CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

MONTE CRISTO-DIXIE QUEEN
MINE

THIS REPORT IS NOT TO BE
REPRODUCED.
K. PHILLIPS

A

GEOLOGIC EVALUATION

REPORT

on the

Monte Cristo Pegmatite Mine

~~Weaver~~ Mining District (K.P.)
Kirkland

Yavapai County, Arizona

by

Richard E. Mieritz
Mining Consultant
Phoenix, Arizona

May 22, 1979

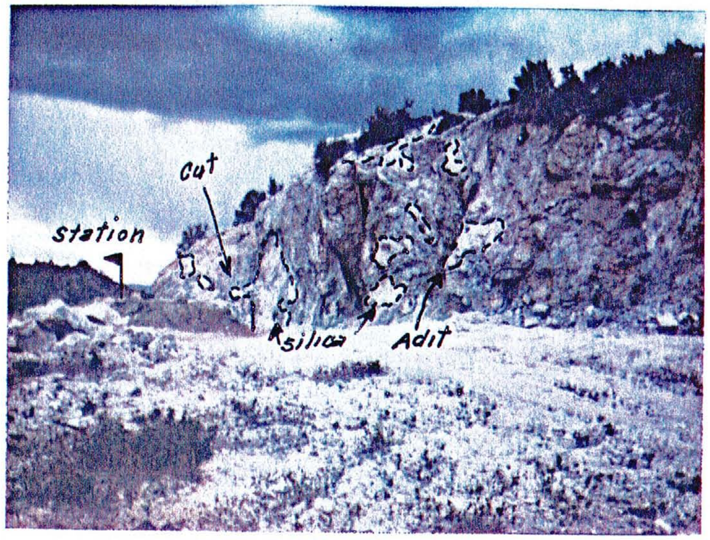

PHOTO: Looking northeast towards face or bank of Open Pit. Some of the Silica pods are outlined on the Photo. The position of the Adit is indicated - being about 8 feet above the present Pit floor.. The most northeastern Cut is also indicated. The start of this Cut is also about 8 feet above the Pit floor.

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INTRODUCTION:

At the request of and authorization by Mr. Chet Cheatwood, President of Verde Products, Inc., an Arizona corporation with offices in Phoenix, the writer personally visited and examined the Monte Cristo Mine (Monte Cristo claims) in Yavapai County, Arizona, on May 19, 1979 for the purpose of observing the pegmatite mineralization within the claimed boundary.

This report is based on the writer's field observations and the writer's knowledge of pegmatite mineralization within a recognized geologic pegmatic zone extending from Morristown to Kingman, Arizona and beyond. The writer has examined several pegmatite properties within this zone. The writer also had access to earlier reports on the property by Einar C. Erickson and Robert Raabe.

Registered Professional Engineer (Mining) CERTIFICATE EXPIRES RICHARD E. MIERITZ DEC. 31, 1979 ARIZONA, U.S.A.

PROPERTY, LOCATION and ACCESSIBILITY:

The property consists of fifteen (15) standard lode mining claims, Monte Cristo #1 through #15, which are mostly located in the southern half of Sec. 34, T. 12 N., R. 5 W. and the northern quarter of Sec. 3, T. 11 N., R. 5 W., G. & S. R. B. & M., Yavapai County, Arizona. Mr. Cheatwood advises these claims have been filed with the U.S. Bureau of Land Management, Phoenix, Arizona, as required by Federal law. This action plus the observed development and assessment work completed on the property should establish the claims as a legal entity. (Map No. 3)

The property is accessible by passenger automobile. From Phoenix, travel northwesterly to Wickenburg, turn northerly on U.S. Highways 89 and 93, following Route 89 to Yarnell. (Route 93 heads northwesterly to Kingman, Arizona.) From the Ranch House Cafe in Yarnell, travel northeasterly on Route 89 to a gravel road junction 6.7 miles distant. Turn north, or left, onto the ranch type road and travel 1.6 miles to a "Y". At this point, bear left and continue for 1.7 miles to another "Y". Here, bear right and continue for 1.5 miles to a locked gate, through gate and 0.2 miles to third "Y" at which point, bear right for 0.2 miles to the pit. (See Maps No. 1 and 2.)

HISTORY, DEVELOPMENT and PRODUCTION:

The property dates back to 1917, when the pegmatites were mined for the beryl content. In the early 20's, the property produced mica. In the late 20's, more beryl and some euxenite (a mineral containing yttrium, erbium, cerium and uranium) were mined. After a long idleness, a mica mill was erected in 1947 and mica produced. This development consisted of a vertical shaft, an adit and some surface mining. Renewed beryl activity in the early - mid seventies saw a drilling exploration program completed. The results of this work appear to be difficult to obtain.

In 1975, Mr. Chet Cheatwood relocated the then "Dixie Queen" claims to the present Monte Cristo claims. Since then, 300 tons of mica have been mined and sold to Buckeye Mica Mill, Buckeye, Arizona. Feldspar has also been mined for test work (100 pound to 1/4 ton lots). This test work by Westwood Ceramics, Hiway Ceramics, Bice, etc. has shown the feldspar to be of high quality and purity, more so than the North Carolina feldspar currently supplying the California market.

Mr. Cheatwood has done much pre-mine work to prepare the available feldspar "ore" for mining and production on a scale to make the venture profitable. To further enhance the operation, negotiations are under way to purchase the now idle "feldspar" crushing and pulverizing mill at Kingman, Arizona.

CLIMATE and FACILITIES:

Except for a few days during the "rainy" period and the winter season, year round operation of the mine can be expected.

The mine workings are at an elevation of 5,000 feet.

No gas or electricity are available at the property. A rancher's stock watering well is a short distance from the workings.

REGISTERED GEOLOGIST CERTIFICATE NO. 7784 RICHARD E. MIERITZ Date Signed ARIZONA, U.S.A.

GENERAL GEOLOGY:

Arizona has a northwest trending zone of 50 to 70 miles in width which has many occurrences of pegmatite structures as veins, blobs, pipes and irregular masses. All these can be of small, medium or large volumes. This zone extends from Morristown - about 40 miles northwest of Phoenix - to Kingman and beyond towards Hoover Dam. (See Map No. 2.)

Pegmatites, in general, geologically are considered the "trash can" of mineralization because pegmatites usually are composed of high temperature minerals and elements not commonly associating themselves with the more common base and precious metals of lead, zinc, copper, gold, silver, etc.

Pegmatites are usually composed of, but not limited to, silica (quartz), feldspars (sodium and/or potassium), beryllium minerals, mica (biotite and/or muscovite), columbium, tantalum, titanium and many rare earth metals - minerals. The size, shape, geographic location nor the structural mode have any great influence on the composition or the constituent quality and/or quantities of any particular pegmatite deposit.

LOCAL GEOLOGY and MINERALIZATION:

The claimed area hosts the widespread pre-Cambrian granite which is part of the Bradshaw Complex common to the area. Most of the granite is "fresh" rock, however, some decomposition has occurred in local areas. Isolated islands of Yavapai schist are also present. (See Map No. 2.)

Here, within the claimed area, a moderate size pegmatite deposit has been moderately explored and developed. This deposit is located on

Monte Cristo #1 and #9 claims. (See Map No. 3.)

The major constituents of this pegmatite deposit are potash and soda feldspars, silica (white-gray, sometimes tan quartz), mica (muscovite, usually silvery of small to quite large plates) and beryl mineral, most frequently in large crystal form.

Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
RICHARD
E. MIERITZ
DEC. 31, 1979
ARIZONA, U.S.A.

DEVELOPMENT:

The deposit is developed by an Adit, several surface pits and trenches and more recently by surface excavation resulting in a vertical face exposure of 40-45 feet in height and some 300 feet in length. (See Photo.) The owner states two other Adits and two vertical shafts exist but are not accessible now.

The writer has surface mapped the deposit (Map No. 4) and checked the geological underground mapping as completed by R. Raabe (Map No. 5). The shaft shown on this map is not accessible - being filled by the recent work. A second shaft to the north also is not accessible. The depths are reported as 50 and 30 feet respectively. The two inaccessible Adits are located some 40 feet vertically below the present "bench" - flat area in the pit - and to the north - being driven to the south. It is reported that the pegmatite was intersected with these Adits.

ORE RESERVES:

Pegmatites, unlike base or precious metal deposits, where samples can be taken and assay contents or values obtained, must be visually examined and estimated. The mineral contents (quartz, feldspars, micas, beryl, etc.) must be visually estimated. Such estimates will vary from engineer-geologist to engineer-geologist, dependent on his knowledge and experience with pegmatites. The end result is that an ore reserve estimate is that - an estimate. However - the more the pegmatite is "opened" for visual examination, the more accurate the estimate will be.

Fortunately, the contained minerals in this deposit are very clearly distinguishable and identifiable by sight. Then too, the development thus far has exposed many faces for the "appraiser" to examine.

Ore Reserve classifications are defined as "Proven or Measured" (positive information in all directions), "Indicated" (positive information in some directions) and "Inferred" (geologic projections based on geologic evidence of the "known" mineralization).

The degree of development at the Monte Cristo deposit does not have sufficient "evidence" to classify an ore reserve into "Measured" except in a small, meaningless way. The degree of development at the deposit is more than required for "Indicated" ore. Thus, a situation exists which is midway between the two classifications and this reserve the writer designates as "Measured - Indicated". The second classification used here is "Inferred."

Map No. 4 (Surface Geology of the Deposit) suggests a deposit of near rectangular shape with surface dimensions of 250 feet in length and an average 100 feet in width. The vertical bank in the pit (See Photo) is estimated as 40 feet and the surface in the middle of the deposit about another 10 feet, say an average of 45 feet. To this figure, 15 additional feet should be added for the material below the present pit floor level. The two inaccessible shafts are reported (Erickson's Report, 1956) as having penetrated the pegmatite 30 to 50 feet below their collars.

The "block" thus has dimensions of 250 feet long, 100 feet wide and 60 feet deep or thick. These figures multiplied for volume and divided by 12 (cubic feet per ton in place) results in 125,000 tons. (See Map No. 4.)

The lower two inaccessible Adits are also reported as encountering the pegmatite deposit. It is therefore reasonable to assume by inference that a "block" of similar dimensions could exist below the above described "Ore Block" and in the amount of a similar tonnage - 125,000 tons. (See Map No. 5)

The writer thus credits the present pegmatite deposit with:

Measured - Indicated	- 125,000 tons
Inferred	- 125,000 tons

The pegmatite zone is in surface evidence for some 500 feet in a southwest direction but has not been explored, thus opening the way for additional potentials.

The pegmatite is composed of four recoverable, marketable minerals, namely, feldspars, quartz (silica), mica and beryl. The percentage of these minerals in pegmatites varies considerably deposit to deposit AND within any specific deposit. Based on the evidence observed by the writer during the visual examination of same, it is the opinion of the writer that the deposit will have the following mineral content average percentages.

Feldspars	70.0%
Silica	25.0%
Mica	3.5%
Beryl	1.5%
	100.0%

In the "Measured - Indicated" ore block there could be - in place:

Feldspars	87,500 tons
Silica	31,250 tons
Mica	4,375 tons
Beryl	1,875 tons
Pegmatite	125,000 tons

Registered Professional Engineer (Mining)
Certificate Expires Dec. 31, 19__
Richard E. Mieritz
Arizona, U.S.A.

MINE OPERATION:

Mr. Cheatwood states his objective is the production of feldspar - to mine, transport, mill in Kingman, Arizona and bag, marketing the final product for $90.00 per ton.

Simultaneous mining of the silica, mica and beryl would provide stockpiles of these minerals for future milling and marketing of a saleable product.

Mr. Cheatwood also states he is assured of a feldspar mining contract by experienced feldspar miners at $6.00/ton, mined and loaded into trucks. Other minerals would be mined and stockpiled for $3.00/ton.

A trucking charge contract to Kingman is indicated as being $13.00/ton - 10¢ a ton mile.

The milling cost at the Kingman plant has not been determined but the writer would estimate a $20.00/ton actual cost, not including capital cost writeoff.

VALUE in PLACE:

It has been estimated that 87,500 tons of feldspar exist. With an 85% mining efficiency projected, there should be 74,375 tons of recoverable feldspar. With a market price of $90.00/ton (Kingman), the "in place" value is $6,600.000.-.

The E.&M.J. April quotes for the other mineral commodities (minimum figures, specifications and price in each case) are:

Silica:	$35 - 46.00/ton, 50 lb. bags
Mica:	$30 - 35.00/ton, scrap
Beryl Ore:	$50 - 55.00/STU (1%), for 10-12%

The above "by products" could further enhance the "in place" value $2,160,000.- or a total of $8,800,000.- for the "Measured - Indicated" ore block.

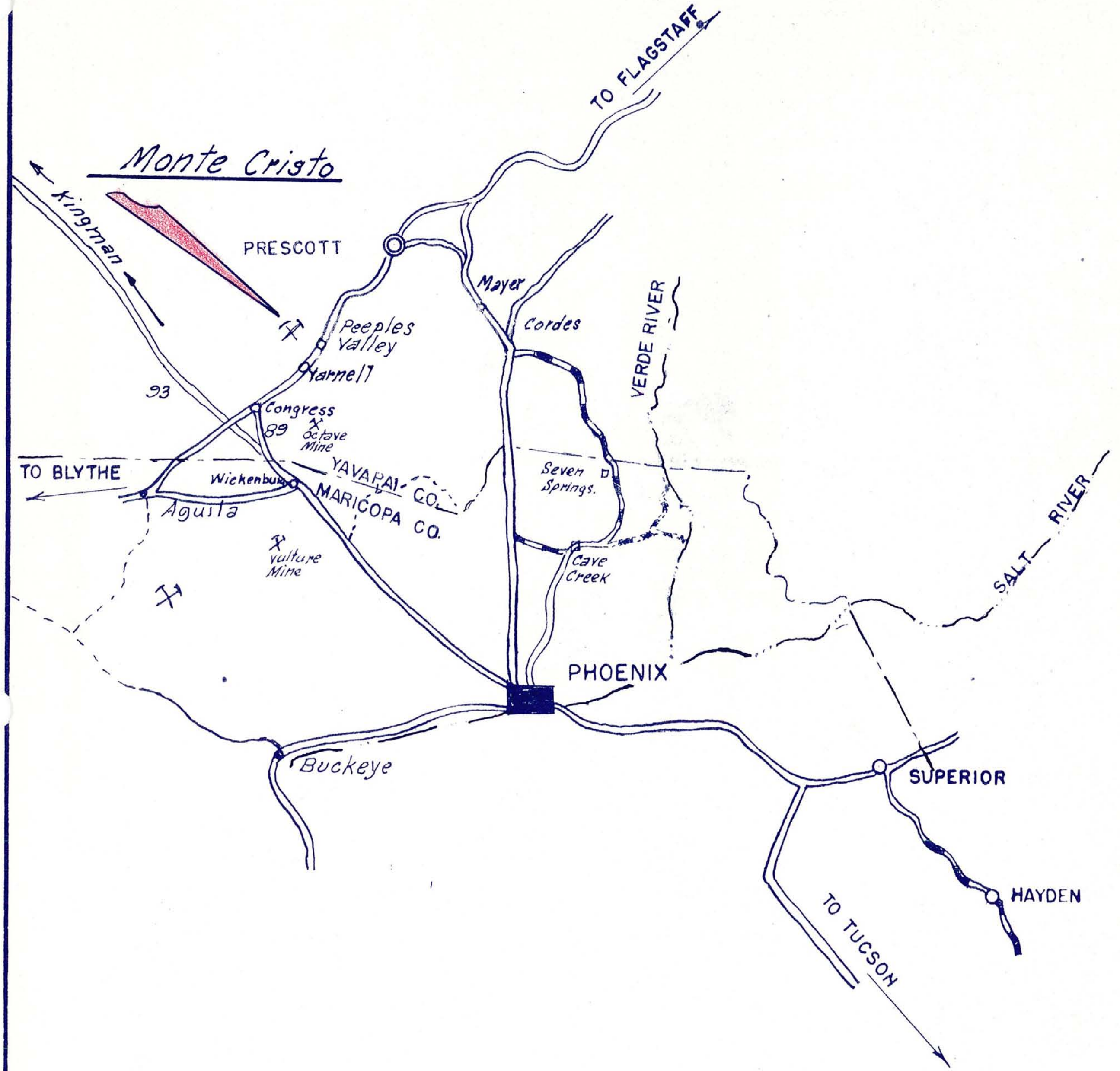
Respectfully submitted,

Registered Professional Engineer
Certificate Expires
RICHARD E. MIERITZ
DEC. 31, 19
ARIZONA

Registered Geologist
Certificate No. 7784
RICHARD E. MIERITZ
Date Signed
ARIZONA, U.S.A.

R. E. Mieritz
Mining Consultant
Phoenix, Arizona

May 22, 1979



Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
RICHARD E. MIERITZ
DEC. 31, 19 66
ARIZONA, U.S.A.

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R.E.M.

INDEX MAP
CENTRAL ARIZ.

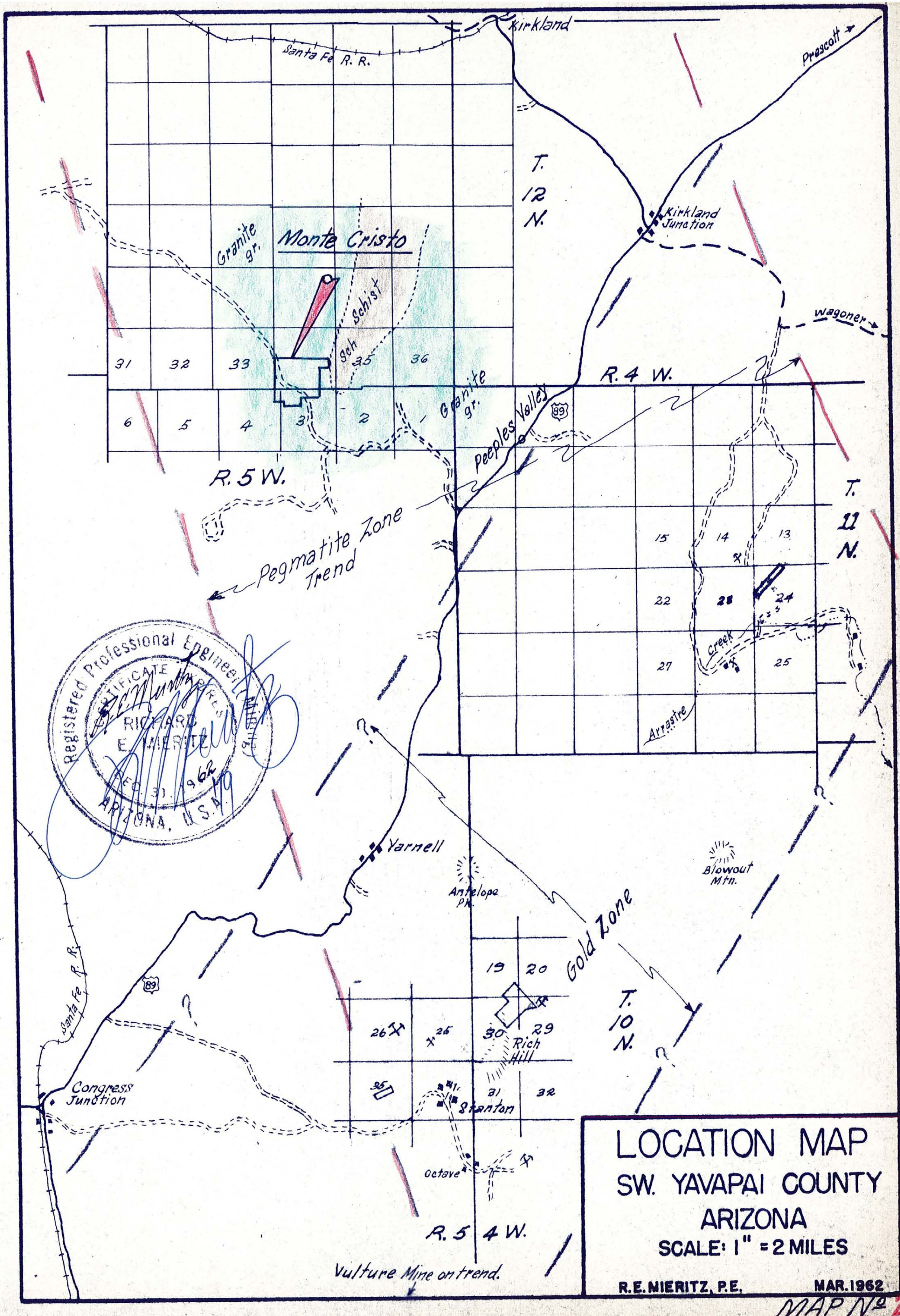
SCALE: 1" = 27 MI.

R. E. MIERITZ, P.E.

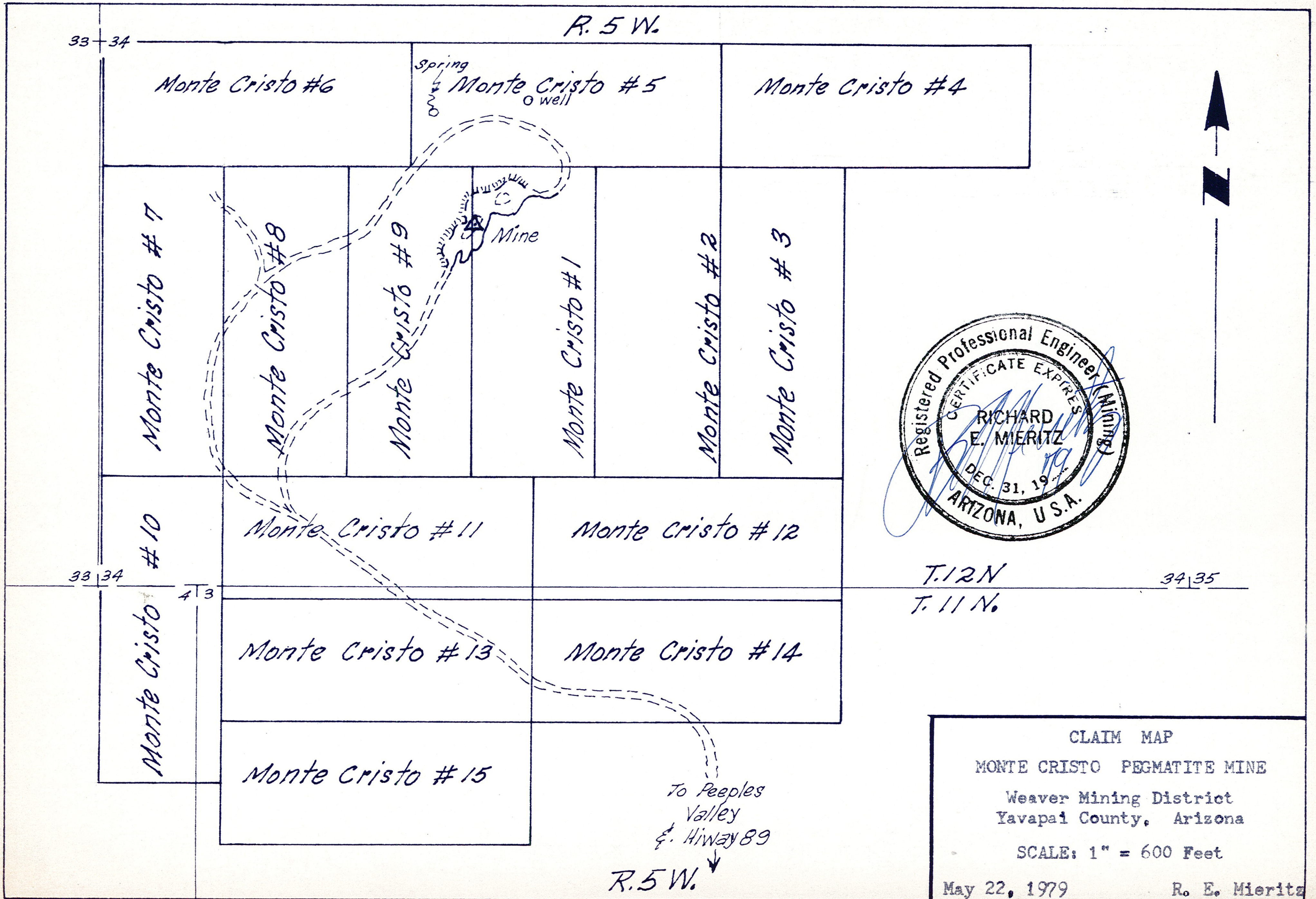
MAR., 1962

MAP No. 1

A-23 USE



Kirkland
Santa Fe R. R.
Prescott
T. 12 N.
Kirkland Junction
Granite gr.
Monte Cristo
Schist
Sch
Wagoner
31
32
33
35
36
R. 4 W.
Granite gr.
6
5
4
3
2
1
Peeples Valley
89
R. 5 W.
T. 11 N.
15
14
13
22
23
24
27
25
Creek
Arrastre
Pegmatite Zone Trend
Yarnell
Antelope Pk.
Blowout Mtn.
Gold Zone
19
20
89
Santa Fe R. R.
T. 10 N.
26
25
30
29
Rich Hill
Congress Junction
31
32
Stanton
Octave
R. 5 4 W.
Vulture Mine on trend.
LOCATION MAP
SW. YAVAPAI COUNTY
ARIZONA
SCALE: 1" = 2 MILES
R.E. MIERITZ, P.E.
MAR. 1962
MAP No 2
Registered Professional Engineer
CERTIFICATE No.
RICHARD E. MIERITZ
ARIZONA, U.S.A.



CLAIM MAP

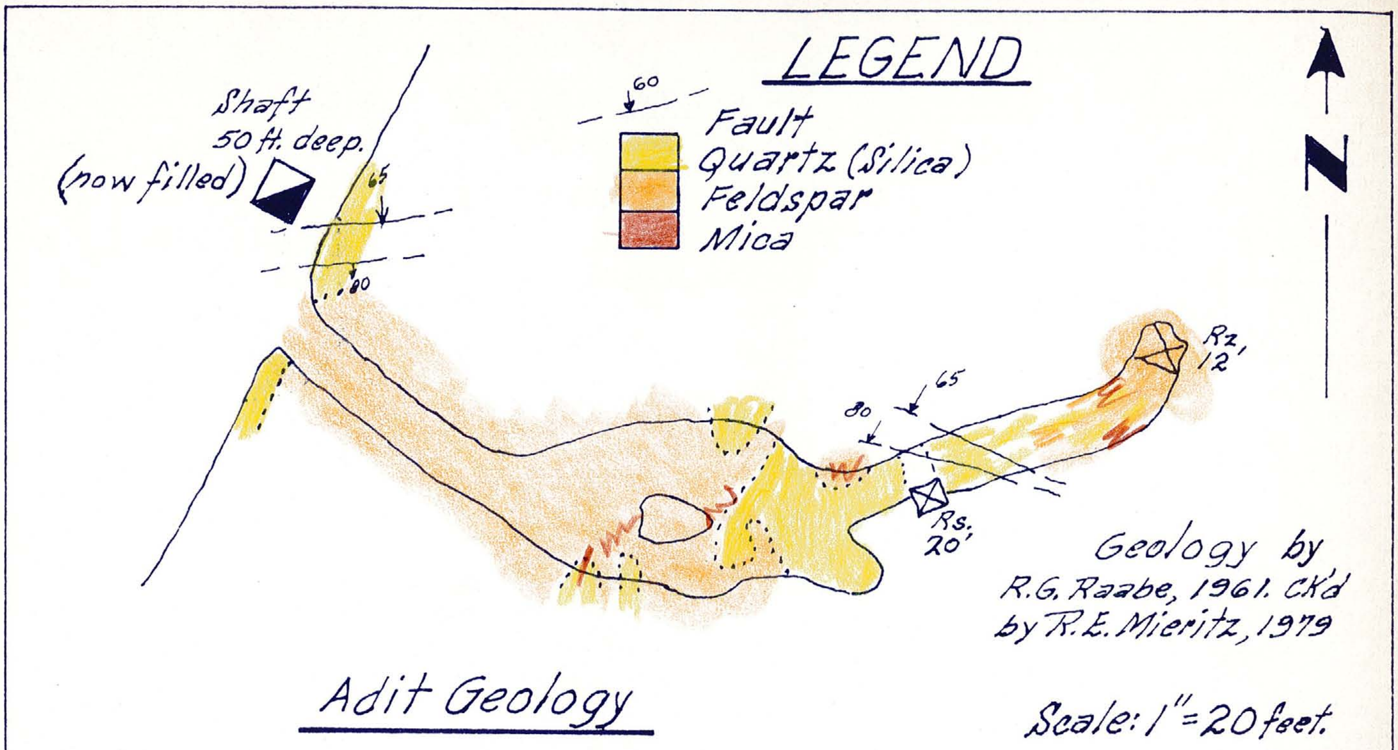
MONTE CRISTO PEGMATITE MINE

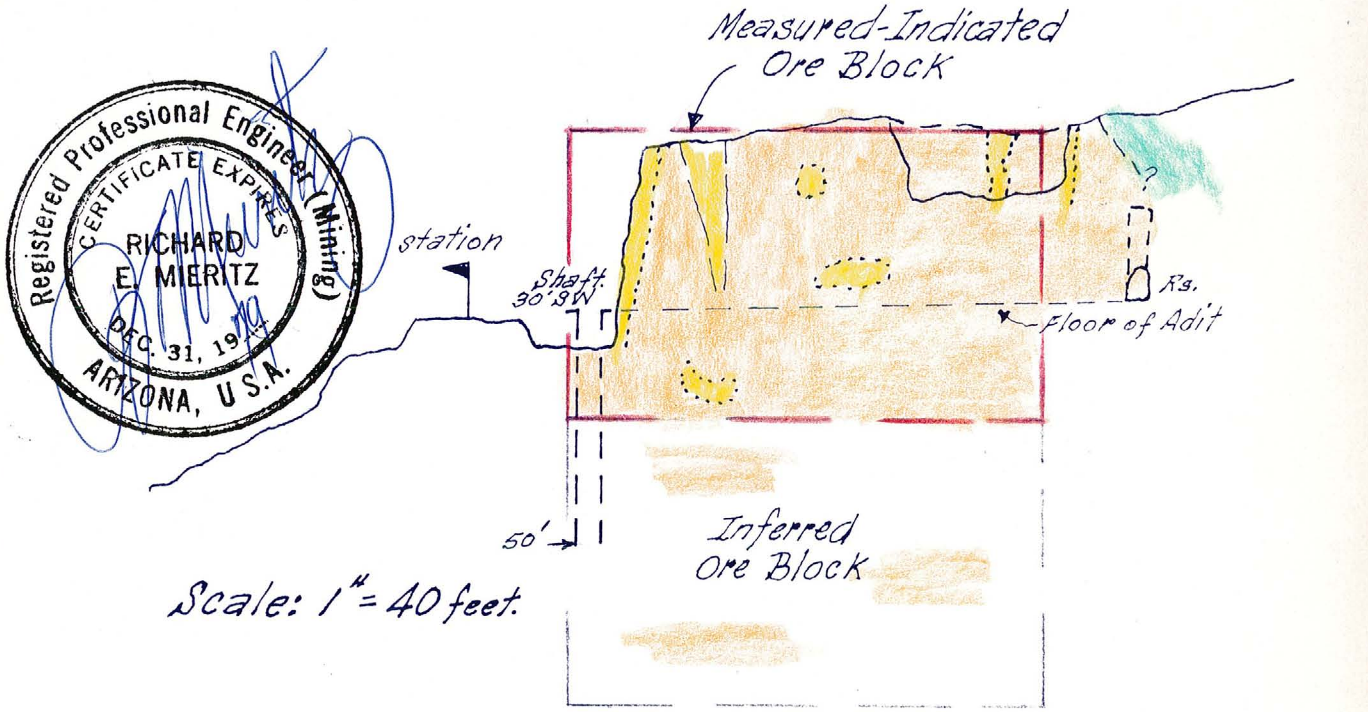
Weaver Mining District
Yavapai County, Arizona

SCALE: 1" = 600 Feet

May 22, 1979 R. E. Mieritz

MAP No 3





SECTION A-A' (S. 55°E)
(from Map № 4) (looking N. 35°E)

NOTE

This Section might well be typical of the Monte Cristo pegmatite deposit. Vertical elevations are writers estimates. Horizontal measurement by Brunton & Range Finder.

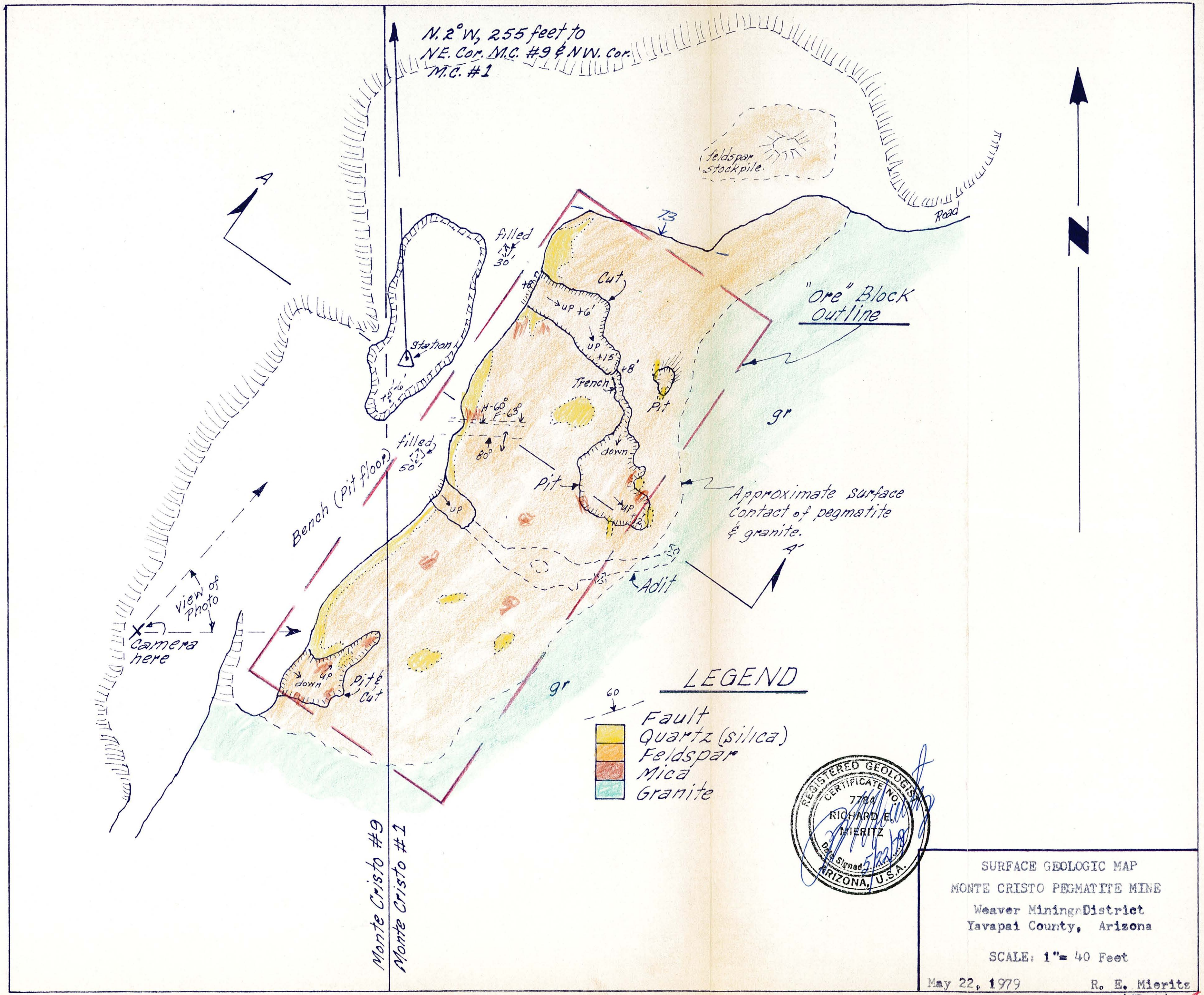
ADIT & SECTION MAP
MONTE CRISTO PEGMATITE MINE

Weaver Mining District
Yavapai County, Arizona

SCALE:- as noted

May 22, 1979 R. E. Mieritz

MAP № 5


N. 2° W, 255 feet to
NE. Cor. M.C. #9 & NW. Cor.
M.C. #1
A
A'
filled
30'
filled
50'
Station
Cut
up +6'
up
+15'
+8'
Trench
Pit
down
up
Pit & Cut
Bench (Pit floor)
view of Photo
Camera here
feldspar stockpile
Road
"Ore" Block Outline
Approximate surface contact of pegmatite & granite.
Adit
gr
gr
N
Monte Cristo #9
Monte Cristo #1
LEGEND
Fault
Quartz (silica)
Feldspar
Mica
Granite
REGISTERED GEOLOGIST
CERTIFICATE NO.
7784
RICHARD E.
MIERITZ
Date Signed 5/22/79
ARIZONA, U.S.A.
SURFACE GEOLOGIC MAP
MONTE CRISTO PEGMATITE MINE
Weaver Mining District
Yavapai County, Arizona
SCALE: 1" = 40 Feet
May 22, 1979
R. E. Mieritz

MAP No 4

6

Geology-Engineering report

Monte Christo Beryllium
claims. Peeples Valley,
Yarnell, Ariz. W.J. Salisbury

Compañía Minera Los Angeles, S. A.
APARTADO POSTAL 306 TEGUCIGALPA, HONDURAS, C. A. TEL. No. 2-4917
POR CABLE: "COMPANGELES"

WJS/j
August 1, 1965

Mr. Daniel C Jacobs
Vice-President
Arizona Beryllium Corporation
Box 53, Congress, Arizona, U.S.A.

Dear sir:

As requested by you, and Mr. Melvin H Jones, I hereby submit my Preliminary Evaluation Report on the Monte Christo mine at Peeples Valley, Arizona. As you will recall, I made my examination of the mine in the company of you and Jones on May 8, 1965. I also visited the mine several times previous to this on a reconnaissance basis and garnered much information on these visits, in addition to perusing a previous geology study. I apologize for the delay in submitting this report, but, as you know, I was engaged as a mining engineer with Compania Minera Los Angeles, S.A. and left shortly after my last examination of the Monte Christo, for Honduras. I have made this report from the notes I have, and have had the ore samples assayed in our laboratory. This latter action has saved you some expenses, as BeO assays come rather high in the States.

There are twelve(12) lode mining claims that are owned by Arizona Beryllium Corporation, and are now understood to be under lease to Allied Beryllium Company of California. It is also understood that the latter company drilled five(5) holes on the property for testing pruposes and supposedly found chrysoberyl at lower levels, although the drill logs and other data, confirming this information have not been made available to Arizona Beryllium Corporation, nor to the writer.

The mine is on a "U" shaped heterogenous(non-lithium) berylliferous pegmatite formation located in a granite batholith in the Weaver mountains. It is about five(5) miles Westerly from U.S. highway 89, in Peeples Valley, North of Yarnell, Arizona (Yavapai county). The highway is a first class paved road, and the five(5) miles to the mine (off the highway) is a good and well maintained county dirt road. The Monte Christo mine was formerly called the Dixie Queen and in the past was operated for mica and possibly some "hand cobbed" beryl was taken out.

GEOLOGY. This mine, as I mentioned before, is in the Weaver mountains located in the Mountain region of the Basin and Range province. The mountains in the vicinity of the mine are an extension of the Yavapai series, which dates prior to the Mazatzal revolution and compares with the Vishnu formation of the Archean era (1 and 1/2 billion years). The pegmatic formation is plutonic of hypergene origin and was formed at magmatic temperatures (higher than hypothermal). Near the Monte Christo is an old diggings of which the writer was told contains scheelite, that was mined to a small extent during WWII. Tungsten is another element that commonly occurs in granitics. I have also been told that there are some old gold prospect holes in the vicinity. While pegmatites ar normally lens shaped, the extent of this deposit(that is about 300Øfeet in length) cannot be determined without drilling data or other geophysical research.

MINERALOGY. This is one phase of this examination in which I differ from the previous results of my colleagues. In fact one previous investigator says the berylliferous formation is not a pegmatite and that the big hexagonal chrystals in sight are not beryl ??? The obviously beryl ($Be_3AL_2(SiO_3)_6$ chrystals are in evidence in the open cut facies on a sparse and sporatic basis. Some of these chrystals are twelve inches(12") in diameter and are of the heliodor(yellow) category, but none were seen that are gem quality. Large vugs of muscovite mica $(OH)_2KAl_2(AlSi_3O_{10})$ can be seen in some portions of the formation. Some of this mica is in books of about eight inches (8") diameter, but the mentioned vugs are scarce. I do not want to present an over optimistic picture of these minerals, as they are like sparse raisens in a loaf of raisen bread. In other scarce pockets, there are small beryl chrystals in a matrix of perthite and sericite.

The gangue of the pegmatite is basically quartz and perthite (and not albite as identified by others). On the contacts of the pegmatite there is a fine-crystalline phase that has the appearance of, but is not, aplite. In the vicinity of the Southwesterly end of the formation is a brown material intermixed with quartz that is garnet. It is reported that there is a small vein of Bismuthite in the North zone that purportedly contains rare earths and is radio-active. As this area is in a pit filled with water, the alleged vein was not examined by the writer.

SAMPLING. No samples were taken from the main pegmatitic facies, as this would have taken several days of labor to clean off the formation so that channel cuts could be taken, and I did not have time to do this. Further, this type of sampling from the surface would still be of limited value. However, in order to get some idea of the values, three(3) samples were taken from equally spaced intervals on the rather extensive tailings pile that is a residue from former mica recovery operations and it is to be understood that the larger pieces of beryl were "hand cobbed" and removed during the processing. The samples that I took were "grab" samples of about ten(10) pounds each. Prior to leaving for Honduras I carefully mixed each of the respective samples and quartered the same and had these quarters with me for testing in our laboratory. Sample A is from the Southwesterly zone of the dump, Sample B is from the approximate center, and Sample C is from the Northerly zone. Chemical assays of BeO content follow:

Sample A	Sample B	Sample C
nil	.40 %	.22 %

No tests were made for mica content, that would be a secondary saleable mineral. The mica content is estimated by me to be from five(5) to ten(10) % of the ore deposit. (I note that one of my predecessors makes an estimate of twelve(12) %).

DEVELOPMENT. Unless substanciated drilling data in the hands of officials of the Allied Beryllium Company can be obtained, the claims should be re-drilled under the direction of a capable

Geologist or Mining Engineer. The data obtained, along with carefull sampling and testing will indicate the values and probable reserves in tonnage. It may also reveal that the property is extremely marginal and that expenditure of time and funds for further development is not justified under present economics. The writer considers that the alleged deposit of chrysoberyl at depths of 116 to 152 feet, with a thickness of 36 feet, is questional. In lieu of the suggested drilling, it would be an excellent gamble to drive an adit into the bottom layer of the deposit from the lower level of one of the ravines below the present "open cut". This would enter the mineralized zone in excess of one hundred (100) feet below the old workings and a cross cut could be made at right angles for further exploratory purposes and for easy removal of the ore. The cost of this would compare very favorably with drilling costs, and the finished facility would be most advantageous for the immediate removal of ore (in the event a good grade of ore is found) and would save tunneling costs that would follow successfull drilling. Assuming an efficient operation of this type, the adit will cost about thirty dollars ($30.00) per foot, including track and pipe.

ECONOMIC CONSIDERATIONS. At this stage of the study, it should be thoroughly understood that we have no firm information on the ore values and the amount of available ore. No one with a sound mind would seriously consider putting a mill on the property, or to commence mining operations based on the meager data available. Nor should anyone spend money on the property for other than exploratory and testing work.

Recent mining journals show that BeO concentrates with BeO content of 10 to 12 % is worth $45.00 per unit. Scrap mica is worth 7 to 12 dents a pound. Present indications reveal that the BeO content of the Monte Christo ore will be in the neighborhood of a fraction of 1 % per ton and the mica might reach 100 pounds in each ton. The stockholders should realize that the mine is no bonanza although there is a strong possibility that it may be able to operate at a profit at sometime in the future. The following factors are submitted for consideration and should have a bearing on managerial action:

a There is one Canadian mine that is operating with ore that averages .25% BeO and this means that at the present day price of BeO, the ore brings $11.25 gross, per ton, from which has to be deducted the mining, milling and transportation costs. Thusly, the profit from this mine must be small, if any. It is not known at the present time as to whether the Monte Christo ore will average the mentioned .25% .

b If the mica in the Monte Christo deposit averages 5% of the total ore, then 100 pounds will be obtained from each ton of ore processed. And this will have a gross value of $7.00 to $12.00 per ton from which a proportionate portion of mining and milling costs will have to be deducted.

c The total gross profit of beryl and mica will be between $18.25 to $23.25 per ton. While I do not have any firm costs of mining and milling this ore, I will make a conservative estimate of $5.00 per ton for these activities. Thusly, the overall profit will be small and insufficient to interest large investors to put up the necessary capital. Milling equipment will be expensive and there are no large quantities of reserve tonnage in sight that might make a large investment feasible in considering many years of operation.

d The cost of a mill to process the beryl and mica will probably be in excess of $2000.00 per ton day. Therefore, a comparatively small 50 ton a day mill will cost $100,000.00 or more. This makes for a must costly operation. It is now reported that the Russians have developed a method of floating beryl by treating it with caustic soda, which renders beryl amenable to floatation by altering the crystal surfaces. This may somewhat cut the costs of future beryl processing in the U.S.

e A market can be readily found for the mica. But the matter of developing a market for the BeO presents another serious problem. While I have missplaced the exact reference in my notes, that I have, there is a Bureau of Mines report entitled "Report on beryllium Production - 1964", that was published in 1965, and this report reveals that during the full year 1964, there was only one(1) ton of BeO concentrates mined and sold in the entire country. This indicates that Brush Beryllium, Beryllium Corporation of the U.S., and other major processors and users of BeO are not buying their requirements on the open market. In most cases, they have their own mines and/or buying additional requirements from the U.S. government. This same mentioned report reveals that the U.S. government traded several millions of dollars in surplus food produced by farmers, for beryllium concentrates produced in foreign countries, thusly negating the opportunity for privately owned mines in the U.S. to operate and find a market for their BeO. In other words, the U.S. government is putting beryl mine owners out of business with surplus food exchanges. I have not received word on how the situation is today, but this is a matter for serious consideration by the stockholders.

f If the Monte Christo mine is to be again operated on the past open pit basis, it should be understood that this will mean prohibitively high stripping ratios. In the suggested operation (under Development, above) the adit cutting the ore body at right angles should be 7 feet by 8 feet for ease of operation and low cost mining.

CONCLUSION. It is hoped by me, that it is realized by all readers of this report, that I spent only a short period of time in examining the Monte Christo property and that some of my opinions and observations are based on this rather cursory investigation. I hope that I can be proved wrong on some of the pessimistic findings, as I would be greatly pleased to see the mine operating at a profit for the benefit of some of my friends, who are stockholders and officers of the Arizona Beryllium Corporation. This report is meant to be a preliminary evaluation report, and this is what it is. If drilling and other exploratory action reveals an abundant and higher grade of ore, then an Economic study should be made, and this report should give detailed information on mining and metallurgy actions and costs, outline all marketing opportunities, and give full information on reserves of ore.

RECOMMENDATION. In the opinion of the undersigned, the Monte Christo mining claims are marginal under present economic and marketing conditions. They may prove to be very valuable (or worthless) following further exploration and development action. For the present, the claims should be retained and the required annual assessment work should consist of test drilling under the direction of a qualified mining engineer or geologist, geophysical testing, and/or driving an exploratory adit into the orebody.

Respectfully submitted,

W. J. Salisbury

W. J. SALISBURY
Mining Engineer
AIME

21

21

ECONOMIC GEOLOGY OF THE
DIXIE QUEEN CLAIMS
Yavapai County, Ariz.

EINAR C. ERICKSON, Geologist.

ADMMR

Arizona Department of Mines and Mineral Resources
1502 West Washington, Phoenix, AZ 85007 Phone (602) 255-3795
Toll Free in Arizona 1-800-446-4259 FAX (602) 255-3777

The following report; The Economic Geology of the DIXIE QUEEN Claims, Yavapai County, Arizona by Einar Erickson exists in many partial copies from many generations of copying and retyping. There may be as many as four copies of some pages, all needed for the purpose of readability. The copies were assembled from many sources.

Yavapai AZMILS No. 339, ADMMR File - DIXIE QUEEN a.k.a. the MONTE CRISTO PEGMATITE

Ken A. Phillips, Chief Engineer
October 19, 1998

Return To
Melvin H. Jones
Box 406
Wickenburg, Az.

THE ECONOMIC GEOLOGY OF THE DIXIE QUEEN CLAIMS YAVAPAI COUNTY ARIZONA.

A PRELIMINARY REPORT ON THE ORE DEPOSITS

by

EINAR C. ERICKSON, GEOLOGIST
PH D (U of A)

THE ECONOMIC GEOLOGY OF THE
DIXIE QUEEN CLAIMS
YAVAPAIE COUNTY
ARIZONA

by
Einar C. Erickson, Geologist

INTRODUCTION

<u>General Statement</u>: The Dixie Queen Claims, 1 through 15 inclusive, examined by the writer consist of 15 unpatented claims generally considered to be the Smith & Kent Mining Claims. The claims were examined on October 23, 1956 at the request of Mr. J. Phillips of Phoenix, Arizona. Essentially the claims examined appear to have been properly staked in accordance with the mining regulations of the state of Arizona. Open cuts had been made for necessary discovery holes. For the purpose of this report the field examination was confined to the Dixie Claims No. 1,2,9 and 5.

<u>History of the Properties</u>: A Mr. Regan had worked the Bull Quartz outcropping which capped beryl-mica and bismuth-gold complex ores, prior to 1917. Mr. W. Young came into the area in 1917 taking up much of the land for cattle and agricultural purposes. In the early 1920's mica was mined from the property which the writer understands consisted of less than half of a normal claim. In 1928 Mr. A. Flagg first examined the property. Two of the Regan boys removed some 400 sacks of beryl soon after and during this period as well mined the property for Euxenite. Not long after this the property became idle and remained so until 1947. A Mr. Westover had relocated the property during the 1940's and in 1947 Mr. H.C. Smith bought half a claim, installed a mill for the recovery of mica. Some attempt was also made at recovery of the bismuth-gold ores. Mr. Kent leased the claims from Smith and located the additional claims which comprise the present group in 1953. The property was leased to a Mr. B. Doolin who did not perform and consequently the

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Location and Accessibility: The Dixie Queen Mining claims are located in the east central part of Arizona, in Yavapai County about thirty-five miles southwest of Prescott. The claims are approximately eleven miles out of Yarnell, Arizona in the Weaver Mountains, just a short distance from Lounce Lookout at an elevation of about 6,000 feet.

The claims are located in Section 3 and 4 of Township 10 North, and Section 34 of Township 11 North, Range 5 West. Geologically the claims are located in the center portion of the Mountain Region or Mexican Highland, southeastern area of the Great Basin Province. The claims are west of the large San Francisco Volcanic field and southwest of the extreme edge of the Colorado Pleateau. The drainage in the area is to the southwest towards the Sonoran Deseret.

The Dixie Queen claims are accessible from the east via good graded roads from Highway 89 six miles from the properties, Accessibility is not a problem. Practically any vehicle can be driven right to the mining site proper.

Climate and Vegetation: The climate is considered to be semi-arid to arid with the precipitation amounting to less than 14 inches per year in the area of the claims. There are approximately 90 days of freeze and thaw in the area, though all year operations are maintainable. There is less than 30 days of thunderstorms in the area, but this fact does suggest that some preventive work should be done on roads and consideration should be given to plant installations so that sudden flood washes will do little damage. The climate is excellent for working, however, with cool nights all year and equable days most of the time.

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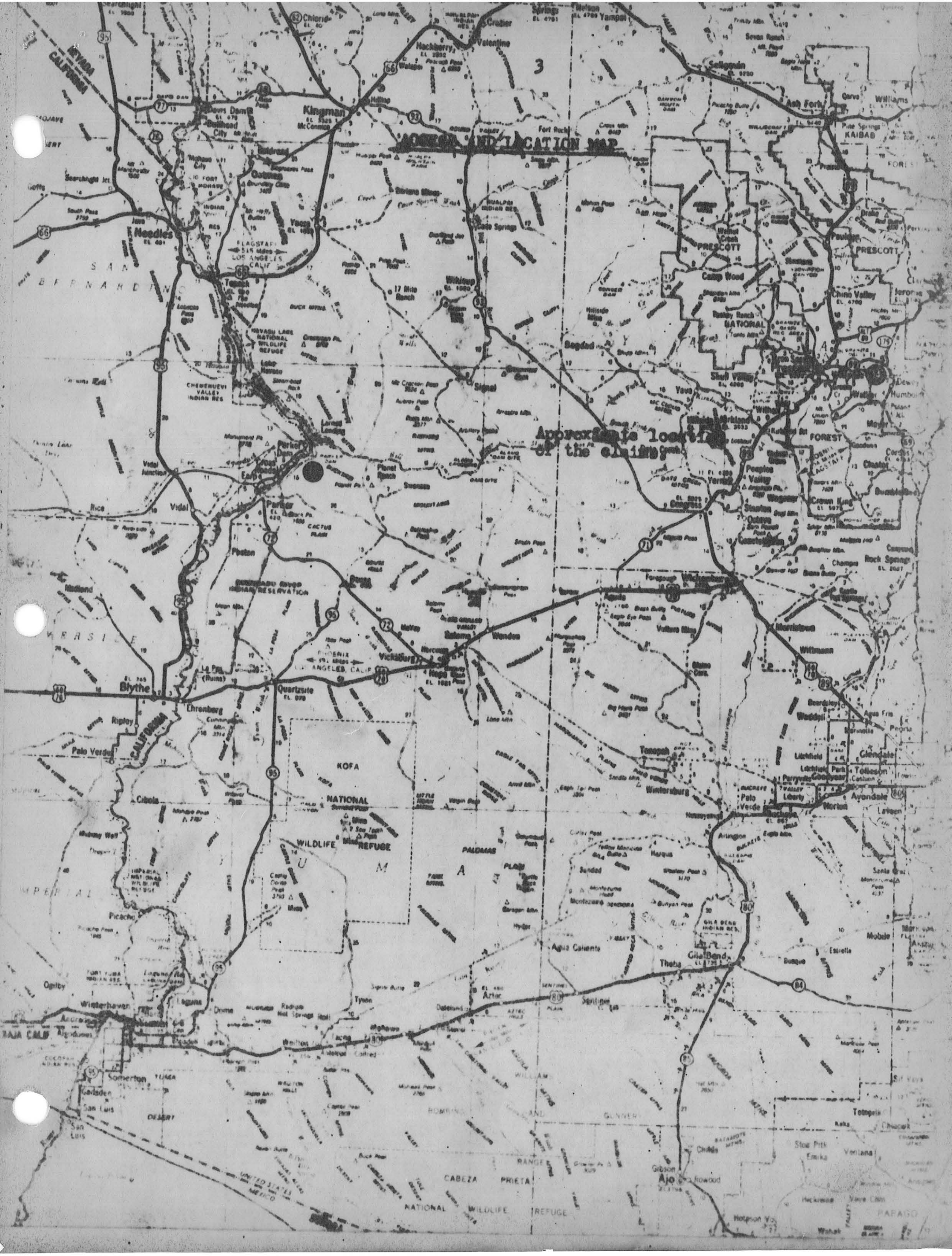
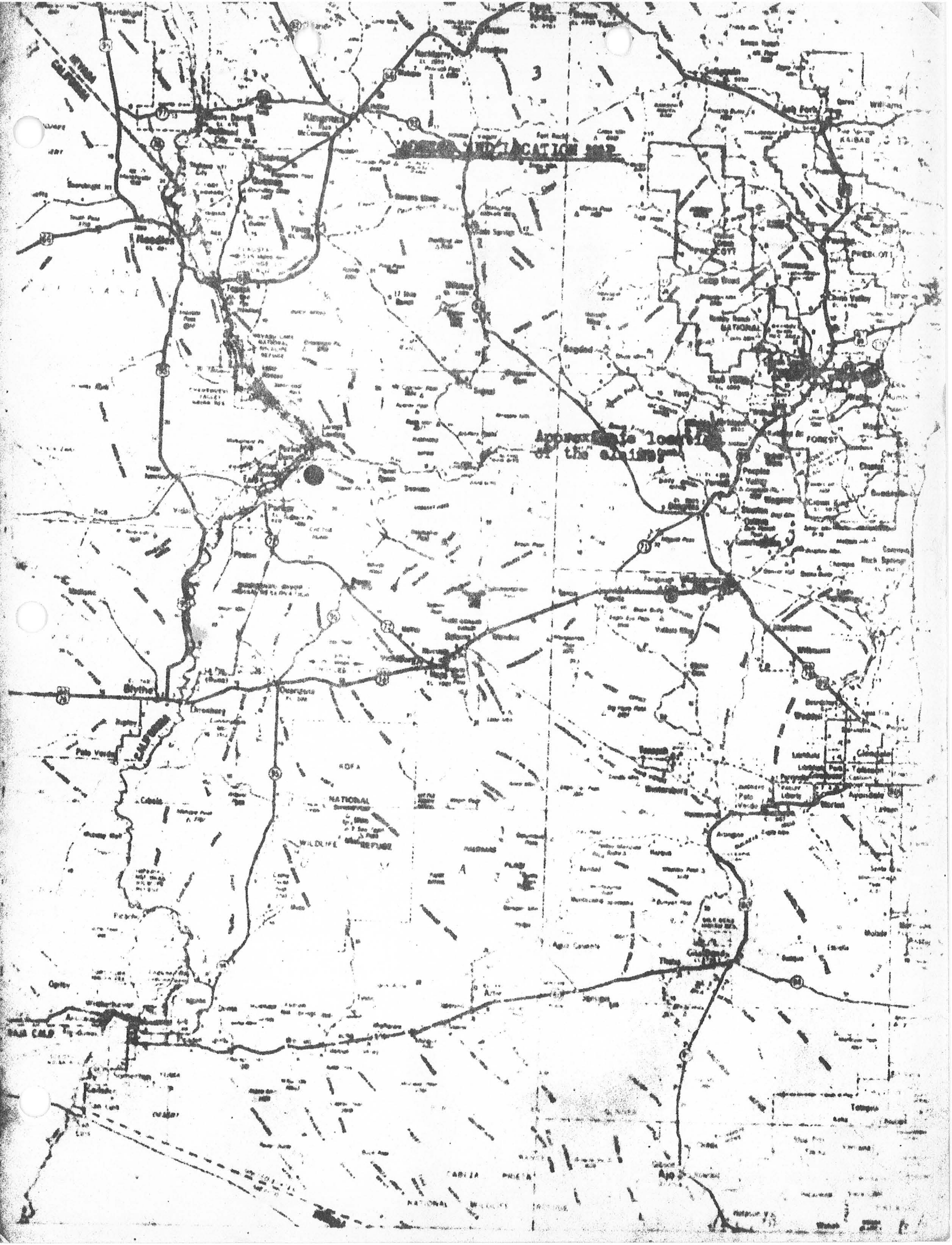

ACCESS AND LOCATION MAP
Approximate location of the claims
Kingman
Needles
Blythe
Ehrenberg
Quartzsite
Parker
Wickenburg
Congress
PRESCOTT
Gila Bend
Ajo
Somerton
KOFA
NATIONAL
WILDLIFE REFUGE
CABEZA PRIETA
NATIONAL WILDLIFE REFUGE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Ehrenberg
Quartzsite
KOFA
NATIONAL
WILDLIFE
REFUGE
FOREST
Ajo
Tacna

The vegetation is limited because of the lack of water as well as the type of outcropping rock. Relatively little decayed granite does not support much life. However some pinion pine and juniper survive as well as nineteen varieties of desert shrubs. None of the local vegetation species are considered at present to be of economic importance or of use, except for some limited lagging materials for certain types of mining activities.

Scope of Report: The scope of this report is limited to the several claims examined, and therefore to the time spent in the field by the writer. A sufficiently complete investigation was made to permit the writer to valuate the existing mineralization, to deal with the general geology of the area and to commence the geochemical study necessary to analize the history and nature and merit of the ore body under investigation. The investigations were conducted in the drifts that had been put in by Mexican miners, and which were typically mexican; too the two shafts on the properties and toethe larger open cuts and bench mining exposures that had been made on the claims. The objective of the present investigation was primarly to provide a geologic report on the area being exploited, and to initiate the etailed study necessary for providing assay data for the eventual installation of a mill to handle the excellent ores that exist and determine their complex character, history and origin and quantity.

Present Work and Methods: A total of three days have been spent by the writer in the area prior to the submittal of this report. The claims were examined first in reconnaisance fashion, and then detailed work was done where the ore area had the greatest exposure and where mining was being done and from where a future mill reserve would be obtained. A map of the workings was made by Brunton compass and pacing and therefore is of approximate accuracy only, but sufficient to aid in the activities to be undertaken. The geologic contacts and structures were delimited and the controls of the ores delineated. Samples were taken to provide minimum grade and maximum tenor assays for the different materials consi ered of economic importance.

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GEOLOGY

Principal Features: Paleotectonic studies show that large parts of Arizona were covered with seaways during parts of Cambrian, Devonian, Mississippian, Pennsylvanian and Permian time. Everywhere the deposits were thin; and in many places in the mountain and desert regions south of the Colorado Plateau they were never deposited or were removed in Mesozoic and Cenozoic time.

Much of Arizona in Devonian time had been depicted above water until subsurface work revealed the presence of Devonian beds in the eastern parts of the state and Tertiary conglomerates suggested the former presence of Devonian beds in the western part. Evidently the later Cretaceous and Tertiary structures that were developed were little influenced by these widespread and thin sediments.

In Triassic time a broad peninsula projected northwestward through central Arizona, obliquely from Cananea, Mexicao to Mesquite, Nevada. Where the Sonoran Desert is now there was a trough of sedimentation that continued to sink into Jurassic time. This peninsula and trough presaged the direction and position of the later orogenic belt and the cyclic metalizations that occurred. The area of the claims was very eventful as far as geologic history goes with periodic uplifts, faulting, volcanism and tectonic activities. Orogenic activities finally resulted in such uplift and subsequent erosion that Archean rocks were exposed. Intrusives and dynamic metamorphism of the Nevadan Orogeny are assignable. The Larmide Orogency intrudeced additional igneous activity and considerable folding and thrusting, especially in southeastern Arizona. Tremendous stocks were intruded into the central part of the state accompanied by other tectonic activities.

High-angle faults cut and offset the bedrock in the region. They trend in many directions. They predate the Laramide orogeny, some are part of it, and the majority are middle and tate Tertiary. Because of block faulting, regional warmping and perhaps other factors, the central and southern part of

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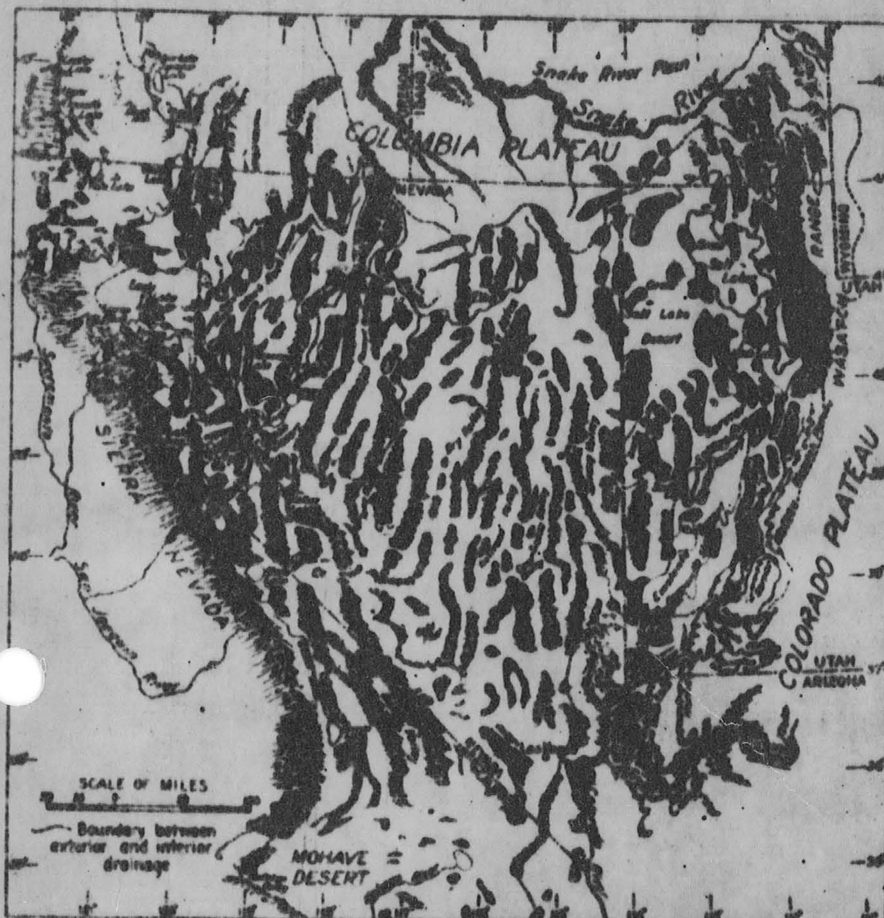
6

THE GREAT BASIN



Physiographic features and the relationship of the area examined to regional geomorphic forms is illustrated in this map.

Structural features with a nearly north south main set and a nearly east-west secondary set provided the zones that became deposite zones for the ores considered.

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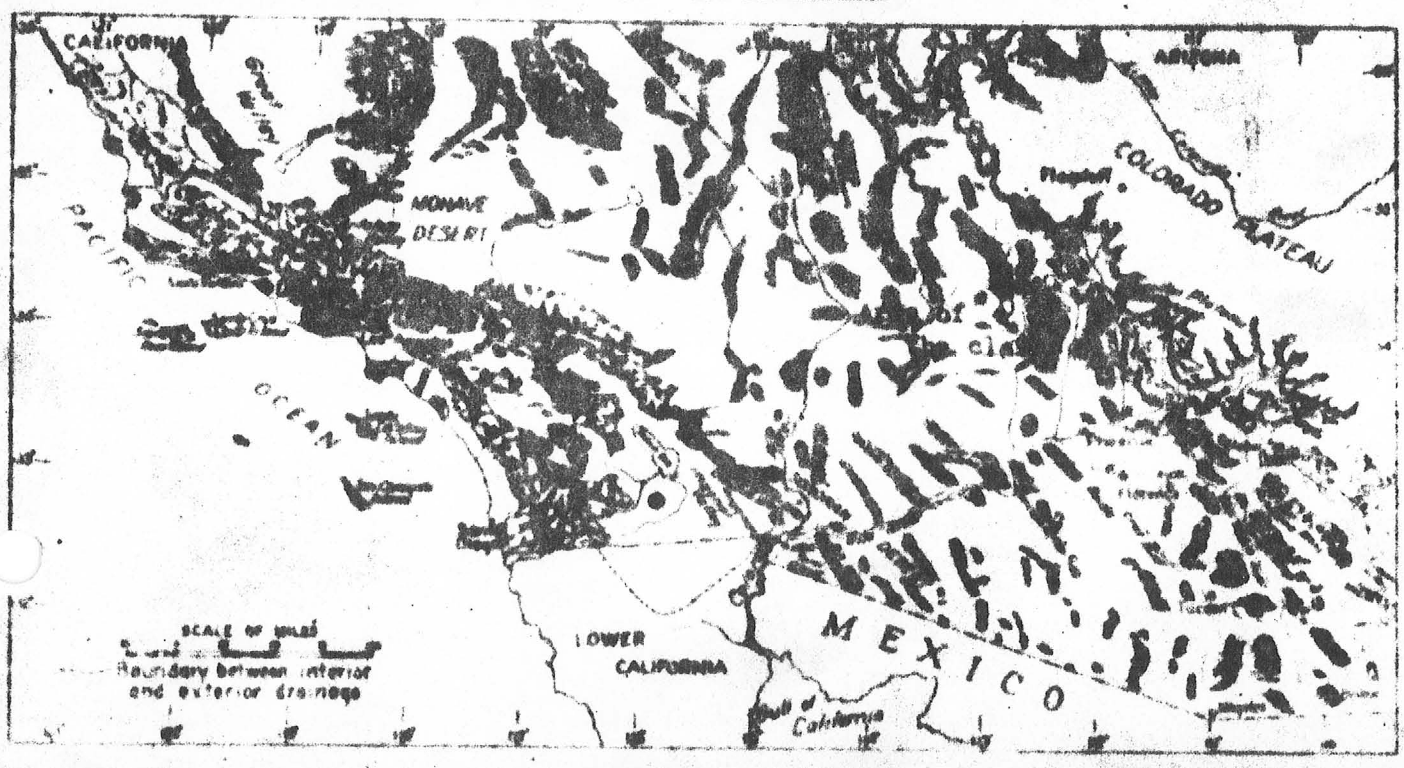

Arizona became an area of aggradation in late Tertiary time. Mild Volcanic activity accompanied the sedimentation and lava flows are locally present in and on top of young formations. Uplift and subsidence of intermontane trough areas continued intermittently into Quaternary time. Eroded material from the trenched areas supplied the relatively thin veneer of Quaternary terrace and stream alluvium.

Tertiary volcanic rocks are nearly everywhere, and in one place represent continuing volcanic activity down to the Pueblo Indian cultural times.

In general the ranges trend northerly in southeastern Arizona and northwesterly in central and southwestern Arizona. This alignment is probably due to late Tertiary faults. Considerable time has elapsed since the last major movements, because extensive pediments have formed across many faults and true fault scraps are few.

Stratigraphy: No sedimentary rocks were observed on the claims examined. Essentially the claims were composed of igneous rocks.

Igneous Geology of the Dixie Queen Claims: The Weaver Mountains appear to be part of a regional exposure of Pre-Cambiran Granite associated with a porphyry and gabbro complex. Tertiary volcanic form inclosing unconformable relationship to the north and east of the area. As the particular granitic complex acts only as a host to a much later mineralization epoch they are not discussed in detail. They appear to have contributed no chemical factors to localization of the ores. Essentially the ores of the claims occur in structural controls that developed during Larmide times and which were pressure outlets during Tertiary metallization activities.

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Geomorphic Map and Index Map.

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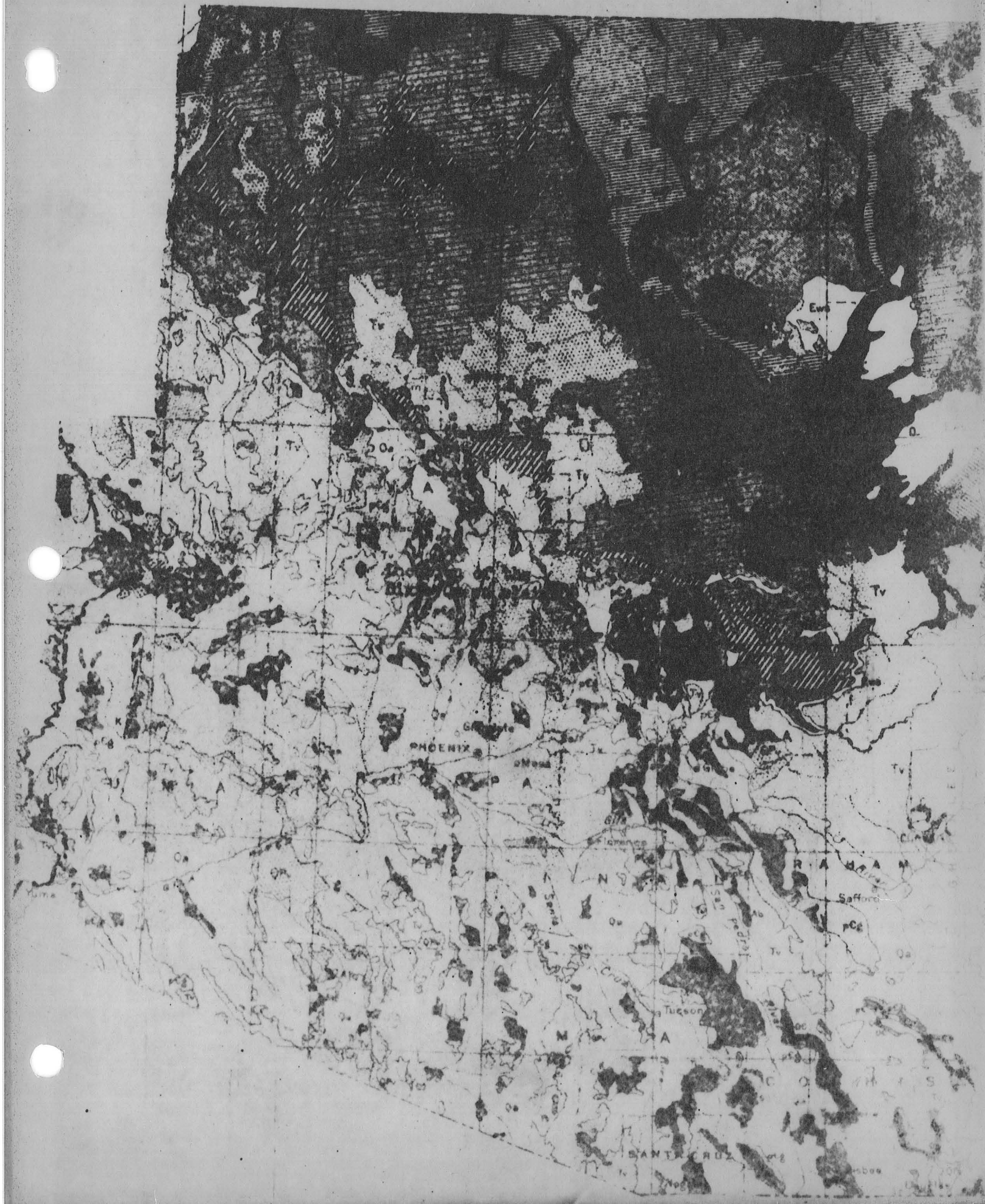
GEOLOGIC MAP OF ARIZONA



GEOLOGIC MAP OF ARIZONA

ROCKY MOUNTAINS
(including Colorado Plateau)

QUATERNARY

Qa

Alluvium, bolson deposits, lake beds, and wind-blown sand

(includes Gila conglomerate, in part of Pliocene age, in Arizona and New Mexico)

TERTIARY

Pliocene

QPv

Younger volcanic rocks

(rhyolite, andesite, and basalt lava flows; Hinsdale formation, Pliocene?)

IDAHO AND MONTANA

PMv

Columbia River and Snake River basalt flows

(includes basalt and rhyolite flows and breccias of Yellowstone Park area)

Miocene

Mbb

Browns Park formation and Bishop conglomerate

(Miocene?)

MPc

Miocene and Pliocene continental deposits

(Late Tertiary lake beds, Santa Fe formation; some Oligocene deposits included in Idaho and Montana)

Tv

Older Tertiary volcanic rocks

(basalt, andesite, and rhyolite lavas, tuffs, and breccias. San Juan tuff, Miocene (?); Silverton and Potosi volcanic series, Miocene; some igneous rocks of probable Cretaceous age included in New Mexico and Arizona)

Oligocene

Ev

Challis volcanics

(chiefly latitic lavas of Oligocene (?) age)

Φw

White River group

Tertiary intrusive rocks

(granite and porphyry; post-Carboniferous intrusive rocks, probably in part Cretaceous, included)

Eocene

Eb

Bridger formation

(Uinta formation included in Uinta Basin)

Egr

Green River formation

UTAH

E

Eocene continental deposits

(undivided)

Ews

Wasatch formation

(Wind River formation; Puerco, Torrejon, and Raton formations; Galisteo formation, Tertiary (?), included in New Mexico)

Efu

Fort Union formation

(Livingston formation, in part of older age, included in Montana; Lance formation included in places in Montana and Wyoming)

CRETACEOUS

Upper Cretaceous

E

Lance formation

Kmv

Mesaverde formation

(Lewis, Steele, and Pierre shales and Montana formation included in places)

WYOMING AND IDAHO

K

Cretaceous rocks

(undivided)

UTAH, WYOMING AND ARIZONA

Ku

Upper Cretaceous rocks

(undivided)

K

Colorado shale

(Mancos shale, in part of Montana age; Dakota and Morrison formations included in places; Pierre shale included in New Mexico)

Lower Cr.

Lower Cretaceous rocks

Dakota sandstone to Morrison formation

(Dakota sandstone (Upper Cretaceous); Comanche series, Cloverly and Kootenai formations, Lower Cretaceous; Morrison formation, Jurassic; Ellis

ROCKY MOUNTAINS
(including Colorado Plateau)

QUATERNARY

Qa

Alluvium, bolson deposits, lake beds, and wind-blown sand
(includes Gila conglomerate, in part of Pliocene age, in Arizona and New Mexico)

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Pliocene

IDAHO AND MONTANA

Pbv

Columbia River and Snake River basalt flows
[illegible] basalt and rhyolite flows and [illegible] Yellowstone Park area

MPc

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Miocene

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(Miocene?)

Miocene and Pliocene continental deposits
Late Tertiary lake beds, Santa Fe formation, some Oligocene deposits included in Idaho and Montana

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Oligocene

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Challis volcanics
[illegible]

Ow

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[illegible] included in [illegible]

Eg

UTAH [illegible]

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Ew

Eocene continental deposits
[illegible]

Wasatch formation
[illegible] River formation [illegible] Torrejon and [illegible] [illegible] Tertiary(?) [illegible] New Mex.

Ef

Fort Union formation
[illegible]

[illegible] formation

Kls

[illegible]

[illegible]taceous rocks [illegible]

Upper Cretaceous rocks

[illegible]

Lower Cretaceous rocks

[illegible] sandstone to Morrison formation
[illegible]

STRATIGRAPHY - CON'T

JURASSIC

IDAHO, COLORADO, AND PARTS OF UTAH AND WYOMING

Jurassic and Triassic rocks
(*undivided; Cloverly formation and Colorado shale included in places*)

Jurassic rocks
(*Sundance and Ellis formations; Ankareh shale, Triassic (?), Nugget sandstone, and Twin Creek limestone; Navajo, Kayenta, and Wingate formations, possibly Triassic, in Colorado, Utah, and Arizona; Triassic included in places*)

Older intrusive rocks
(*Idaho batholith, quartz monzonite of late Jurassic or early Cretaceous age; Boulder batholith of late Cretaceous or Eocene age; some intrusive rocks of Tertiary age may be included*)

TRIASSIC

Triassic rocks
(*Chugwater formation, in part Permian; Chinle formation, Shinarump conglomerate, Moenkopi and Lake formations; Woodside shale and Thaynes formation; Jurassic included in places*)

CARBONIFEROUS

Permian

Lower Permian rocks
(*Chupadera formation, Gym limestone, and Abo sandstone; Capitan and Delaware Mountain limestones; Cutler and Rico formations; Kaibab limestone and Coconino sandstone; Hermit shale and Supai formation at base, separately mapped, Cons. in places*)

IDAHO, OREGON, AND WASHINGTON

Permian volcanic rocks
(*andesite and rhyolite; Seven Devils volcanics; Casto volcanics, Permian ?*)

Pennsylvanian

NARROW AREAS IN ALL STATES

Carboniferous rocks
(*Magdalena group, Pennsylvanian; Lake Valley limestone, Mississippian; Percha shale, Upper Devonian, included in New Mexico; possibly some Upper Devonian included in Idaho*)

Pennsylvanian rocks
(*Amsden formation and Tensleep sandstone; Fountain, Ingleside, Hermosa, Paradox, Maroon, and Weber formations; Magdalena group; Lyons sandstone, Permian, Lykins formation, Permian (?), Dinwoody formation, Triassic, and Phosphoria formation, Permian, included*)

Mississippian

Mississippian rocks
(*Quadrant formation, in part Pennsylvanian; Madison limestone; Redwall and associated formations, in part Devonian; Millsap and Leadville limestones; Ouray limestone, Devonian, included in Colorado; Phosphoria formation, Permian, included in Idaho and Montana; Cambrian included in places in Arizona*)

CAMBRIAN TO DEVONIAN

IDAHO AND MONTANA

Paleozoic undifferentiated
(*Carboniferous and older*)

Devonian to Cambrian rocks
(*Jefferson limestone and Threeforks shale, Devonian; Bighorn dolomite, Ordovician; Flathead, Gros Ventre, Gallatin, and Deadwood formations, Cambrian; Percha shale, Devonian; Fusselman limestone, Silurian; Montoya and El Paso limestones, Ordovician; Bliss sandstone, Cambrian; Abrigo and related limestones and Tonto group, Cambrian; Fremont limestone, Harding sandstone, and Manitou limestone, Ordovician; Sawatch and Ignacio quartzites, Cambrian; some Mississippian in Colorado included*)

Devonian rocks

Silurian and Ordovician rocks

Cambrian rocks

ALGONKIAN

COLORADO, ARIZONA, AND PARTS OF MONTANA AND IDAHO

Belt series undivided and other Algonkian rocks
(*Grand Canyon series, Uncompahgre formation and Vallecito conglomerate, Apache group; "Uinta" formation of doubtful age included*)

Upper part of Belt series
(*Wallace formation, Helena limestone, and younger formations*)

Lower part of Belt series
(*pre-Wallace and pre-Helena formations*)

ARCHEAN

Archean rocks
(*schist, gneiss, and quartzite, probably in part Algonkian; Vishnu schist in Arizona; Llano quartzite, Algonkian (?), in western Texas*)

COLORADO AND TEXAS

Granite and other intrusive rocks
(*separately mapped in Colorado and Texas*)

STRATIGRAPHY - CON'T

IDAHO, COLORADO, AND PARTS OF UTAH AND WYOMING

Jurassic and Triassic rocks

([illegible]; [illegible] formation and [illegible] included in places)

NARROW AREAS IN ALL STATES

Carboniferous rocks

(Magdalena group, [illegible]; Lake Valley limestone, [illegible], [illegible] shale, Upper Devonian, included in New Mexico; possibly some Upper Devonian included in Idaho)

IDAHO AND MONTANA

Paleozoic undifferentiated

(Carboniferous and older)

COLORADO, ARIZONA, AND PARTS OF MONTANA AND IDAHO

Belt series undivided and other Algonkian rocks

([illegible] Canyon series, [illegible] formation and [illegible] group. [illegible] formation of doubtful age included)

Jurassic rocks

([illegible] and [illegible] formations; [illegible] shale, Triassic (?), [illegible] sandstone, and [illegible] limestone; [illegible], [illegible], and [illegible] formations, possibly Triassic, in Colorado, Utah and Arizona, Triassic included in places)

Triassic rocks

([illegible] formation, in part Permian; [illegible] formation, [illegible] conglomerate, [illegible] and [illegible] formations; [illegible] shale and [illegible] formation; Jurassic included in places)

Lower Permian rocks

([illegible] formation, [illegible] limestone, and [illegible] sandstone; [illegible] and Delaware Mountain limestones; [illegible] and [illegible] formations; [illegible] limestone and Coconino sandstone; [illegible] shale and [illegible] formation at base, separately mapped, [illegible] in places)

Pennsylvanian rocks

([illegible] formation and [illegible] sandstone; [illegible], [illegible], [illegible], [illegible], and [illegible] formations; Magdalena group, [illegible] sandstone, Permian, [illegible] formation, Permian (?), [illegible] formation, Triassic, and Phosphoria formation, Permian, included)

Mississippian rocks

([illegible] formation, in part Pennsylvanian; [illegible] limestone; [illegible] and [illegible] formations, in part Devonian; [illegible] and Leadville limestones; [illegible] limestone, Devonian, included in Colorado; [illegible] formation, Permian, included in Idaho and Montana; Cambrian included in places in Arizona)

Devonian to Cambrian rocks

(Jefferson limestone and Threeforks shale, Devonian; Bighorn dolomite, Ordovician; Flathead, [illegible], Gallatin, and Deadwood formations, Cambrian; [illegible] shale, Devonian; [illegible] limestone, Silurian; Montoya and El Paso limestones, Ordovician; Bliss sandstone, Cambrian; [illegible] and related limestones and [illegible] group, Cambrian; [illegible] limestone, [illegible] sandstone, and [illegible] limestone, Ordovician; [illegible] and [illegible] quartzites, Cambrian; some Mississippian in Colorado included)

Upper part of Belt series

(Wallace formation, Helena limestone, and younger formations)

Lower part of Belt series

(pre-Wallace and pre-Helena formations)

Archean rocks

(Schist, gneiss, and quartzite, probably in part Algonkian; Vishnu schist in Arizona, [illegible] quartzite, Algonkian (?), in western Texas)

Older intrusive rocks

([illegible] batholith, [illegible] of late Jurassic or early Cretaceous age; [illegible] batholith of late Cretaceous or Tertiary age; some intrusive rocks of Paleozoic age may be included)

IDAHO, OREGON, AND WASHINGTON

Permian volcanic rocks

(andesite and rhyolite; [illegible] volcanics; [illegible], Permian ?)

Devonian rocks

Silurian and Ordovician rocks

Cambrian rocks

COLORADO AND TEXAS

Granite and other intrusive rocks

(separately mapped in Colorado and Texas)

JURASSIC

TRIASSIC

CARBONIFEROUS: Permian, Pennsylvanian, Mississippian

CAMBRIAN TO DEVONIAN

ALGONKIAN

ARCHEAN

ECONOMIC MINERAL DEPOSITS

General Statement: The writer is not aware of what production has been had from the claims examined. He is aware that recently hand cobbed beryllium crystals brought $500.00 per ton, and that mica shipments have been made that have brought current prices. Bismuth had been concentrated previously among gold and Columbium-Tantalum ores. To what extent is not known. A map of the workings conducted to date showing the position of shafts and drifts accomapnies this report in the back packet.

Mineralization: A geochemical study of the mineralization and the relationship of the mineral deposits on the claims to the adjoining and host igneous rocks is still under way. Until such time that it is completed the writer considers the area to have probably followed the pattern given below:

With the exertion of stress during late Nevadan and early Laramide orogenic activities on the pre-cambrian rocks of the area a fracture system of an east-west trend was developed. This set was eventually dominated by a north-south facture set which became an increasingly weaker zone. At depth, below the pre-cambrian complex, palingenesis is considered to have taken place. This is to say that a melting-in-place due to release, and provision for an outlet, of pressure took place as the near surface facture sets developed. A release in pressure caused the subsurface rocks to liquify. This Palingenesis, or granitization as some call it, may have been accompanied by considerable heat and release of liquids and gaseous. At any rate, the semi-liquid rock mass began to ascend in the direction of pressure release. In doing so it thrust aside the invaded formation along the lines of the facture systems, lifted them in some degree, assimilated portions of the adjacent host rock and melted portions of the overlying materials. Since the only direction of yielding was towards the surface the differentiating material undergoing complex chemical reactions and cooling migrated upward. As it did so the cold adjacent rocks created convection currents, differential crystalization of portions of the material took place

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Assimilation, which is a process of chemical dissolution, rather than melting, and which depends for its effectiveness largely upon the gas content of the ascending mass, is most pronounced at the roof of the mass, where, by the process of "stoping" tongues of the melt insinuate themselves along joints, cracks, fissures and weaker lines of the adjacent rocks, gradually prying loose blocks of these rocks called xenoliths, which sink into and are engulfed in the ascending mass. Such evidences seemed to exist in the open cuts examined with some of the xenoliths being nearly digested or melted as well. Palingenesis also occured in the immediate rocks enclosing the ascending mass. This resulted in a more crystaline granitic rock separating the ore emplacement and the surrounding granite masses.

Through chemical interactions, gravitative separation and fractional crystallization, the ascending mass, which was originally rich in beryllium and the necessary constituents of mica, separated into their various component parts differing in character from the original melt by the increased local concentration and accumulation of the materials having an affinity for one an other. The mass cooled quite slowly as the melt and its host rock were poor conductors of heat and as a consequence larger crystals developed during this congealing action.

The emplacement is not pegmatitic, but rather a solidified mass of an original silicate melt rich in the aluminates and having an abundance of beryllia, bismuth, some gold, rare earths, and mica elements which now constitute an ore body of sufficient proportions and concentration to be of economic importance worthy of serious exploitation.

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No period in original

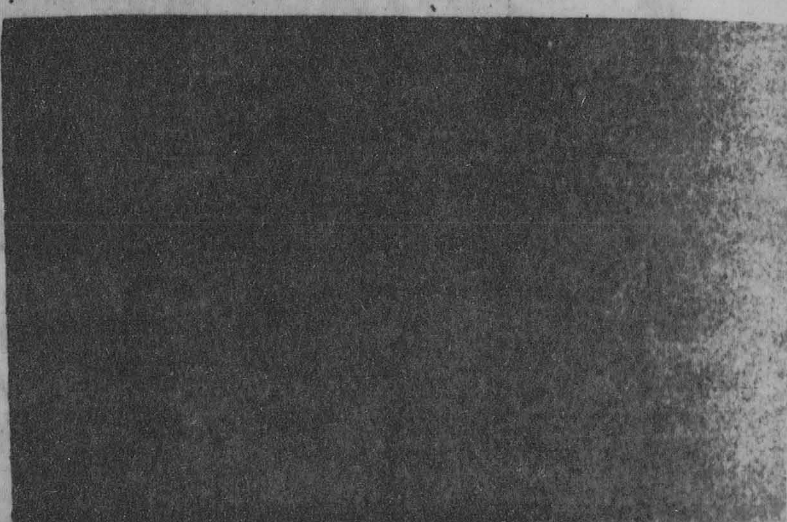
BERYLLIUM DEPOSITS

There are some thirty recognized minerals containing beryllium. In the ore body on the Dixie Queen claims three of the most significent of these are recognized: Beryl ($3BeO \cdot Al_2O_3 \cdot 6SiO_2$) which occurs in small elongate crystals of a bluish-green hue. Phenacite ($2BeO \cdot SiO_2$) occurring as small white cyrstals in the mica zones and in the white altered material chracteriszic of the deposit. The Phenacite occurs more abundantely in the material high in aluminates. However the Phenacite is now only considered of minor importance. It is the chrysoberyl ($BeO \cdot Al_2O_3$) that occurs in large crystals which can be hand cobbed. A secondary mineral, bertrandite, $Be_4Si_2O_7(OH)_2$, occurs on these large crystals also.

For milling purposes it is the small beryl crystals that will comprise the bulk of the mill feed. And because muscovite, mica, appears to be a preferred host for beryllium the scattered mica will necessarily have to be processed. The mica can then be recovered separately as a by product.

The writer observed crystals of beryl as much as 18 inches in cross section and several feet long, stacked like cord wood in the upper exposed areas of the ore deposit. The unique nature of beryllium as a divalent element permitted it to be admitted into the trivalent and quadrivalent structures of aluminium and silicon respectively. So while the crystals of the larger sizes can be removed by hand or mechanically, an excellent mill feed remains behind in the silicon-aluminium complex.

View of the Dixie Queen Mine looking East at the approach. The white appearance of the area is noted because the characteristic color of the ore matrix is white. The old workings are evident. The Main open cut face isexposed which is mainly of quartz with the higher grade ores coming in immediately below it. The excellent location is easily seen in this picture.



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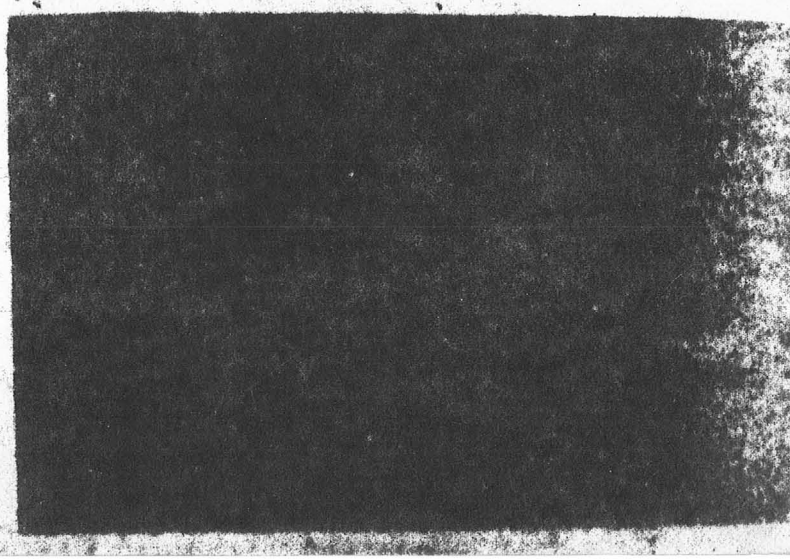
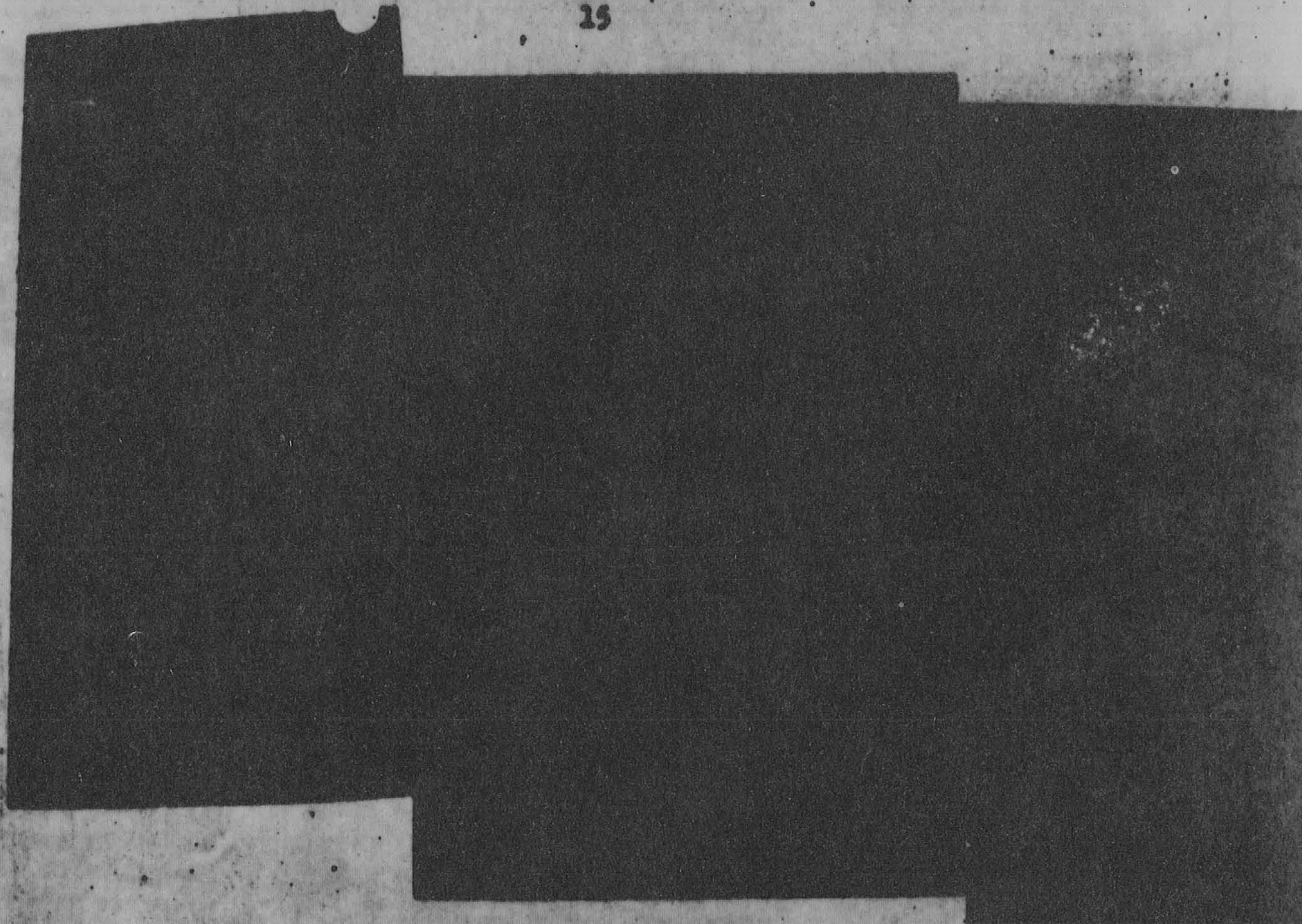


Immediately below the quarts capping the large crystals of beryl and Chrysoberl begin to appear. Green beryl occurs in masses in the quarts itself but the main occurrances are in the materials below. The large crystals have an irregular spacing, but are often found in collected accumulations and often comprise in excess of fifty per cent of the ore.mass. Large crystals were examined in place throughout a distance of three hundred feet in a zone estimated to be more than twenty feet wide. This width is the presently opened width only, the true width may be many times this when the ore deposit is fully delineated. In the old workings where one shaft had penetrated to a depth of more than 50 feet, the southern shaft, and where another shaft had penetrated into the material approximately 30 feet, the crystals were still observed in place.

The southern shaft visible on the above photograph where the head frame stands, is near the central portion of the deposit as it is now opened up. The crystals near the bottom indicate that an approximate 70 feet can be considered the proven depth extension of the ore body. The probable depth from all indications is going to be much more than this. The problem of reserves is not going to be a major one. The northern most shaft, of smaller dimensions appears to be east of the main facture set which provided the depositional area for the ore deposit. It is in this area that other values will be found besides beryl.

This view is looking north east parallel to the open bench cut. The writer in taking the picture is standing nearly on the granite contact. The main ore "vein" is to the right. The cliff face is quartz half way down then goes into the ore material proper. Bench mining will be the best and cheapest approach to this particular ore body.



The Three photos above show the southern part of the o on bench out. The characteristic white of the altered ore matrix is visible. The gray, broken and factured capping is essentially all quartz. At the base of the wall the large beryl crystals are coming in. Seldom are they separated by more than a few feet of distance and they often o cur in masses of three to a dozen or more crystals. They are easily distinguish ble because of their hardness and yellow to greenish color. Mica is also abundant through out the mass.

The fractures so visible h re are those caused by differential pressures near the surface, freeze, thaw, etc, and reflect no actual control. The writer is standing on the sulphide zone just west of the granite-ore contact. The sulphide z ne is of no consequence and may have not been connected in anyway with the present ore deposit. The sulphides could have been introduced at a much earlier period when some local gold deposits were emplaced.

Picture

The three photos above show the southern part of the east bench cut. Th e characteristic white of the altered ore matrix is visible. The grey,broken and factured capping is essentially all quartz. At the base of the wall the large beryl crystals are coming in. Seldom are they separated by more than a few feet of distance and they often occur in masses of three to a Dozen or more crystals They are easily distinguishable because of their hardness and yellow to greenish color. Mica is also abundant through out the mass.

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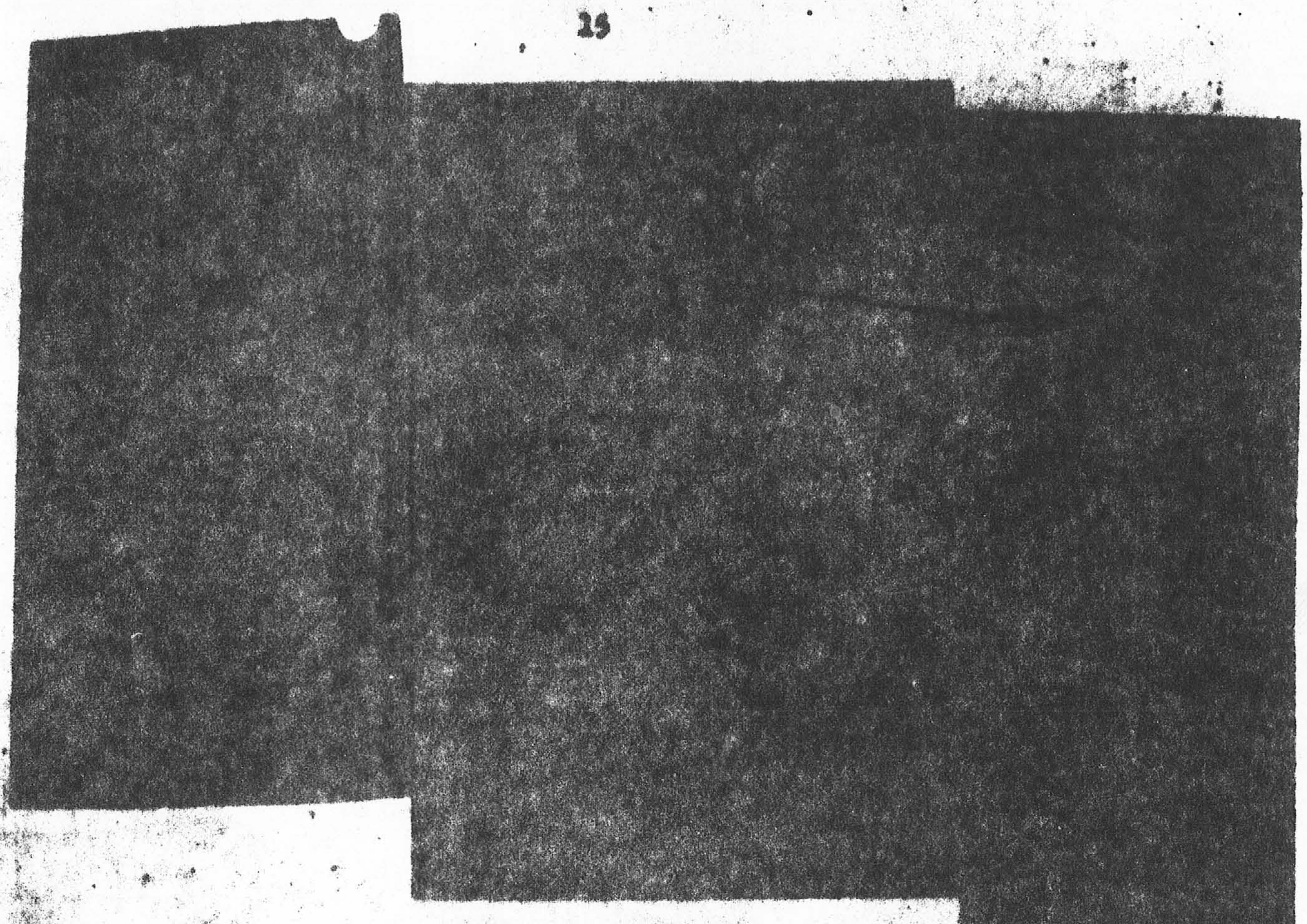

The [illegible] photos above show the southern part of the open bench cut. The characteristic white of the altered ore matrix is visible. The gray, broken and fractured capping is essentially all quartz. At the base of the wall the large beryl crystals are coming in. Seldom are they separated by more than a few feet of distance and they often occur in masses of three to a dozen or more crystals. They are easily distinguishable because of their hardness and yellow to greenish color. Mica is also abundant through out the mass.

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BERYLLIUM RESERVES

The following assays have been received by the writer:

Beryllium	.32 %	(Sample No. 2, taken from the open bench cut)
Beryllium	.26 %	(Sample taken from the sides of the northern shaft)
Beryllium	.11 %	(Sample taken from the waste material disposed by previous workings for mica.)
Beryllium	11.40 %	(Sample of large crystal, high grade variety)

The samples were assayed by Minerals Refining Co. of Salt Lake City, Utah, and Harry White Laboratories of Salt Lake City (Garfield), Utah.

The high assay illustrates the grade of the crystals that can be hand cobbed from the ore deposit. The writer by measurement grid techniques calculates that the ore deposit will yield not less than 5 per cent of its mass as large crystals. As much as 50 per cent locally, can be expected, but a conservative average could be considered as 14 per cent. This figure then means that an average of 280 pounds of beryl and chrysoberyl crystals can be expected per ton of the ore material, but not less than 100 pounds. Beryllia, or BeO, runs, as a rule of thumb, about 10 per cent of the crystal and would therefore yield between 10 and 28 pounds of the BeO for which on the November 1, 1956 market quotes brings $46.00 @ $48.00 per twenty pound unit, or $2.30 per pound. The hand cobb material is therefore valued between $23.00 to $64.40 per ton, minimum.

Remaining in the ore material is an ore of .52 per cent BeO, in the southern half of the ore deposit, and .26 per cent BeO in the northern half with 300 feet of linear extent so far delineated. It is this material that will be utilized as a mill feed.

The U.S. Bureau of Mines has developed a process, highly economic, for the extraction of low grade beryllium deposits. The minimum profitable mill feed for their process is not less than .15 per cent, and .25 per cent is considered excellent. As the range of the ore material after the extraction of the BeO

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The U.S. Bureau of Mines has developed a process, highlyeeconomic, for the extraction of low grade beryllium deposits. The minimum profitable mill feed for their process is not less than .15 per cent, and .25 percent is considered excellent. As the range of the ore material after the extraction of the BeO in th e hand cobbed crystals is between .26 and .52 per cent, the ore deposit is considered excellent for a milling operation.

In sampling the ore for obtaining a mill feed grade assay, the writer deliberately refrained from taking obviously higher grade materials in the channel area where the ore was sampled. As a result when the future mill tests are completed they will reflect a higher assay than that above because of the concentration of beryllium in the mine and from smaller crystals which will be left in the ore material, and from crystals that may fragment or break during the first mechanical separation.

In actual mining, the ore deposit will be expected to yield nearly twenty per cent of its mass asrecoverable crystals, and then give for a milling operation a mill feed of .50 to 1.00 per cent BeO.

For Reserve purposes the writer, from measurements made in the field estimates the following ore quantities:

Proven reserves: 30,000 tons

Probable reserves: 30,000 tons for eachzone 20 feet wide, 300 feet long and 70 feet deep.

Inferred reserves: 160,000 tons.

For th e Inferred reserves the writer can measure a width on the surface of 20 feet. That forty feet is easily assumed because of the additional surface exposures and extent of the quartz and mica outcropings, and that the Linear extent is at least 300 feet, would give four times the volume when the material can be assumed to go twice the proven 70 feet depth. As each unit volume will contain 30,000 tons then four such units would contain 120,000 tons. Additional reserves of an inferred order are assumed because the altered zone has an extension of 80?feet at least which could easily double the reserves of 120,000 tons, but only a 50% figure is considered to give that degree of conservation. As mentioned above, the problem of reserves is not great, they appear to exist in quantity.

in the hand cobbed crystals is between .26 and .22 per cent, the ore deposit is considered excellent for a milling operation.

In sampling the ore for obtaining a mill feed grade assay, the writer deliberately refrained from taking obviously higher grade materials in the channel area where the ore was sampled. As a result when the future mill tests are completed they will reflect a higher assay than that above because of the concentration of beryllium in the micas and from smaller crystals which will be left in the ore material, and from crystals that may fragment or break during the first mechanical separation.

In actual mining, the ore deposit will be expected to yield nearly twenty per cent of its mass as removable crystals, and then give for a milling operation a mill feed of .50 to 1.00 per cent BeO.

For reserve purposes the writer, from measurements made in the field, estimates the following ore quantities:

Proven reserves: 30,000 tons.

Probable reserves: 30,000 tons for each zone 20 feet wide, 300 feet long and 70 feet deep.

Inferred reserves: 160,000 tons.

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MICA RESERVES

By weight the mica content of the ore deposit is approximately 12 per cent. For every ton of removable ore material there would not be less than 100 pounds of mica, as a minimum, with an expected yield of about 200 pounds. Minerals Refining Co. of Salt Lake estimated the content of the mica from channel samples taken in the southern and northern parts of the ore deposit to run between 10 and 12 per cent. But the mica does occur irregularly, but not to the detriment of the ore, for usually when it does become extremely irregular it does so in large masses which can be mined directly. But because the beryllium content is of mill feed grade, it can be processed first and recovered, clean, as a by-product in large quantities which will bring premium prices.

Scrap mica brings from $45.00 to $50.00 per ton, but a number of tests not as yet completed are being made on this mica for its dielectric characteristics and other features because there exists an excellent market for micas of certain types which bring up to $140.00 per ton.

For valuation purposes, however, and until the required tests have been completed and the results are in, the mica content is expected to yield approximately $4.00 per ton. This could be considered a minimum, and is for the ore material in general and not for the large masses.

A potential exists in the mica of this deposit that cannot now be calculated but one should be aware that it is there and in the immediate future its true value will be obtained.

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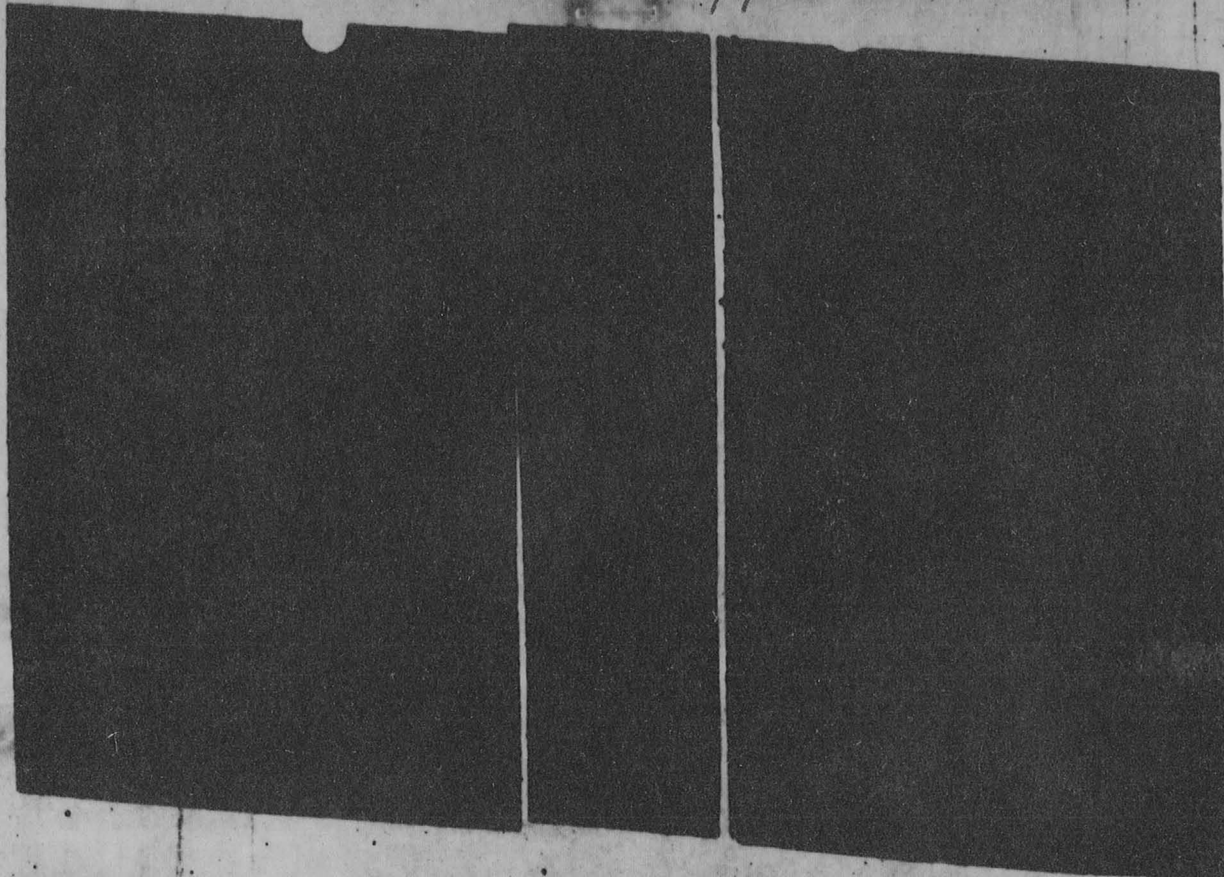

The above photos can be attached to the previous set of three to give a complete picture of the southern half of the ore deposit area which includes the open bench cut.

This photo is taken looking to the [illegible] aligned on the north-south fracture set controling the ore deposit. The dump is from the northern shaft. Again it is easily observed that the deposit lends itself to an open pit operation with ample space for removal and disposal of waste.

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OTHER ORE RESERVES

Complete geochemical tests on the ore material is yet to be completed, but in the preliminary examination several additional by-products are certainly to be considered.

Bismuth: Ore assays from the altered zone in the northern half of the ore deposit yielded a variable content of bismuth. The assays obtained from the White Laboratories varied from .01 per cent Bismuth to 3.42 per cent. These are anomalies and indicate that a later phase of gaseous mineralization may have taken place in some of the material less pervious to emmanations. This results in zones that will be of high grade bismuth, and of zones that will be barren or of low grade. In processing the material for the beryllium the bismuth can be extracted as a by-product, however, and can be expected to yield a considerable amount. Additional sampling will be necessary to estimate just how much average content can be expected. The metal prices quoted on November 1, 1956 lists bismuth at $2.25 per pound. It is to be expected that on the final analysis bismuth will yield a profit as an extracted by-product from beryllia milling.

Strontium: Strontium occurs in amounts from 2 to 20 pounds, and average of 8 pounds per ton is considered probable. Strontium has been recently quoted at $11.00 per pound as a concentrate. A concentrated by product could be prepared in the milling process, and should be considered seriously. Only concentrates are marketable. Strontium only occurs in the altered northern half of the deposit, trace amounts occur in the southern half.

Zinc: This metal could be also extracted, but metallurgical tests would be required. Approximately 6 pounds per ton occurs in the ores.

Nickel: Six pounds of this metal occurs per ton in the ore material.

Yttrium: The sudden recent demand for the element at prices nearly $100.00 per pound might motivate consideration to be given to the half a pound per ton of this element in the ore.

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In addition to the above research being conducted tests are being made to determine what use if any the altered aluminate matrix material can be put to. In considering the above quantities of the elements mentioned, and in testing the matrix it is made increasingly clear that in milling every extractable and recoverable mineral or element that can be removed will bring additional profit, provide for a long range milling operation, and make for clean and thorough mining and milling.

Besides the matrix material the quartz capping can be removed and sold for a small profit as industrial rock, ballast, and silicon mixes for mills. I believe an offer has already been received to purchase the quartz that exists on the claims.

A view looking southwest on the level of the road and open trench cut. The topography is illustrated somewhat, and the open pit activites that can be conducted become apparent.

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MILLING

The field investigations and assaying to date prove this ore deposit to be an excellent mining opportunity for high grading beryl crystals and mica masses. But more important is the milling possibilities that exist. The reserves are adequate for a mill capable of handling not less than 100 tons a day. The mill feed material after removal of the larger crystals will run between $27.00 per ton to many times that depending on how many extractable by products are removed.

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At this early state of study the writer considers the costs on an estimated basis as follows:

Mining the ore per ton:	$	.12
Assaying controls per ton:		.02
Beryllium flotation costs per ton, including mica recovery.		4.50
Installation of other units for recovery processes on by products; per ton:		.50

Present total estimated costs: $ 5.14 per ton.

This figure will be found to be quite close to the final figure when all of the data is in. The mill cost should not exceed $100,000.00 for a 100 tons per day mill. This will include cost of water development, which is not a great problem because at depths from 70 feet down adequate water appears to exist, and this only a short distance from the mine proper.

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MARKETS AND USES OF ORES

Beryllium: The berylium industry has increased in size about 24 times in the past 18 years. The price of beryl ore to the industry has also increased in about the same propertion. At present it is on the approved list for DMEA and other government loan aid programs. It is assured a price market until 1962. It is increasing in demand and is listed as one of the strategic materials.

The domestic resources are small, so far, with most of the reserves coming from Brazil and Union of South Africa.

Its ductility , x-ray penetrability, high melting point, low density and high modulus, give it many and varied uses in this era of complex power, high speeds and radiation controls. Beryllium is used in the x-ray industry, in the acoustical industry and in the commercial industry. In the later it is needed as an agent producing precipitation hardening in copper and nickel. Expecially in the nuclear energy field has it as use as a low neutro absorber and its ability to moderate the velocity of neutrons.

It is used in Beryllium-copper alloys as a high strength-high hardness alloy. It is an alloy inducing high resistance to fatigue and impact in the aircraft manufactoring industry and there are over 70 applications in military equipment and related devices. It is used in metal alloys of many kinds. And future uses are still being developed.

The price and outlook for the beryllium future is excellent. The ore deposit examined lends itself to a good sized operation with a profitable future ahead.

Mica: Mica has uses depending on its grade, cleaness, diaelectric constant size, and other factors. These are being tested for to determine the best market possibility. It has commercial use in the building trades, electrical industry, and industrial rock processes. It can always be sold as scrap mica, but as other markets do exist they will be so explored.

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Thirty-five per cent of the past bismuth production has been used in the pharmaceutical business. About sixty per cent was used in the fabricating alloy industry and the remaining five per cent was used in other types of alloys. But more in the future will find its way into the nuclear field.

It is suspected, but not as yet definately proved, that some gold can also be recovered with the bismuth. The installation of automatic panners in the tailings circuit will remove what ever values may exist.

The markets for the other extractable materials are current and stable. The outlets themselves are excellent for mill concentrates. The markets for hand cobbed beryllium are good. Arvada, Colorado is a purchasing point for Beryllium. High grade mill concentrates can be shipped practically any necessary distance to the several markets that will exist.

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MINING OPERATIONS

The mill location will probably be to the north or west of the mining property. The topography will permit gravity feed to the mill, probably by conveyer belt systems. Water exists in the bottom of the drainage area just below the mine, and will control the mill site.

Mining itself will proceed as an open pit operation with benches being developed until approximately 100 feet is attained, in depth, then probably an open cut can be made to go down on the ore further. The probably final width of the open pit will exceed 100 feet and be nearly 500 feet long, depending on the linear and lateral extensions of the ores.

After the removal of the quartz and when the workings have developed in an around the granitic masses, the material can probably be worked with methods that will not fragment the large crystal leaving them intact for removal. The altered matrix material , once a face is developed, can probably be removed by shovel apparatus and ripping equipment. The problems to be solved are not great nor difficult. For low eventual cost full mechanization of the operation will probably be aimed for.

It might even be wise to conduct a very limited drilling program to fully delineate the full reserve potential and grade of the material at depth. This would not be costly. Some considerations as to where drilling would best yield useful information and detail will be given and a recommendation made at a later date if so desired. It is not necessary to core the ore deposit, but churn drilling while being inexpensive, would also give the required minimum of recovery necessary to valuate the subsurface data. Ore reserves to a depth of 100 feet do not appear to be a problem. The writer considers that ore deposit to have a possibility of 500 feet depth extension or more. Mining operations should be conducted to insure that as expansion and depth is attained little dead work will be required, such as the removal of waste that might have been ill deposited over the ore body extension. A more through regional geology mapping might be considered valuable to this end.

MINING OPERATIONS

The mill location will probably be to the north or west of the mining property. The topography will permit gravity feed to the mill, probably by conveyer belt systems. Water exists in the bottom of the drainage area just below the mine, and will control the mill site.

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CONCLUSIONS

The writer concludes that the ore deposit examined has ore reserves that will exceed one hundred thousand tons containing recoverable amounts of beryllium, mica, bismuth and a number of other profitable elements and materials. It lends itself to inexpensive open pit mining, all year round operations, and will provide necessary water resources and mill feed grade to create an excellent milling installation.

The writer is still working on milling data and geochemical data that will contribute to the operation as a whole and provide the necessary data for setting up the flotation processes and preparing for the mining operation that will be required to exploit fully the ore deposit.

If additional information is required which does not appear in the above report the writer will be glad to furnish the same.

Respectfully submitted,

Einar C Erickson

Einar C. Erickson
Geologist

771 West Sunny Lane
Orem, Utah

ece Nov. 6, 1956

PLEASE RETURN TO - L. B. GASKILL
2553 W. Catalina dr.
Phoenix, Arizona.

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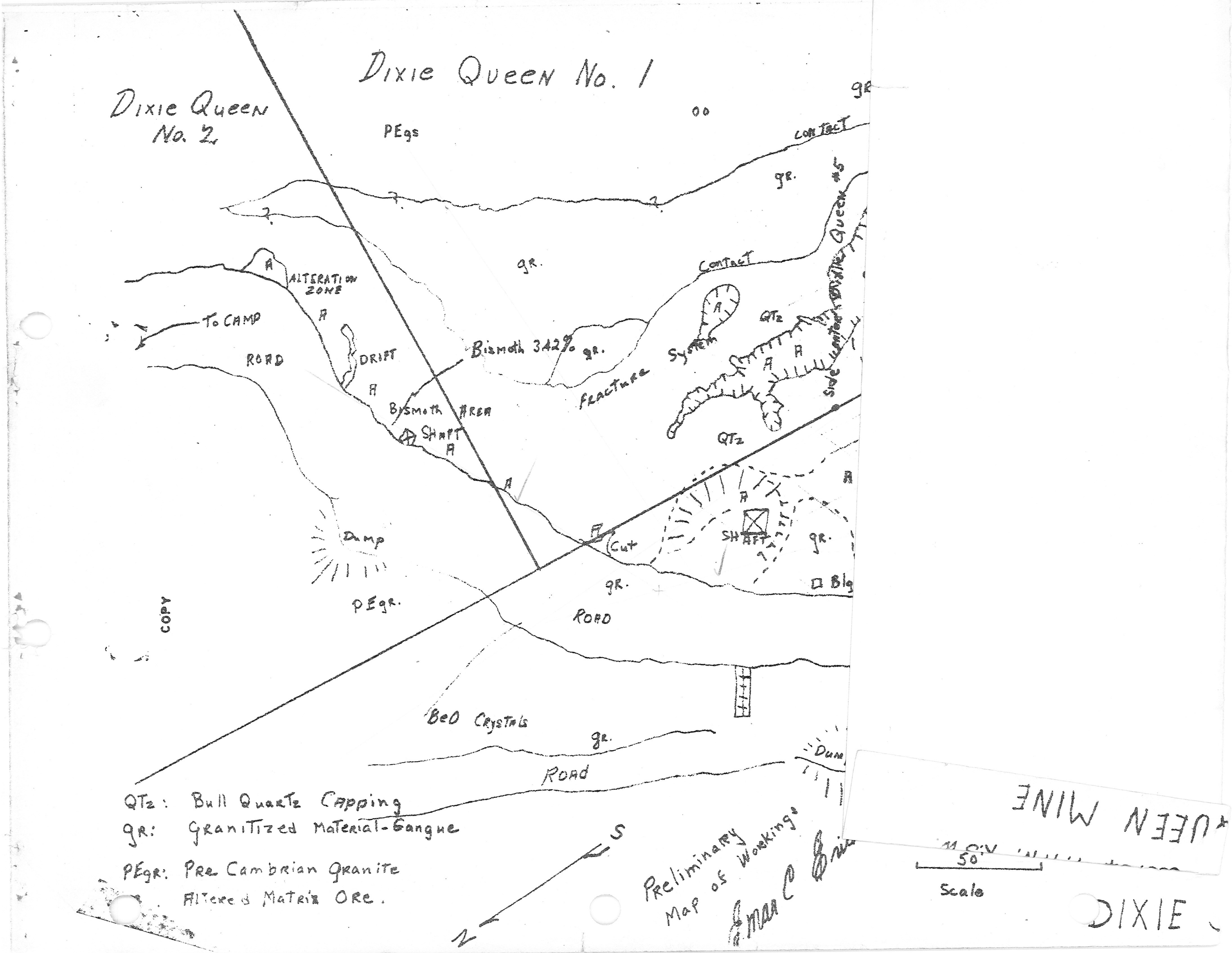

Dixie Queen No. 1
Dixie Queen No. 2
PEgs
gR
CONTACT
gR.
?
?
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Queen #5
gR.
CONTACT
ALTERATION ZONE
A
To CAMP
ROAD
A
DRIFT
Bismoth 3.42%
gR.
QTz
Fracture System
A
A
A
A
Side Contact
Bismoth AREA
SHAFT
A
QTz
A
A
A
SHAFT
Cut
gR.
Dump
PEgR.
gR.
Blg
ROAD
COPY
BeO Crystals
gR.
ROAD
Dum
QTz: Bull Quartz Capping
gR: Granitized Material-Gangue
PEgR: Pre Cambrian Granite
A: Altered Matrix Ore.
S
N
Preliminary Map of Workings
50'
Scale

and gravitative separates of liquids and solids took place in such a manner that a silicate melt accumulated near the top of the ascending mass with trapped gaseous and separated liquids immediately below which escaped as opening fracture permitted.

Assimilation, which is a process of chemical dissolution, rather than melting, and which depends for its effectiveness largely upon the gas content of the ascending mass, is most pronounced at the roof of the mass, where, by the process of "stoping" tongues of the melt insinuate themselves along joints, cracks, fissures and weaker lines of the adjacent rocks, gradually prying loose blocks of these rocks called xenoliths, which sink into and are engulfed in the ascending mass. Such evidences seemed to exist in the open cuts examined with some of the xenoliths being nearly digested or melted as well. Palingenesis also occured in the immediate rocks enclosing the ascending mass. This resulted in a more crystaline granitic rock separating the ore emplacement and the surrounding granite masses.

Through chemical interactions, gravitative separation and fractional crystallization, the ascending mass, which was originally rich in beryllium and the necessary constituents of mica, separated into their various component parts differing in character from the original melt by the increased local concentration and accumulation of the materials having an affinity for one an other. The mass cooled quite slowly as the melt and its host rock were poor conductors of heat and as a consequence larger crystals developed during this congealing action.

The emplacement is not pegmatitic, but rather a solidified mass of an original silicate melt rich in the aluminates and having an abundance of beryllia, bismuth, some gold, rare earths, and mica elements which now constitute an ore body of sufficient proportions and concentration to be of economic importance worthy of serious exploitation.