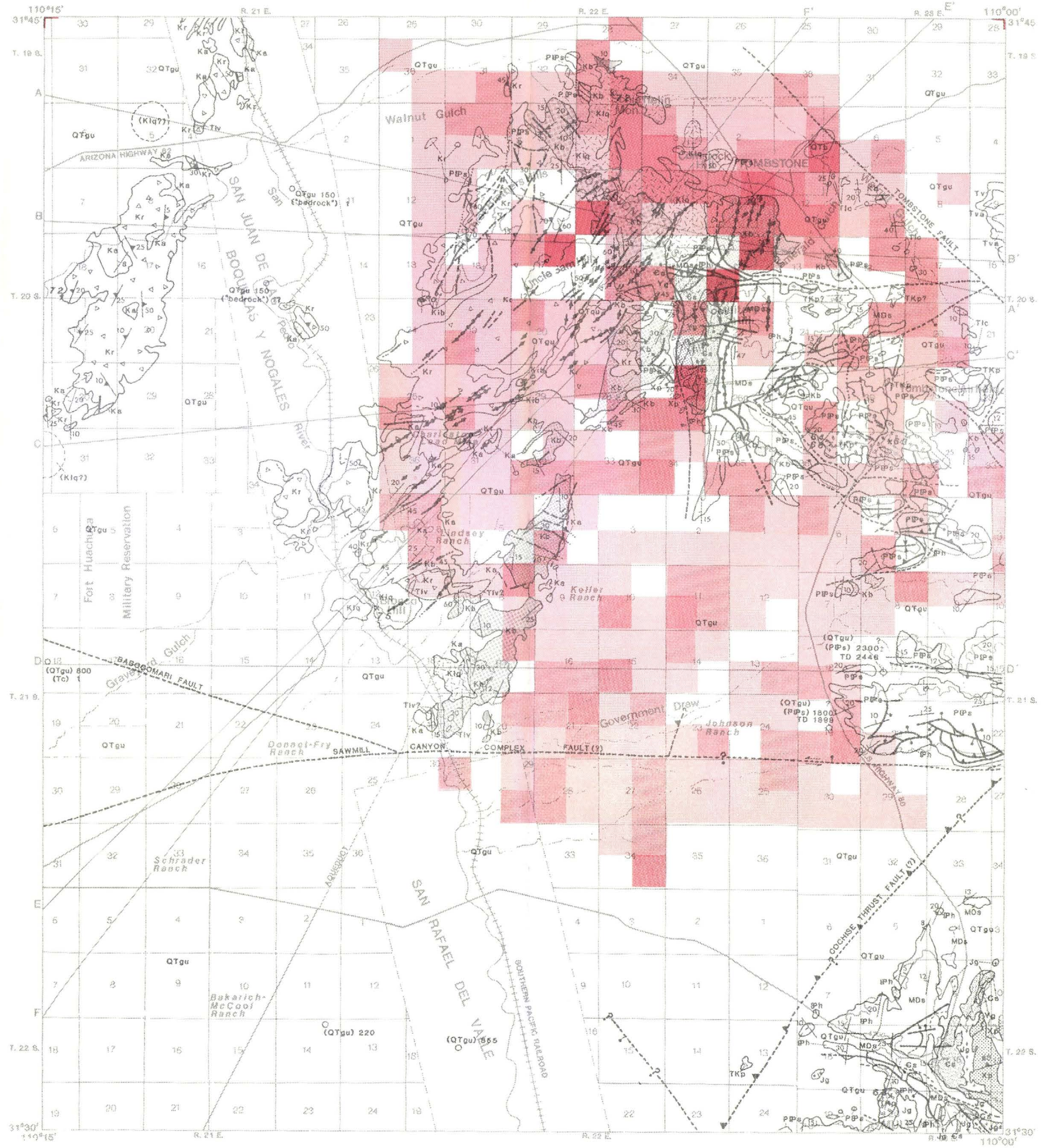
A—A' Cross section line

≤ 400 ppm

401 - 600 ppm

601 - 800 ppm

≥ 800 ppm



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles

N

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 13. Distribution pattern of zinc in mesquite trees (in red), from Newell, R.A., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Explanation

Geology

- **QTgu** — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.
- **QTb** — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old
- **Tva** — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.
- **Tv** — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.
- **Tlc** — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.
- **Tlv** — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.
- **TKg** — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.
- **Kib** — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.
- **Kr** — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.
- **Ka** — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.
- **Klg** — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.
- **Kb** — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick
- **Jg** — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.
- **PIPs** — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.
- **IPh** — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.
- **MDs** — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.
- **OЄs** — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.
- **Єs** — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.
- **Yg** — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.
- **Xp** — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

70

45 Normal

Reverse 45

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

Government Reservation Boundary

Aqueduct

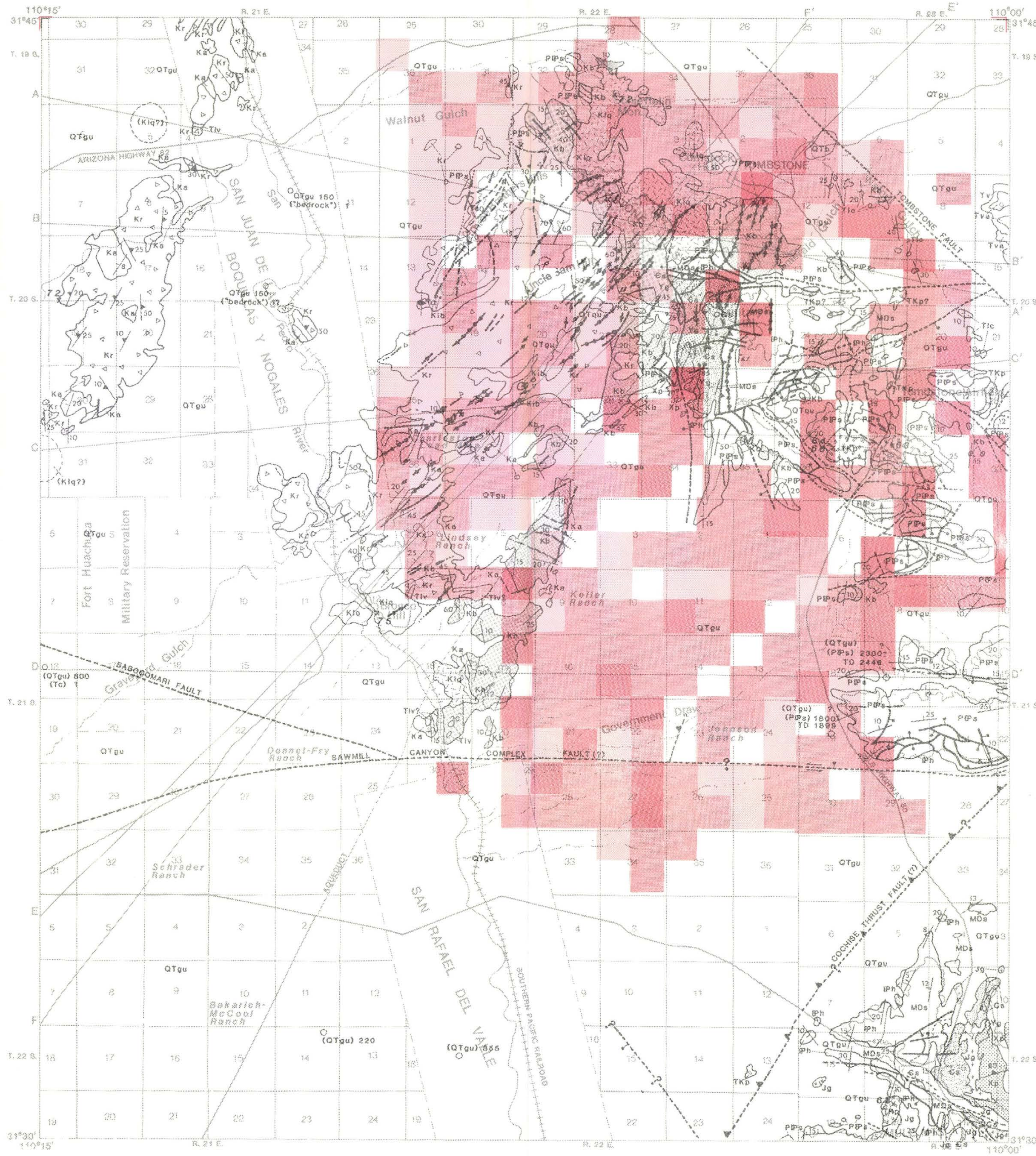
A—A' Cross section line

≤ 100 ppm

101 - 150 ppm

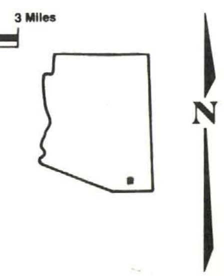
151 - 200 ppm

≥ 200 ppm



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles



Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 14. Distribution pattern of copper in mesquite trees (in red), from Newell, R.A., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tiv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia—exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff.—Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klg — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schieffin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

OCs — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

Cs — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

Government Reservation Boundary

Aqueduct

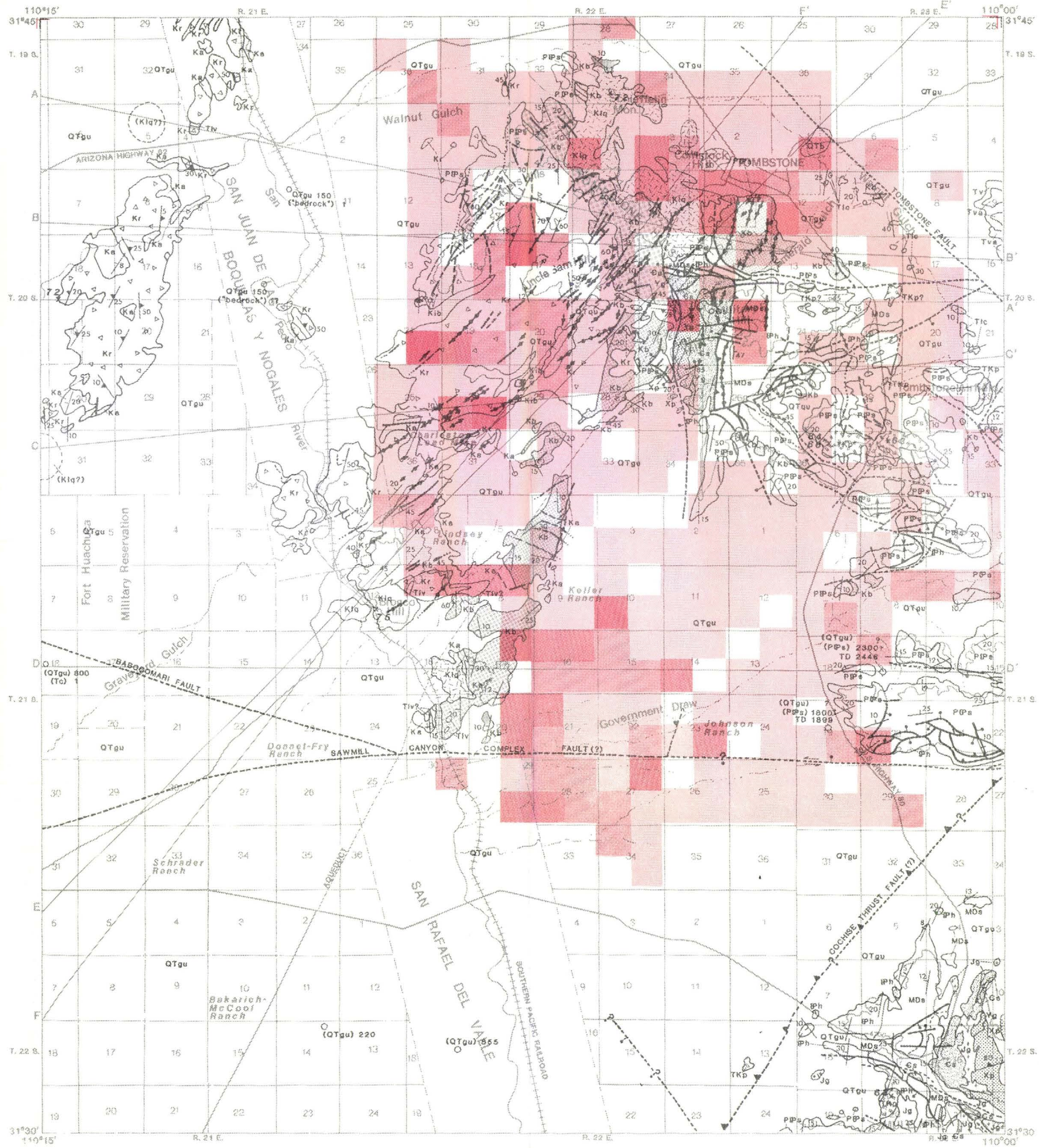
A—A' Cross section line

≤ 5 ppm

5.1 - 9 ppm

9.1 - 14 ppm

≥ 14 ppm



Tombstone Development Company, Inc.
Tombstone, Arizona

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Figure 15. Distribution pattern of molybdenum in mesquite trees (in red), from Newell, R.A., 1973.

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia – exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff. Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klg — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

OЄs — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

Єs — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

Government Reservation Boundary

Aqueduct

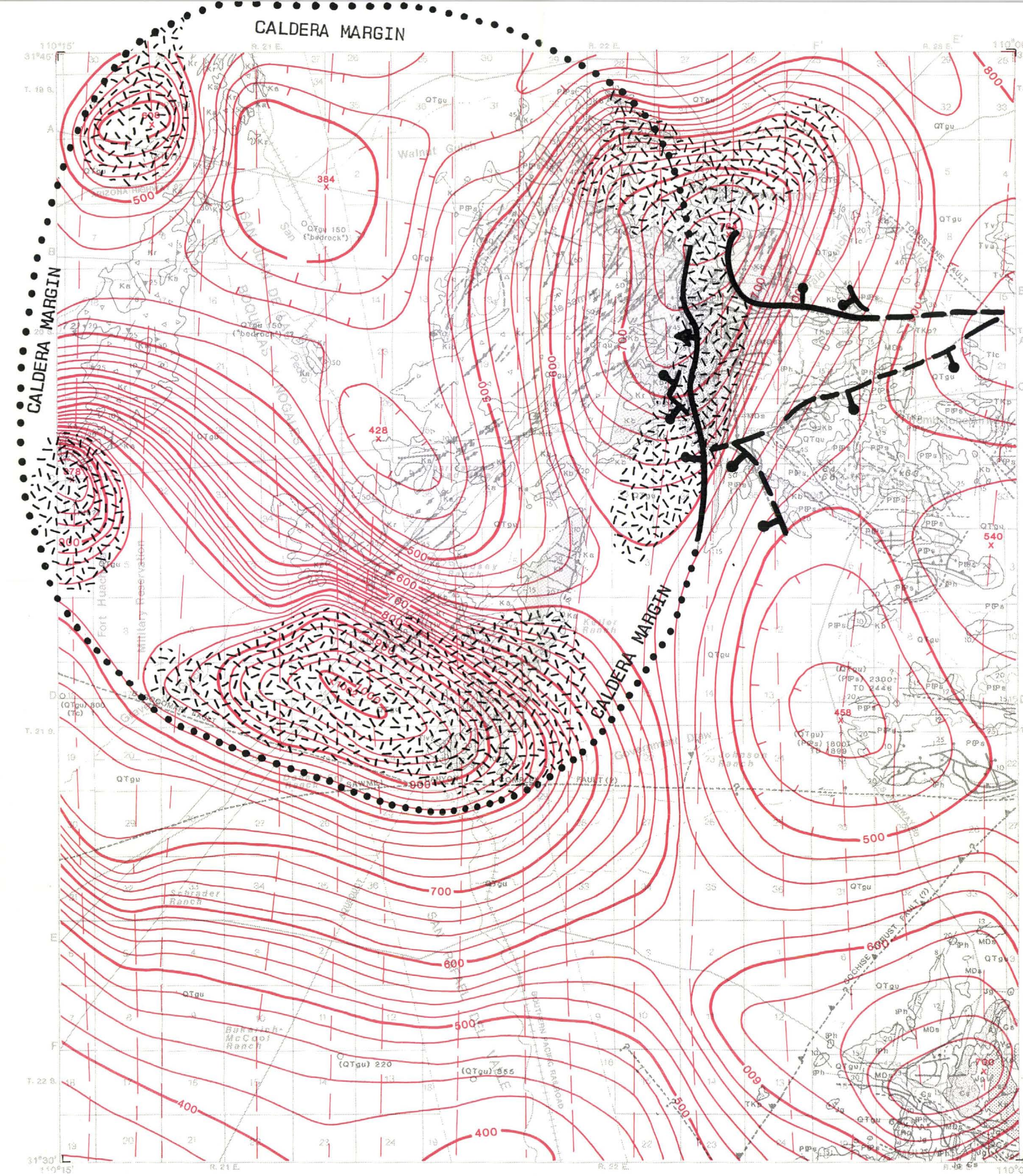
A——A' Cross section line

Flight line

Index contour line

Contour line

Contour interval: 25 gammas



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles

N

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 16. Aeromagnetic map of the Tombstone area.

From *Residual Aeromagnetic map of Southeastern Arizona*, Sauck, W.A., and Sumner, J.S., 1970. From Andreason, G.E., Mitchell, C.M., and Tyson, N.S., 1965

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

Explanation

Geology

QTgu — OLDER OR UNDIFFERENTIATED SURFICAL DEPOSITS (HOLOCENE TO OLIGOCENE):—Gravel, sand, and silt (Pleistocene and Pliocene—Mainly alluvium of basins; includes some colluvium and landslide deposits. Generally light-pinkish gray, weakly indurated, and with poorly rounded clasts; locally well indurated. Thickness several meters to hundreds of meters.

QTb — Basalt (Pleistocene to Pliocene)—Lava flows, pyroclastic rocks, and some intercalated gravel. Thickness several meters to a few hundred meters in most places. Radiometrically dated at 0.25, 1.0, and 3.2 m.y. old

Tva — Extensive andesite and dacite (Miocene and Upper Oligocene)—Lava flows, pyroclastic rocks, some intercalated epiclastic rocks, and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33, and 39 m.y.

Tv — Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene—Lava flows, welded tuff, pyroclastic rocks, and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens to a few thousand of meters thick. Dated at 23, 24, 25, 26, 26, 26, and 27 m.y. An additional date of 47 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tlc — Lower conglomerate, gravel, and sand (Oligocene and Eocene?)—Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick.

Tlv — UPPER CORDILLERAN (LARAMIDE) IGNEOUS ROCKS (LOWER PALEOCENE):—Lower volcanic rocks—Rhyolite to andesite lava flows, pyroclastic rocks, and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east.

TKp — MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS:—Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)—Mostly latitic porphyry to dacitic porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated at 61, 63, 63, 64, and 65 m.y.

Kib — Fluidized intrusive breccia – exact age unknown, but penetrates, and thus younger than Uncle Sam porphyry.

Kr — Rhyodacite tuff and welded tuff. –Includes parts of Salero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Red Bay Rhyolite, Cat Mountain Rhyolite of Brown (1939) and Uncle Sam Prophyry. Includes local intrusive bodies and locally contains fragments of exotic rocks. Thickness commonly several tens of meters to several hundreds of meters. Dated at 66(?), 70, 72, 73, and 73 m.y. The Uncle Sam, in the Tombstone area, is dated 72 m.y.

Ka — Andesitic to dacitic volcanic breccia.—Includes parts of Solero Formation, Sugarloaf Quartz Latite, and Bronco Volcanics, and all of Demetrie Volcanics and Silverbell Formation of Courtright (1958). Commonly contains large blocks of exotic rocks and locally includes some sedimentary rocks and intrusive rocks. Several tens of meters to several hundreds of meters thick in most places.

Klg — Lower quartz monzonite and graodiorite—Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74, and 76 m.y. The Schiefflin granodorite at Tombstone is 72 m.y.

Kb — BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS):—Upper part of Bisbee Formation or Group, undifferentiated, and related rocks.—Includes upper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Amole Arkose of Bryant and Kinnison (1954), and Angelic Arkose. Consists of brownish- to reddish-arkose, gray siltstone, sandstone, conglomerate, and some fossiliferous gray limestone. Commonly several hundred meters thick

Jg — GRANITE AND QUARTZ MONZONITE (JURASSIC)—Stocks of pinkish-gray coarse-grained rock. Locally associated with mineralization. Dated at 140, 148, 149, 149, 150, 153, 160, 161, 167, 178, 185 m.y.

PIPs — Sedimentary rocks (Lower Permian and Upper Pennsylvanian)—consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian), and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone, and gypsum, 120-280 meters thick. Colina Limestone is a medium gray, thick-bedded, sparsely cherty, and sparsely fossiliferous limestone 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale, and limestone, 120-240 meters thick.

IPh — Horquilla Limestone (Upper and Middle Pennsylvanian)—Light-pinkish-gray, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale-reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick.

MDs — SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)—Consists mainly of Escabrosa Limestone (Mississippian)—locally (Armstrong and Silberman, 1974) called Escabrosa Group—and Martin Formation (Upper Devonian), undifferentiated. In part of the Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-310 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous, and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone 6-105 meters thick. Black Prince Limestone is pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick.

O€s — SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN):—El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartz (Middle Cambrian), undifferentiated.—El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown, thin-bedded fossiliferous limestone, sandstone, quartzite, and shale, 210-240 meters thick. Bolsa Quartzite is a brown to white or purplish-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone.

€s — Sedimentary rocks (Upper and Middle Cambrian)—Abrigo Formation (Upper and Middle Cambrian), and Bolsa Quartzite (Middle Cambrian), undifferentiated.

Yg — GRANITOID ROCKS (PRECAMBRIAN Y):—Mainly granodiorite and quartz monsonite, unfoliated to foliated, in part metamorphosed. Generally in stocks, which ahve been little studied.

Xp — PINAL SCHIST (PRECAMBRIAN X)—Chlorite schist, phyllite, and some metavolcanic rocks, metavolcanic rocks, metaquartzite, metaquartzite conglomerate, and gneiss. One metavolcanic rock dated at 1715 m.y.

CONTACT—Dotted where concealed.

MARKER HORIZON—Dotted where concealed.

DIKES—Showing dip.

70 — FAULTS—Showing dip. Dotted where concealed or intruded; ball and bar on downthrown side.

45 — Normal

45 — Reverse

Strike-slip—Arrow couple shows relative displacement. Single arrow shows movement of active block.

Major thrust fault—Sawteeth on upper plate.

Thrust fault—Sawteeth on upper plate.

Anticline.

Syncline.

30 — Inclined strike and dip of beds.

EXOTIC-BLOCK BRECCIA—Rock contains chip or block inclusions of rock different from those of host or other blocks nearby. Typically of volcanic-tectonic or sedimentary-tectonic origin; excludes Tertiary megabreccia deposits.

(QTgu) 157 — Site of well or generalized site of several wells, showing unit penetrated, if known, and depth of well, in feet. 100 feet equals 30.5 meters.

72x — COLLECTION SITE—Radiogenically dated rock showing age in millions of years. Query before symbol where precise location uncertain.

Roads and Highways

Dry wash

Southern Pacific Railroad

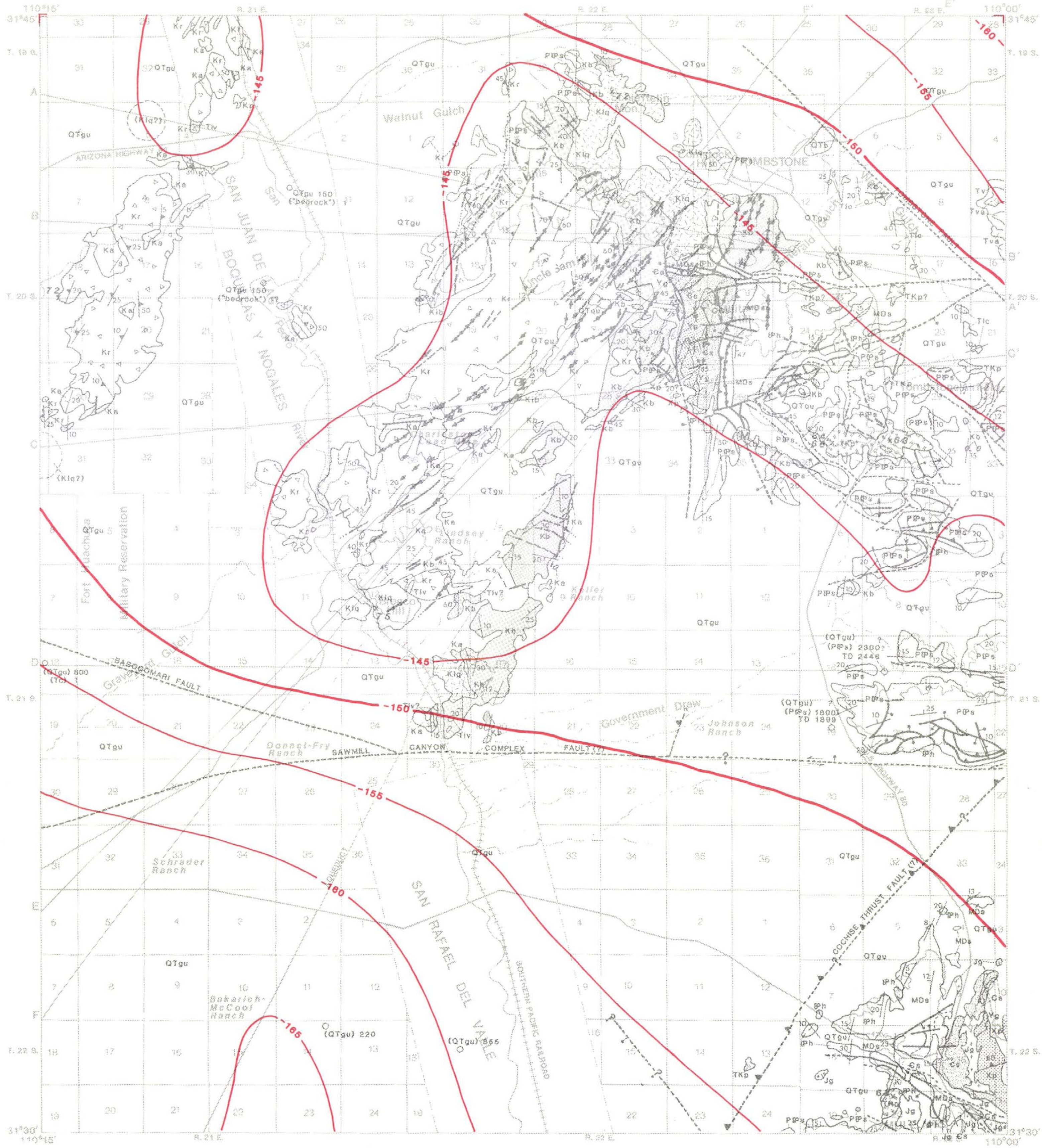
Government Reservation Boundary

Aqueduct

A—A' Cross section line

-150 Gravity contour line

Contour interval: 5 milligals



Tombstone Development Company, Inc.
Tombstone, Arizona

1 0 1 2 3 Miles

N

Geology adopted from Drewes, Harold, 1980, and Newell, R.A., 1973.

Figure 17. Gravity map of the Tombstone area.

From *Bouguer Gravity Anomaly map of Southeastern Arizona*, West, E.E., Sumner, J.S., Aiken, C.L.V., and Conley, J.N., 1973.

By James A. Briscoe
James A. Briscoe and Associates
Tucson, Arizona

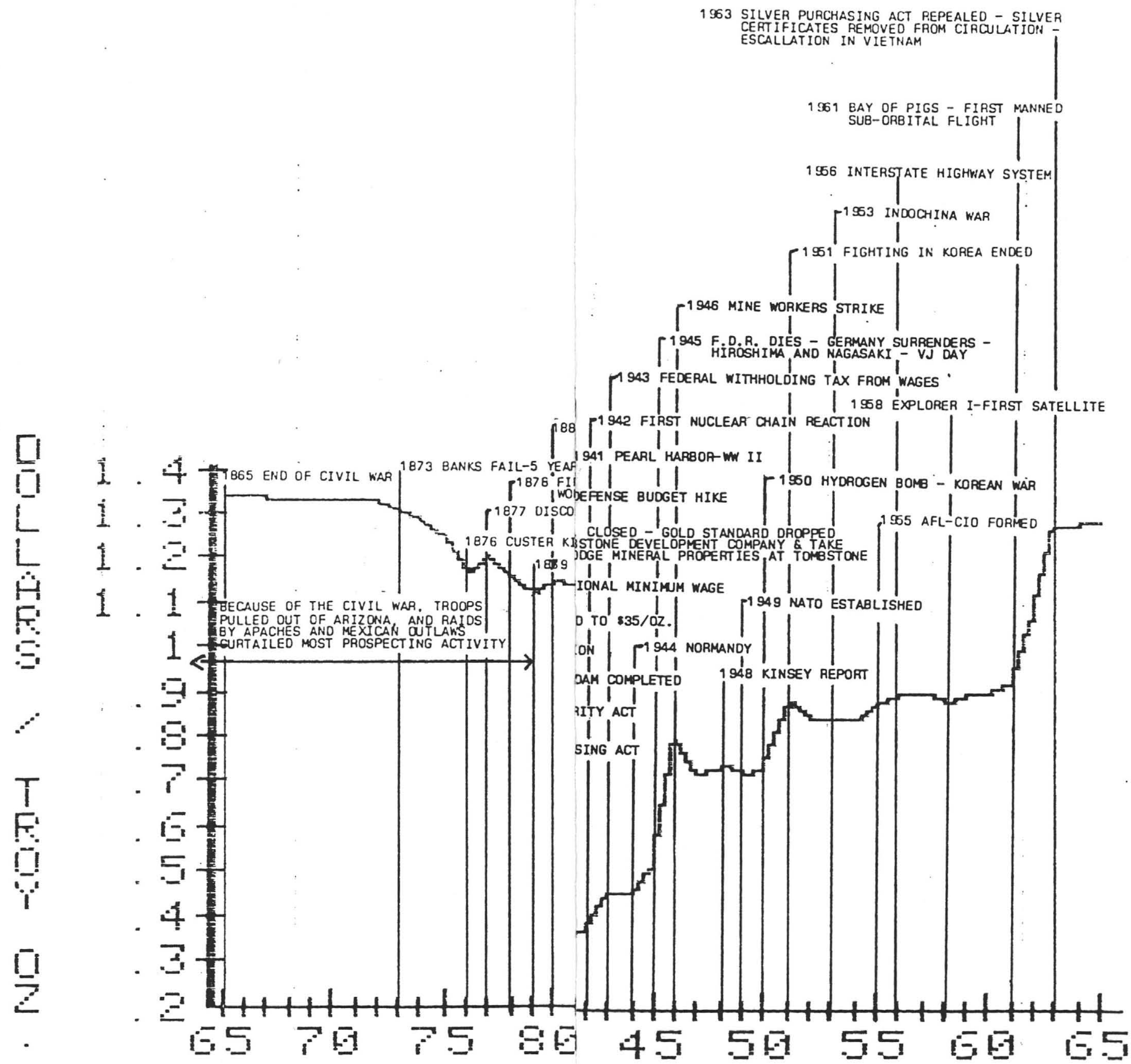
HISTORY

The Tombstone Mining District, then in Arizona Territory, was discovered by the son of a California 49ers, Edward L. Schieffelin in 1877. Tombstone, though isolated and subject to marauding Indians and outlaws in its early days, was affected by world events through their effect on silver prices. Ironically, with Schieffelin's discovery of rich silver mineralization at Tombstone, silver prices began a decline, and the price in 1877 would not be seen again for 86 years (Figure 18). During the thirty-four year period from 1877 to 1915, when most of the ore was produced at Tombstone, declining silver prices, financial panics and the removal of the United States currency from the silver standard, had immeasurably more affect on the mines than the Earp/Clanton fued, Apaches, bandits or underground waters.

The district has generally been divided into the main (eastern) portion and the western portion. The western portion is where the Tombstone Silver Mines, Inc. current property holdings lie. The State of Maine vein was discovered by John Escapule, who came to Tombstone as a photographer for the San Francisco Chronicle in 1878, to report on the silver rush. He caught "silver fever" and remained in Tombstone to prospect. In order to put the mine into operation, he approached financiers from the state of Maine, hence the mine and claim name (Bailey Escapule, 1985, pers. comm.). His decendents are operating his discovery, and are principals in Tombstone Silver Mines, Inc. The patented claims, now held by Tombstone Silver Mines, Inc., including the State of Maine, Brother Jonathan, Lowell, Merrimac, Red Top, Triple X, Clipper and May, were consolidated along with the main part of the district under the Tombstone Consolidated Mining Company.

In 1911, silver prices of approximately $0.55 per ounce (less than half that in effect when Schieffelin discovered Tombstone) brought the demise of efforts to unwater the mines, and the bankruptcy of the Development Corporation of America and its Tombstone Consolidated Mines subsidiary. The Phelps Dodge Corporation, who was a creditor of the Development Corporation of America, took over the Tombstone Consolidated Mines and operated them in a desultory fashion as the Bunker Hill Mining Company from 1914 through 1933. In 1915, the underground workings of the State of Maine mine were thoroughly sampled by Phelps Dodge (Butler, 1938, p. 101). Though 824 samples were taken, markings of which can still be seen on the walls of the State of Maine workings, the only information remaining concerning this sampling was published in the Butler Wilson volume, page 102, reproduced as Figure 34 in this report. In 1904, the Mellgren's, headed by Mr. V. G. Mellgren, a graduate mining and metallurgical engineer (Sarle, C. J., p. 8) began acquiring unpatented claims surrounding the patented ground later to be held by the Bunker Hill Company (Phelps Dodge Corporation subsidiary). The Pittman Act, supporting the price of silver at $1 per ounce between 1920 and 1923, stimulated some production in the main part of the district, primarily in the Bunker Hill mine, and a small amount of production in the western part of the district. During this time, surface mining on the Free Coinage vein and from the Bonanza dump was undertaken. In 1923, the Old Puebla Leasing Company cyanided part of the State of Maine dump and underground mine gob reportedly at a profit (Sarle, p. 8). Also, Chapman (later Dean and Dean Emertris of the College of Mines, University of Arizona, Tucson) undertook a Master's thesis (completed in 1924) to study the metallurgy of potential commercial leaching of the State of Maine mine dump. With the repeal of the Pittman Act in 1923, the price of silver plumeted (Figure 18), and no leaching of the dumps was ever accomplished. In 1933, when the price of silver averaged approximately $0.32 per ounce, the Tombstone Development Company, Inc., was formed by Ed Martin, owner of Tucson Ice, Dr. Roger Kline, founder of the Tucson Clinic, Mr. Moorehead, a retired banker from St. Louis, and Messrs. William Grace, Sr. and William Grace, Jr. (father and son). Lack of sufficient capital forced the Graces out of the deal at the time of incorporation. The purchase price from Phelps Dodge was $75,000 (Bill Grace, 1985, pers. comm.) for all of their patented mining claims in the district, which included essentially all of the producing mines. The company was headed by Ed Holderness, and acquired all the Bunker Hill (Phelps Dodge) properties in the Tombstone Mining District. It was the depths of the Great Depression, and miners were paid $3 per day and were happy to get the work

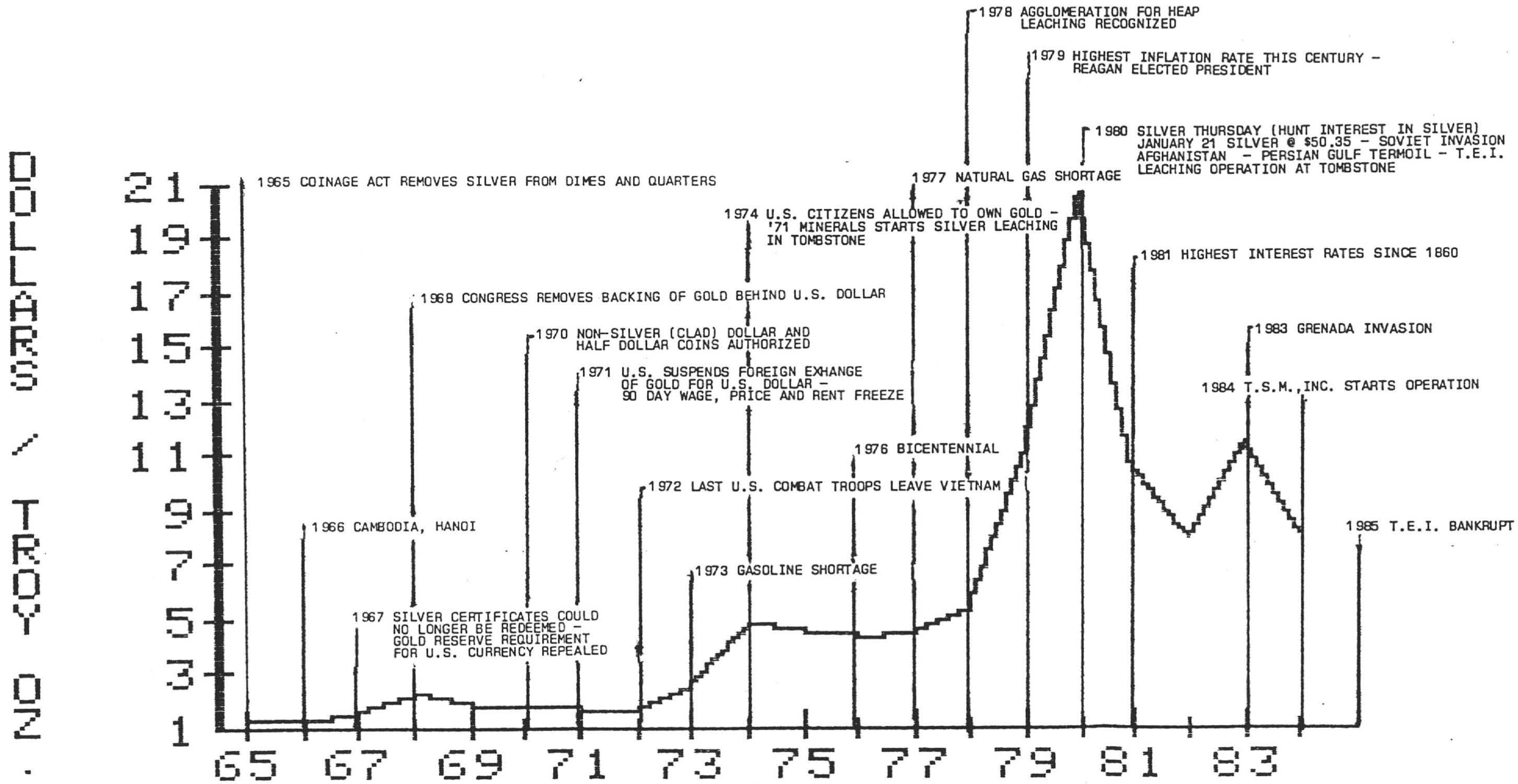
The higher gold price instituted by Franklin Roosevelt in 1932, stimulated some development, particularly in exploration in the main part of the district. The United States Smelting, Refining and Mining Company did considerable underground work in the northeastern part of the main district from early 1934 to May, 1937, on claims leased from the Tombstone Development Company, and shipped some ore. The Tombstone Extension mine was operated by the American Smelting and Refining Company during fifteen months in 1933 and 1934, and subsequently by its original owners, the Tombstone Mining Company and by lessees (Butler, p. 48). Except for some possible treatment of old stope fillings and dump leaching, there was no significant activity in the western part of the district. Sometime in the early 1940's, the State of Maine, Lowell, Brother Jonathan and the Triple X claims were purchased for back taxes by Mr. William Grace, and were subsequently transferred to Ernest Escapule, Senior. Joe Escapule, Sr., about the same time, acquired the True Blue, San Pedro, Santa Ana and the Free Coinage claims. During World War II, there was some study of the manganese deposits in the



PRICE CHART

SILVER PRICE

ROUGH 1965



RECENT SILVER PRICE CHART

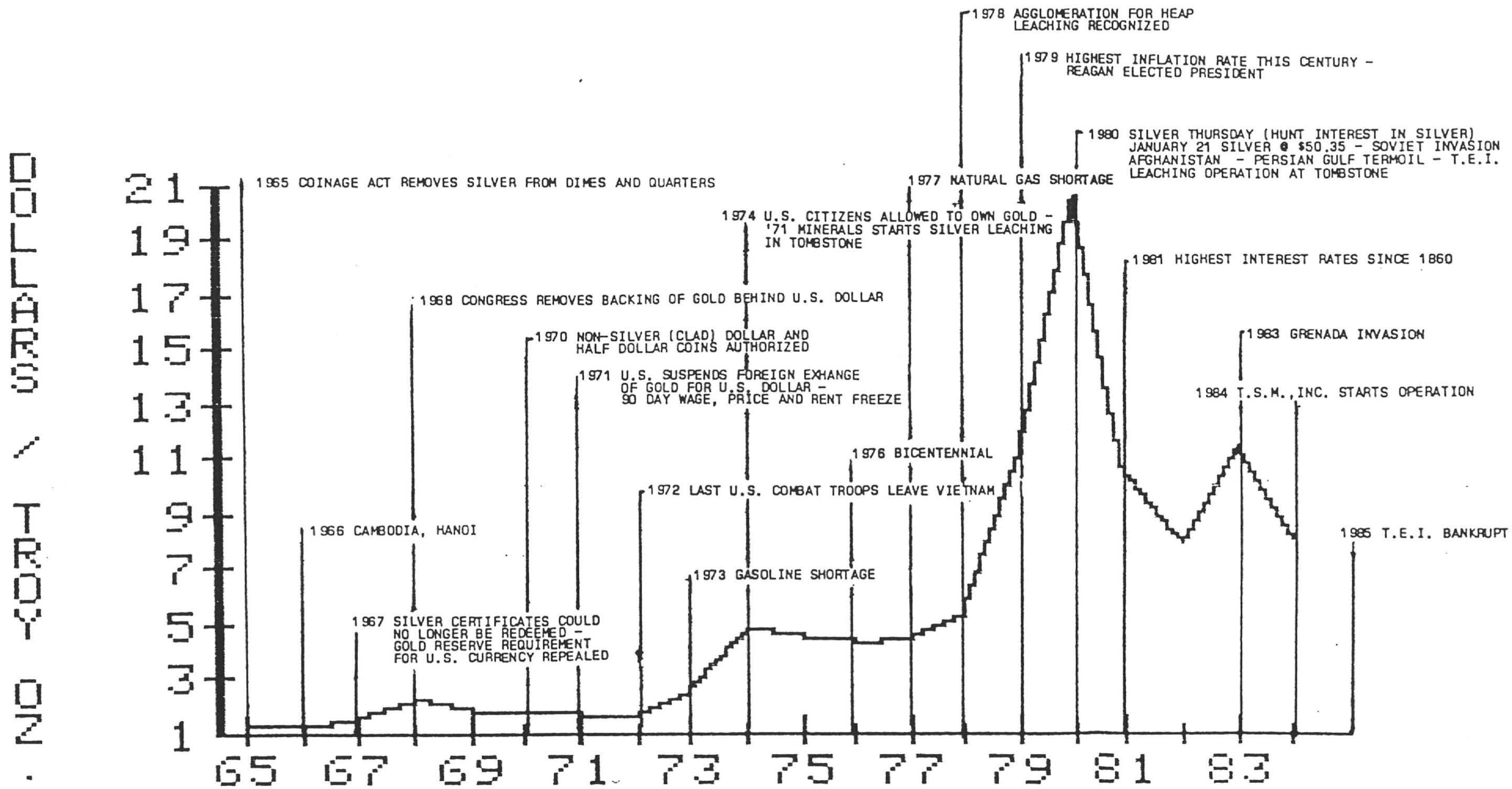
AVERAGE ANNUAL SILVER PRICE

YEARS: 1965 THROUGH 1984

Figure 19

district in relation to the war effort, and some manganese ores were produced, primarily from the Emerald and Bunker Hill mines, owned by the Tombstone Development Company. After World War II, in the late 1940's (the exact date is uncertain), a controlling interest in the Tombstone Development Company was acquired by the Newmont Mining Company. Fred Searls, then president, had great faith in the potential at Tombstone, and felt that after the war, precious metal prices would increase (William Hight, President, Tombstone Development Co., 1982, pers. comm.). Searls proved wrong, and after holding the property until the late 1950's, Newmont's controlling interest was sold to the current owners, a group of investors from Grand Island, Nebraska. Exploration work was done in the late 1950's by the Eagle Picher Company in the northeastern part of the main district, probably around the Silver Thread workings. Their drilling showed exciting values in lead and zinc (Burton DeVere, Billiton Exploration, 1983, pers. comm.). In 1965, the Duval Corporation drilled several rotary holes in the main part of the district probing for porphyry copper mineralization. Not much is known of the results of this exploration, though data is thought to be in the files of the Tombstone Development Company. In the period 1972-1973, the American Smelting & Refining Company obtained a lease on the Horne claims around the Robbers Roost breccia pipe. They drilled three holes to a maximum depth of 5,000 feet on the porphyry copper alteration zone in the vicinity of the breccia pipes. These holes intersected extensive but low grade mineralization, grading vertically downward from a lead-zinc phase of mineralization into porphyry copper type mineralization, including disseminated pyrite, chalcopyrite and molybdenite, as well as secondary feldspar and purple anhydrite. The Uncle Sam tuff was penetrated, intersecting Bisbee Formation, and at about 4,900 feet, the Bisbee was penetrated and the drill entered the Naco Limestone. Poor copper prices at the time and since have discouraged further exploration for copper at this depth.

In 1973, 1971 Minerals, Ltd. - a limited partnership headed by general partners Richard F. Hewlett (operating as Sierra Mineral Management, Inc.) and Bruce Stevenson and James Bishop (operating as Stevenson, Bishop and McCready, Inc. of New York City, New York), optioned the various holdings of the Escapule family in the western part of the district, and later, the land of the Tombstone Mineral Reserve, Inc. (now ALANCO, Inc.) and the lands belonging to the Tombstone Development Company, Inc. In the spring of 1973, the writer was hired by Mr. Dick Hewlett to prepare a report on the State of Maine area. A topographic map of the State of Maine area was prepared at a scale of 1" = 200' with contour intervals at five feet, detailed mapping on black and white photos later to be transfered onto the topographic base, and geochemical sampling was performed. Previously unrecognized windows exposing sediments beneath the Uncle Sam



RECENT SILVER PRICE CHART

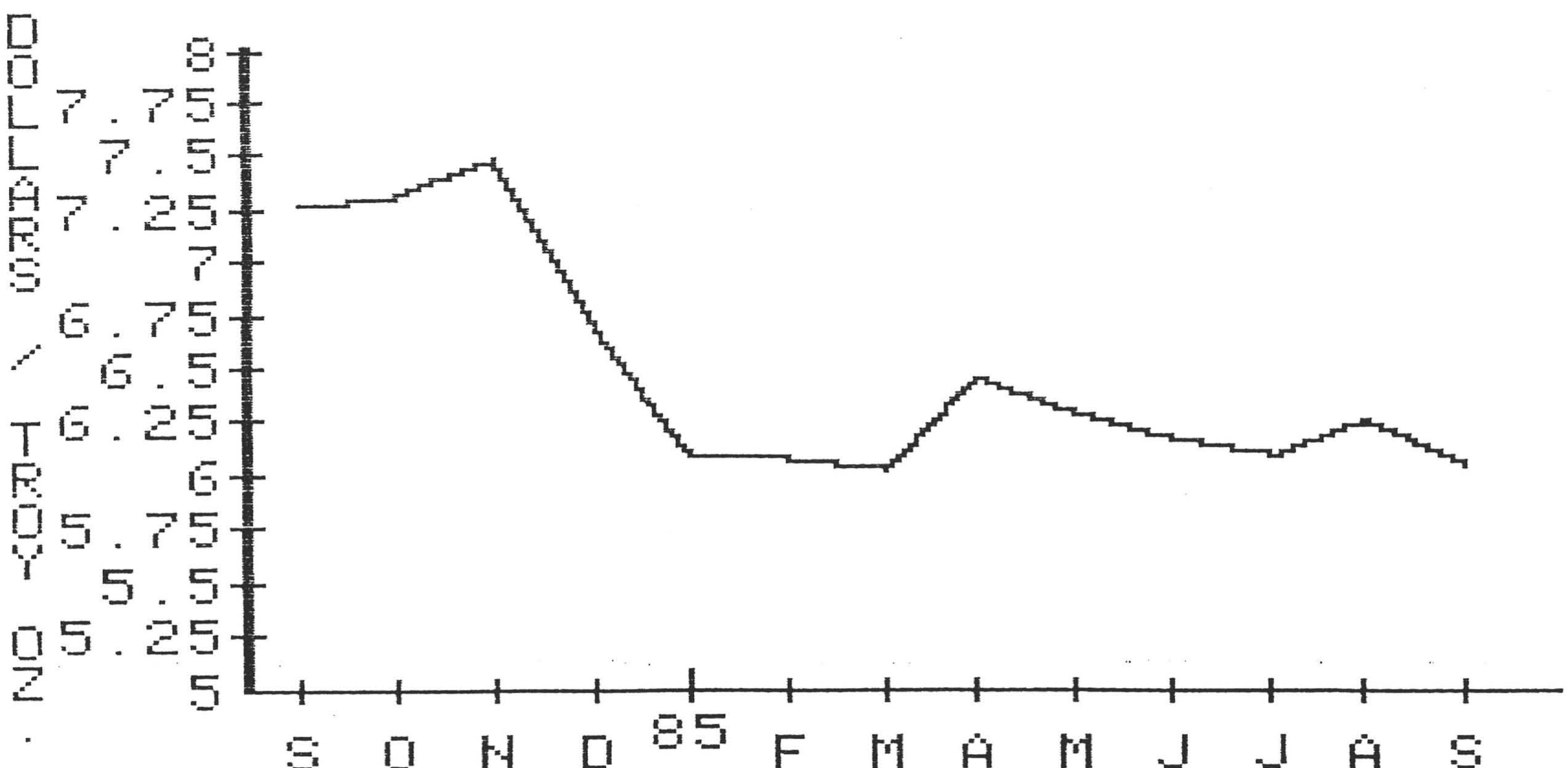
AVERAGE ANNUAL SILVER PRICE
YEARS: 1965 THROUGH 1984

Figure 19

tuff, as well as isoclinal folding in the sediments, were mapped. A comprehensive exporation program was planned and recommended. Also, in October of 1973, just before completion of the detailed report on the State of Maine area, the entire Tombstone District was flown in color aerial photography at a scale of 1" = 2,000' along north-south flight lines. In 1974, a counter-current decantation cyanide mill was moved from the Golden Sunlight mine in Montana, and installed at the State of Maine Mine, in order to treat ore from the State of Maine shaft. Also, the headframe from the #6 shaft at the Cordero mine in northern Nevada was set up on the State of Maine shaft over a newly poured concrete collar. Unfortunately the Golden Sunlight's cyanide mill never operated properly, probably due to underfinancing and poor management. It was later abandoned and the leases relinquished. 1971 Minerals, Ltd. went on to consolidate all of the old mine dumps in the main district on Tombstone Development Co. land into one large heap leach pad, which was operated until 1977, when the Tombstone Development Company lease was relinquished. They subsequently fell upon hard times, and are thought to no longer be a viable entity. None of the exploration program recommended by the writer was ever carried out.

About the same time, Roger A. Newell was completing a Stanford PhD. dissertation covering the area. Newell's maps covering the district as far west as the San Pedro River and as far south as the Bronco Hills, at a scale of 1:31,250 and 1:12,000 (Newell, 1974, Plates 1 & 2), are the most detailed and complete geologic coverage to date. Newell also presented geochemical data from regional sampling of mine dumps within the district (Figures 3 through 17 and Newell, 1974, p. 13-23), which verify mineralization in the district is related to a series of porphyry copper centers.

In 1980, Tombstone Exploration, Inc. (TEI) obtained a lease on the patented Tombstone Development Company lands in the main part of the district. Between 1980 and 1985, TEI operated an open pit mine on the Contention vein, and produced up to 3,000 tons per day of low grade ore averaging in the range of 1.25 ounces silver and .02 ounces gold, from which was recovered approximately 40% of the silver and 60% of the gold. Graves (1985) reports that 2 million ounces of silver and 10,000 ounces of gold were produced in the period from 1970 to 1985, mostly from the Tombstone Exploration, Inc. open pit operation and in a small part by the 1971 Minerals mine dump consolidation. No exploration drilling was ever done, and no ore reserves of significance were measured ahead of mining. Lowered silver and gold prices, poor management and a lack of reserves forced the company into bankruptcy in 1985, and its assets are currently being liquidated.



MONTHLY SILVER PRICE CHART
AVERAGE MONTHLY SILVER PRICE
SEPTEMBER, 1984 THROUGH SEPTEMBER, 1985

Figure 20

A regional map covering southeastern Arizona compiled by Harald Drewes of the United States Geological Survey was published in 1980. In 1982, the writer compiled data and maps from the work of Newell, Drewes and others (Figures 3 through 17). It is concluded from these various data that the volcanic geology and structure in the Tombstone area is related to a Laramide caldera, and mineralization in the district is also related to the caldera and attendant volcanic action and hydrothermal fluids.

Tombstone has primarily been a silver camp, though significant gold, lead, subordinate copper, zinc and manganese have also been produced. The silver to gold production ratio for documented production between 1877 and 1937, is 125.95:1. Production has come mainly from mineralized vein fractures, cutting folded Lower Cretaceous limestones and basal conglomerate of the Bisbee group within the Tombstone Basin (main part of the district). Ninety-five percent or more of the production is from the surface to six hundred feet below, and is primarily from oxide ore minerals.

Between 1879 and 1907, unpublished figures and estimates compiled by J. B. Tenny from old company reports and other sources (Butler, p. 48), indicate that $28,400,000 was produced. Unfortunately, this compilation is based only on dollar production and no information regarding tonnage, grades and ounces or pounds of which specific commodity was produced, is available. From 1908 through 1936, tonnages as well as amounts of gold in dollar value, silver in ounces, copper, lead and zinc in pounds (Butler, p. 49), as well as Tombstone Development Company records through the year 1936, showing the same units, give more specific information on the district. Using this more detailed later information as well as dump tonnages calculated during the period of dump leaching by 1971 Minerals, Ltd. (1972 through 1977 - private company reports for those years), the writer has estimated that 1.25 million tons of ore was produced. Using this estimated tonnage and the recorded production, it is calculated that the average grade for ore produced was 25.89 ounces silver, 0.21 ounces gold, 2.6% lead and 0.10% copper and smaller amounts of zinc and manganese. Not included in these figures are the substantial amounts produced between 1980 and 1985 by Tomstone Exploration, Inc. from its open pit mining operation along the Contention vein.

Total past production at Tombstone, not including that of 1971 Minerals Limited or Tombstone Exploration, Inc., in terms of $400 gold and $10 silver, $.50 lead, $1.00 copper, and $.40 zinc, is approximately $463 million (Figure 21).

GENERAL GEOLOGY OF THE DISTRICT

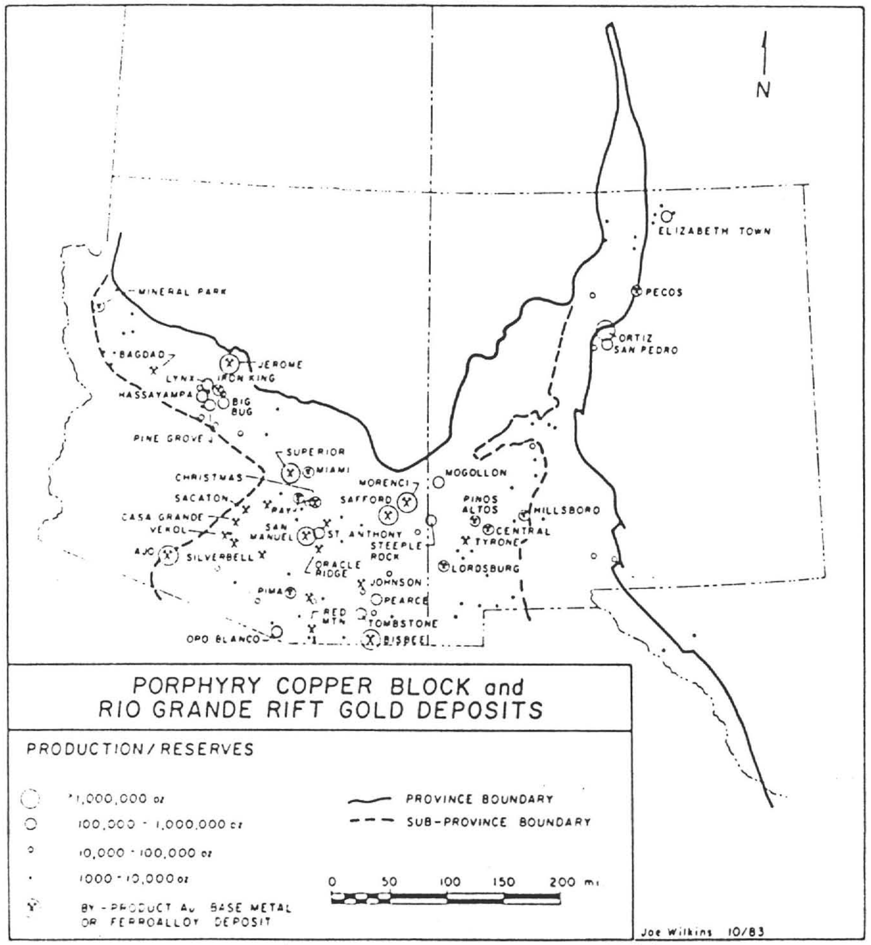
The Tombstone Mining District lies within the southwestern porphyry copper province (Figure 26). Nearby, large porphyry copper deposits are located at Bisbee, some twenty-five miles to the southeast, and the newly discovered deposits at Dragoon are some twenty-five miles to the north. Exploration drilling on a Jurasic porphyry copper system (the same age as Bisbee) at Gleeson, about fifteen miles northeast, was in progress in the early 1970's. However, the drilling disclosed that thrust faulting had broken the original deposit into sub-economic slivers.

The Tombstone area itself has had a complex geologic history, which includes sedimentation, folding, thrust faulting, explosive acid volcanism and caldera formation and resurgence, several stages of intrusion by igneous rocks and mineralization from hydrothermal solutions between 72 m.y. and 63 m.y.

Basement rocks are Precambrian granodiorite and Pinal schist. Over this are deposited approximately 5,000 feet of Paleozoic sediments consisting, for the most part, of limestone. Mesozoic sedimentation includes the Bisbee Formation consisting of plus 3,000 feet of sandstones, shales, mudstones and minor limestones near the base.

The post-Paleozoic tectonic history of the Tombstone area has been complex. At least two episodes of folding and thrust faulting have taken place (Gilluly, p. 122-130). It is apparent (Gilluly, p. 128) that an earlier period of deformation created eastward trending features, and later deformation formed north-trending and oblique features. During the first stage, north-south compression formed east trending folds and minor thrusts, with a north strike and northerly low angle dips. Later, the area underwent southwest-northeast compression, which produced thrust faults of northwesterly trend, and was probably responsible for large features visible in the district today, including the Empire anticline and the north 50 degree east fractures.

There must have been a profound structural weakness at the current location of the Tombstone Hills, because Laramide volcanism appears to form a focus at Tombstone, with relatively smaller effect on the surrounding terrain for a distance of 20 or more miles. Laramide surface volcanism began with the extrusion of the Bronco volcanics, comprised of lower andesite flows and breccias, overlain by rhyolitic tuffs and flows (Newell, R. A., 1974, p. 40-41). Examination by the writer suggests that these rhyolites, at least in part, may be a series of coalescing rhyolite domes, as they exhibit contorted flow, and in places, flow breccia structures. The Bronco andesites, which were



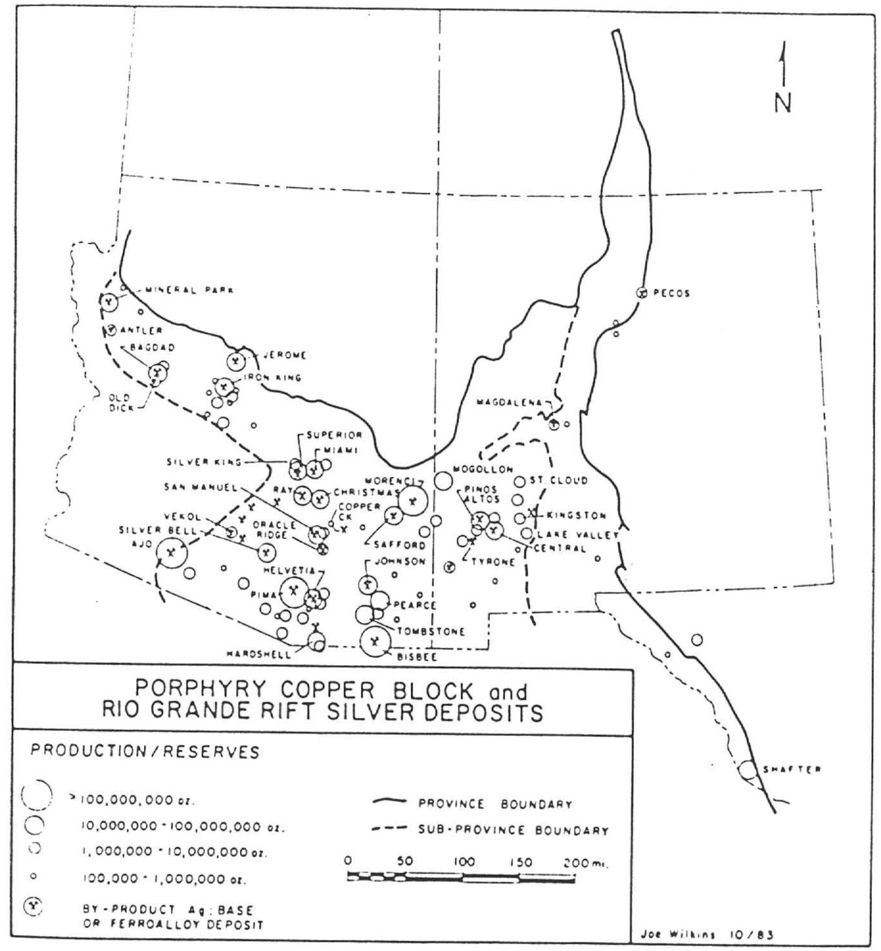


Figure 26
Page 49

extruded as flows, flow breccias and probable lahars, are of the Silverbell type. Extruded over the Bronco volcanics is the 71.9 ±2.4 m.y. (Drewes, 1971) old Uncle Sam quartz latite tuff. The extrusion of the tuff, which probably started issuing forth from the area of the Bronco Hills, resulted in partial evacuation of the underlying magma chamber and caldera collapse, with later resurgent exhalation of more quartz latite tuffs. The current Ajax fault, with some 5,000 feet of stratigraphic throw, formed the eastern margin of the caldera, and appears to localize some of the Uncle Sam vents, as well as later intrusives. Apophyses of the parent magma intruded along the northeasterly portion of the caldera, forming the present outcrops of Schieffelin Granodiorite southwest of Tombstone. Additional apophyses of Schieffelin Granodiorite intruded along the caldera margin at Bronco Hill; near Fairbank, and on the west side of the San Pedro River on the Ft. Huachuca Military Reservation. These probable intrusions are thought to be the source of aeromagnetic anomalies prominent on the aeromagnetic map in Figure 16. The Prompter and Horquilla faults may, in part, be radiating expansion fractures due to the initial doming before the extrusion of the Uncle Sam tuff and resurgence thereafter. Several episodes of explosive eruptions are indicated by multiple cooling units of Uncle Sam tuff, best exposed in the Charleston area. Geothermal convection cells circulating along fractures in the cooling volcanic and related plutonic rocks at depth, gave rise to the current copper, molybdenum, lead, zinc, silver and gold mineralization centers within and adjacent to the caldera. Phreatic (steam) explosions and venting probably gave rise to the breccia pipes in the Robbers Roost-Charleston Lead mine area. Deep exploration drill holes in this area confirm unexposed apophyses (cupolas) of porphyritic quartz monzonite below these altered areas - the probable driving mechanism for both hydrothermal fluidization of the breccia pipes as well as mineralization. Interestingly, Mr. David Sawyer, Stanford PhD. candidate, mapping the Silverbell mineral-volcanic complex for his dissertation, has found it to be a caldera complex (1984, pers. comm.). The sequence - Silverbell andesite, dacite, Mt. Lord ignimbrite, is the same type and sequence of extrusives as present at Tombstone, i.e., the Bronco andesites, Bronco rhyolite, and Uncle Sam tuff. At Silverbell, quartz monzonites intrude the cauldron fault, to be later mineralized by copper, molybdenum, silver, lead and zinc bearing hydrothermal solutions. At Silverbell, the volcanic complex is Laramide - approximately 65 m.y. old.

Age dating of samples of altered rock collected by Newell at the Charleston Lead mine (1974, p. 73), show potassium-argon age date of sericite of 74.5 ± 3 m.y., while a sample of the altered Contention dike material collected by Gustafson (Newell, 1974, p. 74) yield an age of about 72 m.y. The age date of 63 m.y. by Creasey, et al. (1962) for potassium-argon on rhyolite intimately associated with manganese south of the Emerald mine, suggests that the age of manganese mineralization (at least in the Military Hill-Emerald mine area south of the Prompter fault) is approximately 10 m.y. younger than mineralization on the Contention dike and at Charleston. The writer, in 1982, mapped a previously unnoticed apophysis of quartz monzonite porphyry in the Tombstone Extension area, and dikes of the same material in the Comstock Hill area, northwest of the Tombstone townsite. Drewes, in 1985, reported this rock had an age of 62.6 $\pm$ 2.8 m.y. (pers. comm.). This intrusive may be the source rock for the rhyolite dated by Creasey intruding the Prompter fault and as dikes south of the Prompter fault, as well as sill-like bodies southwest of Tombstone near the municipal airport. Further, they may be the source of rhyolite dikes associated with mineralization in the State of Maine area. Unfortunately, no age date on the mineralization on the State of Maine mine has been made.

As pointed out by Livingston et al. (1968, p. 30), "15 of the 16 known porphyry copper deposits in Arizona are intimately related to the late-Cretaceous or early-Tertiary plutons of the Laramide (75 to 55 m.y.)", and of these fifteen deposits, ten had dates between 55 and 65 m.y., and only two had dates greater than 70 m.y. The importance of determining the age of the Tombstone mineralization is thus clearly defined (Newell, 1974, p. 73). If the mineralization or at least some of the mineralization centers at Tombstone can be shown to be contemporaneous with other productive porphyry copper deposits in the surrounding area, then the long term potential for deeper mineralization would be enhanced. Confirmation that all or some mineral centers at Tombstone were related to the older 72 m.y. early Laramide phase of mineralization would suggest a lower copper, higher lead-zinc resource, and lower potential for intersecting a copper molybdenum deposit at depth (Keith, 1985). It is thus important that additional samples carefully collected from target mineral zones be taken and accurately age dated to determine the age of the mineralizing system. Additionally, key rock units such as the rhyolite dikes intruding the State of Maine area should also be age dated.

The following is a chronological summary extracted from Newell's 1974 dissertation on the district. The writer, as previously explained, believes that the extrusion of the Uncle Sam tuff through a series of vents, resulted in evacuation of the underlying magma chamber, and caldera collapse. The deepest collapse, documented by geologic mapping so far, is along the Ajax Hill fault, where some 5,000 feet of stratigraphic throw between the Precambrian on the upside and Cretaceous Bisbee on the downside, is also the loci of conduits for various extrusions and intrusions including; the Uncle Sam tuff, the Schieffelin Granodiorite, the quartz latite porphyry, the granophyre, and the rhyodacite. The reopening of the northeast trending fracture zones the prevalent fracture direction in Arizona since the Precambrian, allowed the circulation of geothermal convection cells altering the surrounding rock and emplacing base and precious metal mineralization. At specific weak spots, this hydrothermal activity appeared to be concentrated and the zones of concentration as known at this time would include the main part of the Tombstone district, the State of Maine area, the Robbers Roost breccia pipe area, the Charleston lead mine area, and possibly mesquite twig geochemical anomalies at Government Draw and Louis Springs (Newell, 1974, p.148-155), and possibly magnetic anomalies at the Charleston crossing, on the Huachuca Military Reservation, west of the San Pedro River, and at Fairbank. Following Newell's chronology, the writer has rearranged the chronology to support the evidence for caldera formation, and intrusion of the the Schieffelin Granodiorite after the extrusion of the Uncle Sam tuff and caldera collapse. The reader should note that the rearranged chronology is permissable within the sound chronologic evidence cited by Newell. The only major change is the timing of movement on the Ajax fault, extrusion of the Uncle Sam tuff, and intrusion of the Schieffelin Granodiorite along the caldera fracture zone - all of which are permissable under Newell's cited geochronologic evidence:

Chronological Summary--Igneous and Structural Activity (Newell, 1974, p. 67-72)

> The following chronological summary is based on field relations and age dates from selected igneous rocks. The summary is presented in a tabulated form to allow better separation and understanding of the complex structural history.
>
> 1. Pre-Cretaceous movement along the Prompter-Horquilla faults. Evidence: Total maximum offset on the Prompter fault is about 4,000 feet, and the Cretaceous Bisbee Formation is offset only about 2,800 feet.
>
> 2. Folding of the Bisbee Formation in the central portion of the Tombstone district. Evidence:
>
>   a. The Tombstone basin is bounded on the west by the Ajax Hill fault.
>
>   b. Fold trends are cut by the Schieffelin Granodiorite, which also cuts the Ajax Hill fault.
>
> 3. Movement along the Ajax Hill fault. Evidence:

a. The Ajax Hill fault cuts the Prompter fault.

b. The Ajax Hill fault is cut by the Schieffelin Granodiorite.

c. The Ajax Hill fault bounds the western margin of the Tombstone basin.

4. Extrusion of the Bronco Andesite, followed by extrusion of the Bronco Rhyolite. Evidence:

   a. The Bronco Rhyolite cuts the andesite, immediately north of the Charleston lead mine.

   b. The Uncle Sam Tuff cuts the Bronco Andesite (center sec. 28, T. 20 S., R. 22 E.).

   c. The Uncle Sam Tuff intrudes the Ajax Hill fault. Note: The Ajax Hill fault is not in contact with the Bronco volcanics, and the possibility exists that these volcanics pre-date the Ajax Hill fault.

5. Intrusion of the north-trending andesite porphyry dikes. Evidence:

   a. The dikes cut folds within the Bisbee Formation.

   b. The dikes occur in sedimentary rocks which contain the Schieffelin Granodiorite at depth.

   c. The dikes do not cut the Schieffelin Granodiorite.

6. Intrusion of the Schieffelin Granodiorite. Evidence:

   a. The granodiorite cuts the Ajax Hill fault.

   b. The Schieffelin is less siliceous than the Uncle Sam Tuff.

   c. Creasey et al. (1962) dated the granodiorite at 72 m.y.

7. Renewed movement along the Prompter fault. Evidence:

a. The Prompter fault cuts andesite porphyry dikes.

b. The Prompter fault offsets the Ajax Hill fault.

8. Emplacement and extrusion of the Uncle Sam Tuff. Evidence:

a. The Uncle Sam Tuff cuts the Bronco volcanics (sec. 28, T. 20S., R. 22 E., and sec. 25, T. 20 S., R. 21 E.).

b. The Uncle Sam Tuff follows the Ajax Hill fault.

c. A hornblende andesite dike cuts the Schieffelin Granodiorite and the Uncle Sam Tuff north of Bronco Hill.

d. The Uncle Sam Tuff is more siliceous than the Schieffelin Granodiorite.

3. A potassium-argon date (71.9 $\pm$ 2.4 m.y., Drewes, 1971) from the Uncle Sam Tuff indicates the same age as the Schieffelin Granodiorite.

9. Emplacement of the quartz latite porphyry. Evidence:

a. The quartz latite porphyry cuts the Bronco Andesite.

b. The quartz latite porphyry is compositionally very similar to the Uncle Sam Tuff. Note: The quartz latite porphyry is probably an equivalent of the Uncle Sam Tuff, but textural evidence suggests the porphyry did not vent to the surface.

10. Emplacement of the granophyre. Evidence:

a. The granophyre intrudes the Ajax Hill fault.

b. The granophyre is intensely altered, and this may be due to the emplacement of the rhyodacite.

11. Emplacement of the rhyodacite. Evidence:

a. The rhyodacite intrudes the Ajax Hill fault.

b. The rhyodacite intrudes the Uncle Sam Tuff.

c. The rhyodacite probably altered the granophyre.

12. Earliest fracturing along the northeast-trending fissures. Evidence:

 a. The fissures cut the Uncle Sam Tuff.

 b. The fissures are intruded by hornblende andesite dikes.

13. Emplacement of the hornblende andesite dikes. Evidence: The dikes follow the northeast-trending fissures, in the Uncle Sam Tuff, and in the Schieffelin Granodiorite.

14. Introduction of hydrothermal solutions and formation of the base-metal and silver deposits at Charleston and at Tombstone. Evidence:

 a. Hornblende andesite dikes are hydrothermally altered (Charleston lead mine; sericite date 74.5 ± 3 m.y., Appendix I).

 b. The mineralization followed northeast-trending fractures at Tombstone (Butler and Wilson, 1942, p. 201).

 c. Alteration along the Contention dike yielded a potassium-argon date of about 72 m.y. (Gustafson, pers. comm.).

15. Emplacement of the rhyolite porphyry, and associated dikes and sills. Evidence:

 a. A rhyolite dike cuts an andesite porphyry dike immediately west of Military Hill.

 b. The rhyolite intruded the Prompter fault zone.

 c. Creasey et al. (1962) obtained a potassium-argon date of 63 m.y. for the rhyolite.

16. Renewed minor fracturing along the northeast-trending fissures. Evidence: A northeast-trending fissure cuts the rhyolite dike west of Military Hill.

17. Renewed movement along the Prompter fault. Evidence:

    a. A rhyolite porphyry dike is cut and offset left laterally about 200 ft. by the Prompter fault system.

    b. The northeast-trending fissures do not cross faults belonging to the Prompter system.

18. Introduction of the manganese mineralization, in the southern part of the district. Evidence:

    a. Manganese mineralization is intimately associated with the rhyolite porphyry in the Side Wheel mine west of Military Hill.

    b. Alteration related to silver mineralization along the Contention dike yielded an age of about 72 m.y. (Gustafson, pers. comm.).

    c. The age of the rhyolite porphyry is about 63 m.y. (Creasey et al., 1962).

    d. Manganese deposits are closely associated with the Prompter fault (Butler, Wilson and Rasor, 1938, p. 80), and the rhyolite porphyry has intruded along the Prompter fault.

    e. Quarts veinlets were observed paralleling the ore fissure which cuts the rhyolite dike west of Military Hill.

19. Partial district tilting to the northeast possibly associated with the northwest faulting. Evidence:

    a. Quaternary (?) conglomerate beds along Walnut Gulch dip 40 degrees NE.

    b. Northwest-trending faults (Grand Central, East Boundary, and Walnut Gulch) have progressively lowered the district to the northeast.

    c. Northwest-trending faults post-date the mineralization (Butler, Wilson and Rasor, 1938, p. 37).

20. Emplacement of the basalt and phonolite in Walnut Gulch. Evidence: The basalt cuts Tertiary and quaternary (?) gravels.

Chronological Summary -- Igneous and Structural Activity according to hypothesis by Briscoe that the Tombstone volcanics and mineral deposits are a Laramide caldera complex.

The following chronological summary is based on field relations and age dates from selected igneous rocks prepared by Newell, 1974. The summary is presented in a tabulated form to allow better separation and understanding of the complex structural history. Underlined words and phrases are those added by Briscoe. Chronology has been changed by Briscoe to relfect caldera hypothesis - see preceeding chronological summary for Newell's original order.

1. Pre-Cretaceous (Nevadan - 180 m.y. - contemporaneous with movement along Dividend fault at Bisbee) movement along the Prompter-Horquilla faults. Evidence: Total maximum offset on the Prompter fault is about 4,000 feet, and the Cretaceous Bisbee Formation is offset only about 2,800 feet.

2. Folding of the Bisbee Formation in the central portion of the Tombstone district - the folding is probably district-wide at least, and maybe regional. Evidence:

    a. The Tombstone basin is bounded on the west by the Ajax Hill fault.

    b. Fold trends are cut by the Schieffelin Granodiorite, which also cuts the Ajax Hill fault.

    c. Isoclinal folds in basal Bisbee group sediments, north of the Uncle Sam shaft.

3. Extrusion of the Bronco Andesite, followed by extrusion of the Bronco Rhyolite. Evidence:

    a. The Bronco Rhyolite cuts the andesite, immediately north of the Charleston lead mine.

    b. The Uncle Sam Tuff cuts the Bronco Andesite (center sec. 28, T. 20 S., R. 22 E.).

    c. The Uncle Sam Tuff intrudes the Ajax Hill fault. Note: The Ajax Hill fault is not in contact with the Bronco volcanics, and the possibility exists that these volcanics pre-date the Ajax Hill fault.

4. Intrusion of the north-trending andesite porphyry dikes. Evidence:

    a. The dikes cut folds within the Bisbee Formation.

b. The dikes occur in sedimentary rocks which contain the Schieffelin Granodiorite at depth.

c. The dikes do not cut the Schieffelin Granodiorite.

5. Explosive acid volcanism - extrusion of the Uncle Sam Tuff, followed by caldera collapse and resurgence.

   a. The Uncle Sam Tuff cuts the Bronco volcanics (sec. 28, T. 20S., R. 22 E., and sec. 25, T. 20 S., R. 21 E.).

   b. The Uncle Sam Tuff follows the Ajax Hill fault.

   c. A hornblende andesite dike cuts the Schieffelin Granodiorite and the Uncle Sam Tuff north of Bronco Hill.

   d. (?)The Uncle Sam Tuff is more siliceous than the Schieffelin Granodiorite(?).

   e. A potassium-argon date (71.9 ± 2.4 m.y., Drewes, 1971) from the Uncle Sam Tuff indicates the same age as the Schieffelin Granodiorite.

6. Movement along the Ajax Hill fault following caldera collapse - 5 above. Evidence:

   a. The Ajax Hill fault cuts the Prompter fault.

   b. The Ajax Hill fault is cut by the Schieffelin Granodiorite.

   c. The Ajax Hill fault bounds the western margin of the Tombstone basin.

7. Renewed movement along the Prompter fault. Evidence:

   a. The Prompter fault cuts andesite porphyry dikes.

   b. The Prompter fault offsets the Ajax Hill fault.

8. Emplacement of the quartz latite porphyry after caldera resurgence above. Evidence:

   a. The quartz latite porphyry cuts the Bronco Andesite.

b. The quartz latite porphyry is compositionally very similar to the Uncle Sam Tuff. Note: The quartz latite porphyry is probably an equivalent of the Uncle Sam Tuff, but textural evidence suggests the porphyry did not vent to the surface.

9. Intrusion of the Schieffelin Granodiorite. Evidence:

   a. The granodiorite cuts (intrudes) the Ajax Hill fault.

   b. (?)The Schieffelin is less siliceous than the Uncle Sam Tuff(?).

   c. Creasey et al. (1962) dated the granodiorite at 72 m.y.

10. Emplacement of the granophyre. Evidence:

   a. The granophyre intrudes the Ajax Hill fault.

   b. The granophyre is intensely altered, and this may be due to the emplacement of the rhyodacite.

11. Earliest fracturing along the northeast-trending fissures. Evidence:

   a. The fissures cut the Uncle Sam Tuff.

   b. The fissures are intruded by hornblende andesite dikes.

12. Emplacement of the hornblende andesite dikes. Evidence: The dikes follow the northeast-trending fissures, in the Uncle Sam Tuff, and in the Schieffelin Granodiorite.

13. Emplacement of the rhyodacite. Evidence:

   a. The rhyodacite intrudes the Ajax Hill fault.

   b. The rhyodacite intrudes the Uncle Sam Tuff.

   c. The rhyodacite probably altered the granophyre (and related alteration of the hornblende andesite dikes above).

14. Introduction of hydrothermal solutions and formation of the base-metal and silver deposits at Charleston and at Tombstone. Phreatic (steam) explosive activity at the surface, and fluidized breccia pipe formation in the sub-surface at Robbers Roost and the Charleston Lead Mine area with attendant hydrothermal alteration and base and precious metal mineralization. Evidence:

   a. Hornblende andesite dikes are hydrothermally altered (Charleston lead mine; sericite date 74.5 + 3 m.y., Appendix I).

   b. The mineralization followed northeast-trending fractures at Tombstone (Butler and Wilson, 1942, p. 201).

   c. Alteration along the Contention dike yielded a potassium-argon date of about 72 m.y. (Gustafson, pers. comm.).

   d. Fluidized breccia pipes at Robbers Roost and Charleston Lead Mine.

   e. Cupola of quartz monzonite porphyry intersected in ASARCO drill holes in Robbers Roost area.

   f. Secondary K-spar, biotite, purple anhydrite, disseminated pyrite, chalcopyrite and molybdenite intersected in ASARCO drill holes in the Robbers Roost area.

   g. Sericite, sphalerite, galena, disseminated pyrite, and silver values intersected by Horne drilling in Charleston Lead Mine area.

15. Emplacement of Extension quartz monzonite porphyry. Evidence:

   a. Potassium-argon (hornblende) of 62.8 $\pm$ 2.6 m.y. by Briscoe/Drewes.

16. Emplacement of the rhyolite porphyry, and associated dikes and sills. Evidence:

   a. A rhyolite dike cuts an andesite porphyry dike immediately west of Military Hill.

   b. The rhyolite intruded the Prompter fault zone.

   c. Creasey et al. (1962) obtained a potassium- argon date of 63 m.y. for the rhyolite.

17. Renewed minor fracturing along the northeast- trending fissures. Evidence: A northeast- trending fissure cuts the rhyolite dike west of Military Hill.

18. Introduction of the manganese mineralization, in the southern part of the district. Evidence:

    a. Manganese mineralization is intimately associated with the rhyolite porphyry in the Side Wheel mine west of Military Hill.

    b. Alteration related to silver mineralization along the Contention dike yielded an age of about 72 m.y. (Gustafson, pers. comm.).

    c. The age of the rhyolite porphyry is about 63 m.y. (Creasey et al., 1962).

    d. Manganese deposits are closely associated with the Prompter fault (Butler, Wilson and Rasor, 1938, p. 80), and the rhyolite porphyry has intruded along the Prompter fault.

    e. Quarts veinlets were observed paralleling the ore fissure which cuts the rhyolite dike west of Military Hill.

19. Renewed movement along the Prompter fault. Evidence:

    a. A rhyolite porphyry dike is cut and offset left laterally about 200 ft. by the Prompter fault system. The Free Coinage vein in the State of Maine area is offset 200 feet left laterally by the northern bifrication of the Prompter fault

    b. The northeast-trending fissures do not cross faults belonging to the Prompter system.

20. Partial district tilting to the northeast possibly associated with the northwest faulting. Evidence:

    a. Quaternary (?) conglomerate beds along Walnut Gulch dip 40 degrees NE.

    b. Northwest-trending faults (Grand Central, East Boundary, and Walnut Gulch) have progressively lowered the district to the northeast.

    c. Northwest-trending faults post-date the mineralization (Butler, Wilson and Rasor, 1938, p. 37).

21. Emplacement of the basalt and phonolite in Walnut Gulch. Evidence: The basalt cuts Tertiary and quaternary (?) gravels.

Plio-Pleistocene(?) Gila Conglomerate is exposed along Walnut Gulch south and east of Tombstone. These gravels, which are well indurated by calcium carbonate, are faulted and tilted about 40 degrees to the northeast (Newell, 1974, p. 72), and probably occupy valley basins and pediment areas surrounding the Tombstone Hills. Quaternary alluvium lies both on the Gila Conglomerate as well as older rock units, and comprises thin cover in low lying areas within the Tombstone Hills, and thicker cover within the surrounding valley basins. A small basalt dome (Newell, 1974, p. 61) intrudes the Gila Conglomerate and Quaternary gravels along the east side of Walnut Gulch, approximately one mile northeast of Tombstone.

SURFACE GEOLOGY IN THE STATE OF MAINE AREA

General Background

Author's Previous Work in the Area

The author's first professional geologic work in the Tombstone District and the State of Maine area, took place in 1973, when he was engaged by 1971 Minerals, Ltd. to undertake a geologic evaluation of the State of Maine mine area, in order to delineate mineral targets that would relate to production anticipated from the State of Maine workings and processing of gob from the old stopes. Since it appeared that potential was for relatively small but rich bonanza-type ore bodies, it was felt that a detailed map would be required. The first order of business was to obtain an accurate topographic map at a scale of 1" = 200' with five foot contour intervals.

Base Map Preparation, 1973

The base triangulation survey for the 1973 base map was surveyed by Florian and Collins, civil engineers from Tucson, Arizona. Elevation control was tied to the state survey, using the bench mark at the Public Library at Tombstone. Primary control points were surveyed using theodolites and a Hewlett-Packard distance measuring device. The survey is first order in nature and adheres to minimum government specifications. In addition to the primary control points, all identifiable claim monuments and posts were targeted with white, 24 inch wide butcher paper, in the form of a "Y", with the monument in the center and legs extending outward 10 feet in length. In addition to claim monuments, fence corners, other property boundaries of interest, and some power poles were thus targeted. Probably at least 200 points were so identified. The area was then flown by Cooper Aerial Survey and photographed with black and white film using a Wild RC-10 mapping camera. The map was compiled using Kelsh plotters. Each of the targeted claim monuments and other points of interest were surveyed on the Kelsh with their location and elevation being noted to the nearest one-half foot. Thus, in addition to the topographic lines, there are numerous permanent points of reference scattered throughout the map area. Patent corners of the patented claims were thus accurately located, and claim lines were plotted on the map. Topographic features were scribed on mylar scribecoat and a screened mylar, right-reading base map sheet was then photographically reproduced from the scribecoat master. The scribecoat master remained on file at Cooper Aerial.

Base Map Update, 1985

When the author was engaged by Tombstone Silver Mines, Inc. to review the geology of the area, so many changes had taken place with regard to roads and other culture, particularly in the northwest quarter of Section 16, which covers the primary operatings of the State of Maine Mining Company, a new updated map was required. Unfortunately, the control points surveyed in 1973 by Florian and Collins were marked with wooden stakes and these could no longer be located. Thus, another triangulation control base tied to the state coordinate system was put in by Moria Surveying of Tombstone. Again, theodolites and distance measuring equipment was used for first order survey. Claim corners not targeted in 1973, were targeted again with white, 24 inch wide butcher paper, with legs fifteen feet long. All drill holes that could be located were targeted with butcher paper also. Where drill holes were closely spaced and lay in a line, the end drill holes were marked with a "T", and the intervening drill holes were marked with a twenty-four inch square sheet of butcher paper. Adits were also marked with a "Y" symbol, the "Y" aligned along the direction of the adit. The collars of shafts were also marked because in 1973, with the Kelch then in use, it was difficult, if not impossible, to determine black mine shafts from dark colored surrounding mesquite bushes. It turned out that with new color photography, which was used for mapping, combined with new optical plotters, vertical mine openings could be seen without difficulty, without the expense of targeting paper.

Cooper Aerial re-flew the area at two scales. One flight line which covered the desired width was flown at 1:12600 (1" = about 1,000'), while another set of photos was flown at the larger scale of 1:6,000 (1" = 500). This was done so that as the need might arise, a topographic map at a scale of 1" = 50' with a two foot contour interval could be prepared of any area within the over flight zone. Initially, the northwest quarter of Section 16, where all mining and exploration activity of significance in the previous decade had taken place, was to be mapped at this larger scale, as well as the smaller scale, wider coverage map at 1" = 200' with five foot contour intervals. Coordinates used on the 1973 vintage map were arbitrary, while on the 1985 vintage map, the state coordinate system was used so that it could be compared with other map data within the district. Cooper was able, using their sophisticated computerized equipment, to re-calculate their original photo control points and re-position the coordinate system to correspond to the state coordinate system. They then updated areas of change without the necessity of re-drafting the entire map, thus saving a substantial expenditure. The fifty-scale map of the northwest quarter of Section 16, was actually drawn from the plotting equipment at a scale of 1" = 100', and photographically enlarged two X, without loosing the required accuracy. Both topographic maps were scribed on mylar scribecoat material, from which photographic reproducible mylar copies were made. The topography and other data on the scribecoat master was screened 80% during printing so that annotations on the base map would not be confused or obscured by the base map information. The scribecoat mylar masters remain on permanent file at Cooper Aerial Survey, from which additional, right-reading photo mylar base maps can be produced.

With the voluminous drill hole data, including elevation control plotted on the fifty-scale map, it was determined that the map was too cluttered to be useable for presenting additional geologic information. Therefore, all of the elevation data for the drill holes and coordinates for the base triangulation survey were transfered onto an overlay called the Control Overlay. In this manner, the more simplified base map showing only the drill hole and triangulation point position could be used for geologic presentation purposes. However, by double burning the photographic mylar, a base map containing all information could also be reproduced. All three master sheets, that is the topographic map at a scale of 1" = 200', the topographic map of the northwest quarter of Section 16 at a scale of 1" = 50', and the Control Overlay (control point master overlay) for the fifty-scale map, can be upadted at any time as far as the position of new drill holes, roads, control points, etc.

The original presentation of the fifty-scale map of the northwest quarter of Section 16 came in four sheets, 30" x 30" square. Unfortunately, the joint of this four sheet composite map fell precisely in the middle of the most active mining area. Therefore, yet another composite map, thirty inches square, was constructed by combining the four sheets photographically to form one master original.

Once the topography was completed, two rectified color photo enlargements at a scale of 1" = 50' were matched as closely as possible to the fifty-scale topographic map. These enlargements, from negative 3-5, overlap in the center, but cover the active mining areas in the northwest quarter of Section 16. Although the match is not perfect because of distortion due to elevation differences, particularly over Uncle Sam Hill, the match is close enough so that data can readily be transferred from the color photo to the fifty-scale base map. The resolution on these color photo enlargements is excellent, both in clarity of surface features, as well as color rendition, particularly of alteration patterns and red earth tones due to oxidizing sulfides. Features as small as a two-foot clump of grass, telephone poles and even telephone lines, fences, as well as drill hole markers of the 24" X 24" sheets of butcher paper, can easily be seen. A rough count suggests that for each 30" x 30" photo, there are some 45,000 points of reference.

Geologic Mapping Methods, 1973

In 1973, black and white photos enlarged to a scale of 1" = 200', were used in field mapping. The geologic features were then transfered to the topographic base map. The technique of geologic outcrop mapping was employed. That is, only features that were actually seen in outcrop were plotted on the map. Little or no interpretive information has been added to the base geologic map. Further, actual rock outcrops were shown in the original 1973 colored map in a darker color, while talus-covered slopes on which bedrock was indicated by the presence of only one type of rock detritus, but in which no actual outcrops were present, are indicated by lighter colors. For the most part, it was impossible to trace small vein or dike features through areas of detrital cover. To aid in exploration, numerous bull-dozer roads and cuts were put in, an effort being made to anticipate future drill sites.

In addition to the surface geologic mapping, the black and white contact air photos were examined stereoscopically and linear features identified. These linear features were shown on the original map as heavy dashed blue lines. They probably represent fault or shear zones of substantial magnitude, although their presence can rarely be seen on the ground.

Geologic Mapping Methods in 1985

In 1985, updating of the 1973 vintage map began first by photo interpretation using a mirror stereoscope of the 1" = 1,000' and 1" = 500' scale color air photos, where in 1973, only black and white photos were used. Because of the color of alteration zones, which ranged from red to white, depending on the amount of limonite in outcrop, veins as well as large areas of alteration could be precisely mapped. This was not possible in 1973. Better stereo equipment, as well as transparent inkable mylar overlays and colored permanent marking pens, which were not available in 1973, also made photo interpretation easier and more efficient. Photo interpretation on this new photography had one at three different scales and two different ways. First, both the 1" = 1,000' and 1" = 500' photography was examined with a mirror stereoscope, both with 5X binoculars, and without binoculars. Rock types, alteration features, fault zones, vein zones, prospect pits and mine shafts, were annotated onto transparent overlays on the photo. Also, color photo enlargements at a scale of 1" = 50', matched to the topographic map of that area, were prepared. At this scale, the same type of features could be mapped much more precisely. A more detail-ed description follows:

Stereo Photo Interpretation of 1" = 2,000' and 1" = 1,000' photography

In addition to the new photography, a color photo mosaic of 1973 vintage photography at 1:24,000 scale covering approximately 345 square miles, was prepared by Cooper Aerial Photography, Inc. A second set of the mosaic photos was also printed so that the mosaic could actually be examined and annotated on it in stereoscopic view. This scale of photography is most valuable in mapping large, through going, structural or geologic features of district-wide proportions, i.e., features with a strike length of a minimum of several hundred feet, up to ten or more miles in length. Since the purpose of this report is not regional in scope, but pertains to the immediate State of Maine mine - Tombstone Silver Mines, Inc. property, this district-wide map was not studied in detail. However, it should be noted that the structural texture within the Tombstone Silver Mines, Inc. property is simply a continuation or part of the structural fabric prevalent within a ten mile radius. Northeastern fractures and drainages predominate while north-south and north-west fractures can also be identified. These north-south, north-east and north-west fracture patterns are reflected in the San Pedro River drainage, showing its response to the structural fabric of the district.

Aside from the caldera margin fault and its associated geologic complexities, the Prompter Fault, a major east-west feature, may have important structural influence on the Tombstone Silver Mines, Inc. property. The Prompter can be followed as a continuous feature from U. S. Highway 80 (the Jefferson Davis Memorial Highway), 9,000 feet southeast of the edge of Tombstone, almost due west some 15,000 feet to a point approximately 2,800 feet west of the old Prompter shaft. At this point, the fault splits, or bifricates, and appears to be broken into a west-south-west trending segment, and a northwest-trending segment. This bifrication takes place at the intersection of the Prompter with the Ajax fault, which is also the edge of the caldera margin. The west-southwesterly split can be followed as far west as the San Pedro River, where it causes an abrupt westerly-trending bend in the river drainage, 17,000 feet south of Fairbank. The northeasterly branch passes through the north slope of Mays Hill, and can, with difficulty, be followed also to the San Pedro River, where it appears to also cause a westerly-trending bend in the San Pedro, about 15,000 feet north of Fairbank. The northeasterly branch of the Prompter fault appears to cause the slight left-lateral offset in the Free Coinage-Merrimac vein, just north of the Merrimac end line. The Free Coinage West vein may also terminate to the southwest against this projection of the Prompter, and it also appears to have some effect on terminating the northern end of the San Pedro vein system. In fact, most significant mineralization appears to die out abruptly to the north of this feature. No such termination of mineralization appears to be caused by the southwestern branch of the Prompter, however. It is not clear whether all movement along this feature is post-mineral. However, its trace does not appear to be represented by vein zones (except in the Prompter mine area itself), so it is assumed that most of the movement in the Tombstone Silver Mines, Inc. area has taken place after the mineralizing episode. However, since the Prompter was also active prior to mineralization, it may have played a roll in localizing the silver mineralization that appears to be concentrated in the area of the State of Maine mine. The specifics of this relationship are not clear at present.

The plotting of prospects, fracture zones, alluvial bedrock contacts, and vegetation alignments and fault zones, reveal various important features of the economic geology within the Tombstone Silver Mines, Inc. property, only the highlights of which will be described here. As work progresses on Phase I of the proposed exploration program, these features will be plotted on the 200 scale topographic map.

From the photos it was noted that the Clipper-Free Coinage vein system appears to be one in the same, and it could be followed from the north end of the Free Coinage zone southward 6,000 feet where it intersects a slightly more northeasterly trending vein - drainage system, though there is some suggestion that it may be projected for another 2,000 feet south, giving it a possible length of 8,000 feet. The May vein can be seen to intersect with the Clipper, approximately 1,500 feet south of the Clipper claim end line, the intersection zone showing an increased intensity of limonite stain as well as a prospect pit. The Triple X and Merrimac #1 vein appear to form a four-way intersection with the Clipper vein and a possible post-mineral fault, partially under the Big Pond water retention dam. This area of intersection may localize mineralization, and, therefore, be an attractive drilling target.

Five-Hundred Scale Photography

On the 500 scale photography, the same features identified over a broader area are seen in sharper detail. A vegetation alignment passing through the Charlou office trailer was noted, although the same feature was overlooked on the smaller scale photography. Alteration patterns could be more closely defined so that their outcrop can be more precisely plotted.

1" = 50' Color Photography Matched to Topography

Two 30" X 30" blow ups were made from the 1:6,000 scale negatives, covering about 75% of the northwest quarter of Section 16 - the area of active mining. This photography could not be examined in stereo view (because of the lack of a stereo pair, though the scale would make it unwieldy), but was used for both office interpretation and for a field base map for in-field follow up. The photograph was securely stapled to a 1/4" plywood board with strap for carrying. A sheet of inkable Stabalene mylar was then stapled over the photograph. Itoya-Nikko fine point system permanent ink disposable drafting pen in black, and Stabilo (German) overhead projection waterproof (permanent) colored pens were used to annotate features onto the transparent overlay. These pens, I might add, were also used on the 9 x 9 photos. All cultural features, including fence lines, power poles, bushes and grass clumps more than a foot in diameter, as well as boulders and power lines were all visible to a greater or lesser degree, and could be used for navagational points. Further, since most drill holes had been targeted with two foot squares of white butcher paper, these could also be easily identified. Alteration patterns in both outcrop and as soil coloration in sub-outcrop, and by both color and reflectivivity in trenches, could be closely identified and plotted. In fact, a rough count suggests approximately 45,000 such reference points on the 30 X 30 photograph. The fine color quality allowed the plotting of subtle tonal and color variations representing similar subtle variations in alteration, limonite (after pyrite), and it is assumed corresponding precious metal indicators. As a result, great detail on the delimitation of vein zones and alteration features, in addition to the cultural features, could be obtained. On completion of field mapping with this photo (though further work will probably reveal additional data), the geology was digitized on the CAD (Computer Assisted Drafting) system, and plotted on a mylar overlay at 1" = 50'. On overlaying this plot onto the topographic map, it was found that at this scale, there was about one inch of distortion across the photograph, primarily going upslope towards Uncle Sam Hill. On re-plotting at 1" = 200', it was found that errors at this scale were not significant. Since no optical lens, color air photo can be matched exactly to a planometric topographic map, this map distortion was not unexpected and the usefulness of the photography for this detailed geologic mapping can certainly not be negated.

After mappig on this photo base, it was found that one of the vegetation alignments noted on the 1,000 and 500 scale photos was an old wagon road and had no geologic significance. The vegetation alignment passing by the northwest corner of the Charlou office trailer was confirmed as being a vein by both surface mineral rubble - primarily limonite stained quartz, as well as two backhoe cuts across the vein. After the backhoe "excavator" was used to trench across the vein, it was found that the boundaries of the vein could be picked within approximately one foot accuracy. This vein has been termed the "Office Vein" and after confirmation by backhoe cutting and further examination of the photo, a second vein indicated by a vegetation alignment approximately 20 feet to the west, was identified. This was also confirmed by backhoe cutting. This vein is termed the "Office Vein West", and yet another vein which had already been cut obiquely by backhoe cuts made the preceding year, was identified and termed the "Office Vein l East". Further, sinuous veins extending from prospect pits on the May claim were mapped in detail. Though prospect pitting possibly dating back to the 1880's had been sunk on these veins, no recent exploration had been done. This identification of new veins approximating 3,000 feet in length, alone, justifies the expense of the color photo enlargement. Details of the width and length of other vein features in a way that would not have been impossible, but would have only been performed with great difficulty using black and white photos, or topographic map or without plane table, were identified. It is thus concluded that field mapping on the remainder of the Tombstone Silver Mines, Inc. property in the Tombstone Mining District, and elsewhere, should be performed either at the 1" = 50' scale where great detail is required, or perhaps at 1" = 200', where lesser detail is necessary.

After photo interpretation of the smaller scale color contact print stereo pairs at both scales, the 1" = 50' color enlargements matched to the topography in the northwest quarter of Section 16, were interpreted. By using all three scales of photography, large features crossing the district could be identified on the fifty-scale photography, which features visible on the fifty-scale photography could be cross referenced to the 500 and 1,000 scale photography.

Computer Assisted Drafting Equipment

Recent advances in micro-computer technology has reduced the cost of computer assisted drafting to make it affordable to relatively small companies. The author has been investigating various CAD (Computer Assisted Drafting) systems for the previous year, and when the project was presented for the Tombstone Silver Mines, Inc. properties in Tombstone, it was recommended that a CAD system be used to reduce the drafting and calculation requirements for ore reserve and geologic evaluation. Therefore, Charlou Corporation purchased a CAD system, consisting of a Tandy 2000 computer with a 20 megabyte hard disk, a Houston

Instrument CD size plotter, a Hewlett-Packard 17" X 24" digitizer, and an AUTO-CAD software system by AUTO DESK, Inc. This equipment, costing approximately $10,000, provides state-of-the-art micro-computer CAD drafting and calculating facilities. It is operated by geologist, Bailey Escapule. All geologic, survey and ore reserve data has or is in the process of being entered into this system. A substantial reduction in total drafting time, as well as a vastly more flexible method of manipulating map data is possible with this system. For example, maps can be entered at a very large scale, and reduced to a very small scale, or conversely, entered at small scale and enlarged to extremely large scale. A map can be printed at any scale desired. It s immediately obvious that original maps at different scales can be entered into the computer and then combined to form one composite map. Measurements can be entered into the computer accurately for four decimal places, and again printed out at any required scale. Measurement of the areas irregular areas can be accomplished within a few moments by the computer. It is anticipated that during the exploration and operating phases, all maps and cross sectional data can be entered into the computer, cataloged on its data base management system, and retrieved and manipulated at will. This will substantially reduce the engineering man power required, and thus, engineering management costs.

Both the 1973 geologic map data over the State of Maine area, and the more recent data on the fifty-scale photo enlargement base has been entered into the computer and combined to form the map presented in Figure 29. The cross section, Figure 30, has also been produced by the CAD system.

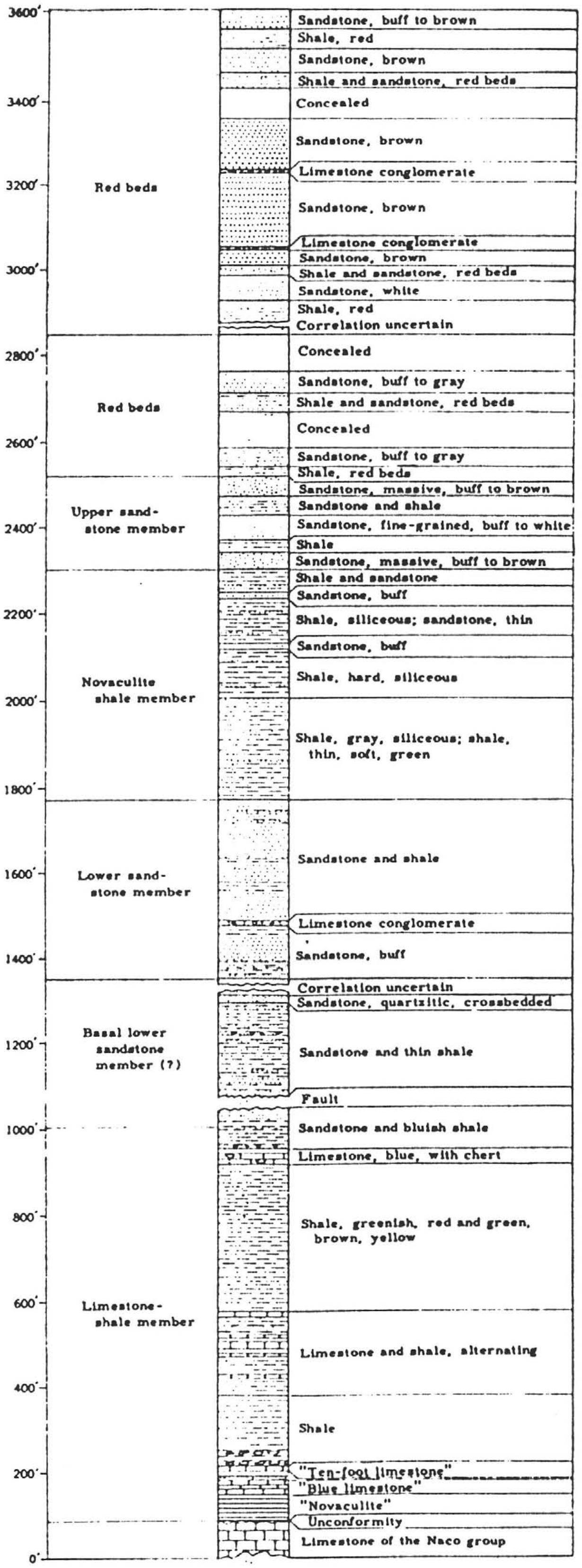
Sedimentary Rocks

Quaternary Alluvium

Quaternary alluvim consisting, for the most part, of stream wash, is located in valley bottoms. The thickest accumulations of Quaternary alluvium occurs in the north-trending drainage directly east of the Free Coinage claim where it is probably ten to a few tens of feet thick. In this area, it obscures the contact between Bisbee Group sediments and Uncle Sam tuff. It is locally up to 15 or more feet thick in the Fox Ranch area, as indicated by scraper cuts. However, in the remaining wash areas, it is probably 5 feet or less in thickness. The contact of the alluvium with bedrock is generally arbitrary and marked with a dashed line on the geologic map. There was insufficient time in this study to map in detail all of the small outcrops within the stream drainage areas marked Quaternary alluvium on the map. In the Fox Wash area in particular, there are numerous windows of bedrock sticking through alluvium.

Bisbee Group Sediments

The great preponderance of sedimentary outcrops within the bounds of the State of Maine geologic map are nondescript Bisbee Group sediments -- probably equivalent of the Morita and Cintura formations as described in the Bisbee area. The sediments can generally be characterized as red bed units consisting of sandstones, quartzites, and arkosic sandstones, shaley mudstones, and shales (Figure 27). Over most of their exposures within the map area, these sediments are soil covered, the rock type indicated only by detrital fragments. Because of this rapid weathering to soil, few exposures show sufficient bedding to determine strike and dip. Where seen, divergent attitude of bedding precludes meaningful comment regarding the detailed structure of Bisbee Group sediments in this area. It is suggested by regional aspects, however, that the beds are generally tilted to the east so that by progressing in a westerly direction, the base of the unit is approached. This idea is reinforced by the presence of limestones cropping out north-northwest of the Free Coinage claim (about 1,600 feet north of the Uncle Sam shaft), and also exposed in the window in the Fox Ranch area. These limestone units are probably corelative of either the Ten Foot or the Blue limestone ore horizons present in the main part of the district. Further evidence of this is suggested by the presence of a quartzite pebble conglomerate, exposed in the Fox Ranch window. This conglomerate is probably the Glance conglomerate. In most of the Tombstone area, the

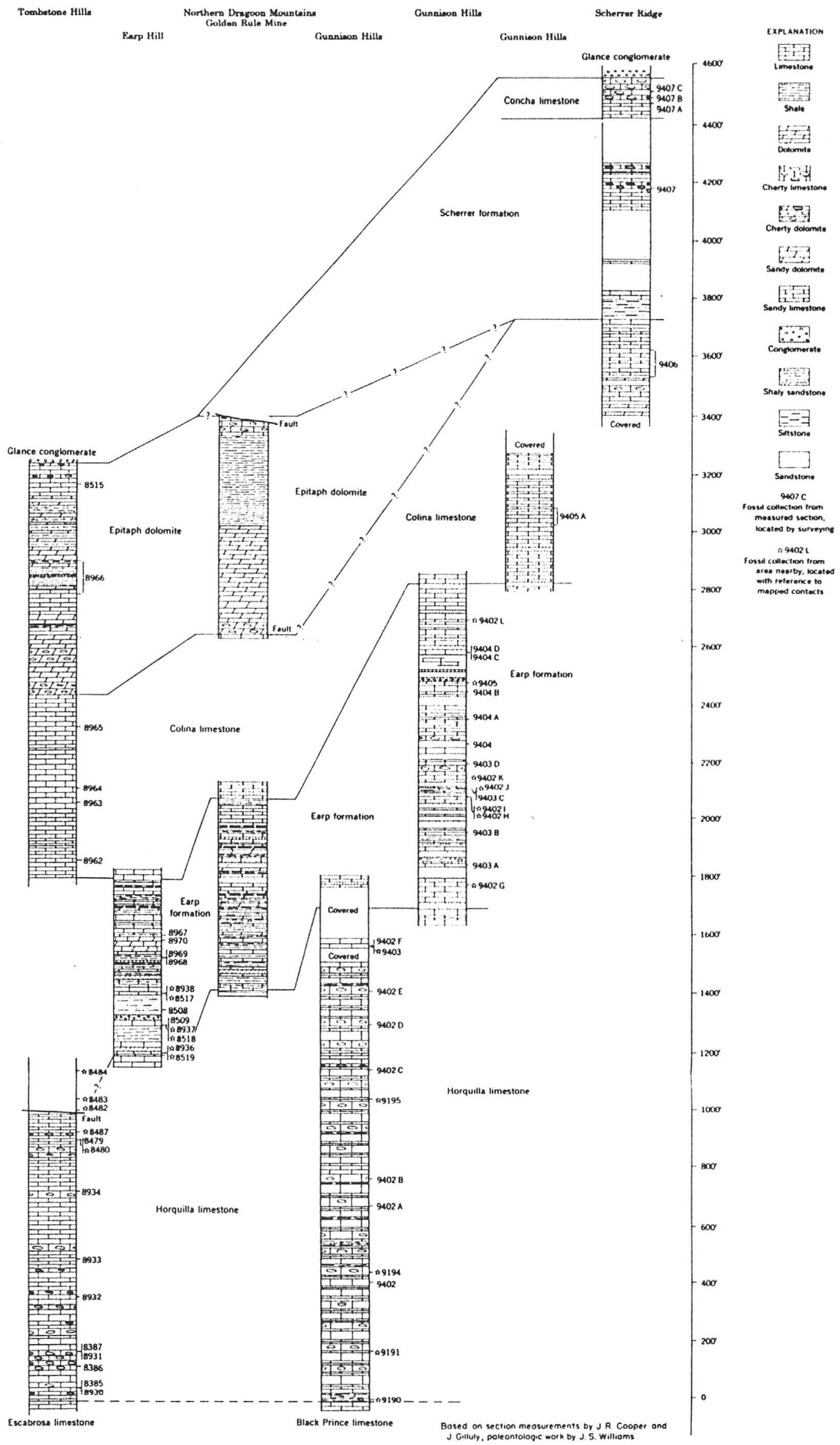


—Composite section of the Bisbee formation in the Tombstone mining district. *After Lyden, O'Donnell, Hernon, and Higdon (unpublished mine rept., 1937).

Glance is not exposed; however, as shown in Figure 28, Gilluly and other workers in the district do show the Glance to be present, at least locally. Where intersected in mine workings, it is intensely silicified and has been termed the "Novaculite". In a small outcrop 2,000 feet north-northwest of the Uncle Sam shaft, there is exposed bleached quartzite breccia, which may be the equivalent of the Novaculite. Similar limestones and conglomerates appear to be absent in the Solstice Hill area, and thus, although not conclusive because of small outcrops and structural complexities, it is presumed that the limestones exposed north of the Uncle Sam shaft and in the Fox Wash window are basal Bisbee formation -- a critical point since this implies that Paleozoic Naco Limestone should be present within a short distance, either horizontally west below the Uncle Sam tuff, or vertically below.

Paleozoic Sediments

No Paleozoic sediments have been mapped within the State of Maine area geology map. Geologic relations indicating that lower Bisbee sediments are exposed in the central part of the mapped area (as discussed above) suggest that Paleozoic sediments should be located shallowly beneath the lower Bisbee in the Fox Ranch area. Futher, it is possible that Paleozoic limes may have been exposed in the pre-Uncle Sam erosion surface, and are now covered by that tuff layer.



CORRELATION OF THE PENNSYLVANIAN AND PERMIAN ROCKS WITH THOSE OF THE DRAGOON QUADRANGLE, ARIZONA

371235 O - 56 - 1 (In pocket)

Igneous Rocks

Uncle Sam Quartz Latite Tuff

Uncle Sam quartz latite tuff comprises the largest area of outcrop within the State of Maine area. The high peaks of Three Brothers Hill, the Dome, Uncle Sam Hill, and Buckman Hill, are all composed of the Uncle Sam tuff.

The tuff has an aphanetic ground mass with phenoclasts of quartz and plagioclase feldspar. A more detailed description can be found in Newell, 1974, p. 47-53. Drewes (1971) obtained a potassium-argon age of 71.9 $\pm$ 2.4 m.y. for the rock. Xenoliths of Bisbee Group sediments are prevalent throughout its exposures, and where it is in contact with the underlying Cretaceous Bisbee Group, the xenolith content increases and the rock appears to almost grade into the sediments. The tops of the higher hills appear to be composed of a more resistant, more strongly welded unit of the Uncle Sam. It is unclear whether this is a primary rock feature or a secondary alteration feature.

The Uncle Sam shows tabular relations in most of the State of Maine area (Figure 29). However, its contacts with the Bisbee Group, approximately 600 feet northeast of the northeast sideline of the Merrimac claim, appears to be steep, as indicated by its lack of deviation across the steep slope in the area. This contact could be a fault. At the northern exposure of the State of Maine vein, 1,100 feet north of the Uncle Sam shaft, indicated by topography, the exposure suggests a flat, tabular contact. About two hundred feet north, it again appears to dip steeply. In all probability, these areas may be feeder dikes, and as such, have continuity of the quartz latite in depth.

If it is remembered that the State of Maine area was at the interior edge of a blossoming caldera, and probably very active tectonically, it is easy to envision steep topography with active fault scarps. The Uncle Sam tuff was deposited over hills, valleys and fault scarp terrain. It is also possible there may be feeders for the Uncle Sam buried by the ash fall within the State of Maine area.

Schieffelin Granodiorite

The Schieffelin granodiorite is a holocrystalline rock. In hand specimen, it is light greenish-gray or pinkish-gray, and mildly porphyritic (Gilluly, p. 103), weathering to a buff color. Petrographically, it is intermediate between quartz monzonite and granodiorite, and could easily be called a quartz monzonite (Gilluly, p. 102). No outcrops of this rock were mapped within the State of Maine area. A complete petrographic description is given in Gilluly, p. 103.

Andesite Porphyry Dikes

Andesite porphyry dikes were mapped on the State of Maine map in only one area which is slightly south and west of the Gold Bug prospect. Dikes of the same type, however, were observed south of the southwest endline of the Chance claim. However, no detailed mapping was done in this area. Similar dikes are very prevalent in the Robbers Roost breccia pipe area. The dike rock consists of a dark-green chloritic-looking matrix, in which are set white feldspar phenocrysts. The dikes are pre-mineral in age and also predate the rhyolite porphyry. In the andesite dike mapped southwest of the Gold Bug area, rhyolite porphyry invades both the hanging wall and footwall of the dike and is younger in age as indicated by spherical xenoliths of andesite porphyry in the rhyolite.

Rhyolite Dikes

Several discontinuous rhyolite porphyry dikes crop out in the central part of the mapped area, and can be traced from the area of the Gold Bug prospect to the north end of the Clipper claim. These dikes were overlooked by previous writers, and mapped as Bisbee sediments by both Lee (1967, Figure 3) and Newell (1974, Plate 1 & 2). The dikes generally have a steep northwesterly dip, although in the Brother Jonathan area, one dip of 42 degrees is recorded. Flow structure generally parallels the walls of the dikes. However, a large dike on the Clipper claim shows turbulent flow structure. The dike outcrops are generally limonite-stained from disseminated pyrite content, are occasionally cut by vein structures, and are more resistant than the surrounding tuff. The spatial relationship of the rhyolite porphyry dikes to the productive part of the State of Maine vein suggests some basic relationship to mineralization. Numerous assays of dike material (though strongly altered) show only background amounts of base and precious metals. It is probable that the dikes and/or their plutonic source resevoir at depth provided the heat source to drive the hydrothermal fluids responsible for the nearby vein mineralization. Why the dikes themselves do not host ore mineralization is not clear. The State of Maine area rhyolite dikes may be of the same age and from the same source as the rhyolite dikes which intrude the

Prompter fault, the area west of Military Hill in the vicinity of the Emerald mine, and the sills of rhyolite which invade Paleozoic sediments near the Tombstone airport on either side of U. S. 80. Those rhyolites have been dated at 63 m.y. (Creasey, et al., 1962). The previously overlooked Extension quartz monzonite porphyry mapped in 1982 by the writer (see section on General Geology), is shown by Drewes (1985, pers. comm.) to be 62.6 ± 2.8 m.y. by potassium-argon (hornblende). This newly recognized plutonic rock may be the source for all of the 63 m.y. old rhyolites in the Tombstone district. The outcrop from which the age date sample was taken showed green copper oxide, suggesting this age intrusive may be more related to porphyry copper systems than the older 72 m.y. alteration in the main part of the district, which appears to have lead-zinc affinities (Keith, 1983).

GEOLOGY AND PROPERTY MAP
OF THE
TOMBSTONE SILVER MINES, INC. PROPERTY
IN THE VICINITY OF
THE STATE OF MAINE MINE
TOMBSTONE MINING DISTRICT
COCHISE COUNTY, ARIZONA

by: JAMES A. BRISCOE

EXPLANATION

Qal   Quaternary Alluvium

Rhyolite Porphyry

Andesite Porphyry

Kut   Cretateous Uncle Sam Tuff

Cretateous Bisbee Group Sediments

Kb   Shale, Sandstone, Quartzite

Kbg   Glance Conglomerate

Kbbl   Blue Limestone

0   250   500

Scale: 1 in. = 500 ft.

Drawn by: Bailey Escapule
October 15, 1985

SYMBOLS

a. Anticline   b. Syncline

Showing trace of axial plane

Contact

Dashed where approximately located
dotted where concealed

Fault

Vein

Photo Linear

Dashed where approximately located
dotted where concealed

25   30   35

a.   b.   c.

Strike and Dip

a. Bedding trends
b. Joint trends
c. Flow structure

Measured Veins
(length x width)
Precisely mapped at 1 in = 50 ft
on color photos

Property Boundaries

——— Surveyed Property

- - - - Boundaries from Metes and Bounds Desc. - Unsurveyed

Figure 29
Page 79

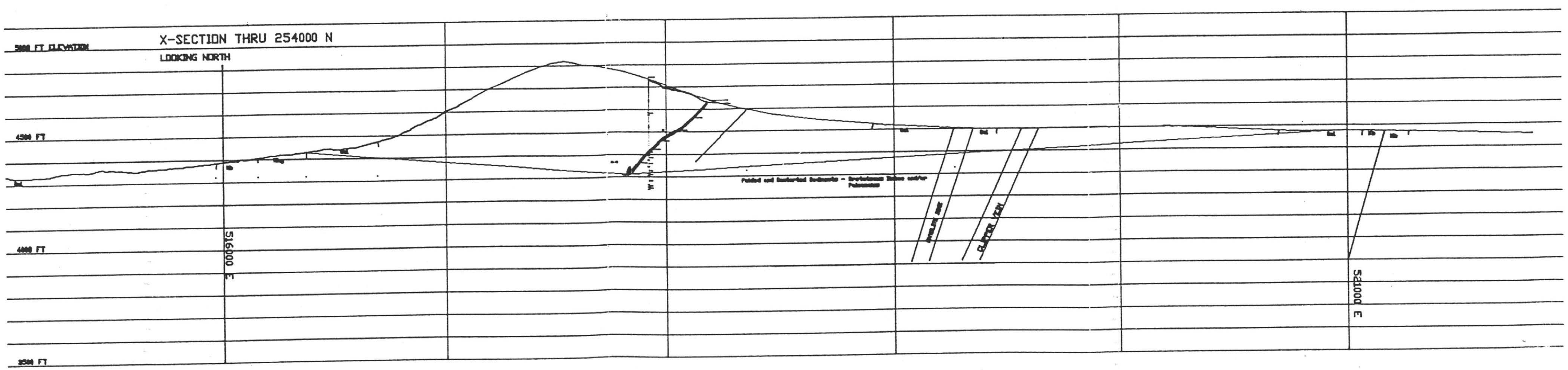


Figure 30
Page 80

STRUCTURAL FEATURES OF THE STATE OF MAINE AREA

General Statement

Structural features within the State of Maine area can be broken down into two broad categories -- steeply dipping features and horizontal and sub-horizontal features. Steeply dipping features which can be easily traced and mapped on the surface would include veins, vein zones, dikes, post-mineral faults, photo-linears, and vegetation alignments. Horizontal and sub-horizontal features would include thrust fault planes, bedding and fault planes with an angle of dip of less than 20 degrees and the basal contact of the Uncle Sam tuff. The horizontal and sub-horizontal features are either poorly exposed or not exposed at the surface, and can only be inferred from detailed surface geologic mapping or measured by drilling. Only the steeply dipping features will be discussed in this section, while the low angle features will be discussed under the heading Sub-Surface Geology, State of Maine Area.

Vein Zones

The strongest direction of structural fracturing within the Tombstone Mining District is approximately north 55 degrees east. This is the typical northeast fracturing direction, which is invariably seen in Arizona porphyry copper deposits. The fracture direction is represented by topographic alignments of ridges and stream drainages, by rhyolite dikes, andesite dikes, and by the vein system which is responsible for most of the mineralization within the district. In the main Tombstone district, northeast of the north-trending Ajax fault, these northeast trending fractures dip to the southeast, while in the State of Maine area, west of the Ajax fault, most of the veins dip to the northwest. The exception to this observation is the Fox vein which dips southeasterly at about 50 degrees. Right lateral movement along the northeast trending veins is suggested by synthetic faults occurring along the shallowly dipping State of Maine structure and the Clipper vein zone. The strongest synthetic structure is the Triple X vein which appears to be continuous between the State of Maine vein and the Clipper vein zone. Similar synthetic structures along the San Pedro vein also suggest right lateral movement.

An offsetting vein structure identified during the recent mining of the Merrimac #1 pit and other "post mineral" structures identified by Joe Graves during the spring of 1985 along the State of Maine vein trend, may be antithetic faulting related to the same right lateral strike-slip movement.

One fracture zone within the Tombstone Silver Mines, Inc. property area trends almost north-south with a vertical dip. This is the San Pedro vein just north of the Fox Ranch. The vein appears to bend to the northeast where it intersects the Fox vein and continues in a northeasterly-trending arc through the San Pedro workings and is lost in the alluvium to the east.

Dikes

Two types of dike rock crop out within the State of Maine area. The most predominant type is rhyolite with only a few exposures of subordinate andesite being seen. The dikes are related to the igneous events that formed the caldera complex, and are both pre-mineral. The andesite predates the rhyolite as is indicated southwest of the Gold Bug area where a composite rhyolite-andesite dike shows spherical xenoliths of andesite in rhyolite. Discontinuous and irregular outcrop patterns of the rhyolite suggest intrusion into tension fractures, which may have been synthetic to the State of Maine right lateral strike-slip movement. Proximity of the rhyolite to productive veins, as well as their pervasively pyritized and altered character may suggest a genetic relationship to the veins. However, no significant metal values have been discovered in the rhyolite to date.

Post-Mineral Faults and Photolinears and Topographic Alignments

Surface evidence of significant post-mineral faulting has only been seen in a few areas. A possible fault was noted in the southwest corner of the May claim, apparently being responsible for a bold ridge of Uncle Sam porphyry a few hundred feet long. One small probable left lateral fault was noted a few feet southwest of the Triple X shaft. This fault appears to offset the adjacent rhyolite dike about 10 feet. However, normal movement in the fault would give the same apparent movement. A few small strike-slip faults were noted in the window in the Fox Ranch area, offsetting limestone beds in the Bisbee sediments. The most significant fault could not be identified in the field, yet is indicated by its left lateral offset of the composite andesite-rhyolite dike southwest of the Gold Bug prospect. This linear appears to correspond with a poorly defined structure visible on aerial photographs. The structure can be traced on the color air photos approximately 4,000' to the south, but apparently terminates against another photolinear northwest of the Gold Bug area (Figure 29).

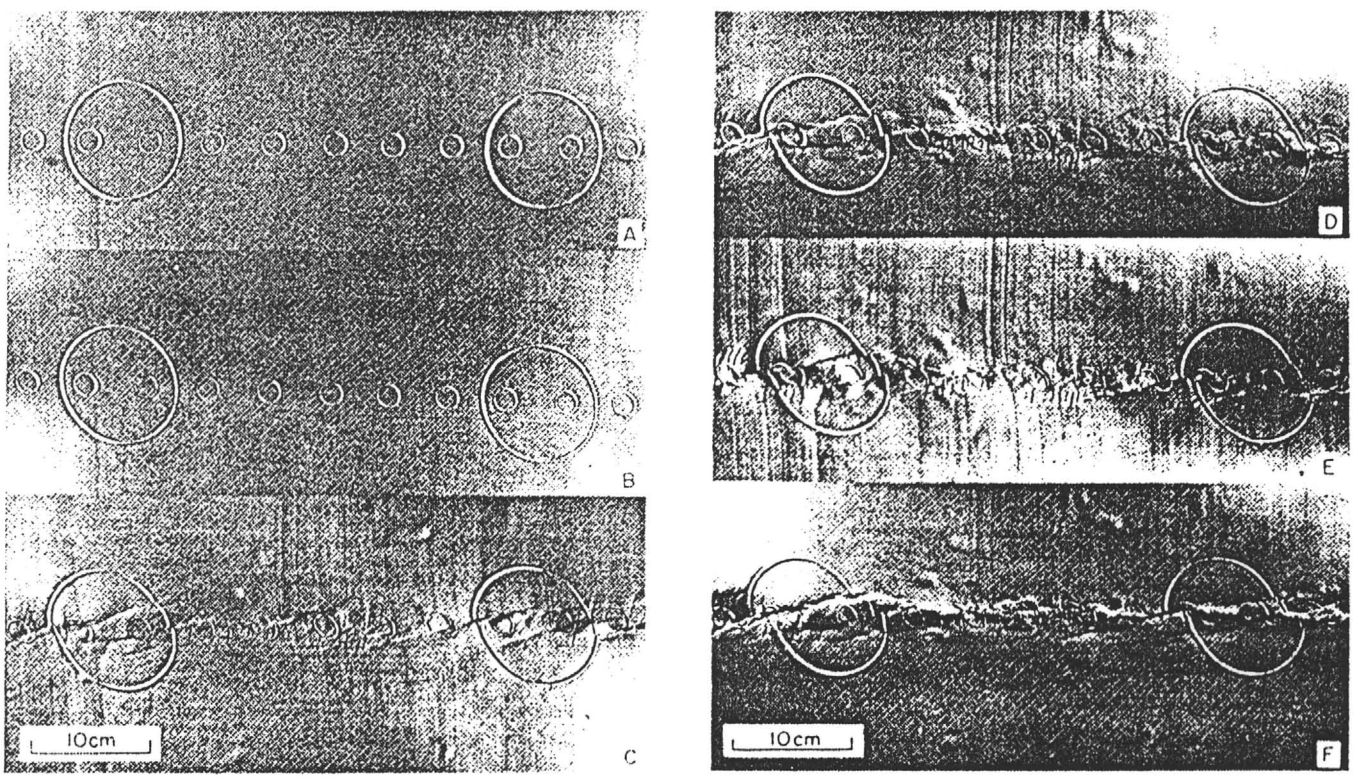
Examination of the 1" = 2,000' color photo mosaic of the district shows the Prompter fault splits at its intersection of the Ajax fault - the caldera margin. The northerly split passes just north of the south end line of the Free Coinage claim, and offsets the Free Coinage vein 200 feet in a left-lateral manner. This offset corresponds to the same offset in a rhyolite dike east of the Prompter mine (Newell, 1974, p. 71).

Topographic alignments, which have not been specifically delineated on the geologic map of the area as faults or veins, probably also represent structural features. The washes probably represent vein zones. At any rate, they are the least resistant areas of rock exposure, and alteration generally appears stronger along their trend. This is corroborated by examination of the color air photos which show red coloration localized along the drainages while absence of this coloration on the ridge tops suggests fresh resistant rock.

In 1973, examination of the 1" = 200' enlargements of the black and white photographs revealed linears, which were shown on the geologic map of the area as heavy dashed blue lines. The linears are for the most part topographic, vegetation or small drainage alignments, and cannot generally be seen from the ground. They appear to be post-mineral, and one of the most prominent, a north-trending feature traceable for in excess of a mile north of Fox Wash, appears to make a right lateral offset in the Fox Wash vein zone. The photolinear which trends east-west and cuts through the top of the Uncle Sam hill (Figure 27), projects through the State of Maine shaft and partially parallels the State of Maine wash, which is alluvial covered. Dump rock on old caved prospect shafts along this wash show fragments of strongly altered Uncle Sam porphyry. The intersection of the structure with the State of Maine shaft suggests that it may be pre-mineral and may have had some influence on mineralization. For the most part, however, it still appears most of these features are post-mineral and may be mid-Tertiary or Quaternary in age. Except in the case of the fracture which offsets the Gold Bug area dike, there is no way at present to measure their dynamic effect on the rocks in the area. It may be, however, that these features bound structural blocks which have been displaced in a vertical sense, either up or down in relation to each other. For this reason, they may have an important bearing on the spatial positions of ore bodies within the area, and thus, their correct interpretation may be of economic significance. Knowledge of their location may be critical in correct interpretation of drill hole data.

SYNTHETIC AND ANTITHETIC FAULTS. Both right-handed and left-handed strike–slip faults emerge in clay deformed in this way (Wilcox, Harding, and Seely, 1973). The faults combine to form conjugate sets marked by an initial conjugate angle of intersection of about 60° (see Figure 9.53C). Of the two conjugate fault sets, the one whose sense of slip is identical to that of the main zone of faulting is called **synthetic**. The one whose sense of slip is opposite to that of the main zone is called **antithetic**. The synthetic faults are typically oriented at a small acute angle to the trace of the main fault zone; the antithetic faults are oriented at a very high angle to the main zone (see Figure 9.53*E*).

Figure 9.53 Clay cake deformation experiments simulating strike-slip faulting. Clay cake is placed on adjoining panels of sheet metal. Strike-slip faulting is achieved by shifting the panels horizontally past one another. (*A*) Starting configuration. (*B*) Initial distortion of clay. (*C*) Onset of faulting and the formation of synthetic and antithetic faults. (*D*) to (*F*) Continued faulting. Folds that develop become oriented parallel to the direction of greatest extension (*X*). [From Wilcox, Harding, and Seely (1973). Published with permission of American Association of Petroleum Geologists.]



General Statement

As mentioned previously under General Geology of the District, low angle structures caused by two episodes of thrust faulting are responsible for some of the complexities of the sub-surface geology within the Tombstone Mining District. The Uncle Sam tuff, which comprises the major portion of the outcrops in the western part of the Tombstone Mining District, is a quartz latite tuff deposited within the Tombstone Caldera. The tuff in the northeastern portion of the caldera (the Tombstone Silver Mines, Inc. properties) is thinner than in the southeast portion (area of the Charleston Mine) and western portions (west of the San Pedro River). The relative thinness is verified by several windows of sediments peeking from beneath the tuff in the vicinity of Uncle Sam Hill, and also the intersection of Bisbee Group sediments in the bottom of the State of Maine shaft. The low angle of this structure is also attested to by its semi-circular outcrop on its eastern edge of the caldera caused by topographic effects. One outcrop of Permian Colina limestone on the northwest edge of May's Hill and the pre-tuff erosion surface developed on Bisbee sediments in the north side of Fox Wash, one mile from the San Pedro River, also indicates the relative thinness of the Uncle Sam in the northern portion of the caldera. The Bronco volcanics which underly the Uncle Sam in the Charleston area have not been identified north of Robbers Roost, but may be present in pre-Uncle Sam topographic lows. All of the sedimentary formations which underly the Uncle Sam tuff (including the the Bisbee Group and Paleozoic sediments) have been involved in thrust faulting (Drewes, 1980). How many layers of thrust sheets are present is not known. Thus, good ore horizons which would include basal Paleozoics and basal Bisbee Group sediments, could lie either near the surface or at great depth depending on wehther they have been repeated by low angle faulting. The only method of determining what the true layer cake nature of the district is, will be by the careful logging of deep exploratory drill holes and perhaps the application of detailed magnetic or possibly even seismic surveys.

Thickness of the Uncle Sam Quartz Latite Tuff

In his 1973 report, Briscoe constructed eight cross sections from surface geologic data, as well as information from the State of Maine workings, through the State of Maine area. The purpose was to determine the approximate thickness of the Uncle Sam tuff, as well as areas of intersections of veins with each other and with sedimentary horizons beneath the Uncle Sam tuff. In about 1980, several diamond drill holes were sunk in the Fox Ranch area by Oxidental Minerals Corp. The Uncle Sam tuff was penetrated at about 90 feet, near the Fox Ranch windmill. Drill logs as well as core will be available from this drilling during the first part of the proposed exploration program, so that additional details regarding the thickness of the Uncle Sam will be compiled.

At present, using the above mentioned data, it is apparent that the thickness of the Uncle Sam ranges from several hundred feet from the tops of the highest hills to a few tens of feet in the bottoms of the washes. The thin areas would be exemplified by the San Pedro mine area, where the tuff appears to be 300 feet or less in thickness. It must be remembered, however, that since the Uncle Sam was extruded onto a tectonically active surface within a resurgent caldera, the thickness can be expected to vary abruptly, and be quite irregular. Further, photolinears identified by Briscoe in 1973, could represent post-mineral faults, which may define structural blocks that have been randomly jumbled up and down, and changing the apparent thickness of the Uncle Sam. Accurate projections of the thickness of the Uncle Sam will have to await numerous drill hole penetrations.

Structure of Sedimentary Rocks Beneath the Uncle Sam Tuff

The Bisbee Group sediments are rather massive nondescript sandstones, siltstones and mudstones over most of their exposure with the State of Maine area. However, north and east of the Free Coinage claim, and in the Fox Ranch area, marker horizons which show structure are exposed. These marker horizons are limestone beds which may be the equivalent of either the Blue Limestone occurring near the base of the Bisbee, or the so-called Ten-Foot Limestone occurring slightly above the Blue Limestone. Mapping of the sediments exposed in the window on the north end of the State of Maine vein show they are warped into a tight anticline plunging to the east. The type of fold and direction of plunge appears to be the equivalent of folds within the Tombstone Basin. It is assumed they were due to the same tectonic forces. In the Fox Ranch window there are exposed two limestone beds and one bed of conglomerate. It is assumed the conglomerate is the Glance Conglomerate, and thus the limestones appear to be overturned in a recumbent fold. Several other fold structures might be proposed to explain the geometry of the exposed features. However, until more data are acquired by drilling, the recumbent fold seems to fit the general geologic environment as well as any. Since at least two events of folding and thrust faulting occurred in this area (Gilluly, 1953), it is quite probable that folds developed during the first episode were again folded during the second episode, thus creating extremely complex fold surfaces (Figure 30). It is assumed that folds are generally northwest trending, as they are in the main Tombstone district.

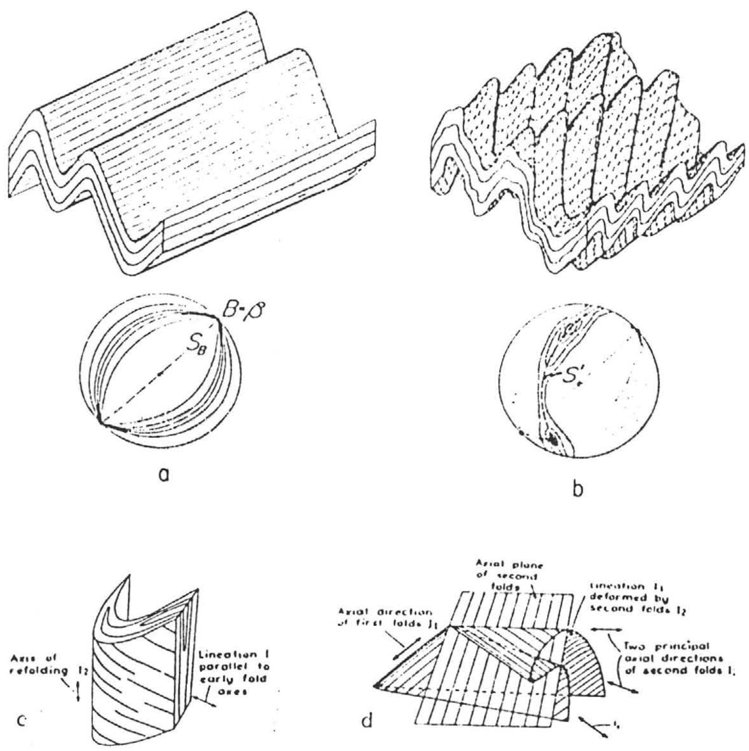


Figure 32A

Figs. 16a and 16b.—Superposed cylindroidal folding with oblique axes, as drawn by Weiss, showing stereographic projections of the bedding and fold axes (from Weiss, 1959, Fig. 5). 16c and 16d.—Superposed deformation of early lineated folds (from Ramsay, 1960, Figs. 1 and 2). Axes and directrices are oblique.

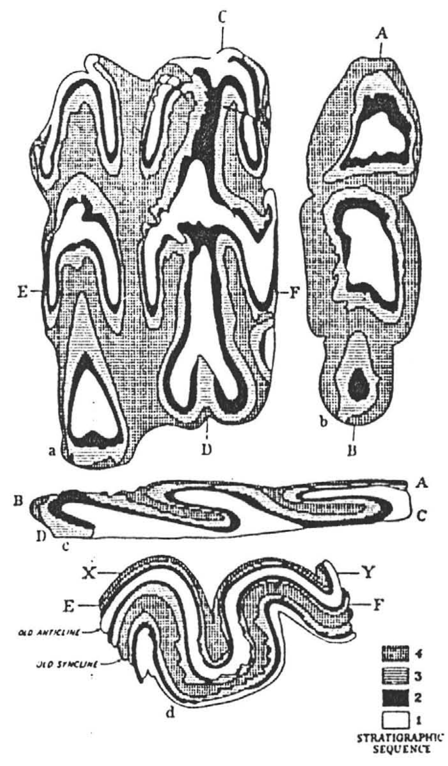


Figure 32B

—Superposition of similar folds with orthogonal strikes and divergent directrices (from Reynolds and Holmes, 1954, Text-fig. 13). EF is the axial direction of the first folding and CD (or AB) that of the second. (a) Surface outcrops after slicing. (b) Surface outcrops on the right-hand side only, as seen at a higher level than that of (a). (c) Section of the model, before slicing off its top, cut along CD of (a) and AB of (b). AB and CD represent the levels at which (b) and (a) were respectively sliced. (d) Section of the model, before slicing off its top, cut along EF of (a). XY and EF represent the levels at which (b) and (a) were respectively sliced.

MINERALIZATION

General Description of Silver Mineralization, and Vein Alteration Within the Uncle Sam Tuff

As mentioned under the heading "Structural Features of the State of Maine Area - Vein Zones", the average strike of the veins bearing silver within the State of Maine area is approximately north 55 degrees east with a dip of from 30 to 80 degrees westerly. The exceptions to this are the San Pedro, Gold Bug and Fox Wash veins which strike more easterly. The Fox Wash vein also has a southwesterly dip (Figure 29).

The only silver mineral, which is documented to have been identified within the area, is bromyrite (AgBr). It is a pistachio green, waxy mineral which occurs in the oxide zone on fracture planes, and is termed horn silver (horn) by the operators within the area. It is the equivalent of cerargyrite (AgCl) and can only be differentiated by chemical or x-ray analysis. It is quite possible that cerargyrite as well as iodyrite (AgI) are present in addition to bromyrite, but no careful analytical work that would differentiate these mineral sub-species has been done. The probable source of silver halides is argentiferous galena, and/or tetrahedrite (Butler & Wilson, p. 52). Numerous assays, taken in 1973, showed a strong geochemical presence of lead, ranging up to multiple thousands of parts per million. The lead is probably present as cerussite or anglesite, but no specimens of these minerals have yet been identified. Open pit operations in the last two years have exposed thin seams of galena along vein structures, associated with higher grade silver, lending credence to the idea that galena is one of the major sources of the silver. Newell did electron microprobe analysis on hessite (Ag2Te) blebs in galena and found them to be composed of (weight percent) 60.9% silver, 38.6% telluride and 0.2% gold (1974, p. 167). Adjacent galena showed only 0.1 weight percent silver. Hessite is probably the primary hypogene silver mineral at Tombstone (Newell, p. 169). The temperature of formation of the hessite was probably about 205 degrees centigrade (Newell, 1974, p. 167). Silver is probably also tied up as argentojarosite or plumbojarosite, and possibly in the manganese oxide minerals. Although operators Charlie and Louis Escapule have developed an eye for rock which contains ore grade silver mineralization, to the casual observer, there appears to be no way of easily judging silver content by eyeballing the rock, unless horn silver is visible, in which case high assays can be anticipated. Traces of copper oxide were seen in the San Pedro area, the dump of the Brother Jonathan shaft, and in the State of Maine workings below the second level, but no copper sulfides have been noted. It is concluded that the copper may have come from the oxidation of tetrahedrite and probably some chalcopyrite occuring as ex-solution blebs in sphalerite as it does in the main part of the district (Newell, 1974, p. 160, 162). Sarle (1928, p. 33) reports that chalcocite was encountered in the lowest level of the San Pedro mine.

Hydrothermal alteration associated with the silver mineralization in the area appears to be mesothermal in character, and this is corroborated by fluid inclusion temperatures measured by Newell (1974, p. 169) in the main district of 205 degrees to 279 degrees (±5 degrees) and 243 degrees to 318 degrees centigrade (±5 degrees) at Charleston. Alteration along the veins in the Uncle Sam tuff consists of emplacement of (as judged by leached capping interpretation, as well as inferences cited in the preceding paragraph) pyrite, minor galena, possibly some sphalerite, tetrahedrite, chalcopyrite and possibly alabandite (manganese sulfide-MnS). All of these sulfide minerals (with the exception of minor remnant galena) have been oxidized above the water table, and are represented by limonite after their respective parent sulfide, or in the case of alabandite(?), black manganese oxide minerals. The silver, represented primarly by bromyrite was probably originally contained in hessite blebs in the galena and in tetrahedrite, before oxidation. Wall rock has been silicified to varying, but generally minor degrees, and alteration to clay and sericite has taken place in the reactive feldspar and aphanetic matrix of the Uncle Sam tuff. Where alteration and vein intensity is greatest, sericite is dominate, while in poorly altered vein areas, argillization is the primary effect. Pyrite is represented at the surface by jarosite and red and yellow limonites. In the most strongly altered veins, maroon and red, "relief" or "live limonite" is present on fractures. In the most poorly altered areas, occasional suggestions of pseudomorphs of limonite after pyrite are seen. All of the dumps in the area with the exception of the San Pedro dump show only oxidized material. Examination of the sulfide bearing fragments on the San Pedro dump show them to be intensely bleached and altered Uncle Sam tuff, with finely disseminated white pyrite along silicious fractures, and disseminated through the rock. Accessory gangue minerals in the San Pedro veins consist of silica and some manganese oxide. Barite is seen only in the Gold Bug area. Manganese appears to be more prevalent in the San Pedro area with lower amounts seen in the Gold Bug, Lowell, Merrimac, and the State of Maine areas. The State of Maine, May and Clipper veins are primarily wide zones of sericitic and argillic alteration with little, if any silicification. They represent the most typical pattern of alteration within the State of Maine area. Traces of amythestine quartz along with a small amount of native gold with horn silver has been seen in the Triple X open pit workings. No primary (sulfide) manganese minerals have been identified on the Tombstone Silver Mines, Inc. properties, to the knowledge of the writer.

Detailed mapping on a 1" = 50' color air photo base map in the Clipper-May area shows that, in detail, the veins are sinuous with varying width (Figure 29). This attests to the saturation of the surrounding Uncle Sam tuff by hydrothermal solutions, probably controlled by micro-fractures and/or inherent porosity within the tuff.

Total vein length mapped in the State of Maine area to date is about 30,000 feet. Detailed mapping in the northwest 1/4 of Section 16 at 1" = 50' in August, documented an additional 3,000 feet. Additional detailed mapping is expected to delineate additonal vein length. Vein length in the main district depicted on the Butler, Wilson, Rasor map (1938, Plate IV), approximates about 63,000 feet.

General Description of Silver Mineralization and Vein Alteration Within the Bisbee Sediments

Bisbee sediments which crop out within the State of Maine area consist of non-descript red beds of quartzite to siltstone, probably the equivalent of the Cintura and Morita formations, in the Chance area, and a small outcrop of what may be basal Blue Limestone warped into a tight isoclinal anticline north of the Uncle Sam shaft. There is also some conglomeratic units (possibly Glance?) intercalated with greenish shales exposed in a window in the Uncle Sam tuff, just east of the Fox Ranch. These exposures, with the exception of the limestone north of the Uncle Sam shaft, are chemically very similar to the Uncle Sam tuff, and the alteration effects on them is quite similar to that seen in the Uncle Sam tuff. Thus, in the sandstones, quartzites and argillites in the eastern part of the property, and noteably on the Red Top claim, pyrite appears to have been disseminated in large areas of the porous rock, and the red stain is primarily due to hematite after pyrite. This same coloration of similar sediments can be seen in the main part of the Tombstone District and in the Tombstone Extension area. In the sediments where there is a high lime content, hydrothermal alteration has silicated the lime to hornfels attended by weak disseminated pyrite. Because of the lime content, pyrite oxidation is minimal.

Vein Widths

The most significant feature of the veins in the State of Maine area is their width. The State of Maine vein itself varies between 100 and 200 feet true thickness (Figure 30) between the hanging wall and footwall ore zones. The Gold Bug vein zone is silicified and strongly altered over a width of about 100 feet, and shows moderate to strong alteration over a width of approximately 300 feet. The Fox Wash vein zone is approximately 100 feet wide, and sub-parallel fracture zones associated with the Fox Wash vein zone appear to be up to 300 feet in maximum dimension. The north trending San Pedro vein in the area of the Fox Ranch windmill is intensely altered over a width of 30 feet, and shows moderate to strong alteration over a width of approximately 20 to 30 feet on either side of the central zone, for a total width of 50 to 60 feet. A parallel structure, which is intensely silicified but has not been mined, shows a width of 10 to 25 feet. A zone southeast from the San Pedro shaft shows disseminated sub-parallel fracture zones over a width of approximately 400 feet. This zone apparently continues across alluvial cover to intersect the north trending San Pedro vein.

In the Three Brothers shaft area, altered rock containing sub-parallel fractures is approximately 300 feet wide. Throughout the general area of the True Blue claim, the Three Brothers shaft, and the San Pedro and Fox veins, the Uncle Sam tuff shows sub-parallel and intersecting veining, the rock being pervasively though weakly altered over an area of approximately 400 feet to 700 feet in width, and about 1,500 feet in length. In the area of the Lowell claim, a vein zone which may be the extension of the State of Maine vein, alters rock over a width of up to 200 feet, and a length of 300 or more feet. The Clipper and Free Coinage claims are located on what the writer has termed the "Clipper Zone". This zone consists of sub-parallel fractures showing weak to strong hydrothermal alteration over a width of 20 feet to about 200 feet, averaging approximately 89 feet wide in the center portion, and a length of at least 3,500 feet.

The width and intensity of mineralization of these veins suggests greater volume and intensity of mineralization than that present in the Tombstone Basin area, from which most of the production of the mining district has come. Further, when it is considered that these vein structures are underlain by reactive limestone units which would have the effect of precipitating metals and silica from ascending hydrothermal solutions, as well as from decending supergene solutions, their apparent strength, and we assume potential, is further emphasized. The best targets for ore bodies, of course, would occur where hydrothermal vein zones intersect the chemically and structurally reactive host rocks - the tightly folded lower Bisbee and upper Paleozoic sediments. More details on these targets will follow below.

Proposed Mechanism for Supergene Leaching of Silver in the State of Maine Area, and its Probable Effect on Near Surface Vein Configuration and Enrichment of Veins at Depth

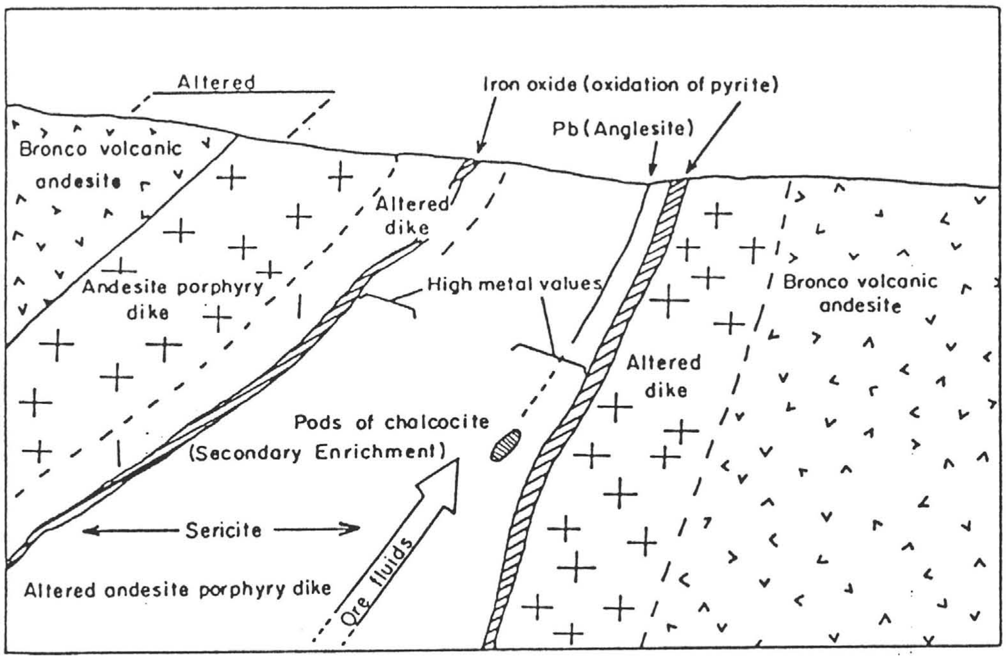
The Confusing Geometry of the State of Maine Area Veins

The silver veins cutting the Uncle Sam tuff appear to all have a similar configuration. In all exposures within the accessible State of Maine workings, the Brother Jonathan workings, and Clipper and Merrimac zones, the veins appear to be composed of a narrow, high grade ore shoot in the hanging wall, immediately adjacent to, or sometimes within poorly altered tuff, consisting of bromyrite along fractures, then a wide zone (largely barren of silver, or, at best, low grade) of argillized and sericitized rock containing abundant limonite after pyrite and assumed other sulfides, and then a lower grade of silver as bromyrite immediately adjacent to or within the poorly altered Uncle Sam tuff in the footwall. During the writer's association with the area, of about twelve years, it seemed incongruous that the best silver mineralization appeared adjacent to the poorest appearing rock adjacent to strong to intensely altered limonite rich vein material which contained little or no silver. Indeed, recent UNC Silver MAP tool work in the Charleston area showed poorly altered wall rock adjacent to wide vein zones carried more silver than did the strongly altered material itself.

The Hypothesis for Supergene Leaching

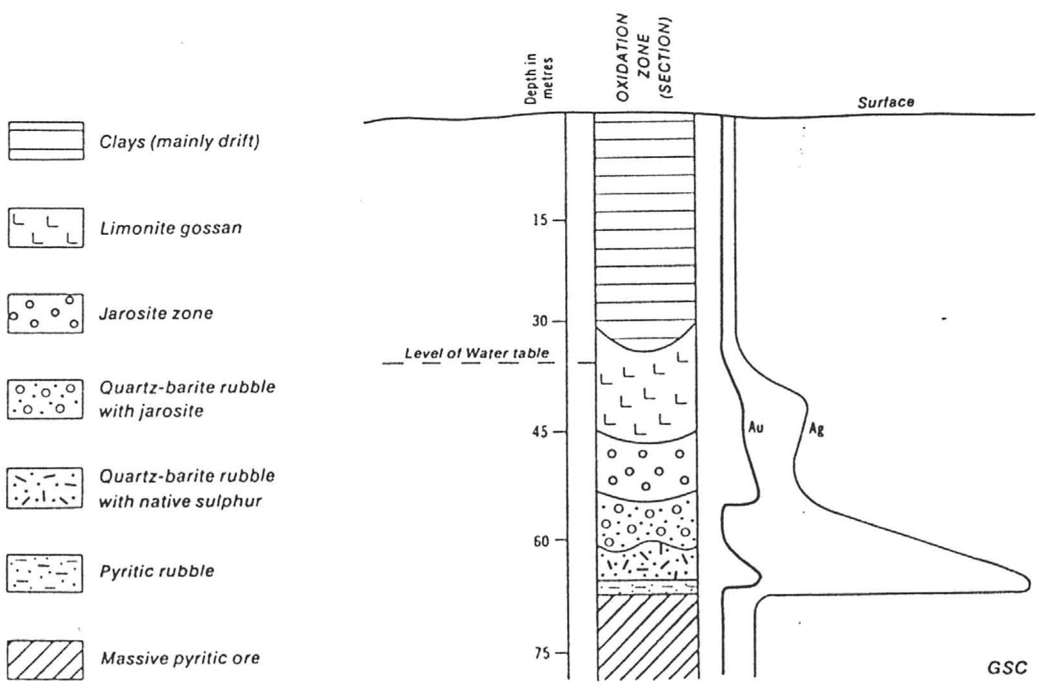
The current understanding of the genesis of the Tombstone District, as part of a caldera feature, and the proper identification of the Uncle Sam as a tuff rather than a porphyry sill, and a review of the solubility of silver in the oxide environment has lead the writer to a hypothesis which appears to well explain the geometry of the veins, as well as having important impact on what the configuration of silver mineralization at depth might be. This hypothesis will be described in the following discussion.

As explained in the discussion of the general geology, the Tombstone District lies within and adjacent to the 72 million year old Tombstone resurgent caldera. The main district lies just outside of the caldera ring fracture (the Ajax fault) which has been intruded by the Schefflin granodiorite. The State of Maine mine area falls just within the caldera ring fracture.



Schematic diagram of the west face of the Charleston Lead mine in the Charleston area.

Figure 33A

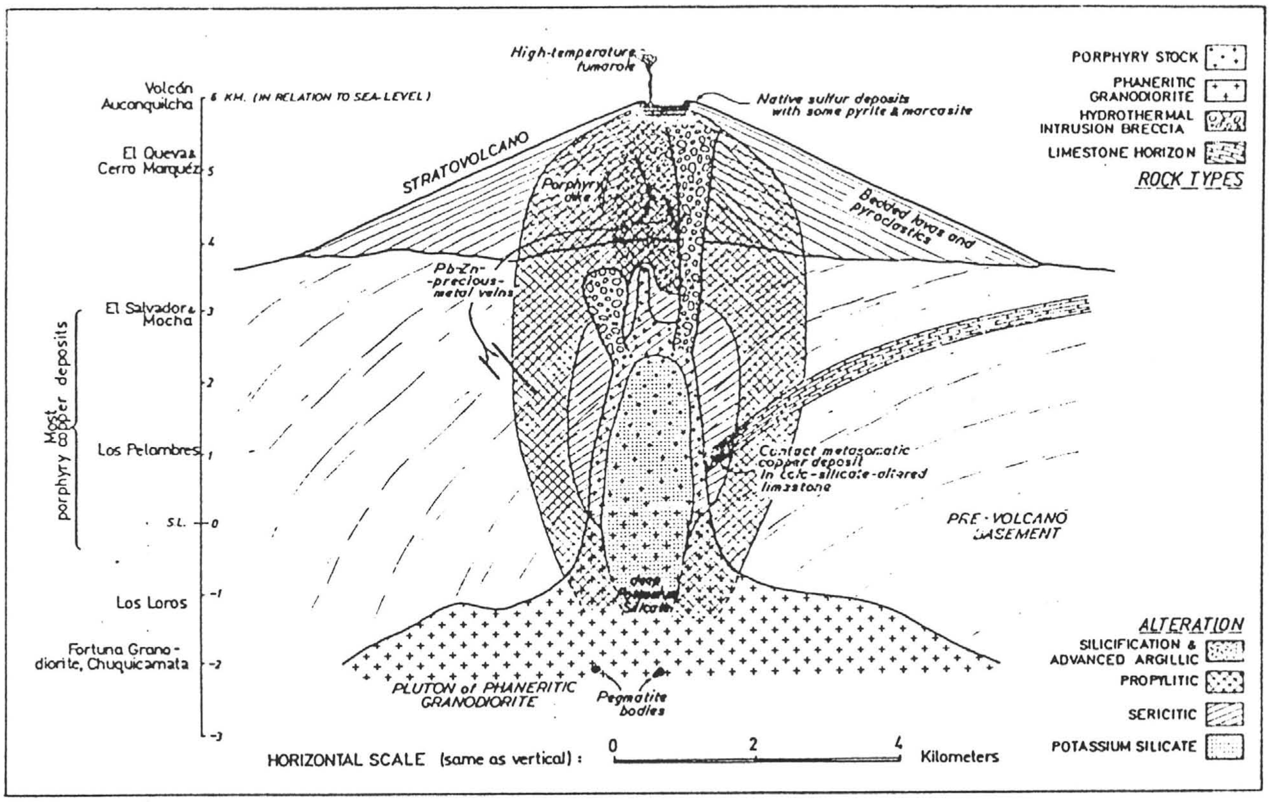


Localization of gold and silver in the oxidized zone of the Maikain 'S' deposit, northern Kazakhstan, U.S.S.R. (after Borodaevskaya and Rozhkov, 1974).

Figure 33B

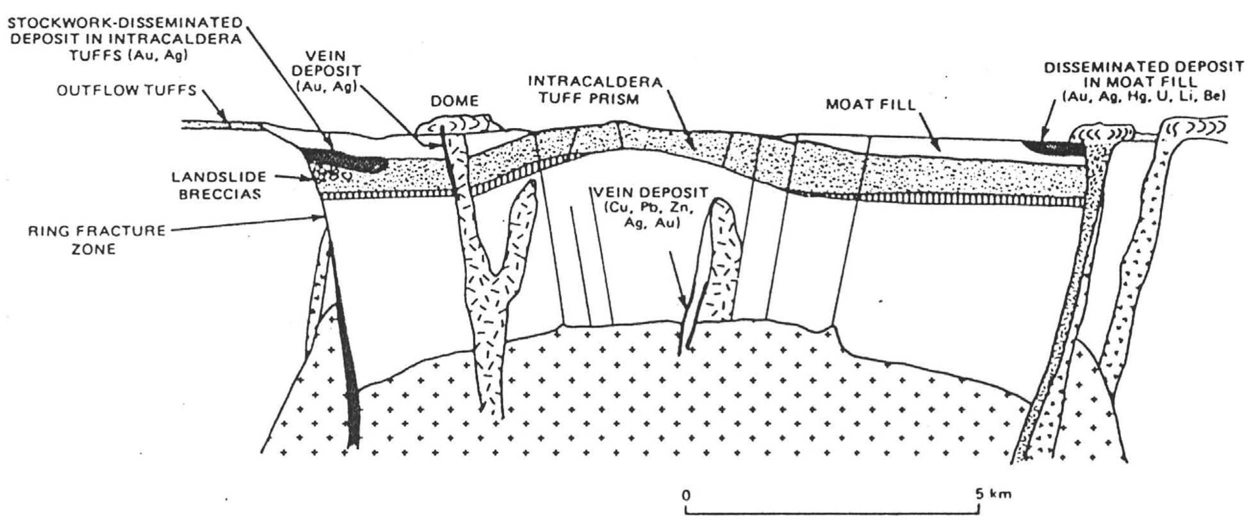
The Uncle Sam tuff was probably extruded as multiple nuee ardentes before, and subsequent to, caldera collapse. Distal portions of the tuff undoubtedly covered the terrain around the caldera, including the main part of the district. Subsequent erosion, however, has removed all of the tuff, except that which lies within the caldera. Extrusive rhyolitic volcanics are a prime source for halides (Vinogradou, 1959) which occur as fluid inclusions entrapped within the extrusives.

After development of the resurgent caldera, culminating in the accumulation of possibly as much as 1,000 feet of Uncle Sam tuff within the State of Maine mine area, typical late stage magmatism occurred. This included the intrusion of the Schefflin Granodiorite into the caldera ring fracture shortly after the caldera formation, and subsequent intrusion of the 62.6 $\pm$ 2.8 m.y. old (Harald Drewes, 1985, pers. comm.) Extension quartz monzonite. Intrusion of, first, andesite porphyry dikes and subsequently rhyolite dikes, occurred in the State of Maine area. Subsequent fracturing occurred sub-parallel to the fractures occupied by the rhyolite dikes, and these fractures were invaded by hydrothermal solutions, which in their lower extremeties probably tap a porphyry copper type environment, but in their upper extremities, grade to mesothermal to possibly epithermal lead, zinc, silver, gold, and manganese veins (Sillitoe, 1973, p. 800 and 1984, p. 1287, 1291 & 1294). During the mid-Tertiary orogeny, the Tombstone area was tilted, like all the surrounding mountains, to the northeast. However, the tilting and deformation was relatively moderate and resulted in no substantial dislocation or destruction by erosion of the mineral deposits, except their surface expressions. After quiescence of the Laramide mineral activity, oxidation of the veins, and erosion of the surrounding Uncle Sam tuff proceeded up to the present time, resulting in the present topographic expression. We know from experimental data (Lingren, 1938, p. 862 & Park & McDiramide, 1985, p. 465) that silver readily dissolves in ferric sulfate solutions. Thus, as the Clipper, State of Maine, and other veins in the area, which are composed of up to 10 percent pyrite as well as galena, sphalerite and tetrahedrite, began to weather and oxidize, the zinc, copper and silver would go into solution, as would the lead and gold more slowly, and move towards the water table where they would encounter reducing conditions. Under reducing conditions at and below the water table, copper would precipitate as chalcocite, while silver would probably precipitate as argentite, stromyrite, and native silver. However, on the journey from their original position in the sulfide minerals of galena (as blebs of hessite?) and tetrahedrite to their position of future re-deposition below the water table, those silver ions near the hanging wall and the footwall zones of the veins would encounter halides, which are present as weathering products of the fresh Uncle Sam volcanic wall rock. The continual decrepitation by



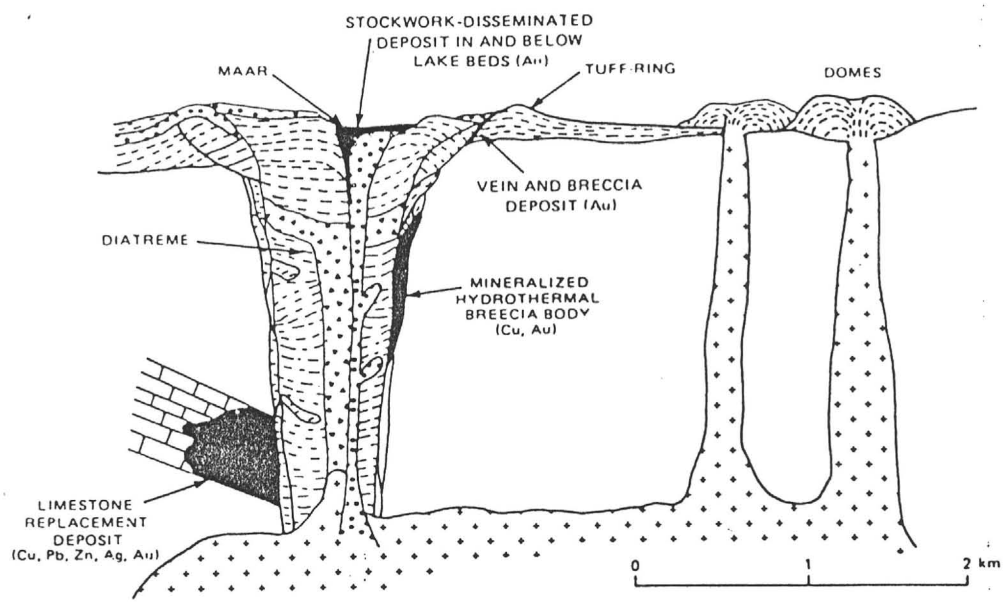
Idealized cross section of a typical, simple porphyry copper deposit showing its position at the boundary between plutonic and volcanic environments. Vertical and horizontal dimensions are meant to be only approximate.

Figure 34A



Idealized model of possible ore deposit types related to a Valles-type caldera.

Figure 34B



Idealized model of possible ore deposit types related to a maar-diatreme system.

Figure 35
Page 99

weathering and mechanical destruction of inclusions within the fresh Uncle Sam tuff provides a continuous supply of bromine, iodine and chlorine to react with the mobile silver in the ferric sulfate solution. Of course when the silver ions encounter halides, they immediately form insoluble silver halides that are precipitated in and immediately adjacent to the fresh Uncle Sam tuff - the source of the halide ions. Since the solubility of the halides is in decreasing solubility order of chlorine-bromine-iodine, after substantial weathering, bromyrite is the predominate halide left in the near surface enviornment.

As erosion progressed downwards through the blanket of Uncle Sam tuff deposited in the current State of Maine mine area, previously enriched zones of silver were exposed to oxidation and sequentially were oxidized only to re-precipitate at a lower level as a continuous oxidation and reduction front, proceeding ahead of the erosion surface; just as the chalcocite blanket in porphyry copper deposits have been developed through sequential stages of leaching precipitation, re-leaching, re-preciitation, etc. Thus, most, if not all, of the silver contained in the column of rock which was once present in the now eroded veins above the current surface, has been precipitated at or below the permanent water table.

This scenario appears to adequately explain why in all the wide vein zones within the State of Maine area (the State of Maine vein, the Clipper vein zone, etc. etc.) there is always a zone of "horn" (bromyrite or other halides) in the hanging wall and in the footwall, but the center portion of the vein, though strongly altered, is barren or relatively so. In all probability, silver values were distributed evenly or relatively so within the vein, but in the central portions where no halides were available to precipitate silver, the silver migrated down the dip of the vein to be precipitated in the reducing zone below the permanent water table. The same mechanism was observed by Lee (1967) at Charleston, as shown in his Figure 7A (p.24), reproduced herein as Figure 33A.

We can therefore expect to always find an enriched zone on the hanging and footwall sides of wide phyllic zones such as the State of Maine and Clipper veins, which carried relatively disseminated silver sulfides. For more narrow veins without a wide zone of phyllic alteration and attendant pyrite, the supply of halides from leaching of the surrounding fresh Uncle Sam tuff may have been sufficient to have precipitated all silver as silver halides. But in the wide vein zones, we can predict that significant enrichment should be found below the water table, much as a chalcocite blanket is typical beneath leached porphyry copper zones. Further, we can expect that most, if not all, of the silver from the vein material which is now completely eroded away will be located within the enrichment zone.

Using this hypothesis, we can predict and anticipate other conditions which will be helpful in maintaining accurate ore control. For example, since silver ions probably migrated into poorly altered or unaltered rock where they were precipitated along micro fractures by halides in the fresh rock, it will not be perplexing to find silver of economic proportions in what appears to be uninteresting rock adjacent to veins. Further, crushing and screening of such silver bearing rock, will probably yield silver in the fine fractions and an oversized product with little or no silver content. Also, where the veins flatten in dip, perculation of halide bearing surface water into a greater thickness of the vein hanging wall in the flattened part of the veins will precipitate additional silver yielding hot spots of more voluminous silver halide mineralization. This is exemplified in the State of Maine mine between the 3rd and 4th levels, where the vein flattens. In fact, any hydrologic traps in the plane of the vein, which would tend to channel surface originated waters carrying higher than normal volumes of halides into the vein, would tend to precipitate a larger volume of silver halides. Thus, careful mapping and structural contouring along the vein surface could be used as ore guides to silver halide mineralization within the oxide portion of the veins. Recognition of the genesis of these halide ore bodies and attention to the factors which might cause their formation may be an important ore guide in profitable exploitation and ore control in surface and underground mining operations within the State of Maine area.

Gold, though substantially less soluble than silver, may also be solubilized in some portions of the typical State of Maine vein environment. Lingren (p. 858) states that where the manganese content is high (as in the Merrimac #2 pit area and along the San Pedro and Fox veins), it may be possible to carry gold downward to be precipitated below the water table. Since, except where noted, the MnO_2 content of the State of Maine area veins is relatively low, we might expect gold to be left substantially untouched. Interestingly, however, the gold content in the State of Maine vein in the various levels, indicated by the 1915 Phelps Dodge assays (Figure 36), is relatively uniform. Since a substantial column of rock (possibly as much as 1,000 feet), has been eroded from above the current surface, we might question what has become of the contained gold. If it were simply mechanically enriched by the dissolution and erosion and removal of lighter and less inert vein and rock constituents, it would be expected to find rich pockets of native gold at or near the surface within the State of Maine area veins. Since no such accumulation has ever been found, it is concluded that either (1) there was not much vein removed from over the current erosion surface, or (2) the vein material carried essentially no gold, or (3) the gold was solublized and has migrated to the permanent water table where it has been precipitated. To the

1915 PHELPS DODGE CORPORATION
ASSAY RECORDS, STATE OF MAINE MINE
BUTLER, WILSON & RASOR, 1938, P.102

LEVEL	NUMBER OF SAMPLES	AVERAGE WIDTH IN FEET	AVERAGE GOLD IN OUNCES	SUM OF SAMPLE WIDTH X GOLD ASSAY	AVERAGE SILVER IN OUNCES	SUM OF SAMPLE WIDTH X SILVER ASSAY	RATIO OF SILVER TO GOLD
1ST AND 2ND........	251	2.73	.017	.04641	1.98	5.4054	116.47:1
3RD................	196	2.06	.023	.04738	3.50	7.21	152.17:1
4TH................	199	1.80	.019	.0342	4.35	7.83	228.95:1
7TH................	178	1.29	.012	.01548	3.27	4.2183	272.50:1
TOTAL->	824	7.88		.14		24.66	
	WEIGHTED	AVERAGE->	GOLD .018		SILVER 3.12		171.9 :1
3RD (HIGH-GRADE SAMPLES)......	4				465.30		

writer, it seems like alternative #3 is more likely. It is also worthy of note that where supergene halides from weathering of the fresh Uncle Sam are encountered, an environment of gold solubility would be present since gold is soluble in halides as adverse to silver, which is insoluble. Thus, within the halide zone, we might find silver halides, but gold would be solublized and removed. No data has been collected within the State of Maine area to test this hypothesis, but because of its importance in mining operations, evidence for or against should be developed in the course of mining.

Bisbee group sediments lie at shallow depth beneath the Uncle Sam tuff and the current erosion surface (Cross Section, Figure 30). Thus, there is a geochemical layer cake in which supergene enrichment will react differently, depending on the chemistry of encountered rock units and whether they are encountered above or below the oxidation zone. The different potential rock types encountered above or below the oxidation zone create a relatively large number of environments, all of which would react somewhat differently in precipitating supergene solutions. For example, if the Clipper vein were to encounter the water table while the vein was still in the Uncle Sam tuff, then supergene solutions would probably precipitate copper and silver (and possibly gold) as chalcocite, argentite, stromeyerite, native gold and possibly native silver, as well as ruby silvers, depending on the content of arsenic and antimony. If, however, the vein intersects the Blue Limestone, the Glance Conglomerate or the Naco Limestone while still above the permanent water table, the ferric sulfate solutions mobilizing copper, silver, zinc and lead (and MnO_2 mobilizing gold?) would pobably be neutralized by reacting with the calcium carbonate of the limestone to precipitate copper carbonates, native silver, silver chlorides, smithsonite, and native gold. If Bisbee red beds were intersected prior to the interception of the water table, and no significant limestone beds were present, an oxide environment similar to that in the Uncle Sam tuff would be maintained, assuming a low lime (calcium carbonate) content. If a pre-tuff erosion surface with coarse clastic material is encountered, the vein may splay out along this more porous zone, possibly developing a significantly wider ore zone at this point. If this erosion surface should contain pebbles or cobbles of carbonate material, then selective replacement as well as supergene enrichment in these cobbles could be present. If limestone units are intersected by the vein below the current water table, then secondary sulfide deposition would occur in a manner similar to that if the vein remained in the Uncle Sam tuff immediately below the water table. However, the enrichment zone may be compressed by the neutralizing character of the surrounding limestone wall rock.

Obviously, a relatively large number of permutations of environments and resulting mineral deposition may be present in the State of Maine area. The geologic exploration staff must be familiar with, and able to interpret and evaluate the various possibilities in order to comprehend the drill data and to make geologic and economic projections.

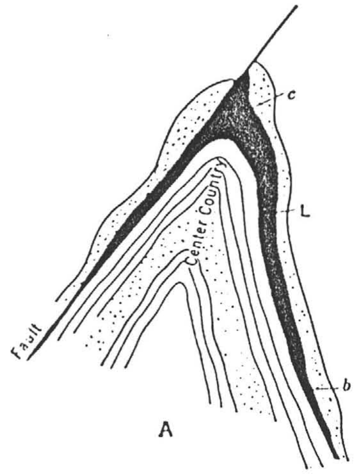
Potential for Enriched Silver Ore Bodies at the Uncle Sam Tuff - Bisbee Sediment Interface and Below

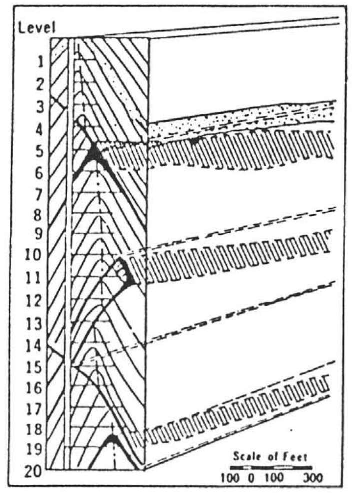
Because of the layer cake nature of the geologic environment within the State of Maine area, we must be alert to the various environments of potential ore deposition, and how the chemistry and structure of this layer cake will effect the position and geometry of potential ore bodies. Failure to understand these multiple environments for ore deposition will result in a lowered, if not completely lacking, success ratio. In the previous section, the writer has discussed the hypogene and subsequent supergene environment of mesothermal veins within the Uncle Sam tuff. In this section, observations will be made concerning the hypogene and perhaps supergene environment of these same veins within folded sediments of the Bisbee and various subsequent Paleozoic formations.

Fold Structures Within the Sediments

We know from previous mining activity in the main part of the district (Butler, Wilson, et al., Bulletin 143, 1938), and in the surrounding area (Galully, James, 1951 & Drewes, Harald, 1980), that tectonic forces have resulted in the thrust faulting and folding of the Bisbee sediments and underlying Paleozoic formations. In the main part of the district, the axial planes of drag folds along northwest trending anticlines and synclines, when intersected by the northeast trending veins, formed saddle reef type replacement zones of bonanza grade silver deposits. Further, these ore bodies appear to have continuity along the strike of the axial planes outwards from the vein conduits. Since these folds are apparently regional in nature, it is logical to conclude that the same types of drag folds would form similar saddle reef type bonanza ore bodies where the Clipper, State of Maine and other veins of the State of Maine area intersect these features at depth. Geologic mapping by the writer has confirmed that one such isoclinal fold exists in the exposure of sediments north of the Uncle Sam shaft. Thus, the same type of mineralization can be expected in the State of Maine area that formed the high grade bonanzas along the various rolls (saddle reefs) in the main district, such as the Visina roll, the Toughnut, the Silver Thread and others. The geologic task is how to predict in three dimensional space not only where these folds in the sediments might occur (and in which horizons - i.e., the Glance Conglomerate ((the Novaculite)), the Blue Limestone, the Twelve Foot or Six Foot Limestone, or the Naco Formation), and where the veins or vein intersection zones may intersect these favorable structures. Obviously, this is a very

Figure 37A

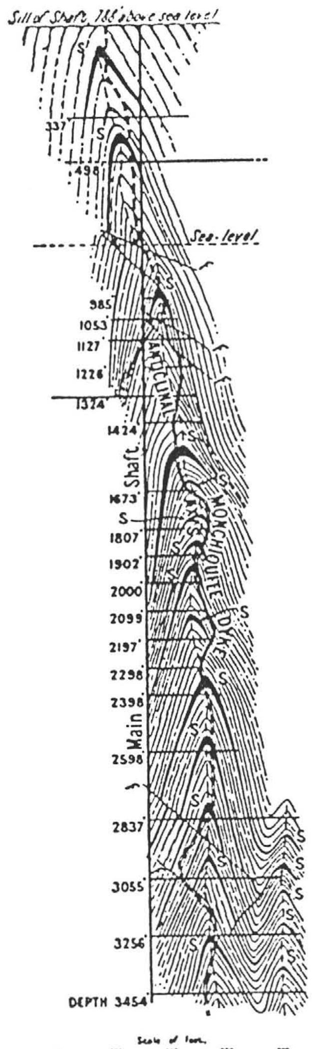




B

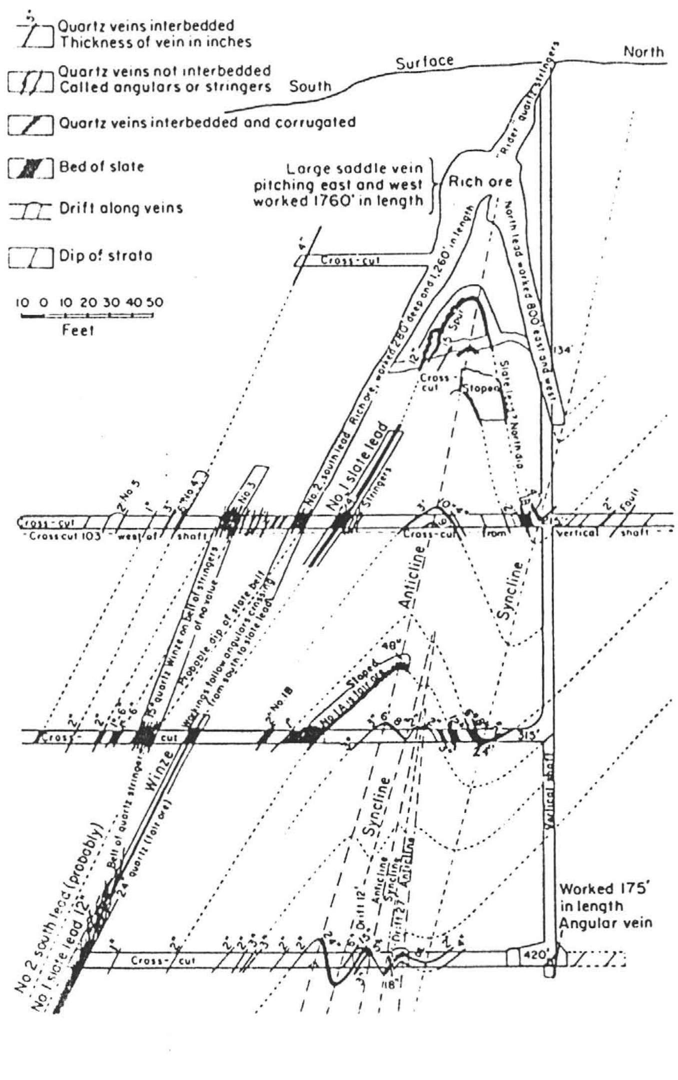
A. Typical saddle reefs of Bendigo, Australia. *c*, cap; *L*, leg. *b*, back; black is gold quartz ore. B, Three types of bendigo reefs and methods of mining them. (After Report by Bendigo Mines, Ltd.)

Figure 37B



Bendigo, Australia. Saddle reefs shown in Great Extended Hustlers shaft. (Baragwanath, Gold Res. World.)

Figure 37C



Saddle rocks in the Dufferin mine, Salmon River gold district, Nova Scotia. (After Faribault as quoted by Malcolm 1912, from Park and MacDiarmid, *Ore Deposits*, W. H. Freeman, 1964.)

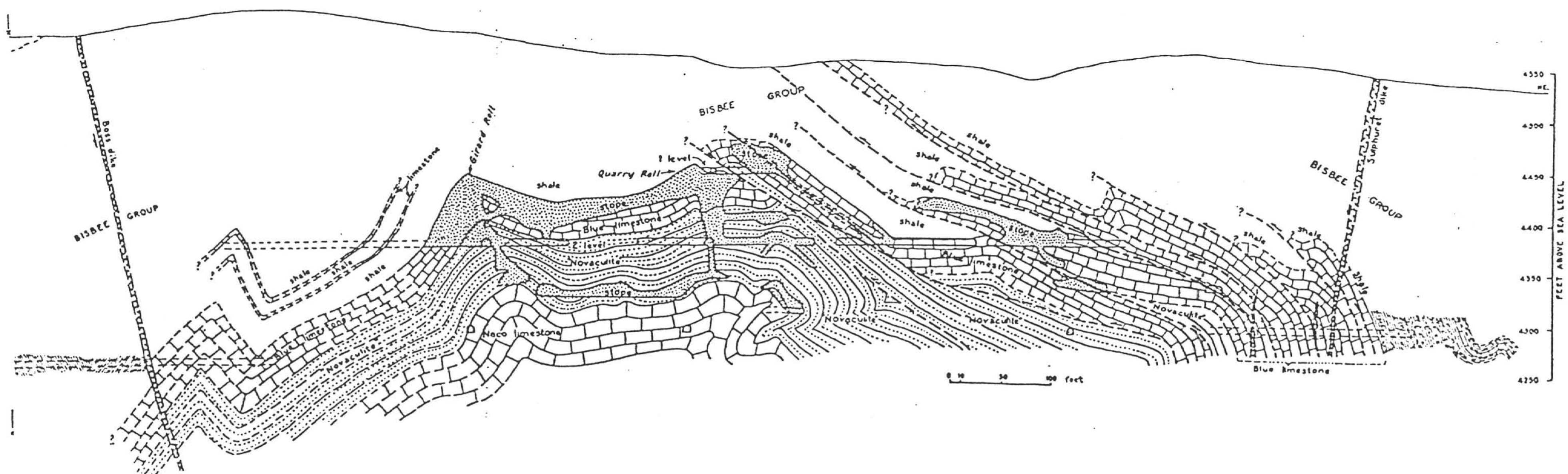


Plate XXIV, A.—Section along West Side fissure, looking northwest (northeast half; joins Plate XXIV, B at line X-X).

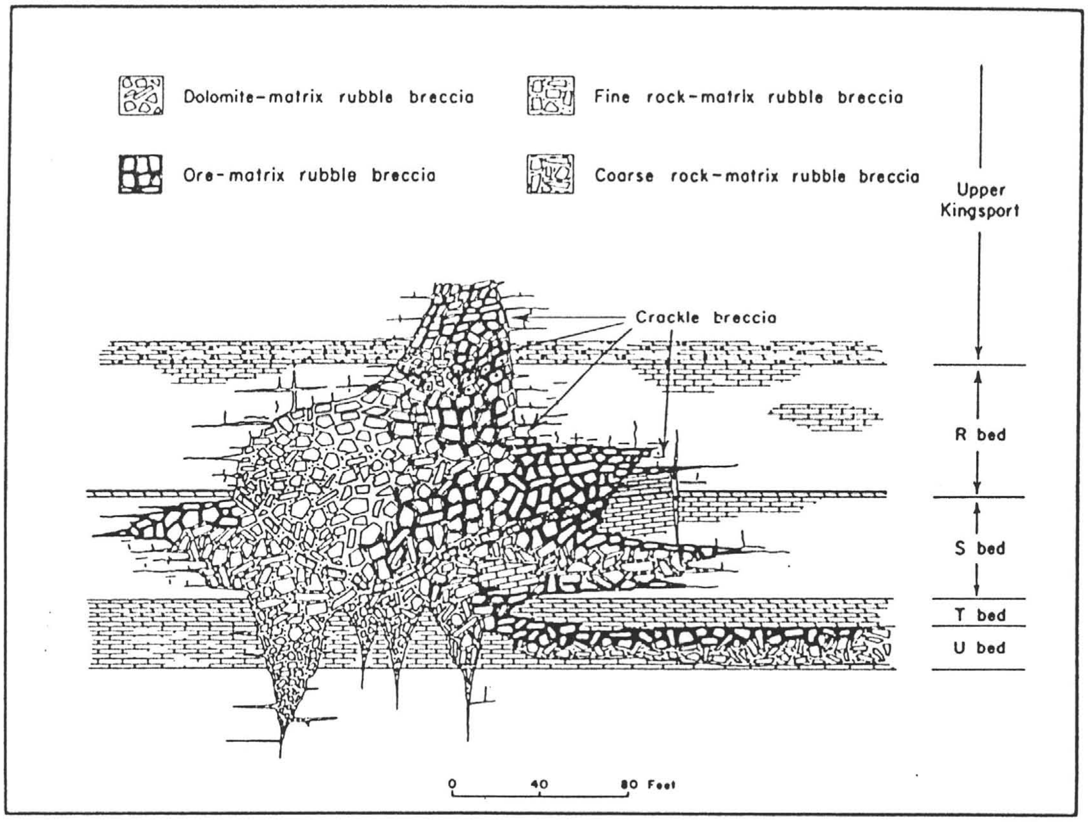
complex three dimensional problem, which is not amenable to easy solutions. However, by ardent, thorough geologic work, including the careful structural, geologic, mineralogic, and geochemical logging of exploration holes, this three dimensional geologic ore puzzle can probably be solved with commensurate economic rewards. Individual ore bodies within the main part of the district were of exceptional grade yielding, at current prices, several millions of dollars of ore, grading over $1,000 per ton. Thus, the writer feels that the reward is probably worth the difficulties of the search.

In addition to the chemical, structural traps offered by drag folds and saddle reefs in lime beds within the Bisbee group, there are some additional targets which should not be overlooked.

Karst Targets

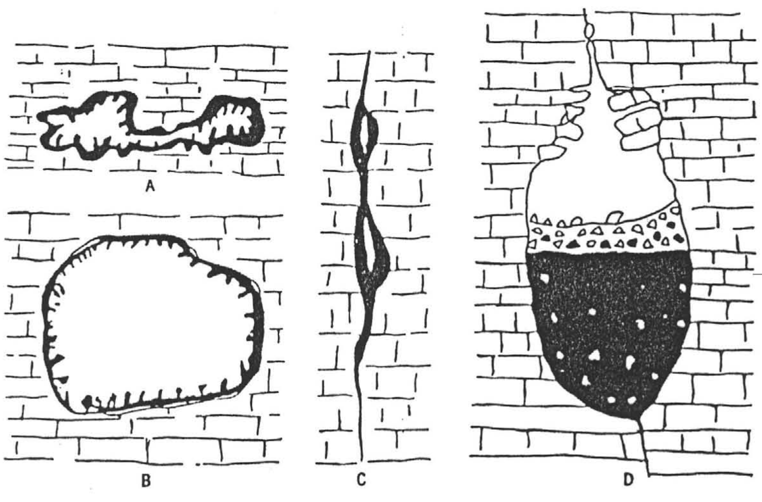
Whenever there are any subaerial erosion surfaces developed on limestone bedrock, there is potential for development of karst topography - that is the development of caves or caverns in the limestone. When these karst (cavern) topography limestones are subsequently covered and then subject to hydrothermal mineralization, the caverns or karsts form ideal targets for the localization of hydrothermal solutions, and deposition of massive sulfide deposits. This mineral deposition in karsts is a possible origin of the Tri-State lead-zinc deposits, though the source of mineralizing solutions is open to much debate. However, in the Leadville Mining District of Colorado, the environment appears to be similar, if not equivalent to that at Tombstone (oral communication Roland C. McEldowney, September, 1985). Here the Leadville Limestone, which has karst development on its erosion surface with overlying formations, has been cut by a caldera with subsequent lead-zinc-silver mineralization. Where the veins have intersected caverns in the Leadville Limestone, massive deposition of silver bearing galena with subordinate zinc and copper has resulted. These exceedingly large and rich ore bodies are currently exploited by the ASARCO-Newmont joint venture - the Black Cloud Mine.

Prior to the deposition of the Bisbee Formation, the Naco Formation was exposed to sub-aerial erosion and potential development of karst topography. During the Cretaceous, it was subsequently covered by the Glance Conglomerate and other units of the Bisbee Formation. During the development of the Tombstone vein system, if karsts were indeed present in the Naco Limestone, they may have well been invaded by the veins, and massive lead-silver-zinc deposition may have occured. In fact, some of the ore bodies in the main part of the district within the Naco Limestone may be such karst replacement zones.



Generalized section through a portion of the Jefferson City Mine showing breccia. (From Crawford and Hoagland, J. Ridge, ed., 1968, Ore deposits of the U.S., p. 253.)

Figure 39A



Solution caves and cavities in limestone. A, B, Open solution cavities lined with crusts of crystals, Wisconsin lead-zinc region (after Chamberlin); C, gash vein or solution enlargement along joint (after Whitney); D, solution cave occupied by ore (black) and cave breccia on bottom, overlain by later breccia and ore, and by breccia fragments (after Walker).

Figure 39B

If such an environment was present in the Naco Formation, then these karst replacements should be considered potential targets in any deep exploration work within the State of Maine mine area.

Since the northeast fracture direction appears to have been the prevalent one since the Precambrian, such karsts may have been aligned along the same northeasterly trend, as have been occupied by the later Laramide silver-lead-zinc-gold veins, which are the subject of the current exploration.

In addition to the Naco Formation, the question remains were there other karst developments lower in the Paleozoic limestone sequence? Any where there was a hiatus in Paleozoic limestone deposition and where that limestone was subject to sub-aerial erosion, there was potential for karst development. An examination of the geologic column (AAPG, 1967) suggests that the Escabrosa limestone (equivalent to the Leadville limestone) underwent a period of sub-aerial erosion as did the Devonian-Martin Limestone. Thus, potential for very deep karst targets in these horizons would be a possibility, as would replacement porphyry copper mineralization, particularly in the Martin, which was very productive at Bisbee.

Possible Changes in Alteration and Mineralization With Depth

The writer has previously described the Tombstone District as being the surface expression of multiple nested porphyry copper systems. Thus, as exploration proceeds more deeply below the State of Maine Mine area, mineralization should grade downwards into a more copper rich and less lead-zinc-silver rich environment, until true porphyry copper mineralization might be encountered at an unknown depth. Increasing grade of contact metamorphic calcsilicate minerals would be expected as would an increasing copper to zinc and lead ratio. Molybdenum might also be expected to increase, and it is conceivable that the rhyolite dikes exposed at the current surface might expand into or be rooted into a granitic pluton, the Extension quartz monzonite or its equivalent. Such a gradation was reported by Ransome in 1914, in the main part of the district, where he mapped complete silicification and calcsilicate alteration on the six hundred foot level of the Pump Shaft workings (Ransome, personal field note summaries, 1914). Further, in Section 36, at the Robbers Roost breccia pipe, drill holes to a 5,000 foot depth by ASARCO in the early 1970's, intersected typical porphyry copper alteration, including disseminated chalcopyrite, secondary K-spar, and purple anhydrite. Such a deep seated porphyry copper target, should it lie below the Tombstone Silver Mines, Inc. property at the State of Maine Mine, is not economically attractive with the currently poor state of the copper industry in the United States. However fluctuating copper prices are the rule, not the exception, and a decade or two in the future may see high copper/moly prices, which would make this an attractive target. Since the size of such a potential porphyry could be substantial, though probably very deep, the economic potential in the future could be significant.

Potential of the State of Maine Area Compared With Known Economic Silver Deposits of Similar Character

In the evaluation of any mineral deposit, without extensive drilling, the geologist must rely on comparisons with known deposits in similar geologic environments. Thus, the geologic model is the primary tool in comparing a potential exploration target to determine whether the costly exploration program might be rewarded sufficiently to justify itself. Other silver deposits geologically comparable to the State of Maine area include the following:

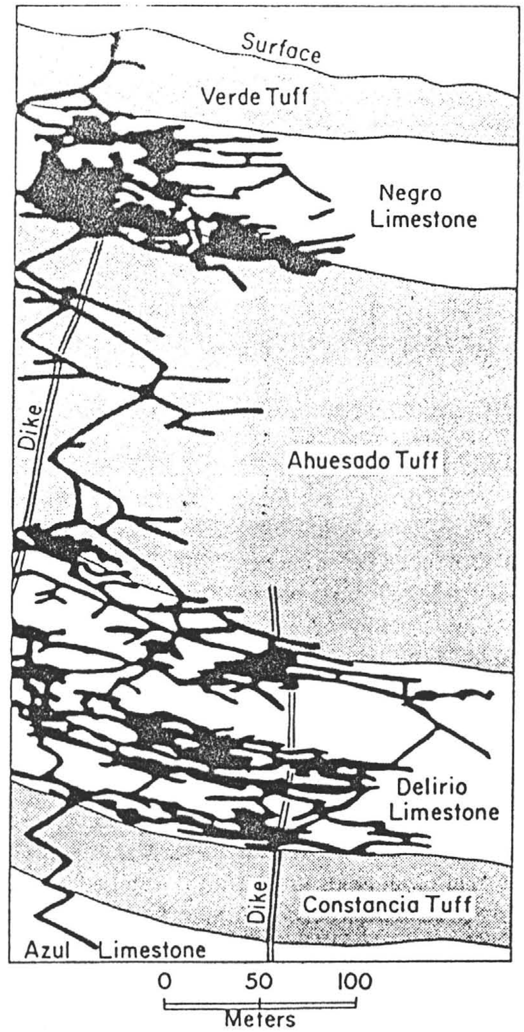
The Constancia Mine, Chanarcillo, Chile

The Constancia Mine, Chanarcillo Chile (see Figure 20-4, (Park & McDieramid, 1975, p. 489, Figure 39, this report), which is hosted by intercalated Cretaceous limestone and tuff, had a zone of supergene enrichment that was a minimum of 130 feet thick to a maximum 500 feet thick below the water table. It produced an approximate total of 100 million ounces of silver, 33 million ounces produced between 1860 and 1885. The production averaged 100 to 240 ounces of silver per ton in the supergene enriched zone. Because of its isolation, only the highest grade material was mined and shipped. Almost all production was from the limestone units. "In places the oxidized (silver) ores cropped out, but elsewhere they were overlain by tuff" (Park & McDiramid, p. 490).

Because none of the underlying limy sedimentary rocks within the State of Maine mine area have been penetrated by either drill holes or mine workings beneath the water table, we could conceivably intersect bonanza type silver mineralization similar to that located at Chanarcillo.

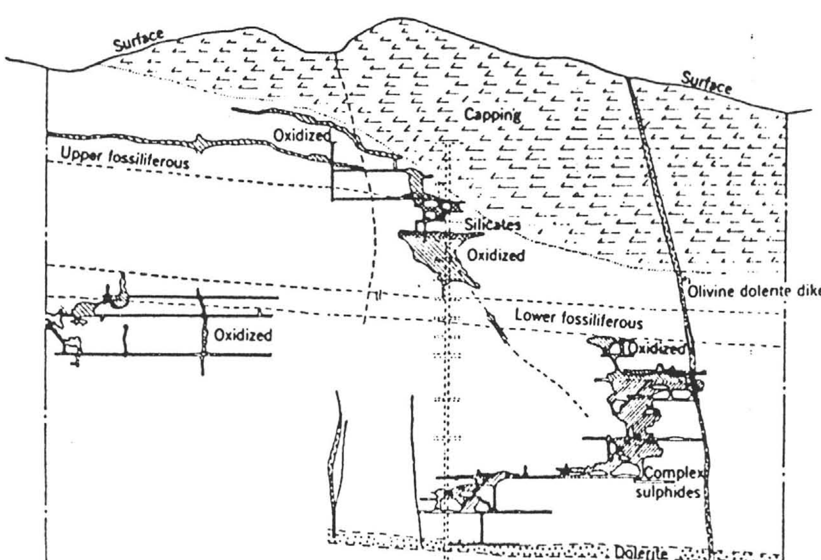
The El Potosi Mine, Santa Eulalia, Hildalgo, Mexico

At the El Potosi Mine, andesite and dacite flows and flow breccias overlie Cretaceous limestone. Veins form mantos, chimneys and irregular replacements in Cretaceous limestones, which are folded into a gentle anticline along which ore bodies are concentrated. This environment is quite similar to the main part of the Tombstone District, and similar to that for which we projected below the State of Maine area. Apparently both low and high temperature environments are present at the El Potosi mine, as indicated by the presence of garnet and other calcsilicates.



Cross section through the Constancia mine, Chañarcillo, Chile, showing the concentration of ore in limestones and the extensions of ore parallel to the bedding. (From Whitehead, 1919, Fig. 2.)

Figure 40A



Cross section of part of the ore bodies of the Potosi mine, Santa Eulalia, Mexico, showing mantos and pipes in limestone (white). The ore is shaded. (From Walker, U.S. Bur. Mines.)

Figure 40B

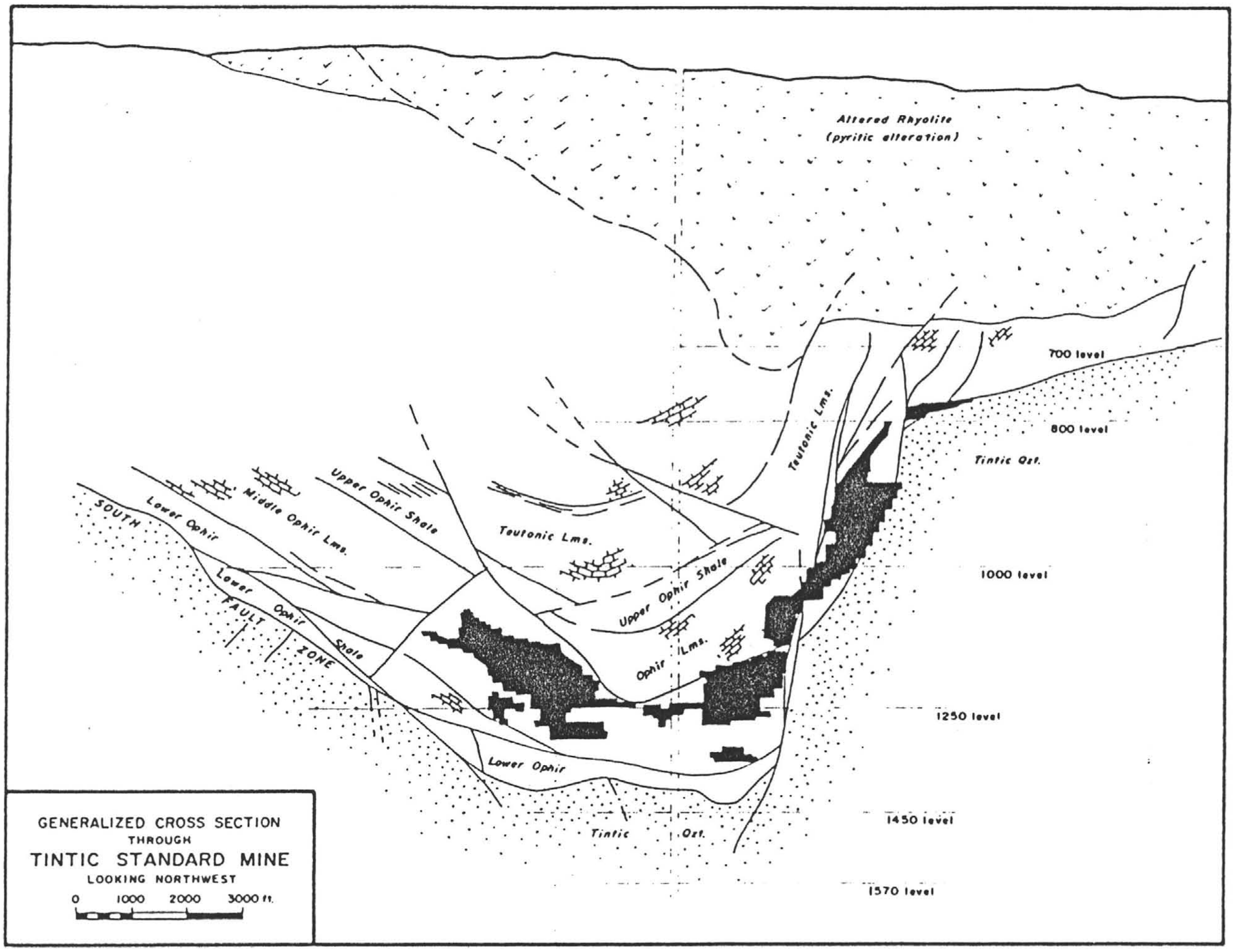
There is garnet and calcsilicate alteration at Tombstone, so here again the environment is similar. The production at the El Potosi mine has been $600 million since 1703, in silver, lead and zinc. This production figure does not represent the current price of silver, but probably silver at $1 or less and similarly low prices for lead and zinc. If we could extrapolate that price to the current price of silver at say $10 per ounce, then the mine may have produced as much as $6 billion in silver.

The Tintic Standard Mine, East Tintic District, Utah

The Tintic Standard Mine is overlain by rhyolite, and the ore is deposited in eugeosynclinal Paleozoics along a synclinal axis, accompanied by much faulting. Major thrust faults have been mapped, which have lead to the discovery of blind ore deposits. Careful geologic and geochemical mapping of the alteration of the surface volcanics lead to the discovery of the Bergin Mine, a blind ore deposit within the same area, in the 1950's. The district has produced silver, lead, zinc, copper and gold mineralization amounting to about $425 million to 1952. These figures do not include any production from the Bergin Mine operated by Kennecott Copper Corp. Further, the values were all at low metal prices in relation to today's prices - gold in the range of $20 to $35 per ounce and silver in the range of $.50 per ounce. The geologic environment, both in host rocks and overlying volcanics, is very similar to the State of Maine area.

The Main Part of the Tombstone District

As a close to this section on comments on the mineral potential of the State of Maine area, a comparison to the main part of the district is worthwhile. In size, they are very similar. Most production has come from a block approximately 6,000 feet square in the main part of the district, where as in the State of Maine area, the greatest intensity of mineralization appears to occupy a block 5,000 feet X 6,000 feet. Perhaps the best comparison might be the area of vein mineralization - that is, length of vein X average width between the two. Since we know, with some degree of accuracy, the production from the main part of the district between 1879 and 1937 (Figure 21), comparing the area of the veins in the two areas and multiplying the vein factor in the State of Maine area X the production in the main district, should give us an estimate of the potential for the State of Maine area. This is shown in the table on the following page:



Generalized cross section through Tintic Standard mine looking northwest.

PRODUCTION POTENTIAL

STATE OF MAINE AREA vs. THE MAIN TOMBSTONE DISTRICT

East edge of Section 16 to W edge of the True Blue claim & N end of the Free Coinage vein to S end of the Clipper vein		Eastern edge of the Contention - Silver thread W to the Scheiffelin Granodiorite & from the Vizina shaft to the Prompter fault	
PHYSICAL SIZE:	6,000' X 5,000'	PHYSICAL SIZE:	6,000' X 6,000'
TOTAL VEIN LENGTH:	29,000'	TOTAL VEIN LENGTH:	63,000'
TOTAL AVERAGE VEIN WIDTH:	28'	TOTAL AVERAGE VEIN WIDTH:	5-15' (not clearly reported)
TOTAL PRODUCTION:	338,000 oz. Ag 787 oz. Au	TOTAL PRODUCTION:	33,468,647 oz. Ag 257,785 oz. Au

Using vein (fissure) length X width of the main district veins vs. the same for the State of Maine area to calculate potential for the State of Maine area;

Area of vein (fissures) for main district = 63,000' in length
X 10' average width
630,000 sq. ft.

Area of vein (fissures) for SOM area = 29,000' in length
X 28' average width
812,000 sq. ft.

812,000 State of Maine sq. ft. / 630,000 Main district sq. ft. = 1.29% of the main district is the State of Maine area potential

34 million oz. Ag produced X 1.29% = 43 million oz. Ag potential for the State of Maine area

258 thousand oz. Au produced X 1.29% = 333 thousand oz. Au potential for the State of Maine area

Figure 42

When compared in this way, it appears that because the State of Maine veins seem to have a greater average width even though the length so far identified is not as great as the main district, the total production in the State of Maine area might be larger than that in the main part of the district. Since production in the district ceased because of lowered silver prices rather than exhaustion of ore (Figure 18), it is quite likely that the main part of the district is far from exhausted, suggesting the potential for the State of Maine area is greater also.

The only difference the writer can discern on concluding this study between the two areas, is that within the State of Maine alteration zone, the strongest parts of the veins are contained within the non-reactive Uncle Sam tuff, which chemically allows the leaching of silver and gold values out of the surface, to be precipitated below the water table, out of site, and where they were beyond the reach of miners in the 1880's. In the main part of the district, reactive limestone neutralized supergene solutions, resulting in bonanza grade precious metal ore bodies now exposed at or near the surface.

Using a price of $10 silver and $400 gold, estimated potential dollar value of precious metals in the State of Maine area appears to be $563 million.

EXPLORATION PROPOSAL

Phase I

I. General

A. Geologic, structural and alteration mapping

1. 1" = 50' on color aerial photography matched to topography NE1/4, Section 16

a.	Photo enlargements of 200 scale topo map	$ 200	
b.	Color photo enlargements	300	
c.	10 days geologic mapping and sampling @ $250/day, + $15 FTL, + $10 vehicle, + $20 ATV, x 10, + $135 mobe and demobe = $295/day x 10 + $135 =	3,085	
	TIME: Consulting geologist 10 days	--------	
			$ 3,585

2. 1" = 200' on color photo base matched to the 1" = 200' Topography base map on remainder of lease area (map area) including all of Section 16, Horne lease ground, etc.

a.	U.S.G.S. topo enlargement for areas not covered by 200 scale map	$ 200	
b.	Color photo mosaics to cover area and 200 scale topo matched to color air photos	1,000	
c.	Geologic mapping and sampling:		
	1). 30 days @ $295/day (incl. FTL)	8,850	
	2). 6 trips mobe/demobe to Tucson x $135	810	
	TIME: Consulting geologist 30 days	--------	
			$ 10,860

3. Sampling for above - R. C. geochem for Cu, Pb, Zn, Mo, Ag, Au, & Hg

a.	Sampler - $7/hour or $56/day x 40 days	$ 2,240	
b.	Electric sampling hammer & equipment	1,700	
c.	Assays - assume 40/day x 40 days or 1,600 samples, assaying for Cu, Pb, Zn, Mo, Au, & Ag, assume in-house cost of $10/ea. run by TSM lab (w/registered assayer)	16,000	
d.	Hg soil vapor analysis by Jerome Instrument Co. Gold Film Mercury Detector @ $3.25/sample	5,200	
			$ 25,140

4. CAD reduction and plotting of data, cross section, etc. 40 days by geologist/cad operator @ $15/hr + $5/hr for computer = $160/ day x 40 days

	$ 6,400	
TIME: Geologist/cad operator 40 days	--------	
		$ 6,400
	TOTAL A	$ 45,985

B. Accumulation, organization and computerized data base design and entry of all existing information. This should include all previous assay information and its map location, reports, correspondence, drill holes and corresponding logs, property information, etc. Further, the computer data base will be designed for data retrieval of all information acquired in the Tombstone Mining District in the future.

1. Accumulation and organization by geologist/ CAD operator – 10 days x 8 hrs x $15/hr	$ 1,200	
TIME: Geologist/CAD operator 10 days	--------	
		$ 1,200
2. Design of computer data base and entry of all data – 30 days x 8 hrs x $15/hr	$ 3,600	
Computer @ $5/hour	1,200	
TIME: Database consultant 30 days	--------	
		$ 4,800
3. Two copies of all data, estimated 5,000 pages x 2 x $.15/copy	$ 1,500	
		$ 1,500
	TOTAL B	$ 7,500

C. Core board construction

1. Existing holes – for coarse fractions, fine fractions and panned fractions only where ore values occur. Estimated 4 hrs/100' hole x $7/hr = $28 + $10/board = $38 x 170 holes	$ 6,460	
TIME: Sampler 85 days or 17 weeks	--------	
		$ 6,460
	TOTAL C	$ 6,460

D. Re-log and computer print log of all available drill holes.

1. Oxy Min holes
2. Santa Fe holes
3. Austral Oil holes
4. Joe Graves supervised TSM holes

Sampler – estimate 14 days @ $7/hr x 8 hrs to move core and cuttings to State of Maine core building and rebox and organize core	$ 784	
Consulting geologist estimated 15 days @ $275/day (incl. FTL) + $270 mobe & demobe = $4,125 + $270	4,395	
Computer and software @ $5/hour	500	
TIME: Sampler 14 days Consulting geologist 15 days	--------	
		$ 5,679
	TOTAL D	$ 5,679

E. Consulting geologist time to analyze, interpret, reduce and prepare report on above - all office time @ $250/day x 40 days.

This will include some geologic supervision of drill holes in II and interpretation of results. The logging will have to be additional work. 10,000

TIME: Consulting geologist 40 days

		$ 10,000
	TOTAL E	$ 10,000
	TOTAL I.	$ 74,440

Summary

TOTAL "A"	$45,985
TOTAL "B"	$ 7,500
TOTAL "C"	$ 6,460
TOTAL "D"	$ 5,679
TOTAL "E"	$10,000
TOTAL I	$75,624

Time to complete - 75 days

or 15 weeks

or 3.35 months

EXPLORATION PROPOSAL

Phase II

II. Drilling program to test for ore grade mineralization along strike length of the Clipper vein

A. Clipper Vein - length exposed approximately 2,000', approximate average width of 75'. Objective to drill out 2 million tons of mixed high and low grade material, open pitable to a depth of 180'.

The average grade that might be expected in the veins would be equivalent to the Phelps Dodge assays, of State of Maine levels 1 and 2, in 1915, showing an average grade of 1.98 oz. Ag and 0.017 oz. Au. If 10% of total tonnage will average 5 oz. which can be selectively mined, then there will be 1,800,000 tons averaging 1.644 oz. Ag/ton and 0.017 oz. Au/ton.

1. The Clipper will be drilled at 200 ' intervals initially, using the 5 hole pattern depicted in Figure 43. If the 200' station spacing shows encouraging results, drilling will continue with intermediate station spacing so that a 100' station spacing will result. This pattern will require 710' of air track drilling per station. It is designed to test continuity of ore and to:

a. Show leaching and/or enrichment patterns with depth.

b. Determine with some accuracy the dip of the vein to a depth of 45' for the hanging wall and 120' to 180' for the foot wall.

c. Test sediments below the Uncle Sam Tuff, if the tuff is penetrated.

d. Test for presence of an enriched silver sulfide blanket within open pitable depths.

Drilling cost - $2/foot x 710' = $1,420/ station x 20 stations = $ 28,400

TIME: 2 days per station and one day moving and unexpected delay. Therefore, 2.5 days per station x 20 stations = 50 days divided by 5 days/week = 10 weeks

----

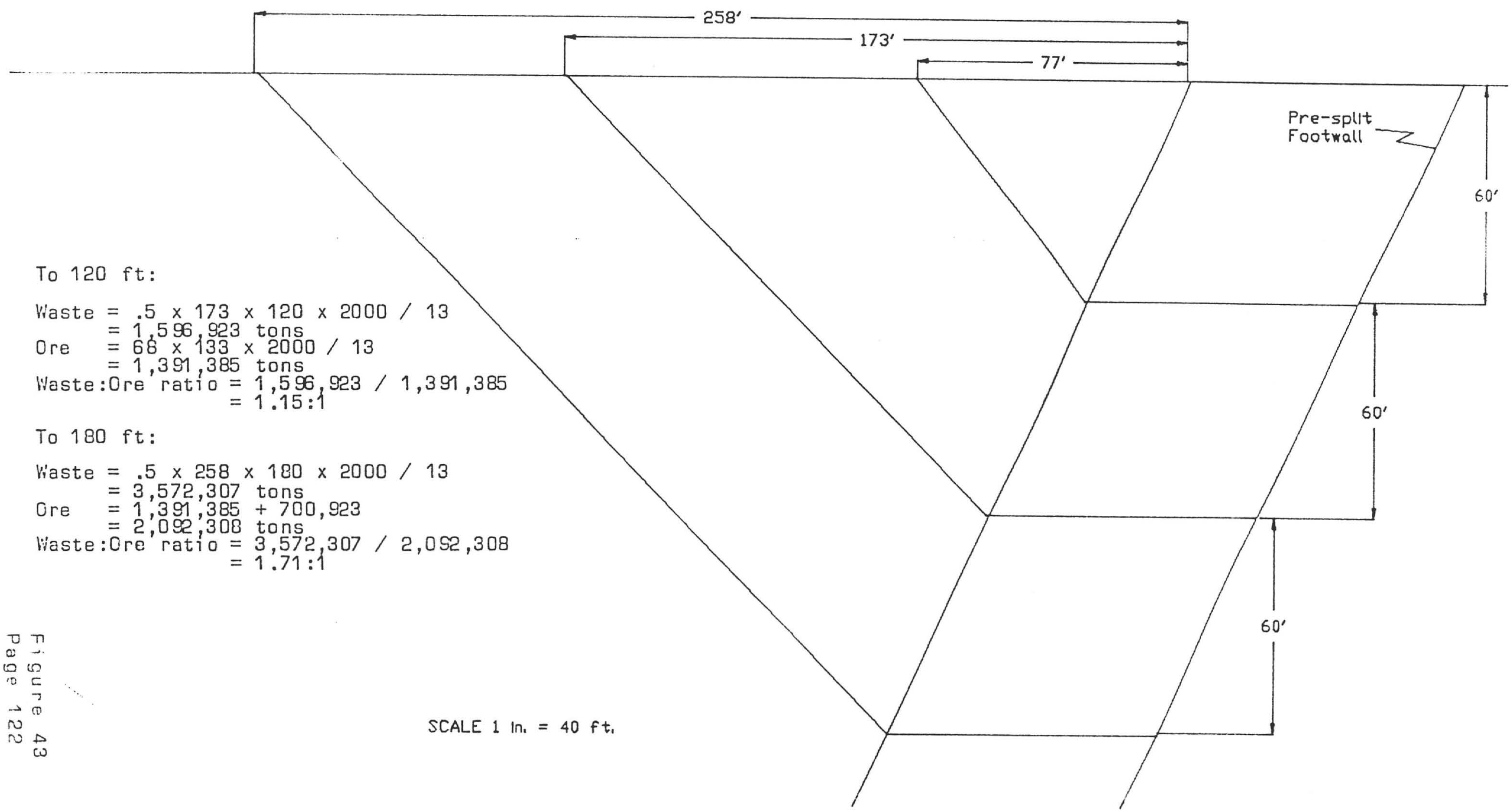
$ 28,400

2. Samples should be taken at 5' intervals from which core boards should be constructed. Also samples should be assayed for Au, Ag, Pb, Zn, Cu and Mo, at least initially. The purpose of these assays is to:

a. Conduct trace element studies that will help in understanding the development (paragenesis) of the vein and predict where higher grade ore might be found.

1). Lead, zinc, copper - a guide to where silver might have been before oxidation and leaching.

WASTE:ORE RATIO CALCULATIONS
CLIPPER VEIN



To 120 ft:

Waste = .5 x 173 x 120 x 2000 / 13
= 1,596,923 tons
Ore = 68 x 133 x 2000 / 13
= 1,391,385 tons
Waste:Ore ratio = 1,596,923 / 1,391,385
= 1.15:1

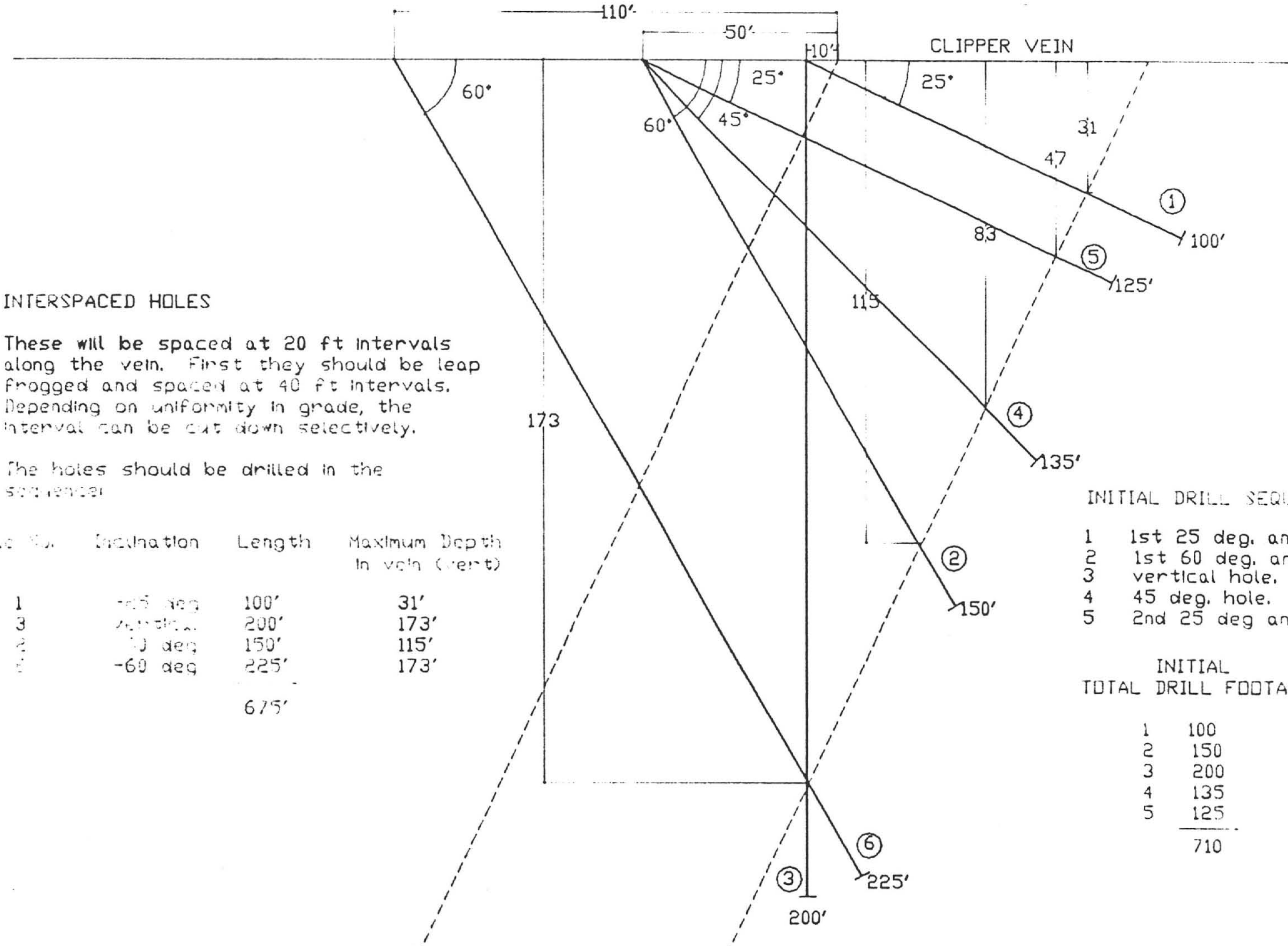
To 180 ft:

Waste = .5 x 258 x 180 x 2000 / 13
= 3,572,307 tons
Ore = 1,391,385 + 700,923
= 2,092,308 tons
Waste:Ore ratio = 3,572,307 / 2,092,308
= 1.71:1

SCALE 1 In. = 40 ft.

Figure 43

SCHEMATIC OF DRILL PLAN ON CLIPPER VEIN



INTERSPACED HOLES

These will be spaced at 20 ft intervals along the vein. First they should be leap frogged and spaced at 40 ft intervals. Depending on uniformity in grade, the interval can be cut down selectively.

The holes should be drilled in the sequence:

Hole No.	Inclination	Length	Maximum Depth in vein (vert)
1	[illegible] deg	100'	31'
3	vertical	200'	173'
[illegible]	[illegible] deg	150'	115'
[illegible]	-60 deg	225'	173'
		675'	

INITIAL DRILL SEQUENCE

1 1st 25 deg. angle hole.
2 1st 60 deg. angle hole.
3 vertical hole.
4 45 deg. hole.
5 2nd 25 deg angel hole.

INITIAL
TOTAL DRILL FOOTAGE

1	100
2	150
3	200
4	135
5	125
	710

SCALE 1 in. = 40 ft.

2). Since these elements occurred with silver before it was leached, increasing trace element content with depth might indicate approaching better silver grades.

b. To determine whether cyanicides (copper, zinc, lead) will cause a significant metallurgical reagent consumption with depth.

Cost will be $10/sample interval x 710'/5' sample intervals = 142 x $10 = $1,420 x 20 drill stations	$ 28,400	
TIME: Same as drilling program (10 weeks)	________	
		$ 28,400

3. Core board construction - core boards (cutting boards) should be constructed of all holes. Scale will be 1" = 10', coarse and unpanned material will be posted for all intervals. Panned material will be posted for ore intervals.

Assume 4 samples/hour @ $7/hour x 142 samples/station x 20 dill stations = 2,840 samples divided by 4/hour = 710 hours x $7/hour	$ 4,970	
TIME: Sampler - 89 man days - thus need 2 samplers for 45 days or 9 weeks	________	
		$ 4,970

4. Geologic logging and correlation of drill holes - estimated 2 hours/board and 140'/board (28 samples) - 100 boards x 2 hours @ $34.38 (incl. FTL) (assumes logs plotted with computer program)

(Geologic logging, above)	$ 6,876	
Computer @ $5/hour x 200	1,000	
Consulting Geologist 200 hrs/40 hr/wk = 5 weeks	________	
		$ 7,876

5. Ore calculation report and recommendations

a. Computer reduction and calculation (by cross-section method) 1/2 day/station (4 hours) x $20/hour x 20 drill stations	$ 1,600	
TIME: Geologist & CAD station 80 hours or two weeks		
b. Consult geologist interpretation 4 hours/station x 20 stations x $34.28 (incl. FTL)	2,750	
Consulting Geologist 80 hrs/40 hrs/wk = 2 weeks		
c. Report and recommendations - 5 days @ $250/day	1,250	
		$ 5,600

6. General supervision of drilling, sampling, ore reserve calculation, etc. by senior geologist

Consulting geologist 80 hours x $36.88/hr. $ 2,950

TIME: Consulting geologist - 2 weeks

		$ 2,950
	TOTAL A	$ 78,196
	TOTAL II.	$ 78,196

SUMMARY

Total drill footage = 20 stations @ 710'/station = 14,200'

Average cost per foot for entire program = $\frac{\$78,196}{14,200}$ = $5.51/foot

Cost of Phase I	$ 75,624	- 15 weeks
Cost of Phase II	$ 78,196	- 10 weeks
	$153,820	25 weeks - 4.33 wks/month = 5.8 months

EXPLORATION PROPOSAL

Phase III - Alternative A

Development Drilling

III. Phase III will consist of detailed drilling along the Clipper vein at 20' intervals. There are two ways this can be done: A. will be the same way Phase II was done, at a cost of $5.51/foot. B. will be done by using the UNC Silver MAP to probe the holes. No samples will be taken, and thus, no geologic logging, coreboards, etc. will be done, and the cost will be $2.10 per foot

A. Secondary drilling along the Clipper vein, drilling holes ----- (see Figure 43). Total drilling per station is 675'. Samples taken as in Phase II, at an average cost of $5.51/foot drilled.

1. First round - holes spaced 40' from the holes with the most erratic values drilled in Phase II.

20 stations x 675'/station = 13,500 feet x $5.51/foot =	$ 74,385	
TIME: 2.5 days per station = 50 days or 10 weeks	--------	
		$ 74,385

2. Second round of holes spaced 20 feet from the most erratic holes from round 1.

20 stations x 675'/station x $5.51/foot	$ 74,385	
		$ 74,385
Time: 10 weeks		

3. Third round holes will be placed 20' from the most erratic holes in the 2nd round

Third round holes will be placed 20' from the most erratic holes in the 2nd round	$ 74,385	
TIME: 10 weeks	--------	
		$ 74,385

4. Fourth round holes will be centered in the remaining 40' intervals left after Round 3. This final round will complete a 20' drill station spacing along the 2,000' foot length of the Clipper vein.

(Fourth round)	$ 74,385	
TIME: 10 weeks or	--------	
		$ 74,385
TOTAL TIME: 40 weeks or 9.24 months	TOTAL A	$297,540

Summary of III. A.

Total footage drilled is 54,000' over 80 stations with 5 holes each for a total of 400 holes and 10,800 five foot assay intervals.

TIME: 40 weeks or 9.24 months

NOTE: If values are found to be very uniform, the station spacing can be increased lowering the total cost to drill out the mineral zone.

Phase III - Alternative B

Development Drilling

B. Secondary drilling along the Clipper vein, drilling hole 4 from the typical drill station described in Figure 43. Total drilling per station is 675 feet. However, no drill cuttings will be collected, thus increasing drill penetration rate & no core boards and no geologic logging. When completed, each hole will be probed with the UNC Silver MAP. Re-calculating the average cost per foot from Phase II if the above procedure is used, follows:

II. A. 1.

1. Drilling - no slowing for samples and no need for an assistant - assume cost of $1/foot	$ 13,500	
		$ 13,500
2. Assays for silver only with UNC Silver MAP, (using UNC Silver MAP promotional data of a daily cost of $287/day or $1,500 divided by 2,500') = $0.60/foot surveyed x 13,500 feet =	$ 8,100	
		$ 8,100
3. Core board construction - none		
4. Geologic logging - none		
5. Ore calculation report and recommendations	5,600	
		$ 5,600
6. General supervision 1/2	1,500	
		$ 1,500
		$ 29,820

7. Cost per foot = $28,700 divided by 13,500' = $2.13/foot

(1) First round drilling as in III. A. 1. 20 stations x 675' = 13,500 x $2.13/foot	$ 28,700	
TIME: 1.5 days/station x 20 = 30 days divided by 5 days/week = 6 weeks		
(2) Second round of drilling as In III. A. 2.	28,700	
TIME: 6 weeks		
(3) Thid round of drilling as in III. A. 3.	28,700	
TIME: 6 weeks		
(4) Fourth round of drilling as in III. A. 4.	28,700	
TIME: 6 weeks		
		$114,800
TOTAL TIME = 24 weeks or 5.5 months	TOTAL B	143,500

Note: If values are found to be very uniform, the station spacing can be increased, lowering the total cost to drill out the mineralized zone.

Recommendations for Phase III - sufficient detail on geology, alteration, trace elements, dip of the vein, and metallurgical character will have been acquired by the end of Phase II so that further sampling as in III. A. will be overkill. I recommend III. B. using the Silver MAP to save money and time.

C. Metallurgical testing

1. Fifty pound column (bucket) tests from drill cuttings
   a. Determine solubility of p.m.
   b. Cyanide consumption related to oxide Cu, Zn & Pb
   c. Lime consumption — $ 5,000
2. Test pitting (trench) cost and metallurgical testing on mine run samples
   a. Trenches to get samples from 40' depth every 500' or 4 trenches $5,000/trench x 4 = — 20,000
      1. Screen tests
      2. Agglomeration tests
      3. Bucket tests — 10,000
   b. Small pilot tests - 100 tons each
      1. 100 ton test leaches
         a. 4 low grade mine run — 2,500
         b. 4 high grade agglomerated — 2,500

$ 40,000

TOTAL C $ 40,000

Summary

			Total Recommended Cost Phase I, II, III-B, III-C
Phase I	(15 weeks)	74,440	
Phase II	(10 weeks)	78,196	
Phase III-A		312,968	$336,136
Phase III-B	(24 weeks)	143,500	
Phase III-C	(6 weeks)	40,000	
	55 weeks)		

EXPLORATION PROPOSAL

Phase IV

Introduction

IV. Phase IV drilling exploration of other veins on the Tombstone Silver Mines, Inc. property. As measured by geologic mapping to date, there are 29,000 feet of unexplored or partially explored silver bearing veins on the Tombstone Silver Mines, Inc. property. It should be noted that with three days of geologic mapping on a new color air photo base at 1" = 50', it was possible to identify approximately 3,000' of previously unrecognized vein structures. Thus, additional detailed mapping proposed in Phase I may identify additional vein length.

A. Identification of and calculation of average vein width on the Tombstone Silver Mines, Inc. property.

		L		W		
1. May vein						
	a.	700'	x	50'	=	35,000
2. Trailer vein system						
	a. Trailer Middle	1,100'	x	20'	=	22,000
	b. Trailer West	300'	x	20'	=	6,000
	c. Trailer East	500'	x	30'	=	15,000
3. State of Maine						
	a.	4,000'	x	50'	=	200,000
4. Merrimac veins						
	1. From Brother Jonathan to 700' north of Merrimac #1 pit	2,000'	x	20'	=	40,000
	2. Merrimac-Free Coinage	1,300'	x	50'	=	65,000
	3. Free Coinage W. vein	1,100'	x	20'	=	22,000
5. Brother Jonathan vein		1,000'	x	20'	=	20,000
6. Triple X vein		1,000'	x	25'	=	25,000
7. Lowell vein		1,000'	x	20'	=	20,000
8. Gold Bug vein		500'	x	200'	=	100,000
9. San Pedro veins						
	a. San Pedro	1,800'	x	30'	=	54,000
	b. San Pedro splays	900'	x	50'	=	45,000
10. Fox Wash veins						
	a. 513,500 E to 514,000 E	1,000'	x	50'	=	50,000

COMPUTER CALCULATIONS OF VEIN AREAS

Central Portion of the NW 1/4 of Section 16
State of Maine Area
(see measured veins - geologic map, Figure 29)

Vein	Area (square feet)	Length (feet)	Average Width (feet)
May	76,821	842	91
Clipper	107,284	1,205	89
Crane West	2,619	130	20
Crane East	10,166	325	31
Clipper West	10,636	215	50
Connection of Clipper with Clipper West	9,270	178	52
Clipper Blob	8,764	162	54
Trailer West	9,382	493	19
Trailer Mid	10,816	579	19
Trailer East	25,237	636	40
TOTALS	270,995 sq ft	4,765 ft	57 ft

Indicated tonnage, not including the Clipper vein, based on rock density of 13 cubit feet per ton.

For each 13 feet of depth, 1 ton of rock for each square foot of area will be generated. Thus:

Total square feet - Clipper vein square feet X 1 square foot X 13 feet in depth - 13 cubic feet per ton X 10 intervals of 13 feet = tonnage to a depth of 130 feet. Thus:

270,995 - 107,284 X 1 ton X 0 = 163,711 X 10 = 1,637,110 tons to a depth of 130 feet, or

2 x 1,637,110 = 3,274,220 tons to 260 feet

Figure 45

b. 514,000 E to 518,500 E

	5,000'	x 10' =	50,000
11. Chance vein	4,000'	x 10' =	40,000
12. Franklin	1,500'	x 15' =	22,500
	29,000'		796,500

796,500' divided by 29,000' = 27.466' or 28' average width

Assume on the average vein ore grade may equal the average P.D. assays for the first and second levels of the State of Maine, i.e. 1.98 Ag and 0.017 Au. Also that a high grade portion averaging 5 oz. Ag comprises 10% of the vein tonnage, then:

For each 100 foot of average vein to a depth of 105' (see pit cross section), 22,615 tons are generated:

High grade:	2,262 tons @ 5 oz. Ag x 80% = 9,048 oz x $ 6 =	$54,288
	2,262 tons @ 0.017 oz. Au x 90% = 34.61 oz x $300 =	10,383
		$64,671
Low grade:	20,353 @ 1.644 oz Ag x 60% = 20,077 oz. x $6 =	$120,457
	20,353 @ 0.017 oz Au x 70% = 242.2 oz. x $300 =	72,660
		$193,117
		$257,788

Total oz. Ag = 29,125

Total oz. Au = 276.81

Total potential tonnage if all identified veins are mineable to a depth of 105' is 22,615 tons x 290 = 6,558,350 tons

Gross precious metal recovery is:

Ag 29,125 x 290 =	8,446,250 x $6 =	$50,677,500
Au 276.81 x 290 =	80,275 x $300 =	24,082,470
		$74,759,970

EXPLORATION PROPOSAL

Phase IV

IV. Exploration on remainder of veins

A. Surface sampling

1. Dumps that remain

a. 2 samples from each dump assayed for Ag, Au, Cu, Pb, Zn, & Mo, Mn, Hg @ $15/sample $ 2,400

b. Sample collection with small backhoe @ $25/hour x 8 hours x 5 days 1,000

c. Geologic supervision and labor
1). Geologic supervision 5 days x $295/day (incl. FTL) 1,475
2). Helper @ $7/hour x 8 hours/day x 5 days 280

TOTAL A $ 5,155

B. Drilling exploration along the other veins

1. Round 1 at 400' spacing

a. Initial drill interval of 1 drill station every 400 feet. Number of drill stations = 29,000' divided by 400' = 72.5 or 73 stations

b. Cost of program

1. Footage/station 760 x $5.51 = $4,187.6/station

2. 73 stations x $4,187.6/station = $305,695

c. Time: Use time for Phase II drilling i.e. 10 weeks x 40 hrs/week divided by 14,200' = 0.0281 hours/foot. This round = 55,480' x 0.0281 = 1,558 hours divided by 40 hrs/week = 39 weeks divided by 4.33 weeks/month = 9.0 months

$305,695

2. Round 2

a. As in round 1, but station spacing at 200' intervals

b. Cost as in Round 1 $305,695

c. Time as in Round 1 - 9 months

$305,695

THE AVERAGE VEIN

DRILLING ORDER

	Inclination	Depth
1	-25 deg	60'
2	verticle	145'
3	verticle	225'
4	-60 deg	125'
5	-45 deg	105'
6	-25 deg	100'
		760'

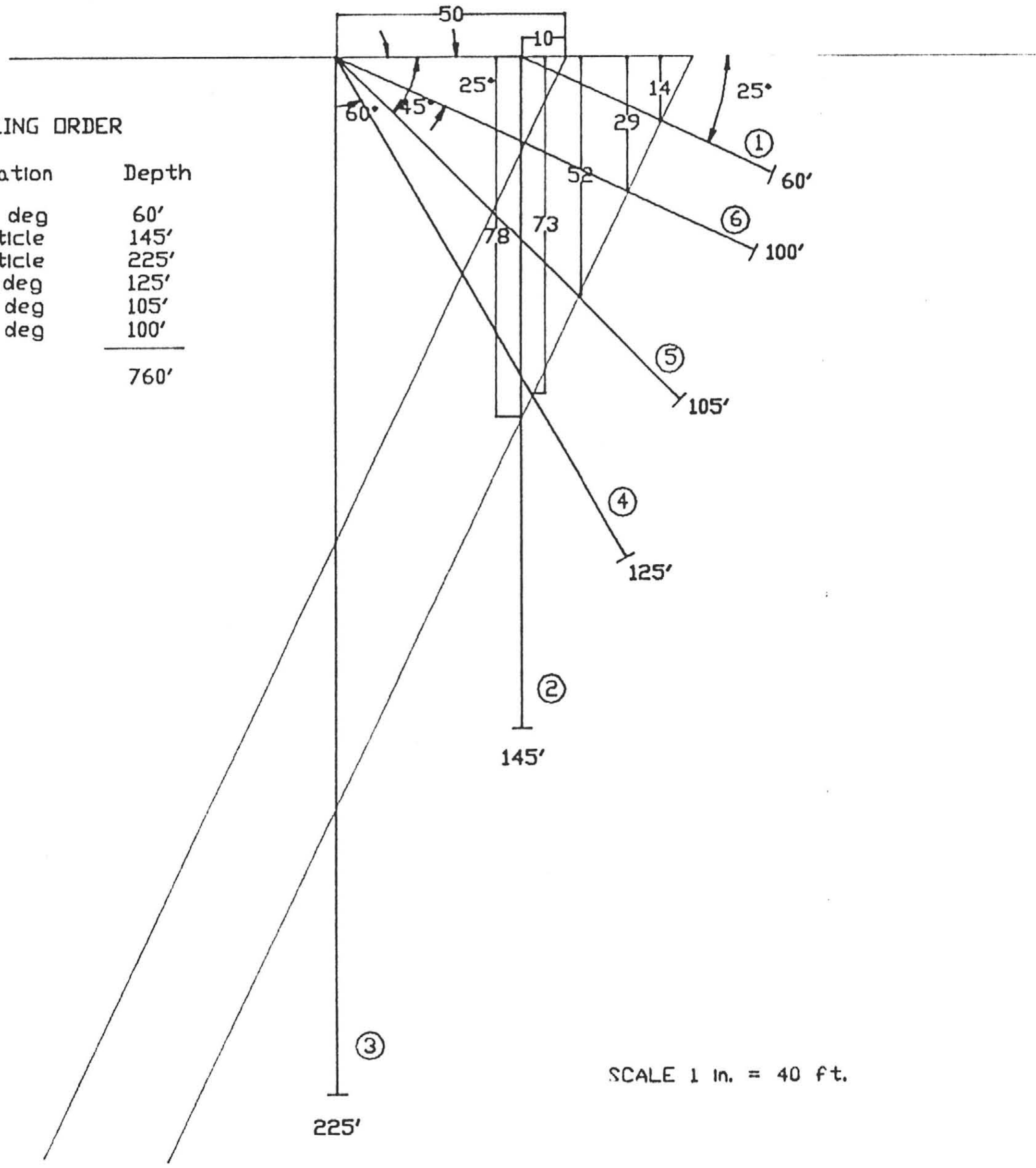
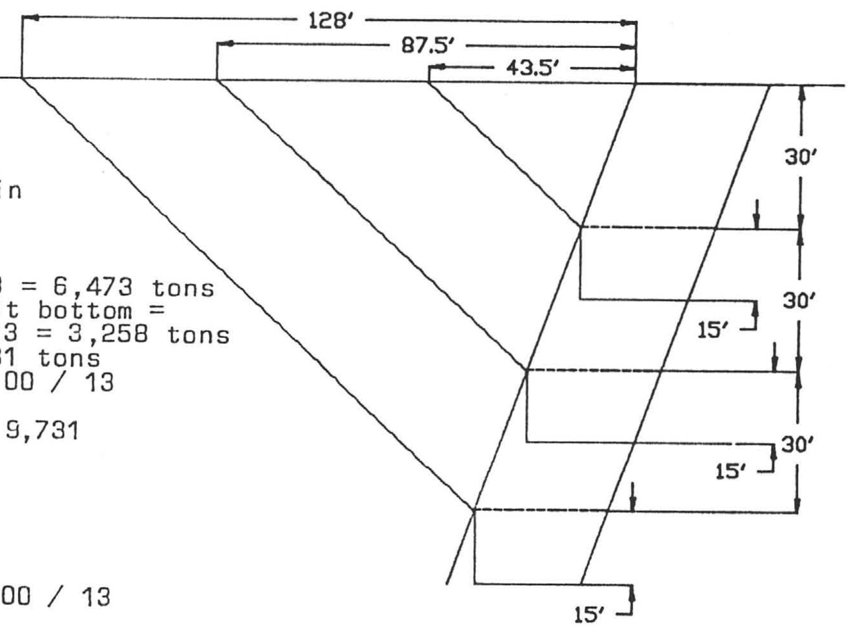


Figure 46

WASTE:ORE RATIO CALCULATIONS
AVERAGE VEIN



Assume Tonnage/100' of vein

To 30 ft:

Ore = 25.5 x 33 x 100 / 13 = 6,473 tons
backhoe cut below pit bottom =
476 - 52.5 x 100 / 13 = 3,258 tons
= 6,473 + 3,258 = 9,731 tons
Waste = .5 x 43.5 x 30 x 100 / 13
= 5,019 tons
Waste:Ore ratio = 5,019 / 9,731
= 0.52:1

To 60 ft:

Ore = 6,473 x 2 + 3,258
= 16,204 tons
Waste = .5 x 87.5 x 60 x 100 / 13
= 20,192 tons
Waste:Ore ratio = 20,192 / 16,204
= 1.25:1

To 90 ft:

Ore = 6,473 x 3 + 3,258
= 22,677
Waste = .5 x 128 x 90 x 100 / 13
= 44,307 tons
Waste:Ore ratio = 44,307 / 22,677
= 1.95:1

Note: Ore mined 15' deeper than last bench by underhand mining with backhoe. This reduces the stripping ratio.

SCALE: 1 in. = 40 ft.

3. Round 3

a. Detailed drilling along the veins at 100' intervals. But UNC Silver MAP will be used, no samples taken, no core boards made. Costs will be about the same per foot as in III.B., and footage the same as in IV.B. 1 & 2

55,480' x $2.10/foot = $116,508

TIME: See III.B.1.
approximately 2 days/station x 73 stations = 146 days divided by 29 weeks divided by 4.33 weeks/month = 6.74 months

$116,508

4. Spacing at 40' intervals $116,508

TIME: As in Round 3 - 6.74 months

$116,508

5. Spacing at 20' intervals $116,508

TIME: Same as above - 6.74 months

$116,508

TOTAL TIME: 38.2 months or 3.2 years

TOTAL B $960,914

TOTAL IV $966,069

SUMMARY OF EXPLORATION COSTS ALONG 29,000' OF OTHER VEINS

	Time	Expense
IV.B. Round 1 & 2	18.0 months	$611,390
IV.B. Rounds 3, 4 & 5	20.2 months	$349,914
	3.2 years	$960,914

NOTE: If mineralization is uniform, station spacing can be increased, lowering the total required drilling, and cost to test the mineral zone.

There are some alternatives here. As a low cost expedient, holes in Round 1 could be drilled more rapidly without collecting samples, and the holes probed with the UNC Silver MAP tool. This would drop the initial cost to $116,508 and determine whether drilling and sample collecting were justified. It would have the drawbacks that no samples would be collected, and therefore little would be known about the geology. An alternative would be to collect samples every 10 feet and make core boards from those where assays were high so that geology could be interpreted

EXPLORATION PROPOSAL

Phase V

V. General geologic, structural and alteration/ mineralization mapping, central Tombstone Mining District, T.D.C. mining claims and others

A.	Target all claim corners	$ 5,000	
B.	Base triangulation grid	$ 3,000	
			$ 8,000
C.	Color aerial photography and topographic mapping		
	1. 1" = 200'		
	2. 1" = 50'	$ 10,000	
			$ 10,000
D.	Matching color photos to the topographic map	$ 1,000	
	TIME: A, B, & C is 1.5 months		
			$ 1,000
E.	Digitizing maps of all surface and underground workings, geology, alteration, mineralization, drill holes, etc. for entry on same scale base map		
	1. CAD camera addition to computer	$ 4,000	
	2. Geologist/CAD operato for one month at $20/hour x 40 hrs/week x 4.33 weeks/month	3,464	
	TIME: 1 month		
			$ 7,464
F.	Initial field mapping and geochemical sampling		
	1. Consulting geologist - 1 month		
	a. 1 month x 4.33 wks/month x 40 hrs/wk x $36.88 (Incl. FTL)	$ 6,388	
	b. Mobe and demobe Tucson-Tombstone 4 round trips x $135/trip	540	
			$ 6,928
	2. Sampling		
	a. 2 samplers @ $7/hour x 40 hrs/wk x 4.33 wks/mo x 1 month	$ 2,425	
	b. Electric sampling hammer & equipment	1,700	
	c. Assays for Au, Ag, Pb, Zn, Cu, Mo, Mn & Hg @ $15/ea. x 80 samples/day x 5 days/ week x 4.33 wks/mo. x 1 month	25,980	
	TIME: 1 month		
			$ 30,105

G. Data reduction

1. Geologist and computer at $20/hour x 8 hours/ day x 22 days = $ 3,520

TIME: 1 month

$ 3,520

H. Subsurface data plotting & interpretation of cross sections

1. Geologist & CAD 40 days x 8 hrs/day x $20 $ 6,400

TIME: 2 months

$ 6,400

I. Supervision, interpretation and analysis of drill program planning and report preparation by consulting geologist

1. 40 days x 8 hrs/day x 34.88/hr.(incl. FTL) $ 11,002

2. Mobe and demobe Tucson to Tombstone - 4 round trips at $135/trip 540

TIME: 2 months

J. Repro graphics (photo, blueprinting, etc.) 2,000

	$ 18,542
TOTAL V	$ 86,959
Contingency 20%	17,392
	$104,351

TOTAL ELAPSED TIME ABOUT 6 MONTHS

EXPLORATION PROPOSAL

Phase VI

VI. Geophysical mapping of veins and alteration zones

A. Magnetics, radiometrics & VLF run simultaneously	$ 5,000	
B. I.P.	15,000	
TIME: 2 months		
	TOTAL VI	$ 20,000

EXPLORATION PROPOSAL

Phase VII

VII. Drilling Phase 1, main district

A. Equivalent to the Phase III drilling along the "other" veins in the State of Maine area

1. 73 stations x 760'/station x $5.51/foot = 55,480 feet x $5.51/foot — $305,695

TIME: 9 months

TOTAL VII $305,695

EXPLORATION PROPOSAL

Phase VIII & IX

VIII.	Drilling Phase 2 same as Round 2 State of Maine area	$305,390	
			$305,390
IX.	Drilling Phase 3 - same as Rounds 3, 4, & 5 State of Maine Mine area using UNC Silver MAP		
	A. 55,480' x $2.10	$116,508	
	B. 55,480' x $2.10	116,508	
	C. 55,480' x $2.10	116,508	
			$349,524

EXPLORATION PROPOSAL

Phase X

Deep rotary drill holes to explore for high grade supergene enriched silver veins in the State of Maine area below the water table

I. Six inch rotary holes using air & regular circulation - price quote from Venture Drilling Company, Tucson, Arizona

A. 25 holes to 1,000' depth @ $7.30/foot = 25,000' x $7.30 = $182,500

B. Assume supverision, assay & site prep. is $2.70/foot x 25,000' = 67,500

$250,000

II. Recommendations and objectives for each drill hole is taken from Briscoe, J. A., 19073, P. 55-65.

Hole P-1

P-1 is located on the ridge above and to the northwest of the Brother Jonathan inclined shaft. Assuming the State of Maine vein is approximately 15 feet in thickness and dipping at approximately 40 degrees, P-1 should cut the State of Maine vein at a depth of 195 feet to 230 feet. The hole should be drilled a minimum of 250 feet deep, and close track should be kept of cuttings near the bottom. If it continues in altered rock, the hole should be deepened until fresh rock is encountered. As indicated on Section H-H' (Attachment ---), the base of the Uncle Sam tuff should be encountered at approximately 450 to 500 feet. It is the writer's opinion that this hole should be drilled to at least 500 feet, or until the sediments below the Uncle Sam tuff are intersected. If these sediments show alteration, then drilling should continue at least some distance into the sediments in order to determine their character. Ideally, a core sample should be cut at the bottom of the hole.

Hole P-2

Hole P-2 is located with respect to the intensely silicified zone at the Gold Bug prospect north of the Lowell claim. Its purpose is to test the alteration at the Gold Bug prospect and penetrate through the Uncle Sam tuff to determine if replacement type ore bodies are located within the underlying sediments. It should be drilled to a minimum depth of 500 feet. It would be preferable to drill to a depth of 1,000 feet in order to get a clear idea of the sedimentary sequence lying beneath the Uncle Sam in this area, and to test possible extension of other veins which might project toward the hole (Section F-F'). The base of the Uncle Sam tuff should be intersected at approximately 150 feet (see Section F-F'). Between 320 feet and 400 feet, it might well encounter the composite rhyolite andesite dike which crops out to the southwest of the hole location.

If the decision is made to bottom the hole at 500 feet, then it should be filled with mud so that it could possibly be re-entered at a later date. In any event, should it encounter mineralization, it should be deepened until the mineralization is penetrated.

Hole P-3

Hole P-3 is located on the Fox Wash structure. Its purpose is to test grade of mineralization within this structure in the Uncle Sam tuff, and for possible replacement mineralization in sediments beneath the Uncle Sam. The hole will probably cut the bottom of the Uncle Sam at about 240 to 300 feet, and should be drilled to a minimum depth of 500 feet to gain information about the underlying sediments.

Hole P-4

Hole P-4 is located to the east of the shop area on the Clipper claim, and along the Clipper structure (Attachment -- and Section I-I', Attachment ---). Its purpose is to cut the zone of intersection between the Triple X vein structure and the Clipper vein structure at the interface between the sediments and the Uncle Sam tuff. This should occur at approximately 120 feet, and drilling should be continued to a minimum depth of 500 feet in order to determine the nature of the underlying sediments (Cross Section I-I', Attachment -- and Section B-B', Attachment --).

Hole P-5

Hole No. 5 is located 1,600 feet north of the Uncle Sam shaft on the crest of an anticline in Lower Bisbee Group sediments (Section H-H', Attachment --). Its purpose is to test for mineralization in favorable horizons along the crest of the anticline and also along the projection of the State of Maine vein. It should be drilled to a minimum depth of 500 feet or to a depth where the Bisbee Novaculite (Glance Conglomerate) has been penetrated, and the Naco Limestone unquestionably cut. Preferably, it could be drilled to a depth of 1,500 feet in order to cut the zone of intersection of the Free Coinage vein and the Unnamed vein (see Section H-H'). However, this deep drilling could be postponed until the Unnamed vein and the Uncle Sam vein have been tested by Holes P-25 and P-18, in order to determine their continuity. Further, a better location might be chosen so that a deep hole could penetrate the 3-way intersection of the Free Coinage, the Unnamed vein and the Triple X vein structure as shown on Section H-H'. At any rate, Hole P-5, if drilled to a shallow depth, should be mud filled and capped for later re-entry.

Hole P-6

Hole P-6 is located in the Fox Ranch area on the extension of what appears to be the San Pedro vein and collars in altered Uncle Sam tuff. Its purpose is to test the thickness of the Uncle Sam, the tenor of the altered rock in the Uncle Sam, and to test for replacement deposits within the Lower Bisbee sediments below the Uncle Sam tuff. It should be drilled to a minimum depth of 500 feet.

Hole P-7

Hole P-7 is located in the northeast corner of the Lowell claim, and collars in altered Uncle Sam tuff. The vein responsible for the alteration at the hole collar dips approximately 42 degrees to the north, and may be the continuation of the State of Maine vein. P-7 is designed to test the tenor of the altered Uncle Sam tuff, the depth to the Uncle Sam sediment interface, and to determine whether there is mineralization in the sediments beneath the Uncle Sam. It should penetrate the Uncle Sam at approximately 200 feet (Section G-G', Attachment --), and should be drilled to a minimum depth of 500 feet.

Hole P-8

P-8 is located approximately 300 feet west of the Escapule Mill at the Fox Ranch. It is designed to test the alteration zone which appears to parallel the Fox Wash and to penetrate the Uncle Sam tuff and test the sediments lying below. It should be drilled to a minimum depth of 500 feet (Section B-B', Attachment --).

Hole P-9

Hole P-9 is located approximately 350 feet north of the Fox Ranch windmill on the San Pedro claim on the San Pedro vein at its intersection with a northeast?-trending vein zone. It is designed to test the tenor of mineralization along the San Pedro vein both in the Uncle Sam tuff and in sediments lying beneath the Uncle Sam tuff. It should be drilled to a depth of 500 feet, and should penetrate the base of the Uncle Sam at approximately 100 feet (Section C-C', Attachment --).

Hole P-10

Hole P-10 is located approximately 250 feet southeast of the Three Brothers shaft on the Fox vein system. P-10 is designed to test the tenor of the Fox vein alteration zone in the Uncle Sam tuff and in the sediments beneath the Uncle Sam tuff. The hole should penetrate the Uncle Sam at approximately 120 feet, and should be drilled a minimum depth of 500 feet. Altered rock will probably be cut for the total length of the hole.

Hole P-11

Hole P-11 is located approximately 440 feet north of the Fox Ranch windmill, and approximately 100 feet northwest of Hole P-9. It is located so as to intersect the plane of intersection of the Fox vein and the San Pedro vein within Bisbee Group sediments (Section C-C', Attachment --). P-11 should penetrate the Uncle Sam at approximately 100 to 120 feet, and cut the point of intersection of the two vein systems at 200 to 250 feet. It should be drilled to a minimum depth of 500 feet.

Hole P-12

P-12 is located approximately 350 feet south of the San Pedro shaft on a strong northeast-trending vein system, which is in total almost 400 feet wide. P-12 is collared in what appears to be the strongest part of the vein system, and is designed to test its tenor in the Uncle Sam tuff and in sediments which lie beneath. It should cut the Uncle Sam tuff in the vicinity of 200 feet, and should be drilled to a minimum depth of 500 feet. It should intersect altered rock throughout its total depth.

Hole P-13

Hole P-13 is located approximately 250 feet northeast of the San Pedro shaft on the San Pedro vein zone. It is designed to test the tenor of this vein zone in both the Uncle Sam tuff and the sediments lying beneath. It should penetrate the Uncle Sam porphyry at 250 to 300 feet, and should be drilled to a minimum depth of 500 feet. It should be in mineralized rock throughout its depth. However, it may cut the most strongly altered part of the vein system between 10 and 40 feet. When the exact location of this hole is spotted in the field, it may be better to move it 50 to 100 feet to the south in order that a greater section of the intensely altered vein material be cut.

Hole P-14

P-14 is located 170 feet southwest of the San Pedro shaft along the San Pedro vein and between surface stopes on that vein. Copper oxide mineralization crops out to the north of the proposed hole location. P-14 is designed to test this intensely altered vein area both in the Uncle Sam tuff and the sediments below as seen on Section F-F' (Attachment --). It should cut the Uncle Sam tuff at about 200 feet, and should be drilled to a minimum depth of 500 feet.

Hole P-15

Hole P-15 is located approximately 550 feet to the northeast of the San Pedro shaft and is collared in Quaternary alluvium. It is on the projection of the very wide San Pedro vein zone, while the north-south trending area of alluvium may represent an intersecting zone of alteration. It is designed as a further test of the San Pedro vein zone, both in the Uncle Sam tuff and in underlying sediments. It should penetrate the Uncle Sam tuff at about 300 feet, and should be drilled to a minimum depth of 500 feet.

Hole P-16

P-16 is located approximately 750 feet east of the San Pedro shaft on the projection of the alteration zone tested by P-12. P-16 is designed as another test of this alteration zone for tenor of rock both in the Uncle Sam tuff and in the sediments beneath. It should be drilled to a minimum depth of 500 feet, and should penetrate the base of the Uncle Sam at a depth of approximately 100 feet (Section D-D', Attachment --).

Hole P-17

P-17 is located 400 feet north of P-5 and approximately 2,000 feet north of the Uncle Sam shaft. It is collared on a brecciated and strongly manganese oxide mineralized quartzite breccia, and is designed to test this zone in depth. It should be drilled to a minimum depth of 300 feet, or until it penetrates the breccia zone and goes into unaltered, unmineralized rock.

Hole P-18

Hole P-18 is located approximately 200 feet west of the Free Coinage vein system (Section D-D'). It is designed to test the grade of the Free Coinage vein system below existing workings and hopefully within the Bisbee Group sediments. It should intersect the Free Coinage vein between 120 and 170 feet. The hole should be drilled a minimum depth of 500 feet in order to thoroughly test the Bisbee Group sediments in this area.

Hole P-19

Hole P-19 is located approximately 150 feet northwest of the quarter corner marker for section 9 and 16, and is located on the Merrimac claim. It is designed to test the Free Coinage vein system and sediments lying beneath that area. It should be drilled to a minimum depth of 500 feet, and will probably remain in altered rock over that depth.

Hole P-20

Hole P-20 is located approximately 1,000 feet north of the Uncle Sam shaft, and collars in the Uncle Sam tuff along the projection of the State of Maine vein. It is designed to test the grade of mineralization of the State of Maine vein in both the Uncle Sam and the Bisbee Group sediments which shallowly underly this location. It should be drilled to a minimum depth of 300 feet.

Hole P-21

Hole P-21 is located approximately 380 feet south-southwest of the quarter corner marker of section 9 and 16, and lies on the Merrimac claim. It is designed as another test of the strong Clipper vein system both in the Uncle Sam tuff and underlying sediments. It should be drilled to a minimum depth of 500 feet, and it is expected to remain in altered rock over this entire depth.

Hole P-22

This hole is located approximately 250 feet from the State of Maine mine office in the State of Maine canyon. It is collared in alluvium, but is designed to test for the presence of a strongly altered structure projecting along the State of Maine canyon. It should be drilled to a minimum depth of 500 feet, and should penetrate the Uncle Sam tuff at approximately 100 feet. If drilled to a depth of 1,000 feet, it would also penetrate the strong Clipper alteration zone within Bisbee Group sediments or possibly the Naco Limestone (Section I-I', Attachment --).

Hole P-23

P-23 is located approximately 150 feet northeast? of the Bonanza shaft, and lies on the Red Top claim. It is designed to test the grade of mineralization along the Bonanza-Solstice-Chance vein and should be drilled to a minimum depth of 500 feet. It should remain in altered rock over this entire distance, and will probably penetrate an andesite porphyry dike with associated mineralization at about 300 feet (Section C-C', Attachment --).

Hole P-24

P-24 is located approximately 700 feet northeast of the mine gate in Maine Wash, and is on the projection of the Clipper vein zone. It is designed as another test of the Clipper vein zone, and as another penetration of the Uncle Sam tuff. It collars in alluvium, but should penetrate the base of the Uncle Sam at approximately 50 feet, and enter Bisbee Group sediments (Section C-C', Attachment --).

Hole P-25

P-25 is located approximately 350 feet southwest of the Uncle Sam shaft, and is designed to penetrate the State of Maine vein in this area below known workings. It should cut the State of Maine vein at approximately 260 feet, which is also the base of the Uncle Sam tuff. It should be drilled to a minimum depth of 500 feet (Section I-I', Attachment --).

Supervision and Revision of Objectives

Because present knowledge of the sub-surface is so scanty, new data obtained by drilling might radically change the nature and objectives of the ensuing program. Recognition, therefore, that objectives might change with continued drilling should be made and the drilling work should be very closely supervised from a geologic standpoint so advantage can be taken of new information. It is suggested that the geologist in charge have enough assistants so that his time will not be occupied with routine sample preparation and handling duties. Rather, he should occupy himself in continued surface mapping or of plotting drill results and updating sub-surface maps. Continued and timely updating of sub-surface information to get an accurate and complete three dimensional picture of the area will be critical to ore finding.

BIBLIOGRAPHY AND REFERENCES

Andreasen, G. E., Mitchell, C. M., and Tyson, N. S., 1965, Aeromagnetic map of Tombstone and vicinity, Cochise and Santa Cruz Counties, Arizona: U. S. Geol. Survey Open File Rept., June 11.

Austin, W. L., 1883, Silver milling at Charleston, Arizona: Eng. Mining Jour., v. 35, Jan. 27, P. 44-46.

Blake, W. P., 1882a, The geology and veins of Tombstone, Arizona: Am. Inst. Min. Metall. Eng. Trans., v. 10, p. 334-345.

---------- 1882b, The geology and veins of Tombstone Arizona--I: Eng. Mining Jour., v. 33, Mar. 18, p. 145-146.

---------- 1882c, The geology and veins of Tombstone, Arizona--II: Eng. Mining Jour., v. 33, Mar. 25, p. 157.

---------- 1882d, Porphyry dike, Tombstone District, Arizona: Eng. Mining Jour., v. 34, July 15, p. 29-30.

---------- 1904a, Mining in the southwest: Eng. Mining Jour., v. 77, Jan. 7, p. 35-37.

---------- 1904b, Tombstone and its mines: Am. Inst. Min. Metall. Eng. Trans., v. 34, p. 668-670.

Blanchard, Roland, 1968, Interpretation of Leached Outcrops, Nevada Bureau of Mines Bull. 66, Mackay School of Mines, University of Nevada, Reno.

Briscoe, James A., 1973, Interum geologic report on the Tombstone Mining District, Cochise County, with particular emphasis on the State of Maine Mine area: Private report to Sierra Mineral Management Co., 71 p.

Briscoe, James A. and Waldrip, Thomas E. Jr., 1982, A Summary of the Tombstone Development Company Lands in the Tombstone Caldera Complex, Cochise County, Arizona - A Geologic Appraisal and Estimate of Mineral Potential, unpublished report to the Tombstone Development Company, Grand Island, Nebraska.

Butler, B. S., and Wilson, E. D., 1937, Structural control of the ore depsits at Tombstone, Arizona (abs.): Econ. Geology, v. 32, p. 196-197.

---------- 1938, Some Arizona ore deposits: Ariz. Bur. Mines Bull. 145, p. 104-110.

---------- 1942, Ore deposits at Tombstone, Arizona, in Newhouse, W. H., ed., Ore deposits as related to structural features: New York, Hafner Publ. Co., p. 201-203.

Butler, B. S., Wilson, E. D., and Rasor, C. A., 1938, Geology and ore deposits of the Tombstone District, Arizona: Ariz. Bur. Mines Geol. Ser. No. 10, Bull. No. 143, 114 p.

Chapman, Thomas G., 1924, The Metallurgy of Chloride Ore from the State of Maine Mine in the Tombstone Mining District, M.Sc. Thesis, University of Arizona, 47 pages.

Church, J. A., 1887a, Concentration and smelting at Tombstone, Arizona: Am. Inst. Min. Metall. Eng. Trans., v. 15, p. 601-613.

---------- 1887b, Concentration and smelting at Tombstone, Arizona: Eng. Mining Jour., v. 43, April 16, p. 274-276.

---------- 1902, Tombstone, Arizona, mining district: Eng. Mining Jour., v. 73, April 26, p. 584.

---------- 1903, The Tombstone, Arizona, mining district: Am. Inst. Min. Metall. Eng. Trans., v. 33, p. 3-37.

Clark, F. W., 1914, Water analysis (from the 1000-foot level, Contention mine, Tombstone, Arizona): U. S. Geol. Survey Water-Supply Paper 364, p. 39.

Comstock, T. B., 1900, The geology and vein-phenomena of Arizona: Am. Inst. Min. Metall. Eng. Trans., v. 30, p. 1038-1101.

Creasey, S. C., and Kistler, R. W., 1962, Age of some copper-bearing porphyries and other igneous rocks in southeastern Arizona: U. S. Geol. Survey Prof. Paper 450-D, p. D1-D5.

Damon, P. E., and Bikerman, M., 1964, Potassium-argon dating of post-Laramide plutonic and volcanic rocks within the Basin and Range province of southeastern Arizona and adjacent areas: Ariz. Geol. Soc. Digest, v. 7, p. 63-78.

Damon, P. E., and Mauger, R. L., 1966, Epeirogeny-orogeny viewed from the Basin and Range province: Am. Inst. Min. Metall. Eng. Trans., v. 235, p. 99-112.

Development Company of America, 1911, Annual report: Eng. Mining Jour., v. 92, July 8, p. 61.

Drewes, Harald, 1980, Tectonic map of southeast Arizona: U. S. Geol. Survey miscellaneous investigation series, Map I-1109, 2 sheets, scale 1:125,000.

---------- 1971, Mesozoic stratigraphy of the Santa Rita Mountains, southeast of Tucson, Arizona: U. S. Geol. Survey Prof. Paper 658-C, 81 p.

Dumble, E. T., 1902, Notes on the geology of southeastern Arizona: Am. Inst. Min. Metall. Eng. Trans., v. 31, p. 696-715.

Dunning, C. H., 1959, Rocks to riches: Phoenix, Arizona, Southwest Publ. Co., Inc., 406 p.

Engineering and Mining Journal, 1878, General mining news: Eng. Mining Jour., v. 26, Oct. 19, p. 279-280.

---------- 1879, General mining news: Eng. Mining Jour., v. 27, May 31, p. 392.

---------- 1879, General mining news: Eng. Mining Jour., v. 27, June 28, p. 468.

---------- 1879, General mining news: Eng. Mining Jour., v. 28, Aug. 16, p. 112.

---------- 1879, Answers to some inquiries concerning Arizona and Nevada mines: Eng. Mining Jour., v. 28, Nov. 1, p. 311-312.

---------- 1879, Tombstone mining district, Arizona: Eng. Mining Jour., v. 28, Nov. 8, p. 340.

Engineering and Mining Journal, 1879, Tombstone district, Arizona: Eng. Mining Jour., v. 28, Nov. 29, p. 393.

---------- 1880, General mining news: Eng. Mining Jour., v. 29, Mar. 20, p. 204.

---------- 1880, General mining news: Eng. Mining Jour., v. 29. Mar. 27, p. 221.

---------- 1880, General mining news: Eng. Mining Jour., v. 29, April 3, p. 238.

---------- 1881, General mining news: Eng. Mining Jour., v. 31, April 9, p. 252.

---------- 1881, Tombstone, Arizona: Eng. Mining Jour., v. 31, May 7, p. 316-317.

---------- 1882, General mining news: Eng. Mining Jour., v. 33, Mar. 18, p. 147.

---------- 1882, Official statement and reports--Tombstone Mill and Mining Co., Tombstone, Arizona: Eng. Mining Jour., v. 33, May 6, p. 234.

---------- 1882, General mining news: Eng. Mining Jour., v. 34, July 22, p. 46-47.

---------- 1883, The Tombstone Mill and Mining Co., Tombstone, Arizona: Eng. Mining Jour., v. 35, May 12, p. 267-269.

---------- 1883, The present condition of the mines of the Tombstone Mill and Mining Co.: Eng. Mining Jour., v. 36, Oct. 13, p. 229-230.

---------- 1883, General mining news: Eng. Mining Jour., v. 36, Nov. 24, p. 328.

---------- 1883, General mining news: Eng. Mining Jour., v. 36, Dec. 29, p. 400.

---------- 1902, The mining revival at Tombstone: Eng. Mining Jour., v. 73, Mar. 1, p. 314-315.

---------- 1904, General mining news: Eng. Mining Jour., v. 77, Feb. 25, p. 334-338.

---------- 1904, General mining news: Eng. Mining Jour., v. 77, April 14, p. 618-621.

---------- 1904, The Tombstone mines, Arizona: Eng. Mining Jour., v. 77, June 9, p. 919-920.

---------- 1982, Featured this month: Pelletizing Aids Tombstone Leaching Operating: Eng. Mining Jour., v. 182, No. 1, January, 1981, p. 94-95.

Escapule, C. Bailey Jr., 1981, Geological Report on the Grace Claim Group, Cochise County, Arizona for Tombstone Silver Mines, Inc., unpublished private report.

Farnham, L. L., Stewart, L. A., and Delong, C. W., 1961, Manganese deposits of eastern Arizona: U. S. Bur. Mines I. C. 7990, 178 p.

Genth, J. A., 1887, Hessite from the Westside mine, Arizona: Am. Philos, Soc., v. 24, p. 36.

Gilluly, James, 1945, Emplacement of Uncle Sam porphyry, Tombstone district, Arizona: Am. Jour. Sci., v. 243, P. 643-666.

---------- 1956, General geology of central Cochise County, Arizona: U. S. Geol. Survey Prof. Paper 281, 169 p.

---------- 1963, The tectonic evolution of the western United States: Geol. Soc. London Quart. Jour., v. 119, p. 133-174.

Gilluly, James, Cooper, J. R., and Williams, J. S., 1954, Late Paleozoic stratigraphy of central Cochise County, Arizona: U. S. Geol. Survey Prof. Paper 266, 49 p.

Goodale, C. W., 1889, The occurrence and treatment of the argentiferous manganese ores of the Tombstone district, Arizona: Am. Inst. Min. Metall. Eng. Trans., v. 17, p. 767-777.

---------- 1890, Addition to the occurrence and treatment of the argentiferous manganese ores of Tombstone district, Arizona: Am. Inst. Min. Metall. Eng. Trans., v. 38, p. 910-912.

Graves, Arthur J., 1984, Geological and Preliminary Valuation Report on the State of Maine Area, Cochise County, Arizona, private report to Tombstone Silver Mines, Inc.

---------- 1985, private report to Tombstone Silver Mines, Inc. on exploration and drilling programs starting in June, 1984.

Hayes, P. T., 1970, Cretaceous paleogeography of southeastern Arizona and adjacent areas: U. S. Geol. Survey Prof. Paper 658-B, 42 p.

Hayes, P. T., Simons, F. S., and Raup, R. E., 1965, Lower Mesozoic extrusive rocks in southeastern Arizona--the Canelo Hills volcanics: U. S. Geol. Survey Bull. 1194-M, p. M1-M9.

Hewett, D. F., 1972, Maganite, hausmannite, braunite: features, modes of origin: Econ. Geology, v. 67, p. 83-102.

Hewett, D. F., and Pardee, J. T., 1933, Manganese in western hydrothermal ore deposits, in Ore deposits of the western states (lindgren volume): Am. Inst. Min. Metall. Eng., p. 680-681.

Hewett, D. F., and Radtke, A. S., 1967, Silver bearing black calcite in western mining districts: Econ. Geology, v. 62, p. 1-21.

Hewett, D. F., and Rove, O. N., 1930, Occurrence and relations of alabandite: Econ. Geology, v. 25, p. 36-56.

Hillebrand, W. F., 1886, Emmonsite, a ferric tellurite (Tombstone, Arizona): Colo. Sci. Soc. Proc., v. 2, p 20-23.

---------- 1889, Analyses of three descloisites from new localities: Am. Jour. Sci., v. 37, p. 434-439.

Hollyday, E. F., 1963, A geohydraulic analysis of mine dewatering and water development, Tombstone, Cochise County, Arizona: M.Sc. thesis, Univ. of Arizona., 90 p.

Huff, L. C., 1970, A geochemical study of alluvium-covered copper deposits in Pima County, Arizona: U. S. Geol. Survey Bull. 1312-C, p. C1-C31.

Jensen, Mead L. & Bateman, Alan M., 1981, Economic Mineral Deposits, John Wiley & Sons, New York.

Keith, S. B., 1973, Index of mining properties in Cochise County, Arizona: Ariz. Bur. Mines Bull. 187, 98 p.

Keith, Stanley B., Gest, Don E., et al., 1983, Metallic Mineral Districts and Production in Arizona, Arizona Bureau of Geology and Mineral Technology, Geological Survey Branch, University of Arizona, Tucson, Arizona.

Lakes, Arthur, 1904, Ore in anticlinals, as at Bendigo, Austrilia, and Tombstone, Arizona: Min. Sci. Press, v. 88, p. 193.

Lee, L. C., 1967, The economic geology of portions of the Tombstone-Charleston district, Cochise County, Arizona, in light of 1967 silver economics: M.Sc. thesis (unpub.), Univ. of Arizona, 99 p.

Lingren, Waldemar, 1933, Mineral Deposits 4th Edition, McGraw-Hill Book Company, Inc., New York & London.

Luepke, Gretchen, 1971, A re-examination of the type section of the Scherrer Formation (Permian) in Cochise County, Arizona: Ariz. Geol. Soc. Digest, v. IX, p. 245-257.

Moses, A. J., 1893, Ettringite from Tombstone, Arizona, and a formula for ettringite: Am. Jour. Sci., 3rd ser. 45, p. 489-492.

Moses, A. J., and Laquer, L. M. I., 1892, Alabandite from Tombstone: Columbia Univ. School of Mines Quart., v. 13, p. 236-239.

Needham, A. B., and Storms, W. R., 1956, Investigation of Tombstone district manganese deposits, Cochise County, Arizona: U. S. Bur. Mines RI 5188, 34 p.

Newell, Roger A., 1974, Exploration geology and geochemistry of the Tombstone-Charleston Area, Cochise County, Arizona: PhD. dissertation (unpubl.), Stanford University, 205 p.

Newhouse, W. H., ed., 1942, Ore deposits as related to structural features: Princeton, N. J., Princeton Univ. Press, 280 p.

Oetking, Philip, 1967, Map No. 2, Geological Highway Map of the Southern Rocky Mountain Region, The American Association of Petroleum Geologists, P. O. Box 979, Tulsa, Oklahoma.

Park, Charles F. Jr., & MacDiarmid, Roy A., 1975, Ore Deposits, 3rd Edition, W. H. Freeman and Company, San Francisco.

Patch, Susan, 1969, Petrology and stratigraphy of the Epitaph Dolomite (Permian) in the Tombstone Hills, Cochise County, Arizona: M.Sc. thesis (unpubl.), Univ. of Arizona, 42 p.

---------- 1973, Petrology and stratigraphy of the Epitaph Dolomite (Permian) in the Tombstone Hills, Cochise County, Arizona: Jour. Sed. Petrol., v. 43, no. 1, p. 107-117.

Penrose, R. A. F., 1890, The manganiferous silver ores of Arizona--Tombstone: Geol. Survey of Arkansas Ann. Rept., v. 1, p. 465-468.

Ransome, F. L., 1904, Geology and ore deposits of the Bisbee quadrangle, Arizona: U. S. Geol. Survey Prof. Paper 21, 167 p.

---------- 1920, Deposits of manganese ore in Arizona--Bisbee and Tombstone district, Cochise County: U. S. Geol. Survey Bull. 710, p. 96-103, 113-119.

Rasor, C. A., 1937, Mineralogy and petrography of the Tombstone mining district, Arizona: PhD. dissertation (unpubl.), Univ. of Arizona., 115 p.

---------- 1938, Bromeyrite from Tombstone, Arizona: Am. Mineral., v. 23, p. 157-159.

---------- 1939, Manganese mineralization at Tombstone, Arizona: Econ. Geology, v. 34, p. 790-803.

Romslo, T. M., and Ravitz, S. F., 1947, Arizona manganese-silver ores: U. S. Bur. Mines RI 4097, 13 p.

Sarle, C. J. & Mellgren, V.G., 1928, Report on the Mellgren Mines, Tombstone Mining District, Cochise County, Arizona, unpublished private report.

Schmitt, H., 1966, The porphyry copper deposits in their regional setting, in Titley, S. R., and Hicks, C. L., eds., Geology of the porphyry copper deposits, southwestern North America: Tucson, Arizona, Univ. of Arizona Press, p. 17-33.

Sillitoe, Richard H., 1973, The Tops and Bottoms of Porphyry Copper Deposits, Economic Geology, v. 68, No. 6, p. 799-813.

Sillitoe, Richard H., & Bonham, Harold F. Jr., 1985, Volcanic Land Forms and Ore Deposits, Economic Geology, v. 79, No. 6, p. 1286-1298.

Staunton, W. F., 1910, The pumping problems at the Tombstone mine: Eng. Mining Jour., Jan. 15, p. 174.

---------- 1918, Effects of an earthquake in a mine at Tombstone, Arizona: Seismol. Soc. America Bull., v. 8, p. 25-27.

Tenney, J. B., 1938, Geology and ore deposits of the Tombstone district, Arizona (rev.): Econ. Geology, v. 33, p. 675-678.

Timmins, W. G., 1981, Geological Report on the Grace Claim Group, Cochise County, Arizona for Artex Resources, Inc., private unpublished report.

Walker, E. W., 1909, Pumping plant at the Tombstone Consolidated: Eng. Mining Jour., v. 88, no. 4, p. 160-162.

Wallace, D. E., and Cooper, L. R., 1970, Dispersion of naturally occurring ions in groundwater from various rock types in a portion of the San Pedro River basin, Arizona: Jour. Hydrology, v. 10, p. 391-405.

West, E. E., Sumner, J. S., Aiken, C. L. V., and Conley, J. N., 1974, Bouger gravity anomaly map of southeastern Arizona, from a geophysical and geological investigation of potentially favorable areas for petroleum exploration in southeastern Arizona; Laboratory of Geophysics, Department of Geosciences, University of Arizona; Arizona Oil & gas Conservation Commission, Report of Investigations 3, 44 p.

Wilson, E. D., and Butler, G. M., 1930, Manganese ore deposits in Arizona: Ariz. Bur. Mines Bull. 127, p. 47-55.

Wilson, E. D., Cunningham, J. B., and Butler, G. M., 1934, Arizona lode gold mines and gold mining: Ariz. Bur. Mines Bull. 137, p. 122-124.

Wilt, J. C., 1969, Petrology and stratigraphy of Colina Limestone (Permian) in Cochise County, Arizona: M.Sc. thesis (unpubl.), University of Arizona, 117 p.

Tombstone Mining Properties
Under the Control of
Tombstone Silver Mines, Inc.
as of November 15, 1985

ACRES	NAME OF CLAIM	OWNER	TYPE OF CLAIM
146.66	State of Maine	TSM, Inc.	Patented mining claim
	Brother Jonathan	"	" " "
	Lowell	"	" " "
	Triple X	"	" " "
	Merrimac	"	" " "
	Red Top	"	" " "
	Clipper	"	" " "
	May	"	" " "
220.79		"	State Prospecting Permits
68.06		"	State Mineral Leases
435.51	SUB TOTAL ACREAGE		
163.28		M. S. Horne	Lease w/ option - fed. unpat. lode mining claim
78.00		S. Henderson	"
1,300.00	Fox Group	E. Escapule Jr., et al.	"
	Missy Group	E. Escapule Jr., et al.	"
	Solstice Group	E. Escapule Jr., et al.	"
600.00	Mtn. View Group	Joe Escapule	"
49.00	Free Coinage	Joe Escapule	Patented mining claim
	San Pedro	Joe Escapule	Patented mining claim
	True Blue	Joe Escapule	Patented mining claim
2,120.98	SUB TOTAL ACREAGE		
2,625.79	TOTAL ACREAGE		
10.00	Chance (1/2)	Interstrat, Inc. (verbal understanding)	Patented mining claim
101.70		Interstrat, Inc. (verbal understanding)	State Prospecting Permit
29.00		Pentony Estate (verbal understanding)	State mineral lease
140.70	SUB TOTAL ACREAGE		
2,766.49	GRAND TOTAL ACREAGE		

APPENDIX II

Evaluation of Previously Calculated

Ore Reserves

by Bailey Escapule

September 27, 1985

EVALUATION OF PREVIOUSLY CALCULATED ORE RESERVES

by BAILEY ESCAPULE

STATE OF MAINE MINING COMPANY

TOMBSTONE, ARIZONA

for JAMES A. BRISCOE

(TOMBSTONE SILVER MINES, INC)

SEPTEMBER 27, 1985

TABLE OF CONTENTS

I. PURPOSE

The purpose of this report is to evaluate the ore reserve estimates made by Mr. A. J. Graves in his report to Tombstone Silver Mines, Inc. (T.S.M. Inc.) titled Geology, Ore Reserves, and Open Cut Mine Planning, dated December 1, 1984.

The reason for this evaluation is that one of the open cut mining areas proposed by Mr. Graves has been mined by T.S.M. Inc. Using the information gained by this mining, we can update the ore reserves and revise the mining method.

II. MINING PLAN

Mr. Graves ore reserve estimates appear to have been based on a final pit design with the final pit slope about 1:1. From experience gained by mining one of the proposed pits (Merrimac #1 Pit), we feel we could revise the original pit design.

Fifteen foot benches can be mined using the International Harvester Excavator owned by T.S.M. Inc. Material mined "underhand" (from the next bench down) can be loaded into dump trucks that will haul the ore or waste from the pit. Access to and from the pits is by ramps at a 20% grade.

Instead of having a 1:1 final pit slope on the hanging wall, we can leave vertical walls up to 25 ft. high. Where the final pit depth is greater than 25 ft., a 5 ft. bench is made 25 ft. above the last working bench. Final pit slope on the foot wall will be the dip of the ore.

Prior to mining all material will be drilled, sampled and blasted.

With this revised mining plan a lower waste to ore stripping ratio will be attained.

III. RESULTS

*GRADE CLASSIFICATION

M = Measured	+/- <20% Accuracy
I = Indicated	+/- 20 - 30% Accuracy
I-F = Indicated-Inferred	+/- 30 - 40% Accuracy
Inf = Inferred	+/- >40% Accuracy

STATE OF MAINE #2 PIT

BENCH	TONS ORE	OZ/TON GRADE	CLASS/% ACC.	TONS WASTE	W/O RATIO
#1	1,983	1.40	I-F/35%	8,925	4.5:1
#2	2,034	2.37	I-F/25%	9,367	4.6:1
#3	2,067	2.82	I-F/35%	4,282	2.1:1
TOTAL	6,084	2.21	I-F/32%	22,574	3.7:1

SMELT ROOM PIT

BENCH	TONS ORE	OZ/TON GRADE	CLASS/% ACC.	TONS WASTE	W/O RATIO
4560	343	0.38	I-F/35%	543	1.6:1
4545	393	2.59	I-F/25%	2,182	5.6:1
4530	420	2.59	I-F/35%	1,003	2.4:1
TOTAL	1,156	1.93	I-F/32%	3,728	3.2:1

TRIPLE EX PIT OPTION "A" (includes block of inferred waste)

BENCH	TONS ORE	OZ/TON GRADE	CLASS/% ACC.	TONS WASTE	W/O RATIO
4565	2,019	1.70	I-F/35%	6,535	3.2:1
4550	3,523	0.28	I-F/35%	10,492	3.0:1
4535	3,458	1.36	I-F/35%	13,717	4.0:1
TOTAL	9,000	1.01	I-F/35%	30,744	3.4:1

TRIPLE EX PIT OPTION "B" (includes block of inferred ore)

BENCH	TONS ORE	OZ/TON GRADE	CLASS/% ACC.	TONS WASTE	W/O RATIO
4565	2,980	1.70	I-F/40%	5,574	1.9:1
4550	5,233	0.28	I-F/40%	8,782	1.7:1
4535	5,119	1.36	I-F/40%	12,056	2.4:1
TOTAL	13,332	1.01	I-F/40%	26,412	2.0:1

SUMMARY OF RECALCULATED RESERVES

PIT	ORE	GRADE OZ/TON	CLASS.	% ACCURACY	WASTE	W/O RATIO
ST. OF MAINE #2	6,084 TONS	2.21	I-F	32%	22,574 TONS	3.7:1
SMELT ROOM	1,156 TONS	1.93	I-F	32%	3,728 TONS	3.2:1
TRIPLE EX "A"	9,000 TONS	1.01	I-F	35%	30,744 TONS	3.4:1
TOTALS	16,240 TONS	1.53	I-F	34%	57,046 TONS	3.5:1

PIT	ORE	GRADE OZ/TON	CLASS.	% ACCURACY	WASTE	W/O RATIO
ST. OF MAINE #2	6,084 TONS	2.21	I-F	32%	22,574 TONS	3.7:1
SMELT ROOM	1,156 TONS	1.93	I-F	32%	3,728 TONS	3.2:1
TRIPLE EX "B"	13,332 TONS	1.01	I-F	40%	26,412 TONS	2.0:1
TOTALS	20,572 TONS	1.42	I-F	37%	52,714 TONS	2.6:1

A.J. GRAVES ORE RESERVE CALCULATIONS SUMMARY

PIT	ORE TONS	GRADE OZ/TON	WASTE TONS	RATIO W:O
ST. OF MAINE	21,490	2.53	68,105	6.1:1
ST. OF MAINE #2	3,710	6.70	8,700	2.4:1
SMELT ROOM	1,110	2.91	7,120	6.4:1
TRIPLE EX	5,320	1.42	24,030	4.5:1
MERRIMAC	3,960	3.11	13,290	3.4:1
TOTALS	35,590	2.69	121,245	3.4:1
LESS ST. OF MAINE	21,490		68,105	
TOTALS	14,100	2.93	53,140	3.8:1

MERRIMAC #1 PIT

	A.J. GRAVES	ACTUAL	DIFFERENCE	% DIFF.
ORE	3,960 TONS	3,926 TONS	-34 TONS	1 %
GRADE	3.11 OZ/TON	2.92 OZ/TON	-0.19%	6 %
WASTE	13,290 TONS	11,224 TONS	-2066 TONS	16 %
RATIO	3.4:1	2.9:1	-0.5:1	15 %

The State of Maine shaft area has been eliminated for open cut mining due to the probable destruction of the main shaft and some of the old workings. After a well executed sampling program in the upper workings, some of this are may be mined with the careful preservation of the main State of Maine shaft.

IV. RECOMMENDATIONS:

Due to the relatively small amount of ore reserves and their classification of indicated-inferred, it is recommended that further drilling be done. This drilling is needed to upgrade the ores classification to measured and also to determine if ore grade values can be extended from the currently proposed pits.

A plan has been suggested by J.A. Briscoe of drilling angle holes in a "fan" shape to intersect the veins at right angles and at different depths. This plan would include drilling an angle hole 10 ft. from the vein's hanging wall outcrop to intersect the vein at right angles. This will determine the veins true thickness. A second hole, at the same location, drilled vertically through the vein will indicate the extent of leaching of ore values from the surface. A second set of holes would be drilled 20 ft. from the vein's hanging wall outcrop. These include a vertical hole, and angle hole at -45 degrees, and an angle hole to intersect the vein at right angles. These three holes should penetrate the vein at the same location along strike, but at different locations down dip.

This series of two drilling locations perpendicular to the strike should be repeated every 20 ft. along the strike of the vein in the areas designated for proposed pits.

This drilling plan would give more detailed information on the widths of the veins and extent of leaching of ore values. Also, the percent accuracy in estimating the ore grade and ore reserves would be upgraded to plus or minus 20% or within a measured ore reserve classification.

James A. Briscoe & Associates, Inc.

Exploration Consultants:
Base and Precious Metals/Geologic and Land Studies/Regional and Detail Projects

James A. Briscoe
Registered Professional Geologist

Thomas E. Waldrip, Jr.
Geologist/Landman

October 16, 1985

Charlie Escapule
Tombstone Silver Mines, Inc.
P. O. Box 1016
Tombstone, Arizona 85638

RE: Report on spread sheet analysis

Dear Charlie:

This is a letter report on how the spread sheet was done, how it can be used, and some of the "what if" scenarios I have created, checking various ore grades, etc., etc. It follows below:

SOURCE OF BASIC DATA

Geologic Estimates

Geologic estimates are taken from my report in progress "Geology and Ore Deposits of the Tombstone Mining District with Emphasis on the State of Maine Mine Area".

Drilling Estimates

Drilling estimates are supplied by Charles B. Escapule and James A. Briscoe.

Mining Estimates

Mining estimates are supplied by Charles B. Escapule and Mike Escapule

Crushing and Agglomerating

Crushing and agglomerating supplied by Charles B. and Mike Escapule

5701 East Glenn Street, Suite 120/Tucson, Arizona 85712/602•721-1375

Heap Leaching and Precipitation

Heap leaching and precipitation figures were supplied by Charlou Corporation - Louie, Charles, and Mike Escapule

Smelting and Refining

Smelting and refining was supplied by Charlou Corporation - Louis, Charles and Mike Escapule

Accuracy

The figures used in the above categories (with the exception of ore reserves and grades which are "Geologically Indicated") are thought to be reasonably accurate, say within +- 15% as of the current date. As ore reserves are measured by drilling, these figures will be cross checked and adjusted to reflect "Measured Reserves". It is possible that, particularly concerning consumable reagents and supplies which will be required in large volume if projected ore reserves are correct, such volume purchases may decrease purchase prices. The estimates are thought to be within the accuracy required to determine whether "Geologically Indicated" reserves will result in a viable operation.

SPREAD SHEET DESCRIPTION

Computer Hardware

Computer hardware was an Apple II Plus computer with 64K RAM memory

Software

Visicalc Computer Software Program, Version 1.0, by Personal Software, Inc.

General Description of Spread Sheet

The Visicalc spread sheet is a system of hierarchical formulae with variables represented by formulae that effect subsequent dependent variables, also represented by formulae. As the first formula is changed, all subsequent dependent variables change. For example, the zinc consumption is dependent on total pounds of precious metal produced. Thus, its consumption is tied to the first variable on the spread sheet, which is high grade production in tons per shift. If it or any one of the subsequent independent variables is changed, zinc consumption is re-calculated, finally changing the profitability of the total operation.

The 64K RAM memory of the Apple was not large enough to contain the entire required spread sheet, linked together. Therefore, the operations were broken down into various categories, which appear on separate sheets. Each sheet, with the exception of Sheet #1 and #7A and #7B which are linked together, are separate spread sheets with individual totals. The spread sheets are as follows:

1. Tombstone Silver Mines, Inc. Cash Flow Projection
2. Expenses - Administrative General
3. Expenses - Administrative Personnel
4. Expenses - Geology/Ore Control/Engineering
5. Expenses - Mining
6. Expenses - Assay and Metallurgy
7. Expenses - Leach Pad and Precipitation Operation
8. Expenses - Precipitate Preparation, Smelting and Refining
9. Expenses - Construction

Because the cost of zinc, on the leach pad and precipitate plant operation spread sheet, was tied to the amount of precious metal produced in pounds, it had to be tied to the mining production in shifts and ore grade, etc., - the upper portion of Sheet #1. This was not true of any of the other breakdown sheets. In addition, because it was awkward to change the additional agglomerating shift and operating costs of the agglomerator, to take into account the additional material to be agglomerated from the screening out of fines from the low grade, coarse crushing operation, this too was put on the cash flow projection, Sheet #1.

Variables

I have marked in blue on all sheets those numbers which are variables which are represented by formulae, and which when changed, will change the remainder of the sheet. For example, on Sheet #1, the variables are, under high grade,

*mining production per shift,
*production shifts,
*contained troy ounces of silver,
*contained troy ounces of gold, and
*the recovery percentage of the gold and silver

On the low grade, the same variables are present. Under Income on the same sheet, the price of silver and the price of gold in dollars per ounce is a variable. Under the heading Agglomerator, the operating costs, which has a reference to Sheet #7, has two variables and then the wages of the 3rd shift agglomerator operator, helper and loader operator are variables, as are their wages and hours. All the remaining figures are dependent variables, which cannot independently be changed, but will change with any change of the blue underlined independent variables. Again, only the figures marked in blue can be changed to properly effect the remainder of the sheet.

I think most of this is self explanatory. However, I do note that in the Capital Cost category on Sheets #1 through #9, the formula isn't clear. In this case, any change in the capital cost will be divided by 12 (for each month of the ensuing year), and be posted equally across the spread sheet in Months #1 through #12. In this way I have amortized all capital and construction costs in the first year. This is an important point to remember because in the second year, if we discover more reserves, all capital costs will have been amortized and will drop out, thus increasing profitability.

On Sheet #7A, I might mention another explanation. Under Cynaide Consumption, there is a multiplier of 21.7 production shifts per month. This factor comes from the top of Sheet #1, so that if the production shifts are changed, all these figures will change. However, all of the consumptions of cyanide, lime, cement, diatomaceous earth and zinc, as well as their prices would be changed directly on Sheet #7. At the bottom of Sheet #7B, the fines from crushing low grade ore to agglomerator is estimated by yourself at 40%, and multiplied by 7,200 tons per day, resulting in 2,880 tons per day, which is also used in reagent consumption. The 40% is a variable as is the 7,200 tons per day a variable at that point in the spread sheet. I hope the remainder of this is self explanatory.

SCENARIOS

General Description

Now that the spread sheet is complete with formulae, we can begin playing "what if" games by changing variables as we think that they might be encountered in actual mining operations. For the variables in the attached scenarios, I have only used changes available to me on Sheet #1 and #7A and #7B, which are as I stated previously, tied together. The variables present in Sheets #2, #3, #4, #5, #6, #8, and #9, can, with more difficulty, be changed, but it was assumed that they would not change drastically. The factors that I have changed in the various scenarios attached are the prices of gold and silver and the grade of gold and silver encountered in both the high grade and low grade production. We could also change recoveries, but I think that they are less likely to change than are the previously stated variables. Because of the numbers of variables and the various possibilities of price changes, we could describe possibly several thousand scenarios that could affect the profitability outcome. Thus, I have only tried to pick the important ones, and I think most of the ones not tried are inconsequential. As it is, I have gone through 11 different scenarios of different possibilities. These are summarized as follows:

Scenario, Page 1

The scenarios are described by reference to the outline of variables in the outline of scenarios. For example, Page 1 is described as Roman Numeral I.A.3., I.B.3., II.A.4., and II.B.3., those being all of the characteristics described by those outline locations that have been varied from my original estimate in this Scenario. This relates to a 3.0 ounce per ton average in the high grade ore of silver, 0.01 per ton average gold in the high grade, a 1 ounce silver assay in the low grade, and a 0.008 ounce per ton gold assay in the low grade. For this example, which is of the closest approximation to the break even point, we will still make a profit of $94,254 at the end of one year. This is my worst case scenario for average grade. If the average grade turns out to be lower than this or the price should go lower, then we will have to change our mining method and go to a smaller tonnage of higher grade or possibly change the heap leaching method - possibly we shouldn't crush the low grade and screen, but rather heap leach mine grade or cut costs elsewhere. Another possibility is simply to wait for a price increase. Of course we could mine at this grade, and once the equipment is paid down, the profit would be higher for the next year's operation if there is any remaining ore reserves.

Scenario, Page 2

In this scenario, I have lowered the average grade of the silver in the low grade to 0.29 ounces per ton. The silver in the high grade remains at 5, the gold in the high grade at 0.017, and the gold in the low grade at 0.014. This would envision that most of the silver is leached out of the low grade material to be precipitated at greater depths, but the gold remains. In this case, we would break even making a profit of $6,228 at the end of the year. I have not tried to vary the treatment proceedure, for example, not crushing the low grade but merely leaching it as mine run, or perhaps crushing, screening and discarding the oversized, etc., etc., all of these possibly having a beneficial impact on profit.

Scenario, Page 3

This assumes that the silver grades would remain at 5 ounces in the high grade and 1.644 in the low grade and that there would be 0.017 ounces gold in the high grade, but -0- ounces of gold in the low grade. If this were the case, we would still have a profit of $3.7 million at the end of the year. Another scenario might be that there would not be any gold in the high grade either, but by looking at the produced gold from this scenario, which has a total value of $956,189, or rounded to $1 million, we can see immediately that we would still make $2.7 million even if there was no gold in either the high grade or the low grade.

Scenario, Page 4

We have assumed that there might be no gold in either the high or low grade and that the high grade would only assay 2.5 ounces per ton. In this case, we would have a profit of $139,488 at the end of the year. If the grades were to be this close between the high and the low grade, it would probably be reasonable to abandon the high grade mining operation and simply let a contractor mine all of the ore as low grade and possibly just leach it as mine run material. Again, these alternatives would have to be examined more closely. I think that this does show that with an average recovered grade of silver of 1.088 ounces per ton (calculated from this scenario), we would still be able to operate at a profit on this large scale operation. Of course it would be so marginal that a dip in the price of silver of perhaps a penny or less would throw the project into the red, thus there is not enough margin for error to make this a viable alternative, without changing other parameters to make it more profitable.

Scenario, Page 5

This scenario reduces the silver price to $5.50 per ounce, and shows that we would still make $7.7 million. Obviously, a small silver price drop wouldn't hurt us much.

Scenario, Page 6

This envisions a silver price drop to $4.00 per ounce. Even with this large a drop we would still make $3.7 million.

Scenario, Page 7

This scenario reduces silver to $3.00 per ounce and shows that we would still make $1 million.

Scenario, Page 8

This scenario drops silver to $2.63 per ounce, which is essentially our breakeven point. This shows that we would loose $6,003 over the year. Of course we would have also paid off our equipment so the following year we would make a profit even at that low price. This scenario is probably not terribly realistic because I have held the price of gold constant at $300.00. But again, it is good for the illustration of how the large scale operation makes the profitability relatively insensitive to silver price fluctuation.

Scenario, Page 9

This scenario drops the price of gold to $100 per ounce, while keeping the price of silver at $5.00 per ounce. It shows that we would make $2.07 million were that to happen. Again, it would be unlikely that the gold price would drop that far without affecting the silver price. However, it does show how important the projected gold content of the ore is to profitability.

Scenario, Page 10

This scenario increases the price of silver to $10 per ounce, which I think may be within reason in the not too distant future, and also increases the price of gold to $450.00 per ounce - which also may be reasonable. However, I changed the grade to 3 ounce silver and 0.01 ounces gold in the high grade and 1 ounce silver and 0.008 ounces per ton gold in the low grade. With these more realistic prices for gold and silver, we would still make $8.4 million, at a pretty low average silver grade.

Scenario, Page 11

In this scenario, I wanted to see how low the grade could go if we had a higher silver price of $10 and a higher gold price of $450.00. Thus, if precious metal prices were to rise, we could still make $375,540 at the end of the year operating on high grade ore of 1.5 ounces silver and 0.01 ounces gold, and low grade of 0.5 ounces silver and 0.008 ounces of gold.

Of course with this low grade material, we might be more profitable changing the mining scheme and having the contractor bulk mine the veins with little or no crushing. Again, these are variables that would have to be run through to ascertain their effect.

Scenario, Page 12

This is a possible worst case scenario assuming that the average grades and tonnages that I have used in my evaluation of the deposit - that is 5 ounce silver and 0.017 ounce gold in the high grade, and 1.644 ounce silver and 0.014 ounces gold in the low grade would be an accurate estimate. If silver were to drop to $4.50 per ounce and gold were to drop to $200 - which is as low as I would imagine they might go - we would still make a profit of $2.8 million.

Thus, I conclude that if the grades are there in the proportions that I have estimated, the mining operation as we now envision it, could withstand drastic decreases in the price of both silver and gold, and still yield a profit.

FACTORS NOT YET CONSIDERED

It is important to realize that these cash flow projections are preliminary, and there are several important factors that have yet to be considered. These are:

* Taxes

* Royalty payments, particularly the 5% NSR royalty payment on state lands

* Financing costs, i.e., these could include both the time value of money (the interest rate), as well as underwriting and stock sales costs

* This is not an accurate time scenario since exploration would take a minimum four months to drill out the ore body, and permitting and construction could take another nine months to one year. Operating capital at some interest rate would be required before positive cash flow would be attained.

* On the positive side, the rock products business you have started, would, if a stable market exists, translate almost entirely to profit, except for crushing costs.

All of the above are variables which can be addressed later. I do believe that these cash flow scenarios show that if my "Geologically Indicated" projections are even approximately correct - and these geologic projections are based on conservative assays taken by the Phelps Dodge Corporation on the State of Maine vein in 1915 - then there is potential for a highly profitable operation. The next step is to go forward with the exploration drilling plan and start tying some of the variables down. I believe as long as we take an innovative approach to potential mining and processing plans for mineralization measured by drilling, even a much smaller operation on higher grade material or conversely a much larger operation on lower grade material, might be similarly profitable.

It is also important to point out that no consideration was given to the potential for higher grade underground ore bodies which may be of bonanza grade, but would require much more expensive mining operations, and possibly more sophisticated extraction techniques. If the surface operation is profitable, some of the profits should be plowed back into deep exploration and mining.

Very truly yours,

James A. Briscoe

JAB/ms

Enclosures

cc: David Thomas
David Howard
Edmund T. Allen, III

SCENARIOS

I. Change grade of low grade

A. Silver @ 1.644, gold will be left the same as we believe silver has been leached out of rock leaving gold

1. Silver @ 1.5
2. Silver @ 1.3
3. Silver @ 1.0
4. Silver @ 0.8
5. Silver @ 0.6
6. Silver @ 0.5
7. Silver @ 0.28 (breakeven with high grade unchanged)

B. Gold content @ 0.014

1. Gold @ 0.014 to 0.012
2. Gold @ 0.012 to 0.010
3. Gold @ 0.010 to 0.008
4. Gold @ 0.008 to 0.006
5. Gold @ 0.006 to 0.004
6. Gold @ 0.004 to 0.002
7. Gold @ 0.002 to 0.000

II. Change the grade of high grade

A. Silver changed in 0.5 oz. increments

1. Silver from 5.0 oz. to 4.5 oz.
2. Silver from 4.5 oz. to 4.0 oz.
3. Silver from 4.0 oz. to 3.5 oz.
4. Silver from 3.5 oz. to 3.0 oz.
5. Silver from 3.0 oz. to 2.5 oz.
6. Silver from 2.5 oz. to 2.0 oz.
7. Silver from 2.0 oz. to 1.5 oz.

B. Gold changed in 0.002 oz. increments

1. Gold from 0.017 oz. to 0.014 oz.
2. Gold from 0.014 oz. to 0.012 oz.
3. Gold from 0.012 oz. to 0.010 oz.
4. Gold from 0.010 oz. to 0.008 oz.
5. Gold from 0.008 oz. to 0.006 oz.
6. Gold from 0.006 oz. to 0.004 oz.
7. Gold from 0.004 oz. to 0.002 oz.
8. Gold from 0.002 oz. to 0.000 oz.

C. At I.A.6., change mining method to all done by contractor, and eleminate mining department all together, except the mine superintendent, who will keep tabs on the contractor.

III. Eliminate coarse crushing of low grade

A. Same grade ore reserves

1. Delete cost for crushing low grade

2. Delete cost for haulage of crushed low grade from crusher

3. Reduce low grade recovery from

a. Silver - 60% to 40% then 30%
b. Gold - 70% to 50% then 40%

B. Reduce silver grade as in I.A.

IV. Change the price of precious metals

A. Silver decrease:

1. From \$ 6.00 to \$ 5.50
2. From \$ 5.50 to \$ 5.00
3. From \$ 5.00 to \$ 4.50
4. From \$ 4.50 to \$ 4.00
5. From \$ 4.00 to \$ 3.50
6. From \$ 3.50 to \$ 3.00
7. From \$ 3.00 to \$ 2.63 (breakeven)

Silver increase:

8. From \$ 6.00 to \$ 6.50
9. From \$ 6.50 to \$ 7.00
10. From \$ 7.00 to \$ 7.50
11. From \$ 7.50 to \$ 8.00
12. From \$ 8.00 to \$ 8.50
13. From \$ 8.50 to \$ 9.00
14. From \$ 9.00 to \$ 9.50
15. From \$ 9.50 to \$10.00
16. From \$10.00 to \$11.00
17. From \$11.00 to \$12.00
18. From \$12.00 to \$13.00
19. From \$13.00 to \$14.00
20. From \$14.00 to \$15.00

B. Gold decrease:

1. From $300.00 to $250.00
2. From $250.00 to $200.00
3. From $200.00 to $150.00
4. From $150.00 t0 $100.00

Gold increase:

5. From $300.00 to $350.00
6. From $350.00 to $400.00
7. From $400.00 to $450.00
8. From $450.00 to $500.00
9. From $500.00 to $550.00
10. From $550.00 to $600.00
11. From $600.00 to $650.00
12. From $650.00 to $700.00
13. From $700.00 to $750.00
14. From $750.00 to $800.00
15. From $800.00 to $850.00
16. From $850.00 to $900.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO I.A.3., I.B.3., II.A.4., II.B.3. (HIGH GRADE AG 3.0 OZ./TON AU .01 OZ./TON & LOW GRADE AG 1 OZ./TON AU .008 OZ./TON)
OCTOBER 16, 1985

SCENARIO I.A.3.
I.B.3.
II.A.4.
II.B.3.
HIGH GRADE AG
@3.0 OZ./TON
AU @.01 OZ./TON
LOW GRADE AG
@ 1 OZ./TON
AU @.008 OZ./TON

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		3
	CONTAINED TROY OUNCES OF GOLD PER TON		.01
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	41664
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	156.24
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1
	CONTAINED TROY OUNCES OF GOLD PER TON		.008
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	93744
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	874.944
RECOVERED TROY OUNCES OF SILVER			135408
RECOVERED TROY OUNCES OF GOLD			1031

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $6.00/OZ: 6.00		812448	812448	812448	812448	812448	812448	812448	812448	812448	812448	812448	812448	9749376	72.42
GOLD SALES @ $300.00/OZ: 300.00		309355	309355	309355	309355	309355	309355	309355	309355	309355	309355	309355	309355	3712262	27.58
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1121803	1121803	1121803	1121803	1121803	1121803	1121803	1121803	1121803	1121803	1121803	1121803	13461638	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.61
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.17
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.42
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	41.26
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.80
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.88
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET #7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.82
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.36
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		343523	343523	343523	343523	343523	343523	343523	343523	343523	343523	343523	343523	4122280	30.84
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.44
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.54
CAPITAL COSTS	205300														
	1852825	1113949	1113949	1113949	1113949	1113949	1113949	1113949	1113949	1113949	1113949	1113949	1113949	13367384	100.00
INCOME LESS EXPENSES		7855	7855	7855	7855	7855	7855	7855	7855	7855	7855	7855	7855	94254	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO I.A.7. (LOW GRADE AG @ .29 OZ./TON)
OCTOBER 16, 1985

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		.28
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	26248.32
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152

RECOVERED TROY OUNCES OF SILVER 95688
RECOVERED TROY OUNCES OF GOLD 1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $6.00/OZ. 6.00		574130	574130	574130	574130	574130	574130	574130	574130	574130	574130	574130	574130	6889559	51.58
GOLD SALES @ $300.00/OZ. 300.00		539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	6468336	48.42
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1113158	1113158	1113158	1113158	1113158	1113158	1113158	1113158	1113158	1113158	1113158	1113158	13357895	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.62
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.17
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.43
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	41.31
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.80
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.89
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET #7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.82
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.36
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		342214	342214	342214	342214	342214	342214	342214	342214	342214	342214	342214	342214	4106563	30.76
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.44
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.54
CAPITAL COSTS	205300														
	1852825	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	13351667	100.00
INCOME LESS EXPENSES		519	519	519	519	519	519	519	519	519	519	519	519	6228	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO I.B.7. (LOW GRADE AU @ -0- OZ./TON)
OCTOBER 16, 1985

SCENARIO I.B.7
LOW GRADEAU @
-0- OZ./TON

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		0
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	0
RECOVERED TROY OUNCES OF SILVER			223555
RECOVERED TROY OUNCES OF GOLD			266

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $6.00/OZ. 6.00		1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	16095970	94.39
GOLD SALES @ $300.00/OZ. 300.00		79682	79682	79682	79682	79682	79682	79682	79682	79682	79682	79682	79682	956189	5.61
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1421013	1421013	1421013	1421013	1421013	1421013	1421013	1421013	1421013	1421013	1421013	1421013	17052159	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.62
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.17
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.43
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	41.31
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.80
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.89
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET #7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.82
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.36
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		342214	342214	342214	342214	342214	342214	342214	342214	342214	342214	342214	342214	4106563	30.76
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.44
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.54
CAPITAL COSTS	205300														
	1852825	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	1112639	13351667	100.00
INCOME LESS EXPENSES		308374	308374	308374	308374	308374	308374	308374	308374	308374	308374	308374	308374	3700492	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO I.B.7., II.A.5. & I.B.8. (NO GOLD, HIGH GRADE AG @ 2.5 OZ./TON, & LOW GRADE SILVER @ 1.644 OZ/TON)
OCTOBER 16, 1985

SCENARIO I.B.7.
II.A.5.
I.B.8.
-0- GOLD/TON
HIGH GRADE AG
@ 2.5 OZ./TON

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		2.5
	CONTAINED TROY OUNCES OF GOLD PER TON		0
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	34720
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	0
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		0
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	0
RECOVERED TROY OUNCES OF SILVER			188835
RECOVERED TROY OUNCES OF GOLD			0

		CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:																
INVESTOR CAPITAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $6.00/OZ.	6.00		1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	13596130	100.00
GOLD SALES @ $300.00/OZ.	300.00		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
DRILL RIG			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
			1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	1133011	13596130	100.00
EXPENSES:																
ADMINISTRATION GENERAL			4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS		40000														
ADMINISTRATION PERSONNEL			17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS		10000														
GEOLOGY/ORE CONTROL/ENGINEERING			46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.14
CAPITAL COSTS		143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK			93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.37
CAPITAL COSTS		99000														
MINING LOW GRADE & WASTE BY CONTRACTOR			459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.99
CAPITAL COSTS		0														
ASSAY AND METALLURGICAL LABORATORY			8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS		16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE			76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.84
CAPITAL COSTS		265200														
AGGLOMERATOR																
OPERATING COSTS (SEE SHEET #7)	2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.82
1 AGGLOMERATOR OPERATOR (3RD SHFT	8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT	6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT	11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE			15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS		60000														
LEACH PAD & PRECIPITATION PLANT OPERATION			350961	350961	350961	350961	350961	350961	350961	350961	350961	350961	350961	350961	4211538	31.30
CAPITAL COSTS		341500														
PRECIPITATE PREP, SMELTING & REFINING			16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.43
CAPITAL COSTS		72450														
CONSTRUCTION			17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.53
CAPITAL COSTS		205300														
		1852825	1121387	1121387	1121387	1121387	1121387	1121387	1121387	1121387	1121387	1121387	1121387	1121387	13456642	100.00
INCOME LESS EXPENSES			11624	11624	11624	11624	11624	11624	11624	11624	11624	11624	11624	11624	139488	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO IV.A.1. (AG TO $5.50/OZ.)
OCTOBER 16, 1985

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT IFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
RECOVERED TROY OUNCES OF SILVER			223555
RECOVERED TROY OUNCES OF GOLD			1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ 5.50/OZ. 5.50		1229553	1229553	1229553	1229553	1229553	1229553	1229553	1229553	1229553	1229553	1229553	1229553	14754639	69.52
GOLD SALES @ $300.00/OZ. 300.00		539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	6468336	30.48
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1768581	1768581	1768581	1768581	1768581	1768581	1768581	1768581	1768581	1768581	1768581	1768581	21222975	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.81
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET # 7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
CAPITAL COSTS	341500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.52
CAPITAL COSTS	205300														
	1852825	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES		643314	643314	643314	643314	643314	643314	643314	643314	643314	643314	643314	643314	7719762	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO IV.A.4. (AG TO $4.00/OZ.)
OCTOBER 16, 1985

SCENARIO IV.A.4.
AG TO $4.00/OZ.

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
RECOVERED TROY OUNCES OF SILVER			223555
RECOVERED TROY OUNCES OF GOLD			1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $4.00/OZ.: 4.00		894221	894221	894221	894221	894221	894221	894221	894221	894221	894221	894221	894221	10730647	62.39
GOLD SALES @ $300.00/OZ.: 300.00		539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	6468336	37.61
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1433249	1433249	1433249	1433249	1433249	1433249	1433249	1433249	1433249	1433249	1433249	1433249	17198983	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920146	6.61
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET #7) 2 X	4576	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X	173.20 HRS./MO.	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X	173.20 HRS./MO.	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X	173.20 HRS./MO.	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.16
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.52
CAPITAL COSTS	205300														
	1852825	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES		307981	307981	307981	307981	307981	307981	307981	307981	307981	307981	307981	307981	3695770	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO IV.A.6. (AG TO $3.00/OZ.)
OCTOBER 16, 1985

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
RECOVERED TROY OUNCES OF SILVER			223555
RECOVERED TROY OUNCES OF GOLD			1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $3.00/OZ. 3.00		670665	670665	670665	670665	670665	670665	670665	670665	670665	670665	670665	670665	8047985	55.44
GOLD SALES @ $300.00/OZ. 300.00		539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	6468336	44.56
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1209693	1209693	1209693	1209693	1209693	1209693	1209693	1209693	1209693	1209693	1209693	1209693	14516321	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.81
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET #7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.52
CAPITAL COSTS	205300														
	1852825	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES		84426	84426	84426	84426	84426	84426	84426	84426	84426	84426	84426	84426	1013108	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO IV.A.7. (AG TO $2.63/OZ.)
OCTOBER 16, 1985

SCENARIO IV.A.7.
AG TO $2.63/OZ.

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
RECOVERED TROY OUNCES OF SILVER			223555
RECOVERED TROY OUNCES OF GOLD			1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $2.63/OZ. 2.62		585714	585714	585714	585714	585714	585714	585714	585714	585714	585714	585714	585714	7028573	52.08
GOLD SALES @ $300.00/OZ. 300.00		539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	6468336	47.92
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1124742	1124742	1124742	1124742	1124742	1124742	1124742	1124742	1124742	1124742	1124742	1124742	13496909	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.81
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET #7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	1710'	17108	17108	17108	205296	1.52
CAPITAL COSTS	205300														
	1852825	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES		-525	-525	-525	-525	-525	-525	-525	-525	-525	-525	-525	-525	-6303	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO IV.B.4. (AU TO $100/OZ.)
OCTOBER 16, 1985

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
RECOVERED TROY OUNCES OF SILVER			223555
RECOVERED TROY OUNCES OF GOLD			1797

		CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:																
INVESTOR CAPITAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $5.00/OZ.	5.00		1117776	1117776	1117776	1117776	1117776	1117776	1117776	1117776	1117776	1117776	1117776	1117776	13413308	86.15
GOLD SALES @ $100.00/OZ.	100.00		179676	179676	179676	179676	179676	179676	179676	179676	179676	179676	179676	179676	2156112	13.85
DRILL RIG			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
			1297452	1297452	1297452	1297452	1297452	1297452	1297452	1297452	1297452	1297452	1297452	1297452	15569420	100.00
EXPENSES:																
ADMINISTRATION GENERAL			4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS		40000														
ADMINISTRATION PERSONNEL			17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS		10000														
GEOLOGY/ORE CONTROL/ENGINEERING			46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
CAPITAL COSTS		143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK			93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
CAPITAL COSTS		99000														
MINING LOW GRADE & WASTE BY CONTRACTOR			459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
CAPITAL COSTS		0														
ASSAY AND METALLURGICAL LABORATORY			8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS		16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE			76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.81
CAPITAL COSTS		265200														
AGGLOMERATOR																
OPERATING COSTS (SEE SHEET #7)	2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT	8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT	6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT	11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE			15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS		60000														
LEACH PAD & PRECIPITATION PLANT OPERATION			354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
CAPITAL COSTS		941500														
PRECIPITATE PREP, SMELTING & REFINING			16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CAPITAL COSTS		72450														
CONSTRUCTION			17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.52
CAPITAL COSTS		205300														
		1852823	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES			172184	172184	172184	172184	172184	172184	172184	172184	172184	172184	172184	172184	2066207	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO I.A.3., I.B.3., II.A.4., II.B.3., IV.A.15 & IV.B.7. (HI GRADE AG 3 OZ/TON, AU .01 OZ/TON, LO GRADE AG 1 OZ/TON, AU .008 OZ/TON
AG @ $10/OZ., AU @ $450/OZ.)
OCTOBER 16, 1985

SCENARIO I.A.3.
I.B.3.
II.A.4.
II.B.3.
IV.A.15.
IV.B.7.
HI GRADE AG @
3 OZ/TON, AU @
.01 OZ/TON
LO GRADE AG @
1 OZ/TON, AU @
.008 OZ/TON
AG @ $10/OZ.
AU @ $450/OZ.

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		3
	CONTAINED TROY OUNCES OF GOLD PER TON		.01
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	41664
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	156.24
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1
	CONTAINED TROY OUNCES OF GOLD PER TON		.008
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	93744
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	874.944
RECOVERED TROY OUNCES OF SILVER			135408
RECOVERED TROY OUNCES OF GOLD			1031

		CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:																
INVESTOR CAPITAL			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $10.00/OZ.	10.00		1354080	1354080	1354080	1354080	1354080	1354080	1354080	1354080	1354080	1354080	1354080	1354080	16248960	74.48
GOLD SALES @ $450.00/OZ.	450.00		464033	464033	464033	464033	464033	464033	464033	464033	464033	464033	464033	464033	556 83 94	25.52
DRILL RIG			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
			1818113	1818113	1818113	1818113	1818113	1818113	1818113	1818113	1818113	1818113	1818113	1818113	21817354	100.00
EXPENSES:																
ADMINISTRATION GENERAL CAPITAL COSTS		40000	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
ADMINISTRATION PERSONNEL CAPITAL COSTS		10000	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.61
GEOLOGY/ORE CONTROL/ENGINEERING CAPITAL COSTS		143000	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.16
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK CAPITAL COSTS		99000	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.40
MINING LOW GRADE & WASTE BY CONTRACTOR CAPITAL COSTS		0	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	41.17
ASSAY AND METALLURGICAL LABORATORY CAPITAL COSTS		16375	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE CAPITAL COSTS		265200	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.87
AGGLOMERATOR OPERATING COSTS (SEE SHEET #7)	2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.82
1 AGGLOMERATOR OPERATOR (3RD SHFT	8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT	6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT	11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
			15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.36
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE CAPITAL COSTS		60000	346061	346061	346061	346061	346061	346061	346061	346061	346061	346061	346061	346061	4152731	31.00
LEACH PAD & PRECIPITATION PLANT OPERATION CAPITAL COSTS		941500	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.43
PRECIPITATE PREP, SMELTING & REFINING CAPITAL COSTS		72450	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.53
CONSTRUCTION CAPITAL COSTS		205300														
		1852825	1116486	1116486	1116486	1116486	1116486	1116486	1116486	1116486	1116486	1116486	1116486	1116486	13397835	100.00
INCOME LESS EXPENSES			701627	701627	701627	701627	701627	701627	701627	701627	701627	701627	701627	701627	8419519	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO I.A.6., I.B.3., II.A.7., II.B.3., IV.A.15 & IV.B.7. (HI GRADE AG 1.5 OZ/TON, AU .01 OZ/TON & LO GRADE AG .5 OZ/TON, AU .008 OZ/TON
AG @ $10/OZ., AU @ $450/OZ.)
OCTOBER 16, 1986

SCENARIO I.A.6.
I.B.3.
II.A.7.
II.B.3.
IV.A.15.
IV.B.7.
HI GRADE AG @
1.5 OZ/TON, AU @
.01 OZ/TON
LO GRADE AG @
.5 OZ/TON, AU @
.008 OZ/TON
AG @ $10/OZ.
AU @ $450/OZ.

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.5
	CONTAINED TROY OUNCES OF GOLD PER TON		.01
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	20832
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	156.24
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		.5
	CONTAINED TROY OUNCES OF GOLD PER TON		.008
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	46872
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	874.944
RECOVERED TROY OUNCES OF SILVER			67704
RECOVERED TROY OUNCES OF GOLD			1031

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $10.00/OZ. 10.00		677040	677040	677040	677040	677040	677040	677040	677040	677040	677040	677040	677040	8124480	59.33
GOLD SALES @ $450.00/OZ. 450.00		464033	464033	464033	464033	464033	464033	464033	464033	464033	464033	464033	464033	5568394	40.67
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1141073	1141073	1141073	1141073	1141073	1141073	1141073	1141073	1141073	1141073	1141073	1141073	13692874	100.00
EXPENSES:															
ADMINISTRATION GENERAL / CAPITAL COSTS	40000	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
ADMINISTRATION PERSONNEL / CAPITAL COSTS	10000	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.62
GEOLOGY/ORE CONTROL/ENGINEERING / CAPITAL COSTS	143000	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.18
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK / CAPITAL COSTS	99000	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.45
MINING LOW GRADE & WASTE BY CONTRACTOR / CAPITAL COSTS	0	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	41.41
ASSAY AND METALLURGICAL LABORATORY / CAPITAL COSTS	16375	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.80
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE / CAPITAL COSTS	265200	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.91
AGGLOMERATOR 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.82
OPERATING COSTS (SEE SHEET #7)		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1106	1108	13302	0.10
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.37
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE / CAPITAL COSTS	60000	339352	339352	339352	339352	339352	339352	339352	339352	339352	339352	339352	339352	4072230	30.58
LEACH PAD & PRECIPITATION PLANT OPERATION / CAPITAL COSTS	941500	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.44
PRECIPITATE PREP, SMELTING & REFINING / CAPITAL COSTS	72450	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.54
CONSTRUCTION / CAPITAL COSTS	205300														
	1852825	1109778	1109778	1109778	1109778	1109778	1109778	1109778	1109778	1109778	1109778	1109778	1109778	13317334	100.00
INCOME LESS EXPENSES		31295	31295	31295	31295	31295	31295	31295	31295	31295	31295	31295	31295	375540	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
SCENARIO IV.A.3. & IV.B.2. (AG @ $4.50 & AU @ $200)
OCTOBER 16, 1985

SCENARIO IV.A.3. & IV.B.4.
AG @ $4.50
AU @ $200.00

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
	RECOVERED TROY OUNCES OF SILVER		223555
	RECOVERED TROY OUNCES OF GOLD		1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $4.50/OZ. 4.50		1005998	1005998	1005998	1005998	1005998	1005998	1005998	1005998	1005998	1005998	1005998	1005998	12071977	73.68
GOLD SALES @ $200.00/OZ. 200.00		359352	359352	359352	359352	359352	359352	359352	359352	359352	359352	359352	359352	4312224	26.32
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1365350	1365350	1365350	1365350	1365350	1365350	1365350	1365350	1365350	1365350	1365350	1365350	16384201	100.00
EXPENSES:															
ADMINISTRATION GENERAL / CAPITAL COSTS	40000	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
ADMINISTRATION PERSONNEL / CAPITAL COSTS	10000	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
GEOLOGY/ORE CONTROL/ENGINEERING / CAPITAL COSTS	143000	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK / CAPITAL COSTS	99000	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
MINING LOW GRADE & WASTE BY CONTRACTOR / CAPITAL COSTS	0	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
ASSAY AND METALLURGICAL LABORATORY / CAPITAL COSTS	16375	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE / CAPITAL COSTS	265200	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.81
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET #7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE / CAPITAL COSTS	60000	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
LEACH PAD & PRECIPITATION PLANT OPERATION / CAPITAL COSTS	941500	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
PRECIPITATE PREP, SMELTING & REFINING / CAPITAL COSTS	72450	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CONSTRUCTION / CAPITAL COSTS	205300	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.52
	1852825	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES		240082	240082	240082	240082	240082	240082	240082	240082	240082	240082	240082	240082	2880988	

OMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
OTAL INCOME AND EXPENSES
CTOBER 16, 1985

SHEET 1

IGH RADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
OW RADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
ECOVERED TROY OUNCES OF SILVER			223555
ECOVERED TROY OUNCES OF GOLD			1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
NCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $6.00/OZ. 6.00		1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	16095970	71.33
GOLD SALES @ $300.00/OZ. 300.00		539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	6468336	28.67
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	22564306	100.00
XPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.81
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET # 7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.52
CAPITAL COSTS	205300														
	1852825	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES		755091	755091	755091	755091	755091	755091	755091	755091	755091	755091	755091	755091	9061093	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
ADMINISTRATION GENERAL EXPENSES
OCTOBER 16, 1985

SHEET 2

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
ADMINISTRATION GENERAL															
OFFICE RENT & UTILITIES		200	200	200	200	200	200	200	200	200	200	200	200	2400	4.05
OFFICE SUPPLIES/MISCELLANEOUS EXPENSES		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
OFFICE FURNISHINGS	20000 ÷12	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	20000	33.78
COMPUTER NETWORK	20000 "	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	20000	33.78
FOOD/TRAVEL/LODGING		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
MANAGEMENT MEETINGS		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
ACCOUNTING		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
LEGAL		200	200	200	200	200	200	200	200	200	200	200	200	2400	4.05
	40000	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59200	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
ADMINISTRATION PERSONNEL EXPENSES
OCTOBER 16, 1985

SHEET 3

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
ADMINISTRATION PERSONNEL															
GENERAL SUPERINTENDENT ($ 31.00/HOUR X 173.20 HOURS/MONTH)		5369	5369	5369	5369	5369	5369	5369	5369	5369	5369	5369	5369	64430	29.86
PICKUP TRUCK	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	4.63
OPERATING COST OF PICK UP TRUCK		500	500	500	500	500	500	500	500	500	500	500	500	6000	2.78
BOOKKEEPER ($ 15.00/HOUR X 173.20 HOURS/MONTH)		2598	2598	2598	2598	2598	2598	2598	2598	2598	2598	2598	2598	31176	14.45
PURCHASING AGENT ($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	7.40
SAFETY ENGINEER ($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	7.40
MONTHLY CONTRACT WITH TOMBSTONE DOCTOR		300	300	300	300	300	300	300	300	300	300	300	300	3600	1.67
SECRETARY ($ 6.40/HOUR X 173.20 HOURS/MONTH)		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	6.16
SECURITY CONTRACT/MONTH		4612	4612	4612	4612	4612	4612	4612	4612	4612	4612	4612	4612	55344	25.65
	10000	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215776	100.00

OMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
EOLOGY/ORE CONTROL/ENGINEERING EXPENSES
CTOBER 16, 1985

SHEET 4

XPENSES:			CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
GEOLOGY/ORE CONTROL/ENGINEERING																	
SR.CONSULTING GEOLOGIST	($ 31.25/HOUR X	173.20 HOURS/MONTH)		5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	64950	11.65
TRAVEL- 1 PICKUP TRUCK	($ 175.00/WEEK X	4.33 WEEKS/MONTH)		758	758	758	758	758	758	758	758	758	758	758	758	9093	1.63
FOOD & LODGING	($ 15.00/DAY X	22 DAYS/MONTH)		330	330	330	330	330	330	330	330	330	330	330	330	3960	0.71
CONSULTING GEOLOGIST	($ 31.25/HOUR X	173.20 HOURS/MONTH)		5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	64950	11.65
TRAVEL- 1 PICKUP TRUCK	($ 175.00/WEEK X	4.33 WEEKS/MONTH)		758	758	758	758	758	758	758	758	758	758	758	758	9093	1.63
FOOD & LODGING	($ 15.00/DAY X	22 DAYS/MONTH)		330	330	330	330	330	330	330	330	330	330	330	330	3960	0.71
GEOLOGIST CAD OPERATOR	($ 19.21/HOUR X	173.20 HOURS/MONTH)		3327	3327	3327	3327	3327	3327	3327	3327	3327	3327	3327	3327	39926	7.16
COMPUTER USE	($ 5.00/HOUR X	173.20 HOURS/MONTH)		866	866	866	866	866	866	866	866	866	866	866	866	10392	1.86
SURVEYOR/MAP TOOL OPER.	($ 11.53/HOUR X	173.20 HOURS/MONTH)		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	4.30
PICKUP TRUCK			2000	167	167	167	167	167	167	167	167	167	167	167	167	2000	0.36
OPERATING COST/MONTH				300	300	300	300	300	300	300	300	300	300	300	300	3600	0.65
4 SAMPLERS	($ 25.60/HOUR X	173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	9.55
PICKUP TRUCK			2000	167	167	167	167	167	167	167	167	167	167	167	167	2000	0.36
OPERATING COST/MONTH				250	250	250	250	250	250	250	250	250	250	250	250	3000	0.54
UNC SILVER MAP & LAND SURVEYING EQUIPMENT			100000	8333	8333	8333	8333	8333	8333	8333	8333	8333	8333	8333	8333	100000	17.94
DRILL OPERATION-2 SHIFTS																	
DRILL PAYMENTS			39000	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	39000	7.00
DRILL OPERATING COST				2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	30000	5.38
2 DRILL OPERATORS	($ 25.60/HOUR X	173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	9.55
2 DRILL HELPERS	($ 12.80/HOUR X	173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	4.77
MISCELLANEOUS SUPPLIES																	
COREBOARDS				500	500	500	500	500	500	500	500	500	500	500	500	6000	1.08
CAD SUPPLIES				200	200	200	200	200	200	200	200	200	200	200	200	2400	0.43
REPRODUCTION				500	500	500	500	500	500	500	500	500	500	500	500	6000	1.08
			143000	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557306	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK
OCTOBER 16, 1985

SHEET 5

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
MINING (HIGH GRADE 800 TONS/DAY-1 SHIFT/DAY-5 DAYS/WEEK)															
MINE SUPERINTENDENT ($ 25.60/HOUR X 173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	4.73
PICKUP TRUCK	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	0.89
OPERATING COSTS		500	500	500	500	500	500	500	500	500	500	500	500	6000	0.53
AIR TRACK DRILL		4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	51600	4.58
DRILL OPERATOR ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
PICKUP TRUCK		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.27
POWDER PERSON ($ 11.13/HOUR X 173.20 HOURS/MONTH)		1928	1928	1928	1928	1928	1928	1928	1928	1928	1928	1928	1928	23133	2.05
POWDER TRUCK		667	667	667	667	667	667	667	667	667	667	667	667	8004	0.71
OPERATING COST		200	200	200	200	200	200	200	200	200	200	200	200	2400	0.21
PRIMERS, PRIMA CORD, & ANFO		35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	420000	37.31
EXCAVATOR		10834	10834	10834	10834	10834	10834	10834	10834	10834	10834	10834	10834	130008	11.55
OPERATING COST		8092	8092	8092	8092	8092	8092	8092	8092	8092	8092	8092	8092	97104	8.63
EXCAVATOR-CURRENT ONE USED AS BACKUP															
EXCAVATOR OPERATOR ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
5 15 TON TRUCKS	28500	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375	28500	2.53
OPERATING COSTS		2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	25200	2.24
3 TRUCK DRIVERS ($ 26.88/HOUR X 173.20 HOURS/MONTH)		4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	55867	4.96
1 SERVICE TRUCK	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	0.89
OPERATING COST		400	400	400	400	400	400	400	400	400	400	400	400	4800	0.43
1 SERVICE TRUCK PERSON($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	1.42
1 FLAT BED DUMP TRUCK (OPERATING COST)		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.27
1 ROAD BLADE (OPERATING COST)		500	500	500	500	500	500	500	500	500	500	500	500	6000	0.53
MAINTENANCE SHOP BUILDING	28000	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	28000	2.49
MAINTENANCE SHOP SUPPLIES	20000	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	20000	1.78
MAINTENANCE SHOP CONSUMABLES		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	12000	1.07
MECHANIC ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
WELDER ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
1 PICK UP TRUCK (OPERATING COST)		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.27
DIESEL TANK	2500	208	208	208	208	208	208	208	208	208	208	208	208	2500	0.22
	99000	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125699	100.00
MINING LOW GRADE & WASTE DONE BY CONTRACTOR (QUOTE FROM FRANK MAGINI)															
LOW GRADE ORE 7200 TONS PER DAY															
X $ 0.78 PER TON															
X 22 DAYS/MONTH															
123552		123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	1482624	26.88
WASTE ROCK 7200 TONS PER DAY															
X 1.72 STRIPPING RATIO															
X $ 0.78 PER TON															
X 22 DAYS/MONTH															
212509		212509	212509	212509	212509	212509	212509	212509	212509	212509	212509	212509	212509	2550113	46.24
CRUSHED & AGGLOMERATED ORE FROM PRIMARY CRUSHER 7200 TONS PER DAY															
X $ 0.78 PER TON															
X 22 DAYS/MONTH															
123552		123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	1482624	26.88
459613		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515361	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
ASSAY AND METALLURGICAL LABORATORY
OCTOBER 16, 1985

SHEET 6

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
ASSAY & METALLURGICAL LABORATORY															
CONSULTING METALLURGIST ($ 300.00/DAY X 5 DAYS/MONTH)		1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000	16.92
FOOD & LODGING ($ 50.00/DAY X 5 DAYS/MONTH)		250	250	250	250	250	250	250	250	250	250	250	250	3000	2.82
TRAVEL 1 ROUND TRIP/MONTH		150	150	150	150	150	150	150	150	150	150	150	150	1800	1.69
METALLURGICAL LABORATORY EQUIPMENT	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	9.40
OPERATING COSTS		500	500	500	500	500	500	500	500	500	500	500	500	6000	5.64
1 PROFESSIONAL ASSAYER ($ 15.36/HOUR X 173.20 HOURS/MONTH)		2660	2660	2660	2660	2660	2660	2660	2660	2660	2660	2660	2660	31924	30.01
1 ORE PREP.TECHNICIAN ($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	15.01
1 ORE PREP.HELPER ($ 6.40/HOUR X 173.20 HOURS/MONTH)		1108	1108	1108	1108	1108	1108	1106	1108	1108	1106	1108	1108	13302	12.51
1 JAW CRUSHER	200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.19
1 PULVERISER	200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.19
1 PLATFORM SCALE	125	10	10	10	10	10	10	10	10	10	10	10	10	125	0.12
3 BALANCES	400	33	33	33	33	33	33	33	33	33	33	33	33	400	0.38
1 SIEVE SHAKER	100	8	8	8	8	8	8	8	8	8	8	8	8	100	0.09
1 OVEN	300	25	25	25	25	25	25	25	25	25	25	25	25	300	0.28
1 HOTPLATE	250	21	21	21	21	21	21	21	21	21	21	21	21	250	0.24
1 GAS FIRED ASSAY FURNACE	300	25	25	25	25	25	25	25	25	25	25	25	25	300	0.28
1 AA MACHINE WITH LAMPS	4500	375	375	375	375	375	375	375	375	375	375	375	375	4500	4.23
	16375	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106363	100.00

OHGSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
EACH PAD & PRECIPITATION PLANT OPERATION
CTOBER 16, 1985

SHEET 7 A

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
XPENSES:															
LEACH PAD & PRECIP.PLANT OPERATION(3 SHIFTS 24 HRS/DAY X 5 DAYS/WEEK)															
POND LINER - CLIPPER ORE BODY ONLY	375000	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	375000	8.81
PLUMBING FOR LEACH POND	75000	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	75000	1.76
24 PPT. PLANTS	460000	38333	38333	38333	38333	38333	38333	38333	38333	38333	38333	38333	38333	460000	10.80
OPERATING COSTS		7603	7603	7603	7603	7603	7603	7603	7603	7603	7603	7603	7603	91236	2.14
4 MIXING TANKS	2500	208	208	208	208	208	208	208	208	208	208	208	208	2500	0.06
6 PUMPS	3000	250	250	250	250	250	250	250	250	250	250	250	250	3000	0.07
OPERATING COSTS		4224	4224	4224	4224	4224	4224	4224	4224	4224	4224	4224	4224	50688	1.19
PLUMBING	24000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	24000	0.56
OPERATING COSTS		500	500	500	500	500	500	500	500	500	500	500	500	6000	0.14
FILTERS		3360	3360	3360	3360	3360	3360	3360	3360	3360	3360	3360	3360	40320	0.95
MISCELLANEOUS		2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	30000	0.70
9 PLANT OPERATORS ($ 69.12/HOUR X 173.20 HOURS/MONTH)		11972	11972	11972	11972	11972	11972	11972	11972	11972	11972	11972	11972	143659	3.37
4 PLANT HELPERS ($ 25.60/HOUR X 173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	1.25
PICKUP TRUCK	2000	167	167	167	167	167	167	167	167	167	167	167	167	2000	0.05
OPERATING COSTS		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.07
REAGENT COSTS															
CYANIDE		148740	148740	148740	148740	148740	148740	148740	148740	148740	148740	148740	148740	1784886	41.92

HIGH GRADE

800 TONS PER DAY-HIGH GRADE
21.70 X PRODUCTION SHIFTS/MONTH HIGH GRADE

17360 = TONS/MONTH HIGH GRADE

2880 TONS/DAY FINES FROM LOW GRADE
21.70 X PRODUCTION SHIFTS/MONTH LOW GRADE

62496 = TONS/MONTH FINES FROM LOW GRADE

79856 = TOTAL TONS/MONTH AGGLOMERATED ORE
2 X POUNDS/TON CYANIDE

159712 = POUNDS OF CYANIDE/MONTH
0.72 X COST OF CYANIDE/POUND

114993 = TOTAL COST OF CYANIDE/MONTH AGGLOMERATED ORE

LOW GRADE

7200 TOTAL TONNAGE-LOW GRADE
2880 - AGGLOMERATED FINES

4320 = COARSE LOW GRADE FRACTION
21.70 X PRODUCTION SHIFTS/MONTH

93744 = TOTAL COARSE LOW GRADE/MONTH
0.50 X CYANIDE CONSUMPTION/TON

46872 = POUNDS OF CYANIDE/MONTH
0.72 X COST OF CYANIDE/POUND

33748 = TOTAL COST OF CYANIDE/MONTH-LOW GRADE

114993 TOTAL COST OF CYANIDE/MONTH AGGLOMERATED ORE
33748 TOTAL COST OF CYANIDE/MONTH-LOW GRADE

148740 TOTAL COST OF CYANIDE/MONTH

206584 (TOTAL POUNDS CYANIDE/MONTH)

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
LEACH PAD & PRECIPITATION PLANT OPERATION
OCTOBER 16, 1985

Item	Calculation	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
LIME			35414	35414	35414	35414	35414	35414	35414	35414	35414	35414	35414	35414	424973	9.98
HIGH GRADE	800 TONS HIGH GRADE PRODUCTION/DAY															
	21.70 X PRODUCTION SHIFTS/MONTH - HIGH GRADE															
	17360 = HIGH GRADE TONS PRODUCED/MONTH															
LOW GRADE	7200 LOW GRADE PRODUCTION/SHIFT															
	21.70 X PRODUCTION SHIFTS/MONTH - LOW GRADE															
	156240 = LOW GRADE TONS PRODUCED/MONTH															
	17360 + HIGH GRADE TONS PRODUCED/MONTH															
	173600 = TOTAL TONS ORE PRODUCED/MONTH															
	6 X LBS. LIME/TON OF ORE															
	1041600 = TOTAL POUNDS OF LIME/MONTH															
	.034 X COST OF LIME/POUND (@ $68/TON)															
	35414															
CEMENT	79856 TOTAL TONS/MONTH AGGLOMERATED ORE		21242	21242	21242	21242	21242	21242	21242	21242	21242	21242	21242	21242	254900	5.99
	5 X 5 LBS. PER TON CEMENT															
	399280 = TOTAL LBS. OF CEMENT/MONTH															
	.0532 X PRICE/LB. (@ $5/94 LB.BAG)															
	21242 = TOTAL COST OF CEMENT USED/MONTH															
DIATOMACEOUS EARTH (DE)	173600 TOTAL TONS ORE PRODUCED/MONTH(HI & LO GRADE)		13888	13888	13888	13888	13888	13888	13888	13888	13888	13888	13888	13888	166656	3.91
	0.50 X .5 LBS. DE/TON															
	86800 = TOTAL LBS. DE USED/MONTH															
	0.16 X PRICE/LB. DE															
	13888 = TOTAL COST OF DE USED/MONTH															
ZINC	69706 TOTAL AU & AG RECOVERY-HI GRADE/TROY OZ.		22257	22257	22257	22257	22257	22257	22257	22257	22257	22257	22257	22257	267084	6.27
	155646 TOTAL AU & AG RECOVERY-LO GRADE/TROY OZ.															
	225352 = TOTAL AU & AG RECOVERED/MONTH															
	14.58 DIVIDED BY 14.58 TROY OZ./AV LBS.															
	15456 = AVOIRDUPOIS LBS. PM PRODUCTION/MONTH															
	2 X LBS. ZINC CONSUMED/LB. OF PM															
	30912 =LBS. OF ZINC CONSUMED/MONTH															
	0.72 X PRICE OF ZINC POWDER/LB.															
	22257 = TOTAL COST OF ZINC/MONTH															
		941500	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	100

FINES FROM CRUSHING LOW GRADE ORE TO AGGLOMERATOR - 0.40% X 7200 TPD = 2880

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
PRECIPITATE PREP AND SMELTING & REFINING
OCTOBER 16, 1985

SHEET 8

		CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:																
PRECIPITATE PREP & SMELTING & REFINING																
OPERATOR	($ 8.96/HOUR X 173.20 HOURS/MONTH)		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	9.69
OPERATOR HELPER	($ 6.40/HOUR X 173.20 HOURS/MONTH)		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	6.92
EQUIPMENT																
20 FILTERS		14600	1217	1217	1217	1217	1217	1217	1217	1217	1217	1217	1217	1217	14600	7.60
1 DRYER		1500	125	125	125	125	125	125	125	125	125	125	125	125	1500	0.78
1 OVEN		700	58	58	58	58	58	58	58	58	58	58	58	58	700	0.36
SMELTING OF PRECIPITATES																
1 FURNACE OPERATOR	($ 10.24/HOUR X 173.20 HOURS/MONTH)		1774	1774	1774	1774	1774	1774	1774	1774	1774	1774	1774	1774	21283	11.07
1 FURNACE OP HELPER	($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	8.30
SMELTING EQUIPMENT																
2 #430 FURNACES		18000	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000	9.36
2 #430 CRUCIBLES		500	42	42	42	42	42	42	42	42	42	42	42	42	500	0.26
1 CONE MOLD		400	33	33	33	33	33	33	33	33	33	33	33	33	400	0.21
1 #100 FURNACE			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
1 ANNODE MOLD		200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.10
1 PLATFORM SCALE		100	8	8	8	8	8	8	8	8	8	8	8	8	100	0.05
MISCELLANEOUS SUPPLIES		250	21	21	21	21	21	21	21	21	21	21	21	21	250	0.13
REFINING DORE BULLION																
1 OPERATOR	($ 11.54/HOUR X 173.20 HOURS/MONTH)		1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	23985	12.48
2 OPERATOR HELPERS	($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	13.84
EQUIPMENT																
1 REFINING CELL		25000	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	25000	13.01
1 #100 FURNACE		6000	500	500	500	500	500	500	500	500	500	500	500	500	6000	3.12
1 #100 CRUCIBLE		200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.10
1 #16 FURNACE			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
1 #16 CRUCIBLE			0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
1 BUILDING		5000	417	417	417	417	417	417	417	417	417	417	417	417	5000	2.60
		72450	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192207	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
CONSTRUCTION
OCTOBER 16, 1985

SHEET S

		MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
CONSTRUCTION & INFRASTRUCTURE															
ELECTRIC INSTALLATION	75000	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	75000	36.53
FOUNDATION EXCAVATION	25000	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	25000	12.18
BUILDINGS	75000	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	75000	36.53
GENERAL LABOR POOL	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	4.87
TELEPHONE SYSTEM	5000	417	417	417	417	417	417	417	417	417	417	417	417	5000	2.44
RADIO SYSTEM (TEI)	6000	500	500	500	500	500	500	500	500	500	500	500	500	6000	2.92
FIRE EXTINGUISHERS	6000	500	500	500	500	500	500	500	500	500	500	500	500	6000	2.92
FIRST AID SUPPLIES	3300	275	275	275	275	275	275	275	275	275	275	275	275	3300	1.61
	205300	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205300	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
TOTAL INCOME AND EXPENSES
OCTOBER 16, 1985

SHEET 1

HIGH GRADE:	MINING PRODUCTION IN TONS PER SHIFT		800
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		5
	CONTAINED TROY OUNCES OF GOLD PER TON		.017
	RECOVERED TROY OUNCES OF SILVER (80%)	.8	69440
	RECOVERED TROY OUNCES OF GOLD (90%)	.9	265.608
LOW GRADE:	MINING PRODUCTION IN TONS PER SHIFT		7200
	PRODUCTION SHIFTS PER MONTH		21.7
	CONTAINED TROY OUNCES OF SILVER PER TON		1.644
	CONTAINED TROY OUNCES OF GOLD PER TON		.014
	RECOVERED TROY OUNCES OF SILVER (60%)	.6	154115.1
	RECOVERED TROY OUNCES OF GOLD (70%)	.7	1531.152
RECOVERED TROY OUNCES OF SILVER			223555
RECOVERED TROY OUNCES OF GOLD			1797

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
INCOME:															
INVESTOR CAPITAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
SILVER SALES @ $6.00/OZ. 6.00		1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	1341331	16095970	71.33
GOLD SALES @ $300.00/OZ. 300.00		539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	539028	6468336	28.67
DRILL RIG		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
LOADER		0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
		1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	1880359	22564306	100.00
EXPENSES:															
ADMINISTRATION GENERAL		4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59196	0.44
CAPITAL COSTS	40000														
ADMINISTRATION PERSONNEL		17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215772	1.60
CAPITAL COSTS	10000														
GEOLOGY/ORE CONTROL/ENGINEERING		46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557304	4.13
CAPITAL COSTS	143000														
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK		93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	93808	1125696	8.34
CAPITAL COSTS	99000														
MINING LOW GRADE & WASTE BY CONTRACTOR		459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515356	40.84
CAPITAL COSTS	0														
ASSAY AND METALLURGICAL LABORATORY		8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106368	0.79
CAPITAL COSTS	16375														
CRUSHING-2 SHIFTS/DAY INCLUDING MAINTENANCE		76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	76679	920148	6.81
CAPITAL COSTS	265200														
AGGLOMERATOR															
OPERATING COSTS (SEE SHEET # 7) 2 X 4576		9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	9152	109824	0.81
1 AGGLOMERATOR OPERATOR (3RD SHFT 8.96/HOUR X 173.20 HRS./MO.		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	0.14
1 AGGLOMERATOR HELPER (3RD SHFT 6.40/HOUR X 173.20 HRS./MO.		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	0.10
1 LOADER OPERATOR (3RD SHFT 11.53/HOUR X 173.20 HRS./MO.		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	0.18
CRUSHING LOW GRADE-2 SHIFTS/DAY INCLUDING MAINTENANCE		15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	15171	182052	1.35
CAPITAL COSTS	60000														
LEACH PAD & PRECIPITATION PLANT OPERATION		354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	31.53
CAPITAL COSTS	941500														
PRECIPITATE PREP, SMELTING & REFINING		16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192204	1.42
CAPITAL COSTS	72450														
CONSTRUCTION		17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205296	1.52
CAPITAL COSTS	205300														
	1852825	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	1125268	13503213	100.00
INCOME LESS EXPENSES		755091	755091	755091	755091	755091	755091	755091	755091	755091	755091	755091	755091	9061093	

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
ADMINISTRATION GENERAL EXPENSES
OCTOBER 16, 1985

SHEET 2

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
ADMINISTRATION GENERAL															
OFFICE RENT & UTILITIES		200	200	200	200	200	200	200	200	200	200	200	200	2400	4.05
OFFICE SUPPLIES/MISCELLANEOUS EXPENSES		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
OFFICE FURNISHINGS	20000	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	20000	33.78
COMPUTER NETWORK	20000	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	20000	33.78
FOOD/TRAVEL/LODGING		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
MANAGEMENT MEETINGS		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
ACCOUNTING		300	300	300	300	300	300	300	300	300	300	300	300	3600	6.08
LEGAL		200	200	200	200	200	200	200	200	200	200	200	200	2400	4.05
	40000	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	4933	59200	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
ADMINISTRATION PERSONNEL EXPENSES
OCTOBER 16, 1985

SHEET 3

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
ADMINISTRATION PERSONNEL															
GENERAL SUPERINTENDENT ($ 31.00/HOUR X 173.20 HOURS/MONTH)		5369	5369	5369	5369	5369	5369	5369	5369	5369	5369	5369	5369	64430	29.86
PICKUP TRUCK	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	4.63
OPERATING COST OF PICK UP TRUCK		500	500	500	500	500	500	500	500	500	500	500	500	6000	2.78
BOOKKEEPER ($ 15.00/HOUR X 173.20 HOURS/MONTH)		2598	2598	2598	2598	2598	2598	2598	2598	2598	2598	2598	2598	31176	14.45
PURCHASING AGENT ($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	7.40
SAFETY ENGINEER ($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	7.40
MONTHLY CONTRACT WITH TOMBSTONE DOCTOR		300	300	300	300	300	300	300	300	300	300	300	300	3600	1.67
SECRETARY ($ 6.40/HOUR X 173.20 HOURS/MONTH)		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	6.16
SECURITY CONTRACT/MONTH		4612	4612	4612	4612	4612	4612	4612	4612	4612	4612	4612	4612	55344	25.65
	10000	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	17981	215776	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
GEOLOGY/ORE CONTROL/ENGINEERING EXPENSES
OCTOBER 16, 1985

SHEET 4

			CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:																	
GEOLOGY/ORE CONTROL/ENGINEERING																	
SR.CONSULTING GEOLOGIST	($ 31.25/HOUR X	173.20 HOURS/MONTH)		5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	64950	11.65
TRAVEL- 1 PICKUP TRUCK	($ 175.00/WEEK X	4.33 WEEKS/MONTH)		758	758	758	758	758	758	758	758	758	758	758	758	9093	1.63
FOOD & LODGING	($ 15.00/DAY X	22 DAYS/MONTH)		330	330	330	330	330	330	330	330	330	330	330	330	3960	0.71
CONSULTING GEOLOGIST	($ 31.25/HOUR X	173.20 HOURS/MONTH)		5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	5413	64950	11.65
TRAVEL- 1 PICKUP TRUCK	($ 175.00/WEEK X	4.33 WEEKS/MONTH)		758	758	758	758	758	758	758	758	758	758	758	758	9093	1.63
FOOD & LODGING	($ 15.00/DAY X	22 DAYS/MONTH)		330	330	330	330	330	330	330	330	330	330	330	330	3960	0.71
GEOLOGIST CAD OPERATOR	($ 19.21/HOUR X	173.20 HOURS/MONTH)		3327	3327	3327	3327	3327	3327	3327	3327	3327	3327	3327	3327	39926	7.16
COMPUTER USE	($ 5.00/HOUR X	173.20 HOURS/MONTH)		866	866	866	866	866	866	866	866	866	866	866	866	10392	1.86
SURVEYOR/MAP TOOL OPER.	($ 11.53/HOUR X	173.20 HOURS/MONTH)		1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	1997	23964	4.30
PICKUP TRUCK			2000	167	167	167	167	167	167	167	167	167	167	167	167	2000	0.36
OPERATING COST/MONTH				300	300	300	300	300	300	300	300	300	300	300	300	3600	0.65
4 SAMPLERS	($ 25.60/HOUR X	173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	9.55
PICKUP TRUCK			2000	167	167	167	167	167	167	167	167	167	167	167	167	2000	0.36
OPERATING COST/MONTH				250	250	250	250	250	250	250	250	250	250	250	250	3000	0.54
UNC SILVER MAP & LAND SURVEYING EQUIPMENT			100000	8333	8333	8333	8333	8333	8333	8333	8333	8333	8333	8333	8333	100000	17.94
DRILL OPERATION-2 SHIFTS																	
DRILL PAYMENTS			39000	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	39000	7.00
DRILL OPERATING COST				2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	30000	5.38
2 DRILL OPERATORS	($ 25.60/HOUR X	173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	9.55
2 DRILL HELPERS	($ 12.80/HOUR X	173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	4.77
MISCELLANEOUS SUPPLIES																	
COREBOARDS				500	500	500	500	500	500	500	500	500	500	500	500	6000	1.08
CAD SUPPLIES				200	200	200	200	200	200	200	200	200	200	200	200	2400	0.43
REPRODUCTION				500	500	500	500	500	500	500	500	500	500	500	500	6000	1.08
			143000	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	46442	557306	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
MINING (HIGH GRADE 800 TPD-1 SHIFT/DAY-5 DAYS/WEEK
OCTOBER 16, 1985

SHEET 5

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
MINING (HIGH GRADE 800 TONS/DAY-1 SHIFT/DAY-5 DAYS/WEEK)															
MINE SUPERINTENDENT ($ 25.60/HOUR X 173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	4.73
PICKUP TRUCK	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	0.89
OPERATING COSTS		500	500	500	500	500	500	500	500	500	500	500	500	6000	0.53
AIR TRACK DRILL		4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	4300	51600	4.58
DRILL OPERATOR ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
PICKUP TRUCK		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.27
POWDER PERSON ($ 11.13/HOUR X 173.20 HOURS/MONTH)		1928	1928	1928	1928	1928	1928	1928	1928	1928	1926	1926	1926	23133	2.05
POWDER TRUCK		667	667	667	667	667	667	667	667	667	667	667	667	8004	0.71
OPERATING COST		200	200	200	200	200	200	200	200	200	200	200	200	2400	0.21
PRIMERS, PRIMA CORD, & ANFO		35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	420000	37.31
EXCAVATOR		10834	10834	10834	10834	10834	10834	10834	10834	10834	10834	10834	10834	130008	11.55
OPERATING COST		8092	8092	8092	8092	8092	8092	8092	8092	8092	8092	8092	8092	97104	8.63
EXCAVATOR-CURRENT ONE USED AS BACKUP															
EXCAVATOR OPERATOR ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
5 15 TON TRUCKS	28500	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375	2375	28500	2.53
OPERATING COSTS		2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	25200	2.24
3 TRUCK DRIVERS ($ 26.88/HOUR X 173.20 HOURS/MONTH)		4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	55867	4.96
1 SERVICE TRUCK	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	0.89
OPERATING COST		400	400	400	400	400	400	400	400	400	400	400	400	4800	0.43
1 SERVICE TRUCK PERSON($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	1.42
1 FLAT BED DUMP TRUCK (OPERATING COST)		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.27
1 ROAD BLADE (OPERATING COST)		500	500	500	500	500	500	500	500	500	500	500	500	6000	0.53
MAINTENANCE SHOP BUILDING	28000	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	2333	28000	2.49
MAINTENANCE SHOP SUPPLIES	20000	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	20000	1.78
MAINTENANCE SHOP CONSUMABLES		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	12000	1.07
MECHANIC ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
WELDER ($ 12.80/HOUR X 173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	2.36
1 PICK UP TRUCK (OPERATING COST)		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.27
DIESEL TANK	2500	208	208	208	208	208	208	208	208	208	206	208	208	2500	0.22
	99000	93808	93608	93608	93808	93608	93808	93606	93608	93606	93808	93608	93608	1125699	100.00

MINING LOW GRADE & WASTE DONE BY CONTRACTOR (QUOTE FROM FRANK MAGINI)

		MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
LOW GRADE ORE	7200 TONS PER DAY														
X $	0.78 PER TON														
X	22 DAYS/MONTH														
	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	1482624	26.88
WASTE ROCK	7200 TONS PER DAY														
X	1.72 STRIPPING RATIO														
X $	0.78 PER TON														
X	22 DAYS/MONTH														
	212509	212509	212509	212509	212509	212509	212509	212509	212509	212509	212509	212509	212509	2550113	46.24
CRUSHED & AGGLOMERATED ORE FROM PRIMARY CRUSHER	7200 TONS PER DAY														
X $	0.78 PER TON														
X	22 DAYS/MONTH														
	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	123552	1482624	26.88
	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	459613	5515361	100.00

SHEET 6

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
ASSAY AND METALLURGICAL LABORATORY
OCTOBER 16, 1985

EXPENSES:

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
ASSAY & METALLURGICAL LABORATORY															
CONSULTING METALLURGIST ($ 300.00/DAY X 5 DAYS/MONTH)		1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000	16.92
FOOD & LODGING ($ 50.00/DAY X 5 DAYS/MONTH)		250	250	250	250	250	250	250	250	250	250	250	250	3000	2.82
TRAVEL 1 ROUND TRIP/MONTH		150	150	150	150	150	150	150	150	150	150	150	150	1800	1.69
METALLURGICAL LABORATORY EQUIPMENT	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	9.40
OPERATING COSTS		500	500	500	500	500	500	500	500	500	500	500	500	6000	5.64
1 PROFESSIONAL ASSAYER ($ 15.36/HOUR X 173.20 HOURS/MONTH)		2660	2660	2660	2660	2660	2660	2660	2660	2660	2660	2660	2660	31924	30.01
1 ORE PREP.TECHNICIAN ($ 7.68/HOUR X 173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	15.01
1 ORE PREP.HELPER ($ 6.40/HOUR X 173.20 HOURS/MONTH)		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	12.51
1 JAW CRUSHER	200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.19
1 PULVERISER	200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.19
1 PLATFORM SCALE	125	10	10	10	10	10	10	10	10	10	10	10	10	125	0.12
3 BALANCES	400	33	33	33	33	33	33	33	33	33	33	33	33	400	0.38
1 SIEVE SHAKER	100	8	8	8	8	8	8	8	8	8	8	8	8	100	0.09
1 OVEN	300	25	25	25	25	25	25	25	25	25	25	25	25	300	0.28
1 HOTPLATE	250	21	21	21	21	21	21	21	21	21	21	21	21	250	0.24
1 GAS FIRED ASSAY FURNACE	300	25	25	25	25	25	25	25	25	25	25	25	25	300	0.28
1 AA MACHINE WITH LAMPS	4500	375	375	375	375	375	375	375	375	375	375	375	375	4500	4.23
	16375	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	8864	106363	100.00

SHEET 7 A

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
LEACH PAD & PRECIPITATION PLANT OPERATION
OCTOBER 16, 1985

	CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
LEACH PAD & PRECIP.PLANT OPERATION(3 SHIFTS 24 HRS/DAY X 5 DAYS/WEEK)															
POND LINER - CLIPPER ORE BODY ONLY	375000	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	375000	8.81
PLUMBING FOR LEACH POND	75000	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	75000	1.76
24 PPT. PLANTS	460000	38333	38333	38333	38333	38333	38333	38333	38333	38333	38333	38333	38333	460000	10.80
OPERATING COSTS		7603	7603	7603	7603	7603	7603	7603	7603	7603	7603	7603	7603	91236	2.14
4 MIXING TANKS	2500	208	208	208	208	208	208	208	208	208	208	208	208	2500	0.06
6 PUMPS	3000	250	250	250	250	250	250	250	250	250	250	250	250	3000	0.07
OPERATING COSTS		4224	4224	4224	4224	4224	4224	4224	4224	4224	4224	4224	4224	50688	1.19
PLUMBING	24000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	24000	0.56
OPERATING COSTS		500	500	500	500	500	500	500	500	500	500	500	500	6000	0.14
FILTERS		3360	3360	3360	3360	3360	3360	3360	3360	3360	3360	3360	3360	40320	0.95
MISCELLANEOUS		2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	30000	0.70
9 PLANT OPERATORS ($ 69.12/HOUR X 173.20 HOURS/MONTH)		11972	11972	11972	11972	11972	11972	11972	11972	11972	11972	11972	11972	143659	3.37
4 PLANT HELPERS ($ 25.60/HOUR X 173.20 HOURS/MONTH)		4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	4434	53207	1.25
PICKUP TRUCK	2000	167	167	167	167	167	167	167	167	167	167	167	167	2000	0.05
OPERATING COSTS		250	250	250	250	250	250	250	250	250	250	250	250	3000	0.07
REAGENT COSTS															
CYANIDE		148740	148740	148740	148740	148740	148740	148740	148740	148740	148740	148740	148740	1784886	41.92

HIGH GRADE

800 TONS PER DAY-HIGH GRADE
21.70 X PRODUCTION SHIFTS/MONTH HIGH GRADE
17360 = TONS/MONTH HIGH GRADE

2880 TONS/DAY FINES FROM LOW GRADE
21.70 X PRODUCTION SHIFTS/MONTH LOW GRADE
62496 = TONS/MONTH FINES FROM LOW GRADE

79856 = TOTAL TONS/MONTH AGGLOMERATED ORE
2 X POUNDS/TON CYANIDE
159712 = POUNDS OF CYANIDE/MONTH
0.72 X COST OF CYANIDE/POUND
114993 = TOTAL COST OF CYANIDE/MONTH AGGLOMERATED ORE

LOW GRADE

7200 TOTAL TONNAGE-LOW GRADE
2880 - AGGLOMERATED FINES
4320 = COARSE LOW GRADE FRACTION
21.70 X PRODUCTION SHIFTS/MONTH
93744 = TOTAL COARSE LOW GRADE/MONTH
0.50 X CYANIDE CONSUMPTION/TON
46872 = POUNDS OF CYANIDE/MONTH
0.72 X COST OF CYANIDE/POUND
33748 = TOTAL COST OF CYANIDE/MONTH-LOW GRADE

114993 TOTAL COST OF CYANIDE/MONTH AGGLOMERATED ORE
33748 TOTAL COST OF CYANIDE/MONTH-LOW GRADE
148740 TOTAL COST OF CYANIDE/MONTH

206584 (TOTAL POUNDS CYANIDE/MONTH)

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
LEACH PAD & PRECIPITATION PLANT OPERATION
OCTOBER 16, 1985

SHEET 7 B

		CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
LIME HIGH GRADE	800 TONS HIGH GRADE PRODUCTION/DAY 21.70 X PRODUCTION SHIFTS/MONTH - HIGH GRADE 17360 = HIGH GRADE TONS PRODUCED/MONTH		35414	35414	35414	35414	35414	35414	35414	35414	35414	35414	35414	35414	424973	9.98
LOW GRADE	7200 LOW GRADE PRODUCTION/SHIFT 21.70 X PRODUCTION SHIFTS/MONTH - LOW GRADE 156240 = LOW GRADE TONS PRODUCED/MONTH 17360 + HIGH GRADE TONS PRODUCED/MONTH 173600 = TOTAL TONS ORE PRODUCED/MONTH 6 X LBS. LIME/TON OF ORE 1041600 = TOTAL POUNDS OF LIME/MONTH .034 X COST OF LIME/POUND (@ $68/TON) 35414															
CEMENT	79856 TOTAL TONS/MONTH AGGLOMERATED ORE 5 X 5 LBS. PER TON CEMENT 399280 = TOTAL LBS. OF CEMENT/MONTH .0532 X PRICE/LB. (@ $5/94 LB.BAG) 21242 = TOTAL COST OF CEMENT USED/MONTH		21242	21242	21242	21242	21242	21242	21242	21242	21242	21242	21242	21242	254900	5.99
DIATOMACEOUS EARTH (DE)	173600 TOTAL TONS ORE PRODUCED/MONTH(HI & LO GRADE) 0.50 X .5 LBS. DE/TON 86800 = TOTAL LBS. DE USED/MONTH 0.16 X PRICE/LB. DE 13888 = TOTAL COST OF DE USED/MONTH		13888	13888	13888	13888	13888	13888	13888	13888	13888	13888	13888	13888	166656	3.91
ZINC	69706 TOTAL AU & AG RECOVERY-HI GRADE/TROY OZ. 155646 TOTAL AU & AG RECOVERY-LO GRADE/TROY OZ. 225352 = TOTAL AU & AG RECOVERED/MONTH 14.58 DIVIDED BY 14.58 TROY OZ./AV LBS. 15456 = AVOIRDUPOIS LBS. PM PRODUCTION/MONTH 2 X LBS. ZINC CONSUMED/LB. OF PM 30912 =LBS. OF ZINC CONSUMED/MONTH 0.72 X PRICE OF ZINC POWDER/LB. 22257 = TOTAL COST OF ZINC/MONTH		22257	22257	22257	22257	22257	22257	22257	22257	22257	22257	22257	22257	267084	6.27
		341500	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	354842	4258109	100

FINES FROM CRUSHING LOW GRADE ORE TO AGGLOMERATOR = 0.40% X 7200 TPD = 2880

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
PRECIPITATE PREP AND SMELTING & REFINING
OCTOBER 16, 1985

SHEET 8

			CAPITAL COSTS	MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:																	
PRECIPITATE PREP & SMELTING & REFINING																	
OPERATOR	($ 8.96/HOUR X	173.20 HOURS/MONTH)		1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	1552	18622	9.69
OPERATOR HELPER	($ 6.40/HOUR X	173.20 HOURS/MONTH)		1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	1108	13302	6.92
EQUIPMENT																	
20 FILTERS			14600	1217	1217	1217	1217	1217	1217	1217	1217	1217	1217	1217	1217	14600	7.60
1 DRYER			1500	125	125	125	125	125	125	125	125	125	125	125	125	1500	0.78
1 OVEN			700	58	58	58	58	58	58	58	58	58	58	58	58	700	0.36
SMELTING OF PRECIPITATES																	
1 FURNACE OPERATOR	($ 10.24/HOUR X	173.20 HOURS/MONTH)		1774	1774	1774	1774	1774	1774	1774	1774	1774	1774	1774	1774	21283	11.07
1 FURNACE OP HELPER	($ 7.68/HOUR X	173.20 HOURS/MONTH)		1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	15962	8.30
SMELTING EQUIPMENT																	
2 #430 FURNACES			18000	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000	9.36
2 #430 CRUCIBLES			500	42	42	42	42	42	42	42	42	42	42	42	42	500	0.26
1 CONE MOLD			400	33	33	33	33	33	33	33	33	33	33	33	33	400	0.21
1 #100 FURNACE				0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
1 ANNODE MOLD			200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.10
1 PLATFORM SCALE			100	8	8	8	8	8	8	8	8	8	8	8	8	100	0.05
MISCELLANEOUS SUPPLIES			250	21	21	21	21	21	21	21	21	21	21	21	21	250	0.13
REFINING DORE BULLION																	
1 OPERATOR	($ 11.54/HOUR X	173.20 HOURS/MONTH)		1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	23985	12.48
2 OPERATOR HELPERS	($ 12.80/HOUR X	173.20 HOURS/MONTH)		2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	2217	26604	13.84
EQUIPMENT																	
1 REFINING CELL			25000	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	25000	13.01
1 #100 FURNACE			6000	500	500	500	500	500	500	500	500	500	500	500	500	6000	3.12
1 #100 CRUCIBLE			200	17	17	17	17	17	17	17	17	17	17	17	17	200	0.10
1 #16 FURNACE				0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
1 #16 CRUCIBLE				0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
1 BUILDING			5000	417	417	417	417	417	417	417	417	417	417	417	417	5000	2.60
			72450	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	16017	192207	100.00

TOMBSTONE SILVER MINES, INC. CASH FLOW PROJECTIONS
CONSTRUCTION
OCTOBER 16, 1985

		MONTH #1	MONTH #2	MONTH #3	MONTH #4	MONTH #5	MONTH #6	MONTH #7	MONTH #8	MONTH #9	MONTH #10	MONTH #11	MONTH #12	TOTAL YEAR	CATEGORY %
EXPENSES:															
CONSTRUCTION & INFRASTRUCTURE															
ELECTRIC INSTALLATION	75000	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	75000	36.53
FOUNDATION EXCAVATION	25000	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	2083	25000	12.18
BUILDINGS	75000	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	6250	75000	36.53
GENERAL LABOR POOL	10000	833	833	833	833	833	833	833	833	833	833	833	833	10000	4.87
TELEPHONE SYSTEM	5000	417	417	417	417	417	417	417	417	417	417	417	417	5000	2.44
RADIO SYSTEM (TEI)	6000	500	500	500	500	500	500	500	500	500	500	500	500	6000	2.92
FIRE EXTINGUISHERS	6000	500	500	500	500	500	500	500	500	500	500	500	500	6000	2.92
FIRST AID SUPPLIES	3300	275	275	275	275	275	275	275	275	275	275	275	275	3300	1.61
	205300	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	17108	205300	100.00