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(30)
item 16

Report on Green Monster Ore

The Green Monster Mine is approximately 13 miles west of Goodsprings, Nevada, in Clark County, Nevada.

The mine is owned by the Hearst Estate and is being leased by Roy Jacobsen, who has been working the property since 1942. The property is being worked for the lead and zinc content of the ore. Mostly zinc.

The local stratigraphic section includes several hundred feet of dolomite, limestone and quartsite covered by alurial gravel and slope wash. The general strike of the area is northwest and the dip is southwest at varying angles.

In general the ore above the 400 foot level is 15 to 20 per cent zinc and 1 percent lead. Below the 400 foot level the zinc values start dropping and the lead values start increasing. In general the ore above the 400 foot level is oxidized with but small traces of sulfide lead. Nowever, below the 400 foot level the galena becomes more prominent and in one shoot as much as 10 per cent lead was reported in he form of galena.

The ore in general occurs in tabular bodies elongated to the plane of bedding. Most of the ore is a mixture of hydrozincite, calamine, smithsonite, cerrussite, anglesite and galena with traces of aurichalcite in a gangue of white dolomite.

The ore occurs as aggregates of brown to gray minerals. The brown is of course iron stain. The calamine forms firable

aggregates of acicular appearing crystals which are badly iron stained. The aurichalcite is present only in traces. Assay for copper shows as a trace.

Hydrozincite and cerussite are the most abundant ore minerals.

The ore the writer worked on was probably from below the 400 foot level. This conclusion was arrived at by comparing the mineralization and assays of the project ore with the geological reports.

The work the writer did on this ore was almost entirely devoted to developing a method for concentration and/or extraction of uranium from the ore. The lead and zinc content of the ore was noted but no work was done aimed toward the extraction of the lead and zinc minerals.

The primary uranium bearing mineral consists of kasolite which in Fords' Dana, is listed as having the following composition: $PbO-UO_3-SiO_2-H_2O$.

The other minerals of value consisted of oxidized lead and zinc minerals with a small percentage of galena, no sphalarite being noted.

The gangue consisted of dolomitic limestone. The chemical analysis of the ore is as follows:

17.8% CaO
13.6% MgO
1.9% Fe
1.36% U_3O_8
9.34% Zn
14.01% Pb
.55% Al_2O_3
.51% S
.53% SiO_2

The specific gravity of the ore is 2.9 and the Ph is 6.

No actual settling tests were run but throughout the testing no difficulties were encountered due to low settling rates and the ore appeared to settle quite rapidly.

The ore upon being received was crushed in rolls to 100 per cent minus 10 mesh. It was then mixed and sampled by coning, quartering and spliting. Approximately 1000 grams were taken for a screen analysis.

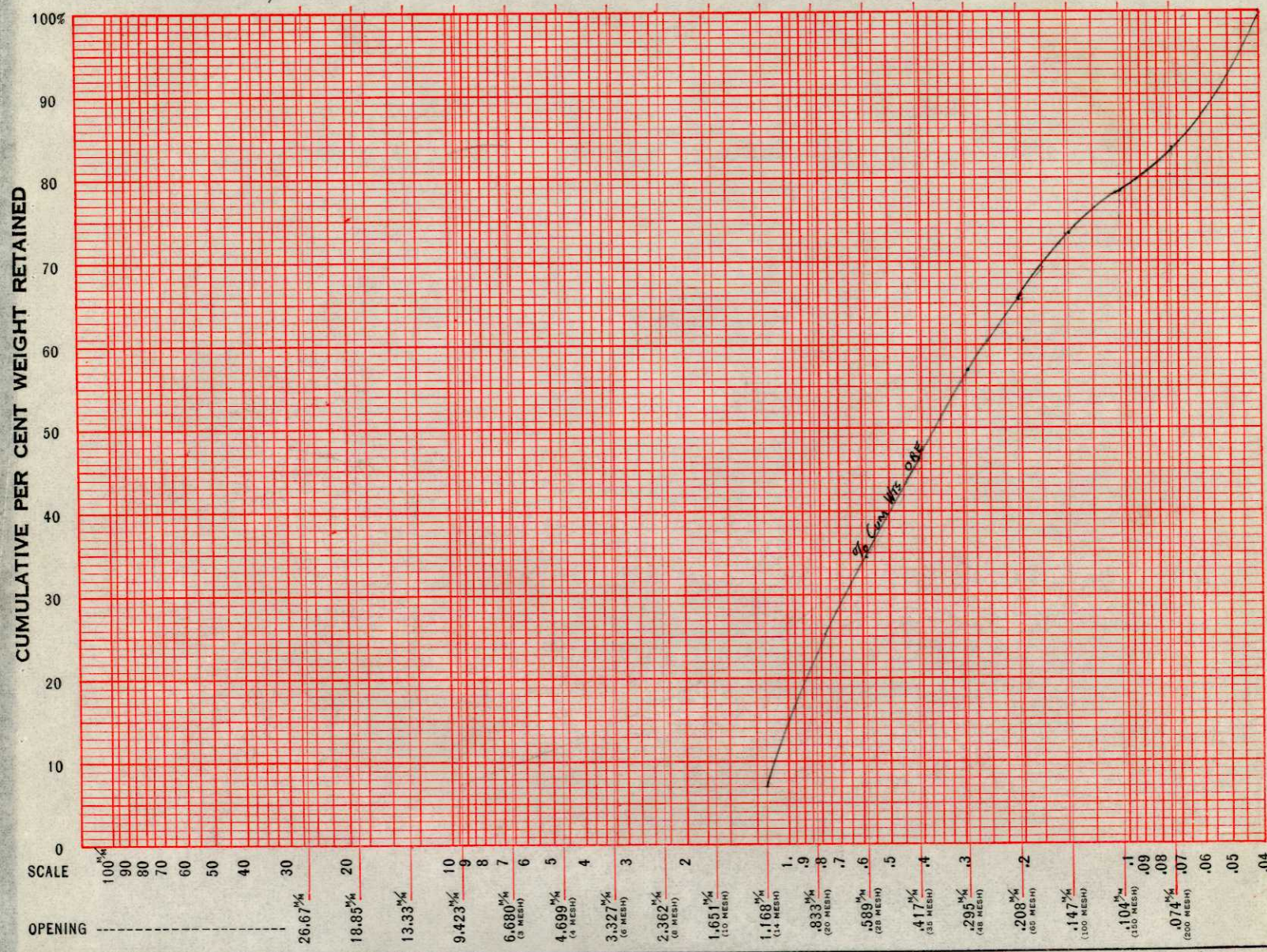
The results of the screen analysis are as follows:

The Tyler Standard Screen Scale

Form No. L-6
Please mention above when ordering

Cumulative Logarithmic Diagram of Screen Analysis on Sample of GREEN MONSTER ORE

Name GILMORE, H.R. Date SEPT '53



SCREEN SCALE RATIO 1.414

Retained on	Openings: Millimeters	Openings: Inches	Tyler Mesh	U. S. No.	Sample Weights Gms	Per Cent	Per Cent Cumulative Weights	Sample Weights	Per Cent	Per Cent Cumulative Weights	Sample Weights	Per Cent	Per Cent Cumulative Weights
	26.67	1.050											
	18.85	.742											
	13.33	.525											
	9.423	.371											
	6.680	.263	3										
	4.699	.185	4	4									
	3.327	.131	6	6									
	2.362	.093	8	8									
	1.651	.065	10	12									
"	1.168	.046	14	16	73.3	7	7						
	.833	.0328	20	20									
"	.589	.0232	28	30	288.9	27.4	34.4						
"	.417	.0164	35	40	125.6	12.0	46.4						
"	.295	.0116	48	50	111.8	10.6	57.0						
"	.208	.0082	65	70	87.0	8.3	65.3						
"	.147	.0058	100	100	83.9	7.9	73.2						
"	.104	.0041	150	140	56.5	5.3	78.5						
"	.074	.0029	200	200	55.1	5.3	83.8						
Pass THRU	.074	.0029	200	200	170.3	16.2	100.0						
				Totals,	1052.2	100.0%							

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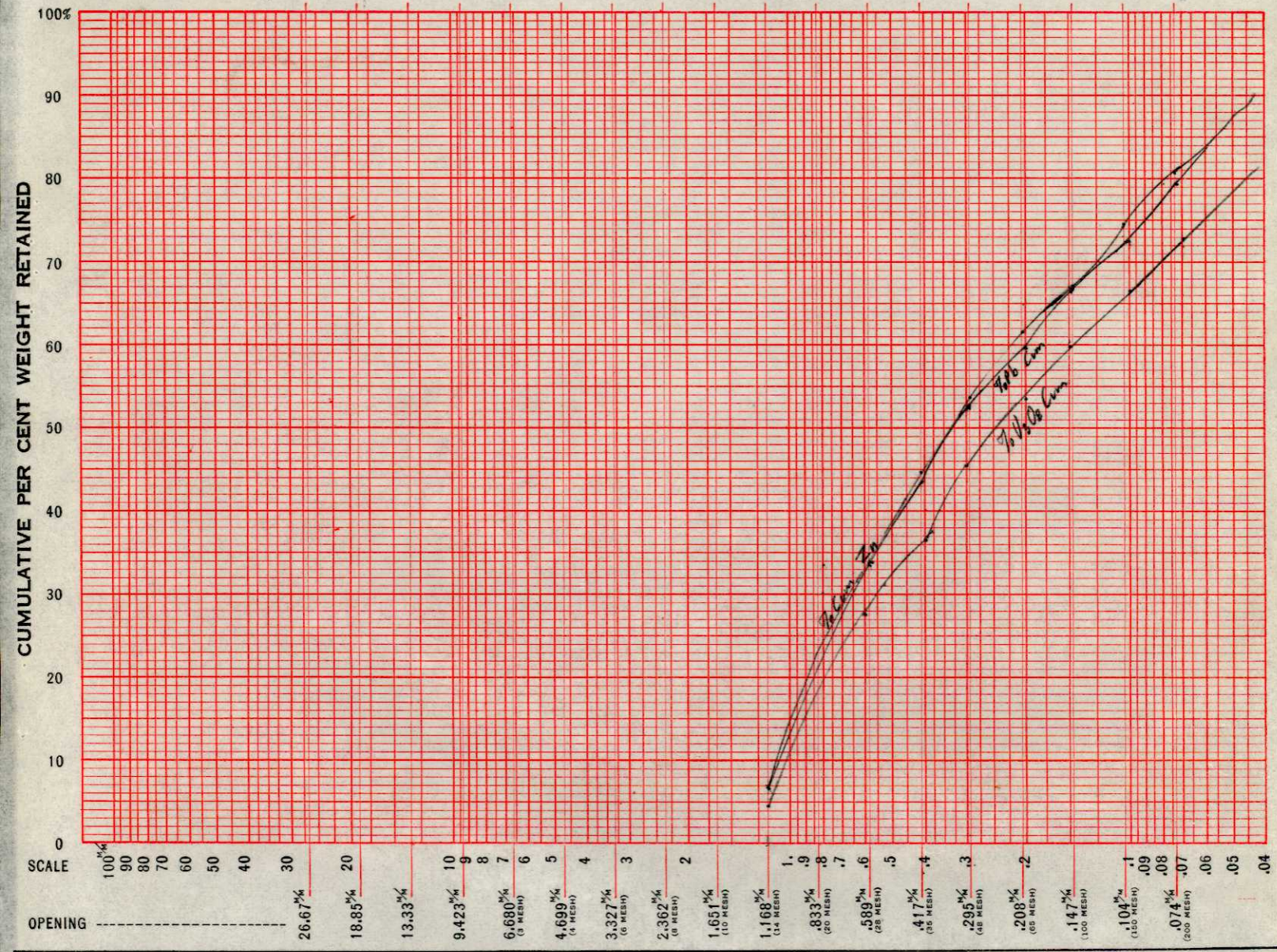
Cumulative Logarithmic Diagram of Screen Analysis on Sample of GREEN MONSTER ORE

Name GILMORE, H.R. Date SEPT '53



SCREEN SCALE RATIO 1.414

RETAINED ON	Openings: Milli-meters	Openings: Inches	Tyler Mesh	U. S. No.	Sample Weights gm Zn Head	Total Per Cent Zn	Per Cent Cumulative Weights	Sample Weights gm Pb Head	Total Per Cent Pb	Per Cent Cumulative Weights	Sample Weights gm Cu Head	Total Per Cent Cu	Per Cent Cumulative Weights
ON	26.67	1.050											
	18.85	.742											
	13.33	.525											
	9.423	.371											
	6.680	.263	3										
	4.699	.185	4	4									
	3.327	.131	6	6									
	2.362	.093	8	8									
	1.651	.065	10	12									
	1.168	.046	14	16	6.79	6.84	6.84	9.82	6.65	6.65	.643	9.64	9.64
	.833	.0328	20	20									
	.589	.0232	28	30	26.57	27.00	33.84	39.86	27%	33.65	3.120	22.6	27.24
	.417	.0164	35	40	10.67	10.85	44.69	14.31	9.7	43.35	1.240	9.00	36.24
	.295	.0116	48	50	8.83	9.00	53.69	13.30	9	52.35	1.219	8.85	45.09
	.208	.0082	65	70	7.87	7.90	61.59	10.86	7.35	59.70	1.165	8.45	53.54
	.147	.0058	100	100	7.38	7.40	68.99	10.88	7.36	67.06	.870	6.32	59.86
	.104	.0041	150	140	5.48	5.57	74.56	7.97	5.4	72.46	.876	6.37	66.23
	.074	.0029	200	200	5.90	6.24	80.80	8.60	6.74	79.20	.931	6.76	72.99
Pass THRU	.074	.0029	200	200	18.90	19.20	100.00	32.02	21.8	100.0	3.712	27.01	100.00
				Totals,	98.34	100.00	100.00	147.44	100.00	100%	13.776	100.00	100.00

These results obviously show that there is no concentration of the valuable constituents by particle size separation. If they show anything they point to the fact that the finer size range contained the largest fractions of U_3O_8. This was confirmed by a microscopic examination of the sizes which also showed that no appreciable liberation of the kasolite was achieved until the minus 200 mesh range was reached.

The results of the screen analysis seemed to point to a straight hydrometallurgical process. However, to affirm this several tests were run on the possibilities of a gravity separation being obtained. The products of these tests wee examined by microscope which showed that no appreciable separation had been achieved. Consequently, due to the involved assay for U_3O_8 and the microcopic results, assays were not run.

The next testing done was to attempt to float the dolomitic gangue, thereby concentrating the uranium in the tails. The writer would like to point out that during the preliminary testing he was searching for a trend more than a finished process. Consequently due to the time involved complete accurate metallurgical balances were not maintained. All tail sampling was done by dip sampling which yeilds accurate samples but does not lend itself to metallurgical balancing.

Due to the fine mesh of liberation a 100 per cent minus 150 mesh grind was used. This was determined to be a 15 minute grind.

The test work is as follows: (on all float tests ~~two~~ A 500 gram denver sub "A" cell was used)

15 min. grind
500 gms ore

5 min cond.
.5 lbs ton 708
Ph 9 with Na_2CO_3
20° C

Conc : 76gm U_3O_8:.82%

Tails : 1.46% U_3O_8

Froth medium heavy. No frother added.

#2

Conc : 92gms: U_3O_8:.803%

15 min. grind
500 gms ore

5 min cond
.5 lbs ton 708
Ph 9 with Na_2CO_3
70° C

Tails : 1.48% U_3O_8

Froth medium heavy. No frother added.

Since no appreciable difference was observed in floating hot against floating cold the remainder of the test work was done at room temperature or approximately 20°C.

#3

Conc 42gm U_3O_8:.795%

cleaning

15 min grind
500 gms ore

5 min cond
.5 lbs ton: 708
Ph 9

Middlings 53gms
.92% U_3O_8

Tails 1.45

Cleaning froth light and lacy; no frother added.

Rougher froth medium heavy; no frother added.

It appeared to the author at this point the floating the gangue off appeared to lead to a blind alley as even .795% U_3O_8 ore was still highgrade. Therefore the following float tests were made:.

#4

Conc 72gm 1.92% U_3O_8

15 min. grind
.5 lbs ton
do decylamine acetate
+ Na_2CO_3 to Ph_2

5 min. cond - float

Tails: 1.28% U_3O_8

Pine oil .1 lb/ton added for frother.

This test showed no results so only one more test was made. This test was avoided until the last as it was considered a "shot in the dark". A reagent 404 float was made. This produced no results either so floatation as a means of ore dressing was dropped.

If the ore had had a better mesh of liberation more test work would have been done. With mesh of liberation of minus 200 mesh and the results of the tests that had been made, the process of floating the ore did not appear to be promising.

The next test made was a sulfuric acid leach. This test was undertaken with the full knowledge that the reagent consumption would be prohibitive but, never the less, the writer felt that the testing should be done if only to prove whether or not the ore was amendable to a sulfuric acid leach.

Test:

50 gms ore to Ph of 0.9 with H_2SO_4

Added a 50% by weight concentrated H_2SO_4 solution.

Kept pulp hot in steam bath and agitated intermitantly for 24 hours.

The extraction on this test was 98 per cent of the U_3O_8.

The reagent consumption was a little over 1.5 tons of concentrated H_2SO_4 per ton of dry ore.

The process could be feasible, maybe, if sulfurous acid could be used for the major neutralization and sulfuric acid used only for the final neutralization. This, however, would call for considerable research.

No further test work was done on acid leaching other than the one preceeding test.

Several other leaching tests were conducted. Some were entered into with the prior knowledge that they probably would not work, but with no absolute knowledge that they would not work available, the tests were conducted.

One test performed was with a hot saturated brine solution made slightly acid with H_2SO_4. What was hoped for was that the Pb

present in the kasolite would go into solution and somehow take with it the U_3O_8. Some uranium actually did enter the solution but the highest extraction obtained was 19.3%.

Another test performed was with a NaCN and Na_2CO_3 solution. Since all the uranium present was theoretically in the hexavalent state the writer hoped that the uranium would complex with the cyanide and thus enter solution. However, the test work showed that the soluability of the uranium was due entirely to the Na_2CO_3 and cyanide actually reduced the soluability probably due to the fact that cyanide is a good reducing agent.

The most promising test work was done with sodium carbonate leaching. So far an extraction of 64% has been realized. Future tests will be conducted with a Na_2CO_3.leach.

The writer intends to investigate a pressure leach using Na_2CO_3 and $NaHCO_3$ plus oxidizing with air or oxygen at several atmospheres pressure.

TRY FLOATATION USING 404 WITH NaOH FOR Ph Control