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July 19, 1974.

RECONNAISSANCE GEOLOGICAL INVESTIGATION OF PERLITE DEPOSITS IN MIDDLE AREA OF THE BLACK MOUNTAINS, MOHAVE COUNTY, ARIZONA.

In accordance with instructions of Mr. Howard S. Gable, Box 946, Kansas City, Mo., the undersigned, on the 17th of July, 1974 was conducted over the "Pearl" mining claim area by Mr. and Mrs. Clellan L. Daily of Winslow, Arizona. Mr. Jack Day, agent of Mr. Gable was also present and assisted in the study of the perlite outcrops. With only one day spent in the area, and with intermittent rain storms, only a limited portion of the perlite outcrops, including that on the mining claims, was covered. Only the observed outcrops are outlined on the attached map (Incl.#1), and many outcrops in the area could be missed.

As stated above, the major part of the area visited is covered by lode mining claims owned by Mr. Gable. These claims will be surveyed in the near future and re-aligned. A map of the claims is not made part of this report for this reason.

GEOLOGY. The general area is composed of Tertiary Rhyolites, with some of the higher ridges and hills covered with Quaternary basaltic lava flows. The valley area where the perlite outcrops are found, is called "Detrital Valley", which is well named. The perlite crops out intermittently along the ridges and sporadically in the lower regions in the form of ancient flows, but parallels rhyolite flows and in some places there are alternating bands of perlite and tuffs, as well as some breccias with fragments of perlite. Some latites were also observed. In places, the perlite becomes of poorer quality and grades into rhyolite.

It is to be pointed out that this is a rhyolite type of perlite. Some of the outcrops show what appears to be the highest grade of perlite, and this is in color from grey, bluish grey to white. A small amount of black perlite was found. This perlite has the typical volcanic glass appearance with concentric cracks. At this point, it might be well to go into some definitions used in the perlite industry. "Perlitic" means resembling perlite, concentrically lamellar; applied to microscopic structure in glassy rocks resembling that of an onion. "Pumiceous" refers to the foamy structure of pumice. A devitrified perlite is also known and this is usually considered suitable for perlite industrial use. Some of the outcrops in the area have this appearance.

In the perlite industry, it appears that any rock that has 2 to 5% water, and will expand from 4 to 20 times its original volume, sets it apart from other volcanic glasses, and this is the distinguishing feature.

One perlite exposure on the side of a ridge had a thickness in excess of 30 feet. Perhaps some flows will have a much greater thickness, but this can only be determined by drilling.

CONCLUSIONS:

While hearsay evidence indicates the perlite in the Black Mountains is of good commercial grade, and I see no reason to disagree with this viewpoint, based on observed deposits and perusal of literature having a bearing on the subject. However, in considering the various industrial uses of perlite, with different specifications, laboratory testing should be accomplished. Using for these tests, the several types of perlitic rocks found in the area. The results should show the cut off points, when mining is undertaken. This information will be most important when tonnage of reserves is estimated.

Several grab samples of the perlitic rocks were taken and Mr. Day has this petrographic material. This includes volcanic rocks that appear to grade into perlite. As the testing of perlite requires a specialty laboratory, and the costs will be high, the writer is not undertaking this task as part of this report.

After laboratory testing has been accomplished, a drilling program should be initiated to determine reserves of commercial grade perlite.

It is the opinion of the undersigned, that the perlite claims in the area covered by this report, have great value. Efforts should be continued to survey and re-align present claims, and to develop the property so it can be put into production.

MINING GEOLOGIST.

P.O. box 406,
Wickenburg, Arizona, 85358.

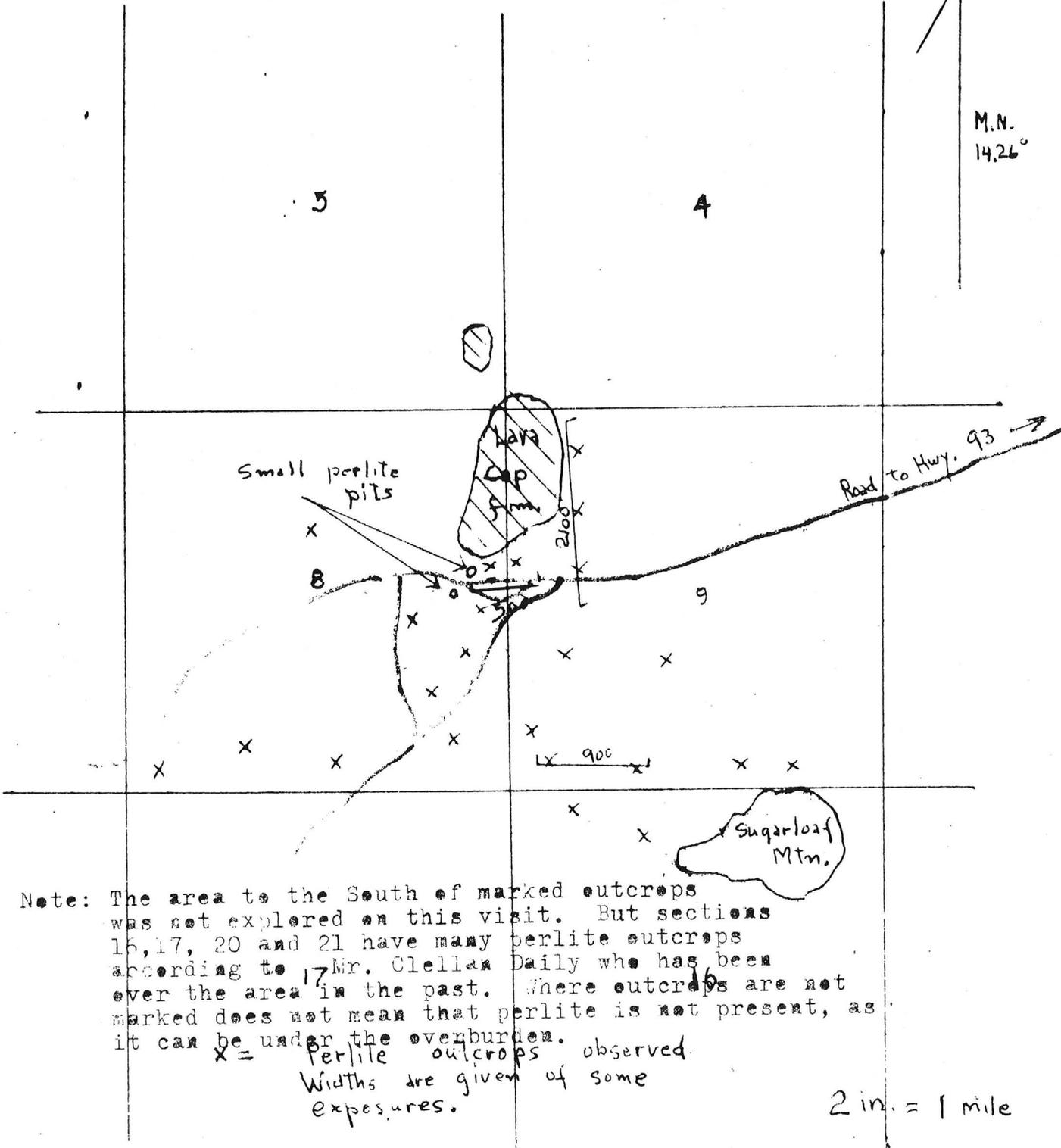
cc To Mr. Jack Day.

T23N.

R19W.

1 N.

M.N.
14.26°

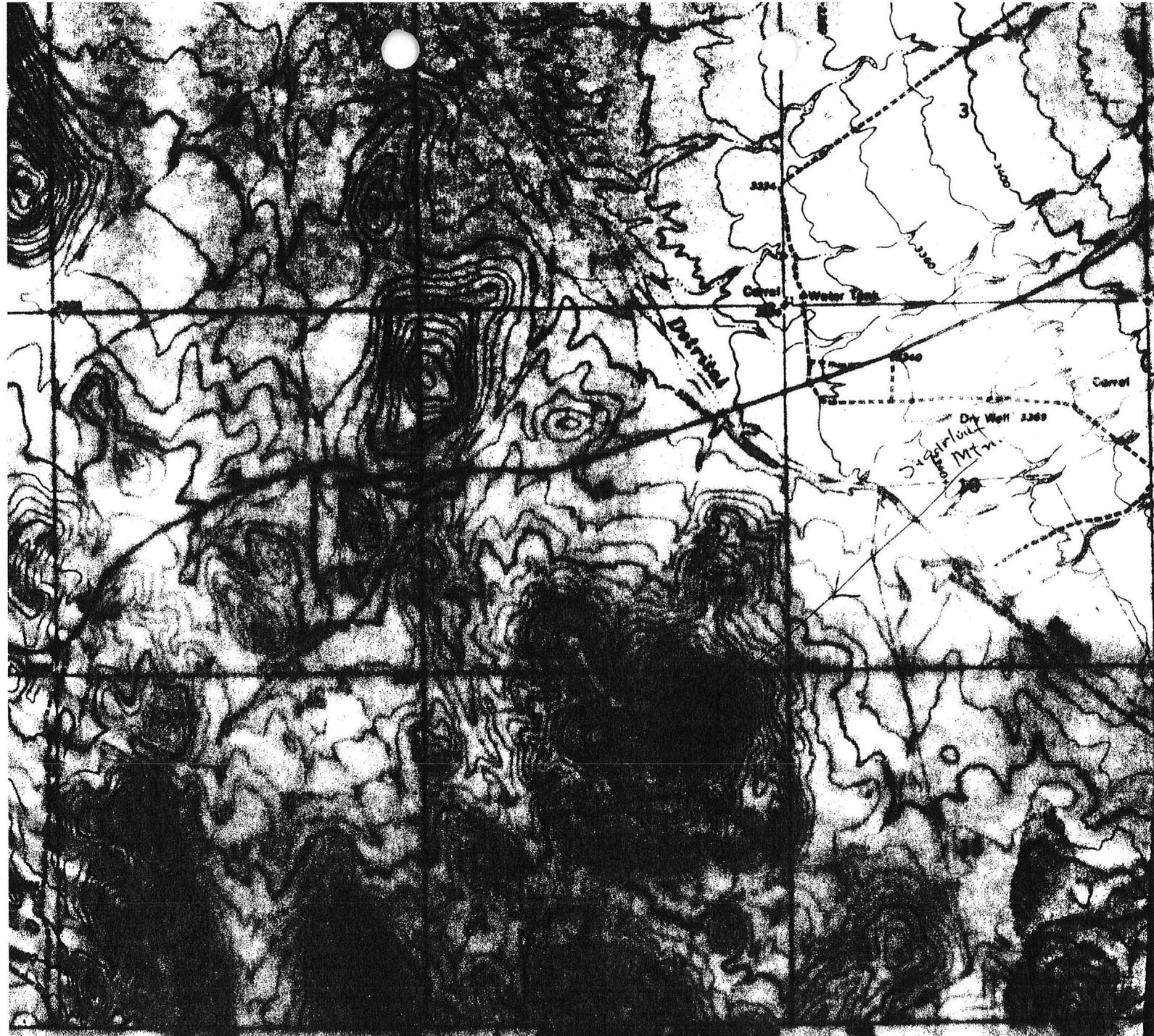


Note: The area to the South of marked outcrops was not explored on this visit. But sections 16, 17, 20 and 21 have many perlite outcrops according to Mr. Clellan Daily who has been over the area in the past. Where outcrops are not marked does not mean that perlite is not present, as it can be under the overburden.

x = perlite outcrops observed.
Widths are given of some exposures.

2 in. = 1 mile

INCL #1



GRASS HOPPER
JCT. ARIZ
Quad

THIS MAP IS THE PROPERTY OF THE U.S. GEOLOGICAL SURVEY AND IS LOANED TO YOU BY THE U.S. GEOLOGICAL SURVEY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.

MELVIN H. JONES

Mining Geologist

~~Box F, Montello, Nevada 89830~~

Box 406

Wickenburg, Ariz. 85358.

MEMORANDUM FOR THE RECORD.

SUBJECT: Perlite - Kingman, Arizona area.

April 15, 1974. At Kingman, Arizona with Howard S. Gable. Together with Actor Patten*, Pearl Craig, Van Daily, Jack Day, Al Hack* and Gable, proceeded to the Haviland Perlite claims out of Yucca, Arizona accompanied by Boris Ivakowsky* and John W Rains (California Portland Cement Company). The latter individuals were interested in acquiring, leasing or purchasing perlite from the property. The group went over the claims, generally. The writer accompanied John Rains (mining engineer) in looking over formations and sampling. Samples were taken from : #1 Grab sample over large area on Claim No. 14 (West side); #2 Grab sample from perlite exposure in gulch on Claim No. 77; Grab sample from pit on claim No. 80.

April 16, 1974. Part of above group (Patten, Craig, Daily, Day, Hack, Gable and writer made trip to upper area of the Black mountain - 20 miles NW of Kingman on Hwy No. 93 and then 3 miles E. on dirt road, to another perlite deposit. Perlite extends across road in places and goes to hill. Mr. Gable made decision to have Mrs. Craig (and crew) to stake out a minimum of 6 lode mining claims in the vicinity. At a small pit near road, the material is the typical perlitic (onion skin) perlite, other exposures grade into pumaceous or tufaceous perlite.

April 18, 1974.

MELVIN H JONES

* Marketing expert (from New Jersey)

** Ore processing expert (from Denver, Colo.)

*** Part of Management, California Portland Cement Co.

Box 406
Wickenburg, Arizona, 85358
12 April 1974

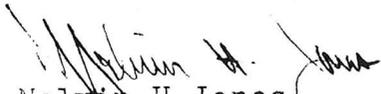
MEMORANDUM FOR THE RECORD

Subject: Visit to the Haviland Perlite claims, Yucca, Ariz.

The writer spent April 10-11, April 1974 on the Haviland Perlite claims located SW of Yucca, Arizona. Mrs. Pearl Craig, Kingman, Arizona, who has been doing most of the claim location work, was also present. Time was spent going over the claims (90 lode claims), examining posting of location notices, roads, and perlite exposures. The property is known to have pumaceous perlite and perlitic perlite (estimated to be 55 and 13 million tons, respectively). These claims were initially taken out by Duval (copper) about 10 years ago under the claim names of Saguara, Chape, Vulcan, Sliver, Dec.21,DMC, Pota, Sherty, and subsequently abandoned (the property was drilled in 1964, however) Considerable time was spent by Mrs. Craig, and the writer locating the old drill holes (a total of 15). These will be mapped.

On April 11, Mr. Don Rodriguez, General Manager of the Metler Bros. Drilling Corporation, accompanied us in going over the mining claims. Mr. Rodriguez will submit an estimate of the cost to re-drill the property to cover location work requirements. Metler Bros. initially drilled the property in 1964 for Duval. He said the drilling at the time took 55 days. Mr. Rodriguez had some of the earlier drilling data with him and gave us the depths of overburden on the drill sites (length of casing used). See inclosure.

Upon arriving at Kingman on April 10th, I made a fast trip to the Duval plant (Northwest of Kingman). There I met and talked with Ronald F. Teissere, Duval geologist. I asked him the question, Why did Duval abandon the Yucca perlite claims? His answer was, that "there is nothing wrong with the perlite ore, but the economic situation years ago, would not permit the mining and shipping of perlite at profit, then. Perhaps there is more demand for perlite, now".


Melvin H Jones
geologist

LON RODRIGUEZ

Overburden in feet.

HA.

#1 - 27		A-1 - 10
2 - 35		A-2 - 25
3 - 25		A-3 - 10
4 - 25		
5 - 25		
6 - 10	didn't see	
7 - 10		
8 - 10		
9 - 5		
10 - 10	pieces of ore	
11 - 10		
12 - 10		
13 - 10		
14 - 10		
15 - 10		

September 14, 1973

RECONNAISSANCE GEOLOGY INVESTIGATION OF PERLITE CLAIMS, LOCATED SEVEN (7) MILES SOUTH OF YUCCA, MOHAVE COUNTY, ARIZONA.

In accordance with instructions of Mr. Howard S. Gable, Box 946, Kansas City, Mo., a cursory and rapid geology examination was made of the seven (7) "July" claims containing perlite located seven (7) miles South of Yucca, Arizona, was made on September 13, 1973. The claims are owned by the Unified Investors Company, of Kingman, Arizona. Mrs. Pearl Craig, Vice-President of said company accompanied the undersigned.

I am told that the Duval Copper Company (Kingman, Arizona) formerly had more than fifty (50) claims covering the perlite area (assuming the perlite was all they were interested in?), but they abandoned them. Unified Investors re-located seven (7) claims in what they feel is the best perlite loca'l. Mrs. Craig has a letter from Duval stating that they have no objections to the "July" claim re-location. I was also told that the Duval Company drilled nine (9) holes on the property in depths varying from 30 to 165 feet. Unified Investors does not have any of this drillhole data.

The claims are located alongside Highway 66 (and the Santa Fe railroad) seven (7) miles below Yucca. (See attached map). There is a railroad siding there called Haviland, and I am told that perlite has been shipped from Haviland in the past.

The Perlite is in hills of silicic volcanic rocks of Tertiary age, that are part of the Black Mountains. Some of the rocks examined in the vicinity of the several perlite veins, is apparently of welded tuff composition. Some of the veins of perlite are 100 feet (or more) in width and their lengths are unknown (but considerable), as they are obscured by the mentioned tuffs. The depths are also unknown. There are apparently a series of these large perlite deposits (parallel to each other), but with some distance between them. There are, however, several large man made pits scattered in the area, showing 10 feet perlite exposures. It would appear that there is a large amount of perlite on the claims (from an inferred viewpoint), this would be several million tons.)

The grade of this perlite is not known to the writer. This can only be determined in special laboratories where its water content, particle size, percent of devitrification, expansion, and other factors can be determined. The perlite is grey in color, grading to whitish, in some cases.

CONCLUSIONS: Before buying, or leasing, (or undertaking development work) on this property, a market study should be made. Transportation costs are always a big factor. If a market can be found at a suitable price, then the perlite can be mined (hopefully at a profit) Prices for perlite are normally negotiated, but they can be from \$10.00 a ton (and up) for crude perlite.

MELVIN H JONES
Mining Geologist.

COPY

H

PRELIMINARY REPORT
on
PERLITE PROCESSING MILL SITE
and
PERLITE DEPOSIT SITE
LOCATED NEAR KINGMAN, ARIZONA

for

MR. HOWARD S. GABLE

Prepared by:

Al Hack & Associates, Inc.
A. Hack

AL HACK & ASSOCIATES, INC.

CONSULTING ENGINEERS

BUILDING 67. WAZEE MARKET

DENVER, COLORADO 80204

PHONE 244-7625 CODE 303

April 23, 1974

**SAND & GRAVEL PLANTS
CRUSHING PLANTS
NON-METALIC PROCESS PLANTS
WEIGHT AGGREGATE PLANTS
PLACER EQUIPMENT**

**COAL TIPPLES
ORE BENEFICATION PLANTS
MATERIAL HANDLING SYSTEMS
OIL SAND PROCESS PLANTS
LIME PLANTS**

Mr. Howard S. Gable
Box 946
Kansas City, Missouri 64141

Subject: Proposed Process Mill for
Perlite Properties near
Kingman & Yucca, Arizona #7415

Dear Mr. Gable:

In accordance with your request I am pleased to submit herewith a preliminary report pertaining to the proposed processing plant to mill perlite ore available on the subject properties, to produce a saleable product of various mesh sizes as required by the custom expanding plants.

The writer visited the properties on April 15th & 16th for the purpose of observing the plant site, railroad siding and other possible plant facilities which will influence the mill design and ultimate capital cost of the mill and also production costs. It should be understood that this trip was not made as the role of geologist or mining engineer, but as plant design engineer.

For purpose of simplification in this report the respective properties will be called the Yucca and Kingman properties.

YUCCA PROPERTIES

The Yucca properties appear to have several advantages. It is understood that a substantial drilling program was carried out by previous owners, with drill logs available to you. Several open pits were observed on the property which indicate a large area is suitable for stripping and open pit operation which is essential in the mining of perlite. An other advantage in connection with this property is the location of a railroad siding, with adjoining land for a process plant site. This is of vital importance due to the lower cost product and comparative large volume which economically is not conducive to long truck hauls in the course of processing.

In the processing of perlite, crushed ore prior to grinding and screening must be dried to less than 1% surface moisture, preferably by natural gas as fuel over propane. An investigation should be made to determine if a natural gas line is within reasonable piping distance from the proposed mill site; and its availability.

The tentative mill site east of the railroad siding has an approximate 10° up slope away from the siding and would be an ideal slope on which to construct the processing mill. A tentative flow sheet as shown on the attached drawing fig. 1 is typical and readily adaptable to essentially all sizes as required by the Perlite Expanding Firms. Special size product requires only screen cloth changes to suit.

Provisions are incorporated in the original design of the plant to produce a product suitable for foreign shipments or to customers having their own crushing & screening plant and will be tentatively set at 4" x 1" size.

The finished product output capacity of the plant has not been established at this time and will be determined by the potential sales contracts and future growth of the market.

The conventional perlite crushing & grinding plant is operated on a dry basis and would require only domestic water for office, toilet facilities and showers. Sufficient ground water should be available at the site.

Natural gas is desirable for drying however, propane could be used but would increase the cost of the end product. Information on the availability of gas and power should be obtained as soon as possible.

The railroad siding should be increased to hold at least 15 preferably 20 hopper cars at one time, cooperation from the railroads is usually available in this respect.

KINGMAN PROPERTY

The Kingman property is located approximately 20 miles from Kingman. As a minimum of development has been done on the property the ore reserves are not established at this time, however several small dozer pits show a good grade of perlite and the possibility of a large ore body is indicated.

The property has neither railroad siding, electric power line or gas and would require a haul of the mine run ore or the sized product to a railroad siding and loading facilities near Kingman, with a resulting increase in the cost of the end product.

An economic study will be necessary to determine the most feasible location of the processing plant; tentatively the process plant location at a rail siding near Kingman with mine run ore hauled to the plant would seem the most logical; the selection of the plant at a rail site several miles from town to minimize environmental impact problems is essential.

Sheet #3 - Mr. Howard S. Gable.

The second but less desirable approach would be to construct the crushing & screening plant at the mine site with duplicate holdings silos, incoming product receiving hopper and blending and loading conveyors at the rail site. This approach would require a substantial additional capital investment for the silos & handling equipment at the rail sites; the manpower requirements would increase with the latter and the end product costs would be substantially higher.

The environmental impact problems would in all probability be somewhat less with the second plan.

We trust that the above information will be of assistance in the planning of your proposed project.

Respectfully submitted,

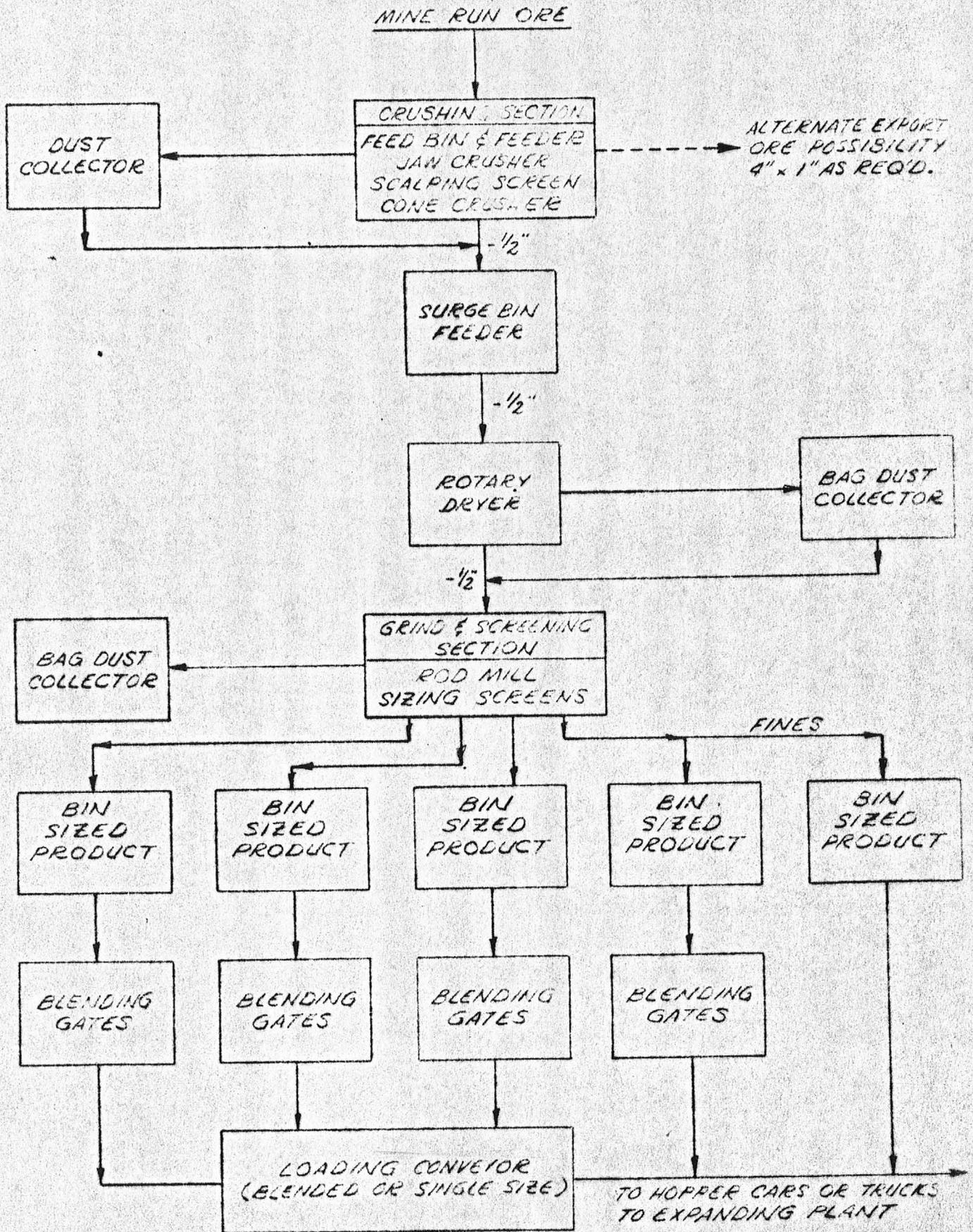
AL HACK & ASSOCIATES, INC.
BLDG. 67 WAZEE MARKET
DENVER, COLORADO 80204

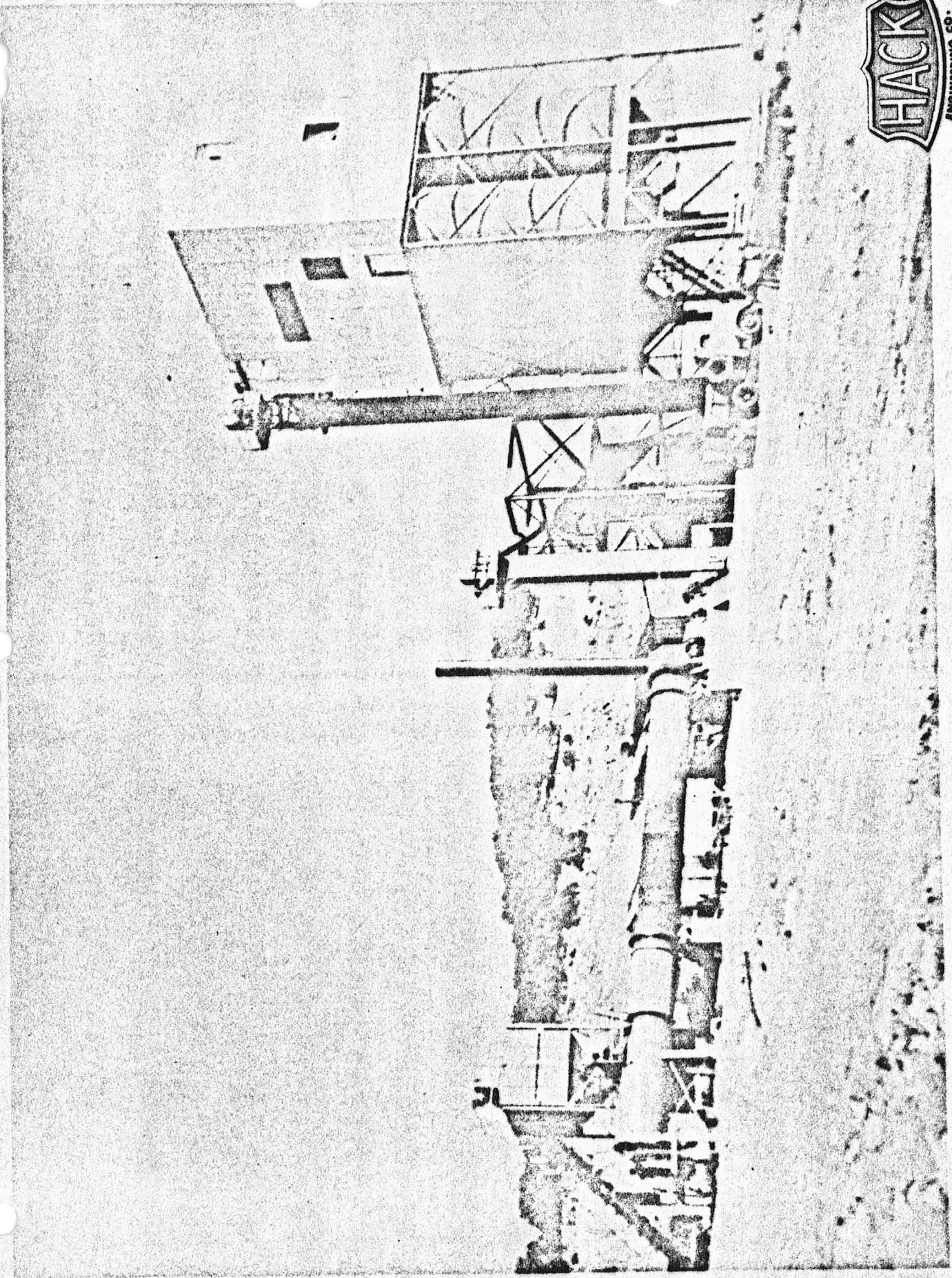
By A. Hack



Project 7415

FLOW SHEET
OF
PROPOSED PERLITE PLANT





COMPLETE PERLITE PLANT designed and engineered by Hack Engineering Company, Denver, Colorado.
This photo shows crushing, drying, screening and processing phase of raw material operation.

PRELIMINARY GEOLOGICAL EVALUATION
REPORT.

HAVILAND PERLITE CLAIMS, SOUTH
OF YUCCA, MOHAVE COUNTY, ARIZONA

by M.H.Jones, Geologist

31 August 1975

Prepared for:
Mr. Howard S. Gable
Box 946
Kansas City, Mo. 64141

MELVIN H. JONES

Mining Geologist

Box 1, Montello, Nevada 89030

31 August 1975

I INTRODUCTION

The Haviland Perlite claims (unpatented) are located about seven (7) miles West of Yucca, Mohave County, Arizona. (See Exhibit B). Of special interest is that the claims adjoin U.S. Highway 66, and the Santa Fe Railroad and there is a side track there. In the past, some Perlite has been shipped from a nearby pit. The claims are in the Southern end of the Black mountains.

These claims were located in accordance with the mining laws, in 1974 by Mr. Howard S. Gable, Box 946, Kansas City, Mo. 64141, and consists of ninety (90) "Haviland" claims in Section 20, T16½N R18W and Sections 34, 26, and 28, T17N, R18W, SLB&M and are adjacent to the large Sacramento wash. (See Exhibit C).

The undersigned's attention was first directed to the mentioned Perlite deposits when he first visited the claim area with Mrs. Pearl Craig, Vice-President of the Unified Investors Company, Kingman, Arizona on September 13, 1973 to examine the seven (7) "July" claims (now part of the Haviland group) (See exhibit H).

The general area now covered by the Haviland claims was originally located and held by the Duval Corporation during 1963-1964 and some drilling and metallurgical research was accomplished by said company. The Duval claims had such names as "Sagurra", "Chapo", "Vulcan", "Sliver", "Pota", "Dec. 21", and "Shorty", but were abandoned subsequently. The writer, asked one Duval official at their copper mine, Northwest of Kingman, Arizona, for the reason

the perlite claims were abandoned. His answer was "there is nothing wrong with the perlite ore, but the economic situation years ago, would not permit the mining and shipping of Perlite at a profit. Perhaps there is more demand for Perlite, now".

One of the reasons for this report is to consolidate data from a variety of sources, as well as to reflect the study and research accomplished by the writer in more than a year, with many visits to the claims, and to endeavor to ascertain apparent perlite reserve tonnage (from drilling data and surface examination).

II SUMMARY AND CONCLUSIONS

There are ninety (90) valid Haviland perlite claims owned by Mr. Howard S. Gable, Box 946, Kansas City, Mo.

Inferred perlite tonnage is ten (10) million tons on the claims. This perlite is broken down into two (2) basic grades (See exhibit D):

22% Perlitic Perlite

78% Puniceous Perlite

Also noted on the property are some spherulitic perlite and small amounts of devitrified perlite, but they are insignificant as far as the overall study is involved.

There is approximately two hundred (200) tons of Perlite ore stockpiled on claims 64 and 81.

Considering the past exploration work (drilling) accomplished on the property, estimated tonnage of perlite should have been ascertained. But only inferred tonnage can now be given, for the reason that past drilling was not properly and systematically planned, and apparently unqualified persons made up the lithographic logs (or no logs were made at all). While some firm information was available from surface exposures, and

from some of the logs, other data was postulated. However, the writer is of the opinion that a tremendous larger overall tonnage is obtainable in the area. (See exhibits E and F).

There is a side track on the railroad at Haviland where ore can be loaded into freight cars. The distance to the Los Angeles industrial area from Haviland is only about three hundred miles (300), and this would be an important factor in transporting low value ores. There is also a water well at Haviland, but the writer has no information on its capabilities. An initial study has been accomplished in establishing a Perlite Processing plant near the Perlite claims (See Exhibit I).

Some testing of the Haviland perlite was accomplished in 1963 and 1964 (See Exhibit G):

a The US Bureau of Mines at Tucson, Arizona tested a mixture of Perlite and Pumice, which resulted in an expanded product having a bulk weight of ten (10) pounds per cubic foot. This material, they state compares favorably with expanded perlite marketed elsewhere in Arizona. Bur. of Mines letter dated April 11, 1963.

b The Colorado School of Mines Research Foundation, Inc., tested perlite samples which resulted in expanded products ranging from 3.2 to 9.2 pounds per Cubic foot. (Letter of July 10, 1963). Then again, on what was called "pit run" samples, the results were 3.5 to 9.2 pounds of expanded material per cubic foot (Letter of August 21, 1964).

The Perlite Institute, 45 West 45th St., New York, N.Y. in their pamphlet, states that expanded perlite has many uses. Expanded perlite as light as 2 lbs. per cubic foot is used for loose fill insulation. Perlite from 7 lbs. to 15 lbs. per cubic

foot is used for plaster and concrete. There are numerous other uses such as; making shingles for roofs, filter material, soil conditioning, insulation board, etc.

On claim number 77 is an old bulldozer pit into what appears to be a poor grade of pumicite. A qualified laboratory should be given samples of this material to determine its commercial feasibility.

At the time of writing of this report, economic conditions in the U.S. are depressed, in particular in the building trade, and this has resulted in a decreased demand for perlite, and its products. However, in the future this material should be in large demand, when the economic situation gets back to normalcy.

III RECOMENDATIONS

The Haviland Perlite claims is a valuable property and should be retained by the owner. Future development should be in the form of maintaining and rebuilding roads, drilling under the supervision of a competent geologist or engineer which should result in comprehensive reserve ore tonnage. Laboratory testing of the various grades of perlite, by area, should also be accomplished to determine ore feasibility for specific purposes.

IV GEOGRAPHY

The claims are located as outlined on maps (Exhibits B and C). The area is generally mountainous as they are located in the South end of the Black Mountains. The climate is desert, which means that the annual rainfall is ten (10) inches or less, each year. The elevation of the Haviland side tract is 1500 feet. Sparce desert type shrubery is there, such as Mesquite, cacti, Sahuaro, Ocotilla, Joshua trees and Palo Verde. From a physiographic viewpoint, the claims are in a part of the Sonoran desert.

Summers are extremely hot, but days are cool and pleasant most of the Winter. Sporadic rains occur, which are usually most infrequent, but whort heavy downpours cause the normally dry washes to run high with water. Adding to this situation are the Pedical soils, which absorb little (or no) water, initially, thusly excelerating the heavy run-off. For milling operations, at this location, year around water supply may be a problem. However, there is an old well on the railroad at Haviland, which will probably produce some water, but probably a limited amount.

V STRATIGRAPHY AND PETROGRAPHY

Thru-out the claims are many outcrops of Perlite, which for the purpose of this study, will be divided into two (2) grades Pumiceous and Perlitic. The classical Perlite as described in petrology textbooks, would be the Perlitic or spherulitic perlite. However, the Perlite Industry calls any rock which contains 2 to 6% water, and will greatly expand on heating, a form of "Perlite". So the field, broadens out, from the classical perlite rock known to most rockhounds and mineral students.

Perlite, is of course, a siliceous volcanic glass rock and is regarded as an extrusive that occurs chiefly as selvages and flows. But in a few areas, it has been demonstratively proved to be intrusive. It is to be pointed out that most perlite is rhyolitic in origin. This applies to the Haviland claims where it is Tertiary rhyolitic perlite. In this case, the perlite contains Orthoclase feldspar. Perlitic means that it is concentrically lamellar, and pumiceous means that it has a near foamy texture.

At places, this volcanic glass can be seen resting on granite, gneiss and schist. The total volcanic series, which

is 8000 feet or more in thickness, also has trachyte, andesite, latite, tuff and basalt. A few outcrops show devitrified perlite, resulting from weathering, and this perlite would have little commercial value.

VI GEOLOGIC STRUCTURE.

The perlite, on a discontinuous basis thru-out the claims, is 25 to 150 feet in thickness, and occurs usually in the upper portion of the volcanic series. The perlite flows can be seen in many outcrops and some are several thousand square feet in area. It goes underground at some places for undetermined distances (beneath breccia, tuff, latite, or basalt).

The volcanic series in the Eastern area of the Haviland claims dips gently Southeastward, and is displaced, somewhat, by faults of Northwest strike. On the West bank of the Sacramento wash (section 26 for example), the breccia-perlite dips beneath the surface, but forms a mass about 150 feet in thickness of which the lowest 50 feet is relatively pure perlite showing some quartz phenocrysts; its middle 50 feet contains several layers of spherulitic rhyolite, and the upper 50 feet consists of alternating bands of perlite and latite. Intrusive latite, forming the crest of the ridge is in contact with this perlite mass on the West.

VII GEOLOGIC HISTORY.

The geologic history of the perlite has already, been covered in part, above. The Perlite is Tertiary in age, meaning it was formed by vulcanism during the Cenozoic era (between 30 and 70 million years ago). During this period, there was constant diastrophism consisting of tremendous volcanic activity and earth movements. It is hypogene in origin and the fast cooling of the magma, during a time when it has the proper constituents

(water in particular), and the proper ph, and environmental situation, resulted in the perlite. The Haviland perlite will have the same chemical content as the common rock, rhyolite.

VIII ECONOMIC CONSIDERATIONS

On the subject of calculating Perlite ore tonnages on the Haviland claims, Duval Corporation drilled fifteen (15) holes from 35 to 205 feet in depth, during 1964. The mentioned drilling program apparently followed no systematic pattern to establish tonnage, and the number of holes were also too limited for this purpose. The undersigned, has examined the logs covering these drill holes and most of the strata or formations encountered are poorly described or interpreted by careless or unqualified persons (geologists?). Some of the logs have little or no lithographic data, at all. Thusly, the logs contribute little assistance in determining types of perlite, or their depths, nor do they describe, adequately, other types of rocks encountered.

Then again, in 1974, fifteen (15) discovery holes were drilled, (near the original Duval holes), under the supervision of Mrs Pearl Craig, Kingman, Arizona. Apparently, no one studied the cuttings, nor made lithgraphic logs??? So this puts the burden of determining perlite ore reserve tonnage on surface exposures, or outcrops, and the use of other data obtained from surveys and reports made by Government geologists in the past.

Other information obtained by courtesy of the Duval Corporation are most helpful, such as the pyrometallurgical studies. (See exhibit G). It is noted that the Pumice perlite tested by the US Bureau of Mines (Tucson) resulted in the following: Material from 10 to 20 mesh, heated to 1000 to 1100 deg.C., resulted in 10 pounds per cubic foot of expanded perlite (even though

there was about 10% of unexpanded gangue there-in). This adds up to a fine grade of commercial expanded perlite.

Then again, the Colorado School of Mines Research Foundation in testing Haviland perlite of different meshes, came up with commercial grades of expanded perlite within a range of 3.2 to 15 pounds per cubic foot. The unexpanded rock, after being screened weighs about 55 pounds per cubic foot. (Crude perlite, in its unbroken form, prior to being mined, weighs about 150 pounds per cubic foot).

It is believed important to again mention that the Haviland Perlite claims adjoin US Highway 66, and are on the Santa Fe railroad. The claims are only about 300 miles from a large industrial area (Los Angeles), and this makes an ideal transportation situation. This is very important with non-metallic low priced ores, such as perlite. Crude perlite has been quoted at about \$14.00 per ton, FOB shipping point, but the price paid for perlite is normally negotiated. Perlite, universally, is open pit mined and this can be accomplished economically, and here, we have only a short haul to the railroad. About 200 tons of perlite has been mined and is stockpiled on the claims.

AL Hack & Associates, Inc., Consulting Engineers, of Denver, Colorado have completed a study for a "proposed Process Mill for Perlite near Yucca, Arizona". In examining the report, the writer finds no obstacles to constructing such a plant in the Haviland claim area. See Exhibit I, attached.

A map has been prepared showing the surface perlite exposures and underground extrapolations from other data, and reflects much past research on the part of the Duval people. A tonnage figure of 10 million tons of perlite is arrived at, but this is

an inferred tonnage, only. See Exhibit D.

Respectfully submitted

MELVIN H. JONES
Mining Geologist

425 So. 3rd. St.,
Las Vegas, Nevada 89101

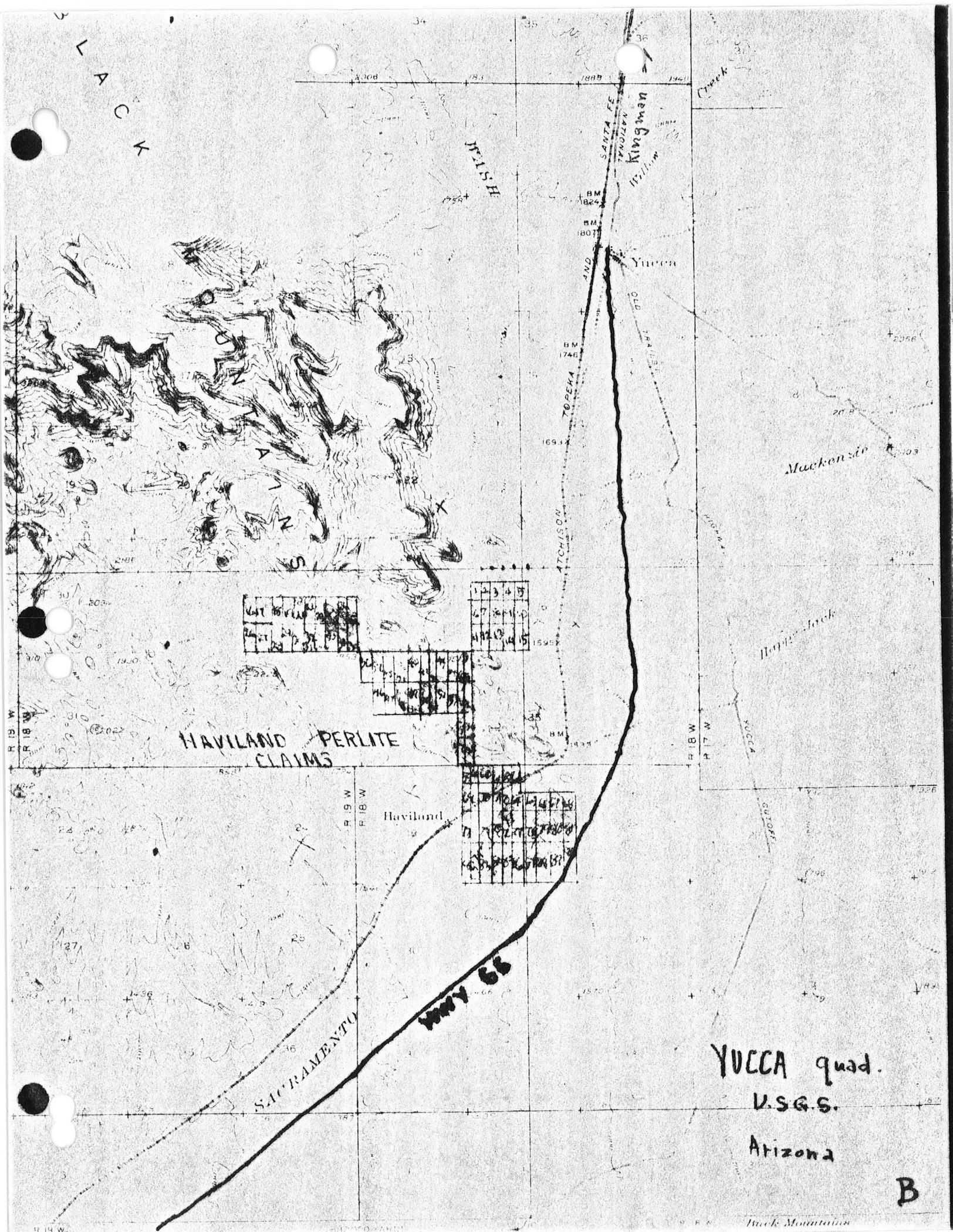
I N D I C E S

Exhibits.

- A - References
- B - Map Topographical - Haviland claims
- C - Map Haviland claims showing drill holes
- D - Map Haviland claims showing inferred ore reserves
- E - Duval drill hole lithographic logs (15)
- F - Extract - "Ariz. Perlite" E. Wilson and G. Roseveare (Ariz. Bur of Mines) "Black Mountains"
- G - Laboratory Expansion tests.
- G - 1 - Bur. of Mines, Tucson, Arizona, April 11, 1963
- G - 2 - Colo. School of Mines Research Foundation 7/10/63
- G - 3 - Colo. School of Mines Research Foundation 8/21/64
- H - Recon. Geology Invest. of Perlite claims, seven miles S. of Yucca, Ariz. M. Jones, Sept. 14, '73
- I - Preliminary Report on Perlite Processing Mill located near Kingman, Arizona for H. S. Gable. Al Hack and Associates, Inc.

REFERENCES

1. Phamphlet No. 1-1 1962 Origin and Characteristics, Typical Chemical and Physical properties of Perlite, Perlite Institute.
2. Arizona Perlite, by Eldred D. Wilson and George H Roseveare, Arizona Bureau of Mines, University of Arizona. October 1945
3. Perlite, Department of Mineral Resources, State of Arizona, Chas. H. Dunning, Director, 1947.
4. U.S. Bureau of Mines, I.C. 7364, Perlite, Source of Syhthetic Pumice, 1946.
5. Rocks and Rock Minerals, Pirsson.
6. Geology of the Industrial Rocks and Minerals, Robert L. Bates.



L
A
C
K

WILSH

SANTA FE
TRAVELER
Kingman
William

Yucca

HAVILAND PERLITE
CLAIMS

Haviland

MAY 65

SACRAMENTO

YUCCA quad.
U.S.G.S.
Arizona

B

Black Mountain

DRILL HOLE LOG

DUVAL SULPHUR & POTASH COMPANY

HOLE NO. 3

PROJECT Haviland Perlite SIZE NX

TYPE

LOCATION Vulcan 20 Claim

START 11/3/64

N E ELEV. 1575'

T.D. = 90'

STOP 11/4/64

FROM	TO	INTERVAL	RECOVERY	CHARACTER	REMARKS
0	15	15	0		Rock bit
15	20	5	15	spherulitic welded tuff (?)	
20	24	4	0	purple-grey color	
24	26	2	95	pink argillized, pumiceous tuff perlite agglomeration (PePu) merate, Noticable biotite content.	
26	32	6	100	occasional chunks of rhyolite (?)	
32	35	3	66	PePu, less pink argillaceous material with depth.	
35	45	10	60	-du-	
45	46	1	100	-du-	
46	48	2	100	blue-grey perlite	
48	55	7	100	slightly argillized perlite tuff agglomerate. More perlite; less pumice noted.	
55	58	3	100	-du-	
58	64	7	100	vitric lithic tuff agglomerate. Agglomeratic inclusions = 1/2" - 1/2" average.	
64	74	10	100	Noticable increase in 1" pumice fragments 70' - 77'	
74	84	10	100	-du-	
84	90	6	100	-du-	

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DRILL HOLE LOG

DUVAL SULPHUR & POTASH COMPANY

HOLE No. 4

PROJECT Haviland Perlite

SIZE NX

TYPE

LOCATION Chapo claim

START 11/6/64

N E ELEV. 1500

T.D. = 90'

STOP 11/10/64

FROM	TO	INTERVAL	RECOVERY	CHARACTER	REMARKS
0	35	35	0		Rock bit
35	43	8	5%	Perlite - pumice - rhyolite (?) tuff	
43	46	3	100	agglomerate with fragments	
46	56	10	55%	2" to sand size; fragments	
56	58	2	100	average 1/4"	
58	66	8	100	Spherulitic perlite. Dark grey perlite with >50% lithic material (mostly brown rhyolite (?) spherulites in bands; clasts + some blue opal)	
66	76	10	95	-do-	
76	83 ⁵	7 ⁵	100	-do. Note that the rock gradually becomes more rhyolitic (?) with depth	
83 ⁵	90	6 ⁵	90	-do.	

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LOGGED BY

BEARING INCL. <i>Vertical</i>	Coord. : N E	HOLE NO <i>5</i> OCEAN ELEV. DEPTH <i>70'</i>
----------------------------------	-----------------	---

Sheet 2

DESCRIPTION	CF	% Cu	% AsCu	% Mo	% AgMo	% EQIV.	GROUPING - RMKS
<i>Rock bit to 25' thru spars. like pebbles</i>							
<i>25'-26' Scheradicite pebbles</i>							
<i>26'-30' Sch. WT</i>							
<i>30'-41' W.T. Ash fall thin bedded lenticles to 1/2" dia</i>							
<i>41'-70' W.T. Brown with fine lenticles less than 1/8"</i>							
<i>Bedding dipping @ ~25° near top to ~10°</i>							
<i>T.D. 70'</i>							

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BEARING
INCL.

Coord. : N
E

HOLE NO 6
COLLAR ELEV.
DEPTH 100'

S. 10000 27 S.W.

DESCRIPTION

0-100 (D)
Shattered Permian
Block flow - all
appears to be good.

As Cu As Mo % Mo As Mo % Mo As Mo % Mo

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ASSAY-GEOLOGY COMPOSITE LOG

Sheet of

BEARING
INCL.

Coord. : N
E

HOLE NO 13
COLLAR ELEV.
DEPTH 35

Petz # 37

DESCRIPTION	Fe	Si	Al	%	Cu	%	As	Cu	%	Mo	%	As	Mo	%	EQUIV.	GROUPING - RMKS.

Overburden Q₆

ground
up?

Petz # 100 - probably
fossil? some - lithic
Veinlets 12-26

Petz # 100
for no apparent
reason

Tanish gray
fine - probably
commercial quality
some bio but
not much foldifer
33-34 feet - in 2
fractures.

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ASSAY-GEOLOGY COMPOSITE LOG

Sheet of 14

BEARING
INCL.

Coord. : N
E

HOLE NO 14
COLLAR ELEV.
DEPTH 85

Point # 72

DESCRIPTION

(g) (g) (g) (g) % Cu % AgCu % Mo % AsMo % EGIV

GROUPING - MARKS

PuPe from top
to bottom -
Probably Com'l
depending on
tones of Matrix

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BEARING
INCL.

Vert.

Coord. : N
E

Symposium #7

HOLE NO. 15-
COLLAR ELEV.
DEPTH

DESCRIPTION

Wt % Asst
Wt % Ni
Wt % Cu
Wt % As
Wt % Mo
Wt % FeOx

GRAVIMETRIC - WATER

Pale Gray Bio
Perlite

Axialite with Spheralite - 25%

Axialite with Spheralite

as Spheralite

as Spheralite

From 125' on definitely
not commercial Spheralite

125

WT. Spheralite

to 100%

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Southern area: . In the southernmost portion of the Black Mountains perlite crops out in secs. 22, 26, 27, 28, 34, and 35, T. 17 N., R. 18 W. These deposits, north of Haviland and southwest of Yucca, are within $3/4$ to 2 miles of the Santa Fe railway.

In the northern portion of sec. 27, the following succession extends upward from the valley fill (thicknesses estimated): (1), tuff and breccia containing angular boulders of perlite up to more than 6 feet in diameter, 400 feet thick; (2) perlite, 90 to 150 feet; latite breccia, 35 to 50 feet; (3) latite, 50 feet; pumiceous glass and tuff, 90 feet; (4), latite, capped by basalt northward, 60 feet.

The perlite of this area contains phenocrysts of quartz ranging up to about 0.1 inch in diameter.

Southward the volcanic series dips gently southeastward and is displaced somewhat by faults of northwest strike. On the west bank of Sacramento Wash, in sec. 35, the breccia-perlite lower contact dips beneath the surface. Here the perlite crops out mainly as an oblong area about 100 feet long by a maximum of 75 feet wide. It forms a mass approximately 150 feet in thickness of which the lowest 50 feet is relatively pure perlite showing some quartz phenocrysts; its middle 50 feet contains several layers of spherulitic rhyolite; and the upper 50 feet consists of alternating bands of perlite and latite. Intrusive latite forming the crest of the ridge is in contact with this perlite mass on the west.



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
REGION III

TUCSON METALLURGY RESEARCH
LABORATORY

1726 NORTH VINE AVENUE
TUCSON, ARIZONA

April 11, 1963

Mr. Don Clippinger, Geologist
Duval Corporation
P. O. Box 11277
Tucson 2, Arizona

Dear Don:

Herewith are the results of expansion tests made on a sample from Mohave County, Arizona. The material was a mixture of pumice and perlite.

The sample was crushed through 10-mesh and a 10 to 20-mesh fraction was screened out and expanded in our muffle furnace at temperatures from 1000 to 1100° C. When heating the ground fractions at these temperatures the rock exploded violently during the expansion tests and it was found necessary to preheat the charge at 500° C for 5 minutes before continuing the tests. Heating the preheated size fraction at 1100° C gave an expanded product having a bulk weight of 10 pounds per cubic foot and containing about 10 percent of unexpanded gangue as determined by sink-float fractionation in water. The expanded product was white in color and compares favorably with perlite now marketed in the Phoenix and Tucson areas.

Sincerely,

LaMar G. Evans
Supervisory Research Metallurgist

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COLORADO SCHOOL OF MINES RESEARCH FOUNDATION, INC.

GOLDEN, COLORADO

July 10, 1963

Mr. Don Clippinger
Senior Geologist
Duval Corporation
Post Office Box 1127
Tucson, Arizona

330613

Dear Mr. Clippinger:

The following are procedures used and results obtained in the tests conducted on perlite samples No. 1257, No. 1258, and No. 1259, submitted to us.

All three samples were highly oxidized and relatively soft and light weight. The samples were stage crushed to minus- $\frac{1}{4}$ -inch in a laboratory jaw crusher. At minus- $\frac{1}{4}$ -inch a $\frac{1}{4}$ split was taken for expansion tests. This split was screened at 35-mesh and the oversize reduced by stages in a laboratory burr mill to minus-35-mesh. Stage reduction with screening helped prevent production of excessive fines.

The minus 35-mesh material was screened at 65-mesh and expansion tests conducted on the minus-35 plus 65-mesh fraction. However because of the very large proportion of minus-65-mesh material it was decided to screen this fraction at 100 mesh and run expansion tests on the 65 x 100-mesh fraction.

Expansion tests were conducted in a 2-inch stainless steel vertical shaft furnace. Exploratory runs indicated a furnace wall temperature of approximately 1950F produced optimum expansion.

Results:

Sample No. 1257

Screen analysis
35 x 65-mesh 19.5%
minus 65-mesh 80.5%

Expanded products

35 x 65-mesh 9.2 lb/cu ft
65 x 100-mesh 3.2 lb/cu ft

Sample No. 1258

Screen analysis	
35 x 65-mesh	33.9%
-65-mesh	66.1%

Expanded products

35 x 65-mesh	8.1 lb/cu ft
65 x 100-mesh	3.2 lb/cu ft

Sample No. 1259

Screen analysis	
35 x 65-mesh	31.8%
minus-65-mesh	68.2%

Expanded products

35 x 65-mesh	7.9 lb/cu ft
65 x 100-mesh	5.3 lb/cu ft

From the above results it appears the 35 x 65-mesh fraction still contained considerable oxidized and non-expanding material while the 65 x 100-mesh material was much cleaner. This was also observed in the two materials prior to expansion, and explains the higher bulk density of the coarser material.

The expanded material from all three samples was a very good white color, the coarser being just a shade darker than the finer. The feed material contained considerable dark, micaceous material.

Freshly mined material will probably have expansion properties equal to or superior to those exhibited in the above samples. Crushing characteristics may also change considerably in the fresh material.

Yield of expanded material for the separate samples vary as follows:

No. 1257	35 x 65-mesh	unexpanded	55 lbs/cu ft
	35 x 65-mesh	expanded	9.2 lbs/cu ft
	Yield =		42.2 cu ft/ton of ore
No. 1258	65 x 100-mesh	unexpanded	55 lbs/cu ft
	65 x 100-mesh	expanded	3.2 lbs/cu ft
	Yield =		146 cu ft/ton of ore

No. 1258	35 x 65-mesh	unexpanded	55 lbs/cu ft
	35 x 65-mesh	expanded	8.1 lbs/cu ft
	Yield = .		83.8 cu ft/ton of ore
	65 x 100-mesh	unexpanded	55 lbs/cu ft
	65 x 100-mesh	expanded	3.2 lbs/cu ft
	Yield = .		122 cu ft/ton of ore
No. 1259	35 x 65-mesh	unexpanded	55 lbs/cu ft
	35 x 65-mesh	expanded	7.9 lbs/cu ft
	Yield =		80.5 cu ft/ton of ore
	65 x 100-mesh	unexpanded	55 lbs/cu ft
	65 x 100-mesh	expanded	5.3 lbs/cu ft
	Yield =		67.7 cu ft/ton of ore

Samples of the expanded materials are being forwarded under separate cover for your examination.

If there are any questions regarding the above results, please do not hesitate to write us.

Yours very truly,

Parke O. Yingst

Parke O. Yingst

Senior Project Engineer

/laj

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DUVAL CORPORATION

COLORADO SCHOOL OF MINES RESEARCH FOUNDATION, INC.

GOLDEN, COLORADO 80402

21 August 1964

Mr. Donn M. Clippinger
Senior Geologist
Duval Corporation
Post Office Box 38
Sahuarita, Arizona
85629

340306

Dear Mr. Clippinger:

Tests on the sample of perlite ore have been completed and reported herein.

As stated in your letter of instructions the ore was highly oxidized and while the results are very encouraging the characteristics, especially with respect to crushing, will alter appreciably when fresh material is tested.

The material was crushed to one-inch and then screened at $\frac{1}{2}$ -inch and the oversize reduced to $\frac{1}{4}$ -inch. The sample was split on a Jones splitter - one split being reduced by stages to minus 35-mesh and screened at 35-, 65-, and 100-mesh.

The other split was screened at 8-mesh and a plus and minus product obtained. After the weights were obtained they were also reduced by staging to minus 35-mesh and screened at 35-, 65-, and 100-mesh.

The experimental runs were made on the "Pit Run" material. Tests on the original plus and minus 8-mesh were made at about the same temperature. Tests were made in a vertical shaft furnace. Temperatures recorded are the temperatures of the furnace wall taken through an observation hole in the insulation with an optical pyrometer.

Body 112

Screen Analysis:

+8 mesh from $\frac{1}{4}$ " head material	37.3%
-8 mesh from $\frac{1}{4}$ " head material	62.7%
-8 mesh screened	
+35 mesh	50.1%
-35+65 mesh	15.5%
-65+100 mesh	6.6%
-100 mesh	27.8%
-8 mesh screened after reduction to -35 mesh	
-35+65 mesh	37.3%
-65+100 mesh	11.1%
-100 mesh	51.6%

Expansion Tests"Pit Run" Material:

Test No. 1	35x65 mesh feed 2040°F 7.3 lb/cu ft
Test No. 2	35x65 mesh feed 2100°F 8.7 lb/cu ft
Test No. 3	35x65 mesh feed 2200°F 6.1 lb/cu ft
Test No. 4	65x100 mesh feed 1950°F 3.5 lb/cu ft

+8 mesh Material:

Test No. 5	35x100 mesh feed 1950°F 12.4 lb/cu ft
Test No. 6	65x100 mesh feed 1950°F 6.5 lb/cu ft

-8 mesh Material:

Test No. 7	35x65 mesh feed 1970°F 9.2 lb/cu ft
Test No. 8	65x100 mesh feed 1970°F 5.1 lb/cu ft

From the above it will be noted that the minus 65x100-mesh material gave a lighter weight product than the coarser 35x65-mesh material indicating that more retention time is needed for the coarser material since both tests were made at the same furnace conditions (Tests No. 5 and 6, 7 and 8).

Mr. Donn M. Clippinger

340806

Page 3

21 August 1964

The 65x100-mesh expanded products were very white and uniform. The 35x65-mesh products were a little off-white in color. This will probably correct itself in fresh material.

The ore will easily produce a product in the range of 7½ to 15 lb range of commercial perlite.

Samples of the expanded products are being forwarded under separate cover.

If there are any questions regarding the above please write or call.

Yours truly,

Parke O. Yingst
Senior Project Engineer

/sjs

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