93
Item 1

See map files
- 2 maps

REPORT FOR MINERALS CONCENTRATING CO.
ON MAGNETOMETER SURVEYS ON THE AJA IRON PROPERTIES
ESMERALDA COUNTY, NEVADA

By

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Contents

Illustrations

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INTRODUCTION

In the period November 7-10, 1961, the writer made a series of magnetometer surveys for Minerals Concentrating Co. on parts of the AJA iron properties, Esmeralda County, Nevada. Mr. R. B. Records represented the Company in the field and assisted in making the surveys. The magnetic measurements were made with an Askania vertical magnetometer having a sensitivity of 50 gammas per scale division. The purpose was to determine whether economic amounts of magnetite iron ore might be present in certain areas showing surface indications of iron mineralization, and to make preliminary estimates of possible tonnages.

The two properties are situated in southern Esmeralda County and are reached from the north via Coaldale Junction and State Highway 3A. One, located on the west slope of the Silver Peak Range, is referred to as the "North End" property, and the other, located high in the Palmetto Mountains, is here designated the "South" property.

One of two areas surveyed on the South property shows magnetic indications of magnetite of probable economic grade and tonnage. The other area shows rather extensive mineralization but may not contain material that would be feasible to mine. Measurements on the North End property showed no indications of economic mineralization.

SOUTH PROPERTY

Location

The South property is at an altitude of about 8,200 feet on or near the crest of the Palmetto Mountains, which form a southeasterly extension of the Silver Peak Range. The locality, which is in either the south part of T. 4 S., R. 39 E. or the north part of T. 5 S., R. 39 E., M.D.B.M., is reached via a mountain road leading northward from State Highway 3 west of Lida. No map of the claims is available.

A total of 18 magnetometer traverses were run on the South property, in two groups. A grid of 15 traverses was surveyed on the AJA No. 4 and AJA No. 9 claims a few hundred feet northeast of the point where the main access road reaches the crest of the central ridge. This locality is here designated the "main south area". Three traverses were run along a broad saddle some 2,000 feet to the northwest on the Jim Dandy No. 4 claim, where outcrops and a prospect pit show iron mineralization. This locality is here designated the "saddle area".

Geology

For the purposes and extent of the present magnetic surveys no detailed geologic studies or mapping were necessary. The chief rocks are Paleozoic sedimentary and metamorphic rocks, and granitic intrusive rocks that presumably are of Jurassic or Cretaceous age. The latter rocks occur west and north of the present surveyed areas

but were not noted in the immediate vicinity of the traverses, although certain nearly white, fine-grained rocks in the mineralized zones may be dikes related to the main intrusion.

In the saddle area the magnetite apparently occurs as partial replacements of highly altered dark limestone, or possibly as one of the minerals in zones of tactite associated with dikes. Much of the main south area is covered by shallow overburden, but float and scattered outcrops indicate the presence of quartzite, cherty argillite, impure limestone, and fine-grained white dike (?) rock. The magnetite presumably occurs as replacement bodies or short irregular veins in the limy members. In places it is closely associated with granular siliceous rocks containing abundant fine garnet, again suggesting tactitic alteration.

Main south area

Plan of survey. The results of the magnetometer measurements in the main south area are shown on the accompanying magnetic map (in pocket), on a scale of 50 feet to the inch and a contour interval of 2,000 gammas. The survey took the form of a grid, with traverse 5 serving as the base line and with the other traverses running normal to it, as shown on the map. Most of the magnetic measurements were made at 25-foot intervals along the traverse lines, but a 50-foot interval was used in parts of the border areas.

The grid lies on the lower west slope of a high ridge, the crest of which is a considerable distance to the east. At the north

end traverse 6 runs along a high bench formed by a narrow low spur of the main ridge, and to the north the ground drops away steeply. The 4S end of traverse 5, the 0-point of traverse 4, and the west part of traverse 7 are on the central ridge that leads northwestward to the mineralized saddle area.

The map also shows the positions of four claim posts, thus tying the grid to the claims, and the approximate location of the dozer road to aid in field identification. All of the traverses are staked with marked laths at the 0-points on the base line and at the end points. Because of slope variations and other possible deviations, all development locations should be determined by direct measurements from the nearest stakes.

Magnetic findings. The magnetic contours outline a general anomalous zone about 700 to 1,000 feet wide and about 1,400 feet long, that trends roughly N. 20° W. along the lower west slope of the main ridge. Within this general zone there are numerous sharp magnetic breaks and narrow positive and negative anomalies indicative of near-surface magnetite mineralization. High-grade magnetite float is found in the central part of the grid, and outcrops of high-grade magnetite occur on the high bench at the north end in the vicinity of the central part of traverse 6. Thus it appears that the main bodies are at or near the rock surface beneath only a shallow cover of overburden.

Over most of its length, except at the extreme south end, the general anomalous zone is separated into two irregular belts of positive magnetic intensity by an irregular belt of low or negative

intensity that extends northwestward through the central part of the grid. On the south this low belt terminates in a strong negative anomaly centering at the 150N point of traverse 5, and the two positive belts coalesce and terminate just to the south. On the north the eastern positive belt terminates abruptly in a strong negative anomaly just north of the 0-point of traverse 6. The north part of the western positive belt has a distinct northwesterly trend and is not definitely closed off by the present survey, although the positive anomaly narrows on the west part of traverse 13.

Within the general mineralized zone there are four strong or moderately strong positive anomalies of possible economic importance, three in the eastern positive belt and one in the western belt. They indicate centers or zones of relative maximum magnetite concentration, although no magnetic anomaly can be strictly interpreted in terms of exact grade. The sharpness of the anomalies indicates that the tops of the bodies are at or near the surface.

The largest and strongest positive anomaly, here referred to as the central anomaly, is in the central part of the grid, where it extends diagonally across the base line along a northwesterly trend. It has a rather large area within the 10,000-gamma closure and shows peaks above 20,000 gammas at 25W on traverse 16 and at 50E on traverse 17, and a peak above 30,000 gammas at 25E on traverse 8. The anomaly indicates a body of probable high grade that appears to have the form of a narrow, irregular, elongate lens or short, irregular vein. The magnetic curves further indicate an apex

close to the surface, a possible steep westerly dip, and a considerable depth extent.

Closely related to the central anomaly magnetically and spacially is another, here called the east anomaly, that lies close to the east edge of the general anomalous zone. It is broad on the north, where traverse 16 shows double peaks above 8,000 gammas, and it has a strong peak above 18,000 gammas at 175E on traverse 8. The magnetic intensity drops off abruptly on the south, although minor peaks mark a southerly extension through traverses 17 and 10. A closely related peak above 10,000 gammas occurs at 125E on traverse 10. The anomaly probably marks an irregular center of mineralization in which the grade of material generally may be rather low, but which includes at least one short lens or pod of higher grade. The curves do not indicate a shallow bottom for the zone as a whole, although the higher grade pod may not extend very far down dip.

A third positive anomaly, here called the north anomaly, occurs at the north end of the grid, mainly in the area between traverses 14 and 6. It somewhat resembles the east anomaly in that it shows a fairly large area of moderate magnetic intensity and much smaller areas of higher intensity. It includes a narrow peak above 14,000 gammas at the 0-point of traverse 13 and a larger peak of about 20,000 gammas at the 675N point of traverse 5, which are separated by a sharp negative reversal at the 650N point of traverse 5. This reversal may be more pronounced than is indicated by the present magnetic contours, to the extent that the positive anomaly might not be a single unit at the higher magnetic values. The surrounding large

negative anomaly suggests that at least the higher grade material may not extend to much depth. This high bench area shows erratic small outcrops of high-grade magnetite, but it is probable that the north zone as a whole is of considerably lower grade.

The fourth main positive anomaly, here called the northwest anomaly, is an elongate one of northwesterly trend in the northwest part of the grid. It shows a narrow peak above 12,000 gammas at the 125W point of traverse 12, but the entire 10,000-gamma closure is small. The 8,000-gamma closure is considerably wider and has a strike length of about 170 feet. The anomaly appears to indicate a vein-like concentration of magnetite that may not be of very high grade for the most part. The dip appears to be nearly vertical or perhaps steeply to the southwest, and there is no magnetic indication of a shallow bottom.

The nature and trend of the northwest anomaly and the central anomaly suggest that the underlying bodies of magnetite may be closely related structurally. Both may have been formed along a steep main fault or shear zone of northwesterly strike, and this structure may have been the chief path of access for the mineralizing solutions. Such a structure and its attendant mineralization might continue beyond the limits of the present grid, and additional magnetic measurements would be required both to the southeast and the northwest to determine whether extensions of this postulated structure are present.

The scattered weaker and mainly smaller positive anomalies, most of them in the range of 4,000 to 7,000 or 8,000 gammas, and such broader weak anomalies as that on the west part of traverse 8, indi-

cate the presence of abnormal amounts of magnetite, but it is not likely that much if any of the underlying material is of mineable grade. Locally, such areas might furnish small amounts of concentrating ore to a magnetic separator if they were opened in the general course of mining operations.

Preliminary tonnage estimates. As already noted, the magnetic readings do not provide any specific determinations of grade, nor do they determine the exact boundaries of a magnetic body. Further, economically, the boundaries of an ore body often are not natural walls but are a function of the grade and type of material that it is desirable to mine. Therefore, in making preliminary tonnage estimates based upon the magnetic findings alone, arbitrary boundaries must be selected that at best provide only a probable range of tonnage values. The following preliminary estimates are based upon planimeter determinations of the areas within certain magnetic closures, assuming vertical walls and a factor of 10 cubic feet per ton.

On the basis of the 10,000-gamma closure, the body underlying the central magnetic anomaly would contain about 550 tons of ore per foot of depth, or a total of 55,000 tons to a depth of 100 feet below the top of the body. This figure probably represents a maximum for this anomaly, at least so far as high-grade direct-shipping ore is concerned, and the recoverable amount of such material may be considerably less. On the other hand, the anomaly easily might represent this much or more mineable material if magnetic separation methods could be applied successfully. In any event, it seems certain that the central anomaly represents the heart of the deposit as now

mapped, both geologically and economically, and that the success of any mining operation depends upon it to a very considerable extent.

The east anomaly, on the basis of the 10,000-gamma closure alone, represents about 200 tons per foot of depth. The assumed pod of higher grade material underlying the main peak on traverse 8 might not be expected to extend farther down dip than its strike length, or some 50 to 75 feet, and on this basis it might contain 10,000 to 15,000 tons. The east anomaly as a whole, however, particularly in the area between traverses 8 and 16, may denote a considerably larger tonnage of beneficiating ore.

Tonnage estimates for the north anomaly will vary rather widely depending upon which of the higher magnetic values is used and what depth extent is assumed. As already suggested on page 7, the outcrops and the magnetic findings seem to indicate that the higher grade laterial is erratic, that it may not extend very far down dip, and that the zone as a whole may contain mainly lower grade ore. The 8,000-gamma closure, which cannot be considered a high magnetic value, represents about 200 tons per foot of depth, or 10,000 tons to a depth of 50 feet, whereas the two 10,000-gamma closures represent about 100 tons per foot, or 5,000 tons to a depth of 50 feet. Thus it seems best to assume that the north zone will not produce more than 5,000 to 10,000 tons of high-grade ore, although the zone as a whole might yield a considerably higher tonnage if the material can be beneficiated successfully.

The northwest anomaly, on the basis of the 8,000-gamma closure, denotes a zone containing about 350 tons per foot of depth, or 35,000 tons to a depth of 100 feet. In view of the relatively low values of the magnetic peaks, little or none of this material may be of direct-shipping grade, but the zone may constitute a sizable reserve of beneficiating ore.

In summary, then, assuming cleanly tabular bodies, no intermixed waste, and full mining recovery, the central, east, and north zones might yield 70,000 to 80,000 tons of higher grade ore. Actually, it is probable that the bodies are tapering pods or lenses, that they do contain intermixed waste or lower grade material, and that because of their small size and irregularity dilution will occur in mining, so that until stripping or drilling provide more information on size, shape, and grade it would be well to assume that the actual yield might be half of the above figures, or 35,000 to 40,000 tons of possible direct-shipping ore to a depth of 100 feet. The four main zones together, or the mineralized zone as a whole, ultimately might yield a much higher tonnage of ore, depending upon the type and grade of material that can be beneficiated by magnetic separation.

Saddle area

Plan of survey. The plan and results of the survey in the saddle area are shown on the accompanying sheet of magnetic profiles (in pocket). The control point of the survey, or the 0-point of traverse 1, is the location post of the Jim Dandy No. 4 claim on the northeast side of the saddle. From this point traverse 1, 1,000 feet long, runs along the middle of the saddle and thence diagonally down the steep slope of the hill to the southwest. Traverses 2 and 3 cross the upper parts of the saddle area at no great distance vertically below traverse 1.

Most of the magnetic measurements were made at 25-foot intervals along the traverses, but a 50-foot interval was used along the northeast 200 feet of each line, where the magnetic intensity is uniformly neutral. Two 12.5-foot intermediate measurements were made on traverse 3 between 550S and 600S, where a sharp negative reversal occurs, to determine more closely the exact widths of the peaks.

Magnetic findings. Except in the smooth border area on the northeast, the magnetic profiles are very irregular, showing many closely spaced positive and negative peaks within a broad zone in which the average magnetic intensity is somewhat above normal. The individual peaks are narrow, and at least some of them would be still narrower if measurements were made at shorter intervals, as illustrated by the intermediate measurements near the west end of traverse 3. In addition to being narrow the positive peaks in general are not strong magnetically, and there is no readily apparent magnetic correlation between traverses. The strong negative anomalies on traverses 2 and 3

suggest that the total thickness or depth extent of mineralized material may be small, in other words, that a bottom is close by.

The above magnetic findings indicate that in the saddle area there is a broad, probably shallow zone of mineralization containing mainly small, erratic, low-grade concentrations of magnetite. The outcrops seem to indicate that the magnetite occurs as irregular partial replacements in altered dark limestone, or that the occurrence may be essentially a zone of tactite in which magnetite is one of the secondary minerals. Certainly some of the outcropping rock is a mixture of magnetite, garnet, and green secondary minerals. Thus it appears that the saddle area contains little or no mineable high-grade iron ore, although the mineralized zone might yield a small amount of feed for a magnetic separator.

NORTH END PROPERTY

The North End property is located in a canyon on the west slope of the central part of the Silver Peak Range, reportedly in T. 3 S., R. 37 E., M.D.B.M. Here small pods or lenses of magnetite and varying amounts of limonite occur in a contact zone between Paleozoic limestone and a light-colored granitic intrusive rock. A considerable amount of dozer stripping and trenching across the contact zone has revealed only minor iron mineralization.

Two magnetometer traverses 200 feet apart were run across the contact zone near the bottom of the canyon, the second line crossing the contact near a prospect pit that shows a small pod of magnetite. The first line was 500 feet long, the second line was 300 feet long, and measurements were made at 50-foot intervals on the lines.

The first line is entirely neutral magnetically and shows definitely that no appreciable amount of magnetite is present. The second line shows a very slight magnetic peak in the vicinity of the prospect pit, but it also indicates that no economic amount of magnetite iron ore is present either near the surface or at depth. No further development work is justified in that part of the contact zone covered by the magnetometer traverses.

RECOMMENDATIONS

No general recommendation regarding further development of the AJA properties by Minerals Concentrating Co. is made here, because the writer does not have at hand sufficient engineering and economic information to form a judgment as to the economic feasibility of a mining program in this locality. Whereas the North End property definitely does not appear to warrant any further work, it is assumed that further testing and development work will be undertaken on the South property.

On this basis it is suggested that dozer trenching or drilling, or both, be undertaken in the main south area of the South property, to obtain more specific information on the size, grade, form, and general nature of the magnetic material underlying the four main positive anomalies. As the overburden almost certainly is thin over most of the area, dozer trenching would be the cheapest and quickest means of obtaining additional information. Trenches should be planned to expose the bedrock completely across the mineralized zones indicated by the anomalies, after which further stripping can be done along the strike if it seems advisable.

If the dozer trenching yields favorable results it probably would be well to follow with drilling, as an aid to proper planning of mining operations. This might be done either by wagon drill or diamond drill, preferably the latter. Until more is known as to the shapes and altitudes of the bodies at depth, it is recommended that the first holes be vertical ones located on or near the magnetic

peaks. Later, inclined holes might be drilled to determine the true thicknesses of the supposedly lenticular or tabular bodies and to develop geologic sections for pit and mining purposes. Locations for both the trenches and the drill holes should be made by measurements from the nearest marked traverse stakes.

As there is a distinct possibility that the main northwest-trending mineralized zone postulated herein may extend northwestward or southeastward, or both, beyond the limits of the present grid, it would seem advisable to make additional magnetic tests in these localities. Such work preferably should be done in advance of the trenching or drilling, or at least while these operations are in progress.

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