



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](mailto: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.

0182

GLANVILLE MANAGEMENT LTD.

May 14, 1990

Mr. J. Martinez  
Secretary  
Excellon Resources Inc.  
304 - 850 Burrard Street  
Vancouver, B.C.  
V6Z 2J1

Dear Mr. Martinez:

Further to your instructions, we have reviewed the Tombstone Project and more particularly, the exploration potential for additional gold and silver ores.

We have concluded that the Property under option to Excellon Resources Inc. has substantial merit and the probability of finding additional ore, both lower grade treatable by heap leaching and higher grade bonanza ores, treatable by milling, is very high.

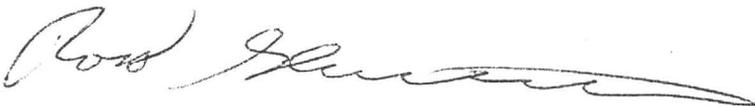
We believe that the cost to restart the open-pit, heap leach operation will be less than US \$1.5 million, including 3 months' working capital but exclusive of exploration costs.

An initial exploration program costing \$200,000 is recommended, to be followed, if successful, by a more substantial drilling program estimated at \$250,000.

We appreciate the opportunity to be of service to you and trust you will find the enclosed report satisfactory. Should you have any questions or require clarification of anything, please do not hesitate to call either one of us.

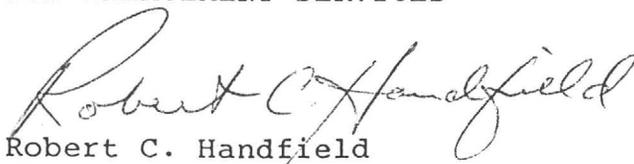
Sincerely,

GLANVILLE MANAGEMENT LTD.



Ross Glanville  
B.A.Sc., P.Eng., M.B.A., C.G.A.

RCH MANAGEMENT SERVICES



Robert C. Handfield  
Ph.D., F.G.A.C.

A REPORT ON THE  
TOMBSTONE PROJECT, COCHISE COUNTY, ARIZONA

FOR  
EXCELLON RESOURCES INC.

MAY 1990

ROSS GLANVILLE  
GLANVILLE MANAGEMENT LTD.

AND

ROBERT C. HANDFIELD  
RCH MANAGEMENT SERVICES

## TABLE OF CONTENTS

	<u>PAGE</u>
EXECUTIVE SUMMARY	1
INTRODUCTION	2
PROPERTY LOCATION AND ACCESS	3
PROPERTY OWNERSHIP	3
CLIMATE/PHYSICAL FEATURES	6
HISTORY	8
PREVIOUS EXPLORATION	11
REGIONAL GEOLOGY	14
LOCAL GEOLOGY	16
MINERALIZATION	16
GENERAL	16
OXIDATION	17
EXPLORATION POTENTIAL	18
GENERAL	18
SURFACE MINABLE POTENTIAL	18
UNDERGROUND POTENTIAL	21
COSTS TO RESUME PRODUCTION	22
CONCLUSIONS AND RECOMMENDATIONS	23
PROPOSED 1990 WORK PROGRAM AND BUDGET	25
APPENDIX I	CERTIFICATES OF QUALIFICATION
APPENDIX II	REFERENCES
APPENDIX III	DRILL HOLE ASSAYS

EXECUTIVE SUMMARY

The Tombstone mineral claims, optioned by Excellon Resources Inc., are located on the outskirts of Tombstone, Arizona, a district where total production of precious and base metals is estimated to have been in excess of \$300 million at current prices. The site of some of the richest production in the Tombstone District was the Grand Central and Contention Mines, lying at the center of Excellon's leases.

Several attempts have been made in the last twenty years to produce precious metals within the District by means of open pit mining and heap-leach processing. Gold and silver production from these operations has been estimated to be up to \$40 million, but exact figures are unavailable because two of the operations were privately owned companies. Failure of these operations can be directly related to problems other than lack of ore potential.

Previous exploration has generally been only sporadic and has been under funded, but nevertheless has resulted in sufficient information to confirm the high potential for finding additional significant ore deposits, both surface minable and higher grade underground types. Trenching and drilling undertaken in 1989 on the Excellon claims encountered high grade silver and gold mineralization in both the north and south pits more than 3,000 ft apart. More specifically, drill hole 89-33, located within a previously unrecognized pyritic anomaly, returned a 35 ft interval from 45 to 80 ft averaging 0.20 oz/t gold and which contained a 5 ft interval grading 0.70 oz/t gold. Significant silver mineralization also occurred in this hole as well as several others. Samples in trench 10200N assayed as high as 196 oz/t silver and up to 1.25 oz/t gold.

The highly encouraging results from the trenching and drilling, the widespread alteration and mineralization, and the extensive past mining all point to a very high potential for finding additional ore deposits.

The presence of a Merrill-Crowe processing plant and substantial components of a heap leach operation mean that capital costs and required working capital to resume production will be relatively low and are estimated to total less than US \$1.5 million.

We recommend an initial exploration program to include geochemical sampling, a CSAMT geophysical survey and 3,600 ft of drilling. This program, estimated to cost \$200,000, if successful, should be followed by a more substantial drill program costing approximately \$250,000.

#### INTRODUCTION

Glanville Management Ltd. and RCH Management Services were commissioned by Mr. J.R. Martinez, Jr., Secretary of Excellon Resources Inc., to prepare this report.

This report is based on two property visits by Mr. Glanville, both in 1988, a review of various documents listed in the references and two meetings between Mssrs. Glanville and Handfield and Mr. James Briscoe, consultant to Cowichan Mines Ltd. In addition, Mr. Glanville held discussions with various people familiar with the property when he was on site.

We have not made a recent visit to the property nor have we checked title to the property. However, as stated earlier, we have discussed the property with professional engineers and/or geologists who have worked on the property and in the immediate area. Although all care has been taken in assessing and reviewing the data and in preparation of this report, Glanville Management Ltd. and RCH Management Services hereby disclaim any and all liability arising out of its use or circulation.

#### PROPERTY LOCATION AND ACCESS

The Property is on the outskirts of the town of Tombstone, Cochise County, Arizona, about 60 miles southeast of Tucson and approximately 35 miles north of the border between the United States and Mexico (Figs. 1 & 2). Tombstone is well serviced by major all-weather paved highways including U.S. Highway 80, which goes through the centre of town, and Arizona State Highways 82 and 90. A number of gravel and dirt mine roads provide ready access to all parts of the property. A good supply of skilled and semiskilled labour is available in Tombstone or Sierra Vista, a city of about 30,000 people, 20 miles southward.

#### PROPERTY OWNERSHIP

Excellon Resources Inc. has entered into a letter of intent to acquire all of the rights held by certain parties (herein all referred to as Cowichan Resources, Inc.) in the claims (the Property) listed in Exhibit A. The rights of Cowichan Resources, Inc. are held subject to the terms of a Lease Agreement entered into in January, 1988, and a separate agreement referred to as the "Magini Agreement". A more complete description of the terms of these Agreements is to

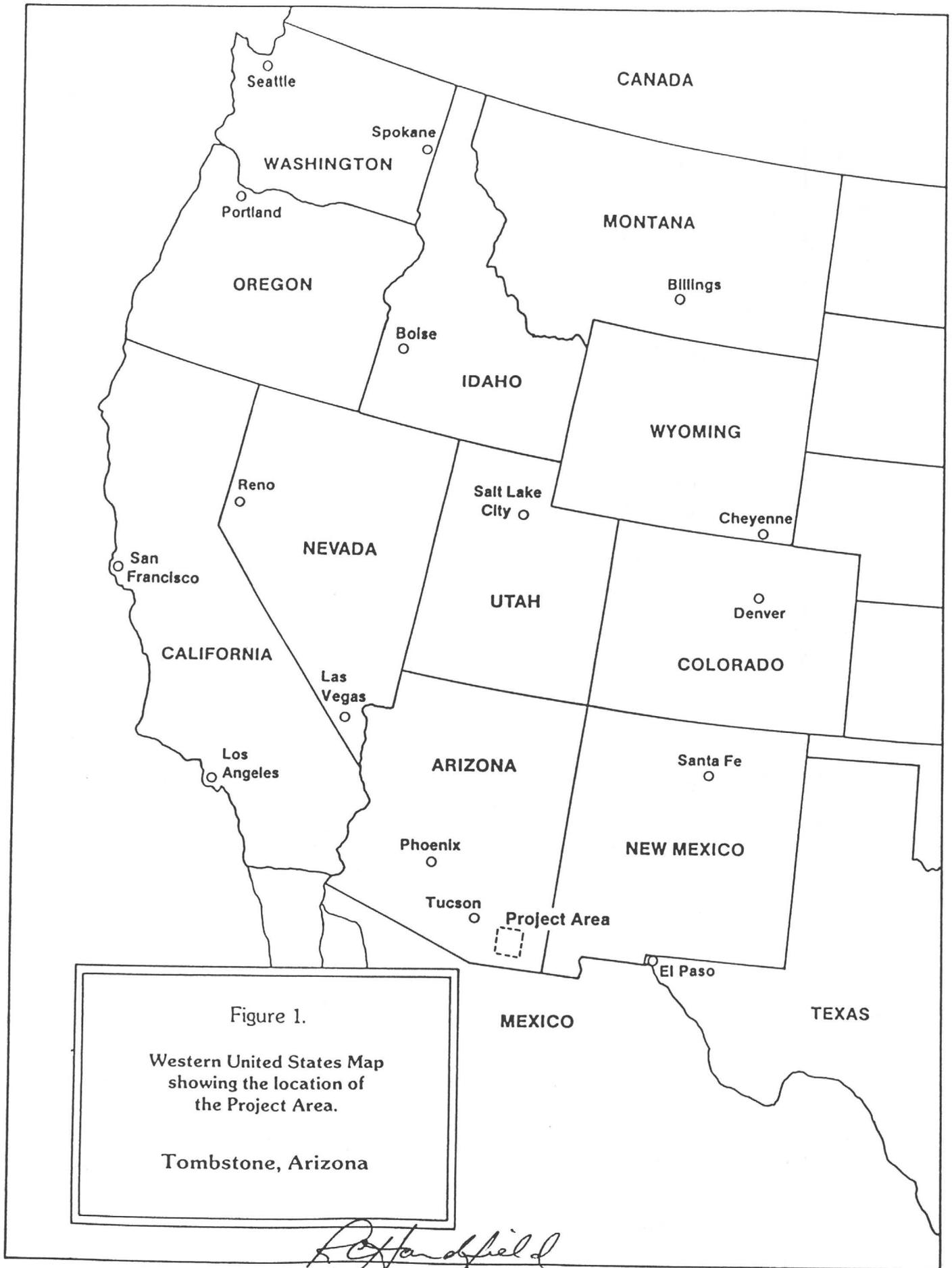


Figure 1.  
Western United States Map  
showing the location of  
the Project Area.  
Tombstone, Arizona

*R. Handfield*

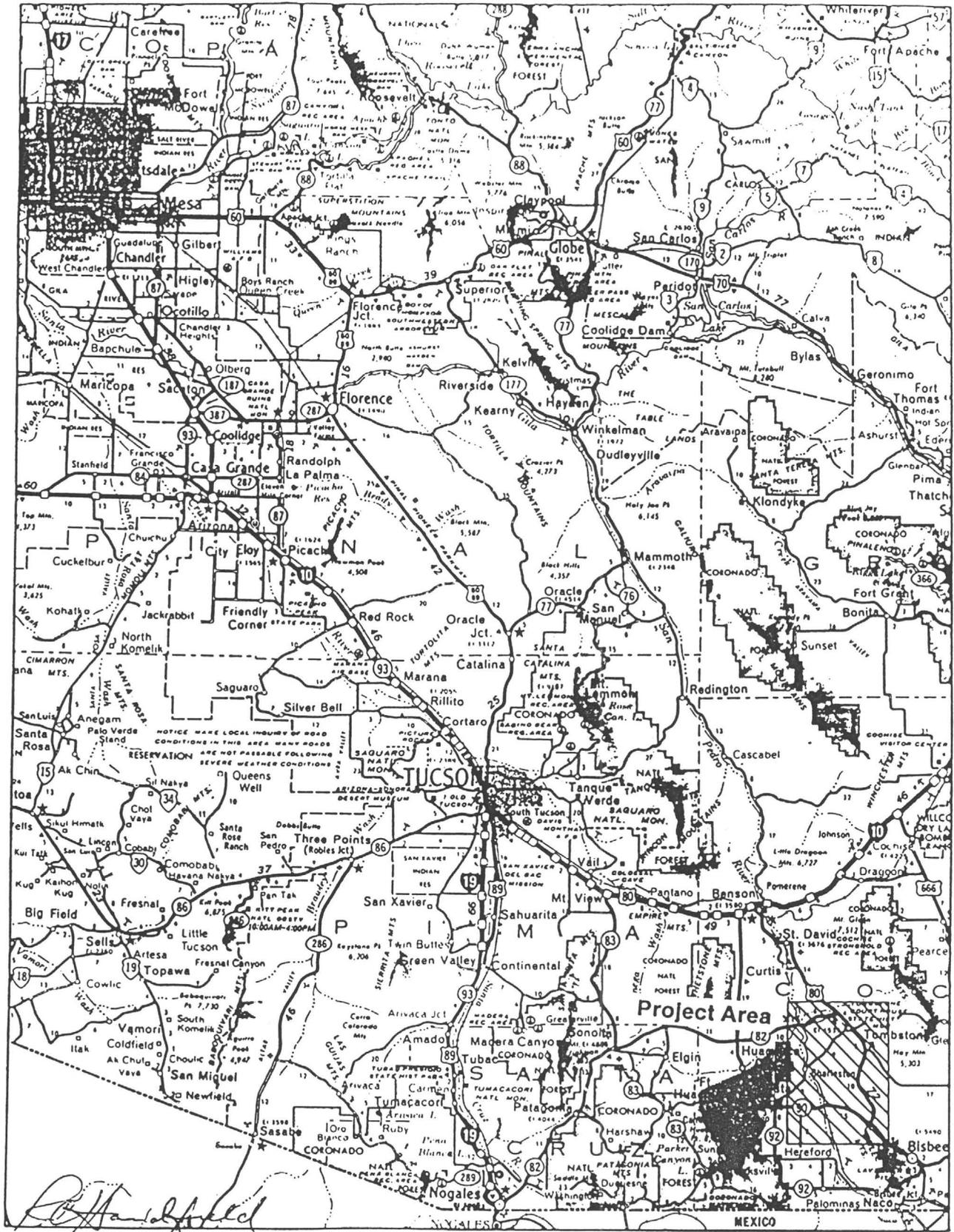


Figure 2. Highway map showing the location of the Project Area in relation to Tucson and Phoenix, Arizona

be found in Glanville's valuation report of October, 1988, but essentially the agreements call for certain cash payments, escalating minimum royalty payments and variable rate NSR royalties which begin at 5% when silver is selling at less than \$10.00 (US) per oz. Cowichan Resources, Inc. acquired the mineral rights to a depth of 500 ft, with Santa Fe Pacific Mining leasing the rights below that level.

The salient terms of the letter of intent between Excellon and Cowichan are:

1. Excellon must pay \$30,000 cash on execution of the letter of intent;
2. Excellon must spend a minimum of \$200,000 on the Property by October 1, 1990;
3. Excellon must assume certain obligations, including costs of security and underlying lease payments;
4. Excellon must complete expenditures of up to an additional \$500,000 to place the Property into production;
5. Excellon must issue 200,000 shares of its capital stock to Cowichan in installments;

Excellon also acquires certain other rights once the Property is placed back into production, including the right to purchase the recovery plant and equipment.

#### CLIMATE/PHYSICAL FEATURES

The climate of Tombstone (altitude 4,530 feet), 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 annual precipitation is less than 15 inches.

EXHIBIT A

Patented Claims Located in Sections 11, 12, 13 and 14, Township 20 South,  
Range 22 East, Gila and Salt River Base and Meridan,  
Cochise County, Arizona

<u>Claim Name</u>	<u>Patent No.</u>	<u>Claim Name</u>	<u>Patent No.</u>
Houghton	3228	Content	69
Cincinatti	254	North Point	808
New Year	213	Empire	46
Cornell	3228	Head Center	3213
Michigan	3228	Yellow Jacket	3213
Illinois	3228	Silver Belt	793
Grand Central	143	Portection	3230
Contention	120	Moonlight	751
Naumkeg	148	Fortuna	3214
Flora Morrison	258	Sydney	475
So. Ext. Grand Central	144	Sulphuret	48
Contentment	252	Mayflower	798
Buffalo	3228	Ninety-Nine	3225
Southern Bell	3228	Last Chance #2	809
Tranquility	49	Boss	800
Cocopah	82	Grand Dipper	540
Silver Tread	790	Telephone	927

Unpatented Claims Located in  
Cochise County, Arizona

<u>Claim Name</u>	<u>Docket</u>	<u>Page</u>	<u>AMC #</u>	<u>Section</u>	<u>Township</u>	<u>Range</u>
TDC #26	1489	49 & 50	125079	12 & 13	20 S	22 E
TDC #27	1489	51 & 52	125080	13	20 S	22 E
TDC #28	1489	53 & 54	125081	13	20 S	22 E
TDC #29	1489	55 & 56	125082	13	20 S	22 E
TDC #30	1489	57 & 58	125083	13 & 14	20 C	22 E

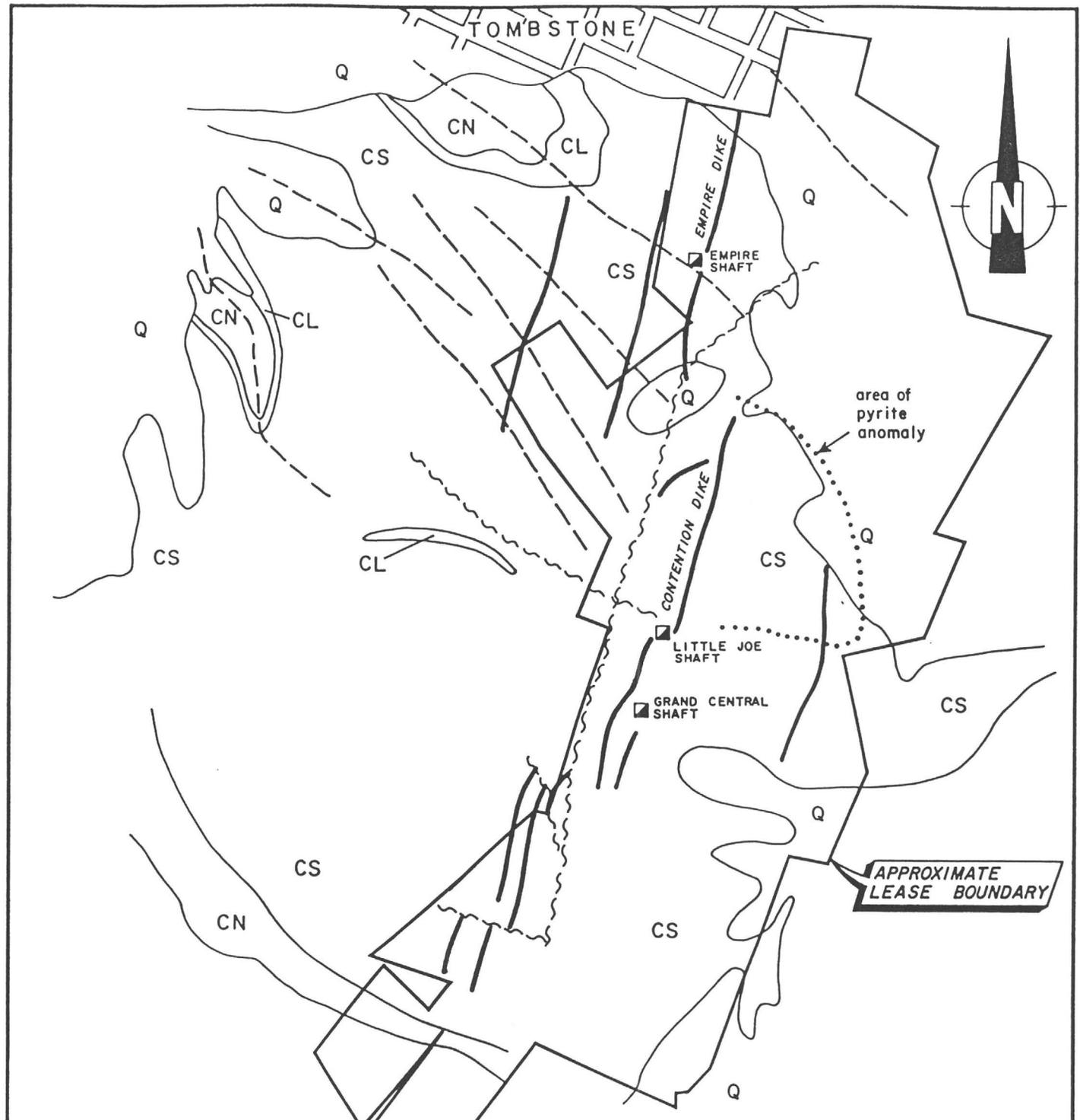
The Tombstone Hills rise to a maximum altitude of 5,339 feet, or some 800 feet above the surrounding plane. Even slopes and rounded contours characterize the area. Desert shrubs predominate, since the property is above altitudes favourable to abundant cacti and below those favourable to forest trees.

### HISTORY

The Tombstone Mining District was discovered in 1877, and by 1880 was a famous boomtown with a number of mines producing silver, gold, and lead as well as minor copper and manganese. Production from 1879 through 1885 averaged over 1.8 million oz per year of silver.

Two of the major mines of the Tombstone District were the Contention and Grand Central, now included within the property held by Cowichan Mines Ltd. and under option to Excellon (Fig. 3).

Like all boomtowns and mining operations, the Tombstone District was beset by a number of problems over the years, some external and some a product of the District. These problems included fluctuating, but mainly declining, silver prices, water at about the 600 ft level, fractured ownership and labour problems. Nothing could be done about the silver price except to change the cut-off grade of ore being mined but the other problems were all solved in one manner or another. Water was first encountered in 1881, and by 1882, was a serious problem as other mines got deeper. By 1883, pumping machinery was installed in the Contention and Grand Central Mines, and in early 1884 ore was being produced from below the water table. Despite other problems and a declining silver price, production was maintained at fairly good levels until 1907, but dropped drastically in 1908 and again



LEGEND

QUATERNARY

**Q** gravel and sand

CRETACEOUS

**CS** Bisbee Group : shale and sandstone

**CL** Bisbee Group : limestone

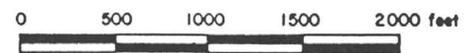
**CN** Bisbee Group : novaculite

porphyry dike

fold axis

fault

*R. Handfield*



EXCELLON RESOURCES INC.  
 TOMBSTONE PROJECT  
 Property Boundary &  
 Simplified Geology

in 1909 when problems with the pumps caused serious flooding in the mines. Phelps Dodge Corporation purchased much of the mineral rights in the District in 1914, but production never again achieved the levels of the 1880's, mainly as a result of the low silver prices. When Tombstone was discovered, silver was \$1.25 per ounce but by 1900 had fallen to the \$0.70 per ounce range and stayed below \$0.80 until just before 1920 when it climbed back to \$1.00. Increasing prices from 1917 through 1922 saw production back at 1890 levels, but the fall during the 1920's to a low of \$0.30 ended that resurgence. In 1933, Phelps Dodge sold out and production essentially ceased in 1936.

During the period 1877 to 1907 an estimated 24.3 million oz of silver and 192,000 oz of gold were produced. The ensuing years through 1936 produced another 7.0 million oz of silver and 64,000 oz of gold. Total estimated lead production for the 59 years was in excess of 50 million lbs while copper was in excess of 2.3 million lbs.

Estimates are that about 95% of the past production was from above the 600 level (i.e. the present water table) and therefore, was primarily oxidized ore.

In 1973, a heap leach operation using old dumps for ore was started by '71 Minerals Ltd. and reportedly operated successfully but no production records are available.

Tombstone Exploration Inc. (TEI) began mining from an open pit situated over the old Contention Mine in 1980, and treated the ore by heap-leaching. The operation did not close until 1984, and indications are that more than \$40 million in gold and silver were produced. Because TEI was a private company full financial records of its operations are not available. A cyanide leak in 1984 and several lawsuits

related to ownership and control of the operation and subsequent technical problems were apparently the prime causes of TEI filing for protection from creditors under Chapter 11 of the US Bankruptcy laws. As a result of this the tangible assets were sold off and TEI removed from the property.

In 1988 Cowichan Mines Ltd. took over the leases and resumed mining and processing of ore but under-capitalization resulted in production ceasing in 1989. An exploration program was begun by them in late 1989 but lack of money and numerous difficulties with the drilling (J. Briscoe, pers. comm.) resulted in the program being abandoned after moderate success. This program is discussed in more detail below.

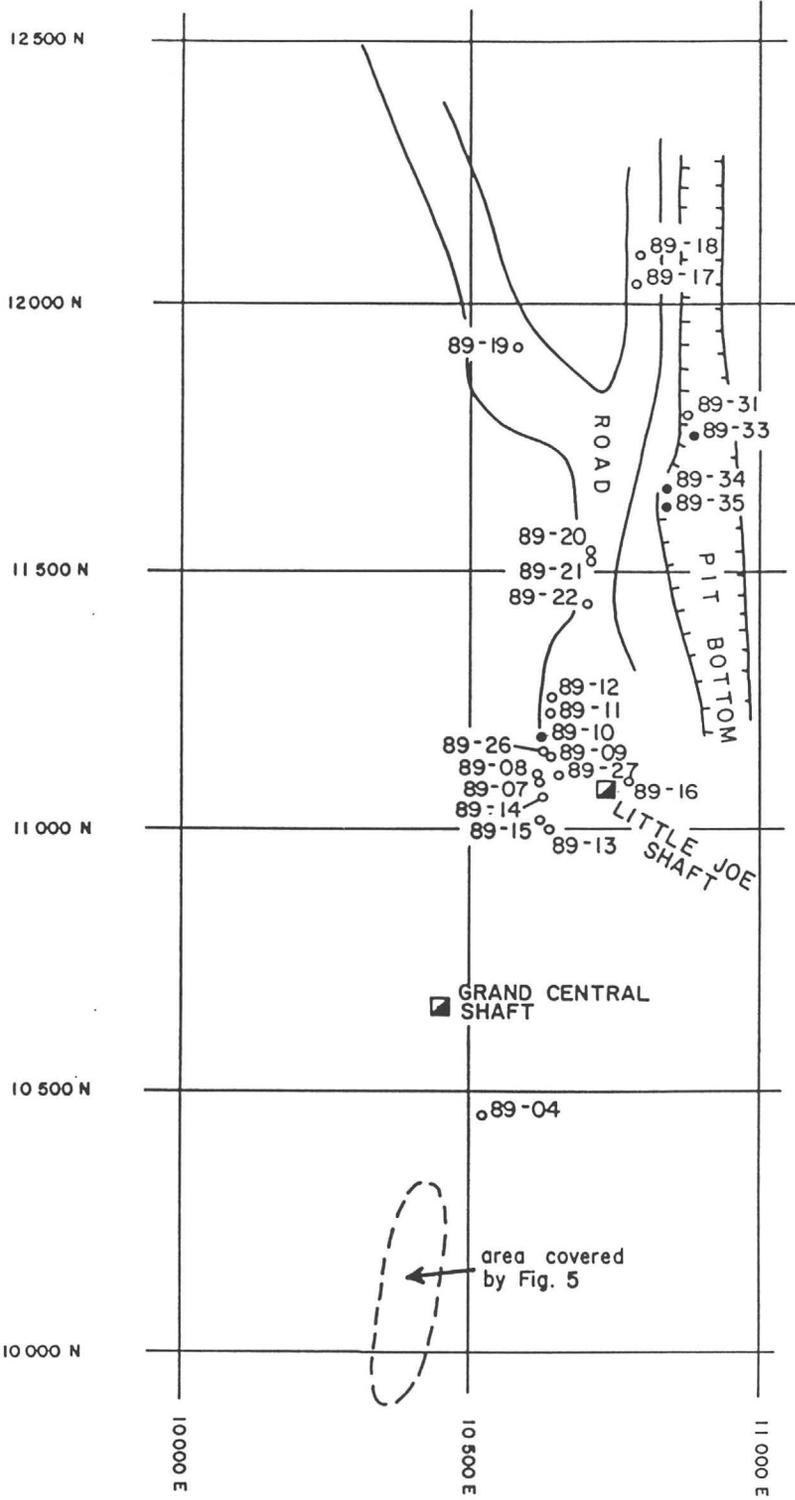
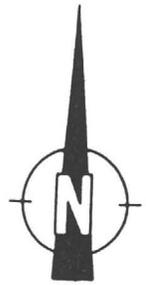
#### PREVIOUS EXPLORATION

In 1974, Roger Newell completed a Ph.D. dissertation at Stanford University, the objective of which was to "evaluate the Tombstone mining district for additional mineralization, through the application of modern geologic concepts and exploration methods" (Newell, 1974). So far as is known, this was the first detailed examination of the district since prior to 1940. Newell employed detailed geologic mapping, radiometric age dating, metal ratios, biogeochemistry, infrared aerial photography and spacecraft imagery and concluded that the district had at least seven potential target areas that warranted additional work. Most of these areas are based on the intersections of major structural components and biogeochemistry and are aimed at finding "new" ore as opposed to finding extensions of existing mines. An important result of Newell's work was the finding that the manganese and probably copper mineralization at Tombstone is younger (63 m.y.) than the silver mineralization (72 m.y.) and falls well within the age span of the porphyry coppers of the southwestern U.S.

Tombstone Exploration, Inc., as previously stated, began an open pit mining operation in early 1981 centered on the Contention and Grand Central Mines. It is not known what, if any, exploration was done prior to commencement of mining. TEI concluded that "core drilling, percussion drilling or reverse circulation drilling would not be effective in the area of the present pit" (TEI, 1983) and instead sampled by means of trenches excavated by machine every 25 ft and dug to a depth of six ft. Mining and ore control were based on sampling of these trenches. However, elsewhere in the same document, reference is made to a reverse circulation drilling program being conducted to "prove out ore zones and expand the pit". No details or results of this program are available.

Cowichan Mines Ltd. began an evaluation and exploration program in 1989 after shutting down their mining operation to more fully re-evaluate ore reserves. This program included some drilling, compilation of historic data and geologic interpretation from aerial photography, all under the direction of J.A. Briscoe, Registered Professional Geologist. As forewarned by TEI, the drilling (Fig. 4) encountered severe difficulties in the open pit where a combination of old workings, caved ground and intense leaching and oxidation resulted in most holes being abandoned at very shallow depths. Of 35 holes drilled, only 2 exceeded 55 ft in depth. The assay results of the best mineralized of these holes are shown in Table I and all assays are shown in Appendix III.

Trenching done by Cowichan in the bottom of the south pit revealed an interesting distribution of high values (Fig. 5) which, when taken in conjunction with the known association of ore with cross folding, suggests that the mining should be undertaken in an east-west direction rather than north-south. However, at this time, the real importance of the trenching is that it confirms the widespread presence of significant silver and gold values.



LEGEND

- 1989 drill hole
- hole whose results are shown in table 1



EXCELLON RESOURCES INC.

TOMBSTONE PROJECT

1989 Cowichan Mines  
Drill Hole Locations

(North end of Contention Pit)

*Robert Field*

### REGIONAL GEOLOGY

The Tombstone District in the southern Basin and Range province lies in the heart of one of the great porphyry copper areas of the world with 6 deposits within a 50 mile radius of Tombstone and double that number within a 100 mile radius. Almost all of these deposits are associated with Late Cretaceous or Early Tertiary intrusions.

The Tombstone mining district occurs on the northeastern edge of the Tombstone Hills which are underlain by rocks ranging in age from Precambrian to Quaternary. The Precambrian is represented by metamorphic and igneous rocks and are unconformably overlain by Paleozoic shelf sediments typical of the southwestern U.S. The Cretaceous Bisbee Group which includes conglomerate, sandstone, mudstone and limestone is unconformable upon the Paleozoics and in turn is unconformably overlain by volcanics of Late Cretaceous or Early Tertiary age. The Uncle Sam Porphyry, originally mapped as intrusive (Gilluly, 1956) is now recognized as a Late Cretaceous welded tuff (Drewes, 1971) and is thought to represent the center of a Cretaceous caldera (Lipman and Sawyer, 1985; Briscoe, 1989). This has important implications for future exploration in the District and is discussed in more detail later in this report.

Gilluly (1956) mapped the general area and discussed the geology and structure in far more detail than is necessary here. It is sufficient to note that he stated the structure of the Tombstone Hills is complex and its development cannot readily be determined.

The silver, gold and base metal deposits mined to date occur in a syncline of the Bisbee Group sediments along the northeast caldera margin. Metal zoning patterns similar to those associated with porphyry copper deposits have been shown to exist in the Tombstone Hills but on a scale far larger than in the old mining district (Newell, 1974).



Grand Central Shaft

330 feet

10225 N

10200 N

10175 N

10150 N

10125 N

10100 N

10075 N

10050 N

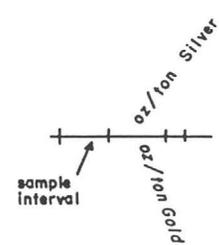
10025 N

10000 N

9975 N

9950 N

LEGEND



EXCELLON RESOURCES INC.

TOMBSTONE PROJECT

1989 Trench Samples  
(South end of Contention Pit)

*Robb Field*

## LOCAL GEOLOGY

As mentioned previously, the Tombstone district occurs in a syncline of Cretaceous age Bisbee sediments. The syncline axis trends generally west and plunges to the east. It is complicated by a series of smaller, tighter folds that trend across the syncline in a northwest direction. The bonanza grade ore bodies mined in the early days of the camp occur in drag folds in the anticlines in favourable limestone horizons. Butler, Wilson and Rasor (1938) provided the most detailed examination of the geology of the mines and the structural control of the ores.

Within the Tombstone district, Bisbee Group sediments are cut by a number of highly altered, en echelon andesite porphyry dikes that strike north to just east of north (Newell, 1974). Mineralization is closely associated with these dikes and northeast trending fissures (Fig. 3). Ore occurs as veins within the sediments and also within the dikes. Replacement zones occur within the sediments where the fissures intersect limy horizons, especially along the crests of folds. One of the largest dikes, the Grand Central-Contention dike is up to 70 ft wide and is now well exposed in the center of the Contention pit. Ore previously mined by TEI and Cowichan occurs on both sides of this dike.

Nearly all of the rocks within the lease area exhibit varying degrees of alteration and are highly fractured and oxidized.

## MINERALIZATION

### General

Work by a number of researchers has concluded that there was more than one episode of mineralization. Williams (1982) reported that there had been two stages of mineralization, of which the first, silver-rich, had base metals as a major component and represented all of the replacement ores and most of the veins.

The second and younger episode occurred in stringers and veins and was spatially related to the dikes, especially in the Grand Central-Contention zone. Gold was more abundant in this episode and occurred at least partly as tellurides.

Although the bulk of the past production has been from veins and replacement deposits, ore minerals were also deposited on small fractures, veinlets and joints as well as in the matrix of brecciated portions of the dikes. It is this dispersal of minerals that has made possible the consideration of bulk mining and treatment by heap leaching.

### Oxidation

Oxidation of ore minerals has been severe in the upper 100-200 ft and has occurred on a lesser scale down to about 600 ft, the depth of the current water table. The practical results of this oxidation are two-fold. Firstly, silver grades should increase with depth to, or near, the water table and then may substantially decrease, although the exact depth at which this will happen will depend on the location of the water table over thousands of years, not just the last hundred years or so. Secondly, the minerals and rocks are so leached and oxidized that they are quite friable which decreases recovery in drilling and may adversely affect grade as determined in drill core and cuttings.

Gold is generally considered not to be as readily affected by oxidation and leaching, so that gold grades will not necessarily change with depth. However, the minerals with which the gold is associated may well be oxidized and this could affect the recovery of the gold in drilling.

## EXPLORATION POTENTIAL

### General

A number of workers (Briscoe, 1982, 1989; Lipman and Sawyer, 1985; Newell, 1974;) have suggested that the Tombstone area is an ancient caldera system and may be the site of one or more porphyry copper centres. If this is the case, then the potential for finding additional significant mineralization is enormous, although much of it may be at great depths and not of economic interest to Cowichan. Nevertheless, district wide potential for additional near-surface ore is significant.

Newell's (1974) district study of metal zoning and biogeochemistry using mesquite bushes concluded that there were at least seven important exploration targets in an area encompassing about 80 sq. miles south of Tombstone. It should be emphasized that these are "new" targets discernible on a district scale. Two of these seven targets adjoin the Property, one on the northeast end and the other across the south end. While neither of these two targets are covered by Excellon's agreement, they are indicative of the general potential of the area.

### Surface Movable Potential

Since the agreement on the Property covers the mineral rights only to a depth of 500 ft, surface minable ore is of most interest to Excellon, although there is certainly the potential for finding higher grade vein and replacement mineralization that might warrant underground mining down to the 500 ft level. This depth definitely encompasses the majority of the oxidized zone and the potentially high grade supergene enriched silver ores. It is also within this zone where the ores most susceptible to treatment by heap leaching occur.

Because of difficulties with the 1989 drilling program previously discussed, results were not as useful as expected. However several drill holes, and especially 89-33, returned very encouraging results (Table I and Fig. 4). These drill holes confirm that there is significant ore grade mineralization yet to be discovered.

Holes 89-33, 34 and 35 were drilled in the area of a recently recognized pyritic anomaly on the east side of the Contention zone (Figs. 3 and 4). Hole 89-33, drilled at -60<sup>0</sup>, encountered several high grade gold zones as well as considerable lower grade material. The interval from 45 ft to 110 ft averaged .12 oz/t gold and contained a 35 ft interval from 45 to 80 ft averaging 0.20 oz/t gold. While the interval 75-80 was the highest at 0.70 oz/t gold, the following interval from 80-85 ft was not recovered, so it is not known whether this high grade zone may be thicker than 5 ft. The hole bottomed in interesting gold values with the last 5 ft interval assaying 0.035 oz/t. As can be seen from Table I, much of the hole contained silver values in excess of 1 oz/t but interestingly enough, the highest gold values do not coincide with the highest silver values. This was noted in several of the other holes as well. Several holes intersected fairly high silver values, most notably 89-34 with several 5 ft intervals running better than 4 oz/t silver. The last 10 ft of this hole averaged 6.8 oz/t silver. Unfortunately, Cowichan ran short of money and the holes were not geologically logged but sample cuts have been saved so that this can be done in future.

Brisco (1989) estimates that the area of the pyritic anomaly is about 700 by 1000 ft. If the mineralization in hole 89-33 is related to this anomaly, the potential for an important ore deposit is very good.

TABLE I

<u>Drill Hole No.</u>	<u>Interval</u>	<u>Gold (oz/t)</u>	<u>Silver (oz/t)</u>
DH 89-10	0-5	0.002	1.17
	5-10	0.004	2.04
	10-15	0.003	1.79
	15-20	0.001	2.55
	20-24	0.063	5.57
DH 89-24	0-5	0.020	5.00
	5-10	0.068	6.18
	10-15	0.060	4.44
	15-20	0.014	1.83
	20-24	0.034	0.98
DH 89-33	0-5	0.017	0.87
	5-10	0.018	1.06
	10-15	0.005	0.90
	15-20	0.007	1.56
	20-24	0.024	2.34
	24-30	0.015	1.21
	30-35	0.005	0.89
	35-40	0.003	0.74
	40-45	0.018	0.83
	45-50	0.241	0.82
	50-55	0.158	0.56
	55-60	0.149	1.80
	60-65	0.081	2.29
	65-70	0.063	1.44
	70-75	0.021	0.79
	75-80	0.695	1.13
85-90	0.025	0.63	
90-95	0.013	0.37	
95-100	0.048	2.03	
100-005	0.025	1.74	
105-110	0.035	1.61	
DH 89-34	0-5	0.006	0.29
	5-10	0.027	1.29
	10-15	0.020	6.72
	15-20	0.014	4.20
	20-25	0.014	2.25
	25-30	0.013	1.58
	30-35	0.049	1.97
	45-50	0.032	8.01
	50-55	0.014	5.72
DH 89-35	0-5	0.015	1.24
	5-10	0.052	0.79
	10-15	0.039	5.97
	15-25	0.019	3.36
	25-30	0.040	1.54
	30-35	0.021	1.61

Additional confirmation of the potential for both very high grade deposits and lower grade, but more widespread mineralization, comes from the trenching done by Cowichan in 1989 and discussed above under Previous Exploration (Fig. 5). The distribution of better grade trenches alternating with lower grade trenches suggests these higher grades may be associated with rolls or cross-folds and that perhaps exploration should be more focused in an east-west direction. Of special note is the trench located at grid line 10200N (Fig. 5), with silver values as high as 196 oz/t and gold values up to 1.25 oz/t.

Sampling on the 300 level of the Empire Mine near the north end of the property (Fig. 3) also returned very encouraging results. Grab samples of a breccia pipe exposed there taken by a reliable third party reportedly assayed up to 0.15 oz/t gold and 21.7 oz/t silver while mineralization adjacent to the breccia assayed up to 0.36 oz/t gold and 8.6 oz/t silver.

The Grand Central-Contention zone has been mined by open pit methods on and off since 1980 over a length of about 3,000 ft. However, the Contention vein/dike system extends both north and south of the present pit, making this total potential ore zone about 6,000 ft long. Based on the extensive past workings, the pervasive vein system and the known structures, and the low to high grade gold and silver values encountered in recent exploration, we believe the potential for additional ore here is very good.

#### Underground Potential

If additional narrow high grade zones are discovered, as in the interval 75-80 ft in hole 89-33, which assayed 0.70 oz/t gold, it may become advantageous to mine such zones by underground methods, especially if such zones are found at greater depths. Briscoe has postulated that the major ore producing anticlines cross the Contention zone to the east side where they were previously unknown. Where such folds are cut by the northeast trending veins or fissures, high grade ore zones should be present. Hole 89-33 and trench 10200N may well be into such zones.

Glanville (1988) reviewed the underground potential of this property and concluded that there was substantial potential for underground operations. Nothing has occurred that would require modification of that conclusion. On the contrary, the more recent work described in this report serves only to reinforce that conclusion.

#### COSTS TO RESUME PRODUCTION

While the main purpose of this report is to confirm the exploration potential of the Property and to recommend an exploration program, we believe it is worthwhile to comment on the expenditures required to place the Property back into production and the necessary levels of working capital that are likely to be required.

A Groundwater Quality Protection Permit (No. G-0020-02) has been issued by the State of Arizona and according to Cowichan, no additional permits are required to resume production. According to the terms of the permit, it is transferable upon 30 days notice of change of ownership.

A nearly complete heap leaching and Merrill-Crowe recovery facility is currently in place, including the following:

3 ponds for pregnant, barren and make-up solutions;

ore pads,

3,000 tons/day Merrill-Crowe plant.

After defining sufficient ore to warrant start-up, some refurbishment of the recovery plant will be necessary as well as construction of additional ore pads, replacement of the top liner on some of the existing pads and the drilling of several monitor wells. The following capital costs and working capital requirements have been estimated by consultants to Cowichan who are familiar with the plant. We have reviewed the estimates and on the basis of our experience with heap leach operations, we believe them to be reasonable.

Capital Costs:

	<u>US\$</u>
Pre-stripping	\$ 150,000
New pad construction/replace liners	155,000
Plant refurbishment/monitor wells	75,000
Expand spent ore pile	50,000
Contingency @ 15%	<u>65,000</u>
Sub-Total	\$ 495,000

Working Capital (90 days):

Rolling stock/crushing equip. lease	\$ 500,000
Chemicals/miscellaneous	150,000
On-site admin. and overhead	150,000
Contingency @ 15%	<u>122,000</u>
Sub-Total	\$ 932,000
TOTAL	<u><u>\$1,427,000</u></u>

### CONCLUSIONS AND RECOMMENDATIONS

The Grand Central-Contention property optioned to Excellon Resources Inc. was the location of the greatest amount of precious and base metal production from the Tombstone District, an area which has produced more than 33 million oz of silver and 260,000 oz of gold plus substantial amounts of base metals, all with a combined estimated value exceeding \$300 million at recent metal prices.

Open pit mining activities during the 1980's proved that mineralization is not confined to the major veins and replacement deposits, but is generally more widely distributed in small veinlets, fissures and on joint surfaces.

While of substantially lower grade than the ore produced in the early part of this century, this material is readily treatable by modern heap leaching methods. The combination of bulk surface mining of low grade ore and treatment by heap leaching opens the way to substantial non-traditional ore reserves.

The recognition that important ore localizing structures continue across the historic ore zone to the east, combined with the high grade results obtained in drill hole 89-33 and trench 10200N, suggests that there may also be substantial potential for additional bonanza grade ore similar to that mined in the past.

Since discovery of these two types of ore are somewhat independent of one another, we recommend a \$200,000 first stage exploration program employing a multi-faceted approach. The presence on site of an essentially complete heap leach operation dictates that short term emphasis should be placed on the discovery of heap leachable ore. We recommend that

drill cuttings, at least from the longer holes, be logged and that more detailed maps be produced showing the old workings, the projected structures and the 1989 drill holes. Soil geochemistry and rock chip sampling may be useful in delineating areas for drilling for the bulk minable ores, but in old mining districts such as Tombstone care must be taken that widespread contamination does not adversely affect the results. Some orientation surveys can be undertaken, to be followed by more widespread sampling if warranted. Zonge Engineering of Tuscon has submitted a proposal for a preliminary CSAMT geophysical survey and we agree that such a technique may be useful in identifying drill targets, especially of the larger vein and replacement type ore.

We recommend that this first phase of evaluation should include some drilling, especially in the vicinity of the pyritic anomaly and drill holes 89-33, 34 and 35. Since none of the holes need be deeper than 500 ft and many need only be in the 200-300 ft range, a drill program of 3,600 ft will give considerable latitude in locating holes. Because of the difficulties encountered in previous drilling, we recommend that some effort be made to analyze the past problems and review the proposed drilling with someone conversant with such problems. There are a number of drilling techniques available to explorationists and no one of them is always the right choice. Because many of the veins, fissures and dikes are vertical, vertical drill holes are not appropriate except perhaps in specific instances.

If the results of this program are positive, then we recommend an additional follow up drill program of approximately 15,000 ft, including several holes which should be to the depth limits of the lease, i.e. 500 ft. Such a program would cost approximately \$260,000.

PROPOSED 1990 WORK PROGRAM AND BUDGET

Phase I

Compilation, logging of 1989 drill cuttings	\$ 32,000
Soil and rock geochemistry	25,000
CSAMT geophysical survey	28,000
Preliminary drilling (3,600 ft)	72,000
Drill cutting assays	18,000
Analysis and report	<u>8,000</u>
	Sub-Total
	\$183,000
Contingency @ 10%	<u>18,000</u>
	Total
	<u><u>\$201,000</u></u>

Phase II

Follow up drilling (15,000 ft)	\$225,000
Report and project review	<u>10,000</u>
	Sub-Total
	\$235,000
Contingency @ 10%	<u>24,000</u>
	Total
	<u><u>\$259,000</u></u>

APPENDIX I

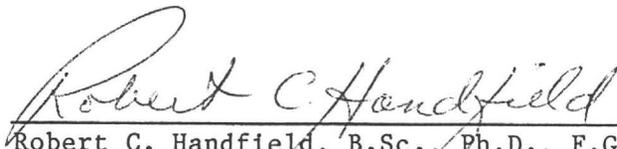
CERTIFICATES OF QUALIFICATION

CERTIFICATE OF QUALIFICATION

I, Robert C. Handfield, of 825 Hendecourt Road, North Vancouver, British Columbia, Canada, hereby certify that:

- (1) I am a B.Sc. (Hons.) graduate in geology from the University of British Columbia (1965).
- (2) I hold a Ph.D. in geology from Princeton University, Princeton, N.J. (1970).
- (3) I am a Fellow (F2816) of the Geological Association of Canada.
- (4) I have been practising in the mining profession since 1974 and have evaluated exploration and mining properties in many parts of Canada and the U.S.A.
- (5) I was formerly Vice President of Giant Bay Resources Ltd. Prior to that I was Acquisitions Manager for Texasgulf, Inc. and previously district exploration manager for the same company.
- (6) This report is based on information provided to me by Excellon Resources Inc. and Cowichan Resources Inc. As stated in the terms of reference, I have not visited the property.
- (7) I have no interest, nor do I expect to receive any interest, either directly or indirectly, in the Tombstone Project or Excellon Resources Inc.
- (8) I herewith grant my permission for Excellon Resources Inc. to use this report for whatever purpose deemed necessary.

DATED in Vancouver, British Columbia, on the 14th day of May, 1990.

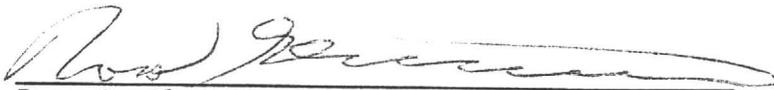
  
Robert C. Handfield, B.Sc., Ph.D., F.G.A.C

CERTIFICATE OF QUALIFICATION

I, Ross O. Glanville, of 7415 Pandora Drive, Burnaby, British Columbia, Canada, hereby certify that:

- (1) I am a B.A.Sc. (Mining Engineering) graduate from the University of British Columbia (1970).
- (2) I hold a Masters Degree in Business Administration (M.B.A.) from the University of British Columbia (1974).
- (3) I am a registered member of the Association of Professional Engineers of British Columbia, and have been since 1972.
- (4) I am a registered member of the Certified General Accountants Association of British Columbia.
- (5) I am President of Glanville Management Ltd., a company specializing in the valuations of exploration properties and mining companies.
- (6) I have been practising my mining engineering profession since 1970 and have valued exploration and mining properties in many parts of Canada and the U.S.A., as well as in other areas of the world.
- (7) I was formerly President of Giant Bay Resources Ltd. and Vice President - Valuations of Wright Engineers Limited, a large international mining, engineering, and consulting company. Prior to that I was a mining engineer and transportation manager with Placer Development Ltd., and a mining and project analyst with two major investment holding companies.
- (8) This report is based on information provided to me by Excellon Resources Inc. and Cowichan Resources Inc. and two visits to the property in 1988.
- (9) I have no interest, nor do I expect to receive any interest, either directly or indirectly, in the Tombstone Project or Excellon Resources Inc.
- (10) I herewith grant my permission for Excellon Resources Inc. to use this report for whatever purpose deemed necessary.

DATED in Vancouver, British Columbia, on the 14th day of May, 1990.



Ross O. Glanville, B.A.Sc., P.Eng., M.B.A., C.G.A

APPENDIX II

REFERENCES AND DOCUMENTS EXAMINED

## REFERENCES AND DOCUMENTS EXAMINED

- Briscoe, James A. and Associates, 1982, A Summary of the Tombstone Development Company Lands in the Tombstone Caldera Complex, Cochise County, Arizona: private report.
- Briscoe, James A. and Associates, 1989, Preliminary Asset Status Dossier, PBR-Cowichan Mineral Resources Contention Mine Lease Tombstone Mining District, Cochise County, Arizona: private report.
- Butler, B., Wilson, E. and Rasor, C., 1938, Geology and Ore Deposits of the Tombstone District, Arizona: Arizona Bur. of Mines Geol. Series #10, Bull. #143, 114 p.
- Excellon Resources Inc., 1990, Letter of Intent between Excellon and Cowichan Resources Inc., et al: private document
- Gilluly, J. 1956, General geology of Central Cochise County, Arizona: U.S. Geological Survey P.P. 281, 169 p.
- Glanville, R. 1988, A Valuation of the Tombstone Mineral Claims for Cowichan Mines Ltd.: private report.
- Lipman, P.W. and Swayer, D.A., 1985, Mesozoic ash-flow caldera fragments in southeastern Arizona and their relation to porphyry copper deposits: *Geology*, v. 13, p. 652-656.
- Newell, R.A., 1974, Exploration geology and geochemistry of the Tombstone-Charlestone area, Arizona: Ph.D. thesis, Stanford Univ., Stanford, California.
- State of Arizona, 1989, Groundwater Quality Protection Permit No. G-0020-02: 29p.

Tombstone Exploration, Inc., 1983, Report on Operations:  
private Company report.

Traywick, B.T., 1983, The Mines of Tombstone: published by  
Red Marie's, p. 35.

Williams, S.A., 1982, Memorandum on the Grand Central-  
Contention Ore Zone, Tombstone, Arizona: private memorandum  
for Tombstone Exploration, Inc.

Zonge Engineering, 1989, Confidential Proposal, CSAMT  
Surveys, Tombstone Project, Arizona: private report.

APPENDIX III

DRILL HOLE ASSAYS

GARY A. LINDROOS  
 950 Skyline Drive  
 Tombstone, Arizona 85638

ASSAY REPORT

Sample Identification	Troy Oz Au	Troy Oz Ag
1-A	0.002	0.08
2-A	0.018	0.07
3-A	0.003	0.11
4-A	Trace	0.11
1-B	0.008	0.40
2-B	Trace	0.36
3-B	0.010	0.18
4-B	0.003	0.24
5-B	0.016	0.71
6-B	0.002	0.24
7-B	0.007	0.50
8-B	0.009	0.35
9-B	0.002	0.29
10-B	0.003	0.29
11-B	Trace	0.05

89-3 CUTTINGS

89-3	5 - 15	0.004	0.16
89-3	15 - 20	Trace	0.18
89-3	20 - 25	0.002	0.17
89-3	25 - 30	0.014	0.63

Sample I. D.	Troy Oz Au	Troy Oz Ag	
89-02	0 - 5	Trace	Trace
	5 - 10	Trace	Trace
	10 - 15	Trace	Trace
	20 - 25	Trace	Trace
	25 - 30	Trace	Trace
89-04	0 - 5	Trace	Trace
	5 - 10	0.005	0.43
	10 - 15	0.004	0.45
	15 - 20	0.003	0.40
	20 - 25	0.003	0.28
	25 - 30	0.006	0.42
	30 - 35	Trace	0.02



D. Pow Special (Fines)	0.084	11.74
Little Joe Floor	0.036	5.11
1-B Fines	0.015	1.22

Sample I. D.	Troy Oz Au	Troy Oz Ag
89-04 35 - 40	0.003	0.34
40 - 45	0.001	0.14
45 - 50	Trace	0.13
50 - 55	Trace	0.14
55 - 60	Trace	0.12
60 - 65	Trace	0.12
65 - 70	Trace	0.13
70 - 75	Trace	0.09
75 - 80	Trace	0.05
80 - 85	Trace	0.10
85 - 90	Trace	0.02
90 - 95	0.002	0.21
89-05 0 - 5	Trace	0.13

Sample I.D.	Tr Oz Au	Tr Oz Ag
89-06 0 - 5	Trace	0.19
89-07 0 - 5	Trace	0.19
5 - 10	0.007	0.41
* 10 - 15	0.010	0.65
15 - 20	0.007	0.72
CUTTINGS	0.003	0.30

89-08 0 - 5	Trace	0.20
5 - 10	0.006	0.23
10 - 15	Trace	0.24
15 - 20	Trace	0.17
20 - 24	Trace	0.21
CUTTINGS	0.002	0.21

Sample I. D.	Troy Oz Au	Troy Oz Ag
89-09 0 - 5	Trace	0.20
5 - 10	Trace	0.31
10 - 15	0.002	0.34
15 - 20	Trace	0.23
20 - 24	0.003	0.25
CUTTINGS	0.004	0.38

89-10	0 - 5	0.002	1.17
	5 - 10	0.004	2.04
	10 - 15	0.003	1.79
	15 - 20	0.001	2.55
	20 - 24	0.063	5.57
	CUTTINGS	0.007	2.33
89-11	0 - 5	Nil	Trace
	5 - 10	Trace	0.15
	CUTTINGS	TRACE	0.29
89-12	0-5	TR	0.15
	5-10	TRACE	0.15
	10-13	TRACE	0.18
	CUTTINGS	TRACE	0.15
89-13	0-5	0.002	0.17
	5-10	0.008	0.64
	10-15	0.006	0.61
	15-20	0.002	0.38
	20-24	0.002	0.38
89-14	0-5	trace	0.12
	5-10	0.010	0.73
	10-15	TRACE	0.02
	15-20	NIL	TRACE
	20-24	NIL	TRACE
89-15	0 - 5	0.002	0.24
	5 - 10	0.002	0.30
	10 - 15	0.004	0.32
	15 - 20	0.002	0.30
	20 - 24	0.003	0.40
89-16	0-5	TRACE	0.02
	5-10	NIL	TRACE
	10-15	NIL	TRACE
	15-20	NIL	TRACE
	20-24	TRACE	0.12
	CUTTINGS	0.003	0.30
89-17	0 - 5	Nil	Trace
	5 - 10	Nil	Trace
	10 - 15	Trace	0.09
	15 - 20	Trace	0.03
	20 - 24	Trace	0.06



89-18	0 - 5	Trace	0.04
	5 - 10	Trace	0.02
	10 - 15	Trace	0.03
	15 - 20	Trace	0.03
	20 - 24	Trace	0.05

89-19	0 - 5	0.002	0.19
	5 - 10	0.004	0.31
	10 - 15	0.004	0.42
	15 - 20	0.002	0.23
	20 - 24	0.003	0.23

89-13	Cuttings	0.007	0.61
89-14	Cuttings	Trace	0.15
89-15	Cuttings	0.002	0.40
89-16	Cuttings	0.003	0.30
89-17	Cuttings	0.005	0.28
89-18	Cuttings	0.003	0.37

89-20	0 - 5	0.001	0.25
	5 - 10	0.002	0.32
	10 - 15	0.004	0.25
	15 - 18	0.001	0.18

Sample I. D.	Troy Oz Au	Troy Oz Ag
89-21	0 - 5	Trace
	5 - 10	0.17
	10 - 15	0.24
	15 - 20	0.32
		0.31

Sample I. D.	Troy Oz Au	Troy Oz Ag
89-22		
	0-5	.003
		0.26
89-23		
	0-5	.005
		0.16
89-24		
	0-5	0.020
	5-10	0.068
	10-15	0.060
	15-20	0.014
	20-24	0.034
		5.00
		6.18
		4.44
		1.63
		0.98



Sample I. D.	Troy Oz Au	Troy Oz Ag
89-25		
0-5	.002	1.44
5-10	.007	0.75
10-13	.001	0.50
89-26		
0-5	0.006	0.24
5-10	0.003	0.23
10-15	0.006	0.21
15-20	0.002	0.69
20-24	0.007	0.93
89-27		
0-5	0.009	0.25
5-10	0.007	0.30
10-15	0.001	0.24
15-20	TRACE	0.21
20-24	TRACE	0.21
89-31		
0-5	0.068	1.78
5-10	0.024	2.42
10-15	0.025	1.46
89-33		
0-5	0.017	0.87
5-10	0.018	1.06
10-15	0.005	0.90
15-20	0.007	1.56
20-24	0.024	2.37
24-30	0.015	1.21
30-35	0.005	0.89
35-40	0.003	0.74
40-45	0.018	0.83
45-50	0.241	0.82
50-55	0.158	0.56
55-60	0.149	1.80
60-65	0.081	2.29
65-70	0.063	1.44
70-75	0.021	0.79
75-80	0.695	1.13
85-90	0.025	0.63
90-95	0.013	0.37
95-100	0.048	2.03
100-105	0.025	1.74
105-110	0.035	1.61



89-34

8-5	0.006	0.29
5-10	0.027	1.29
10-15	0.020	6.72
15-20	0.014	4.20
20-25	0.014	2.25
25-30	0.013	1.58
30-35	0.049	1.97
45-50	0.032	0.01
50-55	0.014	5.72

89-35

8-5	0.016	1.24
5-10	0.052	0.79
10-15	0.039	3.97
15-20	0.019	3.36
20-25	0.040	1.54
30-35	0.021	1.61

89-052

8-5	0.002	0.27
5-10	Trace	0.14

89-055 #1

8-5	Trace	0.13
-----	-------	------

89-222

8-5	0.003	0.78
5-10	0.007	0.24
10-15	Trace	0.16
15-20	0.004	0.58

89-042 #2

5-5	0.013	3.02
-----	-------	------

