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SECOND REPORT FOR MINERAL MATERIALS CO. ON A MAGNETOMETER SURVEY ON THE BUENA VISTA IRON DEPOSIT, CHURCHILL COUNTY, NEVADA.
by E. L. Stephenson (January, 1952)

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ON A MAGNETOMETER SURVEY ON THE BUENA VISTA IRON DEPOSIT
CHURCHILL COUNTY, NEVADA

By

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INTRODUCTION

This report presents and summarizes the results of magnetometer measurements made for Mineral Materials Co. on a part of the Buena Vista iron deposit, Churchill County, Nevada. The surveyed area lies mainly in the south central part of Section 4, T. 24 N., R. 34 E., in the extreme northern part of the county. The ore bodies consist of more or less irregular masses of high-grade magnetite in gabbro. The ore occurs along well-defined mineralized zones, and the localization of the magnetite probably is structurally controlled. The chief outcrops occur at the west base of a low hill. Ore now is being mined in this main outcrop area.

The magnetometer surveying was done in two stages. In July 1951, while Mineral Materials Co. was preparing to make surface installations for open pit mining, traverses were run at 100-foot intervals over the low ground lying west of the main outcrop, and shorter traverses were run across the outcrop area. The traverses formed a

grid, with the 0-point at the northwest corner of the Iron Mountain claim. The chief purpose of this work was to trace possible westerly extensions of the ore under cover, and to assure that the mine plant and buildings would not be placed over buried ore bodies. At this time, also, a magnetic base station for permanent reference was established in magnetically neutral ground well to the northwest of the mining area. A report was prepared on this earlier work, including a magnetic map, and this second report is in part a recapitulation of the first one.

In October 1951, some little time after mining had started, the shorter traverses of the first survey were extended southward, and the entire grid was extended eastward for 1000 feet, by running additional traverses at 100-foot intervals up the west slope of the hill to a point beyond the first crest or shoulder. This is a direct extension of the first survey, working from the same base value, and the entire grid is now designated as Grid No. 1. The original magnetic map has been revised and enlarged accordingly, and the new map which accompanies this second report supersedes the earlier prints. The chief purpose of the second survey was to trace the mineralized zones eastward, and to determine zones or areas of maximum mineralization, in order to guide diamond drilling for the purpose of developing additional mining locations.

All of the measurements were made with a standard Askania vertical magnetometer, having a sensitivity of approximately 30 gammas [1/] per scale division.

1/1 gamma = 0.00001 gauss, the unit of magnetic intensity. The earth's magnetic field has a total intensity of approximately 0.6 gauss, or 60,000 gammas.

GEOLOGY

The chief country rock in the Buena Vista area is classified as gabbro, and all of the known ore bodies occur in this rock. Apparently all of the gabbro contains at least small amounts of accessory magnetite, and therefore it is somewhat magnetic, but the magnetite content varies widely. Along certain areas, particularly in the vicinity of the ore bodies, much of the gabbro is heavily impregnated with grains, stringers, and small veinlets of magnetite. These large, irregularly magnetic masses of rock produce many strong, local magnetic variations, and to a large extent they account for the positive anomalous zones. These well-defined zones of magnetite enrichment, which include the commercial ore bodies, strongly suggest that the mineralization was structurally controlled and occurred much later than the intrusion of the gabbro, although, in addition, there may be two phases of the intrusive rock, one much richer in magnetite than the other.

The chief structural features in the area are normal faults, which seem to be especially numerous in the vicinity of the ore bodies. The fault pattern probably was well established prior to mineralization, but in addition the bodies are cut by numerous post-mineral faults.

The ore bodies can best be described as irregular and disconnected replacement lenses occurring along well-defined zones. Some of the larger bodies have considerable length and depth extent,

and in this sense they are somewhat tabular and vein-like, but there are pronounced and numerous variations in size both laterally and vertically. As a whole, the magnetite bodies have wide horizontal distribution and a fairly large vertical range in the gabbro. Individual bodies vary in size from small lenses of a few tons to bodies containing many thousands of tons.

MAGNETOMETER SURVEY

Plan of the survey

The general plan of the magnetometer survey is shown on the accompanying magnetic map. The 0-0 point of Grid No. 1 is the northwest corner post of the Iron Mountain patented claim, and the base line, or east-west zero line, which is the control line for the grid, runs approximately along the north side line of the claim. The base line is staked at 100-foot intervals, as are also the 6S and 10S lines, and much of the 4N line.

The 0 magnetometer traverse runs through the 0-point and also through the southwest corner of the Iron Mountain claim, on a bearing of approximately due north. Parallel traverses at 100-foot intervals extend the grid 400 feet westward and 1500 feet eastward. In general, the western traverses run 500 feet north and 1000 feet south of the base line, the central traverses run 500 feet north and 1200 feet south, and the eastern traverses run 200 feet north and 1000 feet south. Traverses 4W, 3W, and 3E run to odd distances, as shown on the map. The accompanying list of traverses gives the coordinate distances and total lengths.

On all of the lines, magnetometer stations were occupied at intervals of 50 feet. On the 3E, 4E, and 5E lines, no measurements were made in the main outcrop area, first, because of the rough, steep nature of the outcrop and the extreme magnetic variability, and, later, because of the presence of mining machinery.

LIST OF MAGNETOMETER TRAVERSES

Traverse	Coordinate distance	Total length
4W	500N - 1100S	1600'
3W	500N - 1400S	1900'
2W	500N - 1000S	1500'
1W	500N - 1000S	1500'
0	500N - 1000S	1500'
1E	500N - 1000S	1500'
2E	500N - 1000S	1500'
3E	600N - 1200S	1800'
4E	500N - 1200S	1700'
5E	500N - 1200S	1700'
6E	500N - 1200S	1700'
7E	500N - 1200S	1700'
8E	500N - 1200S	1700'
9E	500N - 1200S	1700'
10E	200N - 1200S	1400'
11E	200N - 1000S	1200'
12E	200N - 1000S	1200'
13E	200N - 1000S	1200'
14E	200N - 1000S	1200'
15E	200N - 1000S	1200'
	Total	30,400'

Results of the survey

The results of the magnetometer survey are shown in detail on the new magnetic map, which is drawn on a scale of 100 feet to the inch and contoured on an interval of 1000 gammas. In order to make the magnetic pattern clearer and to emphasize the chief anomalies and anomalous zones, the map also is colored in three colors, namely, yellow for areas of +10,000 to +15,000 gammas, orange for areas of +15,000 to +20,000 gammas, and red for areas above +20,000 gammas.

For the grid as a whole, the chief magnetic feature is a broad zone of high but variable magnetic intensity in the central part, associated with the main outcrop area. The magnetic anomalies indicate a zone of intense magnetite mineralization, within which the main masses of high-grade ore occur. On the basis of the +10,000-gamma contour, the most intensely mineralized part extends about 200 feet northwest of the main outcrop and 800 or 900 feet east of the outcrop, although the zone as a whole extends entirely across the grid and continues both easterly and westerly beyond the last traverses. West of the outcrop, as noted in the first report, the magnetic results indicate a strike of about N. 55° W. for the zone as a whole. East of the outcrop the general trend appears to be about due east, but the magnetic patterns strongly suggest offsetting along cross-faults, and local magnetic trends as well as certain outcrops suggest that the northwesterly strike may be dominant.

The main high zone is bordered on both the north and south by broad zones of low magnetic intensity, indicated in part by the hachured contour lines. The northern part of the grid is all low, except for a broad but weak positive reentrant, noted on the 4E line in the first report and map, between the 4E and 5E lines. This anomaly probably indicates a zone of minor magnetite enrichment in the gabbro. On the south, the main negative zone lies in the east-central part of the grid, directly south of the main outcrop and the eastern high anomalies. In general, the magnetic lows may be considered as border phases that are expressions of the distortion in the magnetic field, caused by the concentrations of magnetite within the positive zone. The lows do not mean a complete absence of magnetite mineralization, for masses of magnetite-rich gabbro and at least small lenses of ore occur within them in places.

Regarding the high zone west of the main outcrop, the first report stated:

"Within this zone.....there are two subparallel bands of maximum magnetic intensity. The northern band extends northwest from the outcrop area to about 100N on the 1E traverse, or a distance of about 300 feet beyond the outcrop. The southern band extends at least to the 0-point on the 1W traverse, or a distance of about 400 feet beyond the outcrop. In general, then, the magnetic readings show the presence of a highly mineralized zone about 350 feet wide, extending somewhat beyond the northwest corner of the

Iron Mountain claim. Although not all of the rock in this broad zone can be considered to be ore, of course, the strength of the readings and the sharpness of the magnetic borders strongly suggest that substantial amounts of ore occur in this area."

This arbitrarily sets the +5000-gamma contour as the boundary of the mineralized zone, and this contour also was chosen, as an arbitrary working limit, to outline the area that should be kept free of permanent surface installations.

Diamond drilling, done in the vicinity of the main outcrop since the first magnetic survey, suggests that the chief near-surface commercial ore is likely to lie within the +10,000-gamma contour or even the +15,000-gamma contour. It again is strongly emphasized, however, that not all of the material within these arbitrary boundaries is ore, and, on the other hand, that parts of the main bodies, as well as smaller masses of ore, occur outside of these boundaries. Ore also may occur at depth under some of the broad but low positive anomalies. It remains probable that substantial amounts of commercial ore occur at fairly shallow depths west of the main outcrop, and additional drilling will be necessary to adequately test the potentialities of the magnetic zone.

East of the main outcrop, the anomalous zone contains two main bands of very high magnetic intensity. One of these extends directly from the outcrop area eastward through the 8E line, centering a little south of the 2500 coordinate line, and having a more

southeasterly trend in the eastern part. The other band runs somewhat south of east from 200S on the 10E line to 300S on the 13E line. The anomaly is strongest on the 10E, 12E, and 13E lines. Outcrops near the crest of the hill suggest that the anomaly may be due to a series of fairly large magnetite lenses, occurring in an en echelon pattern. The areal relationships of these two main bands, and the presence of strong negative reentrants on the 8E, 9E, and 10E lines, suggest that they may be parts of a single body that has been cut and displaced northward on the east by a cross-fault.

North of the east end of the east band there is another high peak, centering at 200S on the 13E line, which essentially is a part of the main positive anomaly on this line. This north peak is associated with a rather large outcrop of magnetite that occupies the southwest peak of the hill and extends in a northwesterly direction nearly to the 12E line. The magnetic anomaly also extends to the 14E line, and the relationships suggest a band of ore lying parallel to the larger southern band. The two bands might be segments of the same body, displaced along a strike fault.

Two other prominent positive anomalies occur on the borders of the main high zone. One of these, lying at 450S between the 3E and 5E lines, marks the south ore band of the main outcrop. It has been partly tested by U.S.B.M. diamond drill hole No. 3 and by certain holes drilled by Mineral Materials Co., and it is now being mined. The magnetic results show that this band of ore cuts off or tapers

out between the 5E and 6E lines on the east. On the west it may be continuous with the sharp peak at 350S on the 2E line, but at the best it does not extend very far west of this line.

The other strong positive anomaly occurs on the base line, mainly between the 6E and 7E lines, but extending with diminished magnetic strength westward as far as the 5E line and southeastward possibly to 100S on the 8E line. The peak of the anomaly exceeds 14,000 gammas on the 6E line and 24,000 gammas on the 7E line. Its strength and character indicate a band of magnetite, probably of ore grade, underlying the low ridge immediately north and east of the present mining area. The sharpness of the anomaly indicates that the top of the body is at fairly shallow depth, and its shape suggests a vertical or very steep south dip.

The main anomalous zone also shows certain other minor sharp peaks, as at 550S on the 10E and 11E lines, 400S on the 11E line, and 450S and 650S on the 13E line. These most likely represent small lenses of magnetite of short strike length and probably of very limited depth extent.

The two main bands of high magnetic intensity and the associated anomalies mark the localities within the grid most favorable for the development of additional commercial ore. Outcrops, and the sharpness of the anomalies, show that the tops of the bodies are at or near the surface. The slight asymetry of the magnetic curves suggests that the main mineralized zone as a whole dips steeply southward, and the larger individual bodies probably do likewise.

In the southern part of the grid the magnetic data show two narrow positive zones that are more or less parallel to the main anomalous zone and that are separated from each other by a narrow band of negative anomalies. The first report noted a sharp and fairly strong positive anomaly centering at 350S on the 0 traverse, and suggested that it might "mark a branching offshoot or faulted segment of the main southern ore zone". The report also noted that "the southern ends of the 1E and 2E traverses show quite strong anomalies that may represent the western end of a more intensely mineralized zone". It now appears that these two centers mark the western ends of the positive zones, which extend to the east and south beyond the limits of Grid No. 1. The positive anomalies probably mark structurally controlled zones of magnetite mineralization, similar to the main anomalous zone, although it now seems doubtful that the zones contain bodies of a size and grade to constitute commercial ore. The strongest anomalies occur in the northern zone at the east edge of the grid, centering at 800S and 950S on the 15E line. If further work is done in the Buena Vista area, it may be well to trace these zones farther to the east.

RECOMMENDATIONS

The next main step in the development of the area included in Grid No. 1 will be diamond drilling, which is now in progress. In all instances, such drilling should be carried well ahead of actual mining work, in order to best plan the development of the pits, with regard to ore supply, stripping limits, access roads, and waste disposal. In a number of places the drilling probably can be supplemented to advantage by bulldozer trenching. The drilling and related phases of the development program may be divided into two parts, (1) testing of areas for immediate additional pit operations, to provide a larger, more varied, and more flexible source of ore, and (2) testing of areas to be fitted into a longer range program.

It should be noted that, for the deposit as a whole, both the magnetic data and the available geologic data indicate extensive faulting and rather extreme variability of the ore bodies and zones. Further, even in the more favorable zones, much of the material may be of submarginal grade, consisting of magnetite-rich gabbro and small lenses and bands of ore. As a result, a relatively large amount of drilling and other testing probably will be required for satisfactory planning of the mining operations. In general, it would seem best to avoid any large amount of deep drilling, other than to establish the dips and general nature of the main zones at depth, and to tie most of the drilling rather closely to the actual pit operations.

For immediate additional development, in particular to tie in with the present pit operations, the bands of high magnetic intensity

in the central and eastern parts of the main anomalous zone are most favorable. The magnetite concentrations indicated by the magnetic anomalies begin at or near the surface on the west slope and crest of the hill directly east of the main outcrop area. The magnetic data indicate a very considerable depth extent for the zone as a whole, but the depth extent and grade of individual lenses or bands of ore must be determined by drilling. A long, almost horizontal hole is being drilled into the hill on the 11E line, the collar being at 11E-5S. This will provide a good long-range test of the eastern part of the main zone at depth. For more immediate development, the bands of high magnetic intensity can best be tested in relatively shallow steps, by means of short inclined holes drilled from the south. In addition to the two main bands, such tests should include the ore outcrop and strong anomaly on the peak of the hill between 12E and 14E. Certain locations for this type of drilling were made in the field in December 1951. In the absence of a topographic or geologic map, additional locations also should be made in the field. In general, this drilling will be from the south, but exact bearings and angles of inclination will have to be determined on the basis of the topography, the relationships between outcrops and magnetic anomalies, the depths at which it is desired to cut the mineralized bands, and the results of any previous drilling.

In conjunction with this drilling it probably would be well to cut a series of long bulldozer trenches across the main zone, for purposes of sampling and more complete geologic mapping. Such work would test the nature and grade of the material immediately beneath the main anomalies, and would aid in planning the drill holes.

Fairly early in the drilling program, also, it would be well to test the north anomaly on the base line between 6E and 7E, especially because of its proximity to the present mining area. Additional ore might be developed here at fairly shallow depth, and pit plans and stripping limits might need to be modified accordingly. The tests can best be made by drilling inclined holes from the south, near the bottom of the little gulch. The locations and angles of the holes should be planned to cut the axis of the anomaly at a depth of at least 50 feet below the top of the ridge.

For longer range development of the main zone, at least a few additional holes should be drilled west of the main outcrop area. At the close of field work in October, four holes were recommended and located in the field, as follows:

Hole	Coordinates	Bearing	Angle
1	100E-125S	-	Vert.
2	200E-420S	N. 35° E.	-35°
3	200E-250S	N. 35° E.	-35°
4	100E-0	N. 35° E.	-40°

Of these, only Hole No. 1, designated as M.M.C. Hole No. 4, so far has been drilled, to a depth of 51 feet. This hole did not encounter ore, showing either that no ore underlies the flank of the anomaly or that it lies at a depth greater than 51 feet. Depth calculations indicate that the second alternative may be the correct one. In any event, the results of this hole suggest that in general it will be best to drill inclined holes.

The other locations, bearings, and angles remain suitable

for shallow tests of the zone. Location No. 2 will test a possible westerly extension of the main south ore band, No. 3 will test the central part of the zone immediately west of the outcrop, and No. 4 will provide a shallow test of the north border near the end of the anomalous zone. The latter hole is planned tentatively as a limiting hole, and it may not encounter ore. The location can be moved southeastward and the angle can be increased if desired.

At a later date it also may be desirable to test some of the outlying anomalies. Aside from the southeast corner of the grid, where an extension of the magnetic survey may be desirable, the three most favorable locations are marked by the anomalies that center at 350S on the 0 line, 850S on the 3E line, and 1000S on the 7E line. These anomalies can best be tested by inclined holes drilled from the south on a northeasterly bearing. The anomalies may be caused entirely by magnetite impregnations in the gabbro, of submarginal grade, but they cannot be fully evaluated until a few test holes have been drilled.

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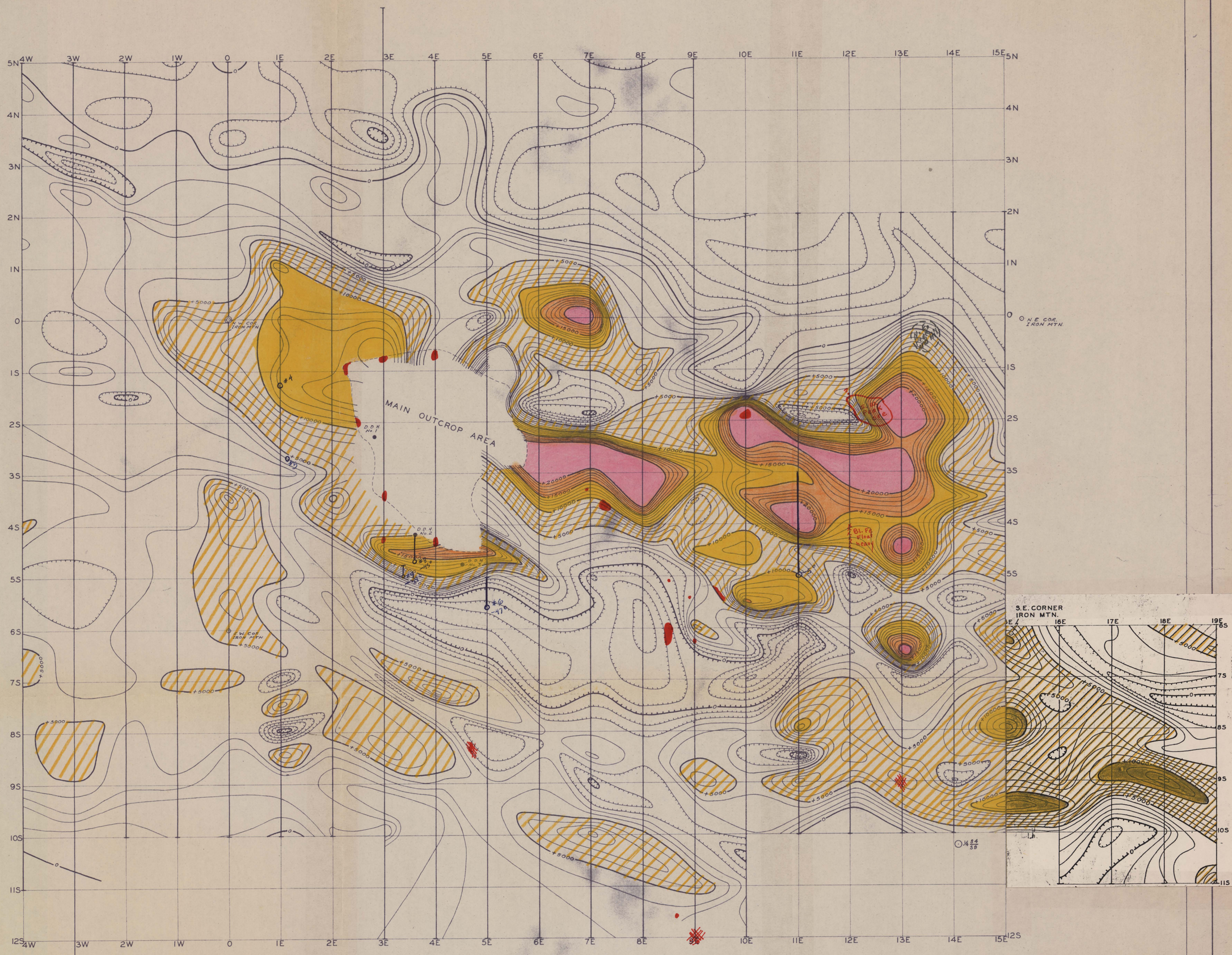
MINERAL MATERIALS CO.



MAGNETIC MAP OF GRID NO. 1, BUENA VISTA IRON DEPOSIT, T. 24 N., R. 34 E., CHURCHILL COUNTY, NEVADA

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