

April 6, 1984

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Willow Creek Mine and Greenhorn Claims
Madison County, Montana

After review of geologic and mine planning evaluation work done by the Exploration Department and the Mines Department from 1979 through March 1984, it is my opinion that these properties are not viable and do not warrant further work. As shown by the attached reports, the Willow Creek property lacks sufficient quantities of high-brightness talc that may be extracted economically, talc and chlorite are intimately mixed to some degree, stripping ratios are unfavorable, tremolite is present in the carbonate zone, and the apparent lack of other valuable minerals categorize this property as one in which Cyprus has no further interest. The attached report on the adjacent Greenhorn claims summarizes an evaluation in which very little talc was encountered, tremolite was again present, and no other valuable minerals were detected.

It is my recommendation that the leases on these properties be terminated.

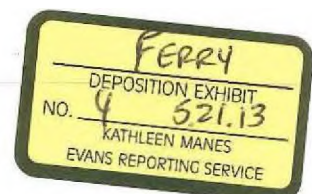
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HMH/bbi

Attachment

PLAINTIFF'S
EXHIBIT
CAM-27

Montana 0406



CPC-BCALTRSCPT00000892

WILLOW CREEK MINE EVALUATION - 1984

An in-depth study of the Willow Creek Mine has been conducted to determine its viability. This study addresses (1) the criteria of 1981 which led to the decision to not reopen the mine, (2) the viability of the mine based on today's economics and (3) the presence of tremolite within the ore body. This report is based on data derived from a continuous and thorough examination of the Willow Creek Mine which has been carried out by Cyprus Industrial Minerals Company at costs estimated at about \$100,000 since taking control of the mine.

In 1980, when evaluation of geologic and drill hole data began, the ore reserve criteria was 500,000 tons of high brightness (+85 GEB) ore. Reserve calculations made during this initial study indicated that approximately 38,000 tons of +85 GEB talc were present, thus the half-million-ton criteria was not met. No further studies by the Exploration Department were felt necessary at this time. Since the initial study, reserve criteria have changed and smaller deposits are being considered. This change, coupled with a need to document the results of the 1981 work, prompted a re-evaluation of the Willow Creek Mine early in 1984.

The re-evaluation not only considered proven reserves (reserves based on calculations from the initial study), but also considered the stripping ratio (to the 6875 level), and the presence of tremolite.

Prior Work

Prior to the acquisition of the Willow Creek Mine, the former operators, Resource Processors, conducted drilling programs in 1977 (16 drill holes) and 1978 (28 drill holes). Records indicate an investigation of the Willow Creek Mine's chlorite potential was made during 1975. Four analytical reports (dated March 13, April 11, April 21 and May 2, 1975) discussing chlorite potential are attached and conclude that the chlorite is not acceptable for ceramic use (May 2, 1975 report).

History of CIM Exploration Activities

Cyprus Mines Corporation (CIM) entered into a lease/option agreement on the Willow Creek property with Resource Processors, Inc., in May 1979. The mine is situated on four unpatented lode mining claims in Madison County, Montana.

- 1979 The Exploration and Mine Development Department began evaluation of the property by contracting for and completing an aerial survey of the property. This survey was completed by Intermountain Aerial Surveys, Inc. and a topographic map at a scale of 1" = 200' was generated as a result. In addition, Exploration Research Associates, Inc., of Los Angeles, California, geologically mapped the immediate mine area so that a drilling program could be laid out in an intelligent manner. (See ERA report dated October 8, 1979, attached.)
- 1980 During 1980, a drilling program was completed by O'Keefe Drilling Company of Butte, Montana. Thirty-four drill holes were completed for a total of 8,830 feet drilled. In addition to drilling, four to six hours of bulldozer work were necessary to prepare and provide access to drill sites. Upon completion of the drilling over 300 samples (which were collected by an on-site geologist) were split and sent to the CIM analytical lab in Los Angeles, California. All samples which were sent for analysis were subjected to three methods of analysis: X-ray diffraction, to determine mineralogy; General Electric brightness, to determine brightness at a specific frequency; and acid soluble content, to determine the amount of either calcium or dolomite that is present. The main pit area was geologically mapped with plane table and alidade at a scale of 1"=50' by Cyprus personnel and a hired consultant in August of 1980.
- 1980-81 Interpretation of all available data began once drill hole locations were surveyed and coordinates calculated and lab analysis data were received. Interpretation required at least three months to integrate information which was gathered while geologically mapping and drilling the area. The interpretative phase, at a scale of 1" = 50', resulted in the drafting of 50 cross sections and 19 level plans, and upon completion, reserve calculations were made.

The Talc Division initiated an additional drilling program in 1981 with the use of the T-4 drilling rig. The purpose of this program was to hopefully delineate and prove additional reserves of high purity/high GEB talc. Thirty holes were drilled for total footage of 7,290 feet. Data based on lab analyses of samples from five holes supported earlier findings and did not enhance the desirability of this property.

Several samples were assayed for gold and silver content and economical values were not obtained. (See attached assay report from Union Assay Office, Inc., October 31, 1981.)

- 1984 A stripping ratio, based on a preliminary pit design and 1981 reserve calculations, was calculated. The occurrence of fibrous minerals within the Willow Creek orebody was investigated.

Reserve Calculations

A professionally accepted method was used to calculate the reserves. This method is a statistical approach, and it tends to be generous. This method was acceptable for a first look at the ore body.

First the carbonate zone was planimeted and total volume calculated. The following method was used:

Example No. 1

Level	Area Ft. ²
A	100
B	200

$\frac{(\text{Avg. Area of 2 levels}) (\text{Bench Height})}{27 \text{ Ft.}^3/\text{Yd.}} \times 2.25 \text{ Tons/Yd.} = \text{Tons}$

$$1) \frac{100 \text{ Ft.}^2 + 200 \text{ Ft.}^2}{2} = 150 \text{ Ft.}^2 \quad (\text{average area of two levels})$$

$$2) \frac{(150 \text{ Ft.}^2) (25 \text{ Ft.})}{27 \text{ Ft.}^3/\text{Yd.}} \times 2.25 \text{ Tons/Yd.} = 312.5 \text{ Tons} \quad \text{carbonate for this bench}$$

The quantity (percentage) of talc present within the entire carbonate zone was then calculated. Following is the step-by-step procedure which was used to make these calculations:

- 1) The total footage of the carbonate zone (dolomite-talc-chlorite-calcite) was determined for each hole and then within this zone the total talc bearing interval was determined.
- 2) Within the talc interval, the average grade of the talc was determined.
- 3) The average grade of talc within the talc interval was multiplied times the total footage of the talc interval to obtain a "weighted footage talc" of contained talc.
- 4) The total footage of carbonate was determined for all drill holes, and this number was divided into the "weighted footage talc" (total

for all drill holes) of talc to obtain a percentage of talc within the carbonate zone.

Example No. 2

(1) Drill Hole	(2) Total Footage Carbonate	(3) Total Footage Talc Zone	(4) Avg. % of Talc Within Ore Zone	(5) Weighted Footage Talc [(3) x (4)]
1	100	50	65	32.5
2	50	25	75	18.8
Total	150	75	-	51.3

$51.3 \div 150 = 34.2\%$ contained talc within the carbonate zone.

The quantity of talc of a given GEB value was determined as follows:

- 1) The total footage of talc of a given GEB range (>85, 80-85, 75-79 and <75) for all drill holes was determined.
- 2) The total footage of a given GEB range of talc was then compared to the total footage of the talc zone (Column (3), Example No. 2), and the percentage of this grade of talc within the interval was obtained. This procedure was repeated for each grade of talc. This represents the percentage of a given grade of talc that is present within the talc zone of the ore body.

Example No. 3

Drill Hole	Total Footage +85 GEB	Total Footage 80-85 GEB	Total Footage 75-79 GEB	Total Footage <75 GEB
1	2	4	3	5
2	5	3	3	4
Total	7	7	6	9

$7 (+85) \div 75$ (Column 3, Example No. 2) = 9.3% +85 GEB within the ore zone

$(9.3\%) \times (\text{total tons of talc}) = \text{tons of +85 GEB talc}$

Reserve calculations showed that substantial quantities of high brightness talc (Table No. 1) did not exist on this property. The total mineralized zone (dolomite-talc-chlorite-talcose rock types) was calculated to be approximately 2.5 million tons, of which 772,500 tons (30.9%) was talc. Of the 772,500 tons of talc, only 37,982 tons (5.0%) was +85 GEB, and, based on these results, it was recommended by the Exploration and Mine Development Department that the property be dropped.

Stripping Ratio

In order to fully understand the viability of the Willow Creek Mine with respect to today's (1984) economics, the stripping ratio was calculated. An industry-accepted method was employed to calculate the volume of material to be removed to recover the proven talc reserves. A preliminary open pit mine was designed with an overall pit slope of 45°, and included removal of material from level 6875 (top of pit) to level 7450, a depth of 575 ft. below present pit bottom. Upon completion of the pit layout, each level was planimeted and tonnage was calculated. (See Example No. 1.)

An additional 15% of the total calculated tonnage was added to allow for safety benches, benches and haulage roads. This resulted in 21,895,580 tons of material (waste plus ore) to be removed.

Anticipating 75% recovery (based on CIM past experiences), the following stripping ratios would result:

Ore Categories	(Tons) Contained Talc	(%) Recovery	Tons of Recoverable Talc	Tons of Waste	Waste/ Ore
All Contained Talc	775,136	.75	581,352	21,314,228	37:1
+75 GEB	229,441	.75	172,081	21,723,499	126:1
+80 GEB	158,128	.75	118,596	21,776,984	184:1
+85 GEB	37,982	.75	28,487	21,867,093	768:1

Note: See attached map showing pit design.

Economic parameters used in 1981 as well as those used in 1984 show that stripping ratios of these magnitudes are out of the question for CIM to reopen and operate this mine.

Evaluation Costs

It is estimated that since 1979 CIM has invested over \$100,000 in order to evaluate this property. (See attached memo to Ralph Godeff, March 30, 1984.)

TABLE NO. 1

1981 RESERVE CALCULATIONS
 PLANIMETERED VOLUMES (MINERALIZED ZONE)

N-S Cross Sections: 2,492,200 Tons

E-W Cross Sections: 2,513,507 Tons

Level Plans: 2,514,889 Tons

Average: 2,508,532 Tons

Percent Error:

N-S vs. E-W 1.0%

E-W vs. Level Plans .1%

N-S vs. Level Plans .9%

Tonnage Breakdown:

<u>Commodity</u>	<u>Percent of Structure</u>	<u>Tonnage</u>
Talc	30.9%	775,136
Chlorite	30.6%	767,611
Dolomite/Talcose	38.5%	965,785

Tonnage by GEB (Based on Footage)

85+	=	37,982 Tons
80-84	=	120,146 Tons
75-80	=	71,313 Tons
Below 75	=	545,695 Tons

Tremolite Occurrence

Analytical data based on analysis of chip samples from the Willow Creek Mine have confirmed the presence of tremolite throughout the down dip extension of the ore body.

A detailed study of the tremolite occurrence was made in 1984 in order to determine if the tremolite was zoned and whether selective mining methods could be employed to mine the talc and not touch the tremolite. The tremolite was present in 16 holes (see Table No. 2). Each hole was looked at to determine where the tremolite occurred within it with relationship to the hanging wall, footwall, carbonate zone, and the horizontal distribution within the area. A phone call was made by R. L. Weeks to Patricia Colville (Supervisor, Minerals Characterization, Cyprus Research Lab) to confirm the laboratory data, and after additional work, Mrs. Colville verified that the specific mineral tremolite was present and is the fibrous variety. The occurrence of the mineral tremolite at the Willow Creek Mine has been noted by R. B. Berg of the Montana Bureau of Mines and Geology (Montana Bureau of Mines and Geology Memoir 45, 1979, p. 46.)

Based on the analysis of the above data, it can be concluded that the tremolite is not zoned and that selective mining methods could not be successfully employed to avoid mining tremolite. As indicated on the planview map, tremolite occurs along 80 percent of the strike length of the ore body. A detailed look at each hole containing tremolite revealed the distribution of tremolite to be random. Tremolite was found to occur within the carbonate zone, the hanging wall gneiss, footwall gneiss, at both the contact of the hanging wall gneiss and carbonate zone and the footwall gneiss and carbonate zone. Quantity of tremolite in these occurrences ranged from a trace to 20 percent.

TABLE NO. 2
TREMOLITE OCCURRENCES
IN ORILL HOLES AT WILLOW CREEK MINE

WC-3-80 (1-2%):	In F.W. and H.W. None present within carbonate zone.
WC-10-80 (trace only):	Occurs within chlorite zone, at contact of chlorite zone and talc/carbonate zone and within zone of best talc.
WC-11-80 (trace only):	Occurs within chlorite zone throughout hole. Occurs at lower contact where going from talc back to chlorite within talc zone.
WC-12-80 (less than 2%):	Within carbonate zone.
WC-13-80 (trace):	Within zone of best talc.

CP-5-80 (trace-10%): Within carbonate zone and at contact of carbonate zone and F.W. falling within both zones.

WC-5-80 (trace-1%): Within talc-chlorite zone, present within zone of best GEBs (83.6).

WC-401 (10%): Within F.W. at contact of carbonate and F.W.

WC-403 (5%): Within talc-chlorite zone.

WC-407 (1-10%): Within chlorite-talc zone, and dolomite-calcite-talc zone (not associated with F.W. or H.W.).

WC-408 (1-10%): Within H.W. and within dolomite-calcite zone.

WC-409 (trace): Within dolomite-talc zone.

WC-410 (trace-20%): Within H.W., within dolomite-talc, talc-dolomite zone.

WC-411 (trace-2%): Within talc-dolomite zone.

WC-413 (1%): Within talc-chlorite-dolomite zone.

WC-416 (1-10%): Within dolomite-calcite-talc-chlorite zone.

Graphite and Pyrite

The presence of both graphite and pyrite was noted in the talc zone in drill holes completed during 1980. The presence of both of these minerals has the effect of lowering the brightness of the talc.

Conclusions

Based on economic criteria in use by Cyprus Industrial Minerals in 1981, reserve studies indicated mining was not economic. A new look at the economics in light of CIM talc requirements in 1984 which greatly reduced the reserve criteria (a minimum of 20,000 tons of ore with a GEB of +86 and no greater than a 20:1 waste/ore ratio) showed that mining would not be economic due to high stripping ratios. Above all, the presence of the tremolite throughout the carbonate zone negates this property for consideration for mining.

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R. L. Weeks

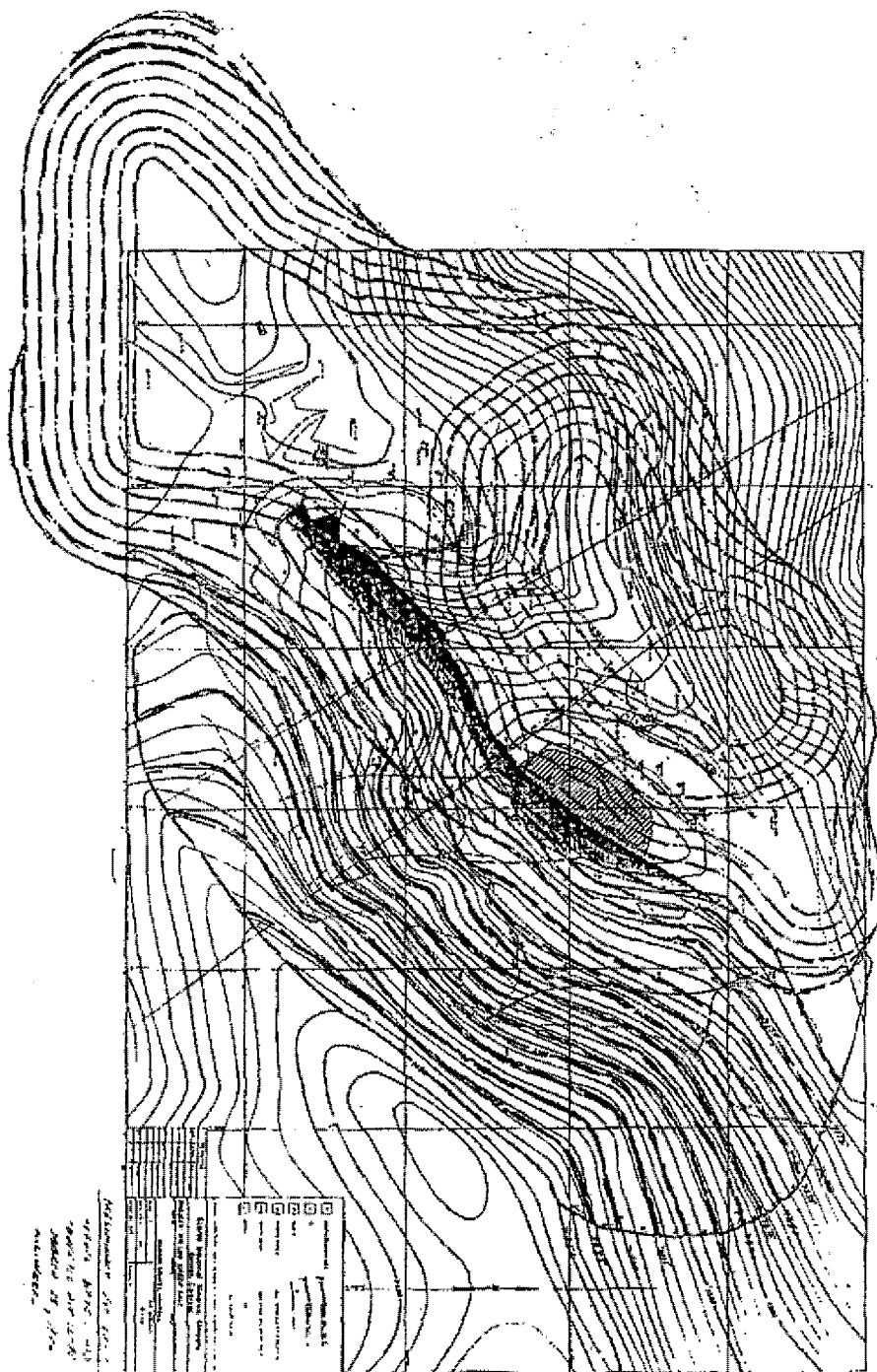
WILLOW CREEK MINE, MONTANA
1980 Drilling Summary

Drill Hole #	T.D.	Talc Interval (ft)		H.M.	F.M.	Lab Data Interval		Comments
		T.D.	F.M.			Lab Data Interval	Comments	
1 CP-6-80	212	55-67, 74-78		47		Same as Talc Interval	Trans. 74-78	
2 CP-5-80	260	140-150, 180-195, 230-240		69		Same as Talc Interval	Trans. in Carb.	
3 CP-6-80	185	119-130		65	2357	Same as Talc Interval		
4 CP-7-80	155	105-185		40	163	Same as Talc Interval		
5 CP-6-80	310	--		--	0	None	All Gr.	
6 CP-9-80	310	--		35	160	None		
7 CP-10-80	160	--		43	110	None		
8 CP-11-80	135	--		--	0	None	All Gr.	
9 CP-12-80	195	105-110, 115-150		103	155	Same as Talc Interval		
10 CP-13-80	210	145-210		156	207	Same as Talc Interval		
11 CP-14-80	265			167	210			
12 MCJ-1-80	295			50	223	None		
13 MCJ-2-80	220			18	165	None		
14 MCJ-3-80	115	30-45		18	80	None		
15 MCJ-4-80	65	None		14	40	None		
16 MCJ-5-80	287	None		50	260	None		
17 MCJ-6-80	202	None		25		None		
18 MCJ-7-80	300	185-205, 255				None		
19 MCJ-8-80	302	None				None		
20 MCJ-10-80	324	105-120 Tr.				None		
21 VE-1-80	334	297-332		287	297-332	None		
22 WC-2-80	316	283-315		283	283-315	None		
23 WC-3-80	280	233-280		233	233	None		
24 WC-4-80	240	143-240		143	268	None		
25 WC-5-80	235	170-174, 178-200, 204-210, 220-225, 212-218		170	Carb.	170-200, 204-210, 212-218, 220-235	Amph. Mostly Chlorite	
26 WC-6-80	190	152-185		150	180	None		
27 WC-7-80	300	None		--	--	None		
28 WC-8-80	402	None		--	--	None		
29 WC-9-80	185	135-178				None		
30 WC-10-80	336	170-215				None		
31 WC-11-80	245	10-13, 205-207		Collar Carb.	178	None		
32 WC-12-80	245			Collar Carb.	217	None		
33 WC-13-80	285	120-155		115	156	None		
34 WC-14-80	285	219-222				None		

1981 Drilling Summary (T-4 Holes)

Drill Hole #	T.D.	Talc Interval (ft)		H.M.	F.M.	Lab Data Interval		Comments
		T.D.	F.M.			Lab Data Interval	Comments	
35 401	228	170-175		140	170	Same as Talc Interval	10% Tremolite 170-175	
36 402	270	140-150		20	230	Same as Talc Interval		
37 403	300	115-175, 200-215		110	285	Same as Talc Interval	3% Tremolite 165-170	
38 404	250	--		237	245	None	All Gr.	
39 405	300	180-175		147	--	150-180		
40 406	300	115-125, 135-175		115	250	Same as Talc Interval	1% Tremolite 170-175	
41 407	279	155-160, 170-220		165	2957	155-160, 170-285, 295-300	Tremolite to 10% 185-190	
42 408	273	115-228		115	263	110-220	205-210	
43 409	225	135-145, 150-155, 160-194		35	220	Same as Talc Interval	1% Tremolite 185-190	
44 410	300	128-130, 145-150, 175-225, 230-250		90	235	Same as Talc Interval	Tremolite to 20% 160-175	
45 411	225	140-215		15	--	None	Tremolite to 2% 210-215	
46 412	250	160-180, 190-195, 215-255		115	250	Same as Talc Interval		
47 413	300	150-210, 215-230		105	265	Same as Talc Interval		
48 414	200	115-120, 130-150		65	150	65-80, 85-100, 115-120, 130-150	1% Tremolite 220-230	
49 415	216	155-185, 195-200		122	--	Same as Talc Interval		
50 416	250	120-180, 165-195		15	195	85-90, 100-220	Tremolite to 10% 150-155	
51 417	250	175-185, 200-210, 225-230		132	232	170-185, 200-210, 225-230	160-165	
52 418	300	165-175		134	--	165-175, 200-265		
53 419	300	160-175		103	170	Same as Talc Interval		
54 420	300	220-230, 260-270		173	--	220-240, 260-270		
55 421	185			160	--			
56 422	200	175-180, 185-195, 210-235		130	234	Same as Talc Interval		
57 423	200	115-150		70	167	Same as Talc Interval		
58 424	200	125-155		67	164	Same as Talc Interval		
59 425	110	None		58	--	None		
60 426	200	60-75, 80-85, 90-115, 125-135		26	175	None	Not assayed	
61 427	200	15-35		3	55	None	Not surveyed, not assayed	
62 428	225	160-170		72	163	None	Not surveyed, not assayed	
63 429	200	None		100	165	None	Not surveyed	
64 430	200	None		112	173	None	Not surveyed	
65 431	200	104-137		18	170	None	Not surveyed, not assayed	

Montana 0415



Montana 0416

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