MICA (CLAY)-MI2L

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MICA IN NORTH CAROLINA

(A PRELIMINARY REPORT)

FIELD STUDIES

By

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HARTWELL MICA AREA

Introduction

An unusually coarse pegmatitic granite has been located and its boundaries roughly mapped southwest of Hartwell, Hart County, Georgia (See attached map). This granite lies along the drainage divide between Boyds and Cedar Creeks, which flow to the southeast, and Lightwood Log Creek, which flows to the north and east. The granite underlies an area approximately three miles long and one and one-half miles wide at its greatest width. Mica may be seen in the soil, beginning at a point about the southwestern city limits of Hartwell and extending along the Royston Highway for a distance of approximately two miles.

This granite area is not to be confused with the sheet mica-producing areas which occur elsewhere in this county.

Generally, the topography of the granite area is relatively flat, since it occurs along a drainage divide. It is occasionally cut by small valleys and in the entire area the maximum relief probably does not exceed 40 feet.

General Geology

The most abundant rock type in Hart County is mica schist. In addition to the mica schist, considerable granite occurs in the county, and a zone of sillimanite schist extends southwestward from Hartwell to the Elbert County line. Regional rock trends in this section are generally to the northeast, with dips about 45° to the southeast.

The muscovite granite mapped is essentially a coarse, crystalline granite composed principally of medium to coarse potash feldspar with occasionally a little plagioclase feldspar, a little milky to smoky quartz, mica (both muscovite and biotite), tourmaline, and garnet. Percentages of these minerals in the rock are estimated to be approximately as follows: feldspar, 60-65 percent; mica (muscovite), 10-20 percent; mica (biotite), 0-4 percent; quartz, about 15 percent; tourmaline and garnet, 1 percent.

This granite has intruded and mostly assimilated the muscovite-quartz schist country rock; occasional remnants of this schist occur in the granite, and in these inclusions the mica has been recrystallized, especially along the planes of schistosity, into coarser flakes of muscovite. It is thought that perhaps 20 percent of the area outlined or mapped as granite is underlain by schist inclusions. Some of the more prominent schist inclusions are designated on the map, but others occur which can be located only by prospecting.

The granitic area is surrounded generally by a mica schist which shows coarse recrystallization, as do the mica schist inclusions. Distribution of this schist is also shown on the attached map. It will be noted that this material extends north and northeastward from the granite area to the Savannah River and probably into South Carolina. A sample of this schist collected northeast of Hartwell and submitted to the Asheville Laboratory indicates that it contains about 32 percent mica.

Weathering in most of the area studied has progressed to at least water level and in some cases undoubtedly extends below the top of the water table. Generally in this region the water table varies from 15 to 35 feet below the surface.

Prospecting

A small area located about 3-1/2 miles southwest of Hartwell, on farms owned by Tom Myers and C. L. LeCroy, was prospected by auger drilling (See attached distribution map and also log of auger holes for more information). Results on samples obtained from this prospecting have been reported by the Minerals Research Laboratory of the North Carolina State College in Asheville. Twenty-five holes, ranging in depth from 10 to 22.5 feet, were put down by hand-operated 2-1/2" soil augers at an average cost of about $0.32 per foot. Only one hole (hole #1) had to be abandoned because it was too hard to auger; however, this hole was about 13 feet deep when abandoned.

In general, it can be concluded that weathering extends to a depth of at least 25 feet in the area prospected, and in this area the mica content of the rock ranges from about 8 percent to 30 percent mica, with an average of about 17 percent. Only a few of the samples show biotite, and it is believed that this type occurs in local segregations of coarse pegmatitic material.

No reserves of mica are given in this report. However, it should be pointed out that the amount of this type of micaceous granite is exceedingly large, as indicated from the area outlined.

Possible Plant Sites and Water Supply

The town of Hartwell is served by the Hartwell Railroad which joins the Southern Railroad at Bowersville. This railroad crosses Lightwood Log Creek about one-half mile west of Hartwell. This stream contains

sufficient water at all seasons of the year to supply the amount needed for a mica recovery plant that might be located upon it. The relief at the point where the railroad crosses the creek is about 40 feet, thus affording a good location for a plant. Also, a southern tributary of Lightwood Log Creek originating in the granite area itself contains probably enough water to operate a plant. It is thought that it would be better to locate a plant near the railroad and a large stream than to pipe water to the deposit itself. The area prospected is about five miles by road from the possible plant site at the railroad on Lightwood Log Creek. The roads extending from the prospected area to the suggested plant site are paved except for about three-fourths of a mile; thus, road conditions would be good at all times.

The principal industry in this section of Georgia is agriculture. However, it is believed that sufficient labor of the type needed for an operation producing mica for grinding would be available.

Mining

The area underlain by coarse mica granite is large and reasonably uniform in character; thus, mechanical equipment for mining can and should be used. It is thought that the use of power shovels in mining would probably have the advantage over some other types of mining equipment since, by the use of power shovels, most of the schist inclusions could be eliminated in the pit. The material is all deeply-weathered; thus, no blasting in mining is anticipated. Trucks of large capacity could haul the ore from the pits to the plant at a cost probably less than piping sufficient water to the mica area and then transporting the finished or washed product to the railroad.

Summary

A coarse pegmatitic granite containing from 8 to 30 percent mica occurs about three miles west and southwest of Hartwell. The granite is deeply weathered and could be easily mined by mechanical equipment. The closest and best plant site in regard to rail transportation and water supply is located about one-half mile west of Hartwell where the railroad crosses Lightwood Log Creek.

Kenton H. Teague

Kenton H. Teague
Associate Geologist

Log Augor Holes in Scrap Mica Prospecting
Hart County, Georgia

Field Sample No.	Augor Hole No.	Depth in inches from	to	Description of sample	Land Owner
Hart 3	1	0	6	Top soil	
		6	61	Red stained clay and mica	
		61	97	Cream colored clay and mica	Tom Meyers
		97	130	Gray kaolin and mica	
		130	138	Some kaolinized	
		138	144	Too hard to auger at 144"	
Hart 4	2	0	15	Top soil	
		15	68	Red stained clay and fine mica	
		68	223	Kaolinized granite and plg. not iron stained	
Hart 5	3	0	20	Top soil	
		20	83	Red clay and mica	
		83	228	Pegmatite and granite containing fine mica, all white in color	
Hart 6	4	0	12	Top soil	
		12	54	Red clay and mica	
		54	180	Schist and pegmatite, but largely decomposed mica schist, iron stained	
		180	270	Pegmatite granite, white in color. Bottom still in pegmatite material	
Hart 7	5	0	7	Top soil	
		7	120	Red clay and little mica weathered, granitized mica schist. Very soft drilled awfully slow.	
			120	Shot with ½ stick dynamite	
		120	222	Granite and mica schist, but mostly mica schist somewhat granitized.	

Log of auger holes, Hart County (continued)

Field Sample No.	Auger hole No.	Depth in inches from	to	Description of sample	Land Owner
Hart 8A	6	0	10	Top soil	
		10	24	Red clay and mica	
		24	126	Red stained pegmatite, quite rich in mica	
Hart 8B	6 (cont.)	126	156	Only slightly stained pegmatite rich in mica, very hard to auger	
			160	Shot with ½ stick dynamite	
		160	264	Coarse pegmatite and little granite.	
Hart 9A	7	0	20	Top soil	
		20	108	Yellow clay and little fine mica-looks somewhat like it may have been transported	
Hart 9B		108	270	Weathered granite and pegmatite to entire bottom	
				Hit water at 21 ft. level	
Hart 10	8	0	12	Top soil	
		12	144	Weathered mica schist somewhat granitized, somewhat like hole #5	
Hart 11	9	0	24	Top soil	
		24	84	Weathered granite and granitized schist	
		84	228	Weathered granite containing considerable fine mica	
Hart 12	10	0	30	Top soil	
		30	198	Weathered granitized schist iron stained	
Hart 13	11	0	42	Red stained, coarse pegmatite and lot of mica	
		42	144	Stained weathered granite	
		144	156	Unstained weathered granite	
		156	216	Weathered pegmatite granite	

Log of auger holes, Hart County, (continued)

Field Sample No.	Auger hole No.	Depth in inches from	to	Description of sample	Land owner
Hart 14	12	0	12	Top soil	
		12	84	Iron stained mixture of granite and schist	
		84	216	Unstained granite and a little schist all weathered. Schist in bottom of hole	
Hart 15	13	0	12	Top soil	
		12	156	Weathered micaceous granite slightly yellow in color	
		156	264	Reddish stained, weathered granite	
	Water Level 18 ft.				
Hart 16	14	0	180	No top soil--Coarse pegmatite rich in mica. Reasonably uniform in color and mica content from top to bottom. All very good	
Hart 17A	15	0	15	Top soil	C. L. Looney
		15	90	Red clay and some mica from what appears to be weathered granite	
Hart 17B		90	168	Weathered pegmatitic granite containing considerable mica and is cream in color	
		168	204	Stained, weathered granitized mica schist. Schist in bottom of hole	
Hart 18	16	0	8	Top soil	
		8	108	Red stained pegmatite granite and pegmatite	
		108	204	Pegmatitic granite and pegmatite weathered	
Hart 19	17	0	4	Top soil	
		4	60	Red clay and mica	
		60	264	Granite and pegmatite unstained, but weathered	

Log of auger holes, Hart County, (continued)

Field Sample No.	Auger hole No.	Depth in inches from	to	Description of sample	Land owner
Hart 20	18	0	24	Top soil	
		24	54	Red clay and a little fine mica from weathered granite	
		54	62	Weathered pegmatite and granite containing considerable mica (unstained)	
		62	70	Granitized mica schist	
		70	180	Weathered granite	
Hart 21	19	0	15	Top soil	
		15	90	Red stained weathered granite	
		90	264	Weathered granite	
Hart 22	20	0	20	Top soil	
		20	72	Red stained weathered granite and pegmatite	
		72	228	Weathered granite and pegmatite	
Water Level 19 ft.					
Hart 23	21	0	15	Top soil	
		15	84	(no mica) red clay and weathered granite	
		84	156	Coarse pegmatite granite with considerable mica	
Hart 24	22	0	14	Top soil	C. L. Locroy (cont'd)
		14	75	Weathered granite and pegmatite containing considerable mica somewhat stained	
		75	121	Weathered granite and pegmatite	
Hart 25A	23	0	15	Top soil	
		15	75	Weathered granite and pegmatite stained red	
Hart 25B		75	264	Weathered granite unstained containing fine mica	
Hart 26	24	0	28	Top soil-red in color	
		28	96	Red stained clay with a little fine mica, all apparently from weathered schist.	

Log of auger holes, Hart County, (continued)

Field Sample No.	Auger Hole No.	Depth in inches from	to	Description of sample	Land owner
Hart 27	25	0	12	Top soil	
		12	84	Red stained clay and weathered granite	
		84	120	Weathered granite and pegmatite	

MICA RECOVERY TESTS

By

MINERALS RESEARCH LABORATORY

Of

NORTH CAROLINA STATE COLLEGE

Introduction

Mica recovery test results from thirty-one samples from Hart County, Georgia are reported herein. Twenty-nine samples were from 2 1/2" auger borings and three samples were surface grab samples. The locations, hole logs, and descriptions are shown in Table 1.

Each of these samples was given an examination prior to test-work to determine roughly the test procedure to employ. In general, the test procedure can be said to be very similar and it is thought that the flowsheet shown would handle all the samples satisfactorily. Likewise, this examination enabled the samples to be catalogued as to the (1) color of the mica, (2) presence or absence of biotite, and (3) size of mica flakes. Thus the results shown can be examined to these ends to aid the field work and general planning.

In general the test procedure involved primary desliming followed by a light rod mill action (essentially a scrubbing action to remove [illegible] and screening to recover the coarse mica. The screen undersize was then deslimed and froth flotted to recover the fine mica. Then the mica products constituted the "recoverable mica" in the sample. Microscopic estimation were then made of the other products to give the figure "total mica".

While some samples contained biotite mica and other samples contained clay stained mica, it appears that the composite micas recovered would be a suitable mica for the roofing industry. The average total mica contained in the samples is 17.7 percent and the average total recovered mica is 15.4 percent.

A flowsheet is shown together with a material balance and other pertinent data required in the treatment of the composite samples.

Test Procedure And Results

All of the samples from Hart County were of the same general nature, that is, they were contained in a decomposed granite rock. No wide variations in mica size, thickness of books, or presence of trouble-some contaminating minerals were present to necessitate special treatment. However, six samples contained mica which would not float in the regular manner but required a caustic pre-conditioning treatment to scrub or otherwise clean the mica prior to recovery by flotation. This special treatment required is shown in the flowsheet and these samples are so designated "caustic pre-conditioning required".

All of the samples were sufficiently decomposed to require no crushing. The samples as received contained an average of 30 percent clay. This was removed by agitation and screening on 100 mesh screen. The clay removed here contained a negligible amount of mica. The -100 mesh sands were then rod-milled two minutes at 20 percent solids. The rod mill discharge was then screened on a 20 mesh screen to recover the coarse mica. As a general rule, this coarse mica does not float readily and is very easily and conveniently removed by screening. The -20 mesh sands were then floated

through a 325 mesh screen and floated with sulphuric acid, amine T, and pine oil. In these cases where no suitable mica concentrate could be made by flotation, the -20 mesh sands were conditioned at high solids with caustic and washed with subsequent flotation in the regular manner.

All the concentrates, both by screening and flotation are above 90 percent mica. This purity is believed to be in general much higher than commercial scrap mica sold today. The waste products were low in mica with an indicated over-all mica recovery of 87.0 percent.

Table 2 is a tabulation of the test results. From the column "Type" the various samples containing biotite and clay stained mica can be separated if required.

Table 3 shows the weight in pounds per cubic foot of the micas together with the screen analyses. It would appear from a composite viewpoint that all the micas could be combined and hammermilled to prepare a roofing product. For use as wet ground mica material the biotite and stained mica would be a handicap and all of the mica would be of a size generally considered not grindable in the conventional roller grinders. These grinders require coarse [illegible] according to the local producers.

By R. [illegible]

Approved by:
L. L. McMurray
October 29, 1947

TABLE NO. 1

Field # Sample No.	Auger Hole No.	Sample Depth in inches	Description of Sample
Hart 3	1	0 - 144	Medium clay content, mica slightly iron stained. Mica contained 7 percent Biotite.
Hart 4	2	0 - 228	High clay content, mica slightly iron stained.
Hart 5	3	0 - 228	Medium clay content, mica medium iron stained.
Hart 6	4	0 - 270	Sample contained some schist which is highly iron stained. Medium clay content.
Hart 7	5	0 - 222	Contained schist. Mica extremely iron stained. Medium clay content.
Hart 8A	6	0 - 126	Mica medium iron stained. High in clay content.
Hart 8B	6	126 - 264	Mica unstained. Low clay content. Mica coarse in size.
Hart 9A	7	0 - 103	Sample low in mica content. Mica fine in size. Extremely high clay content. Mica medium iron stained.
Hart 9B	7	103 - 270	Mica fine sized unstained. Medium clay content.
Hart 10	8	0 - 144	Contained mica schist. Mica highly iron stained, [illegible] fine size, medium clay content.
Hart 11	9	0 - 228	Contained some schist. Mica medium iron stained and fine in size. Medium clay content.
Hart 12	10	0 - 198	Contained schist. Mica highly iron stained. Medium clay content.
Hart 13	11	0 - 216	Mica contains 1.0 percent Biotite, mica unstained. High clay content.

TABLE NO. 1 (con.)

Field Sample No.	Auger Hole No.	Sample Depth in inches	Description of Sample
Hart 14	12	0 - 216	Granitized schist. Medium clay content. Mica high iron stained.
Hart 15	13	0 - 264	High clay content. Mica only slightly stained.
Hart 16	14	0 - 180	Mica very coarse. Low clay content. Mica unstained.
Hart 17A	15	0 - 90	Extremely high clay content. Mica slightly iron stained.
Hart 17B	15	90 - 204	Contains some schist. Medium clay content. Mica medium stained.
Hart 18	16	0 - 264	High clay content. Mica medium iron stained.
Hart 19	17	0 - 264	Medium clay content. Medium iron stained mica. Mica contains 8.0 percent biotite.
Hart 20	18	0 - 180	Mica contains 2.0 percent biotite. Low clay content. Mica only slightly stained.
Hart 21	19	0 - 264	High clay content. Mica slightly iron stained.
Hart 22	20	0 - 228	High clay content. Mica very slightly iron stained.
Hart 23	21	0 - 171	Medium clay content. Mica only slightly iron stained.
Hart 24	22	0 - 192	Medium clay. Medium iron stained mica. Mica contains 5.0 percent biotite.
Hart 25A	23	0 - 75	Extremely high clay content. Mica medium iron stained.
Hart 25B	23	75 - 204	High clay content. Mica unstained.

TABLE NO. 1 (con.)

Field Sample No.	Auger Hole No.	Sample Depth in inches	Description of Samples
Hart 26	24	0 - 96	Schist. High clay content. Mica high iron stained.
Hart 27	25	0 - 120	Medium clay content. Mica only slightly stained.

* Laboratory Sample Number is the field number preceded by 305.

TABLE NO. 2

Sample Number	% Mica in Sample	% Mica Recovered by Diff Grind	% Mica Recovered by Flotation	Percent Recovery	Type Mica*
3	13.5	8.8	2.2	84.0	D-2, I-1
4	15.3	6.1	7.9	92.0	I-1
5	17.5	6.2	9.3	89.0	I-2
6	26.0	5.1	19.5	95.0	S-1, I-3
7	26.0	9.0	13.9	88.0	S-2, I-3
8A	15.7	9.0	5.1	90.0	I-2
8B	17.9	9.1	7.7	94.0	I-1
9A	8.1	0.2	5.2	67.0	I-2
9B	14.3	3.3	10.2	94.0	I-1
10	28.2	1.9	17.7	70.0	C-2, I-3
11	21.9	1.5	17.8	88.0	S-1, I-2
12	30.3	4.8	20.5	84.0	C-2, I-3
13	16.8	5.0	6.6	69.0	D-1, I-1, C
14	22.9	3.4	14.1	78.0	S-1, I-3
15	17.0	5.0	9.2	84.0	I-1, C
16	29.8	21.3	8.0	97.0	I-1
17A	11.3	4.5	5.2	86.0	I-2, C
17B	17.0	6.0	11.0	94.0	I-1, S-2
18	18.6	10.4	6.0	89.0	I-2
19	13.3	5.4	5.0	85.0	D-2, I-2, C
20	23.3	5.5	17.3	98.0	D-1, I-1
21	11.9	2.5	7.9	88.0	I-1
22	12.3	5.0	5.4	85.0	I-1
23	7.9	3.6	3.3	87.0	I-1

TABLE NO. 2 (con.)

Sample Number	% Mica in Sample	% Mica Recovered by Diff. Grind	% Mica Recovered by Flotation	Percent Recovery	Type Mica*
24	16.7	9.1	5.6	88.0	B-1, I-2, C
25A	7.3	3.5	2.1	77.0	I-2
25B	13.1	3.8	7.1	84.0	I-1
26	15.5	4.2	10.4	94.0	S-1, I-3, C
27	21.3	10.8	9.8	97.0	I-1
Total	512.6	174.8	271.9	2515.0	
Average	17.7	6.0	9.4	87.0	

* S-1 Part schist

S-2 All schist

B-1 Mica contains biotite but 5 percent

B-2 Mica contains 5 percent biotite

I-1 Low or no iron stain

I-2 Medium iron stain

I-3 High iron stain

C Mica floats only after pre-conditioning at high pulp with caustic soda.

TABLE NO. 3

SCREEN ANALYSIS AND BULK DENSITIES OF CONCENTRATES

Clean Mica and Brown Mica with Biotite

Flotation		Differential Grind	
Screen	% On	Screen	% On
+35	45.9	+3	0.0
+48	66.4	+3	9.7

TABLE NO. 3 (Con.)

Flotation		Differential Grind	
Screen	% On	Screen	% On
+65	81.2	+10	25.1
+30	84.2	+14	52.4
+100	89.3	+20	84.8
+150	94.1	-20	100.0
-150	100.0		

Samples Containing Schist

Flotation		Differential Grind	
Screen	% On	Screen	% On
+35	49.8	+3	0.0
+48	72.3	+3	0.5
+65	86.2	+10	3.2
+80	87.9	+14	39.4
+100	93.1	+20	73.6
+150	97.3	-20	100.0
-150	100.0		

Carroll No. 1

Flotation		Differential Grind	
Screen	% On	Screen	% On
+35	54.4	+3	0.0
+48	69.4	+3	0.0
+65	83.7	+10	1.3
+80	87.2	+14	39.3

TABLE NO. 3 (Cont.)

Carroll No. 1 (cont.)

Flotation		Differential Grind	
Screen	% On	Screen	% On
+100	92.7	-100	62.6
+150	96.3	-20	100.0
-150	100.0		

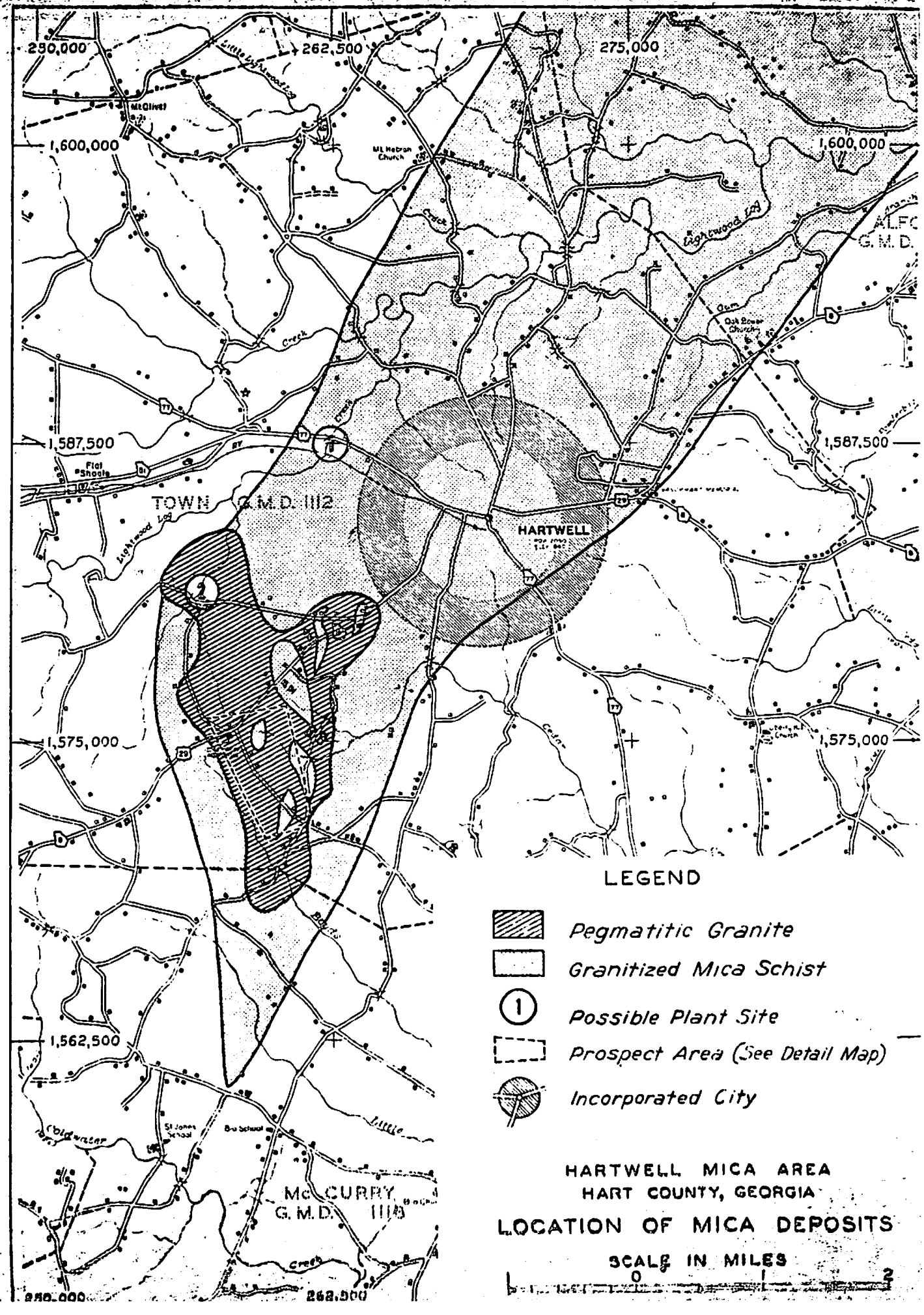
Bulk Densities of Concentrates

Product	#/ft³
Clean Mica	
1- Differential Grind	19.6
2- Flotation	24.0
Clean Mica With Biotite	
1- Differential Grind	21.3
2- Flotation	30.5
Sample Containing Biotite	
1- Differential Grind	36.1
2- Flotation	39.0
Carroll Pt. 1	
1- Differential Grind	26.9
2- Flotation	34.3

TABLE 4

Crab Samples, Part-1 and 2

Sample Number	% Mica In Sample	% Mica Rec. in Flake Size	% Mica Rec. in Flotation	Percent Recovery
Part - 1	3.4	1.9	94.1	96.0
Part - 2	71.4	6.5	23.3	89.8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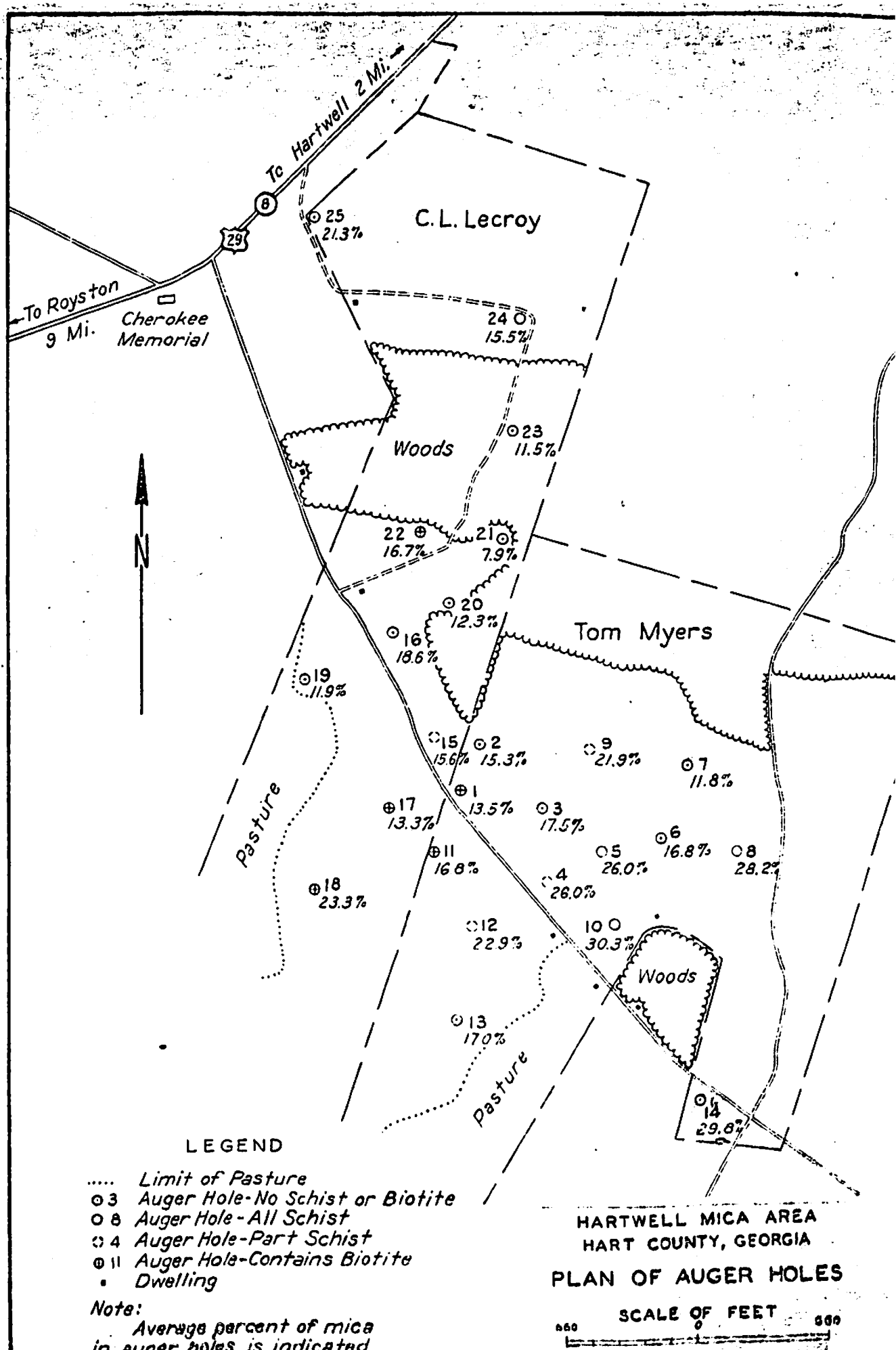
275,000
1,600,000
1,600,000
1,587,500
1,587,500
1,575,000
1,575,000
1,562,500
TOWN G.M.D. 1112
HARTWELL
McCURRY G.M.D. 1116
LEGEND
Pegmatitic Granite
Granitized Mica Schist
1
Possible Plant Site
Prospect Area (See Detail Map)
Incorporated City
HARTWELL MICA AREA
HART COUNTY, GEORGIA
LOCATION OF MICA DEPOSITS
SCALE IN MILES
0
1
2


To Hartwell 2 Mi.
8
29
To Royston
9 Mi.
Cherokee
Memorial
C. L. Lecroy
25
21.3%
24
15.5%
Woods
23
11.5%
N
22
16.7%
21
7.9%
20
12.3%
Tom Myers
16
18.6%
19
11.9%
15
15.6%
2
15.3%
9
21.9%
7
11.8%
1
13.5%
17
13.3%
3
17.5%
6
16.8%
5
26.0%
8
28.2%
11
16.8%
4
26.0%
18
23.3%
12
22.9%
10
30.3%
Woods
13
17.0%
Pasture
Pasture
14
29.8%
LEGEND
..... Limit of Pasture
⊙ 3 Auger Hole-No Schist or Biotite
○ 8 Auger Hole-All Schist
◌ 4 Auger Hole-Part Schist
⊕ 11 Auger Hole-Contains Biotite
• Dwelling
Note:
Average percent of mica in auger holes is indicated thus: 26.0%
HARTWELL MICA AREA
HART COUNTY, GEORGIA
PLAN OF AUGER HOLES
SCALE OF FEET
660
0
660