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MEMORANDUM REPORT

on

A MAGNETOMETER SURVEY OF DENNY'S GULCH AND SAWLOG CREEK IN THE KOYUKUK-CHANDALAR REGION, ALASKA

to

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Commissioner of Mines

by

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INTRODUCTION

During the period of August 15 to September 4, 1951, the writer made a geophysical magnetic survey of Denny's Gulch and Sawlog Creek, two closely adjacent streams between the Koyukuk and Chandalar Districts. The survey was requested by the locators of placer claims on the two creeks, Dennis O'Keefe and Ernest Wolff, and was approved by the then Commissioner of Mines, Leo H. Saarela. The purpose of the survey was to attempt to trace the locations of the probable placer paystreaks on the two creeks in order to reduce future prospecting in barren areas. The instrument used in the survey was a Schmidt-type vertical magnetometer owned by the Department of Mines. Ernest Wolff assisted the writer in the work.

SUMMARY

The country rock of the area under investigation is mostly a micaceous-quartz-schist, and evidence of both acidic and basic intrusions are present. The placer geology is not clear because of slides and slide material mixed with the sediments. No paystreak had been struck at the time of the survey, but the geology and mineralization make it seem likely that one does exist. Native iron is present, which made it appear that the paystreak would be sufficiently magnetic for a successful magnetometer survey, but the apparently magnetic bedrock covered up any magnetic

fields that the placer concentration may have caused.

From a study of the profiles, it is thought that in some of the traverses, the lowest anomalies indicate the deepest part of the channel. This is not true in all cases. It is believed that when more prospecting has been accomplished, and the resulting increased geological information is studied concurrently with the results of this survey, facts will be discovered that will be of benefit to subsequent operations.

Several extremely high anomalies were observed which indicate subsurface magnetic bodies. The magnetic mineral or minerals causing these ultra-high readings were not determined.

ACKNOWLEDGMENT

Acknowledgment and appreciation are due Denny O'Keefe and Ernest Wolff for their unsurpassed hospitality to the writer during his stay on their property. The writer also wished to acknowledge the valuable assistance of Ernest Wolff in the performance of the survey. This help contributed very much toward the ease, speed, and accuracy of the work.

LOCATION

It was requested by Mr. O'Keefe that the exact location of his creek be kept confidential until he accomplishes further exploration work. When he decides that the location may be divulged, it will be appended to this report. The general location is in the vicinity of Twin Lakes, which are at the head of the South Fork of the Koyukuk River and also about fifteen miles east

of Big Lake. Approximate geographical coordinates are 149° 00' W Longitude and 67° 30' N Latitude. There is no vicinity map included with this report, for no mapping by any agency has been done of this region and a vicinity map would be largely guess-work at this time.

Denny's Gulch and Sawlog Creek are accessible by air and foot only. Float plane and ski plane landings may be made in the appropriate seasons on Twin Lakes or on South Fork Lake, also in the vicinity. About two miles north of South Fork Lake is a glacial outwash plain on which it is believed a good landing field could be constructed.

The creeks are seven to ten miles from the lakes by trail and about fifty miles from Wiseman by way of Big Lake and the Middle Fork of the Koyukuk River.

HISTORY

History of the two creeks is non-existent. They are about midway between the mining districts of the Koyukuk and the Chandalar, but there is no evidence of any past prospecting or mining there. The near vicinity has apparently escaped attention until the arrival of Denny O'Keefe, four or five years ago. He has spent a large share of his time there since his discovery in sinking prospect shafts on his One Below Claim and in prospecting the surrounding country.

Ernest Wolff located claims on Sawlog Creek at a later date upon information from O'Keefe concerning the area. He has been groundsluicing in an effort to reach bedrock. The claims are recorded at Wiseman. The names Sawlog Creek, Denny's Gulch, and

South Fork Lake were originated by the above locators, there being no names on record for these features.

TOPOGRAPHY

The topography of the area is in its early maturity or, possibly, very late youth. Considerable erosion has occurred, yet hillsides are steep and there are many outcrops. The country has been glaciated, but most of the evidence of glaciation has been eroded away. The area under investigation varies between 2,000 and 3,000 feet in elevation.

TIMBER AND VEGETATION

The timber in the district is small spruce and there is very little of it. By far the largest portion of the ground is open and covered with "niggerheads" except where there are outcrops. On Denny's Gulch, the timber has all been cut, and on Sawlog Creek, there are two sparse patches of it remaining. The streams are lined with small willows and a small amount of brush. The timber scarcity is a definite drawback to this locality.

CLIMATE

Because of the high latitude and elevation, the climate is severe in the winter and very few hot days are experienced in the summer. The surface mining season would not be longer than about four months. Rainfall is normally rather light, and a sufficient supply of water for mining may be a problem, especially on Sawlog Creek.

GEOLOGY

The country rock is mostly a micaceous-quartz-schist carrying a little graphite and a trace of magnetite. Indications of an acidic intrusive were noted, yet basic rocks are also in an abundance. Colors can be panned from many of the outcrops, and other minerals noted in small amounts included sphalerite and smithsonite in quartz. Actinolite exists in a few spots. Several occurrences of a black, crumbly, graphite schist were noted which was originally thought to be the highly magnetic material. Later investigations proved this a false assumption.

Upstream from the area under investigation, the valley narrows and becomes precipitous. More advanced metamorphism was noted there, mostly in the matter of greater deformation of the formations. Small, twisted, inconsistent quartz stringers are in evidence, and while no assay values of commercial interest have been found, colors can be panned nearly anywhere from the formation and from the sliderock. A few large nuggets have been found in the creek bed of Denny's Gulch where the grade is steep and the gravel large and shallow. Native iron appears in small bright pieces and seems to be associated with sphalerite and rutile. Green stains were noted that were attributed to copper, and the creek water has a bitter taste which is probably caused by arsenic. Here again, both basic and acidic igneous material exists.

A low "saddle", or pass, exists between Denny's Gulch and Sawlog Creek which may contain a paystreak. This saddle is included in the Drumlumon Bench Claim and can be seen in Figures

1 and 2. It appears from the topography that at one time the stream in Denny's Gulch might have flowed through the present saddle and down the lower channel of Sawlog Creek. A smaller possibility is that Sawlog Creek at one time flowed into Denny's Gulch. A careful check of the characteristics of the gold from different points on the two creeks would give some definite evidence on this.

The sedimentary geology of Denny's Gulch in the area being prospected is a combination of stream-laid and slide material. The valley sides, being quite steep, are still sliding down at a comparatively rapid rate. Slides can be seen if Figure 3 is carefully scrutinized. Large pieces of sliderock can be found on the surface in the center of the nearly flat valley floor, although the sediments are up to at least fifty feet deep. A red gravel, which is not next to bedrock, seems to carry a large share of what gold has been recovered from the prospect shafts thus far. A paystreak had not been struck yet, but it is reasonable to assume from the foregoing occurrences of gold and the sedimentation that has occurred that one should exist. Further, the concentration should contain a fairly high percentage of magnetic material because of the native iron. For these reasons, a magnetometer survey here was considered to be a worthwhile project and reasonably sure of being successful.

MAGNETIC WORK

The instrument used was a Schmidt-type vertical magnetometer owned by the Department of Mines and manufactured by Wilson-Hull, Golden, Colorado. This is a magnetic-balance type instrument, and has the same magnetic system as the Askania magnetometers.

The system is not temperature-compensated. The instrument and tripod can be seen in Figure 4. It was calibrated at College, Alaska, before the survey, by creating varying known magnetic fields with a ground coil.[1] Three magnets were calibrated at that time with the magnetometer, and were then used for recalibration of the magnetometer during the course of the survey. All readings taken during the survey, including calibrations and temperature correction curves, are recorded in Field Book No. W-1.

In the earlier part of the survey, magnetic anomalies were measured in traverses at approximate right angles to the streams. These lines were laid out at 500 or 1,000-foot intervals and the stations in the lines were set at 25-foot intervals at first, but as the lines were later extended up the sides of the valleys in an effort to detect bench deposits, the station intervals away from the creeks were increased to 50 and 100 feet, and in a few cases, 200 feet. As there was no existing map of the area under investigation, sufficient Brunton surveying was done to produce one. The survey was tied to the claim corners, which are well marked, and the traverses, and intervals between them, were measured by tape. With one exception, all traverses with their magnetic profiles are plotted on the map. The traverses were considered too far apart for a sufficiently accurate isanomalic map, so none was made. The base line, representing a level of 1,000 gammas, is plotted exactly on the location of the traverse. The traverse that was not plotted on the map was surveyed across the

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1. J. H. Swartz, "Determination of the Sensitivity of a Vertical Magnetometer By Means of a Coil Laid on the Ground." (U. S. Bureau of Mines, 1942), p. 7.

wide valley into which Denny's Gulch enters below the lowest point on the map. This traverse (Line W) crossed the valley a short distance above what appears to be a small meteor crater. A setup was made on the edge of this crater, and observations were also made in other places away from the regular traverses to determine magnetic fields over various outcrops.

The ground and magnetic profiles of all traverses were also plotted in careful detail on separate sheets on a larger scale than on the map for a more thorough study of each profile.

Since only the one instrument was used, checking back to the base or a secondary base approximately every hour was necessitated to determine the diurnal changes. This, of course, caused a good deal of delay and extra setups and time spent in walking back and forth. Some inaccuracy results from this type of an operation also. An average of at least one out of every four days was too disturbed by large magnetic fluctuations to work with the magnetometer, but on these days, the mapping was accomplished. A total of 305 stations were occupied in 18 lines and 10 stations not in lines. Total observations, not counting calibrations, numbered 446. Successive observations in the lines required from 6 to 10 minutes each, depending on the condition of the moss or muskeg at the station.

At the start of the survey, a base was established near the camp which was given an arbitrary magnetic value of 1,000 gammas. This base is shown on the map. Observations were made here at the start and finish of each half day's work, and hourly if within reasonable walking distance, and all anomalies were calculated with respect to this point. Sub-bases were established for the hourly checks while on the Sawlog Creek traverses.

Instrument troubles were encountered in the way of a changing sensitivity and some erratic readings, but these were not serious enough to significantly alter the profiles obtained or to change the ultimate results or value of the project. Upon return to the College office, magnetograms of the College Coast and Geodetic Survey installation were studied to determine if any violent magnetic disturbances had occurred during any time of actual magnetic work that had not been detected.

RESULTS

It appears that the country rock in the area under investigation is generally more than normally magnetic. No arrangement of anomalies on the profiles or the map can be detected that indicate a placer concentration, and it is believed that the bedrock and the slide material included with the gravel were responsible for the lack of paystreak indications. In some of the traverses, it is rather evident that the magnetic profile roughly indicates the relative depth of bedrock, but this is not true of all the profiles. Quite often, setups on bare bedrock did not reveal the anticipated high anomalies.

A number of the traverses were extended rather high up the valley sides in an effort to determine the possibility of the existence of placer benches. Nothing conclusive was found here, either, but the most likely places to prospect for benches would be in locations on the slopes where the magnetic profile drops and then rises again, indicating a possibility of deeper bedrock at this point. For example, this possibility exists in two places on Line S, which crosses the saddle between the creeks which was

mentioned earlier.

Very high anomalies were found in Lines 7 and 8 and in the southern portions of Lines 10 and S, indicating a highly magnetic sub-surface body under these locations. Another extremely high anomaly was found at the NE end of Line 14. As stated earlier, this highly magnetic material could not be discovered. Probably the highest anomaly of the survey was found on the top of a small knoll about 200 or 300 feet west of the knoll on which the lower left limit corner of Three Below on Denny's Gulch is located. There is an exposure of actinolite at that point, but the actinolite is not the magnetic mineral.

Several observations were made on various outcrops in an effort to learn the identity of the highly magnetic material, but nothing conclusive was found. Also, the effects on the instrument of closely-held samples of various rocks were checked with no results. No abnormal magnetism was found at the edge of the "crater".

CONCLUSIONS

At present, little of value can be deduced from the results of the survey. The bedrock and slides have distorted what magnetic fields the paystreak may be causing. On some of the traverses, it is believed that the lowest anomalies indicate the deepest bedrock, but this is not absolutely certain. When further prospecting is accomplished, and the increased amount of geological information gained therefrom is studied in conjunction with the magnetic profiles, it is very likely that patterns will be discovered that can be used to an advantage in subsequent prospecting or mining.

The failure of this project to provide immediate valuable information should not be used as an argument against magnetometer work. Magnetic surveys can be, and have been, definitely successful in locating placer concentrations, but the conditions as to the bedrock and the content of the concentration must be favorable.

James A. Williams
Associate Mining Engineer

Figure 1. Saddle between creeks. Looking NW from S corner of Drumlumon Bench.

Figure 2. Saddle between creeks. Looking E from high outcrop on left limit of Sawlog Creek.

Figure 3. Danny's Gulch. Looking downstream from above S corner of Drumlumon Bench.

Figure 4. Magnetometer used in survey.

Figure 5. Camp and prospect shafts in Denny's Gulch. Flags marking Line 0 are midway between shafts and tent.

Figure 6. Upper Sawlog Creek. Looking downstream from between Lines 7 and 8.

Figure 7. Sawlog Creek. Looking downstream (W) from above the right limit end of Line 8.

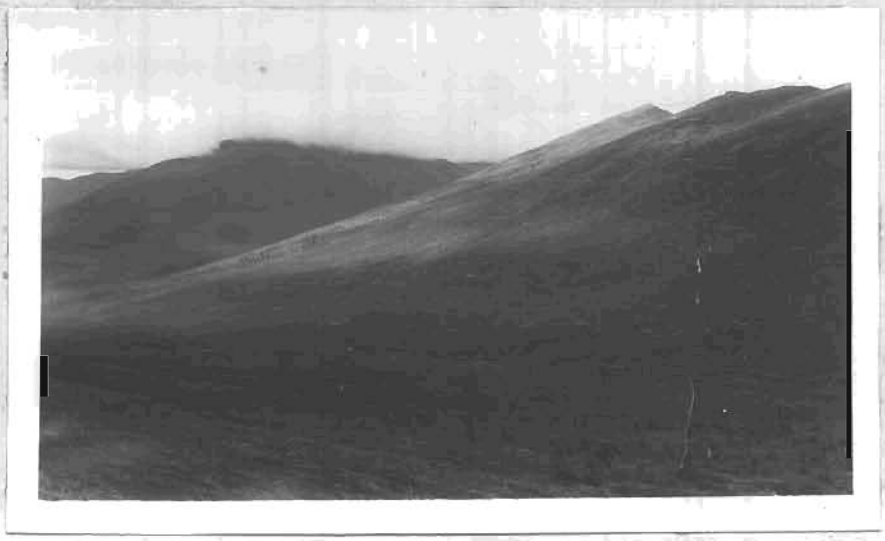

Figure 8. Lower Sawlog Creek. Looking N across Whitey and Bill Ass'n. from the top of high outcrop on left limit.

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EASTMAN TOPOGRAPHIC SAFETY
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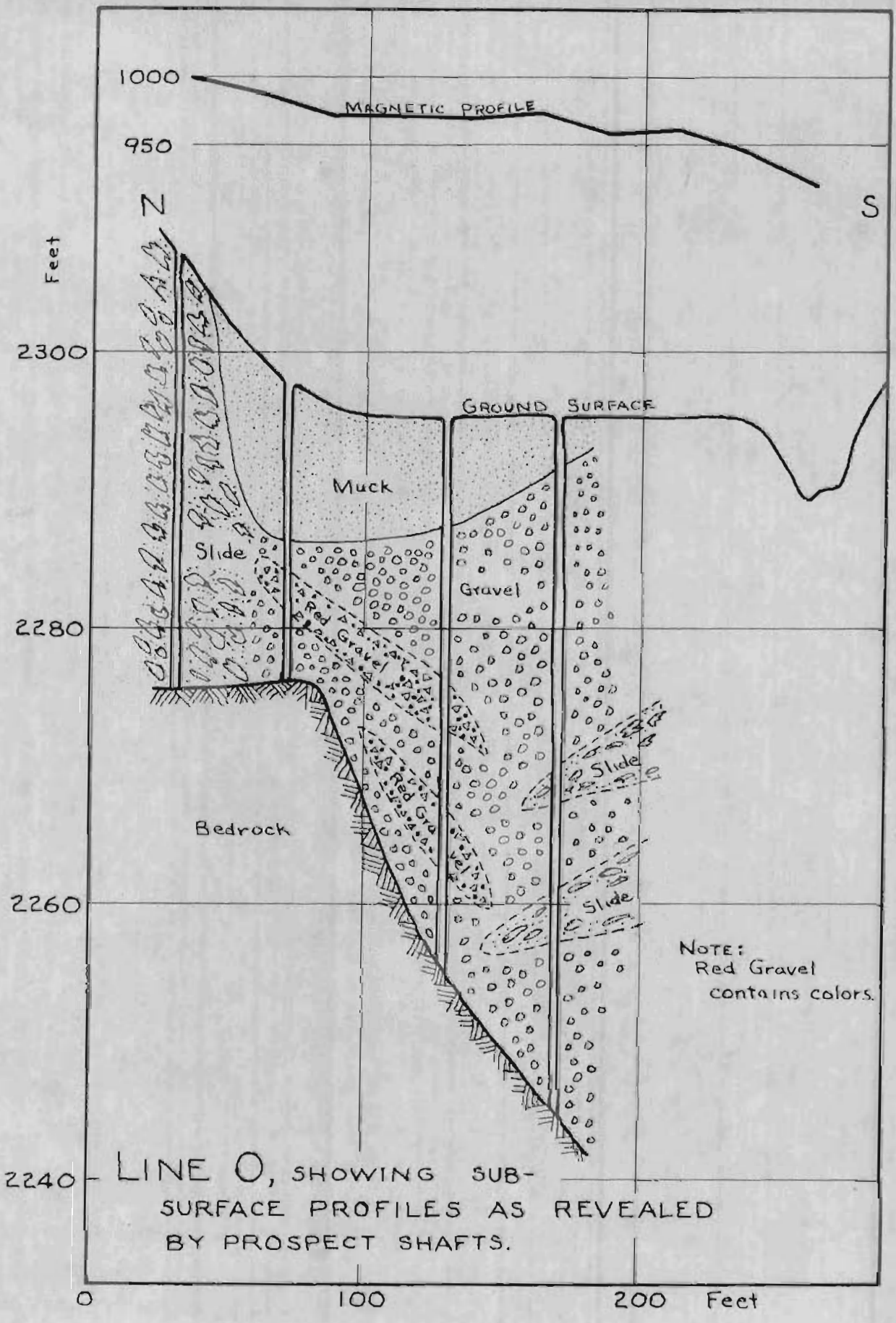

LINE O, SHOWING SUB-SURFACE PROFILES AS REVEALED BY PROSPECT SHAFTS.