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November 12, 1955

Mr. Gloyd M. Wiles  
Manager, Mining Department  
National Lead Company  
111 Broadway  
New York 6, N. Y.

Dear Gloyd:

Enclosed are three copies of my remarks on the Parry kyanite occurrences near Phoenix. Although close to home, the area contains some of the most rugged country that I have ever scrambled over.

I had some delay in getting this fellow Ward to show me over the ground. He was both ill and sore at the owner, Parry. However, he did lay off work on Monday, November 7, and guided me over the claims. Inasmuch as he lost \$16 in his day's wage at the foundry, I paid him that amount instead of the \$10 suggested in your letter of October 25.

I had a number of partial analyses made here in Phoenix in order to get some idea of the alumina and silica content of the country rock.

There is some coarse-grained kyanite on the property, but it is a proposition only for a couple of Mexican highgraders.

With kind regards,

Yours sincerely

E. N. Pennebaker

ENP:mc

P.S. I am returning the Parry report to you under separate cover.

## KYANITE-BEARING ROCKS

### NEAR SQUAW PEAK, PHOENIX MOUNTAINS

### MARICOPA COUNTY, ARIZONA

#### CONCLUSIONS

Near Squaw Peak there are two modes of occurrence of kyanite. One is along a narrow persistent zone where coarse kyanite in subordinate amounts is locally intergrown with white quartz. This kyanite occurs as thin lenses that are 2 to 8 inches wide and generally only a few feet in length, such lenses being separated along the zone by low-grade or barren quartz. The occurrence is typically pegmatitic with pinches and swells and erratic arrangement of the kyanite. The tonnage is limited, and the occurrence is only amenable to small-scale mining operations. Hand sorting and perhaps further beneficiation would be required, and the daily output would be small. This is not recommended as a company operation; at best it is a project for pocket-hunting owners or leasers.

Kyanite also occurs as a substantial constituent of certain layers of the country rock, where it is finer grained and possibly forms 25 to 50% of certain stratigraphic zones. This kyanite is apparently intimately intergrown with fine-grained quartz, and its beneficiation would require fine grinding and concentration that would give a granular or finely powdered product whose grain size would probably be smaller than the lower permissible limit. There is an abundant tonnage of this type of material.

It is recommended that the option be declined.

#### INTRODUCTION

On November 6 and 7, 1955, the writer examined the kyanite-bearing area near Phoenix, Arizona, belonging to Parry and Walton. The first day in the field was spent alone, becoming familiar with the general geology; on the second day the writer was accompanied by Mr. Keith Ward, who is familiar with the ground and pointed out various occurrences of kyanite.

The property consists of some 7 lode mining claims held under lease on State land. These claims are arranged to form a strip running northeasterly across Squaw Peak in the Phoenix Mountains immediately north of and just outside of the city limits of Phoenix, Arizona. Most of the terrane is extremely rugged, with Squaw Peak rising some 1,400 feet above the valley to reach a height of about 2,500 feet.

Kyanite of possible commercial interest occurs in two ways:

(1) As pegmatitic segregations intergrown with coarse white quartz, and

(2) As a finer-grained constituent of the local country rock, which here consists of layers of steeply dipping schist made up of various proportions of quartz, sericite, kyanite, and other minerals.

#### COARSE-GRAINED KYANITE

The coarse-grained kyanite and quartz occur along a fairly well defined zone striking northeast and dipping steeply with the layering of the metamorphic host rocks. In addition there are apparently several other less persistent zones, the uncertainty as to the exact number being caused by the pegmatitic nature of the occurrence and the possibility of cross-faulting.

The more persistent zone is several thousand feet long but averages only 2 feet or less in width and consists mostly of interlaced lenses and stringers of coarse white quartz. Kyanite occurs sporadically intergrown with the quartz as spherulitic, coarse-bladed aggregates, most of the spherules being from 1 to 2 inches across. These occur crowded together to form thin, discontinuous lenses generally from 2 to 8 inches wide and several feet long. In a few places there may be fairly good persistence for a distance of several tens of feet. In between the locally productive sections of the quartzose zone, kyanite is very scarce or lacking.

It should be emphasized that coarse-kyanite forms only a subordinate part of a narrow quartz-rich zone, that the seams of possibly worthwhile kyanite are generally thin, and that the valuable mineral comes in and leaves the zone in the usual erratic, pegmatitic manner.

Schrader of the U. S. Geological Survey described (1918) a lode "8 feet in width....(that) is composed almost wholly of a gangue of metamorphic minerals consisting chiefly

of kyanite and tourmaline in the estimated ratio of 8 to 1". The writer saw no such substantial thicknesses of coarse kyanite. Evidently Schrader's description applies to a particular locality and is not applicable to the entire zone. Certainly the general average thickness along the zone examined is a great deal less, with aggregated kyanite forming a subordinate part of a quartz-rich zone. Schrader also states that "there is a meager development of quartz in the lode". The writer's observation does not support this statement, as he found quartz generally intergrown with coarse kyanite. The inference is that Schrader's statement applies only to a limited occurrence.

The principal impurity associated with the coarse-grained kyanite is white quartz. Much of this could be freed from the kyanite by relatively coarse crushing of a hand-picked product. According to the report by Schrader very fine-grained tourmaline locally constitutes an impurity that carries boron and iron. In the specimens and samples taken by the writer, this did not appear to be particularly abundant, but the possible presence of these elements in very fine-grained form should not be overlooked. Later mineralization has superimposed copper, mercury, iron, and sulphur in places along the coarse kyanite zone. These impurities are localized and could be avoided by sacrificing certain sections of the coarse kyanite zone. Copper does not constitute any asset as a possible by-product, and it is doubtful if recovery of mercury would prove to be worthwhile. (There is no present activity here to mine these metals, even at the present very high prices.)

The coarse kyanite cannot be mined clean because of the narrowness and irregularity of the zone and the intergrowth with quartz. Hand sorting would be required, but a considerable fraction of the kyanite would be wasted in the rejects unless further crushing and concentration were employed. The hand-sorted product would probably be in lumps 1 to 2 inches in diameter; the size of the concentrated product made from rejects from hand sorting would probably be a small fraction of an inch. Although tunnel mining can be employed, costs per pound of product would be high due to the narrowness of the kyanite lenses and their erratic occurrence; there would be much dead work in seeking the next lens after one that was mined had played out.

It is concluded that at best the coarse kyanite occurrence could only be handled by a leaser or small operator, and even under this procedure it is doubtful if it would be profitable. Only a limited daily production could be expected. The occurrence is not one that could be profitably mined by a large company.

At present the only work along the coarse kyanite zone is a few shallow cuts. The property is not sufficiently opened up to prove its continuity, but, on the other hand, judging from the type of occurrence and the openings available, satisfactory continuity does not exist.

KYANITE-BEARING COUNTRY ROCK

The country rock in which the coarse quartz-kyanite zone occurs is itself aluminous. Apparently this alumina is due to finer grained kyanite intergrown with fine quartz and sericite to give rather dense, compact formational units. The layers of country rock vary in the relative amounts of these constituents, but the various units are persistent over long distances, although variations in the proportion of constituents along strike has not been determined.

Schrader describes country rock on the hanging wall of the vein zone as containing 60% quartz and 30% kyanite; on the footwall of the zone, 30% quartz and 60% kyanite. The writer sampled hanging wall and footwall at one place with the following results:

	<u>Al<sub>2</sub>O<sub>3</sub></u>	<u>SiO<sub>2</sub></u>
Hanging Wall	16.10%	75.36%
Footwall Wall	14.02%	72.48%
Nearby Country Rock on east	18.72%	71.04%

A thick layer of country rock was pointed out to the writer as containing corundum and diaspore, although its dense texture did not permit the visual determination of these minerals. A sample of this material returned:

<u>Al<sub>2</sub>O<sub>3</sub></u>	<u>SiO<sub>2</sub></u>
13.56%	74.24%

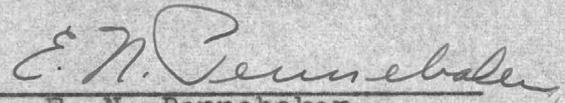
The corundum and diaspore are clearly subordinate constituents. Another thick layer of a somewhat similar-appearing rock was sampled by the writer with the following results:

<u>Al<sub>2</sub>O<sub>3</sub></u>	<u>SiO<sub>2</sub></u>
14.60%	81.20%

All of the above are fine to medium in texture, and this seems to be the general rule for this area of alumina-rich rocks. It would take fine grinding to free the fine-grained quartz for removal by concentration, and other impurities would apparently also have to be eliminated. The exact fineness of grinding can only be told by a detailed microscopic examination of the various types of material; nevertheless it is evident that the grain size would be smaller than the lower limit given in Mr. Knauft's letter of November 9, 1955.

It is apparent that there are very substantial tonnages of alumina-bearing country rock on the Parry ground in which kyanite is a major constituent, occurring in amounts possibly ranging from 25 to 50%. This mineral is fine to moderate in grain size and is intimately intergrown with fine-grained quartz. Its beneficiation would require fine grinding, and the product would be finely ground kyanite of doubtful economic interest.

It is possible that certain layers of metamorphic rock are present in this area in which the finer-textured kyanite is much more abundant. To find such zones would require very detailed geological mapping aided by many chemical analyses and a great deal of microscopic work. Even in such material it is likely that some fine-grained quartz would be present and fine grinding would be required.

  
E. N. Pennebaker

Scottsdale, Arizona  
November 12, 1955

# ARC LABORATORIES

Division of Arizona Research Consultants, Inc.

917 W. HATCHER RD.

PHOENIX, ARIZONA

WINDSOR 3-3573

FOR:

E. N. Pennebaker  
P. O. Box 817  
Scottsdale, Arizona

DATE

November 10, 1955

LAB No.

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## RESULTS

Lab. No.	Description	% Silica	% Alumina
1144	ENP # 1	71.04	18.72
1145	ENP - 2	72.48	14.02
1146	ENP - 3	75.36	16.10
1147	ENP - 4	81.20	14.60
1148	ENP - 5	74.24	13.56

Respectfully submitted,  
ARC Laboratories

*John T. Long, Jr.*  
John T. Long, Jr.

NATIONAL LEAD COMPANY

MINING DEPARTMENT

111 BROADWAY

NEW YORK 6, N.Y.

GLOYD M. WILES  
MANAGER



October 25, 1955

Mr. E. N. Pennebaker  
P.O.Box 817  
Scottsdale  
Arizona

Dear Penny:

Attached are the papers pertaining to the Joe M. B. Parry Kyanite (et al) deposit near Phoenix, about which I spoke to you on the telephone to-day.

It is my understanding our principal interest will be in Kyanite and that it must be in lump form in order to be useful in our refractory plant. The value of this after it is concentrated should be approximately \$50. per ton, FOB Mine. This gives a hypothetical figure from which you are to work.

You will notice you are to contact -

Mr. Keith Ward  
Capitol Foundry  
4444 South 8th Street  
Phoenix,

whom you can employ as a guide to take you to the property, at a rate of \$10. per day. He is reported to be a week-end miner.

You have all of the papers, some of which I have not yet had time to read, so I pass the problem to you.

With kindest regards, I am

Sincerely yours,

GMW:ACB

- Encs. 1) Folder marked PHOENIX KYANITE, with Carbon of letter, unsigned, dated June 11, 1955, from University of Arizona to Joe M.B.Parry
- 2) CC Memo. dated Sept. 27, 1955, R.W.Knauft, Pres., Chas. Taylor Sons Co. to Joe M.B.Parry
- 3) AN OPTION TO MAKE AN EXAMINATION dated Oct. 4, 1955, signed by Joe M.B.Parry
- 4) AN AGREEMENT TO SUB-LEASE, between Joe M.B.Parry and Marvin Walton, Lessors and Chas. Taylor Sons Co., Lessee; undated, initialed by J.M.B.P. only
- 5) Original Memo. Oct. 7, 1955, R.W.Knauft to J.Murray Johnston
- 6) Original letter Oct. 10, 1955, J.Murray Johnston to GMWiles attaching above file.



# The CHAS. TAYLOR SONS Co.

A SUBSIDIARY OF NATIONAL LEAD COMPANY

Established 1864

CINCINNATI 14, OHIO  
P. O. BOX 58 - ANNEX STATION

AIR MAIL

November 9, 1955

Mr. G. M. Wiles, Manager  
Mining Department  
National Lead Company  
111 Broadway  
New York 6, N. Y.

SUBJECT: Joe M. B. Parry  
Phoenix, Arizona

Dear Mr. Wiles:

Murray Johnston has suggested that we send you a tentative specification covering the kyanite which might be found in the deposit controlled by Mr. Parry, adjacent to Phoenix, Arizona. This property to be really worth while should produce massive kyanite, andalusite or sillimanite from which coarse material can be recovered without beneficiation. If it is necessary to fine grind the ore and run it over jig tables or through separators in order to recover the kyanite, the property can offer nothing which is not presently available from Comercialores, Cloven, S. C., or the Kyanite Mining Company, Cullen, Va.

Here are the specifications which we suggest:

### CHEMICAL ANALYSIS

SiO <sub>2</sub> . . . . .	36.0% Maximum
Al <sub>2</sub> O <sub>3</sub> . . . . .	60.0 Minimum
Fe <sub>2</sub> O <sub>3</sub> . . . . .	1.0 Maximum
TiO <sub>2</sub> . . . . .	1.5 "
CaO . . . . .	0.2 "
MnO . . . . .	0.3 "
Alkalies . . . . .	0.4 "
Ig. Loss . . . . .	1.0 "
PCE . . . . .	Cone 37-38

GRAIN SIZING - Grain sizing should be no finer than 4-F with approximately 40% of this through 4 mesh and on 10 mesh.

MATERIAL - If kyanite, should be calcined, preferably at the mining site.

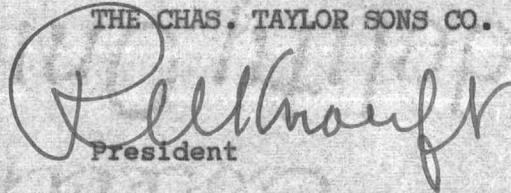
*1/8" aperture?*

Mr. G. M. Wiles  
11/9/55 - page 2

If you would like to have one of our ceramic engineers visit the property with Mr. Pennebaker or one of your field men, we shall be very glad to conclude the arrangements at your convenience. Thank you very much for your help.

Sincerely yours,

THE CHAS. TAYLOR SONS CO.

  
President

RWKnauff/bt  
cc: E. N. Pennebaker ✓  
JMJ