UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

2160 0546

DISTRIBUTION OF GOLD AND OTHER ORE-RELATED ELEMENTS NEAR ORE BODIES IN THE OXIDIZED ZONE AT GOLDFIELD, NEVADA

By

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Open-file report

1973

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Distribution of gold and other ore-related elements near ore bodies in the oxidized zone at Goldfield, Nevada

By R. P. Ashley and J. P. Albers

Abstract

The heart of the Goldfield mining district occupies 0.6 square mile within a 15-square-mile area of hydrothermally altered Tertiary volcanic rocks. Most of the ore shoots were irregular bodies of epithermal bonanza ore within a few contiguous silicified zones enclosed within clay-bearing altered rocks. In 1966, 278 samples of argillized and silicified dacite were collected from excavations at the Combination and January mines, which once yielded gold in commercial quantities. Semiquantitative analyses show that gold, silver, lead, bismuth, mercury, and arsenic are notably enriched in rocks of the cuts. All these elements except lead and mercury formed conspicuous ore minerals. Geochemical maps and one geochemical profile across strike show that relatively high concentrations of all these elements are restricted to silicified zones. This low-tenor metallization dispersed through silicified zones does not extend into adjacent clay-bearing rocks. During oxidation arsenic, copper, molybdenum, and zinc were more or less strongly leached from the silicified zones and the ore bodies within them, but these metals did not form distinct

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 (p. 1a follows)

supergene halos in the surrounding argillized rocks. From the semiquantitative data available, the average amount of gold in silicified vein material is between 2.4 and 3.8 ppm.

(p. 2 follows)
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~~We recommend that~~ geochemical sampling to detect relict hypogene dispersion patterns in the Goldfield altered area, using oxidized rock samples, should be restricted to the silicified zones. If only a few samples are collected from each silicified zone, analysis for lead, of all the elements tested besides gold, is most likely to detect significant gold metallization, even though the lead was only a minor constituent of the ores. Abundance of iron oxides is not a reliable guide to anomalous amounts of gold.

Introduction

General

This report discusses distributions of ore-related elements, particularly those closely associated with gold, in the oxidized ~~zone in the vicinity~~ part of a mined gold-bearing vein at Goldfield, Nev. The work described herein is part of a broader study treating the geology and geochemistry of hydrothermally altered rocks in the vicinity of Goldfield.

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Most of the gold ore produced near Goldfield came from a 0.6-square-mile area immediately northeast of the town of Goldfield (figs. 1 and 2). This area will be referred to as the "main district";

Figures 1 and 2 near here

it is a small part of a 15-square-mile area of hydrothermally altered Tertiary volcanic rocks extending to the east and north, termed the "Goldfield altered area." The main district lies at the western margin of the Goldfield Hills, a group of peaks with maximum relief of about 1,200 feet, nearly surrounded by desert basins. Maximum relief in the main district is only 180 feet, with elevations ranging from 5,640 to 5,820 feet. The climate is arid; vegetation, sparse. U.S. Highway 95 passes through the town of Goldfield. An all-weather gravel road skirts the western and northern sides of the main district, and several dirt roads traverse it.

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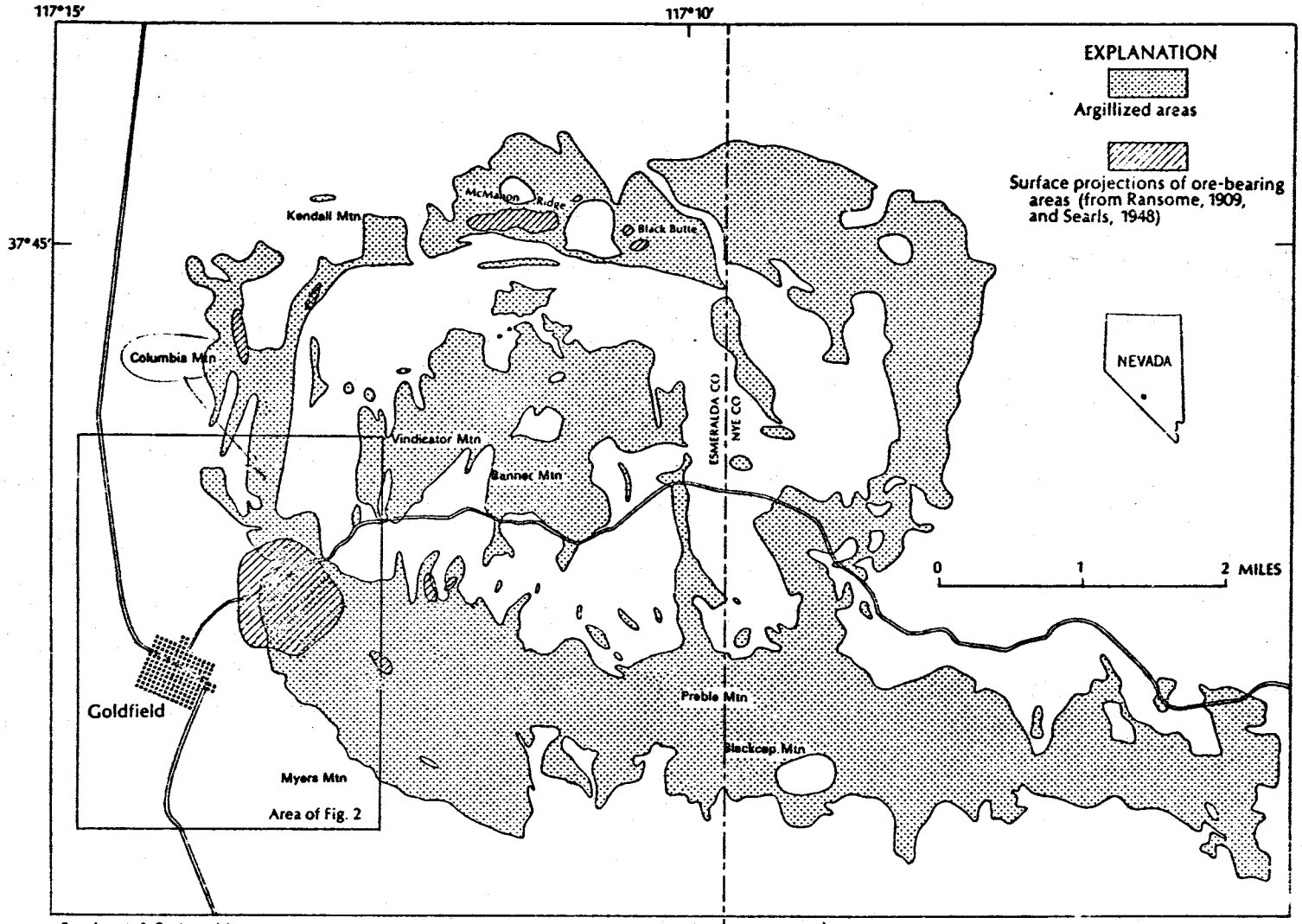
Fig. 1 - Map of the Goldfield district, showing areas of hydrothermal alteration and locations of ore deposits.



Base from U.S. Geological Survey Goldfield 1952 and Mud Lake, 1952

Alteration contacts by J. P. Albers, H. R. Cornwall, and R. P. Ashley, 1966

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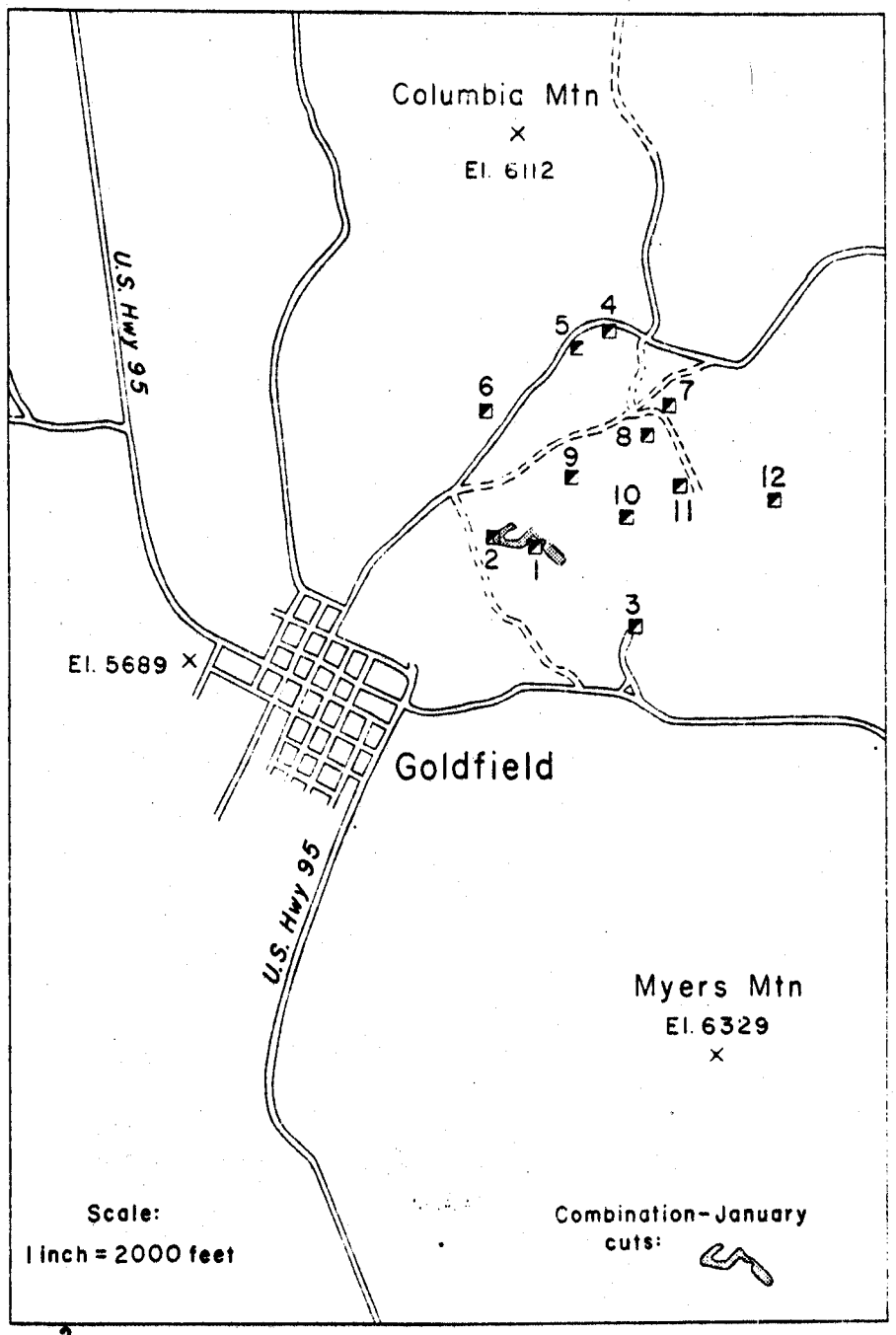

Figure 2/—Map of Goldfield, Nevada, and vicinity, showing the locations of major mines and the Combination-January cuts. 1. Combination mine. 2. January mine. 3. Florence mine. 4. Laguna mine. 5. Red Top mine. 6. Silver Pick mine. 7. Jumbo Extension mine. 8. Clermont mine. 9. Mohawk mine. 10. Jumbo mine. 11. Grizzly Bear mine. 12. Merger mine.

In March 1966 the Davis-Goldfield Mining Corporation completed two deep exploratory cuts in the main district which provided most of the samples for this study. These open cuts lie just east of the Combination and January shafts, along the vein system common to these two mines (pls. 1 and 2). The open cut walls, 15 to 50 feet high, expose many tunnels and stopes developed upward from the 80-foot level of the Combination mine, but the mine workings are almost completely inaccessible. Three months after excavation ceased, 278 samples for geochemical analysis were collected from the cut walls at 5-foot intervals. The cuts were mapped and sample locations were determined by planetable methods. The planimetric maps of the cuts (pls. 2-13) do not show elevations and contours, because the land surface around the cuts and the cut floors both have relatively little relief, whereas the intervening cut walls at the time of sampling and mapping were very steep, representing elevation changes between 15 and 50 feet along any given profile across the cut wall.

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The main objective of this study is to identify indicator elements suitable for geochemical exploration for gold; each element must be evaluated with the following requirements in mind. Ideally, amounts of an indicator element should correlate well with amounts of gold, and the range of values should be detectable by a reasonably inexpensive analytical procedure, with few samples falling below the detection threshold. Data also should be subject to less sampling error than gold data, and the element should form a dispersion aureole or halo larger than its associated economic gold deposit. These requirements imply that both the indicator element and gold were concentrated by means of the same processes. The 278 samples from the cuts and much smaller numbers of average-grade ore, high-grade ore, and unoxidized altered rock samples were studied to find indicator elements for gold.

~~The assumed exploration target is another heavy metals deposit in the vicinity of Goldfield like that mined in the main district.~~

Since a genetic relationship exists between hydrothermal alteration and ore deposition, the entire 15-square-mile altered area, which includes the main district, has potential for new deposits. The Combination-January cuts expose oxidized altered and low-tenor metallized rocks, so data from them should show geochemical relationships that will be found **in bedrock samples collected from the surface** throughout the altered area. ~~Provided that subsequent geochemical exploration is limited to bedrock samples.~~

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Wilson (1944) evaluated several elements as indicators for gold in the Goldfield district. He showed that silver, bismuth, and tin are positively correlated with gold in the Goldfield Consolidated main vein on the 830-foot level of the Jumbo Extension mine (2,400 feet northeast of the Combination shaft, see fig. 2 and Searls, 1948, pl. 2). Although he did not find a clear relationship between gold, silver, bismuth, and tin in and near the Clermont vein on the 225-foot level of the Clermont mine (2,000 feet northeast of the Combination shaft), or ~~in~~ at two surface localities, including one on the Jumbo vein (Jumbo mine, fig. 2, 1,200 feet east-northeast of the Combination shaft), Wilson concluded that bismuth and silver are promising indicator elements for gold. Since his samples yielding recognizable element correlations were entirely from unoxidized rocks, his results apply most directly to underground exploration. Except for preliminary results of this study (Ashley and Albers, 1969), no other reports concerning indicator elements for gold at Goldfield have been published.

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In the first section of this report we identify potential indicator elements for gold. These include the following metals associated with gold in the Goldfield ores: copper, zinc, arsenic, antimony, bismuth, tellurium, mercury, lead, molybdenum, tin, and probably selenium. In the second section we examine geochemical maps of the Combination-January cuts for gold and for the seven of the above elements for which we have adequate data. In the third section, we attempt to determine which elements owe their spatial distribution in the cuts primarily to hypogene dispersion, and which owe their distributions largely to supergene processes. We also attempt to explain various interesting features seen on the geochemical maps, and various associations between the ore-related elements. The final section draws together information from the preceding sections pertinent to geochemical prospecting in the Goldfield altered area.

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The cooperation and assistance of Davis-Goldfield Mining Corporation, owner of the investigated ground, made this project possible. All underground information on the Combination and January mines is from level maps compiled by Goldfield Consolidated Mines Corporation (unpub. data), now held by Davis-Goldfield Mining Corporation. Mr. M. G. Martin was particularly helpful in providing these maps. D. H. Whitebread and L. D. Schultz assisted in geologic mapping and sampling of the cuts. The late Martin C. Duffy, owner of the Florence mine, conducted us through that mine, allowed us to map and sample the limited workings still open, and discussed with us the history of the mine. Mary E. Ashley coded the geochemical data for computer input.

Geologic setting

The geology of the Goldfield area has been described by Ransome (1909, 1910a, b), Locke (1912a, b), Searls (1948), Albers and Cornwall (1968), and Albers and Kleinhampl (1970). The main district is at the western margin of a Tertiary volcanic center composed of silicic and intermediate tuffs and volcanic breccias, and rhyolite, quartz latite, trachyandesite, and rhyodacite flows. These volcanic rocks cover Ordovician metasedimentary rocks and Mesozoic granitic rocks that crop out in many small inliers to the north and northeast of the main district.

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The altered area and the position of the main district within it are shown in figure 2. At most localities the edge of the altered area shown in the figure represents the boundary between fresh rock and rock strongly enough argillized to be visibly bleached and locally stained with limonite. At some localities such as Blackcap Mountain, however, altered rocks are covered by younger unaltered volcanic rocks or alluvium, in which case the edge of the altered area is actually a contact with overlying materials rather than an alteration contact. Argillized rocks represent the bulk of the material within the altered area, but many silicified zones (veins) also appear, always surrounded by argillized rocks. The silicified zones are localized along, and delineate, the faults and fractures that served as conduits for the hydrothermal fluids that produced the alteration. Along the south side of the area, from the main district through Preble Mountain and continuing to the east edge of the map, these faults and fractures are very numerous, and trend northwest to nearly east-west, with steep dips both to the north and south. Alteration in the central part of the area, in the vicinity of Vindicator and Banner Mountains, was controlled by northeast-trending, east-dipping shingle faults. The fault blocks dip west, and are successively downdropped to the east. The west and north sides of the altered area are defined by a belt of altered rock which extends from the main district northward through Columbia Mountain to Kendall Mountain, then eastward through Black Butte. This belt reveals an arcuate structural pattern, with most of the faults and fractures alined approximately parallel to the inner margin of the belt. Although

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the faults here do not dip consistently inward toward the Vindicator Mountain-Banner Mountain area, the arcuate pattern suggests that ring fracturing occurred during the Tertiary volcanism, possibly accompanied by collapse, thereby forming at least a partial caldera (see Albers and Kleinhampl, 1970).

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The ore deposits of the main district were irregular pipes and sheets within seven or eight vein systems composed of silicified rocks, striking north and dipping at moderate to low angles to the east. Dacite, andesite, and latite were altered to form these silicified zones and the argillized rocks which surround them.[1] The

[1] The terms "dacite," "andesite," and "latite" are the names Ransome gave to the three volcanic units that dominate the Tertiary section in the main district. We retain Ransome's nomenclature for this report. By current volcanic rock classification systems (Rittmann, 1952; O'Connor, 1965), the dacite is a rhyodacite; the andesite includes both trachyandesite and rhyodacite flows; and the latite is a quartz latite.

Combination-January, the westernmost of the major vein systems, is shown on level maps of the Combination and January mines (pl. 1). The first level of the Combination mine was 80 feet below the shaft collar, at an elevation of 5,650 feet. Since the open cuts intersect workings that were reached from this level, a generalized geologic map of the cuts and adjacent surface has been substituted for the map of the first level. Early in the development of the properties, the workings of the Combination and January mines were joined; the Combination shaft serviced workings of the January throughout most of the history of production. Consequently, many workings of the January are accordant with those of the Combination, and different maps are not required for the two mines.

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Dacite is the most widespread rock type in the two mines, occurring on all levels, but latite increases at the expense of dacite with increasing depth (pl. 2). Dacite rests directly on latite in the mine workings and abuts andesite just east of the mine workings. Latite, andesite, and dacite form a stratigraphic sequence from base to top 3 miles east of the town of Goldfield; in the Combination-January area the dacite either intrudes the andesite, as suggested by Ransome (1909, p. 79-81) or is interlayered with the andesite, as suggested by Searls (1948, p. 11, 12). Geologic mapping elsewhere in the Goldfield mining district indicates that Ransome's interpretation of the dacite as locally intrusive into the andesite and latite is more likely correct. Locally on the west side of the open cuts, as much as 15 feet of sedimentary breccia of the Siebert Formation unconformably covers the hydrothermally altered volcanic rocks of the cuts (pl. 2). Mine dumps and 2 to 5 feet of alluvium cover much of the surface around the cuts (alluvium not shown on pl. 2). The positions of contacts shown on plates 1 and 2 are inferred where they are covered by these postalteration materials.

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The most conspicuous feature of the Combination-January vein system is the abrupt change of strike at the January shaft from N. 60°-70° W. for the southern part of the system to N. 50°-65° E. for the northern part. The acute angle thus formed persists to the second (130-foot) level, but opens progressively on the third (180-foot), fourth (230-foot), and fifth (280-foot) levels, and is not a notable feature on the sixth (380-foot) level (see pl. 1). The arcuate vein that passes through the January shaft at the surface and on the second level is nearly vertical at the shaft, but dips northwest north of the shaft and northeast south of the shaft. In the vicinity of the shaft, the dip of the vein decreases below the second level, reaching 65° E. on the fourth level. The January shaft and the vein both continue to the fifth level, but these workings are not included on the Goldfield Consolidated Mines Corporation maps, so we do not know their full extent and have omitted them from plate 1. This western part of the vein system pinches out below the fifth (280-foot) level. The eastern part of the vein system dips steeply in the area east and south of the Combination shaft, but northwest of the shaft, on the inside or eastern side of the sharp bend, dips are 50°-30° E. decreasing with increasing depth.[/] The eastern and western parts of

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the vein system are close together near the surface, whereas separation is maximum at the fourth level. On the fifth and sixth levels all vein

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material shown belongs to the eastern part of the system, which continues to a maximum depth of 440 feet below the Combination shaft collar, corresponding to a minimum elevation of 5,290 feet. Most of the stoping was done from locations at the surface at elevations as high as 5,710 feet, to a point 330 feet below the Combination shaft collar, at an elevation of 5,400 feet. Ransome includes the western part of the vein system in his description of the January mine (1909, p. 216-220, pl. XVI), and includes the eastern part of the system in his description of the Combination mine (1909, p. 209-216, pls. XVII, XVIII).

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/The ore bodies lying in the eastern part of the sharp bend had not yet been discovered at the time Ransome examined these mines. Consequently we have no detailed information for this part of the area on the distribution of silicified rock. It is likely, however, that the eastern part of the vein system extends northwestward into this ground and that it includes these ore bodies.

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The shapes and orientations of veins belonging to the Combination-January vein system are probably controlled mainly by pre alteration fractures. Also, on the fourth, fifth, and sixth levels, some veins conform to the shape of the dacite-latite contact. (See discussions by Ransome, 1909, p. 211-212, 217-218; ~~and~~ Locke, 1912b, p. 844, on form of the Combination-January vein system.) At many localities the veins have been fractured and brecciated due to post alteration movement, but in most cases these displacements are too small to significantly change the shapes of the veins.

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The Combination-January open cuts closely follow the Combination-January vein system (pls. 1 and 2), but they expose structures other than the veins themselves. A conspicuous structure seen in the cuts is the set of northeast-trending faults exposed 160 feet northwest of the Combination shaft. Neither this set of faults, nor the parallel-trending but southeast-dipping fault located 320 feet west-northwest of the Combination shaft, can definitely be identified on the second level or deeper levels. Possibly the dip of the northwest-dipping fault system progressively decreases with depth; if so, it could connect with the northeast-trending, 30°-northwest-dipping fault seen 250 feet northwest of the Combination shaft on the second level, before dying out at greater depth. The 140-foot-wide block between the two northeast-trending faults with opposing dips may be down-dropped, offsetting the silicified zone segment between the faults to the west. Comparing the map of the cuts with the maps for the second, third, and fourth levels, however, the silicified zone lying east of the conspicuous set of northeast-trending faults certainly must be part of the zone that passes near the Combination shaft, and the silicified zone lying to the west of this set of faults certainly must be part of the zone that passes through or near the January shaft. Since these two silicified zones appear to be separate at depth, they are likely also separate at the level of exposure represented by the cuts, implying that only small displacements are associated with the northeast-trending faults.

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 (p. 16 follows)

Analytical methods

Gold values[1] for samples from the Combination-January cuts were determined by atomic absorption spectrophotometry using hot hydrobromic acid extraction from 2-gram samples (Huffman and others, 1967). Three other groups of samples were analyzed by the cold hydrobromic acid-bromine method of Thompson, Nakagawa, and VanSickle (1968). Tellurium and zinc concentrations were also determined by atomic absorption spectrophotometry (Nakagawa and Thompson, 1968; Ward and others, 1969, p. 20-22). Antimony concentrations were determined by a solution-colorimetric method, and arsenic concentrations by the Gutzeit-apparatus confined-spot colorimetric method (Ward and others, 1963, p. 38-44). Mercury concentrations were determined by the atomic absorption technique described by Vaughn and McCarthy (1964), and Vaughn (1967). All other elements, including silver, barium, beryllium, bismuth, cobalt, chromium, copper, lanthanum, manganese, molybdenum, niobium, nickel, lead, tin, strontium, vanadium, yttrium, iron, magnesium, calcium, and titanium were determined by 6-step semiquantitative spectrographic analysis (Ward and others, 1963, p. 91-94; Grimes and Marranzino, 1968).

[1] The terms "value," "amount," and "concentration," as used in this report, mean quantity of an element expressed as weight per unit weight of rock. The specific units used in this report are percent and parts per million (ppm).

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R. L. Miller, E. E. Martinez, F. Michaels, T. A. Roemer, J. A. Thomas, J. D. Mensik, W. D. Goss, G. T. Burrow, G. D. Shipley, and C. Huffman carried out the gold analyses. The analysts for tellurium were H. D. King and E. E. Martinez; for zinc, G. W. Dounay; for antimony, H. D. King; for arsenic, A. L. Meier, Z. Stephenson, and W. Campbell; for mercury, W. W. Janes, J. James, S. Noble, J. G. Frisken, and W. Campbell. A. W. Helz, W. B. Crandell, J. L. Harris, H. W. Worthing, C. Heropoulos, H. Bastron, E. L. Mosier, J. M. Nishi, and J. L. Finley made the spectrographic analyses.

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Statistical methods

Element abundances[1] were calculated using techniques described by Miesch (1967). Frequency distributions for gold, mercury, arsenic, and zinc show moderate to strong positive skewness, so the data were transformed to common logarithms of the concentration values; a better statistical estimate of abundance is possible if the frequency distribution is relatively symmetrical. All other elements were spectrographically determined, with geometric reporting intervals, making it mandatory to convert the data for these elements to common logarithms to provide statistics valid for intercomparison (see Miesch, 1967). The class intervals used for the gold, mercury, arsenic, and zinc histograms given on plates 4, 8, 9, and 12 were determined using a formula based on Sturges' rule (Sturges, 1926).[1] For all other elements, class intervals are equivalent to the geometric reporting interval used in 6-step spectrographic analysis: the sixth root of 10. Results are reported to the nearest number in the series 1, 0.7, 0.5, 0.3, 0.2,

[1] "Abundance," as used in this report, means average concentration or weight proportion of an element in a given specimen or body of rock. Here it is calculated essentially by averaging analyses for some number of specimens of a given rock type.

[1] $C_i = \frac{MAX_i - MIN_i}{NM_i}$, where C_i is the class interval, or class size, MAX_i is the largest data value, MIN_i is the smallest data value, and NM_i is the number of classes. $NM_i = 2.5 + 1.4427261n(N_i)$, where N_i is the number of data values.

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(p. 18a follows)

0.15, 0.1, etc. Analytical error (one standard deviation) is approximately plus or minus one reporting interval.

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 (p. 19 follows)

In order to compare abundances of various elements in various data sets, relative abundances were calculated as follows: First, arithmetic means and standard deviations were computed for each element using all data (transformed to common logarithms) within the analytical detection limits. The antilogarithms of the means thus calculated are geometric means. Some elements have "censored" frequency distributions: here some fraction of the observations fall below the lower analytical detection limit or above the upper analytical detection limit. For these elements, geometric means are too high if the censored data falls below a minimum detection limit, or too low if the censored data falls above a maximum detection limit. Using Cohen's method (see Miesch, 1967; Cohen, 1959, 1961), these means and their associated standard deviations were revised. Cohen's method assumes that the data outside the censor point would, if known, complete a normal (in this study, lognormal) distribution when combined with the known portion of the distribution. The revised geometric mean and standard deviation calculated by the method are those of this ideal complete distribution. Use of Cohen's method for log-transformed data, therefore, assumes that the frequency distribution is lognormal. Many of the elements have frequency distributions that depart substantially from lognormal, but the method gives a satisfactory estimate of the geometric mean as long as the total distribution is unimodal. Where more than 50 percent of the data for an element are censored, lognormality is a tenuous assumption. Here abundance estimates are not calculated, and the true abundance is assumed to be

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(p. 19a follows)

less than the detection threshold value (all such cases involve the lower detection limit). Where geometric means or deviations for two data sets are claimed to be significantly different statistically, the difference between them was tested for significance at the 95-percent-confidence level (Moroney, 1956)

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 (p. 20 follows)

The abundance estimates derived by the above method are suitable for intercomparison, and they are used in figures accompanying the text. These estimates, however, are not the best estimates of true abundance possible, because the geometric mean generally gives values somewhat smaller than the true abundance. To obtain the best possible estimate of true abundance, one must calculate Sichel's t estimator, a statistical measure of central tendency for lognormal frequency distributions, designed to eliminate the negative bias inherent in the geometric mean.[1] The t estimator gives a value close to the

[1] Footnote near here

arithmetic mean, but is not as strongly influenced by relatively few very high values, as is the arithmetic mean. To obtain t, the antilog of the geometric mean is multiplied by a correction factor approximately proportional in size to the antilog of the geometric standard deviation but also partly determined by the number of samples (see discussion by Miesch, 1967, p. B7-B8). Sichel's t estimator was calculated for each element from the geometric mean and standard deviation previously calculated with the aid of Cohen's method. These values are included in table ~~6~~ 4 for the interested reader, even though they are not used for the data comparisons upon which this study relies. Approximate confidence intervals for Sichel's t were calculated for gold using an equation given by Aitchison and Brown (1963, p. 50).

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The *t* estimator, developed by H. S. Sichel (1952, 1966), is not to be confused with Student's *t*, a frequency distribution function commonly used to calculate confidence intervals for various statistical measures. Sichel developed the *t* estimator ~~specifically~~ for evaluating ore blocks in South African gold mines.

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Correlation coefficients were calculated for each pair of elements by computer using the log-transformed data, although using the untransformed data would have produced the same results because we calculated Spearman's rank correlation coefficient rather than the more widely used product-moment correlation coefficient. Flanagan (1957) showed that the rank correlation coefficient is particularly suitable for semi-quantitative spectrographic data, and is the only valid method of computing a correlation coefficient between an element determined chemically and an element determined spectrographically. The Spearman rank correlation coefficient is nonparametric, and therefore does not require the assumptions that must be made when using the product-moment correlation coefficient. These assumptions include a fundamentally normal distribution for each element, independence of successive data pairs, and homogeneity of variances. Since most of the elements investigated here were determined spectrographically, but several important elements were determined chemically, we have adopted Flanagan's method. Each correlation coefficient was calculated using only those observations having data within the detection limits for both elements involved. Since a different number of observations was used for nearly every correlation coefficient, the reliability of each coefficient is different. Each coefficient was subjected to a significance test, using Student's t. The correlation matrices (fig. 7) show which correlation coefficients are significant at the 99- and 95-percent confidence levels. Flanagan (1957) presents and explains the formulas for computing both the rank correlation coefficient and the

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(p. 21a follows)

significance test, and gives references to the statistics literature that carries the derivations of these formulas. Additional explanation of rank correlation coefficients and the way in which we use results of the significance test are given later in this report (p. ~~66-66a~~ ~~67 67a~~ 77-77a).

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(p. 22 follows)

Hydrothermal alteration and metallization

General

The Tertiary volcanic flows that occupied the Combination-January area were hydrothermally altered, metallized, and later oxidized to the depths now accessible. Hydrothermal alteration and metallization were related as follows. Strong fracture zones which cut the flows provided channelways for the hydrothermal solutions; the rocks in and adjacent to these fracture zones were silicified, and rocks farther from the fracture zones were argillized. According to Ransome (1909, p. 158), Locke (1912a, p. 800-801,) and Collins (1907a, p. 398), ore was associated with silicified zones (veins), and little ore extended into surrounding argillized rocks. Changes in ore grade were often abrupt, but boundaries between ore and low-grade or barren rock were always gradational over at least a few feet (Ransome, 1909, p. 213, 218; Collins, 1907b, p. 435). Hydrothermal wallrock alteration was well advanced when metallization began, but some hydrothermal quartz and alunite formed contemporaneously with metal sulfides and gold (Ransome, 1909, p. 167, 169-170). Fracturing of the silicified ledges during the later stages of alteration produced local concentrations of gold and sulfides and provided relatively large open cavities in which rich ore formed. The bulk of the precious metal recovered, however, was apparently disseminated through volumes of rock within the silicified zones; most ore is therefore structurally controlled by prealteration fracturing (Ransome, 1909, p. 160-162). In the extensive barren parts of the Goldfield altered area the silicified zones show structural

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relationships and alteration mineral assemblages identical to those in metallized areas, so metals were deposited during and after wallrock alteration only where they were available to the hydrothermal system, presumably entering the system at deeper levels.

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467-100

The fault zones and shear zones shown on plate 2, although they probably do not represent large displacements, record movement that occurred after silicification developed along northwest-trending fractures. The shear zones consist of many closely spaced fractures, whereas fault zones consist of one or several large breaks with few subsidiary fractures. Much of the rock exposed in the cuts, both silicified and argillized, is moderately to intensely fractured; the fractures have diverse orientations and at many localities show slickensides representing movement in diverse directions. They are too small and too numerous to show on plate 2. ~~Ore minerals, particularly in high-grade ores, filled open spaces in shattered portions of the silicified zones. The shattering resulted from movement that occurred after hydrothermal alteration was well advanced but before metallization was complete; metallization accompanied the later stages of hydrothermal alteration (Ransome, 1909, p. 215-216).~~ In some of the shear zones and fault zones, clay minerals differ in abundance and proportions from adjacent argillized rocks, suggesting that these breaks formed before hydrothermal activity ceased. Supergene alteration could also be partly or wholly responsible for these differences in clay content, but we cannot rule out the possibility that at least some, possibly all of the postsilicification fault zones and shear zones shown on plate 2 originated before hydrothermal alteration and metallization ceased, even though some of these breaks and many small fractures show slickensides that must postdate all alteration.

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All rock exposed in the cuts is within the upper part of the oxidized zone. The depth of oxidation at the Combination mine is 130 to 140 feet (Ransome, 1909, p. 177, 216), and water was encountered at 210 feet when the shaft was sunk (Collins, 1907a, p. 398). The depth of oxidation at the January mine is 180 feet and the original water level was 160 feet (Ransome, 1909, pl. XVI, p. 187, 219).

To completely describe the petrographic changes produced by hydrothermal alteration, metallization, and oxidation, we should ideally have suites of unaltered rocks, unoxidized argillized rocks, unoxidized silicified rocks, unoxidized average-grade ores, unoxidized high-grade ores, oxidized argillized rocks, oxidized silicified rocks, and oxidized average-grade and high-grade ores. Of these nine groups, we were able to obtain satisfactory numbers of unaltered rocks, unoxidized silicified rocks, unoxidized average-grade ores, unoxidized high-grade ores, oxidized argillized rocks, and oxidized silicified rocks. The Combination-January cuts provided particularly large numbers of oxidized argillized and silicified rocks. Although some silicified rock samples from the cuts actually constitute average-grade ores, all high-grade oxidized ore has been mined out. The following sections describe the petrographic characteristics of unaltered dacite, then the locations and petrographic characteristics of the unoxidized rocks, and then the petrographic characteristics of the oxidized rocks. The petrographic descriptions in the latter section are more detailed because the number of oxidized samples available is much greater than the number of unoxidized samples. Oxidation produces few mineralogic changes but does produce some notable geochemical changes, ~~discussed later in the report.~~

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Petrography of unaltered dacite samples

The Combination-January cuts mainly expose altered dacite. Since no samples were collected from the few small exposures of altered andesite, this section describes only the petrography of unaltered dacite, for comparison with the unoxidized and oxidized altered dacite samples to be described in following sections. Seventeen samples collected from scattered outcrops east of the main productive area provided geochemical data used later in the report. Thin sections for three of these 17 samples provided the following data.

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~~Petrography of unaltered and oxidized altered dacite samples~~

The Combination-January cuts expose soft clay-bearing altered rock and hard silicified rock equally well; both are the products of hydrothermal alteration of dacite and andesite. Since no samples were collected from the few small exposures of altered andesite, this section describes only the petrography of altered dacite and, for comparison, unaltered dacite. Three thin sections from rocks outside the Combination-January area provide the data on unaltered dacite.

The * Dacite is characterized by porphyritic texture, with 20 to 25 percent plagioclase phenocrysts 0.3 to 10 mm in diameter, about 5 to 8 percent each of biotite, hornblende, and augite phenocrysts as much as 2 mm long, 0.5 to 1 percent corroded quartz phenocrysts as much as 2 mm long, and 1 percent opaque grains 0.1 to 0.3 mm in diameter. The plagioclase phenocrysts show normal oscillatory zoning, and have a bulk composition of about An_{50}. The groundmass is one-half to two-thirds microlites of sodic labradorite, a few percent minute opaque and mafic grains, and the remainder glass. The groundmass shows good pilotaxitic texture.

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Petrography of unoxidized altered rocks and ores

Sampling of unoxidized materials from the Combination-January area would have been desirable, but was not possible due to lack of access and lack of ore samples. Thirteen unoxidized silicified dacite samples for petrographic and minor-element comparisons were collected from the Florence mine (fig. 3), 1,600 feet southeast of the Combination mine,

Figure 3 near here

because the Florence is the only mine currently accessible. The Florence and the Combination are both located on the same vein system. The 16 unoxidized average-grade ore samples are from mine dumps throughout the main district (fig. 4) and the 15 high-grade ores are from mines

Figure 4 near here

in several parts of the main district (fig. 5). Only two of the high-grade

Figure 5 near here

ore samples are unequivocally known to have come from the area under study. Three other high-grade samples most likely came from the Combination mine but could also have come from any one of the other major mines except the Florence.

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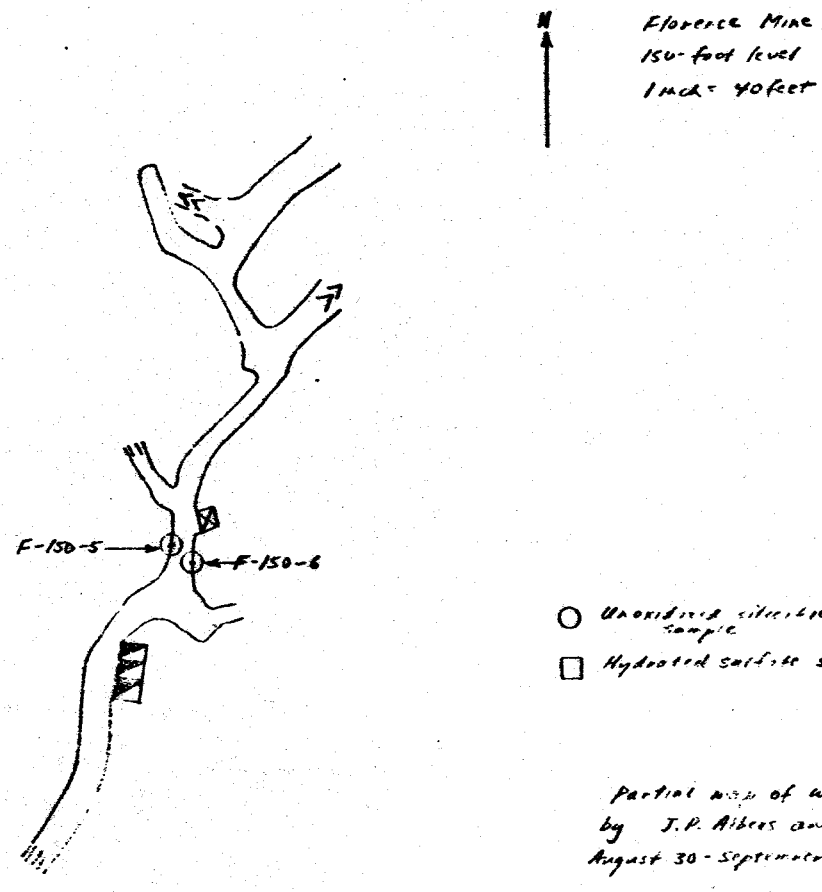
Figure 3

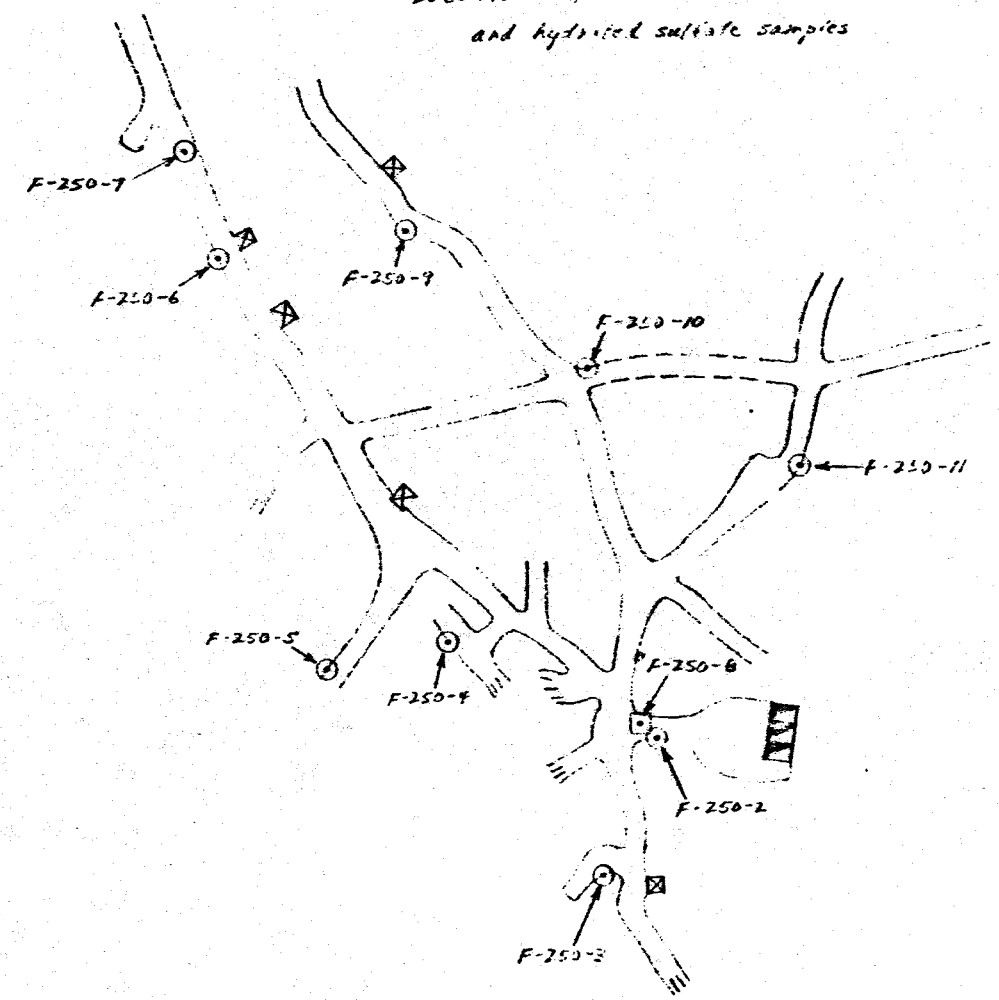
Locations of unoxidized silicified dacite and hydrated sulfate samples



27a

Figure 3

Locations of unoxidized silicified dacite and hydrated sulfate samples

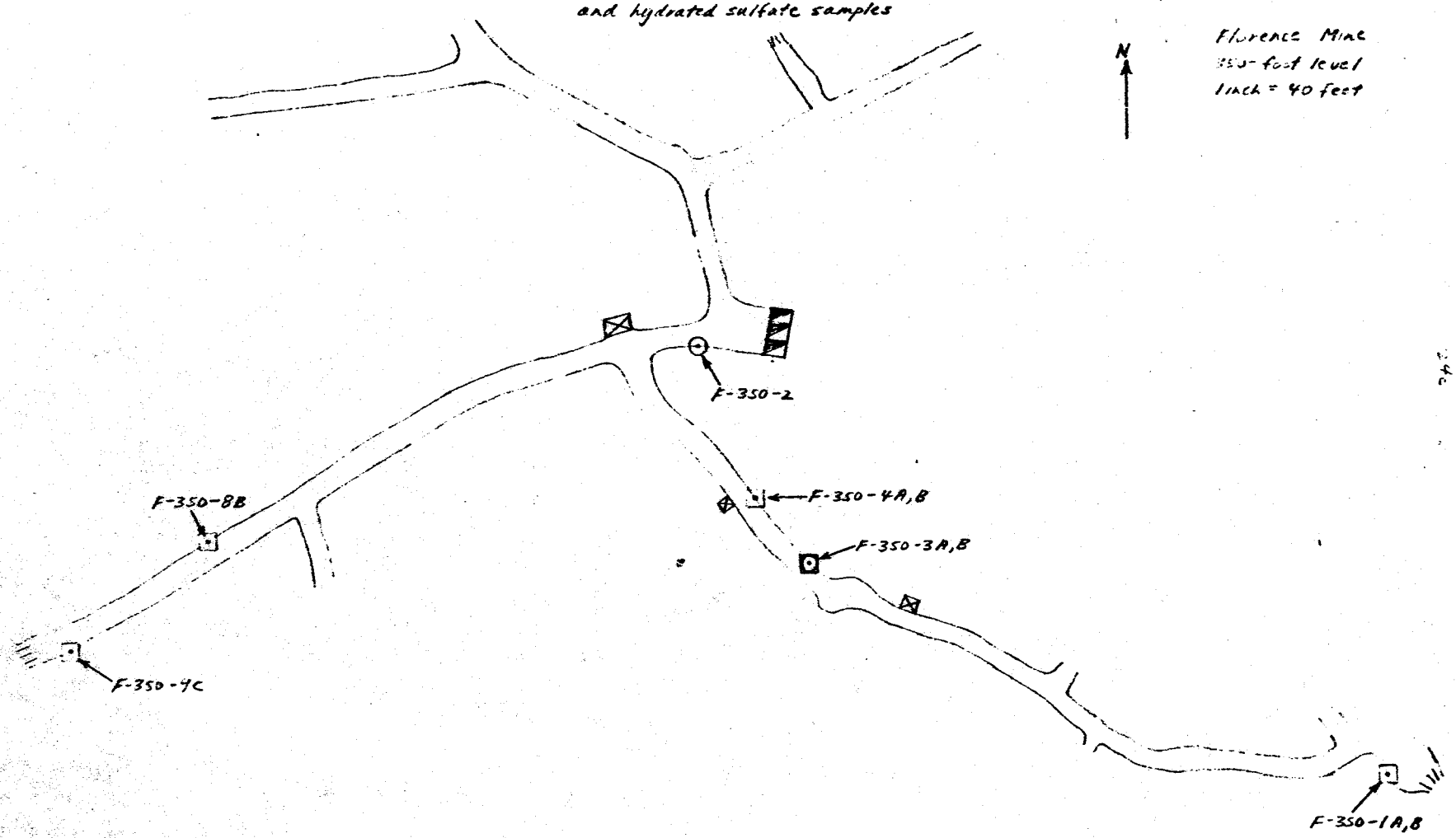


Florence Mine
250-foot level
1 inch = 40 feet

N

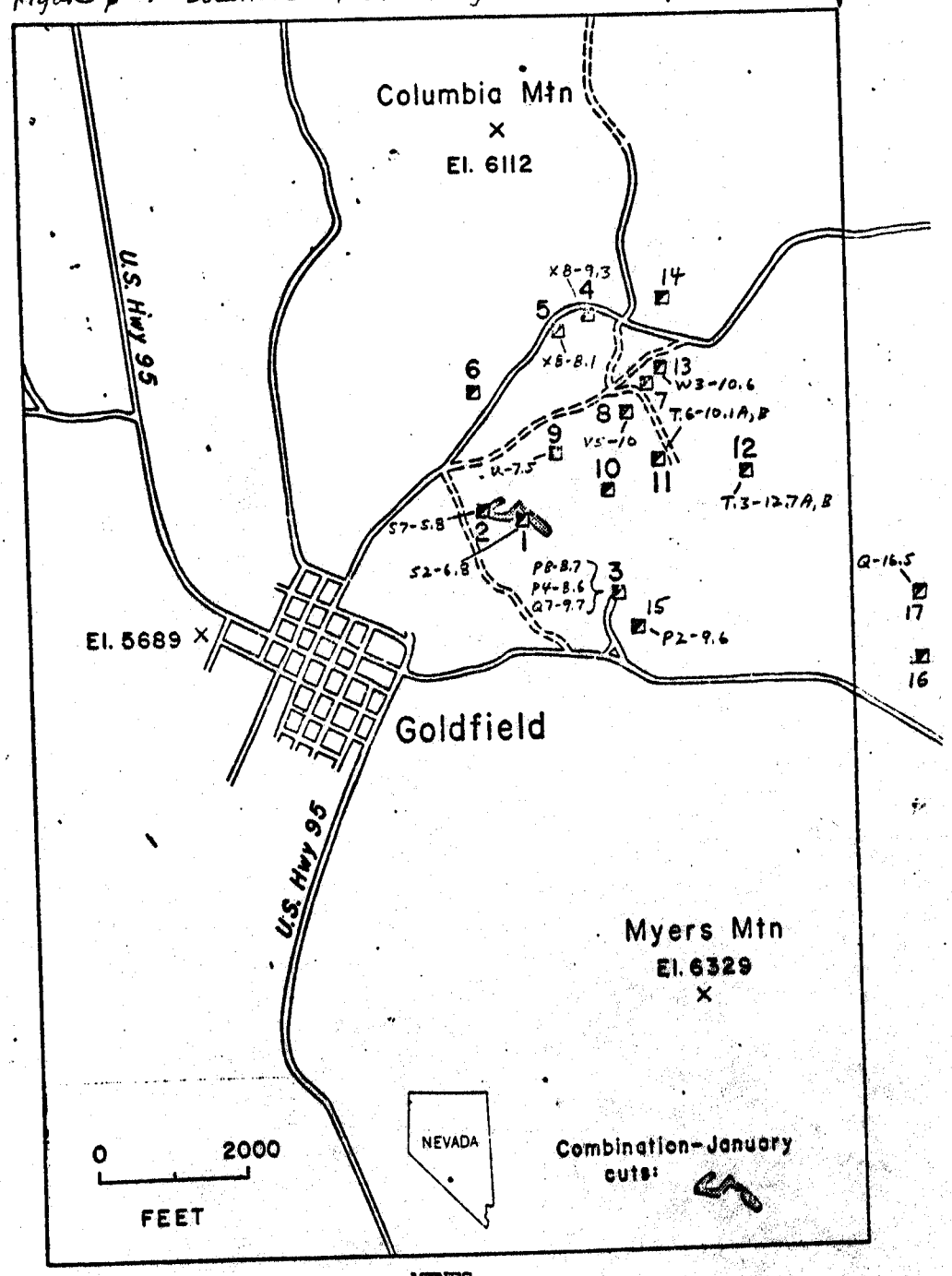
Figure 3

Locations of unoxidized silicified dacite and hydrated sulfate samples



27c

Figure 4. Locations of average-grade ore samples



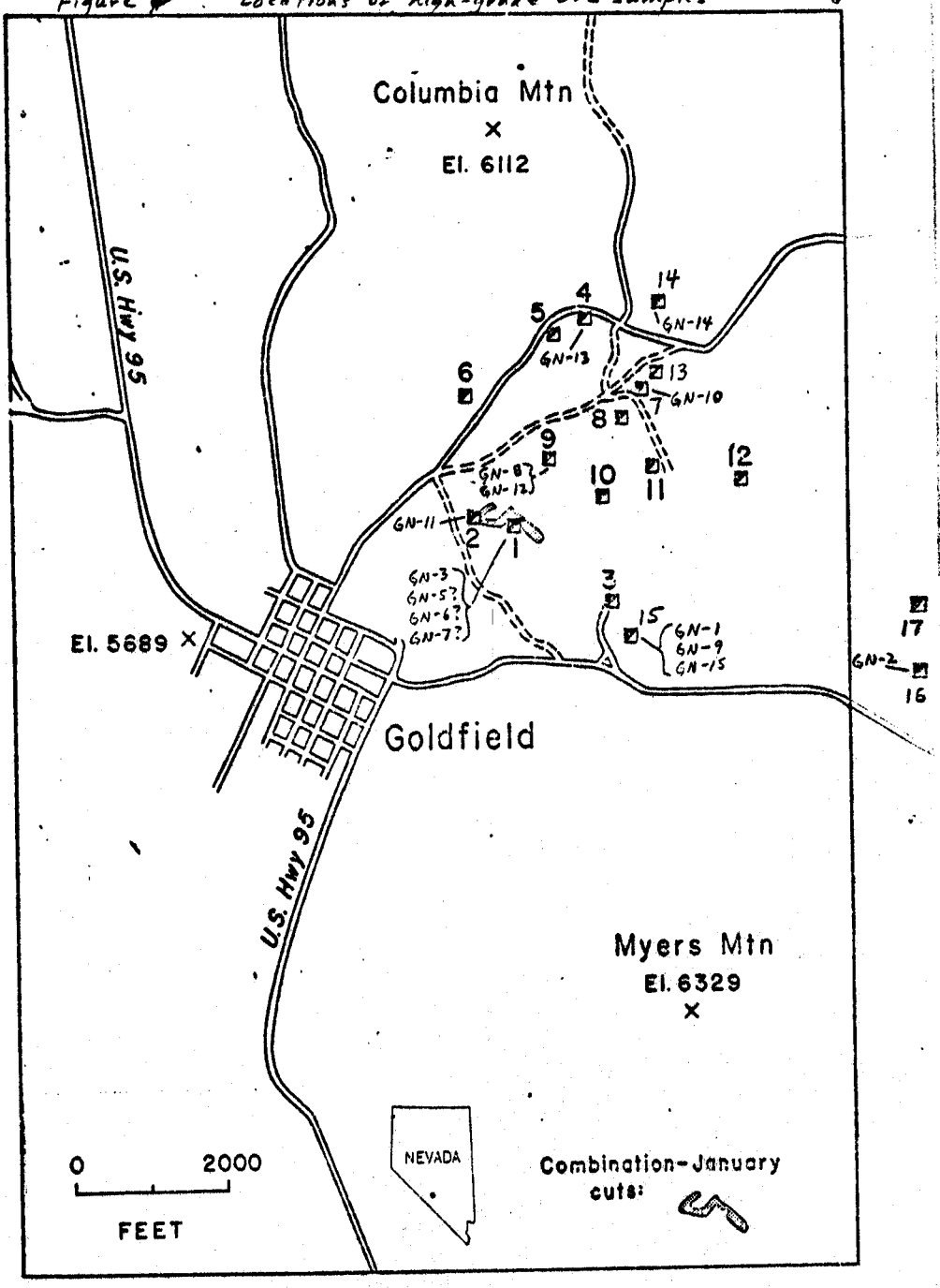
MINES

1. COMBINATION (S2-6.8)
2. JANUARY (S7-5.8)
3. FLORENCE (P8-8.7, P4-8.6, Q7-9.7)
4. LAGUNA (X8-9.3)
5. RED TOP (X8-8.1)
6. SILVER PICK
7. JUMBO EXTENSION
8. CLERMONT (VS-10)
9. MOHAWK (U-7.5)
10. JUMBO
11. GRIZZLY BEAR (T6-10.1A, T6-10.1B)
12. MERGER (T3-12.7A, T3-12.7B)
13. VELVET (W3-10.6)
14. KEWANAS
15. LITTLE FLORENCE (P2-9.6)
16. GOLD KAY
17. DEEP MINES (Q-16.5)

Note: the Deep Mines has no recorded production (Searls, 1948, p. 18).

Figure 5. Locations of high-grade ore samples

[Index(1)]



MINES

1. COMBINATION (GN-3, GN-5?, GN-6?, GN-7?)
2. JANUARY (GN-11)
3. FLORENCE
4. LAGUNA (GN-13)
5. RED TOP
6. SILVER PICK
7. JUMBO EXTENSION (GN-10)
8. CLERMONT
9. MOHAWK (GN-8, GN-12)
10. JUMBO
11. GRIZZLY BEAR
12. MERGER
13. VELVET
14. KEWANAS (GN-14)
15. LITTLE FLORENCE (GN-1, GN-9, GN-15)
16. GOLD BAR (GN-2)
17. DEEP MINES

3. Locat on (mine) unknown for GN-4.

Notes:
1. GN-13 is from the Mushett lease, adjacent to the Laguna.
2. The Deep Mines has no recorded production.

~~The unaltered dacite is a porphyritic volcanic rock with~~ plagioclase, biotite, hornblende, augite, ~~and a few quartz phenocrysts in an aphanitic, partly glassy groundmass. A more complete description is given on p. 33.~~ In unoxidized silicified dacite, the groundmass and phenocrysts are both replaced by quartz, alunite, and kaolinite, but the phenocrysts are richer in alunite and kaolinite than the groundmass. Pyrite partly replaces former mafic minerals and is also scattered throughout the altered groundmass. The oxidized silicified rocks described in more detail in the next section are petrographically the same as these rocks, except that hematite or goethite replaces the pyrite. Unoxidized average-grade ores contain 10 to 25 percent sulfide-bearing quartz aggregates which form veinlets that cut the silicified wall rock, or surround wall rock breccia fragments. Pyrite, stibioluzonite, and other sulfides (see p. ~~24~~ 35) in these veinlets and fillings form crusts or are intergrown with the quartz. Considerable alunite accompanies the quartz in many veinlets, and kaolinite fills scattered vugs remaining at the centers of the veinlets. Much of the material in the veinlets filled open fractures or open breccias, but some specimens show metasomatic effects extending several millimeters from the vein margins into the silicified wall rocks. Otherwise, wall rocks in these specimens are identical to unmetallized unoxidized silicified rocks; relict textures are generally well preserved. In a few specimens stibioluzonite is disseminated through the silicified wall rock. Here relict textures are obliterated, indicating that metasomatism locally extends at least several centimeters from veins into wall rocks. The high-grade samples could

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only be examined visually; sulfide minerals are conspicuous in all samples and abundant in some. Native gold is visible in several. **Details of ore mineralogy will be presented in a later section.**

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Petrography of oxidized altered dacite samples

The oxidized altered rocks exposed at the surface at Goldfield have been described in detail by Harvey and Vitaliano (1964). The criteria we use for classifying individual oxidized altered-rock samples from the Combination-January cuts are generally the same as the criteria they used for distinguishing several alteration zones and subzones. Thin sections from 30 of the samples from the cuts and X-ray diffractograms for 112 of the samples from the cuts provided the petrographic data which follows.

In this report we use the term "illite" to refer to a group of clay minerals having $d_{(001)}$ approximately equal to 9.9Å, that do not expand when treated with ethylene glycol. We do not distinguish between $1M_d$ and $2M_1$ polymorphic forms, both of which occur in these rocks. The term "kaolinite" refers to any member of the kaolinite group except halloysite (kaolinite, nacrite, dickite). We have not attempted precise identification of kaolinite-group minerals. The term "montmorillonite" refers to a group of expandable clay minerals having $d_{(001)}$ approximately equal to 14.7 to 15.5Å (samples air dried).

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Soft, clay-bearing altered rocks, although considered a single group for geochemical comparisons, are described here in two subgroups: those that contain montmorillonite, and those that do not. Montmorillonite-bearing rocks, restricted to a small area northwest of the Combination shaft (pl. 2), have plagioclase phenocrysts that are partly to almost completely altered to aggregates of 1 to 10 μ-long illite and montmorillonite grains. Illite flakes and leucoxene granules replace biotite. Illite, leucoxene(?) or opaques, and, in some cases, minor quartz replace hornblende and augite. The groundmass is an aggregate of 1 to 5 μ-diameter quartz grains and 1 to 10 μ-long montmorillonite, illite, and in some rocks kaolinite flakes. Crystals of jarosite 2 to 10 μ in diameter are scattered through the groundmass of some specimens. These rocks have experienced the weakest hydrothermal alteration of any rocks exposed in the cuts; they were located farther from local sources of hydrothermal solutions than any other rocks described here. They belong to the montmorillonite subzone of the argillic zone described by Harvey and Vitaliano (1964, p. 568).

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Clay-bearing rocks with no montmorillonite contain abundant illite and ~~various~~ varying amounts of kaolinite. In rocks with appreciable kaolinite, this mineral replaces the plagioclase phenocrysts with aggregates of crystals less than 3 μ to as much as 50 μ in diameter. In most rocks illite also occupies the plagioclase phenocrysts; the amount varies from a few flakes parallel to former crystallographic planes to 80 percent of the crystal, intergrown with the kaolinite. Biotite is replaced by illite and leucoxene; hornblende and augite are replaced by leucoxene, hematite, and minor quartz. The groundmass is an aggregate of 10-μ quartz grains with as much as 20 percent 1 to 5-μ illite and as much as 30 percent diffuse patches of very fine-grained kaolinite. Scattered 1 to 5-μ granules of hematite, leucoxene, and in some rocks 10-μ jarosite or barite form about 10 percent of the groundmass. These clay-bearing rocks, which belong to the illite-kaolinite subzone of Harvey and Vitaliano (1964, p. 568-571), are the product of more intense hydrothermal alteration than the montmorillonite-bearing rocks.

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867-100

The rocks mapped as silicified rocks constitute the second group of samples used for geochemical comparisons (pl. 2). They are microcrystalline quartz with 15 to 65 percent alunite and kaolinite. Most rocks contain alunite and kaolinite in 10:1 to 1:3 proportions, but some have no kaolinite. Typically, alunite and kaolinite together form about one-third of the rock. It is dense and hard, resembling chert, because most of the alunite and kaolinite ~~is localized at the sites of~~ replaces former plagioclase phenocrysts, and sometimes former biotite phenocrysts, whereas the groundmass is mostly fine-grained intergrown quartz. Samples with more than 50 percent alunite and kaolinite become relatively soft, because these minerals become ~~important in~~ significant constituents of the groundmass; these rocks are indistinguishable in the field from non-silicified clay-bearing rocks. Twelve such samples, found locally at the margins of visibly silicified zones, are included with silicified rocks on plate 2. These alunite- and kaolinite-rich zones are always substantially thinner than the harder silicified zones adjacent to them. Former plagioclase phenocrysts in silicified rocks are represented by randomly oriented aggregates of 20- to 100-μ-wide alunite plates with 25 to 80 percent quartz (10 to 50μ) and kaolinite (2 to 10μ). The groundmass is now a 2 to 20μ aggregate of quartz with 10 to 50 percent alunite or kaolinite or both, alunite generally the more abundant, and scattered granules of hematite, leucoxene or rutile, and in some rocks diaspore or jarosite. Subhedral areas containing 20 to 50 percent hematite, leucoxene or rutile, and rarely jarosite, but otherwise similar to the groundmass, represent biotite, hornblende, and augite

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phenocrysts. In some rocks, however, biotite is the site of coarse platy alunite with 20 to 30 percent fine-grained leucoxene or rutile, hematite, and minor quartz. The silicified rocks belong to the alunite-quartz zone of Harvey and Vitaliano (1964, p. 571). They form crudely tabular bodies which represent the rocks immediately adjacent to the fissures that conducted hydrothermal solutions.

32a (p. 33 follows)

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~~36a~~ 42A (p. ~~37~~ 41A follows)

All the altered rocks show moderately to well-preserved relict textures regardless of intensity of alteration. Relict quartz phenocrysts remain in all samples.

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Potential indicator elements:

elements associated with gold in Goldfield ores

~~The Tertiary volcanic flows that occupied the Combination-January area were hydrothermally altered, metallized, and later oxidized to the depths now accessible. This section of the report focuses on geochemical features produced by the metallization process;~~ in this section our objective is to identify all the elements that are associated with gold in the Goldfield ores. Published descriptions of the ores and comparisons between silicified rocks (13 samples), average-grade ores (16 samples), and high-grade ores (15 samples), all unoxidized, serve~~d~~ to delineate the potential indicator element~~s~~.

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Unoxidized ore typically contained pyrite (FeS_2), bismuthinite (Bi_2S_3), stibioluzonite (famatinite)($Cu_3(Sb,As)S_4$)_/, and native gold

_/Ransome (1909, p. 118-119) identified this mineral as famatinite, and presented an analysis showing the As:Sb ratio of the mineral to be nearly 1:1. Levy (1968) has shown that famatinite belongs to the tetragonal series luzonite-stibioluzonite, and has suggested that the name famatinite be dropped. Our X-ray data, when compared with Levy's data, indicate that the Goldfield famatinite is stibioluzonite.

Ransome, 1909, p. 110-119, 165-166, 170). Collins (1907a, p. 398) reported tetrahedrite($(Cu,Fe)_{12}(Sb,As)_4S_{13}$) and small quantities of chalcopyrite ($CuFeS_2$) and sphalerite (ZnS) from the unoxidized ores of the Combination mine. Ransome (1909, p. 216) reported telluride ore from the 280-foot level of the Combination (unoxidized ore). Tolman and Ambrose (1934, p. 264-278) reported marcasite (FeS_2), tennantite ($(Cu,Fe)_{12}(As,Sb)_4S_{13}$), goldfieldite ($Cu_3(Te,Sb,As)S_4$)_/, sylvanite

_/Palache, Berman, and Frondel (1944) give the formula $Cu_{12}Sb_4Te_3S_{16}$. Thompson (1946), and more recently Levy (1968), consider goldfieldite a member of the tetrahedrite group. Levy gives the formula $Cu_3(Te,Sb,As)S_4$.

($AgAuTe_4$), hessite (Ag_2Te), and petzite ($(Au,Ag)_2Te$) in ores from other mines in the vicinity. Searls (1948, p. 20) reports calaverite ($AuTe_2$) from a small vein developed by Newmont Mining Corporation about 0.3 mile west of the Florence mine. Ransome (1909, p. 112) described a few

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(p. ~~24a~~ 35a follows)

occurrences of galena (PbS). Ransome's analyses of ore from the Mohawk mine show copper, tellurium, bismuth, antimony, arsenic, gold, silver, zinc, and traces of lead (1909, p. 167, 169). X-ray diffraction and optical examination of the 16 average-grade ore samples[1] confirm

[1] The ores examined contain approximately 0.1 to 2 ounces gold per ton and 0.1 to 6 ounces of silver per ton except for one sample bearing 30 ounces silver per ton. The average values for Goldfield, calculated using annual production figures for the most active period of the district, 1906 through 1918, are 1.56 ounces gold per ton and 0.35 ounces silver per ton (U.S. Geol. Survey, 1906-1918).

stibioluzonite and subordinate tetrahedrite-tennantite, which is often enclosed in the stibioluzonite. Polished sections show that small amounts of bismuthinite are commonly associated with tetrahedrite-tennantite. Cursory examination of the 15 high-grade ores[1] spectrographically

[1] Samples loaned by National Museum of Natural History, Smithsonian Institution.

analysed for this study revealed no new major ore minerals. Searls (1948, p. 18) reported minor but notable amounts of tin in ore from some of the deeper ore bodies of the district. Preliminary microprobe data obtained by G. K. Czamanske show that stibioluzonite contains tin in variable amounts: Concentrations of 0.5 percent tin are common and a maximum of 2.7 percent tin was detected. No separate tin-bearing phase was recognized. A polished section of one of the average-grade ores

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867-100

provided this microprobe data and some additional microprobe data referred to later in the report. The ores were thus characterized by copper, antimony, arsenic, bismuth, tellurium, gold, silver, zinc, lead, and tin, in approximate order of decreasing absolute abundance. The economically important elements were gold, silver, copper, and lead, in order of decreasing total value of production.

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Elements suitable for geochemical exploration must occur in notable amounts in ore-bearing silicified zones, but not in barren silicified zones. To identify elements that were introduced mainly during metallization, rather than during silicification alone, we compare spectrographic data for unoxidized silicified rocks with similar data for unoxidized average-grade and high-grade ores. Analytical results and statistical data are given in tables 1 and 2. Data for 17

TABLES 1 and 2 NEAR HERE

samples of unaltered dacite are included for comparison with the altered and metallized rocks. The average minor-element content of these samples should be similar to that of the dacite in the Combination-January area before hydrothermal alteration. The samples comprising the three groups of unoxidized rocks and ores are few in number and from scattered localities, but they can be used for qualitative comparisons because the same alteration mineral assemblages occur throughout the district, and ore mineral assemblages from various parts of the district have important features in common (Ransome, 1909, p. 165-169, 172-172). Unaltered dacite samples, unoxidized silicified dacite samples, unoxidized average-grade ores, and unoxidized high-grade ores form a sequence of four groups whose compositions show progressively stronger effects of the ore-forming process.

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Appendix-1

Table 1

~~Appendix A~~

Analytical data, 17 analyzed dacite samples
Fe, Mg, Ca, Ti in percent, all others in
parts per million

Sample	Au	Ag	Pb	Bi	Hg	As	Cu	Zn	Mo	Ba
AAG-662	L(0.02)	L(0.5)	20	L(10)	0.04	L(10)	L(2)	N(200)	L(2)	700
AAG-682	L(0.02)	L(0.5)	10	L(10)	0.12	L(10)	30	N(200)	L(2)	2000
AAG-633	L(0.02)	L(0.5)	30	L(10)	0.18	L(10)	10	N(200)	L(2)	1500
AAG-722	L(0.02)	L(0.5)	10	L(10)	0.24	L(10)	2	N(200)	L(2)	700
AAG-724	L(0.02)	L(0.5)	20	L(10)	0.10	L(10)	5	N(200)	L(2)	1000
AAG-773	0.02	L(0.5)	15	L(10)	n.d.	L(10)	5	N(200)	L(2)	700
AAH-019	L(0.02)	L(0.5)	20	L(10)	0.03	L(10)	2	N(200)	L(2)	2000
AAS-987	L(0.02)	L(0.5)	20	L(10)	0.16	L(10)	5	N(200)	L(2)	3000
AAH-495	L(0.02)	L(0.5)	20	L(10)	0.10	L(10)	50	N(200)	L(2)	1500
ADQ-865	L(0.1)	N(0.5)	15	N(10)	0.05	L(10)	10	N(200)	N(3)	1500
ADQ-869	L(0.1)	N(0.5)	10	N(10)	0.05	L(10)	15	N(200)	N(3)	1500
ADQ-874	L(0.1)	N(0.5)	15	N(10)	0.04	L(10)	15	N(200)	N(3)	1500
ADQ-895	L(0.1)	N(0.5)	15	N(10)	0.03	L(10)	20	N(200)	3	3000
ADQ-942	L(0.1)	N(0.5)	15	N(10)	0.04	L(10)	20	N(200)	N(3)	1500
ADQ-943	L(0.1)	N(0.5)	15	N(10)	0.03	L(10)	30	N(200)	3	1500
ADQ-945	L(0.1)	N(0.5)	15	N(10)	L(0.01)	L(10)	30	N(200)	N(3)	1500
ADR-068	L(0.1)	N(0.5)	20	N(10)	0.07	L(10)	15	N(200)	N(3)	2000

Note: L means "less than" the detection threshold shown in parentheses. N means "not detected," with the detection threshold shown in parentheses. n.d. = not determined.

Table 1

Appendix A, continued

Sample	Be	Co	Cr	La	Mn	Nb	Ni	Sr	V	Y
AAG-662	1	5	10	30	300	n.d.	5	700	100	20
AAG-682	1	50	20	30	1500	n.d.	20	1500	200	20
AAG-688	L(1)	15	30	70	500	n.d.	15	1000	200	20
AAG-722	1	10	15	50	500	n.d.	15	700	200	20
AAG-724	1	L(5)	20	50	1000	n.d.	10	1000	100	20
AAG-773	1	7	20	50	500	n.d.	15	700	150	20
AAH-019	L(1)	10	30	50	700	n.d.	10	700	70	15
AAG-987	1	7	50	50	700	n.d.	15	700	200	15
AAH-425	L(1)	7	30	50	1000	n.d.	7	1500	150	15
ADQ-865	N(1)	10	15	70	700	10	7	500	100	20
ADQ-869	N(1)	10	20	70	700	10	15	700	150	30
ADQ-874	N(1)	15	15	70	700	10	10	700	150	30
ADQ-895	N(1)	15	30	70	700	10	15	1500	200	30
ADQ-942	N(1)	15	15	70	2000	10	15	700	150	30
ADQ-943	1	100	30	70	1000	10	50	1000	150	30
ADQ-945	N(1)	20	30	70	2000	10	15	1500	200	30
ADR-068	N(1)	10	20	100	2000	15	10	1500	150	20

Sample 1

Appendix A, continued

sample	Fe	Mg	Ca	Ti
AAG-662	3.0	1.0	1.0	0.3
AAG-682	7.0	2.0	3.0	0.5
AAG-688	7.0	1.5	2.0	0.5
AAG-722	3.0	1.0	1.0	0.2
AAG-724	5.0	1.0	2.0	0.3
AAG-773	2.0	1.0	2.0	0.3
AAH-019	5.0	1.0	5.0	0.2
AAG-987	7.0	1.5	5.0	0.7
AAH-495	10.0	2.0	3.0	0.7
ADQ-865	2.0	2.0	3.0	0.15
ADQ-869	2.0	1.5	1.5	0.2
ADQ-874	2.0	1.5	2.0	0.2
ADQ-895	3.0	1.5	3.0	0.5
ADQ-942	5.0	5.0	3.0	0.7
ADQ-943	7.0	5.0	3.0	0.7
ADQ-945	7.0	5.0	7.0	0.7
ADR-068	5.0	2.0	3.0	0.7

Table 1

Appendix B

Analytical data, 13 unoxidized silicified dacite samples from the Florence mine

Fe, Mg, Ca, Ti in percent, all others in parts per million

Sample	Au	Ag	Pb	Bi	Hg	As	Cu	Zn	Mo	Sb
F-150-5	0.33	2	300	10	0.67	15	200	<(200)	<(2)	<(100)
F-150-6	0.39	<(0.5)	150	<(10)	0.30	30	100	<(200)	<(2)	<(100)
F-250-2	<(0.02)	0.5	70	<(10)	0.30	10	150	<(200)	2	<(100)
F-250-3	0.75	<(0.5)	10	15	1.25	10	150	<(200)	2	<(100)
F-250-4	4.32	<(0.5)	30	<(10)	0.42	5	70	<(200)	<(2)	<(100)
F-250-5	<(0.02)	<(0.5)	100	<(10)	0.80	10	100	<(200)	15	<(100)
F-250-6	1.79	5	300	200	1.05	10	300	200	<(2)	<(100)
F-250-7	1.11	20	70	1000	10.4	320	>(5000)	<(200)	15	700
F-250-9	0.44	<(0.5)	300	<(10)	1.10	30	1000	<(200)	2	<(100)
F-250-10	0.96	0.7	100	<(10)	0.33	5	100	<(200)	<(2)	<(100)
F-250-11	<(0.02)	<(0.5)	150	<(10)	0.24	20	500	<(200)	7	<(100)
F-350-2	0.05	<(0.5)	100	10	0.47	15	150	<(200)	2	<(100)
F-350-3B	<(0.02)	15	15	200	4.90	>(320)	2000	<(200)	<(2)	700

Note: > means "greater than" the upper detection limit shown in parentheses. See note under Appendix A for explanation of other symbols.

Appendix B, continued

Table 1

Sample	Sn	Ba	Be	Co	Cr	La	Mn	Nb	Ni	Sr
F-150-5	L(20)	5000	L(1)	L(5)	50	30	70	n.d.	5	2000
F-150-6	L(20)	3000	L(1)	L(5)	15	30	L(10)	n.d.	10	500
F-250-2	L(20)	700	L(1)	10	30	30	50	n.d.	7	5000
F-250-3	L(20)	L(100)	L(1)	10	5	30	150	n.d.	10	L(100)
F-250-4	L(20)	700	L(1)	5	15	30	100	n.d.	5	300
F-250-5	L(20)	5000	L(1)	150	70	30	100	n.d.	30	5000
F-250-6	L(20)	2000	L(1)	500	10	20	50	n.d	70	1500
F-250-7	200	1000	L(1)	300	20	20	30	n.d.	50	700
F-250-9	L(20)	5000	L(1)	70	30	50	100	n.d.	30	1500
F-250-10	L(20)	300	L(1)	7	20	30	30	n.d.	7	1000
F-250-11	L(20)	3000	L(1)	150	15	50	100	n.d.	10	1500
F-350-2	L(20)	2000	L(1)	10	30	50	70	n.d.	7	500
F-350-3B	30	100	L(1)	L(5)	L(5)	20	30	n.d.	5	150

Appendix B, continued

Table 1

Sample	V	Y	Fe	Mg	Ca	Ti
F-150-5	200	<(10)	2.0	0.07	0.07	1.0
F-150-6	150	<(10)	2.0	0.02	0.2	0.5
F-250-2	300	<(10)	5.0	0.15	0.2	0.7
F-250-3	50	<(10)	5.0	0.15	0.05	0.7
F-250-4	150	<(10)	3.0	<(0.02)	<(0.05)	0.7
F-250-5	200	<(10)	10.0	0.07	0.15	0.5
F-250-6	30	<(10)	7.0	0.2	<(0.05)	0.2
F-250-7	70	<(10)	20.0	0.1	0.1	0.2
F-250-9	200	<(10)	7.0	0.07	0.15	0.7
F-250-10	150	<(10)	5.0	0.03	<(0.05)	0.3
F-250-11	100	<(10)	5.0	0.2	0.1	0.5
F-350-2	100	<(10)	7.0	0.03	0.15	0.5
F-350-3B	30	<(10)	1.0	<(0.02)	0.1	0.3

Table 1

Appendix C

Analytical data, 16 unoxidized average-grade ore samples
Fe, Mg, Ca, Ti in percent, all others in parts per million

Sample	Au	Ag	Pb	Bi	Hg	As	Cu	Zn	Mo	Sb
S7-5.8	70	100	300	1500	G(6.0)	G(5000)	30000	L(200)	5	10000
S2-6.8	32	70	50	500	G(6.0)	3000	10000	L(200)	5	2000
T3-12.7A	3.0	20	200	50	2.7	G(5000)	50000	L(200)	10	3000
T3-12.7B	4.0	20	100	200	0.26	200	10000	700	15	700
U-7.5	63	1000	300	2000	0.20	G(5000)	20000	L(200)	L(3)	2000
Q-16.5	2.0	3	1500	70	0.22	30	1500	L(200)	3	L(100)
P8-8.7	4.0	70	300	100	G(6.0)	G(5000)	30000	L(200)	L(3)	3000
X8-8.1	5.0	15	300	70	G(6.0)	1000	10000	3000	L(3)	2000
P2-9.6	3.0	30	100	20	G(6.0)	5000	10000	L(200)	L(3)	700
P4-8.6	1.0	5	300	30	0.38	100	300	L(200)	L(3)	L(100)
Q7-9.7	23	30	300	30	G(6.0)	4000	15000	L(200)	5	1500
X8-9.3	1.0	15	2000	200	1.0	150	10000	L(200)	5	200
T6-10.1A	45	30	200	100	G(6.0)	150	10000	L(200)	15	1500
T6-10.1B	2.0	200	200	1500	2.0	G(5000)	70000	L(200)	3	15000
V5-10	16	15	1000	30	2.7	G(5000)	10000	L(200)	3	1500
W3-10.6	10	100	2000	500	3.5	G(5000)	70000	1000	5	10000

Appendix C, continued

Table 1

Sample	Sn	Te	Ba	Be	Co	Cr	La	Mn	Nb	Ni
S7-5.8	1000	7000	200	<(1)	5	2	<(20)	10	<(10)	5
S2-6.8	200	<(1000)	200	<(1)	10	7	<(20)	10	<(10)	20
T3-12.7A	700	<(1000)	200	<(1)	7	5	<(20)	10	<(10)	15
T3-12.7B	10000	<(1000)	70	<(1)	100	10	<(20)	5	<(10)	200
U-7.5	50	30000	300	<(1)	5	15	<(20)	10	<(10)	10
Q-16.5	20	<(1000)	500	<(1)	10	7	<(20)	2	<(10)	50
P8-8.7	700	<(1000)	300	<(1)	10	3	<(20)	10	<(10)	30
X8-8.1	700	<(1000)	500	<(1)	5	15	<(20)	15	<(10)	5
P2-9.6	150	<(1000)	300	<(1)	5	5	<(20)	7	10	10
P4-8.6	<(10)	<(1000)	500	<(1)	5	2	<(20)	15	10	10
Q7-9.7	2000	<(1000)	500	<(1)	7	15	<(20)	10	<(10)	10
X8-9.3	10	<(1000)	500	<(1)	7	5	<(20)	15	<(10)	50
T6-10.1A	300	<(1000)	150	<(1)	15	3	<(20)	7	<(10)	30
T6-10.1B	<(10)	7000	200	<(1)	15	3	<(20)	5	<(10)	10
V5-10	<(10)	<(1000)	150	<(1)	15	3	<(20)	7	<(10)	30
W3-10.6	<(10)	<(1000)	300	<(1)	10	15	30	1	<(10)	15

Appendix C, continued

Table 1

Sample	Sr	V	Y	Fe	Mg	Ca	Ti
S7-5.8	150	20	<(10)	5.0	0.005	0.07	0.07
S2-6.8	70	20	<(10)	6(10)	0.002	0.03	0.07
T3-12.7A	100	30	10	7.0	<(0.002)	0.02	0.07
T3-12.7B	30	100	<(10)	6(10)	<(0.002)	0.015	0.015
K-7.5	150	70	<(10)	3.0	0.005	0.03	0.2
Q-16.5	100	30	<(10)	6(10)	<(0.002)	0.03	0.03
P8-8.7	200	20	<(10)	6(10)	0.005	0.1	0.01
X8-8.1	500	150	<(10)	3.0	0.007	0.05	0.15
P2-9.6	150	70	<(10)	3.0	0.005	0.05	0.15
P4-8.6	150	15	<(10)	3.0	0.015	0.07	0.07
Q7-9.7	200	70	<(10)	2.0	<(0.002)	0.1	0.15
X8-9.3	300	30	<(10)	6(10)	<(0.002)	0.1	0.03
T6-10.1A	30	15	<(10)	6(10)	<(0.002)	0.015	0.03
T6-10.1B	100	30	<(10)	1.5	<(0.002)	0.02	0.1
V5-10	700	70	<(10)	7.0	<(0.002)	0.05	0.03
W3-10.6	200	100	<(10)	5.0	<(0.002)	0.03	0.07

Table 1

Appendix D

Analytical data, 15 unoxidized high-grade ore samples

Bi, As, Cu, Sb, Te, and Fe in percent, all others in ppm

	Au	Ag	Pb	Bi	Hg	As	Cu	Zn	Mo	Sb
GN-1	300	1000	150	1.0	1500	10	30	1500	15	7.0
GN-2	2000	5000	200	10	200	3	20	700	200	5.0
GN-3	10000	500	300	0.5	30	0.3	1.0	300	10	0.15
GN-4	150	500	70	0.05	500	10	50	1000	20	7.0
GN-5	100	700	30	0.07	700	15	50	1500	7	7.0
GN-6	150	700	150	0.02	150	10	30	1000	20	7.0
GN-7	200	700	70	0.03	1000	15	50	1500	7	7.0
GN-8	30000	3000	2000	15	200	0.7	5.0	N(100)	N(2)	7.0
GN-9	20000	100	70	0.07	20	N(0.02)	0.05	N(100)	N(2)	0.007
GN-10	500	2000	700	2.0	150	7	20	3000	50	5.0
GN-11	1000	700	100	1.0	3000	10	20	1000	N(2)	7.0
GN-12	7000	20000	1500	10	150	N(0.02)	0.5	N(100)	N(2)	0.1
GN-13	200	300	2000	10	500	2	5.0	20000	5	1.5
GN-14	50	1000	50	0.5	N(20)	7	20	3000	20	5.0
GN-15	20	10	30	0.01	50	N(0.02)	0.03	N(100)	N(2)	0.005

Note: all data obtained by 6-step semiquantitative spectrographic analysis. Spectra of 10-fold and 100-fold dilutions were also recorded to better evaluate those elements occurring at high concentrations. Special exposure parameters were used to obtain the values for Hg.

Table 1

Appendix D, continued

	Sn	Te	Cd	Ba	Be	Co	Cr	La	Mn	Nb
GN-1	30000	2.0	700	50	N(1)	100	3	N(30)	50	N(7)
GN-2	5000	10	100	7	N(1)	3	7	N(30)	1	N(7)
GN-3	100	3.0	N(50)	700	N(1)	10	10	N(30)	7	N(7)
GN-4	7000	0.7	300	70	N(1)	15	5	N(30)	10	N(7)
GN-5	7000	0.7	500	15	N(1)	150	N(1)	N(30)	3	N(7)
GN-6	3000	0.5	700	150	N(1)	15	3	N(30)	2	N(7)
GN-7	7000	1.0	700	30	N(1)	20	2	N(30)	L(1)	N(7)
GN-8	30	5.0	300	30	N(1)	N(2)	1	N(30)	1	N(7)
GN-9	N(7)	0.7	N(50)	100	N(1)	7	5	N(30)	5	10
GN-10	10000	5.0	200	20	N(1)	30	10	N(30)	N(1)	N(7)
GN-11	7000	5.0	150	2	N(1)	N(2)	3	N(30)	10	N(7)
GN-12	N(7)	3.0	150	2	N(1)	N(2)	1.5	N(30)	N(1)	N(7)
GN-13	5000	0.3	700	300	N(1)	15	10	30	1.5	N(7)
GN-14	1000	N(0.1)	N(50)	20	N(1)	100	2	N(30)	5	N(7)
GN-15	N(7)	N(0.1)	N(50)	500	N(1)	15	7	N(30)	7	N(7)

Table 1

Appendix D, continued

	Ni	Sr	V	Y	Fe	Mg	Ca	Ti
GN-1	50	20	50	N(10)	0.2	15	50	100
GN-2	1.5	N(5)	70	N(10)	0.2	2	L(7)	30
GN-3	10	500	50	N(10)	1.0	20	500	1000
GN-4	15	70	100	N(10)	1.0	15	70	150
GN-5	100	10	50	N(10)	0.7	5	L(7)	70
GN-6	10	100	70	N(10)	1.0	5	50	300
GN-7	15	15	100	N(10)	0.7	3	7	150
GN-8	N(1)	20	N(3)	N(10)	0.1	3	20	150
GN-9	1.5	150	30	N(10)	0.7	30	200	2000
GN-10	7	100	200	N(10)	1.5	10	20	30
GN-11	2	N(5)	20	N(10)	0.15	2	7	10
GN-12	N(1)	N(5)	N(3)	N(10)	0.02	L(2)	L(7)	10
GN-13	20	700	70	N(10)	2.0	20	500	1500
GN-14	70	70	50	N(10)	7.0	50	30	20
GN-15	3	700	70	10	1.5	50	2000	2000

Table 2

Table 8

Appendix G

Statistical data, 17 unaltered dacite samples

Element	% of samples below detection threshold	Geometric mean (log %)	Geometric standard deviation (log %)	Cohen's mean (log %)	Cohen's standard deviation (log %)
Au	94	—	—	—	—
Ag	100	—	—	—	—
Pb	0	-2.79	0.13	—	—
Bi	100	—	—	—	—
Hg 1/	6	-5.17	0.31	-5.23	0.38
As	100	—	—	—	—
Cu	6	-2.94	0.42	-3.00	0.47
Zn	100	—	—	—	—
Mo	88	—	—	—	—
Ba	0	-0.84	0.19	—	—
Be	59	—	—	—	—
Co	6	-2.87	0.33	-2.92	0.36
Cr	0	-2.66	0.17	—	—
La	0	-2.24	0.14	—	—
Mn	0	-1.08	0.24	—	—
Nb 2/	0	-2.98	0.06	—	—
Ni	0	-2.89	0.22	—	—
Sr	0	-1.04	0.16	—	—
V	0	-1.83	0.14	—	—
Y	0	-2.66	0.11	—	—
Fe	0	0.63	0.24	—	—
Mg	0	0.25	0.24	—	—
Ca	0	0.41	0.23	—	—
Ti	0	-0.41	0.25	—	—

1/ Determined for 16 samples.
2/ Determined for 8 samples.

Table 8

Appendix H

Statistical data, 13 unoxidized silicified dacite samples from the Florence mine

Element	% of samples outside detection limits ‖	Geometric mean ¹ (log %)	Geometric standard deviations ² (log %)	Cohen's mean ³ (log %)	Cohen's standard deviation ⁴ (log %)
Au	31	-4.20	0.51	-4.86	1.12
Ag	54	-3.50	0.61	-4.41	1.06
Pb	0	-2.07	0.46	—	—
Bi	54	-2.20	0.78	-3.18	1.18
Hg	0	-4.10	0.47	—	—
As	8 (6)	-2.79	0.46	-2.66	0.62
Cu	8 (6)	-1.65	0.43	-1.52	0.60
Zn	92	—	—	—	—
Mo	46	-3.37	0.39	-3.71	0.51
Sb	85	—	—	—	—
Sn	85	—	—	—	—
Ba	8	-0.85	0.51	-0.96	0.63
Be	100	—	—	—	—
Co	23	-2.41	0.72	-2.75	0.91
Cr	8	-2.68	0.30	-2.75	0.36
La	0	-2.51	0.14	—	—
Mn	8	-2.19	0.23	-2.27	0.34
Nb	no data				
Ni	0	-2.91	0.38	—	—
Sr	8	-0.99	0.44	-1.09	0.54
V	0	-1.97	0.31	—	—
Y	100	—	—	—	—
Fe	0	0.67	0.32	—	—
Mg	15	-1.11	0.33	-1.23	0.42
Ca	23	-0.93	0.19	-1.05	0.28
Ti	0	-0.33	0.21	—	—

‖ (6) indicates percentage of samples above an upper detection limit. Otherwise, percentage given is the number of samples below a lower detection limit.

Table 8

Appendix I

Statistical data, 16 unoxidized average-grade ore samples

Element	% of samples outside detection limits	Geometric mean F_1 (log %)	Geometric standard deviations (log %)	Cohen's mean F_2 (log %)	Cohen's standard deviations (log %)
Au	0	-3.14	0.60	—	—
Ag	0	-2.45	0.60	—	—
Pb	0	-1.49	0.45	—	—
Bi	0	-1.83	0.64	—	—
Hg	44(G)	-1.34	0.76	-0.49	1.21
As	44(G)	-4.07	0.49	-3.41	0.90
Cu	0	0.09	0.58	—	—
Zn	81	—	—	—	—
Mo	31	-3.25	0.25	-3.40	0.32
Sb	13	-0.68	0.48	-0.89	0.72
Sn	25	-1.52	0.82	-2.07	1.22
Te	81	—	—	—	—
Ba	0	-1.58	0.24	—	—
Be	100	—	—	—	—
Co	0	-3.03	0.32	—	—
Cr	0	-3.25	0.31	—	—
La	94	—	—	—	—
Mn	0	-3.14	0.31	—	—
Nb	88	—	—	—	—
Ni	0	-2.74	0.40	—	—
Sr	0	-1.85	0.36	—	—
V	0	-2.39	0.31	—	—
Y	94	—	—	—	—
Fe	38(G)	0.55	0.21	0.83	0.41
Mg	56	-2.27	0.24	-2.75	0.51
Ca	0	-1.40	0.28	—	—
Ti	0	-1.19	0.31	—	—

Table 8

Appendix J
Statistical data, 15 unoxidized high-grade ore samples

Element	% of samples outside detection limits	Geometric mean, % (log %)	Geometric standard deviation, % (log %)	Cohen's mean, % (log %)	Cohen's standard deviation, % (log %)
Au	0	-1.20	0.94	—	—
Ag	0	-1.06	0.81	—	—
Pb	0	-1.60	0.55	—	—
Bi	0	-0.33	1.05	—	—
Hg	7	-1.61	0.61	-1.71	0.69
As	20	0.68	0.52	0.08	1.30
Cu	0	0.77	1.03	—	—
Zn	27	-0.81	0.44	-1.26	0.86
Mo	33	-2.75	0.45	-3.23	0.81
Sb	0	0.06	1.08	—	—
Sn	20	-0.57	0.83	-1.24	1.56
Te	13	0.24	0.46	0.04	0.67
Cd	27	-1.48	0.30	-1.79	0.58
Ba	0	-2.41	0.75	—	—
Be	100	—	—	—	—
Co	20	-2.67	0.48	-2.95	0.72
Cr	7	-3.41	0.31	-3.46	0.36
La	93	—	—	—	—
Mn	20	-3.36	0.47	-3.55	0.59
Nb	93	—	—	—	—
Ni	13	-2.99	0.59	-3.17	0.73
Sr	20	-2.08	0.62	-2.42	0.89
V	13	-2.21	0.24	-2.41	0.56
Y	93	—	—	—	—
Fe	0	-0.25	0.62	—	—
Mg	7	-3.02	0.47	-3.08	0.52
Ca	20	-2.17	0.74	-2.47	0.92
Ti	0	-1.87	0.77	—	—

 (p. 39 follows)

The comparisons provided by Figure 6 confirm that copper

Figure 6 near here

dominates the ores, and antimony, arsenic, bismuth, tellurium, gold, silver, zinc, lead, and tin are relatively abundant, as one would expect from available information on the ores. Data for tellurium are incomplete, but there is no reason to believe that amounts greater than 0.1 percent (1,000 ppm) reside in unaltered or unoxidized silicified dacite. In addition to the above elements, mercury and cadmium are relatively abundant. Molybdenum shows modest enrichment in some ore samples, although the averages for molybdenum in the two groups of ores are not ~~notably~~ significantly larger than the average for unoxidized silicified dacite. These elements form a group which will subsequently be referred to as "ore-related elements." These are the elements to be investigated as geochemical indicators for the Goldfield deposits. Barely detectable amounts of palladium appeared in seven of the high-grade ore samples, and small but variable amounts of indium appeared in five of the high-grade ore samples. Detectable tungsten (200-300 ppm) appeared in two high-grade ore samples. Platinum, tantalum, and thallium were sought by spectrographic analysis, but none of the samples from any data set contained detectable amounts of these elements. The only element not tested that might be important as an indicator is selenium. Ransome (1909, p. 134, 166) notes that selenium was found in tellurium-bearing oxidation products from two mines several miles northeast of the main district. Levy (1968, p. 131-132) notes an unidentified selenium-bearing mineral found as inclusions in goldfieldite.

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Figure 7(a)

Element abundances in unaltered dacite, unoxidized silicified dacite, and unoxidized ores

Data sets:

1 = unaltered dacite (17 samples)

2 = unoxidized silicified dacite (13 samples)

3 = unoxidized average-grade ores (16 samples)

4 = unoxidized high-grade ores (15 samples)

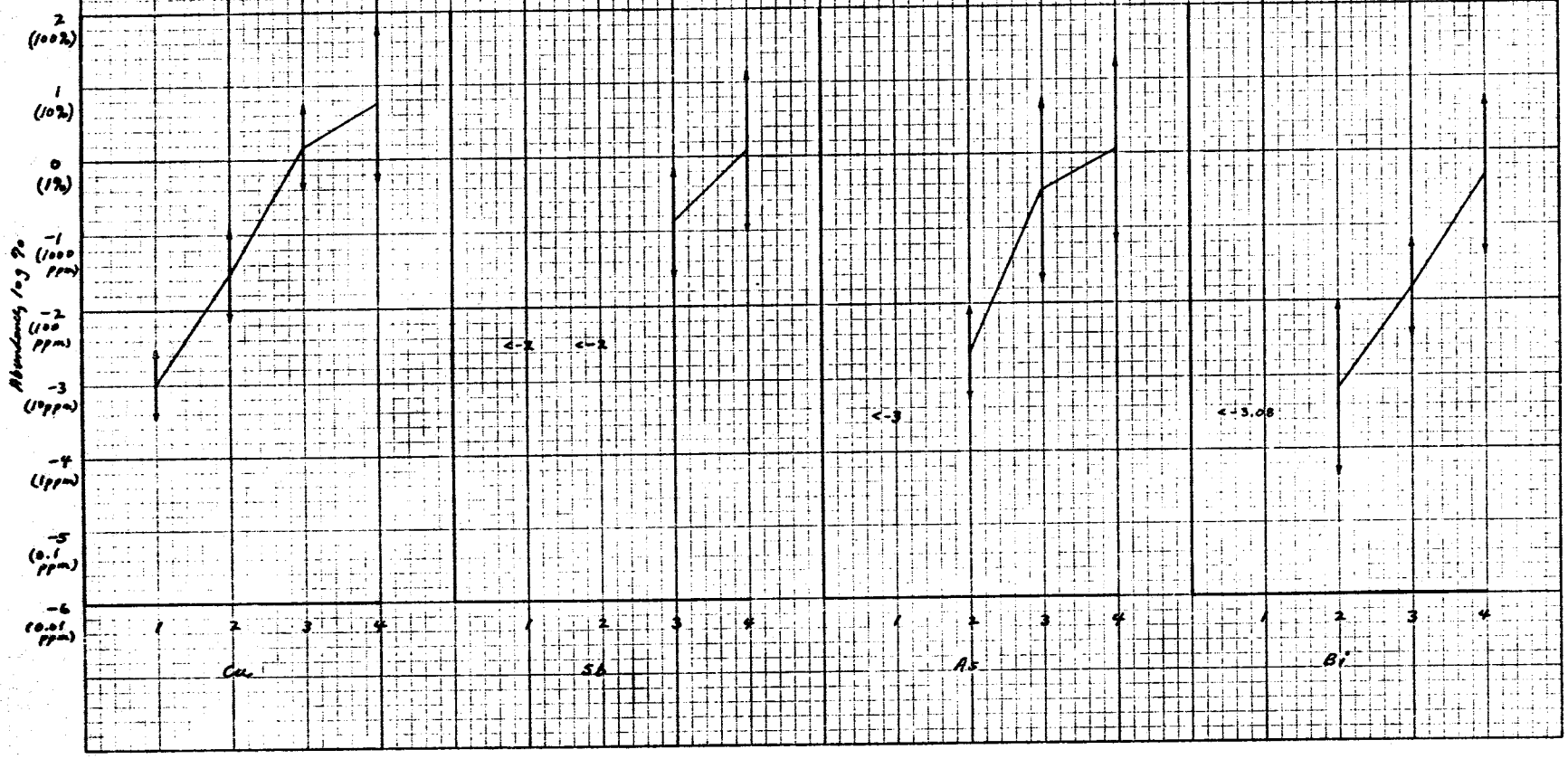
located along abscissa

+1σ (geometric deviation)

geometric mean

−1σ (geometric deviation)

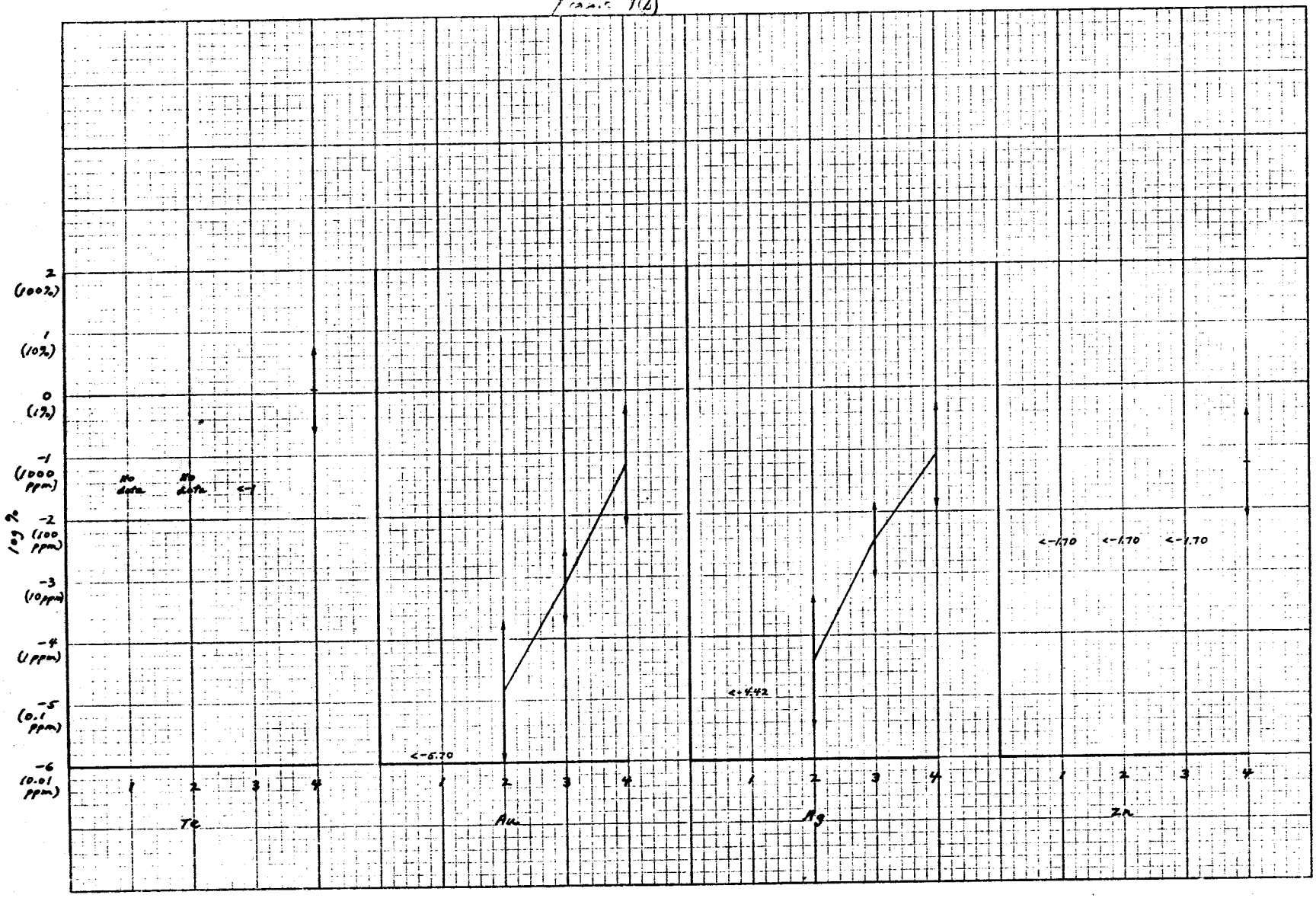
Ore related elements arranged in approximate order of decreasing abundance in rich ores. All other elements arranged alphabetically, following the major elements Fe, Mg, Ca, Ti.



39a

6

Figure 1(b)



6

Figure 6(c)

Figure 8(d)

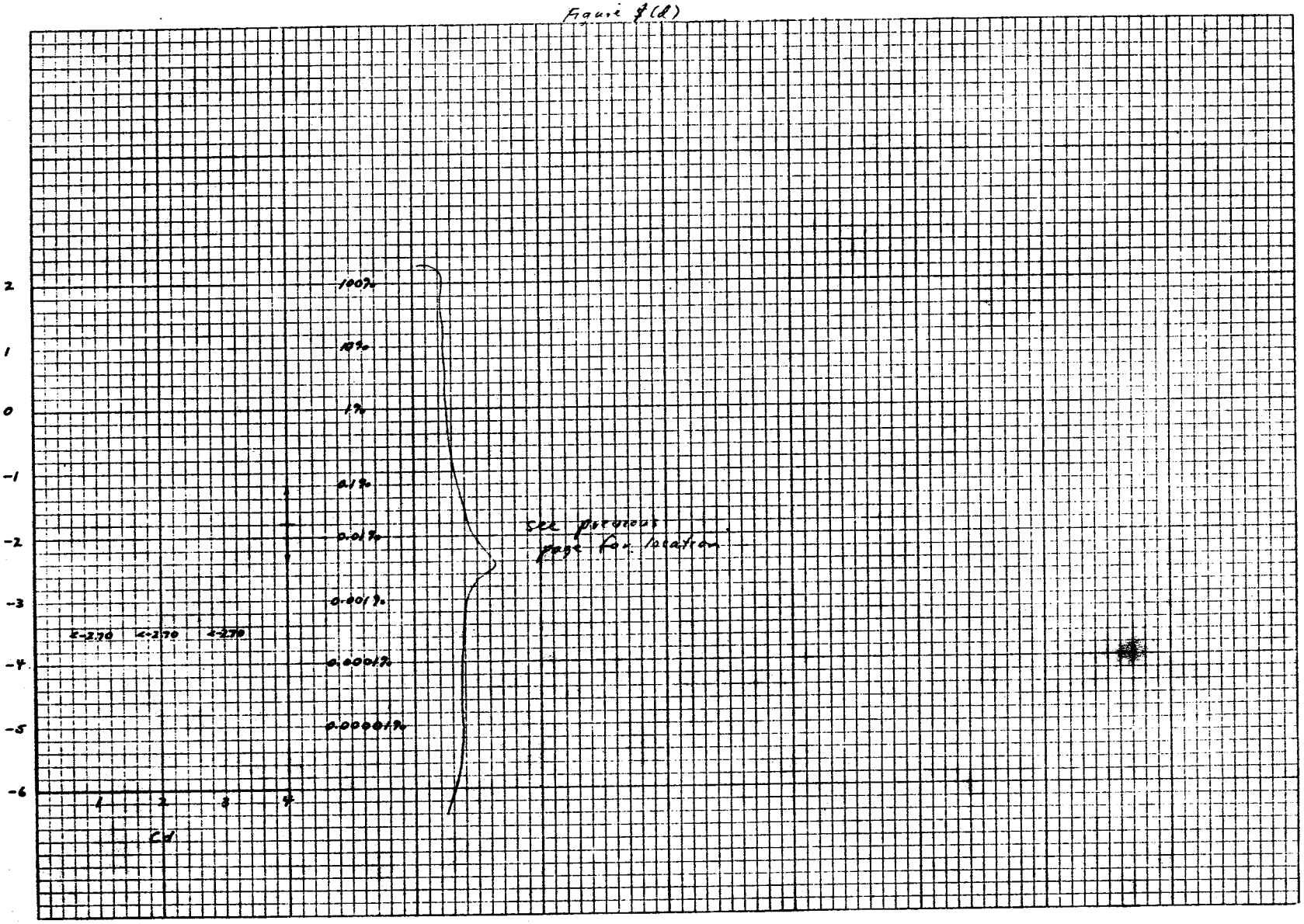

2
1
0
-1
-2
-3
-4
-5
-6
100%
10%
1%
0.1%
0.01%
0.001%
0.0001%
0.00001%
<-2.70
<-2.70
<-2.70
1
2
3
4
Cd
See previous page for location

Figure 6(c)

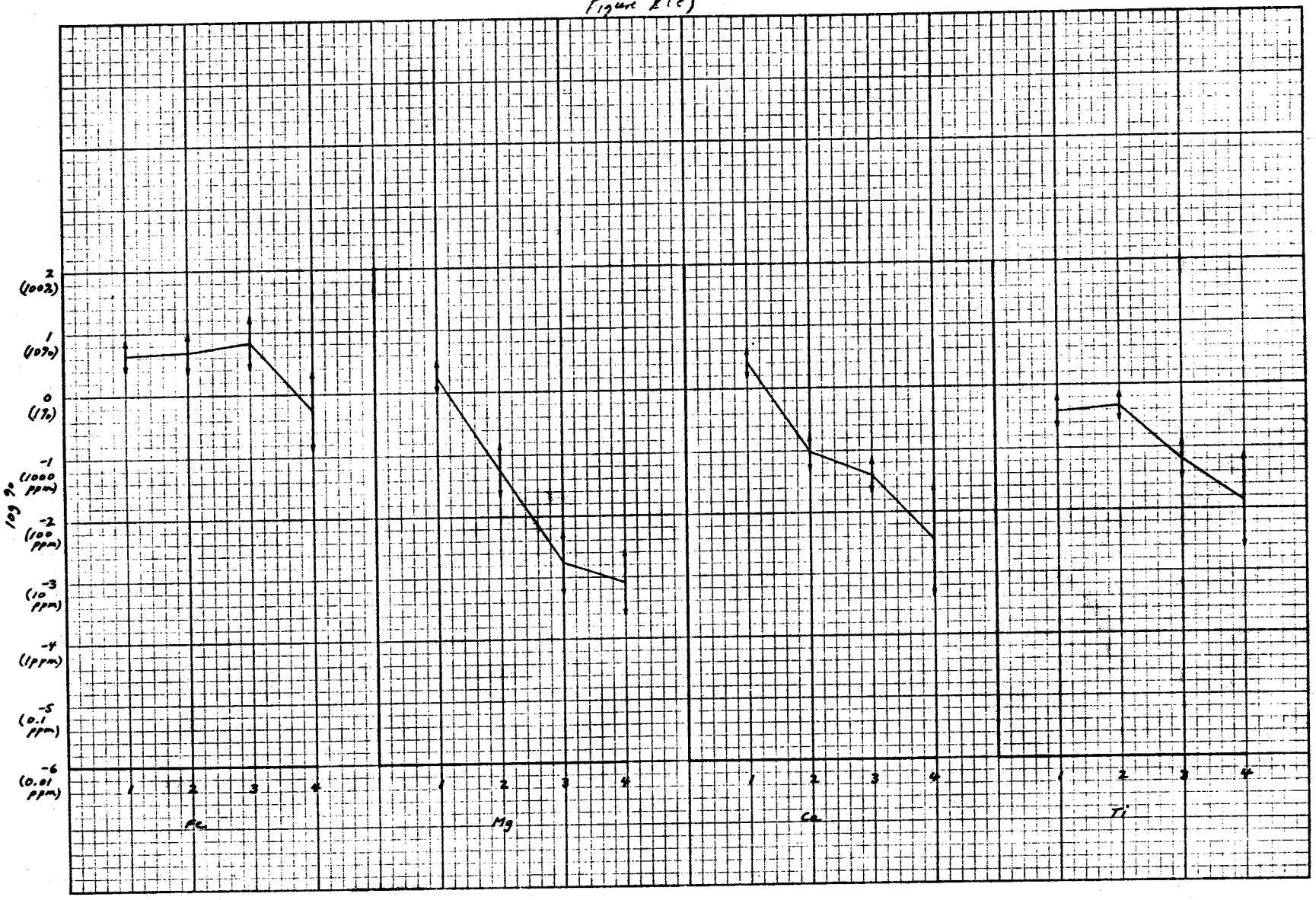
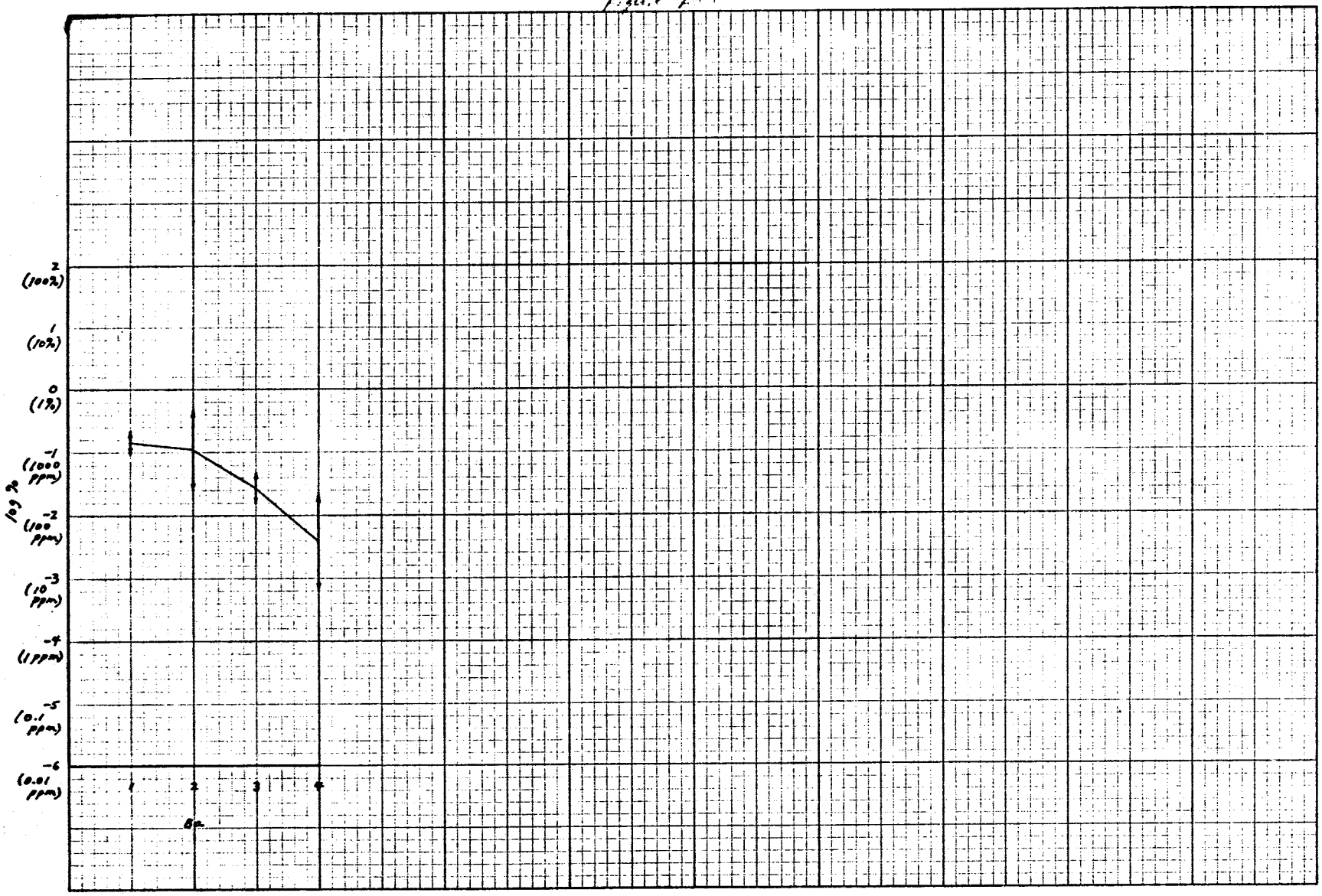


Figure 6



39e

Figure 6 (g)

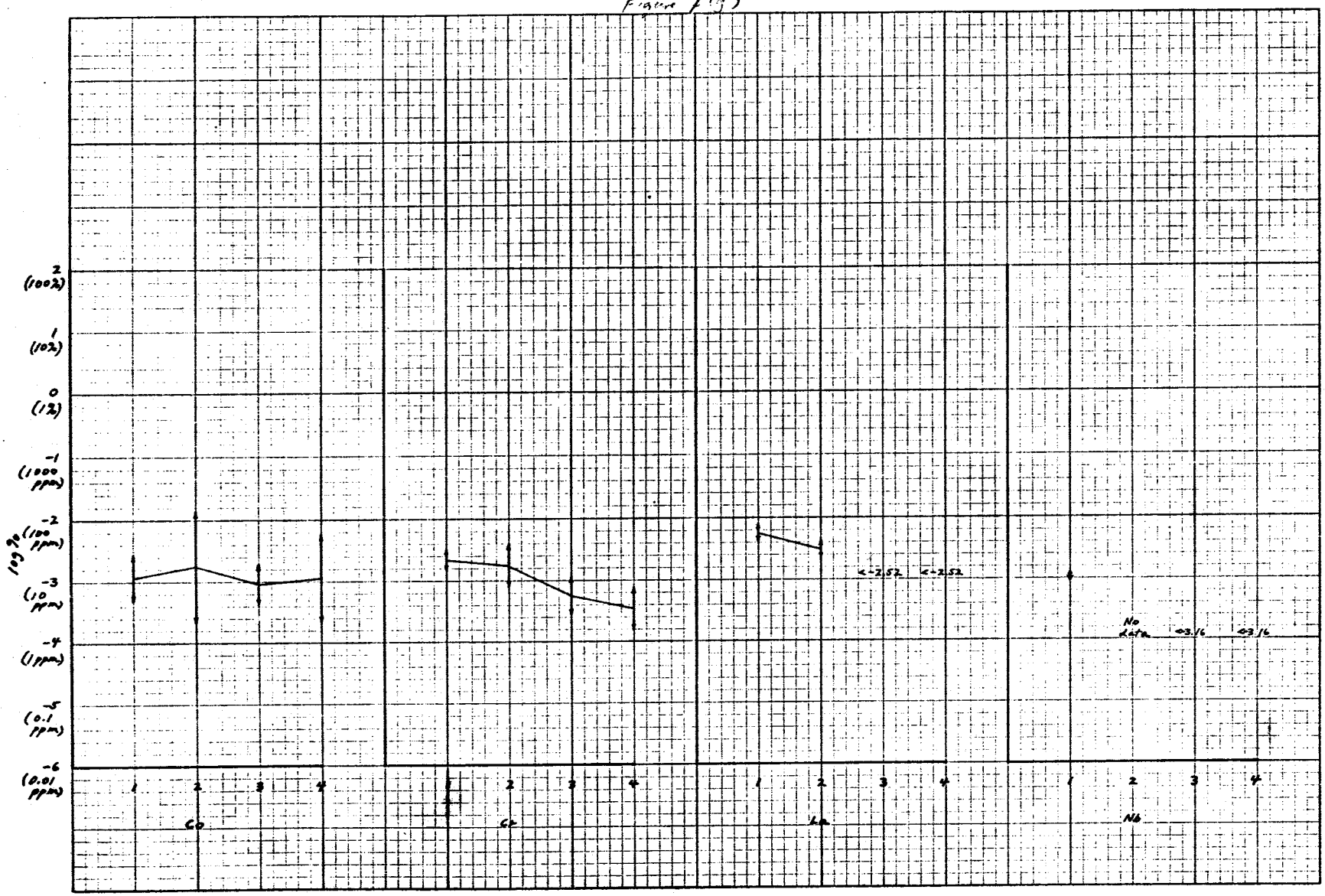


Figure 6(i)

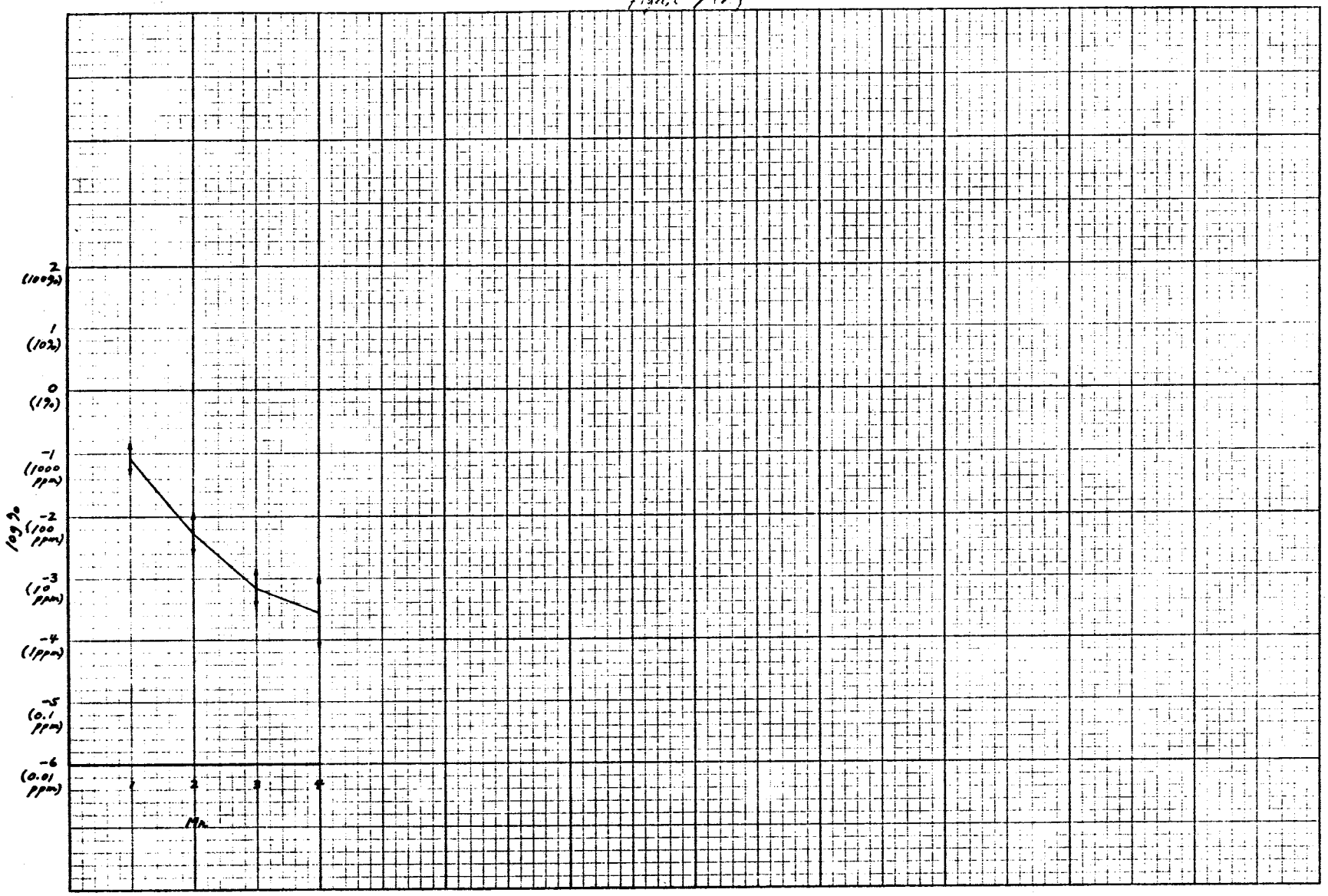
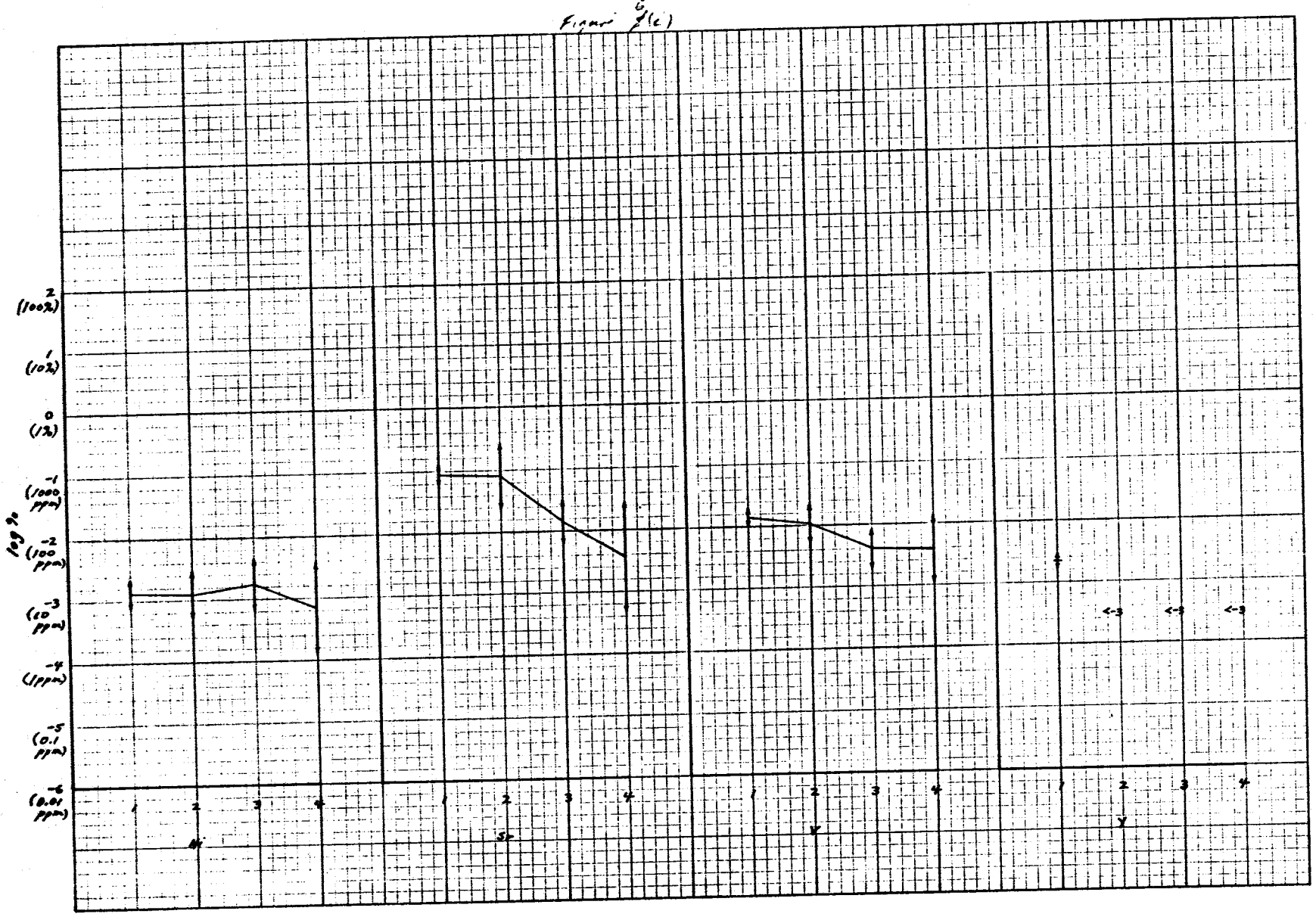


Figure 6(c)



The diagrams for iron, cobalt, chromium, nickel, and vanadium (fig. 6) are notably different from those for the elements described above. Regarding iron, unoxidized silicified dacite samples bear pyrite, much of which replaces former mafic minerals. Since the iron of this pyrite probably came from the preexisting mafic minerals, it is reasonable that unaltered and unoxidized silicified dacite have comparable amounts of iron, even though their mineral assemblages are vastly different. Some average-grade ore samples have pyrite associated with quartz veins and open-cavity fillings, in addition to that which replaces former mafic minerals in the silicified wall rock, producing iron contents notably larger than those seen in unoxidized silicified dacite samples. The average iron content, however, is not significantly larger than that calculated for unoxidized silicified rocks. High-grade ore samples, on the other hand, have much stibioluzonite and other ore minerals but relatively little pyrite, so these samples contain significantly smaller amounts of iron. Cobalt, chromium, nickel, and vanadium change little or not at all through the groups of samples. Cobalt and nickel (Ramdohr, 1969, p. 779) probably are retained in pyrite along with iron. These two elements are not, however, significantly less abundant in the high-grade ores, as is the case with iron; small amounts may have been introduced into the high-grade ores along with the abundant base and precious metals found therein. Cobalt and nickel data for the high-grade ores show significantly larger ~~standard~~ geometric deviations than do the data for average-grade ores, suggesting that more complex processes involving addition, as well as removal influenced

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~~30 (p. 30a follows)~~
40 (p. 40a follows)

cobalt and nickel concentrations in the high-grade ores. It is not clear why chromium and vanadium are not more strongly depleted; we do not know which mineral phase(s) they reside in. Vanadium in the ores could reside in tetrahedrite-tennantite or stibioluzonite; substantial amounts of vanadium occur in colusite ($Cu_3(Sn,V,As)S_4$), a mineral closely related to both the luzonite and tetrahedrite-tennantite mineral series (Levy, 1967, p. 129).

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Magnesium, calcium, and manganese each show a pronounced and progressive decrease, indicating that depletion is directly related to intensity of hydrothermal activity. The same is true of titanium, barium, and strontium, except that each of these shows no significant difference in abundance between unaltered and unoxidized silicified dacite samples. Barium and strontium data, however, show significantly larger standard deviations in unoxidized silicified rocks than they do unaltered rocks, suggesting that hydrothermal alteration produced a net increase in barium and strontium ~~concentrations~~ in some samples and a net loss in other samples. Thin sections of the unoxidized silicified dacite samples show that titanium is retained in leucoxene (fine-grained anatase, TiO_2) or in some cases rutile (TiO_2), and barium and strontium are retained in barite ($BaSO_4$) or celestite ($SrSO_4$) or both. Barite and celestite form a continuous solid solution series, but natural minerals are generally nearly pure $BaSO_4$ or $SrSO_4$ (Deer and others, 1962, p. 187-188, 197-198). The barite-celestite series mineral(s) recognized in thin section are too fine grained to separate easily for a more exact composition determination. It is not surprising to find barite (or celestite) along with the abundant alunite ($KAl_3(OH)_6(SO_4)_2$) in the silicified rocks, since all these minerals are sulfates. Alunite abundance generally decreases with increasing amounts of ore minerals, and barite (celestite) probably decreases also.

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Titanium, barium, and strontium could potentially form negative geochemical anomalies in areas with gold metallization. These elements could also conceivably be depleted, however, by particularly strong or long-enduring hydrothermal activity without metallization. Use of negative anomalies, furthermore, requires particularly careful chemical analysis and involves greater difficulties in interpretation than use of positive anomalies; therefore these elements will not be considered further.

Lanthanum, niobium, and yttrium probably are depleted relative to amounts in fresh dacite, but little else can be said with the data available.

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Dispersion patterns of ore-related elements in the oxidized zone

General

The previous section of this report established that copper, antimony, arsenic, bismuth, tellurium, gold, silver, zinc, cadmium, tin, lead, mercury, and molybdenum characterize metallization at Goldfield. The following discussion examines the relationships between most of these elements in oxidized rocks of the Combination and January mines. It is particularly important to see whether these elements form primary aureoles or secondary halos around the ore bodies, and how closely ~~related such~~ the elements are related to each other in the aureoles or halos.[1]

---

[1] Our use of the terms "primary," "secondary," "aureole," and "halo" is the same as that of Hawkes and Webb (1962). Since the Goldfield deposits are epigenetic (and hypogenetic), our usage is also concordant with revised definitions of the terms "primary," and "secondary" proposed by James (1967).

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Plate 2 is a geologic map of the open cuts at the Combination and January mines, showing rock types, structural features, and hydrothermal alteration zones. Sample localities are shown on plate 3. Specific localities mentioned in the text are numbered separately, and these numbers are given on plate 2 and the geochemical maps, plates 4-~~13~~ 5.

The 278 samples of oxidized hydrothermally-altered dacite that provide the data for this part of the report were collected every 5 feet about 4 feet above the floor of the large central cut, the smaller northwesternmost cut, and the northwestern part of the cut east of the Combination shaft (see pl.2). Much of the latter cut is occupied by caved material over ~~now caved~~ ~~glory hole and~~ stopes; samples here were taken about 4 feet above the top of the cave-in debris accumulated against the upper walls. The present walls are partly, perhaps largely, scarps left by blocks that broke off and slid or fell into the large caved area. Except for the caved area, the walls at the time of sampling and mapping were freshly excavated and very steep, representing elevation changes between 15 and 50 feet along any given profile across the cut wall. All rock exposed in the cuts is within the upper part of the oxidized zone. The depth of oxidation at the Combination mine is 130 to 140 feet (Ransome, 1909, p. 177, 216), and water was encountered at 210 feet when the shaft was sunk (Collins, 1907, P. 398). The depth of oxidation at the January mine is 180 feet and the original water level was 160 feet (Ransome, 1909, pl. XVI, p. 187, 219).

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Open workings, some forming precipitous holes, disrupt the sampling scheme at most of the 14 locations where they intersect the cuts. Six of these are shown on plate 2 along the west wall of the largest cut between localities 2 and 7. These all lie within silicified rocks and field examination indicates that they are probably old stopes. The seventh location (loc. 20), at the southeast end of the large caved area, in argillized rocks, is probably an access drift. Three more openings are located on the wall of the largest cut, between localities 6 and 7, and connect with the large opening shown at 7. The last four appear in the vicinityof locality 8, and were probably originally interconnected. All the workings represented by the latter two groups of openings are tunnels and possibly stopes that intersect the nearly vertical cut wall at various elevations; the several near locality 8 almost overlap when projected onto a horizontal plane. For simplicity, therefore, these workings are not included on the plates. To place the resulting problem of sampling bias in perspective, 12 of the existing samples (samples 88, 89, 90, 91, 92, 161, 162, 185, 186, 187, 194, 195; about 9 percent of the silicified rock samples) came from the walls or floors of stopes, and probably contain less gold and other gold-related elements than the mined-out rock ~~would have~~. Furthermore, several additional samples would have been taken in the vicinity of locality 8 if it had not been previously disrupted by mining activity.

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Element distribution maps

Rocks affected differently by hydrothermal activity often show pronounced differences in amounts of ore-related elements, so plate 2 is used as a base for the element-distribution maps (pls. 4 and 5 ~~-13~~) which follow. The analytical and statistical data used to make the maps and accompanying histograms are given in tables 3 and 4. The cuts generally

TABLE 3 AND 4 NEAR HERE

parallel the vein system, but they expose one section approximately across strike immediately northwest of the Combination shaft (see AA', pls. 3-5 ~~-13~~). A geochemical profile for this section is shown for each element along with the geochemical map to help bring out relationships between the minor element distributions and various alteration and structural features, and to show the degree of contrast between oxidized metallized silicified and nonmetallized argillized rocks. This contrast may also be termed "anomaly height-to-background ratio," or "anomaly contrast." The histograms accompanying each geochemical map show the relative amounts of each element in silicified versus argillized rocks. The histograms also show the relative numbers of samples included in each range of values represented by a different map symbol. Distribution maps are included for gold, lead, silver, bismuth, mercury, arsenic, copper, molybdenum, and zinc.

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Table 3. Analytical data for oxidized silicified and argillized rock samples from the Combination-January cuts

SILICIFIED ROCKS, PERCENT

SAMPLE	AU,%	AG,%	PB,%	BI,%	HG,%	AS,%	CU,%	ZN,%	MO,%	BA,%
1	0.000180	0.001000	0.015000	0.0 N	0.000050	0.006000	0.002000	0.0 L	0.0 N	0.070000
2	0.000088	0.000150	0.010000	0.0 N	0.000100	0.004000	0.000700	0.0 L	0.0 N	0.070000
3	0.000150	0.000200	0.050000	0.0 N	0.000010	0.0 L	0.002000	0.0 L	0.0 N	0.070000
4	0.000100	0.000100	0.007000	0.0 N	0.000010	0.012000	0.001500	0.0 L	0.0 N	0.070000
5	0.000069	0.000200	0.010000	0.0 N	0.000010	0.001000	0.000700	0.0 L	0.0 N	0.070000
6	0.000200	0.000300	0.015000	0.001000	0.000010	0.0 L	0.001000	0.0 L	0.0 N	0.070000
7	0.000450	0.002000	0.050000	0.001500	0.000050	0.001000	0.010000	0.0 L	0.0 N	0.070000
8	0.000310	0.000300	0.020000	0.001000	0.000020	0.001000	0.001500	0.0 L	0.0 N	0.070000
9	0.000340	0.000300	0.020000	0.001000	0.000020	0.001000	0.003000	0.0 L	0.0 N	0.070000
10	0.000188	0.000300	0.020000	0.0 N	0.000020	0.012000	0.005000	0.0 L	0.0 N	0.070000
11	0.000279	0.000300	0.007000	0.003000	0.000050	0.016000	0.020000	0.0 L	0.003000	0.030000
30	0.000080	0.000150	0.050000	0.001000	0.000011	0.001000	0.003000	0.0 L	0.001000	0.200000
32	0.000145	0.000300	0.015000	0.000500	0.000008	0.006000	0.003000	0.0 L	0.000700	0.020000
34	0.000150	0.000030	0.030000	0.0 N	0.000011	0.001000	0.001000	0.0 L	0.000300	0.070000
35	0.0 L	0.000070	0.030000	0.0 N	0.000006	0.001000	0.002000	0.002500	0.001000	0.015000
36	0.000290	0.000200	0.050000	0.0 N	0.000008	0.0 L	0.003000	0.0 L	0.000300	0.020000
37	0.000708	0.000150	0.070000	0.0 N	0.000015	0.0 L	0.001500	0.0 L	0.000300	0.070000
38	0.000639	0.000200	0.030000	0.0 N	0.000015	0.001000	0.000500	0.0 L	0.0 N	0.100000
39	0.000430	0.000200	0.070000	0.0 N	0.000024	0.001000	0.000700	0.0 L	0.000300	0.100000
45	0.000288	0.000500	0.005000	0.005000	0.000020	0.001000	0.003000	0.0 L	0.0 N	0.020000
63	0.000010	0.000500	0.003000	0.0 N	0.000013	0.006000	0.002000	0.002500	0.001500	0.070000
64	0.000010	0.0 N	0.0 N	0.0 N	0.000010	0.008000	0.001500	0.003000	0.000500	0.100000
65	0.000140	0.0 N	0.020000	0.0 N	0.000008	0.004000	0.001500	0.0 L	0.000500	0.100000
66	0.000090	0.0 N	0.010000	0.0 N	0.000006	0.010000	0.001000	0.0 L	0.0 N	0.070000
67	0.000275	0.0 N	0.015000	0.0 N	0.000011	0.001000	0.002000	0.0 L	0.0 N	0.300000
68	0.000207	0.0 N	0.070000	0.0 N	0.000006	0.010000	0.000500	0.0 L	0.000500	0.050000
69	0.000010	0.0 N	0.010000	0.0 N	0.000006	0.008000	0.000700	0.0 L	0.0 N	0.050000
74	0.000018	0.0 N	0.003000	0.0 N	0.000006	0.001000	0.001000	0.010000	0.0 N	0.070000
75	0.000180	0.0 N	0.020000	0.0 N	0.000015	0.014000	0.007000	0.0 L	0.000700	0.070000
77	0.000030	0.0 L	0.015000	0.0 N	0.000015	0.002000	0.001000	0.005000	0.000500	0.050000
78	0.000240	0.0 L	0.050000	0.0 N	0.000017	0.016000	0.001500	0.004000	0.000500	0.050000
79	0.000036	0.0 L	0.015000	0.0 N	0.000011	0.014000	0.002000	0.014000	0.000500	0.070000
80	0.000150	0.0 L	0.007000	0.0 N	0.000015	0.020000	0.007000	0.0 L	0.001000	0.050000
81	0.000246	0.000500	0.020000	0.003000	0.000011	0.001000	0.001000	0.0 L	0.0 N	0.070000
82	0.000290	0.000300	0.020000	0.003000	0.000019	0.001000	0.001000	0.0 L	0.0 N	0.070000
83	0.000120	0.000300	0.015000	0.0 N	0.000013	0.001000	0.001000	0.0 L	0.0 N	0.050000
84	0.000190	0.000100	0.020000	0.0 N	0.000011	0.002000	0.001500	0.0 L	0.0 N	0.100000
85	0.000016	0.000100	0.015000	0.0 N	0.000006	0.002000	0.001000	0.0 L	0.0 N	0.020000
86	0.000170	0.000500	0.015000	0.003000	0.000011	0.002000	0.001500	0.0 L	0.0 N	0.070000
87	0.000140	0.000300	0.030000	0.003000	0.000004	0.001000	0.001500	0.0 L	0.0 N	0.070000
88	0.000090	0.000300	0.020000	0.003000	0.000004	0.002000	0.001500	0.004000	0.0 N	0.070000
89	0.000055	0.000300	0.010000	0.0 N	0.000006	0.001000	0.000500	0.0 L	0.0 N	0.030000
90	0.000965	0.000100	0.030000	0.0 N	0.000006	0.001000	0.002000	0.0 L	0.0 N	0.050000
91	0.000940	0.000150	0.015000	0.0 N	0.000011	0.0 L	0.000700	0.0 L	0.0 N	0.200000
92	0.000010	0.000050	0.015000	0.0 N	0.000006	0.006000	0.001000	0.0 L	0.001000	0.050000
101	0.000226	0.000100	0.030000	0.0 N	0.000010	0.001000	0.001000	0.003000	0.000300	0.150000
116	0.000016	0.0 L	0.000700	0.0 N	0.000010	0.010000	0.002000	0.005000	0.000500	0.020000
117	0.000010	0.0 L	0.000700	0.0 N	0.000010	0.002000	0.002000	0.0 L	0.0 N	0.100000
118	0.000010	0.0 L	0.001500	0.0 N	0.000010	0.004000	0.000500	0.0 L	0.001000	0.070000
119	0.000029	0.0 N	0.007000	0.0 N	0.000008	0.001000	0.000500	0.0 L	0.0 N	0.070000

SILICIFIED ROCKS, PERCENT

SAMPLE	BE,%	CO,%	CR,%	LA,%	MN,%	NB,%	NI,%	SR,%	V,%	Y,%
1	0.0 N	0.0 N	0.001000	0.0 N	0.015000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
2	0.0 N	0.0 N	0.001000	0.0 N	0.001500	0.0 N	0.0 N	0.050000	0.007000	0.0 N
3	0.0 N	0.0 N	0.001000	0.0 N	0.001500	0.0 N	0.0 N	0.070000	0.007000	0.0 N
4	0.0 N	0.0 N	0.001000	0.0 N	0.003000	0.0 N	0.0 N	0.050000	0.010000	0.0 N
5	0.0 N	0.0 N	0.001500	0.0 N	0.000700	0.0 N	0.0 N	0.030000	0.010000	0.0 N
6	0.0 N	0.0 N	0.001000	0.0 N	0.002000	0.0 N	0.0 N	0.030000	0.007000	0.0 N
7	0.0 N	0.0 N	0.001000	0.0 N	0.002000	0.0 N	0.0 N	0.050000	0.007000	0.0 N
8	0.0 N	0.0 N	0.001000	0.0 N	0.002000	0.0 N	0.0 N	0.050000	0.007000	0.0 N
9	0.0 N	0.0 N	0.001000	0.0 N	0.003000	0.0 N	0.0 N	0.050000	0.007000	0.0 N
10	0.0 N	0.0 N	0.001000	0.0 N	0.007000	0.0 N	0.0 N	0.050000	0.005000	0.0 N
11	0.0 N	0.003000	0.001000	0.0 N	0.030000	0.0 N	0.0 N	0.070000	0.020000	0.0 N
30	0.000030	0.000500	0.002000	0.003000	0.005000	0.0 N	0.000200	0.050000	0.010000	0.000500
32	0.000030	0.0 N	0.001500	0.0 N	0.005000	0.0 N	0.000200	0.050000	0.007000	0.000500
34	0.000050	0.000500	0.003000	0.007000	0.007000	0.0 N	0.000300	0.150000	0.007000	0.000700
35	0.000030	0.0 N	0.002000	0.007000	0.010000	0.0 N	0.000200	0.150000	0.015000	0.000700
36	0.000030	0.0 N	0.002000	0.0 N	0.005000	0.0 N	0.000200	0.050000	0.007000	0.000500
37	0.000030	0.0 N	0.002000	0.005000	0.002000	0.0 N	0.000200	0.050000	0.007000	0.000500
38	0.000030	0.0 N	0.001500	0.005000	0.001500	0.0 N	0.000200	0.150000	0.007000	0.000500
39	0.000030	0.0 N	0.001500	0.003000	0.002000	0.0 N	0.000200	0.200000	0.007000	0.000500
45	0.000050	0.000700	0.001000	0.007000	0.003000	0.001000	0.000200	0.030000	0.003000	0.000700
63	0.000030	0.0 N	0.001000	0.005000	0.030000	0.0 N	0.000300	0.100000	0.007000	0.000500
64	0.0 N	0.0 N	0.002000	0.0 N	0.030000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
65	0.0 N	0.0 N	0.002000	0.007000	0.003000	0.0 N	0.0 N	0.100000	0.010000	0.002000
66	0.0 N	0.0 N	0.002000	0.007000	0.001000	0.0 N	0.0 N	0.020000	0.007000	0.0 N
67	0.0 N	0.0 N	0.002000	0.007000	0.003000	0.0 N	0.0 N	0.030000	0.007000	0.002000
68	0.0 N	0.0 N	0.001500	0.0 N	0.001000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
69	0.0 N	0.0 N	0.002000	0.007000	0.001000	0.0 N	0.0 N	0.100000	0.007000	0.0 N
74	0.0 N	0.0 N	0.001500	0.007000	0.000700	0.0 N	0.0 N	0.050000	0.007000	0.0 N
75	0.0 N	0.0 N	0.001500	0.007000	0.003000	0.0 N	0.0 N	0.050000	0.010000	0.0 N
77	0.0 N	0.0 N	0.001500	0.0 N	0.000700	0.0 N	0.0 N	0.070000	0.007000	0.0 N
78	0.0 N	0.0 N	0.001000	0.0 N	0.000700	0.0 N	0.0 N	0.100000	0.007000	0.0 N
79	0.0 N	0.0 N	0.001500	0.0 N	0.000700	0.0 N	0.0 N	0.050000	0.007000	0.0 N
80	0.0 N	0.0 N	0.001000	0.0 N	0.001500	0.0 N	0.0 N	0.070000	0.007000	0.0 N
81	0.0 N	0.0 N	0.001500	0.0 N	0.007000	0.0 N	0.0 N	0.050000	0.003000	0.0 N
82	0.0 N	0.0 N	0.001500	0.0 N	0.001000	0.0 N	0.0 N	0.050000	0.003000	0.0 N
83	0.0 N	0.0 N	0.002000	0.0 N	0.000700	0.0 N	0.0 N	0.030000	0.005000	0.0 N
84	0.0 N	0.0 N	0.002000	0.0 N	0.000700	0.0 N	0.0 N	0.070000	0.007000	0.0 N
85	0.0 N	0.0 N	0.002000	0.005000	0.001000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
86	0.0 N	0.0 N	0.002000	0.0 N	0.000700	0.0 N	0.0 N	0.050000	0.007000	0.0 N
87	0.0 N	0.0 N	0.002000	0.0 N	0.000700	0.0 N	0.0 N	0.050000	0.007000	0.0 N
88	0.000050	0.0 N	0.001000	0.003000	0.001500	0.0 N	0.0 N	0.050000	0.007000	0.000300
89	0.000050	0.0 N	0.000300	0.0 N	0.000300	0.000700	0.0 N	0.010000	0.001500	0.000300
90	0.000050	0.0 N	0.001500	0.005000	0.000700	0.0 N	0.0 N	0.100000	0.007000	0.000300
91	0.0 N	0.0 N	0.001500	0.003000	0.001000	0.0 N	0.0 N	0.015000	0.002000	0.000300
92	0.000070	0.0 N	0.001000	0.005000	0.010000	0.0 N	0.000300	0.030000	0.010000	0.002000
101	0.000150	0.0 N	0.001500	0.005000	0.001000	0.0 N	0.000300	0.015000	0.005000	0.001000
116	0.0 N	0.0 N	0.003000	0.010000	0.001500	0.002000	0.0 N	0.050000	0.005000	0.0 N
117	0.0 N	0.0 N	0.0 N	0.0 N	0.001000	0.002000	0.0 N	0.002000	0.003000	0.0 N
118	0.0 N	0.0 N	0.000300	0.0 N	0.001000	0.002000	0.0 N	0.010000	0.003000	0.0 N
119	0.0 N	0.0 N	0.002000	0.007000	0.001000	0.001000	0.0 N	0.070000	0.005000	0.0 N

SILICIFIED ROCKS, PERCENT

SAMPLE	FE,%	MG,%	CA,%	TI,%
1	1.499999	0.010000	0.070000	0.300000
2	0.500000	0.010000	0.070000	0.300000
3	1.499999	0.010000	0.070000	0.300000
4	0.500000	0.007000	0.070000	0.300000
5	0.200000	0.010000	0.100000	0.300000
6	0.700000	0.010000	0.100000	0.300000
7	1.999999	0.010000	0.070000	0.300000
8	1.499999	0.007000	0.070000	0.300000
9	1.999999	0.010000	0.300000	0.300000
10	1.999999	0.007000	0.050000	0.150000
11	0.0 G	0.070000	0.300000	0.070000
30	6.999997	0.010000	0.050000	0.200000
32	4.999998	0.015000	0.030000	0.200000
34	6.999997	0.200000	0.100000	0.200000
35	9.999996	0.020000	0.050000	0.300000
36	4.999998	0.015000	0.050000	0.200000
37	2.999998	0.015000	0.150000	0.200000
38	1.000000	0.015000	0.100000	0.200000
39	2.999998	0.010000	0.100000	0.150000
45	1.999999	0.010000	0.030000	0.500000
63	0.0 G	0.070000	0.050000	0.200000
64	2.999998	0.100000	0.070000	0.300000
65	4.999998	0.150000	0.100000	0.300000
66	2.999998	0.0 N	0.050000	0.200000
67	1.499999	0.150000	0.150000	0.300000
68	4.999998	0.0 N	0.070000	0.150000
69	1.999999	0.030000	0.100000	0.200000
74	1.000000	0.0 N	0.050000	0.200000
75	6.999997	0.0 N	0.050000	0.200000
77	2.999998	0.0 N	0.070000	0.300000
78	2.999998	0.0 N	0.070000	0.150000
79	2.999998	0.0 N	0.050000	0.200000
80	4.999998	0.0 N	0.030000	0.150000
81	0.300000	0.007000	0.100000	0.300000
82	0.500000	0.010000	0.070000	0.200000
83	0.300000	0.007000	0.100000	0.150000
84	4.999998	0.007000	0.100000	0.200000
85	0.700000	0.010000	0.070000	0.200000
86	4.999998	0.010000	0.100000	0.200000
87	0.150000	0.010000	0.070000	0.200000
88	0.500000	0.015000	0.100000	0.300000
89	0.200000	0.007000	0.010000	0.500000
90	0.100000	0.007000	0.150000	0.300000
91	0.200000	0.007000	0.070000	0.200000
92	6.999997	0.050000	0.070000	0.500000
101	0.700000	0.010000	0.030000	0.200000
116	1.000000	0.003000	0.020000	0.300000
117	0.500000	0.002000	0.020000	0.300000
118	1.499999	0.003000	0.007000	0.300000
119	0.500000	0.007000	0.050000	0.200000

SILICIFIED ROCKS, PERCENT

SAMPLE	AU,%	AG,%	PB,%	BI,%	HG,%	AS,%	CU,%	ZN,%	MO,%	BA,%
120	0.000010	0.000200	0.005000	0.0 N	0.000010	0.0 L	0.000500	0.0 L	0.000500	0.100000
121	0.000017	0.0 N	0.007000	0.0 N	0.000010	0.008000	0.003000	0.006500	0.000700	0.030000
129	0.000020	0.0 N	0.005000	0.0 N	0.000006	0.020000	0.003000	0.005000	0.001000	0.200000
130	0.000236	0.0 L	0.030000	0.0 N	0.000019	0.016000	0.005000	0.009000	0.001500	0.070000
142	0.000160	0.0 N	0.030000	0.0 N	0.000052	0.001000	0.000300	0.005000	0.0 N	0.070000
161	0.000160	0.0 L	0.070000	0.0 N	0.000011	0.012000	0.001000	0.006000	0.0 N	0.070000
162	0.000020	0.0 N	0.007000	0.0 N	0.000035	0.001000	0.000300	0.016000	0.0 N	0.030000
163	0.001540	0.000100	0.070000	0.003000	0.000035	0.010000	0.001500	0.002500	0.000500	0.070000
166	0.001886	0.0 L	0.010000	0.0 N	0.000022	0.002000	0.000300	0.003000	0.0 N	0.050000
167	0.000797	0.0 L	0.050000	0.0 N	0.000021	0.002000	0.000500	0.003000	0.0 N	0.070000
168	0.002970	0.000200	0.030000	0.0 N	0.000028	0.025000	0.005000	0.0 L	0.000700	0.030000
169	0.000216	0.000100	0.050000	0.000500	0.000024	0.016000	0.001500	0.0 L	0.0 N	0.070000
170	0.000090	0.0 L	0.015000	0.0 N	0.000013	0.001000	0.001500	0.004000	0.0 N	0.070000
171	0.000396	0.0 L	0.020000	0.0 N	0.000024	0.002000	0.001500	0.0 L	0.0 N	0.050000
172	0.000270	0.000700	0.020000	0.0 N	0.000028	0.008000	0.001500	0.0 L	0.0 N	0.050000
173	0.000298	0.000300	0.070000	0.003000	0.000015	0.016000	0.010000	0.0 L	0.0 N	0.070000
174	0.000466	0.001000	0.070000	0.010000	0.000042	0.014000	0.002000	0.0 L	0.0 N	0.070000
175	0.000230	0.001000	0.050000	0.0 N	0.000040	0.014000	0.001500	0.005000	0.0 N	0.070000
176	0.000220	0.000500	0.050000	0.0 N	0.000032	0.001000	0.002000	0.0 L	0.0 N	0.070000
177	0.000270	0.000500	0.050000	0.001500	0.000027	0.014000	0.002000	0.0 L	0.000300	0.050000
178	0.000166	0.000700	0.050000	0.003000	0.000060	0.014000	0.000500	0.002500	0.0 N	0.050000
179	0.000510	0.002000	0.050000	0.003000	0.000090	0.016000	0.003000	0.0 L	0.000300	0.050000
180	0.000160	0.000300	0.070000	0.0 N	0.000023	0.012000	0.000500	0.0 L	0.0 N	0.050000
181	0.000068	0.000200	0.030000	0.0 N	0.000014	0.010000	0.001000	0.0 L	0.0 N	0.070000
182	0.000050	0.0 L	0.050000	0.0 N	0.000004	0.002000	0.001000	0.0 L	0.0 N	0.050000
183	0.000080	0.000100	0.020000	0.0 N	0.000010	0.004000	0.001500	0.0 L	0.0 N	0.070000
184	0.000110	0.000300	0.050000	0.0 N	0.000010	0.008000	0.001500	0.0 L	0.000700	0.070000
185	0.000440	0.000100	0.150000	0.0 N	0.000010	0.008000	0.002000	0.0 L	0.001000	0.070000
186	0.000519	0.000200	0.070000	0.001500	0.000010	0.001000	0.003000	0.0 L	0.001000	0.050000
187	0.002380	0.000200	0.070000	0.0 N	0.000010	0.006000	0.005000	0.0 L	0.000300	0.050000
188	0.000736	0.000200	0.070000	0.0 N	0.000010	0.002000	0.000700	0.0 L	0.0 N	0.050000
189	0.000028	0.000300	0.005000	0.0 N	0.000010	0.001000	0.003000	0.005000	0.0 N	0.020000
190	0.000020	0.000200	0.020000	0.0 N	0.000013	0.001000	0.005000	0.0 L	0.001000	0.100000
191	0.000210	0.0 L	0.070000	0.0 N	0.000010	0.001000	0.000700	0.0 L	0.0 N	0.100000
192	0.000058	0.000100	0.030000	0.0 N	0.000015	0.002000	0.003000	0.003000	0.000700	0.070000
193	0.000100	0.000200	0.050000	0.0 N	0.000017	0.0 L	0.000200	0.0 L	0.0 N	0.070000
194	0.000080	0.000300	0.000700	0.0 N	0.000010	0.001000	0.001500	0.003000	0.000300	0.030000
195	0.000136	0.0 L	0.015000	0.0 N	0.000011	0.001000	0.000200	0.0 L	0.0 N	0.070000
196	0.000020	0.0 L	0.015000	0.0 N	0.000013	0.001000	0.005000	0.0 L	0.000300	0.070000
197	0.000750	0.0 L	0.050000	0.0 N	0.000015	0.001000	0.000700	0.005000	0.000300	0.050000
198	0.000270	0.0 L	0.070000	0.0 N	0.000008	0.001000	0.003000	0.0 L	0.001000	0.050000
199	0.000040	0.000200	0.007000	0.0 N	0.000010	0.001000	0.000700	0.005000	0.000500	0.100000
200	0.000025	0.000300	0.005000	0.0 N	0.000006	0.001000	0.000500	0.0 L	0.0 N	0.050000
201	0.000090	0.0 N	0.050000	0.0 N	0.000006	0.0 L	0.000700	0.0 L	0.0 N	0.050000
220	0.000030	0.0 N	0.020000	0.001500	0.000004	0.016000	0.020000	0.006000	0.001000	0.050000
221	0.000040	0.000200	0.007000	0.0 N	0.000011	0.014000	0.000700	0.007000	0.0 N	0.070000
222	0.000098	0.000200	0.007000	0.0 N	0.000010	0.010000	0.003000	0.0 L	0.0 N	0.050000

SILICIFIED ROCKS, PERCENT

SAMPLE	BE,%	CO,%	CR,%	LA,%	MN,%	NB,%	NI,%	SR,%	V,%	Y,%
120	0.0 N	0.0 N	0.001000	0.015000	0.001000	0.002000	0.0 N	0.070000	0.005000	0.0 N
121	0.0 N	0.0 N	0.003000	0.007000	0.001000	0.0 N	0.0 N	0.070000	0.005000	0.0 N
129	0.0 N	0.001000	0.0 N	0.010000	0.200000	0.001500	0.0 N	0.020000	0.003000	0.0 N
130	0.0 N	0.0 N	0.001500	0.0 N	0.030000	0.0 N	0.0 N	0.050000	0.005000	0.0 N
142	0.0 N	0.0 N	0.001500	0.0 N	0.000200	0.000500	0.0 N	0.030000	0.005000	0.0 N
161	0.0 N	0.0 N	0.001000	0.0 N	0.015000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
162	0.0 N	0.0 N	0.001500	0.0 N	0.000700	0.0 N	0.0 N	0.010000	0.007000	0.0 N
163	0.0 N	0.0 N	0.003000	0.0 N	0.001000	0.0 N	0.0 N	0.100000	0.010000	0.0 N
166	0.0 N	0.0 N	0.000700	0.0 N	0.000200	0.0 N	0.0 N	0.050000	0.005000	0.0 N
167	0.0 N	0.0 N	0.001500	0.0 N	0.001500	0.0 N	0.0 N	0.070000	0.007000	0.0 N
168	0.0 N	0.0 N	0.000300	0.0 N	0.001500	0.0 N	0.0 N	0.070000	0.005000	0.0 N
169	0.0 N	0.0 N	0.000700	0.0 N	0.000500	0.0 N	0.0 N	0.070000	0.005000	0.0 N
170	0.0 N	0.0 N	0.001500	0.0 N	0.000100	0.001000	0.0 N	0.100000	0.007000	0.0 N
171	0.0 N	0.0 N	0.002000	0.0 N	0.000700	0.000700	0.0 N	0.050000	0.010000	0.0 N
172	0.0 N	0.0 N	0.001500	0.0 N	0.000700	0.000700	0.0 N	0.070000	0.005000	0.0 N
173	0.0 N	0.0 N	0.001500	0.0 N	0.001500	0.0 N	0.0 N	0.070000	0.010000	0.0 N
174	0.0 N	0.0 N	0.001500	0.0 N	0.001000	0.000700	0.0 N	0.070000	0.007000	0.0 N
175	0.0 N	0.0 N	0.001500	0.0 N	0.002000	0.0 N	0.0 N	0.050000	0.005000	0.0 N
176	0.0 N	0.0 N	0.001500	0.0 N	0.001000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
177	0.0 N	0.0 N	0.000700	0.0 N	0.003000	0.0 N	0.0 N	0.050000	0.007000	0.0 N
178	0.0 N	0.0 N	0.000700	0.0 N	0.000200	0.0 N	0.0 N	0.050000	0.005000	0.0 N
179	0.0 N	0.0 N	0.001500	0.0 N	0.000500	0.0 N	0.0 N	0.050000	0.005000	0.0 N
180	0.0 N	0.0 N	0.001500	0.0 N	0.000700	0.0 N	0.0 N	0.070000	0.010000	0.0 N
181	0.0 N	0.0 N	0.002000	0.0 N	0.000200	0.0 N	0.0 N	0.070000	0.007000	0.0 N
182	0.0 N	0.0 N	0.002000	0.0 N	0.000200	0.0 N	0.0 N	0.070000	0.007000	0.0 N
183	0.0 N	0.0 N	0.001500	0.003000	0.000500	0.000500	0.0 N	0.050000	0.005000	0.0 N
184	0.0 N	0.0 N	0.002000	0.005000	0.001000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
185	0.0 N	0.0 N	0.005000	0.0 N	0.010000	0.0 N	0.0 N	0.070000	0.003000	0.0 N
186	0.0 N	0.0 N	0.001500	0.0 N	0.001500	0.0 N	0.0 N	0.050000	0.007000	0.0 N
187	0.0 N	0.0 N	0.001500	0.0 N	0.001500	0.0 N	0.0 N	0.070000	0.007000	0.0 N
188	0.0 N	0.0 N	0.000500	0.0 N	0.000500	0.0 N	0.0 N	0.050000	0.003000	0.0 N
189	0.0 N	0.0 N	0.000500	0.0 N	0.000500	0.000500	0.0 N	0.007000	0.002000	0.0 N
190	0.0 N	0.0 N	0.002000	0.005000	0.001500	0.000300	0.0 N	0.150000	0.007000	0.0 N
191	0.0 N	0.0 N	0.001500	0.003000	0.001000	0.000300	0.0 N	0.030000	0.007000	0.0 N
192	0.0 N	0.0 N	0.002000	0.0 N	0.000100	0.000300	0.0 N	0.150000	0.007000	0.0 N
193	0.0 N	0.0 N	0.002000	0.0 N	0.000500	0.000300	0.0 N	0.070000	0.005000	0.0 N
194	0.0 N	0.0 N	0.0 N	0.0 N	0.0 N	0.000500	0.0 N	0.007000	0.001500	0.0 N
195	0.0 N	0.0 N	0.001500	0.003000	0.000500	0.0 N	0.0 N	0.015000	0.007000	0.001000
196	0.0 N	0.0 N	0.001500	0.0 N	0.010000	0.0 N	0.0 N	0.050000	0.007000	0.001000
197	0.0 N	0.0 N	0.003000	0.0 N	0.005000	0.0 N	0.0 N	0.050000	0.007000	0.0 N
198	0.0 N	0.0 N	0.003000	0.0 N	0.000700	0.0 N	0.0 N	0.070000	0.007000	0.001000
199	0.0 N	0.0 N	0.003000	0.005000	0.002000	0.0 N	0.0 N	0.010000	0.007000	0.003000
200	0.0 N	0.0 N	0.003000	0.003000	0.000300	0.0 N	0.0 N	0.070000	0.007000	0.0 N
201	0.0 N	0.0 N	0.002000	0.0 N	0.015000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
220	0.0 N	0.0 N	0.002000	0.005000	0.007000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
221	0.0 N	0.0 N	0.002000	0.0 N	0.000200	0.001000	0.0 N	0.070000	0.002000	0.0 N
222	0.0 N	0.0 N	0.001000	0.0 N	0.000200	0.000300	0.0 N	0.020000	0.003000	0.0 N

SILICIFIED ROCKS, PERCENT

SAMPLE	FE,%	MG,%	CA,%	TI,%
120	1.000000	0.007000	0.030000	0.300000
121	2.999998	0.005000	0.050000	0.200000
129	2.999998	0.003000	0.020000	0.300000
130	2.999998	0.003000	0.030000	0.150000
142	0.050000	0.007000	0.100000	0.300000
161	1.000000	0.020000	0.200000	0.150000
162	0.200000	0.007000	0.100000	0.200000
163	1.000000	0.0 N	0.070000	0.200000
166	0.200000	0.007000	0.030000	0.150000
167	0.700000	0.010000	0.100000	0.200000
168	1.499999	0.010000	0.020000	0.150000
169	0.300000	0.010000	0.100000	0.150000
170	0.050000	0.007000	0.200000	0.200000
171	0.300000	0.007000	0.070000	0.200000
172	0.500000	0.007000	0.070000	0.200000
173	1.499999	0.015000	0.070000	0.100000
174	0.500000	0.007000	0.070000	0.150000
175	0.700000	0.007000	0.070000	0.200000
176	0.500000	0.007000	0.070000	0.200000
177	0.300000	0.015000	0.100000	0.100000
178	0.100000	0.003000	0.010000	0.150000
179	0.500000	0.007000	0.070000	0.200000
180	0.300000	0.007000	0.100000	0.150000
181	0.500000	0.007000	0.100000	0.200000
182	0.300000	0.007000	0.070000	0.200000
183	0.200000	0.007000	0.100000	0.300000
184	1.999999	0.015000	0.100000	0.200000
185	1.000000	0.010000	0.050000	0.150000
186	2.999998	0.015000	0.050000	0.300000
187	1.999999	0.015000	0.100000	0.200000
188	0.300000	0.010000	0.070000	0.200000
189	0.200000	0.010000	0.007000	0.300000
190	1.999999	0.007000	0.100000	0.200000
191	0.500000	0.010000	0.100000	0.200000
192	1.999999	0.020000	0.100000	0.150000
193	0.100000	0.007000	0.050000	0.200000
194	0.500000	0.010000	0.015000	0.200000
195	0.200000	0.007000	0.070000	0.300000
196	1.999999	0.015000	0.030000	0.300000
197	1.000000	0.010000	0.070000	0.300000
198	1.999999	0.020000	0.070000	0.300000
199	2.999998	0.020000	0.070000	0.300000
200	0.300000	0.010000	0.070000	0.300000
201	0.300000	6.999997	0.100000	0.300000
220	9.999996	0.030000	0.500000	0.200000
221	0.200000	0.005000	0.050000	0.300000
222	0.200000	0.000700	0.015000	0.200000

SILICIFIED ROCKS, PERCENT

SAMPLE	AU,%	AG,%	PB,%	BI,%	HG,%	AS,%	CU,%	ZN,%	MO,%	BA,%
223	0.000030	0.0 L	0.020000	0.002000	0.000010	0.006000	0.003000	0.0 L	0.0 N	0.030000
240	0.000010	0.0 L	0.005000	0.0 N	0.000010	0.001000	0.007000	0.0 L	0.0 N	0.100000
246	0.000037	0.0 N	0.005000	0.0 N	0.000008	0.001000	0.000700	0.0 L	0.000500	0.070000
249	0.000140	0.0 L	0.003000	0.0 N	0.000010	0.001000	0.000700	0.0 L	0.0 N	0.050000
250	0.000116	0.000150	0.005000	0.001000	0.000008	0.001000	0.000500	0.0 L	0.0 N	0.100000
251	0.000230	0.000300	0.020000	0.003000	0.000010	0.004000	0.001000	0.0 L	0.000300	0.100000
252	0.001407	0.000150	0.010000	0.001500	0.000010	0.008000	0.007000	0.0 L	0.000500	0.100000
254	0.000058	0.0 L	0.010000	0.0 N	0.000004	0.012000	0.001500	0.0 L	0.000500	0.070000
255	0.000210	0.001000	0.030000	0.003000	0.000010	0.008000	0.005000	0.0 L	0.000700	0.050000
256	0.000340	0.003000	0.030000	0.003000	0.000010	0.012000	0.015000	0.004000	0.000700	0.070000
257	0.000330	0.000700	0.050000	0.002000	0.000020	0.001000	0.003000	0.004000	0.0 N	0.070000
258	0.000427	0.005000	0.070000	0.020000	0.000029	0.014000	0.020000	0.005000	0.001000	0.050000
259	0.000119	0.003000	0.030000	0.003000	0.000023	0.001000	0.007000	0.0 L	0.000300	0.050000
260	0.000118	0.0 N	0.030000	0.003000	0.000010	0.006000	0.003000	0.0 L	0.000300	0.070000
261	0.000290	0.0 N	0.020000	0.003000	0.000012	0.016000	0.007000	0.004000	0.001000	0.100000
262	0.000105	0.0 N	0.010000	0.003000	0.000019	0.008000	0.001500	0.0 L	0.001000	0.070000
263	0.000180	0.0 N	0.020000	0.0 N	0.000013	0.001000	0.005000	0.0 L	0.000500	0.100000
264	0.000210	0.000100	0.050000	0.002000	0.000020	0.001000	0.000700	0.003000	0.0 N	0.070000
265	0.000156	0.001500	0.010000	0.003000	0.000024	0.004000	0.002000	0.0 L	0.0 N	0.070000
266	0.000536	0.000150	0.100000	0.007000	0.000018	0.008000	0.005000	0.0 L	0.001000	0.070000
267	0.000419	0.002000	0.050000	0.007000	0.000100	0.010000	0.007000	0.0 L	0.000700	0.070000
268	0.000527	0.003000	0.020000	0.007000	0.000064	0.0 L	0.003000	0.0 L	0.000300	0.070000
269	0.000226	0.000500	0.015000	0.001000	0.000017	0.001000	0.001000	0.0 L	0.000300	0.070000
270	0.000425	0.003000	0.010000	0.003000	0.000068	0.001000	0.001500	0.003000	0.0 N	0.070000
271	0.001860	0.003000	0.030000	0.007000	0.000012	0.001000	0.002000	0.004000	0.000300	0.050000
272	0.000400	0.000200	0.020000	0.005000	0.000015	0.001000	0.001500	0.0 L	0.0 N	0.070000
273	0.000267	0.000200	0.005000	0.0 N	0.000024	0.012000	0.015000	0.0 L	0.001500	0.050000
274	0.000015	0.0 L	0.020000	0.0 N	0.000006	0.001000	0.001500	0.0 L	0.0 N	0.300000
275	0.000049	0.0 L	0.010000	0.0 N	0.000010	0.001000	0.000200	0.0 L	0.0 N	0.050000
276	0.000070	0.000200	0.030000	0.0 N	0.000019	0.012000	0.001000	0.0 L	0.000500	0.050000
277	0.000057	0.000200	0.007000	0.001000	0.000030	0.002000	0.001500	0.0 L	0.0 N	0.050000
278	0.000081	0.000200	0.005000	0.001000	0.000030	0.004000	0.002000	0.0 L	0.0 N	0.050000

SILICIFIED ROCKS, PERCENT

SAMPLE	BE,%		CO,%		CR,%	LA,%		MN,%	NB,%		NI,%		SR,%	V,%	Y,%	
223	0.0	N	0.0	N	0.002000	0.0	N	0.000300	0.0	N	0.0	N	0.050000	0.005000	0.0	N
240	0.0	N	0.0	N	0.003000	0.005000		0.001000	0.000700		0.0	N	0.050000	0.007000	0.0	N
246	0.0	N	0.0	N	0.003000	0.007000		0.002000	0.000700		0.0	N	0.150000	0.007000	0.001500	
249	0.0	N	0.0	N	0.003000	0.0	N	0.000500	0.000700		0.0	N	0.050000	0.007000	0.0	N
250	0.0	N	0.0	N	0.003000	0.005000		0.000500	0.000500		0.0	N	0.100000	0.007000	0.0	N
251	0.0	N	0.0	N	0.003000	0.0	N	0.001000	0.000500		0.0	N	0.070000	0.007000	0.0	N
252	0.0	N	0.0	N	0.003000	0.005000		0.001000	0.000500		0.0	N	0.100000	0.007000	0.0	N
254	0.0	N	0.001000		0.002000	0.005000		0.003000	0.000700		0.0	N	0.070000	0.007000	0.0	N
255	0.0	N	0.0	N	0.001000	0.0	N	0.020000	0.0	N	0.0	N	0.050000	0.015000	0.0	N
256	0.0	N	0.0	N	0.001000	0.0	N	0.005000	0.000500		0.0	N	0.050000	0.007000	0.0	N
257	0.0	N	0.0	N	0.002000	0.0	N	0.000500	0.000500		0.0	N	0.100000	0.005000	0.0	N
258	0.0	N	0.0	N	0.003000	0.0	N	0.007000	0.0	N	0.0	N	0.100000	0.007000	0.0	N
259	0.0	N	0.0	N	0.003000	0.0	N	0.000700	0.0	N	0.0	N	0.070000	0.007000	0.0	N
260	0.0	N	0.0	N	0.003000	0.005000		0.070000	0.000500		0.0	N	0.150000	0.005000	0.0	N
261	0.0	N	0.0	N	0.002000	0.005000		0.100000	0.000500		0.0	N	0.100000	0.015000	0.0	N
262	0.0	N	0.0	N	0.005000	0.005000		0.070000	0.000500		0.0	N	0.030000	0.007000	0.0	N
263	0.0	N	0.0	N	0.003000	0.005000		0.100000	0.000500		0.0	N	0.150000	0.010000	0.0	N
264	0.0	N	0.0	N	0.002000	0.005000		0.005000	0.000500		0.0	N	0.070000	0.010000	0.0	N
265	0.0	N	0.0	N	0.001500	0.0	N	0.001500	0.000500		0.0	N	0.030000	0.005000	0.0	N
266	0.0	N	0.0	N	0.002000	0.0	N	0.003000	0.000300		0.0	N	0.100000	0.007000	0.0	N
267	0.0	N	0.0	N	0.002000	0.005000		0.010000	0.0	N	0.0	N	0.100000	0.007000	0.0	N
268	0.0	N	0.0	N	0.002000	0.005000		0.003000	0.000300		0.0	N	0.030000	0.007000	0.0	N
269	0.0	N	0.0	N	0.003000	0.005000		0.000700	0.0	N	0.0	N	0.050000	0.010000	0.0	N
270	0.0	N	0.0	N	0.002000	0.0	N	0.000500	0.0	N	0.0	N	0.030000	0.005000	0.0	N
271	0.0	N	0.0	N	0.002000	0.0	N	0.000700	0.0	N	0.0	N	0.030000	0.007000	0.0	N
272	0.0	N	0.0	N	0.002000	0.0	N	0.000500	0.0	N	0.0	N	0.070000	0.007000	0.0	N
273	0.0	N	0.001500		0.002000	0.0	N	0.030000	0.000500		0.0	N	0.007000	0.007000	0.0	N
274	0.0	N	0.0	N	0.002000	0.0	N	0.001000	0.000500		0.0	N	0.070000	0.005000	0.0	N
275	0.0	N	0.0	N	0.002000	0.0	N	0.000700	0.000500		0.0	N	0.030000	0.010000	0.0	N
276	0.0	N	0.0	N	0.002000	0.0	N	0.001500	0.000500		0.0	N	0.070000	0.010000	0.0	N
277	0.0	N	0.0	N	0.002000	0.0	N	0.000500	0.0	N	0.0	N	0.100000	0.007000	0.0	N
278	0.0	N	0.0	N	0.002000	0.0	N	0.000700	0.0	N	0.0	N	0.070000	0.007000	0.0	N

SILICIFIED ROCKS, PERCENT

SAMPLE	FE,%	MG,%	CA,%	TI,%
223	0.100000	0.000700	0.050000	0.300000
240	0.700000	0.007000	0.070000	0.200000
246	2.999998	0.100000	0.070000	0.300000
249	0.300000	0.005000	0.070000	0.300000
250	0.500000	0.005000	0.150000	0.300000
251	1.499999	0.005000	0.070000	0.300000
252	1.499999	0.007000	0.150000	0.300000
254	1.499999	0.007000	0.050000	0.300000
255	4.999998	0.020000	0.070000	0.200000
256	2.999998	0.015000	0.070000	0.200000
257	0.300000	0.005000	0.070000	0.300000
258	6.999997	0.030000	0.100000	0.150000
259	1.499999	0.007000	0.050000	0.300000
260	1.499999	0.010000	0.070000	0.300000
261	1.999999	0.020000	0.100000	0.300000
262	1.999999	0.015000	0.050000	0.300000
263	1.000000	0.010000	0.500000	0.300000
264	0.500000	0.015000	0.150000	0.300000
265	1.000000	0.010000	0.050000	0.300000
266	1.999999	0.015000	0.100000	0.200000
267	2.999998	0.015000	0.100000	0.300000
268	1.000000	0.015000	0.100000	0.300000
269	1.000000	0.015000	0.200000	0.300000
270	0.700000	0.010000	0.100000	0.300000
271	0.500000	0.010000	0.150000	0.300000
272	0.700000	0.010000	0.150000	0.300000
273	6.999997	0.050000	0.030000	0.300000
274	0.500000	0.020000	0.070000	0.300000
275	0.200000	0.020000	0.150000	0.300000
276	2.999998	0.030000	0.050000	0.300000
277	1.999999	0.010000	0.050000	0.300000
278	1.499999	0.010000	0.150000	0.300000

SILICIFIED ROCKS, PPM

SAMPLE	AU,PPM	AG,PPM	PB,PPM	BI,PPM	HG,PPM	AS,PPM	CU,PPM	ZN,PPM	MO,PPM	BA,PPM
1	1.80	10.00	150.00	0.0 N	0.50	60.00	20.00	0.0 L	0.0 N	700.00
2	0.88	1.50	100.00	0.0 N	1.00	40.00	7.00	0.0 L	0.0 N	700.00
3	1.50	2.00	500.00	0.0 N	0.10	0.0 L	20.00	0.0 L	0.0 N	700.00
4	1.00	1.00	70.00	0.0 N	0.10	120.00	15.00	0.0 L	0.0 N	700.00
5	0.69	2.00	100.00	0.0 N	0.10	10.00	7.00	0.0 L	0.0 N	700.00
6	2.00	3.00	150.00	10.00	0.10	0.0 L	10.00	0.0 L	0.0 N	700.00
7	4.50	20.00	500.00	15.00	0.50	10.00	100.00	0.0 L	0.0 N	700.00
8	3.10	3.00	200.00	10.00	0.20	10.00	15.00	0.0 L	0.0 N	700.00
9	3.40	3.00	200.00	10.00	0.20	10.00	30.00	0.0 L	0.0 N	700.00
10	1.88	3.00	200.00	0.0 N	0.20	120.00	50.00	0.0 L	0.0 N	700.00
11	2.79	3.00	70.00	30.00	0.50	160.00	200.00	0.0 L	30.00	300.00
30	0.80	1.50	500.00	10.00	0.11	10.00	30.00	0.0 L	10.00	2000.00
32	1.45	3.00	150.00	5.00	0.08	60.00	30.00	0.0 L	7.00	200.00
34	1.50	0.30	300.00	0.0 N	0.11	10.00	10.00	0.0 L	3.00	700.00
35	0.0 L	0.70	300.00	0.0 N	0.06	10.00	20.00	25.00	10.00	150.00
36	2.90	2.00	500.00	0.0 N	0.08	0.0 L	30.00	0.0 L	3.00	200.00
37	7.08	1.50	700.00	0.0 N	0.15	0.0 L	15.00	0.0 L	3.00	700.00
38	6.39	2.00	300.00	0.0 N	0.15	10.00	5.00	0.0 L	0.0 N	1000.00
39	4.30	2.00	700.00	0.0 N	0.24	10.00	7.00	0.0 L	3.00	1000.00
45	2.88	5.00	50.00	50.00	0.20	10.00	30.00	0.0 L	0.0 N	200.00
63	0.10	5.00	30.00	0.0 N	0.13	60.00	20.00	25.00	15.00	700.00
64	0.10	0.0 N	0.0 N	0.0 N	0.10	80.00	15.00	30.00	5.00	1000.00
65	1.40	0.0 N	200.00	0.0 N	0.08	40.00	15.00	0.0 L	5.00	1000.00
66	0.90	0.0 N	100.00	0.0 N	0.06	100.00	10.00	0.0 L	0.0 N	700.00
67	2.75	0.0 N	150.00	0.0 N	0.11	10.00	20.00	0.0 L	0.0 N	3000.00
68	2.07	0.0 N	700.00	0.0 N	0.06	100.00	5.00	0.0 L	5.00	500.00
69	0.10	0.0 N	100.00	0.0 N	0.06	80.00	7.00	0.0 L	0.0 N	500.00
74	0.18	0.0 N	30.00	0.0 N	0.06	10.00	10.00	100.00	0.0 N	700.00
75	1.80	0.0 N	200.00	0.0 N	0.15	140.00	70.00	0.0 L	7.00	700.00
77	0.30	0.0 L	150.00	0.0 N	0.15	20.00	10.00	50.00	5.00	500.00
78	2.40	0.0 L	500.00	0.0 N	0.17	160.00	15.00	40.00	5.00	500.00
79	0.36	0.0 L	150.00	0.0 N	0.11	140.00	20.00	140.00	5.00	700.00
80	1.50	0.0 L	70.00	0.0 N	0.15	200.00	70.00	0.0 L	10.00	500.00
81	2.46	5.00	200.00	30.00	0.11	10.00	10.00	0.0 L	0.0 N	700.00
82	2.90	3.00	200.00	30.00	0.19	10.00	10.00	0.0 L	0.0 N	700.00
83	1.20	3.00	150.00	0.0 N	0.13	10.00	10.00	0.0 L	0.0 N	500.00
84	1.90	1.00	200.00	0.0 N	0.11	20.00	15.00	0.0 L	0.0 N	1000.00
85	0.16	1.00	150.00	0.0 N	0.06	20.00	10.00	0.0 L	0.0 N	200.00
86	1.70	5.00	150.00	30.00	0.11	20.00	15.00	0.0 L	0.0 N	700.00
87	1.40	3.00	300.00	30.00	0.04	10.00	15.00	0.0 L	0.0 N	700.00
88	0.90	3.00	200.00	30.00	0.04	20.00	15.00	40.00	0.0 N	700.00
89	0.55	3.00	100.00	0.0 N	0.06	10.00	5.00	0.0 L	0.0 N	300.00
90	9.65	1.00	300.00	0.0 N	0.06	10.00	20.00	0.0 L	0.0 N	500.00
91	9.40	1.50	150.00	0.0 N	0.11	0.0 L	7.00	0.0 L	0.0 N	2000.00
92	0.10	0.50	150.00	0.0 N	0.06	60.00	10.00	0.0 L	10.00	500.00
101	2.26	1.00	300.00	0.0 N	0.10	10.00	10.00	30.00	3.00	1500.00
116	0.16	0.0 L	7.00	0.0 N	0.10	100.00	20.00	50.00	5.00	200.00
117	0.10	0.0 L	7.00	0.0 N	0.10	20.00	20.00	0.0 L	0.0 N	1000.00
118	0.10	0.0 L	15.00	0.0 N	0.10	40.00	5.00	0.0 L	10.00	700.00
119	0.29	0.0 N	70.00	0.0 N	0.08	10.00	5.00	0.0 L	0.0 N	700.00

SILICIFIED ROCKS, PPM

SAMPLE	BE,PPM	CO,PPM	CR,PPM	LA,PPM	MN,PPM	NB,PPM	NI,PPM	SR,PPM	V,PPM	Y,PPM
1	0.0 N	0.0 N	10.00	0.0 N	150.00	0.0 N	0.0 N	700.00	70.00	0.0 N
2	0.0 N	0.0 N	10.00	0.0 N	15.00	0.0 N	0.0 N	500.00	70.00	0.0 N
3	0.0 N	0.0 N	10.00	0.0 N	15.00	0.0 N	0.0 N	700.00	70.00	0.0 N
4	0.0 N	0.0 N	10.00	0.0 N	30.00	0.0 N	0.0 N	500.00	100.00	0.0 N
5	0.0 N	0.0 N	15.00	0.0 N	7.00	0.0 N	0.0 N	300.00	100.00	0.0 N
6	0.0 N	0.0 N	10.00	0.0 N	20.00	0.0 N	0.0 N	300.00	70.00	0.0 N
7	0.0 N	0.0 N	10.00	0.0 N	20.00	0.0 N	0.0 N	500.00	70.00	0.0 N
8	0.0 N	0.0 N	10.00	0.0 N	20.00	0.0 N	0.0 N	500.00	70.00	0.0 N
9	0.0 N	0.0 N	10.00	0.0 N	30.00	0.0 N	0.0 N	500.00	70.00	0.0 N
10	0.0 N	0.0 N	10.00	0.0 N	70.00	0.0 N	0.0 N	500.00	50.00	0.0 N
11	0.0 N	30.00	10.00	0.0 N	300.00	0.0 N	0.0 N	700.00	200.00	0.0 N
30	0.30	5.00	20.00	30.00	50.00	0.0 N	2.00	500.00	100.00	5.00
32	0.30	0.0 N	15.00	0.0 N	50.00	0.0 N	2.00	500.00	70.00	5.00
34	0.50	5.00	30.00	70.00	70.00	0.0 N	3.00	1500.00	70.00	7.00
35	0.30	0.0 N	20.00	70.00	100.00	0.0 N	2.00	1500.00	150.00	7.00
36	0.30	0.0 N	20.00	0.0 N	50.00	0.0 N	2.00	500.00	70.00	5.00
37	0.30	0.0 N	20.00	50.00	20.00	0.0 N	2.00	500.00	70.00	5.00
38	0.30	0.0 N	15.00	50.00	15.00	0.0 N	2.00	1500.00	70.00	5.00
39	0.30	0.0 N	15.00	30.00	20.00	0.0 N	2.00	2000.00	70.00	5.00
45	0.50	7.00	10.00	70.00	30.00	10.00	2.00	300.00	30.00	7.00
63	0.30	0.0 N	10.00	50.00	300.00	0.0 N	3.00	1000.00	70.00	5.00
64	0.0 N	0.0 N	20.00	0.0 N	300.00	0.0 N	0.0 N	700.00	70.00	0.0 N
65	0.0 N	0.0 N	20.00	70.00	30.00	0.0 N	0.0 N	1000.00	100.00	20.00
66	0.0 N	0.0 N	20.00	70.00	10.00	0.0 N	0.0 N	200.00	70.00	0.0 N
67	0.0 N	0.0 N	20.00	70.00	30.00	0.0 N	0.0 N	300.00	70.00	20.00
68	0.0 N	0.0 N	15.00	0.0 N	10.00	0.0 N	0.0 N	700.00	70.00	0.0 N
69	0.0 N	0.0 N	20.00	70.00	10.00	0.0 N	0.0 N	1000.00	70.00	0.0 N
74	0.0 N	0.0 N	15.00	70.00	7.00	0.0 N	0.0 N	500.00	70.00	0.0 N
75	0.0 N	0.0 N	15.00	70.00	30.00	0.0 N	0.0 N	500.00	100.00	0.0 N
77	0.0 N	0.0 N	15.00	0.0 N	7.00	0.0 N	0.0 N	700.00	70.00	0.0 N
78	0.0 N	0.0 N	10.00	0.0 N	7.00	0.0 N	0.0 N	1000.00	70.00	0.0 N
79	0.0 N	0.0 N	15.00	0.0 N	7.00	0.0 N	0.0 N	500.00	70.00	0.0 N
80	0.0 N	0.0 N	10.00	0.0 N	15.00	0.0 N	0.0 N	700.00	70.00	0.0 N
81	0.0 N	0.0 N	15.00	0.0 N	70.00	0.0 N	0.0 N	500.00	30.00	0.0 N
82	0.0 N	0.0 N	15.00	0.0 N	10.00	0.0 N	0.0 N	500.00	30.00	0.0 N
83	0.0 N	0.0 N	20.00	0.0 N	7.00	0.0 N	0.0 N	300.00	50.00	0.0 N
84	0.0 N	0.0 N	20.00	0.0 N	7.00	0.0 N	0.0 N	700.00	70.00	0.0 N
85	0.0 N	0.0 N	20.00	50.00	10.00	0.0 N	0.0 N	700.00	70.00	0.0 N
86	0.0 N	0.0 N	20.00	0.0 N	7.00	0.0 N	0.0 N	500.00	70.00	0.0 N
87	0.0 N	0.0 N	20.00	0.0 N	7.00	0.0 N	0.0 N	500.00	70.00	0.0 N
88	0.50	0.0 N	10.00	30.00	15.00	0.0 N	0.0 N	500.00	70.00	3.00
89	0.50	0.0 N	3.00	0.0 N	3.00	7.00	0.0 N	100.00	15.00	3.00
90	0.50	0.0 N	15.00	50.00	7.00	0.0 N	0.0 N	1000.00	70.00	3.00
91	0.0 N	0.0 N	15.00	30.00	10.00	0.0 N	0.0 N	150.00	20.00	3.00
92	0.70	0.0 N	10.00	50.00	100.00	0.0 N	3.00	300.00	100.00	20.00
101	1.50	0.0 N	15.00	50.00	10.00	0.0 N	3.00	150.00	50.00	10.00
116	0.0 N	0.0 N	30.00	100.00	15.00	20.00	0.0 N	500.00	50.00	0.0 N
117	0.0 N	0.0 N	0.0 N	0.0 N	10.00	20.00	0.0 N	20.00	30.00	0.0 N
118	0.0 N	0.0 N	3.00	0.0 N	10.00	20.00	0.0 N	100.00	30.00	0.0 N
119	0.0 N	0.0 N	20.00	70.00	10.00	10.00	0.0 N	700.00	50.00	0.0 N

SILICIFIED ROCKS, PPM

SAMPLE	FE,PPM	MG,PPM	CA,PPM	TI,PPM
1	14999.99	100.00	700.00	3000.00
2	5000.00	100.00	700.00	3000.00
3	14999.99	100.00	700.00	3000.00
4	5000.00	70.00	700.00	3000.00
5	2000.00	100.00	1000.00	3000.00
6	7000.00	100.00	1000.00	3000.00
7	19999.99	100.00	700.00	3000.00
8	14999.99	70.00	700.00	3000.00
9	19999.99	100.00	3000.00	3000.00
10	19999.99	70.00	500.00	1500.00
11	0.0 G	700.00	3000.00	700.00
30	69999.94	100.00	500.00	2000.00
32	49999.98	150.00	300.00	2000.00
34	69999.94	2000.00	1000.00	2000.00
35	99999.94	200.00	500.00	3000.00
36	49999.98	150.00	500.00	2000.00
37	29999.98	150.00	1500.00	2000.00
38	10000.00	150.00	1000.00	2000.00
39	29999.98	100.00	1000.00	1500.00
45	19999.99	100.00	300.00	5000.00
63	0.0 G	700.00	500.00	2000.00
64	29999.98	1000.00	700.00	3000.00
65	49999.98	1500.00	1000.00	3000.00
66	29999.98	0.0 N	500.00	2000.00
67	14999.99	1500.00	1500.00	3000.00
68	49999.98	0.0 N	700.00	1500.00
69	19999.99	300.00	1000.00	2000.00
74	10000.00	0.0 N	500.00	2000.00
75	69999.94	0.0 N	500.00	2000.00
77	29999.98	0.0 N	700.00	3000.00
78	29999.98	0.0 N	700.00	1500.00
79	29999.98	0.0 N	500.00	2000.00
80	49999.98	0.0 N	300.00	1500.00
81	3000.00	70.00	1000.00	3000.00
82	5000.00	100.00	700.00	2000.00
83	3000.00	70.00	1000.00	1500.00
84	49999.98	70.00	1000.00	2000.00
85	7000.00	100.00	700.00	2000.00
86	49999.98	100.00	1000.00	2000.00
87	1500.00	100.00	700.00	2000.00
88	5000.00	150.00	1000.00	3000.00
89	2000.00	70.00	100.00	5000.00
90	1000.00	70.00	1500.00	3000.00
91	2000.00	70.00	700.00	2000.00
92	69999.94	500.00	700.00	5000.00
101	7000.00	100.00	300.00	2000.00
116	10000.00	30.00	200.00	3000.00
117	5000.00	20.00	200.00	3000.00
118	14999.99	30.00	70.00	3000.00
119	5000.00	70.00	500.00	2000.00

SILICIFIED ROCKS, PPM

SAMPLE	AU,PPM	AG,PPM	PB,PPM	BI,PPM	HG,PPM	AS,PPM	CU,PPM	ZN,PPM	MO,PPM	BA,PPM
120	0.10	2.00	50.00	0.0 N	0.10	0.0 L	5.00	0.0 L	5.00	1000.00
121	0.17	0.0 N	70.00	0.0 N	0.10	80.00	30.00	65.00	7.00	300.00
129	0.20	0.0 N	50.00	0.0 N	0.06	200.00	30.00	50.00	10.00	2000.00
130	2.36	0.0 L	300.00	0.0 N	0.19	160.00	50.00	90.00	15.00	700.00
142	1.60	0.0 N	300.00	0.0 N	0.52	10.00	3.00	50.00	0.0 N	700.00
161	1.60	0.0 L	700.00	0.0 N	0.11	120.00	10.00	60.00	0.0 N	700.00
162	0.20	0.0 N	70.00	0.0 N	0.35	10.00	3.00	160.00	0.0 N	300.00
163	15.40	1.00	700.00	30.00	0.35	100.00	15.00	25.00	5.00	700.00
166	18.86	0.0 L	100.00	0.0 N	0.22	20.00	3.00	30.00	0.0 N	500.00
167	7.97	0.0 L	500.00	0.0 N	0.21	20.00	5.00	30.00	0.0 N	700.00
168	29.70	2.00	300.00	0.0 N	0.28	250.00	50.00	0.0 L	7.00	300.00
169	2.16	1.00	500.00	5.00	0.24	160.00	15.00	0.0 L	0.0 N	700.00
170	0.90	0.0 L	150.00	0.0 N	0.13	10.00	15.00	40.00	0.0 N	700.00
171	3.96	0.0 L	200.00	0.0 N	0.24	20.00	15.00	0.0 L	0.0 N	500.00
172	2.70	7.00	200.00	0.0 N	0.28	80.00	15.00	0.0 L	0.0 N	500.00
173	2.98	3.00	700.00	30.00	0.15	160.00	100.00	0.0 L	0.0 N	700.00
174	4.66	10.00	700.00	100.00	0.42	140.00	20.00	0.0 L	0.0 N	700.00
175	2.30	10.00	500.00	0.0 N	0.40	140.00	15.00	50.00	0.0 N	700.00
176	2.20	5.00	500.00	0.0 N	0.32	10.00	20.00	0.0 L	0.0 N	700.00
177	2.70	5.00	500.00	15.00	0.27	140.00	20.00	0.0 L	3.00	500.00
178	1.66	7.00	500.00	30.00	0.60	140.00	5.00	25.00	0.0 N	500.00
179	5.10	20.00	500.00	30.00	0.90	160.00	30.00	0.0 L	3.00	500.00
180	1.60	3.00	700.00	0.0 N	0.23	120.00	5.00	0.0 L	0.0 N	500.00
181	0.68	2.00	300.00	0.0 N	0.14	100.00	10.00	0.0 L	0.0 N	700.00
182	0.50	0.0 L	500.00	0.0 N	0.04	20.00	10.00	0.0 L	0.0 N	500.00
183	0.80	1.00	200.00	0.0 N	0.10	40.00	15.00	0.0 L	0.0 N	700.00
184	1.10	3.00	500.00	0.0 N	0.10	80.00	15.00	0.0 L	7.00	700.00
185	4.40	1.00	1500.00	0.0 N	0.10	80.00	20.00	0.0 L	10.00	700.00
186	5.19	2.00	700.00	15.00	0.10	10.00	30.00	0.0 L	10.00	500.00
187	23.80	2.00	700.00	0.0 N	0.10	60.00	50.00	0.0 L	3.00	500.00
188	7.36	2.00	700.00	0.0 N	0.10	20.00	7.00	0.0 L	0.0 N	500.00
189	0.28	3.00	50.00	0.0 N	0.10	10.00	30.00	50.00	0.0 N	200.00
190	0.20	2.00	200.00	0.0 N	0.13	10.00	50.00	0.0 L	10.00	1000.00
191	2.10	0.0 L	700.00	0.0 N	0.10	10.00	7.00	0.0 L	0.0 N	1000.00
192	0.58	1.00	300.00	0.0 N	0.15	20.00	30.00	30.00	7.00	700.00
193	1.00	2.00	500.00	0.0 N	0.17	0.0 L	2.00	0.0 L	0.0 N	700.00
194	0.80	3.00	7.00	0.0 N	0.10	10.00	15.00	30.00	3.00	300.00
195	1.36	0.0 L	150.00	0.0 N	0.11	10.00	2.00	0.0 L	0.0 N	700.00
196	0.20	0.0 L	150.00	0.0 N	0.13	10.00	50.00	0.0 L	3.00	700.00
197	7.50	0.0 L	500.00	0.0 N	0.15	10.00	7.00	50.00	3.00	500.00
198	2.70	0.0 L	700.00	0.0 N	0.08	10.00	30.00	0.0 L	10.00	500.00
199	0.40	2.00	70.00	0.0 N	0.10	10.00	7.00	50.00	5.00	1000.00
200	0.25	3.00	50.00	0.0 N	0.06	10.00	5.00	0.0 L	0.0 N	500.00
201	0.90	0.0 N	500.00	0.0 N	0.06	0.0 L	7.00	0.0 L	0.0 N	500.00
220	0.30	0.0 N	200.00	15.00	0.04	160.00	200.00	60.00	10.00	500.00
221	0.40	2.00	70.00	0.0 N	0.11	140.00	7.00	70.00	0.0 N	700.00
222	0.98	2.00	70.00	0.0 N	0.10	100.00	30.00	0.0 L	0.0 N	500.00

SILICIFIED ROCKS, PPM

SAMPLE	BE,PPM	CO,PPM	CR,PPM	LA,PPM	MN,PPM	NB,PPM	NI,PPM	SR,PPM	V,PPM	Y,PPM
120	0.0 N	0.0 N	10.00	150.00	10.00	20.00	0.0 N	700.00	50.00	0.0 N
121	0.0 N	0.0 N	30.00	70.00	10.00	0.0 N	0.0 N	700.00	50.00	0.0 N
129	0.0 N	10.00	0.0 N	100.00	2000.00	15.00	0.0 N	200.00	30.00	0.0 N
130	0.0 N	0.0 N	15.00	0.0 N	300.00	0.0 N	0.0 N	500.00	50.00	0.0 N
142	0.0 N	0.0 N	15.00	0.0 N	2.00	5.00	0.0 N	300.00	50.00	0.0 N
161	0.0 N	0.0 N	10.00	0.0 N	150.00	0.0 N	0.0 N	700.00	70.00	0.0 N
162	0.0 N	0.0 N	15.00	0.0 N	7.00	0.0 N	0.0 N	100.00	70.00	0.0 N
163	0.0 N	0.0 N	30.00	0.0 N	10.00	0.0 N	0.0 N	1000.00	100.00	0.0 N
166	0.0 N	0.0 N	7.00	0.0 N	2.00	0.0 N	0.0 N	500.00	50.00	0.0 N
167	0.0 N	0.0 N	15.00	0.0 N	15.00	0.0 N	0.0 N	700.00	70.00	0.0 N
168	0.0 N	0.0 N	3.00	0.0 N	15.00	0.0 N	0.0 N	700.00	50.00	0.0 N
169	0.0 N	0.0 N	7.00	0.0 N	5.00	0.0 N	0.0 N	700.00	50.00	0.0 N
170	0.0 N	0.0 N	15.00	0.0 N	1.00	10.00	0.0 N	1000.00	70.00	0.0 N
171	0.0 N	0.0 N	20.00	0.0 N	7.00	7.00	0.0 N	500.00	100.00	0.0 N
172	0.0 N	0.0 N	15.00	0.0 N	7.00	7.00	0.0 N	700.00	50.00	0.0 N
173	0.0 N	0.0 N	15.00	0.0 N	15.00	0.0 N	0.0 N	700.00	100.00	0.0 N
174	0.0 N	0.0 N	15.00	0.0 N	10.00	7.00	0.0 N	700.00	70.00	0.0 N
175	0.0 N	0.0 N	15.00	0.0 N	20.00	0.0 N	0.0 N	500.00	50.00	0.0 N
176	0.0 N	0.0 N	15.00	0.0 N	10.00	0.0 N	0.0 N	700.00	70.00	0.0 N
177	0.0 N	0.0 N	7.00	0.0 N	30.00	0.0 N	0.0 N	500.00	70.00	0.0 N
178	0.0 N	0.0 N	7.00	0.0 N	2.00	0.0 N	0.0 N	500.00	50.00	0.0 N
179	0.0 N	0.0 N	15.00	0.0 N	5.00	0.0 N	0.0 N	500.00	50.00	0.0 N
180	0.0 N	0.0 N	15.00	0.0 N	7.00	0.0 N	0.0 N	700.00	100.00	0.0 N
181	0.0 N	0.0 N	20.00	0.0 N	2.00	0.0 N	0.0 N	700.00	70.00	0.0 N
182	0.0 N	0.0 N	20.00	0.0 N	2.00	0.0 N	0.0 N	700.00	70.00	0.0 N
183	0.0 N	0.0 N	15.00	30.00	5.00	5.00	0.0 N	500.00	50.00	0.0 N
184	0.0 N	0.0 N	20.00	50.00	10.00	0.0 N	0.0 N	700.00	70.00	0.0 N
185	0.0 N	0.0 N	50.00	0.0 N	100.00	0.0 N	0.0 N	700.00	30.00	0.0 N
186	0.0 N	0.0 N	15.00	0.0 N	15.00	0.0 N	0.0 N	500.00	70.00	0.0 N
187	0.0 N	0.0 N	15.00	0.0 N	15.00	0.0 N	0.0 N	700.00	70.00	0.0 N
188	0.0 N	0.0 N	5.00	0.0 N	5.00	0.0 N	0.0 N	500.00	30.00	0.0 N
189	0.0 N	0.0 N	5.00	0.0 N	5.00	5.00	0.0 N	70.00	20.00	0.0 N
190	0.0 N	0.0 N	20.00	50.00	15.00	3.00	0.0 N	1500.00	70.00	0.0 N
191	0.0 N	0.0 N	15.00	30.00	10.00	3.00	0.0 N	300.00	70.00	0.0 N
192	0.0 N	0.0 N	20.00	0.0 N	1.00	3.00	0.0 N	1500.00	70.00	0.0 N
193	0.0 N	0.0 N	20.00	0.0 N	5.00	3.00	0.0 N	700.00	50.00	0.0 N
194	0.0 N	0.0 N	0.0 N	0.0 N	0.0 N	5.00	0.0 N	70.00	15.00	0.0 N
195	0.0 N	0.0 N	15.00	30.00	5.00	0.0 N	0.0 N	150.00	70.00	10.00
196	0.0 N	0.0 N	15.00	0.0 N	100.00	0.0 N	0.0 N	500.00	70.00	10.00
197	0.0 N	0.0 N	30.00	0.0 N	50.00	0.0 N	0.0 N	500.00	70.00	0.0 N
198	0.0 N	0.0 N	30.00	0.0 N	7.00	0.0 N	0.0 N	700.00	70.00	10.00
199	0.0 N	0.0 N	30.00	50.00	20.00	0.0 N	0.0 N	100.00	70.00	30.00
200	0.0 N	0.0 N	30.00	30.00	3.00	0.0 N	0.0 N	700.00	70.00	0.0 N
201	0.0 N	0.0 N	20.00	0.0 N	150.00	0.0 N	0.0 N	700.00	70.00	0.0 N
220	0.0 N	0.0 N	20.00	50.00	70.00	0.0 N	0.0 N	700.00	70.00	0.0 N
221	0.0 N	0.0 N	20.00	0.0 N	2.00	10.00	0.0 N	700.00	20.00	0.0 N
222	0.0 N	0.0 N	10.00	0.0 N	2.00	3.00	0.0 N	200.00	30.00	0.0 N

SILICIFIED ROCKS, PPM

SAMPLE	FE,PPM	MG,PPM	CA,PPM	TI,PPM
120	10000.00	70.00	300.00	3000.00
121	29999.98	50.00	500.00	2000.00
129	29999.98	30.00	200.00	3000.00
130	29999.98	30.00	300.00	1500.00
142	500.00	70.00	1000.00	3000.00
161	10000.00	200.00	2000.00	1500.00
162	2000.00	70.00	1000.00	2000.00
163	10000.00	0.0 N	700.00	2000.00
166	2000.00	70.00	300.00	1500.00
167	7000.00	100.00	1000.00	2000.00
168	14999.99	100.00	200.00	1500.00
169	3000.00	100.00	1000.00	1500.00
170	500.00	70.00	2000.00	2000.00
171	3000.00	70.00	700.00	2000.00
172	5000.00	70.00	700.00	2000.00
173	14999.99	150.00	700.00	1000.00
174	5000.00	70.00	700.00	1500.00
175	7000.00	70.00	700.00	2000.00
176	5000.00	70.00	700.00	2000.00
177	3000.00	150.00	1000.00	1000.00
178	1000.00	30.00	100.00	1500.00
179	5000.00	70.00	700.00	2000.00
180	3000.00	70.00	1000.00	1500.00
181	5000.00	70.00	1000.00	2000.00
182	3000.00	70.00	700.00	2000.00
183	2000.00	70.00	1000.00	3000.00
184	19999.99	150.00	1000.00	2000.00
185	10000.00	100.00	500.00	1500.00
186	29999.98	150.00	500.00	3000.00
187	19999.99	150.00	1000.00	2000.00
188	3000.00	100.00	700.00	2000.00
189	2000.00	100.00	70.00	3000.00
190	19999.99	70.00	1000.00	2000.00
191	5000.00	100.00	1000.00	2000.00
192	19999.99	200.00	1000.00	1500.00
193	1000.00	70.00	500.00	2000.00
194	5000.00	100.00	150.00	2000.00
195	2000.00	70.00	700.00	3000.00
196	19999.99	150.00	300.00	3000.00
197	10000.00	100.00	700.00	3000.00
198	19999.99	200.00	700.00	3000.00
199	29999.98	200.00	700.00	3000.00
200	3000.00	100.00	700.00	3000.00
201	3000.00	69999.94	1000.00	3000.00
220	99999.94	300.00	5000.00	2000.00
221	2000.00	50.00	500.00	3000.00
222	2000.00	7.00	150.00	2000.00

SILICIFIED ROCKS, PPM

SAMPLE	AU,PPM	AG,PPM	PB,PPM	BI,PPM	HG,PPM	AS,PPM	CU,PPM	ZN,PPM	MO,PPM	BA,PPM
223	0.30	0.0 L	200.00	20.00	0.10	60.00	30.00	0.0 L	0.0 N	300.00
240	0.10	0.0 L	50.00	0.0 N	0.10	10.00	70.00	0.0 L	0.0 N	1000.00
246	0.37	0.0 N	50.00	0.0 N	0.08	10.00	7.00	0.0 L	5.00	700.00
249	1.40	0.0 L	30.00	0.0 N	0.10	10.00	7.00	0.0 L	0.0 N	500.00
250	1.16	1.50	50.00	10.00	0.08	10.00	5.00	0.0 L	0.0 N	1000.00
251	2.30	3.00	200.00	30.00	0.10	40.00	10.00	0.0 L	3.00	1000.00
252	14.07	1.50	100.00	15.00	0.10	80.00	70.00	0.0 L	5.00	1000.00
254	0.58	0.0 L	100.00	0.0 N	0.04	120.00	15.00	0.0 L	5.00	700.00
255	2.10	10.00	300.00	30.00	0.10	80.00	50.00	0.0 L	7.00	500.00
256	3.40	30.00	300.00	30.00	0.10	120.00	150.00	40.00	7.00	700.00
257	3.30	7.00	500.00	20.00	0.20	10.00	30.00	40.00	0.0 N	700.00
258	4.27	50.00	700.00	200.00	0.29	140.00	200.00	50.00	10.00	500.00
259	1.19	30.00	300.00	30.00	0.23	10.00	70.00	0.0 L	3.00	500.00
260	1.18	0.0 N	300.00	30.00	0.10	60.00	30.00	0.0 L	3.00	700.00
261	2.90	0.0 N	200.00	30.00	0.12	160.00	70.00	40.00	10.00	1000.00
262	1.05	0.0 N	100.00	30.00	0.19	80.00	15.00	0.0 L	10.00	700.00
263	1.80	0.0 N	200.00	0.0 N	0.13	10.00	50.00	0.0 L	5.00	1000.00
264	2.10	1.00	500.00	20.00	0.20	10.00	7.00	30.00	0.0 N	700.00
265	1.56	15.00	100.00	30.00	0.24	40.00	20.00	0.0 L	0.0 N	700.00
266	5.36	1.50	1000.00	70.00	0.18	80.00	50.00	0.0 L	10.00	700.00
267	4.19	20.00	500.00	70.00	1.00	100.00	70.00	0.0 L	7.00	700.00
268	5.27	30.00	200.00	70.00	0.64	0.0 L	30.00	0.0 L	3.00	700.00
269	2.26	5.00	150.00	10.00	0.17	10.00	10.00	0.0 L	3.00	700.00
270	4.25	30.00	100.00	30.00	0.68	10.00	15.00	30.00	0.0 N	700.00
271	18.60	30.00	300.00	70.00	0.12	10.00	20.00	40.00	3.00	500.00
272	4.00	2.00	200.00	50.00	0.15	10.00	15.00	0.0 L	0.0 N	700.00
273	2.67	2.00	50.00	0.0 N	0.24	120.00	150.00	0.0 L	15.00	500.00
274	0.15	0.0 L	200.00	0.0 N	0.06	10.00	15.00	0.0 L	0.0 N	3000.00
275	0.49	0.0 L	100.00	0.0 N	0.10	10.00	2.00	0.0 L	0.0 N	500.00
276	0.70	2.00	300.00	0.0 N	0.19	120.00	10.00	0.0 L	5.00	500.00
277	0.57	2.00	70.00	10.00	0.30	20.00	15.00	0.0 L	0.0 N	500.00
278	0.81	2.00	50.00	10.00	0.30	40.00	20.00	0.0 L	0.0 N	500.00

SILICIFIED ROCKS, PPM

SAMPLE	BE,PPM	CO,PPM	CR,PPM	LA,PPM	MN,PPM	NB,PPM	NI,PPM	SR,PPM	V,PPM	Y,PPM
223	0.0 N	0.0 N	20.00	0.0 N	3.00	0.0 N	0.0 N	500.00	50.00	0.0 N
240	0.0 N	0.0 N	30.00	50.00	10.00	7.00	0.0 N	500.00	70.00	0.0 N
246	0.0 N	0.0 N	30.00	70.00	20.00	7.00	0.0 N	1500.00	70.00	15.00
249	0.0 N	0.0 N	30.00	0.0 N	5.00	7.00	0.0 N	500.00	70.00	0.0 N
250	0.0 N	0.0 N	30.00	50.00	5.00	5.00	0.0 N	1000.00	70.00	0.0 N
251	0.0 N	0.0 N	30.00	0.0 N	10.00	5.00	0.0 N	700.00	70.00	0.0 N
252	0.0 N	0.0 N	30.00	50.00	10.00	5.00	0.0 N	1000.00	70.00	0.0 N
254	0.0 N	10.00	20.00	50.00	30.00	7.00	0.0 N	700.00	70.00	0.0 N
255	0.0 N	0.0 N	10.00	0.0 N	200.00	0.0 N	0.0 N	500.00	150.00	0.0 N
256	0.0 N	0.0 N	10.00	0.0 N	50.00	5.00	0.0 N	500.00	70.00	0.0 N
257	0.0 N	0.0 N	20.00	0.0 N	5.00	5.00	0.0 N	1000.00	50.00	0.0 N
258	0.0 N	0.0 N	30.00	0.0 N	70.00	0.0 N	0.0 N	1000.00	70.00	0.0 N
259	0.0 N	0.0 N	30.00	0.0 N	7.00	0.0 N	0.0 N	700.00	70.00	0.0 N
260	0.0 N	0.0 N	30.00	50.00	700.00	5.00	0.0 N	1500.00	50.00	0.0 N
261	0.0 N	0.0 N	20.00	50.00	1000.00	5.00	0.0 N	1000.00	150.00	0.0 N
262	0.0 N	0.0 N	50.00	50.00	700.00	5.00	0.0 N	300.00	70.00	0.0 N
263	0.0 N	0.0 N	30.00	50.00	1000.00	5.00	0.0 N	1500.00	100.00	0.0 N
264	0.0 N	0.0 N	20.00	50.00	50.00	5.00	0.0 N	700.00	100.00	0.0 N
265	0.0 N	0.0 N	15.00	0.0 N	15.00	5.00	0.0 N	300.00	50.00	0.0 N
266	0.0 N	0.0 N	20.00	0.0 N	30.00	3.00	0.0 N	1000.00	70.00	0.0 N
267	0.0 N	0.0 N	20.00	50.00	100.00	0.0 N	0.0 N	1000.00	70.00	0.0 N
268	0.0 N	0.0 N	20.00	50.00	30.00	3.00	0.0 N	300.00	70.00	0.0 N
269	0.0 N	0.0 N	30.00	50.00	7.00	0.0 N	0.0 N	500.00	100.00	0.0 N
270	0.0 N	0.0 N	20.00	0.0 N	5.00	0.0 N	0.0 N	300.00	50.00	0.0 N
271	0.0 N	0.0 N	20.00	0.0 N	7.00	0.0 N	0.0 N	300.00	70.00	0.0 N
272	0.0 N	0.0 N	20.00	0.0 N	5.00	0.0 N	0.0 N	700.00	70.00	0.0 N
273	0.0 N	15.00	20.00	0.0 N	300.00	5.00	0.0 N	70.00	70.00	0.0 N
274	0.0 N	0.0 N	20.00	0.0 N	10.00	5.00	0.0 N	700.00	50.00	0.0 N
275	0.0 N	0.0 N	20.00	0.0 N	7.00	5.00	0.0 N	300.00	100.00	0.0 N
276	0.0 N	0.0 N	20.00	0.0 N	15.00	5.00	0.0 N	700.00	100.00	0.0 N
277	0.0 N	0.0 N	20.00	0.0 N	5.00	0.0 N	0.0 N	1000.00	70.00	0.0 N
278	0.0 N	0.0 N	20.00	0.0 N	7.00	0.0 N	0.0 N	700.00	70.00	0.0 N

SILICIFIED ROCKS, PPM

SAMPLE	FE,PPM	MG,PPM	CA,PPM	TI,PPM
223	1000.00	7.00	500.00	3000.00
240	7000.00	70.00	700.00	2000.00
246	29999.98	1000.00	700.00	3000.00
249	3000.00	50.00	700.00	3000.00
250	5000.00	50.00	1500.00	3000.00
251	14999.99	50.00	700.00	3000.00
252	14999.99	70.00	1500.00	3000.00
254	14999.99	70.00	500.00	3000.00
255	49999.98	200.00	700.00	2000.00
256	29999.98	150.00	700.00	2000.00
257	3000.00	50.00	700.00	3000.00
258	69999.94	300.00	1000.00	1500.00
259	14999.99	70.00	500.00	3000.00
260	14999.99	100.00	700.00	3000.00
261	19999.99	200.00	1000.00	3000.00
262	19999.99	150.00	500.00	3000.00
263	10000.00	100.00	5000.00	3000.00
264	5000.00	150.00	1500.00	3000.00
265	10000.00	100.00	500.00	3000.00
266	19999.99	150.00	1000.00	2000.00
267	29999.98	150.00	1000.00	3000.00
268	10000.00	150.00	1000.00	3000.00
269	10000.00	150.00	2000.00	3000.00
270	7000.00	100.00	1000.00	3000.00
271	5000.00	100.00	1500.00	3000.00
272	7000.00	100.00	1500.00	3000.00
273	69999.94	500.00	300.00	3000.00
274	5000.00	200.00	700.00	3000.00
275	2000.00	200.00	1500.00	3000.00
276	29999.98	300.00	500.00	3000.00
277	19999.99	100.00	500.00	3000.00
278	14999.99	100.00	1500.00	3000.00

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SILICIFIED ROCKS, LOG PERCENT

SAMPLE	AU,LOG%	AG,LOG%	PB,LOG%	BI,LOG%	HG,LOG%	AS,LOG%	CU,LOG%	ZN,LOG%	MO,LOG%	BA,LOG%
1	-3.7447	-3.0000	-1.8239	0.0 N	-4.3010	-2.2218	-2.6990	0.0 L	0.0 N	-1.1549
2	-4.0555	-3.8239	-2.0000	0.0 N	-4.0000	-2.3979	-3.1549	0.0 L	0.0 N	-1.1549
3	-3.8239	-3.6990	-1.3010	0.0 N	-5.0000	0.0 L	-2.6990	0.0 L	0.0 N	-1.1549
4	-4.0000	-4.0000	-2.1549	0.0 N	-5.0000	-1.9208	-2.8239	0.0 L	0.0 N	-1.1549
5	-4.1612	-3.6990	-2.0000	0.0 N	-5.0000	-3.0000	-3.1549	0.0 L	0.0 N	-1.1549
6	-3.6990	-3.5229	-1.8239	-3.0000	-5.0000	0.0 L	-3.0000	0.0 L	0.0 N	-1.1549
7	-3.3468	-2.6990	-1.3010	-2.8239	-4.3010	-3.0000	-2.0000	0.0 L	0.0 N	-1.1549
8	-3.5086	-3.5229	-1.6990	-3.0000	-4.6990	-3.0000	-2.8239	0.0 L	0.0 N	-1.1549
9	-3.4685	-3.5229	-1.6990	-3.0000	-4.6990	-3.0000	-2.5229	0.0 L	0.0 N	-1.1549
10	-3.7258	-3.5229	-1.6990	0.0 N	-4.6990	-1.9208	-2.3010	0.0 L	0.0 N	-1.1549
11	-3.5544	-3.5229	-2.1549	-2.5229	-4.3010	-1.7959	-1.6990	0.0 L	-2.5229	-1.5229
30	-4.0969	-3.8239	-1.3010	-3.0000	-4.9586	-3.0000	-2.5229	0.0 L	-3.0000	-0.6990
32	-3.8386	-3.5229	-1.8239	-3.3010	-5.0969	-2.2218	-2.5229	0.0 L	-3.1549	-1.6990
34	-3.8239	-4.5229	-1.5229	0.0 N	-4.9586	-3.0000	-3.0000	0.0 L	-3.5229	-1.1549
35	0.0 L	-4.1549	-1.5229	0.0 N	-5.2218	-3.0000	-2.6990	-2.6021	-3.0000	-1.8239
36	-3.5376	-3.6990	-1.3010	0.0 N	-5.0969	0.0 L	-2.5229	0.0 L	-3.5229	-1.6990
37	-3.1500	-3.8239	-1.1549	0.0 N	-4.8239	0.0 L	-2.8239	0.0 L	-3.5229	-1.1549
38	-3.1945	-3.6990	-1.5229	0.0 N	-4.8239	-3.0000	-3.3010	0.0 L	0.0 N	-1.0000
39	-3.3665	-3.6990	-1.1549	0.0 N	-4.6198	-3.0000	-3.1549	0.0 L	-3.5229	-1.0000
45	-3.5406	-3.3010	-2.3010	-2.3010	-4.6990	-3.0000	-2.5229	0.0 L	0.0 N	-1.6990
63	-5.0000	-3.3010	-2.5229	0.0 N	-4.8861	-2.2218	-2.6990	-2.6021	-2.8239	-1.1549
64	-5.0000	0.0 N	0.0 N	0.0 N	-5.0000	-2.0969	-2.8239	-2.5229	-3.3010	-1.0000
65	-3.8539	0.0 N	-1.6990	0.0 N	-5.0969	-2.3979	-2.8239	0.0 L	-3.3010	-1.0000
66	-4.0458	0.0 N	-2.0000	0.0 N	-5.2218	-2.0000	-3.0000	0.0 L	0.0 N	-1.1549
67	-3.5607	0.0 N	-1.8239	0.0 N	-4.9586	-3.0000	-2.6990	0.0 L	0.0 N	-0.5229
68	-3.6840	0.0 N	-1.1549	0.0 N	-5.2218	-2.0000	-3.3010	0.0 L	-3.3010	-1.3010
69	-5.0000	0.0 N	-2.0000	0.0 N	-5.2218	-2.0969	-3.1549	0.0 L	0.0 N	-1.3010
74	-4.7447	0.0 N	-2.5229	0.0 N	-5.2218	-3.0000	-3.0000	-2.0000	0.0 N	-1.1549
75	-3.7447	0.0 N	-1.6990	0.0 N	-4.8239	-1.8539	-2.1549	0.0 L	-3.1549	-1.1549
77	-4.5229	0.0 L	-1.8239	0.0 N	-4.8239	-2.6990	-3.0000	-2.3010	-3.3010	-1.3010
78	-3.6198	0.0 L	-1.3010	0.0 N	-4.7696	-1.7959	-2.8239	-2.3979	-3.3010	-1.3010
79	-4.4437	0.0 L	-1.8239	0.0 N	-4.9586	-1.8539	-2.6990	-1.8539	-3.3010	-1.1549
80	-3.8239	0.0 L	-2.1549	0.0 N	-4.8239	-1.6990	-2.1549	0.0 L	-3.0000	-1.3010
81	-3.6091	-3.3010	-1.6990	-2.5229	-4.9586	-3.0000	-3.0000	0.0 L	0.0 N	-1.1549
82	-3.5376	-3.5229	-1.6990	-2.5229	-4.7212	-3.0000	-3.0000	0.0 L	0.0 N	-1.1549
83	-3.9208	-3.5229	-1.8239	0.0 N	-4.8861	-3.0000	-3.0000	0.0 L	0.0 N	-1.3010
84	-3.7[illegible]2	-4.0000	-1.6990	0.0 N	-4.9586	-2.6990	-2.8239	0.0 L	0.0 N	-1.0000
85	-4.7[illegible]9	-4.0000	-1.8239	0.0 N	-5.2218	-2.6990	-3.0000	0.0 L	0.0 N	-1.6990
86	-3.7696	-3.3010	-1.8239	-2.5229	-4.9586	-2.6990	-2.8239	0.0 L	0.0 N	-1.1549
87	-3.8539	-3.5229	-1.5229	-2.5229	-5.3979	-3.0000	-2.8239	0.0 L	0.0 N	-1.1549
88	-4.0458	-3.5229	-1.6990	-2.5229	-5.3979	-2.6990	-2.8239	-2.3979	0.0 N	-1.1549
89	-4.2596	-3.5229	-2.0000	0.0 N	-5.2218	-3.0000	-3.3010	0.0 L	0.0 N	-1.5229
90	-3.0155	-4.0000	-1.5229	0.0 N	-5.2218	-3.0000	-2.6990	0.0 L	0.0 N	-1.3010
91	-3.0269	-3.8239	-1.8239	0.0 N	-4.9586	0.0 L	-3.1549	0.0 L	0.0 N	-0.6990
92	-5.0000	-4.3010	-1.8239	0.0 N	-5.2218	-2.2218	-3.0000	0.0 L	-3.0000	-1.3010
101	-3.6459	-4.0000	-1.5229	0.0 N	-5.0000	-3.0000	-3.0000	-2.5229	-3.5229	-0.8239
116	-4.7959	0.0 L	-3.1549	0.0 N	-5.0000	-2.0000	-2.6990	-2.3010	-3.3010	-1.6990
117	-5.0000	0.0 L	-3.1549	0.0 N	-5.0000	-2.6990	-2.6990	0.0 L	0.0 N	-1.0000
118	-5.0000	0.0 L	-2.8239	0.0 N	-5.0000	-2.3979	-3.3010	0.0 L	-3.0000	-1.1549
119	-4.5376	0.0 N	-2.1549	0.0 N	-5.0969	-3.0000	-3.3010	0.0 L	0.0 N	-1.1549

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	BE,LOG%	CO,LOG%	CR,LOG%	LA,LOG%	MN,LOG%	NB,LOG%	NI,LOG%	SR,LOG%	V,LOG%	Y,LOG%
1	0.0 N	0.0 N	-3.0000	0.0 N	-1.8239	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
2	0.0 N	0.0 N	-3.0000	0.0 N	-2.8239	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
3	0.0 N	0.0 N	-3.0000	0.0 N	-2.8239	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
4	0.0 N	0.0 N	-3.0000	0.0 N	-2.5229	0.0 N	0.0 N	-1.3010	-2.0000	0.0 N
5	0.0 N	0.0 N	-2.8239	0.0 N	-3.1549	0.0 N	0.0 N	-1.5229	-2.0000	0.0 N
6	0.0 N	0.0 N	-3.0000	0.0 N	-2.6990	0.0 N	0.0 N	-1.5229	-2.1549	0.0 N
7	0.0 N	0.0 N	-3.0000	0.0 N	-2.6990	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
8	0.0 N	0.0 N	-3.0000	0.0 N	-2.6990	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
9	0.0 N	0.0 N	-3.0000	0.0 N	-2.5229	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
10	0.0 N	0.0 N	-3.0000	0.0 N	-2.1549	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
11	0.0 N	-2.5229	-3.0000	0.0 N	-1.5229	0.0 N	0.0 N	-1.1549	-1.6990	0.0 N
30	-4.5229	-3.3010	-2.6990	-2.5229	-2.3010	0.0 N	-3.6990	-1.3010	-2.0000	-3.3010
32	-4.5229	0.0 N	-2.8239	0.0 N	-2.3010	0.0 N	-3.6990	-1.3010	-2.1549	-3.3010
34	-4.3010	-3.3010	-2.5229	-2.1549	-2.1549	0.0 N	-3.5229	-0.8239	-2.1549	-3.1549
35	-4.5229	0.0 N	-2.6990	-2.1549	-2.0000	0.0 N	-3.6990	-0.8239	-1.8239	-3.1549
36	-4.5229	0.0 N	-2.6990	0.0 N	-2.3010	0.0 N	-3.6990	-1.3010	-2.1549	-3.3010
37	-4.5229	0.0 N	-2.6990	-2.3010	-2.6990	0.0 N	-3.6990	-1.3010	-2.1549	-3.3010
38	-4.5229	0.0 N	-2.8239	-2.3010	-2.8239	0.0 N	-3.6990	-0.8239	-2.1549	-3.3010
39	-4.5229	0.0 N	-2.8239	-2.5229	-2.6990	0.0 N	-3.6990	-0.6990	-2.1549	-3.3010
45	-4.3010	-3.1549	-3.0000	-2.1549	-2.5229	-3.0000	-3.6990	-1.5229	-2.5229	-3.1549
63	-4.5229	0.0 N	-3.0000	-2.3010	-1.5229	0.0 N	-3.5229	-1.0000	-2.1549	-3.3010
64	0.0 N	0.0 N	-2.6990	0.0 N	-1.5229	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
65	0.0 N	0.0 N	-2.6990	-2.1549	-2.5229	0.0 N	0.0 N	-1.0000	-2.0000	-2.6990
66	0.0 N	0.0 N	-2.6990	-2.1549	-3.0000	0.0 N	0.0 N	-1.6990	-2.1549	0.0 N
67	0.0 N	0.0 N	-2.6990	-2.1549	-2.5229	0.0 N	0.0 N	-1.5229	-2.1549	-2.6990
68	0.0 N	0.0 N	-2.8239	0.0 N	-3.0000	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
69	0.0 N	0.0 N	-2.6990	-2.1549	-3.0000	0.0 N	0.0 N	-1.0000	-2.1549	0.0 N
74	0.0 N	0.0 N	-2.8239	-2.1549	-3.1549	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
75	0.0 N	0.0 N	-2.8239	-2.1549	-2.5229	0.0 N	0.0 N	-1.3010	-2.0000	0.0 N
77	0.0 N	0.0 N	-2.8239	0.0 N	-3.1549	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
78	0.0 N	0.0 N	-3.0000	0.0 N	-3.1549	0.0 N	0.0 N	-1.0000	-2.1549	0.0 N
79	0.0 N	0.0 N	-2.8239	0.0 N	-3.1549	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
80	0.0 N	0.0 N	-3.0000	0.0 N	-2.8239	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
81	0.0 N	0.0 N	-2.8239	0.0 N	-2.1549	0.0 N	0.0 N	-1.3010	-2.5229	0.0 N
82	0.0 N	0.0 N	-2.8239	0.0 N	-3.0000	0.0 N	0.0 N	-1.3010	-2.5229	0.0 N
83	0.0 N	0.0 N	-2.6990	0.0 N	-3.1549	0.0 N	0.0 N	-1.5229	-2.3010	0.0 N
84	0.0 N	0.0 N	-2.6990	0.0 N	-3.1549	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
85	0.0 N	0.0 N	-2.6990	-2.3010	-3.0000	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
86	0.0 N	0.0 N	-2.6990	0.0 N	-3.1549	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
87	0.0 N	0.0 N	-2.6990	0.0 N	-3.1549	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
88	-4.3010	0.0 N	-3.0000	-2.5229	-2.8239	0.0 N	0.0 N	-1.3010	-2.1549	-3.5229
89	-4.3010	0.0 N	-3.5229	0.0 N	-3.5229	-3.1549	0.0 N	-2.0000	-2.8239	-3.5229
90	-4.3010	0.0 N	-2.8239	-2.3010	-3.1549	0.0 N	0.0 N	-1.0000	-2.1549	-3.5229
91	0.0 N	0.0 N	-2.8239	-2.5229	-3.0000	0.0 N	0.0 N	-1.8239	-2.6990	-3.5229
92	-4.1549	0.0 N	-3.0000	-2.3010	-2.0000	0.0 N	-3.5229	-1.5229	-2.0000	-2.6990
101	-3.8239	0.0 N	-2.8239	-2.3010	-3.0000	0.0 N	-3.5229	-1.8239	-2.3010	-3.0000
116	0.0 N	0.0 N	-2.5229	-2.0000	-2.8239	-2.6990	0.0 N	-1.3010	-2.3010	0.0 N
117	0.0 N	0.0 N	0.0 N	0.0 N	-3.0000	-2.6990	0.0 N	-2.6990	-2.5229	0.0 N
118	0.0 N	0.0 N	-3.5229	0.0 N	-3.0000	-2.6990	0.0 N	-2.0000	-2.5229	0.0 N
119	0.0 N	0.0 N	-2.6990	-2.1549	-3.0000	-3.0000	0.0 N	-1.1549	-2.3010	0.0 N

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	FE,LOG%	MN,LOG%	CA,LOG%	TI,LOG%
1	0.1761	-2.0000	-1.1549	-0.5229
2	-0.3010	-2.0000	-1.1549	-0.5229
3	0.1761	-2.0000	-1.1549	-0.5229
4	-0.3010	-2.1549	-1.1549	-0.5229
5	-0.6990	-2.0000	-1.0000	-0.5229
6	-0.1549	-2.0000	-1.0000	-0.5229
7	0.3010	-2.0000	-1.1549	-0.5229
8	0.1761	-2.1549	-1.1549	-0.5229
9	0.3010	-2.0000	-0.5229	-0.5229
10	0.3010	-2.1549	-1.3010	-0.8239
11	0.0 G	-1.1549	-0.5229	-1.1549
30	0.8451	-2.0000	-1.3010	-0.6990
32	0.6990	-1.8239	-1.5229	-0.6990
34	0.8451	-0.6990	-1.0000	-0.6990
35	1.0000	-1.6990	-1.3010	-0.5229
36	0.6990	-1.8239	-1.3010	-0.6990
37	0.4771	-1.8239	-0.8239	-0.6990
38	-0.0000	-1.8239	-1.0000	-0.6990
39	0.4771	-2.0000	-1.0000	-0.8239
45	0.3010	-2.0000	-1.5229	-0.3010
63	0.0 G	-1.1549	-1.3010	-0.6990
64	0.4771	-1.0000	-1.1549	-0.5229
65	0.6990	-0.8239	-1.0000	-0.5229
66	0.4771	0.0 N	-1.3010	-0.6990
67	0.1761	-0.8239	-0.8239	-0.5229
68	0.6990	0.0 N	-1.1549	-0.8239
69	0.3010	-1.5229	-1.0000	-0.6990
74	-0.0000	0.0 N	-1.3010	-0.6990
75	0.8451	0.0 N	-1.3010	-0.6990
77	0.4771	0.0 N	-1.1549	-0.5229
78	0.4771	0.0 N	-1.1549	-0.8239
79	0.4771	0.0 N	-1.3010	-0.6990
80	0.6990	0.0 N	-1.5229	-0.8239
81	-0.5229	-2.1549	-1.0000	-0.5229
82	-0.3010	-2.0000	-1.1549	-0.6990
83	-0.5229	-2.1549	-1.0000	-0.8239
84	0.6990	-2.1549	-1.0000	-0.6990
85	-0.1549	-2.0000	-1.1549	-0.6990
86	0.6990	-2.0000	-1.0000	-0.6990
87	-0.8239	-2.0000	-1.1549	-0.6990
88	-0.3010	-1.8239	-1.0000	-0.5229
89	-0.6990	-2.1549	-2.0000	-0.3010
90	-1.0000	-2.1549	-0.8239	-0.5229
91	-0.6990	-2.1549	-1.1549	-0.6990
92	0.8451	-1.3010	-1.1549	-0.3010
101	-0.1549	-2.0000	-1.5229	-0.6990
116	-0.0000	-2.5229	-1.6990	-0.5229
117	-0.3010	-2.6990	-1.6990	-0.5229
118	0.1761	-2.5229	-2.1549	-0.5229
119	-0.3010	-2.1549	-1.3010	-0.6990

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	AU,LOG%	AG,LOG%	PB,LOG%	BI,LOG%	HG,LOG%	AS,LOG%	CU,LOG%	ZN,LOG%	MO,LOG%	BA,LOG%
120	-5.0000	-3.6990	-2.3010	0.0 N	-5.0000	0.0 L	-3.3010	0.0 L	-3.3010	-1.0000
121	-4.7696	0.0 N	-2.1549	0.0 N	-5.0000	-2.0969	-2.5229	-2.1871	-3.1549	-1.5229
129	-4.6990	0.0 N	-2.3010	0.0 N	-5.2218	-1.6990	-2.5229	-2.3010	-3.0000	-0.6990
130	-3.6271	0.0 L	-1.5229	0.0 N	-4.7212	-1.7959	-2.3010	-2.0458	-2.8239	-1.1549
142	-3.7959	0.0 N	-1.5229	0.0 N	-4.2840	-3.0000	-3.5229	-2.3010	0.0 N	-1.1549
161	-3.7959	0.0 L	-1.1549	0.0 N	-4.9586	-1.9208	-3.0000	-2.2218	0.0 N	-1.1549
162	-4.6990	0.0 N	-2.1549	0.0 N	-4.4559	-3.0000	-3.5229	-1.7959	0.0 N	-1.5229
163	-2.8125	-4.0000	-1.1549	-2.5229	-4.4559	-2.0000	-2.8239	-2.6021	-3.3010	-1.1549
166	-2.7245	0.0 L	-2.0000	0.0 N	-4.6576	-2.6990	-3.5229	-2.5229	0.0 N	-1.3010
167	-3.0985	0.0 L	-1.3010	0.0 N	-4.6778	-2.6990	-3.3010	-2.5229	0.0 N	-1.1549
168	-2.5272	-3.6990	-1.5229	0.0 N	-4.5528	-1.6021	-2.3010	0.0 L	-3.1549	-1.5229
169	-3.6655	-4.0000	-1.3010	-3.3010	-4.6198	-1.7959	-2.8239	0.0 L	0.0 N	-1.1549
170	-4.0458	0.0 L	-1.8239	0.0 N	-4.8861	-3.0000	-2.8239	-2.3979	0.0 N	-1.1549
171	-3.4023	0.0 L	-1.6990	0.0 N	-4.6198	-2.6990	-2.8239	0.0 L	0.0 N	-1.3010
172	-3.5686	-3.1549	-1.6990	0.0 N	-4.5528	-2.0969	-2.8239	0.0 L	0.0 N	-1.3010
173	-3.5258	-3.5229	-1.1549	-2.5229	-4.8239	-1.7959	-2.0000	0.0 L	0.0 N	-1.1549
174	-3.3316	-3.0000	-1.1549	-2.0000	-4.3768	-1.8539	-2.6990	0.0 L	0.0 N	-1.1549
175	-3.6383	-3.0000	-1.3010	0.0 N	-4.3979	-1.8539	-2.8239	-2.3010	0.0 N	-1.1549
176	-3.6576	-3.3010	-1.3010	0.0 N	-4.4949	-3.0000	-2.6990	0.0 L	0.0 N	-1.1549
177	-3.5686	-3.3010	-1.3010	-2.8239	-4.5686	-1.8539	-2.6990	0.0 L	-3.5229	-1.3010
178	-3.7799	-3.1549	-1.3010	-2.5229	-4.2218	-1.8539	-3.3010	-2.6021	0.0 N	-1.3010
179	-3.2924	-2.6990	-1.3010	-2.5229	-4.0458	-1.7959	-2.5229	0.0 L	-3.5229	-1.3010
180	-3.7959	-3.5229	-1.1549	0.0 N	-4.6383	-1.9208	-3.3010	0.0 L	0.0 N	-1.3010
181	-4.1643	-3.6990	-1.5229	0.0 N	-4.8539	-2.0000	-3.0000	0.0 L	0.0 N	-1.1549
182	-4.3010	0.0 L	-1.3010	0.0 N	-5.3979	-2.6990	-3.0000	0.0 L	0.0 N	-1.3010
183	-4.0969	-4.0000	-1.6990	0.0 N	-5.0000	-2.3979	-2.8239	0.0 L	0.0 N	-1.1549
184	-3.9586	-3.5229	-1.3010	0.0 N	-5.0000	-2.0969	-2.8239	0.0 L	-3.1549	-1.1549
185	-3.3565	-4.0000	-0.8239	0.0 N	-5.0000	-2.0969	-2.6990	0.0 L	-3.0000	-1.1549
186	-3.2848	-3.6990	-1.1549	-2.8239	-5.0000	-3.0000	-2.5229	0.0 L	-3.0000	-1.3010
187	-2.6234	-3.6990	-1.1549	0.0 N	-5.0000	-2.2218	-2.3010	0.0 L	-3.5229	-1.3010
188	-3.1331	-3.6990	-1.1549	0.0 N	-5.0000	-2.6990	-3.1549	0.0 L	0.0 N	-1.3010
189	-4.5528	-3.5229	-2.3010	0.0 N	-5.0000	-3.0000	-2.5229	-2.3010	0.0 N	-1.6990
190	-4.6990	-3.6990	-1.6990	0.0 N	-4.8861	-3.0000	-2.3010	0.0 L	-3.0000	-1.0000
191	-3.6778	0.0 L	-1.1549	0.0 N	-5.0000	-3.0000	-3.1549	0.0 L	0.0 N	-1.0000
192	-4.2366	-4.0000	-1.5229	0.0 N	-4.8239	-2.6990	-2.5229	-2.5229	-3.1549	-1.1549
193	-4.0000	-3.6990	-1.3010	0.0 N	-4.7696	0.0 L	-3.6990	0.0 L	0.0 N	-1.1549
194	-4.0969	-3.5229	-3.1549	0.0 N	-5.0000	-3.0000	-2.8239	-2.5229	-3.5229	-1.5229
195	-3.8665	0.0 L	-1.8239	0.0 N	-4.9586	-3.0000	-3.6990	0.0 L	0.0 N	-1.1549
196	-4.6990	0.0 L	-1.8239	0.0 N	-4.8861	-3.0000	-2.3010	0.0 L	-3.5229	-1.1549
197	-3.1249	0.0 L	-1.3010	0.0 N	-4.8239	-3.0000	-3.1549	-2.3010	-3.5229	-1.3010
198	-3.5686	0.0 L	-1.1549	0.0 N	-5.0969	-3.0000	-2.5229	0.0 L	-3.0000	-1.3010
199	-4.3979	-3.6990	-2.1549	0.0 N	-5.0000	-3.0000	-3.1549	-2.3010	-3.3010	-1.0000
200	-4.6021	-3.5229	-2.3010	0.0 N	-5.2218	-3.0000	-3.3010	0.0 L	0.0 N	-1.3010
201	-4.0458	0.0 N	-1.3010	0.0 N	-5.2218	0.0 L	-3.1549	0.0 L	0.0 N	-1.3010
220	-4.5229	0.0 N	-1.6990	-2.8239	-5.3979	-1.7959	-1.6990	-2.2218	-3.0000	-1.3010
221	-4.3979	-3.6990	-2.1549	0.0 N	-4.9586	-1.8539	-3.1549	-2.1549	0.0 N	-1.1549
222	-4.0088	-3.6990	-2.1549	0.0 N	-5.0000	-2.0000	-2.5229	0.0 L	0.0 N	-1.3010

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	BE,LOG%	CO,LOG%	CR,LOG%	LA,LOG%	MN,LOG%	NB,LOG%	NI,LOG%	SR,LOG%	V,LOG%	Y,LOG%
120	0.0 N	0.0 N	-3.0000	-1.8239	-3.0000	-2.6990	0.0 N	-1.1549	-2.3010	0.0 N
121	0.0 N	0.0 N	-2.5229	-2.1549	-3.0000	0.0 N	0.0 N	-1.1549	-2.3010	0.0 N
129	0.0 N	-3.0000	0.0 N	-2.0000	-0.6990	-2.8239	0.0 N	-1.6990	-2.5229	0.0 N
130	0.0 N	0.0 N	-2.8239	0.0 N	-1.5229	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
142	0.0 N	0.0 N	-2.8239	0.0 N	-3.6990	-3.3010	0.0 N	-1.5229	-2.3010	0.0 N
161	0.0 N	0.0 N	-3.0000	0.0 N	-1.8239	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
162	0.0 N	0.0 N	-2.8239	0.0 N	-3.1549	0.0 N	0.0 N	-2.0000	-2.1549	0.0 N
163	0.0 N	0.0 N	-2.5229	0.0 N	-3.0000	0.0 N	0.0 N	-1.0000	-2.0000	0.0 N
166	0.0 N	0.0 N	-3.1549	0.0 N	-3.6990	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
167	0.0 N	0.0 N	-2.8239	0.0 N	-2.8239	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
168	0.0 N	0.0 N	-3.5229	0.0 N	-2.8239	0.0 N	0.0 N	-1.1549	-2.3010	0.0 N
169	0.0 N	0.0 N	-3.1549	0.0 N	-3.3010	0.0 N	0.0 N	-1.1549	-2.3010	0.0 N
170	0.0 N	0.0 N	-2.8239	0.0 N	-4.0000	-3.0000	0.0 N	-1.0000	-2.1549	0.0 N
171	0.0 N	0.0 N	-2.6990	0.0 N	-3.1549	-3.1549	0.0 N	-1.3010	-2.0000	0.0 N
172	0.0 N	0.0 N	-2.8239	0.0 N	-3.1549	-3.1549	0.0 N	-1.1549	-2.3010	0.0 N
173	0.0 N	0.0 N	-2.8239	0.0 N	-2.8239	0.0 N	0.0 N	-1.1549	-2.0000	0.0 N
174	0.0 N	0.0 N	-2.8239	0.0 N	-3.0000	-3.1549	0.0 N	-1.1549	-2.1549	0.0 N
175	0.0 N	0.0 N	-2.8239	0.0 N	-2.6990	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
176	0.0 N	0.0 N	-2.8239	0.0 N	-3.0000	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
177	0.0 N	0.0 N	-3.1549	0.0 N	-2.5229	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
178	0.0 N	0.0 N	-3.1549	0.0 N	-3.6990	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
179	0.0 N	0.0 N	-2.8239	0.0 N	-3.3010	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
180	0.0 N	0.0 N	-2.8239	0.0 N	-3.1549	0.0 N	0.0 N	-1.1549	-2.0000	0.0 N
181	0.0 N	0.0 N	-2.6990	0.0 N	-3.6990	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
182	0.0 N	0.0 N	-2.6990	0.0 N	-3.6990	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
183	0.0 N	0.0 N	-2.8239	-2.5229	-3.3010	-3.3010	0.0 N	-1.3010	-2.3010	0.0 N
184	0.0 N	0.0 N	-2.6990	-2.3010	-3.0000	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
185	0.0 N	0.0 N	-2.3010	0.0 N	-2.0000	0.0 N	0.0 N	-1.1549	-2.5229	0.0 N
186	0.0 N	0.0 N	-2.8239	0.0 N	-2.8239	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
187	0.0 N	0.0 N	-2.8239	0.0 N	-2.8239	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
188	0.0 N	0.0 N	-3.3010	0.0 N	-3.3010	0.0 N	0.0 N	-1.3010	-2.5229	0.0 N
189	0.0 N	0.0 N	-3.3010	0.0 N	-3.3010	-3.3010	0.0 N	-2.1549	-2.6990	0.0 N
190	0.0 N	0.0 N	-2.6990	-2.3010	-2.8239	-3.5229	0.0 N	-0.8239	-2.1549	0.0 N
191	0.0 N	0.0 N	-2.8239	-2.5229	-3.0000	-3.5229	0.0 N	-1.5229	-2.1549	0.0 N
192	0.0 N	0.0 N	-2.6990	0.0 N	-4.0000	-3.5229	0.0 N	-0.8239	-2.1549	0.0 N
193	0.0 N	0.0 N	-2.6990	0.0 N	-3.3010	-3.5229	0.0 N	-1.1549	-2.3010	0.0 N
194	0.0 N	0.0 N	0.0 N	0.0 N	0.0 N	-3.3010	0.0 N	-2.1549	-2.8239	0.0 N
195	0.0 N	0.0 N	-2.8239	-2.5229	-3.3010	0.0 N	0.0 N	-1.8239	-2.1549	-3.0000
196	0.0 N	0.0 N	-2.8239	0.0 N	-2.0000	0.0 N	0.0 N	-1.3010	-2.1549	-3.0000
197	0.0 N	0.0 N	-2.5229	0.0 N	-2.3010	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
198	0.0 N	0.0 N	-2.5229	0.0 N	-3.1549	0.0 N	0.0 N	-1.1549	-2.1549	-3.0000
199	0.0 N	0.0 N	-2.5229	-2.3010	-2.6990	0.0 N	0.0 N	-2.0000	-2.1549	-2.5229
200	0.0 N	0.0 N	-2.5229	-2.5229	-3.5229	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
201	0.0 N	0.0 N	-2.6990	0.0 N	-1.8239	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
220	0.0 N	0.0 N	-2.6990	-2.3010	-2.1549	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
221	0.0 N	0.0 N	-2.6990	0.0 N	-3.6990	-3.0000	0.0 N	-1.1549	-2.6990	0.0 N
222	0.0 N	0.0 N	-3.0000	0.0 N	-3.6990	-3.5229	0.0 N	-1.6990	-2.5229	0.0 N

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	FE,LOG%	MN,LOG%	CA,LOG%	TI,LOG%
120	-0.0000	-2.1549	-1.5229	-0.5229
121	0.4771	-2.3010	-1.3010	-0.6990
129	0.4771	-2.5229	-1.6990	-0.5229
130	0.4771	-2.5229	-1.5229	-0.8239
142	-1.3010	-2.1549	-1.0000	-0.5229
161	-0.0000	-1.6990	-0.6990	-0.8239
162	-0.6990	-2.1549	-1.0000	-0.6990
163	-0.0000	0.0 N	-1.1549	-0.6990
166	-0.6990	-2.1549	-1.5229	-0.8239
167	-0.1549	-2.0000	-1.0000	-0.6990
168	0.1761	-2.0000	-1.6990	-0.8239
169	-0.5229	-2.0000	-1.0000	-0.8239
170	-1.3010	-2.1549	-0.6990	-0.6990
171	-0.5229	-2.1549	-1.1549	-0.6990
172	-0.3010	-2.1549	-1.1549	-0.6990
173	0.1761	-1.8239	-1.1549	-1.0000
174	-0.3010	-2.1549	-1.1549	-0.8239
175	-0.1549	-2.1549	-1.1549	-0.6990
176	-0.3010	-2.1549	-1.1549	-0.6990
177	-0.5229	-1.8239	-1.0000	-1.0000
178	-1.0000	-2.5229	-2.0000	-0.8239
179	-0.3010	-2.1549	-1.1549	-0.6990
180	-0.5229	-2.1549	-1.0000	-0.8239
181	-0.3010	-2.1549	-1.0000	-0.6990
182	-0.5229	-2.1549	-1.1549	-0.6990
183	-0.6990	-2.1549	-1.0000	-0.5229
184	0.3010	-1.8239	-1.0000	-0.6990
185	-0.0000	-2.0000	-1.3010	-0.8239
186	0.4771	-1.8239	-1.3010	-0.5229
187	0.3010	-1.8239	-1.0000	-0.6990
188	-0.5229	-2.0000	-1.1549	-0.6990
189	-0.6990	-2.0000	-2.1549	-0.5229
190	0.3010	-2.1549	-1.0000	-0.6990
191	-0.3010	-2.0000	-1.0000	-0.6990
192	0.3010	-1.6990	-1.0000	-0.8239
193	-1.0000	-2.1549	-1.3010	-0.6990
194	-0.3010	-2.0000	-1.8239	-0.6990
195	-0.6990	-2.1549	-1.1549	-0.5229
196	0.3010	-1.8239	-1.5229	-0.5229
197	-0.0000	-2.0000	-1.1549	-0.5229
198	0.3010	-1.6990	-1.1549	-0.5229
199	0.4771	-1.6990	-1.1549	-0.5229
200	-0.5229	-2.0000	-1.1549	-0.5229
201	-0.5229	0.8451	-1.0000	-0.5229
220	1.0000	-1.5229	-0.3010	-0.6990
221	-0.6990	-2.3010	-1.3010	-0.5229
222	-0.6990	-3.1549	-1.8239	-0.6990

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	AU,LOG%	AG,LOG%	PB,LOG%	BI,LOG%	HG,LOG%	AS,LOG%	CU,LOG%	ZN,LOG%	MO,LOG%	BA,LOG%
223	-4.5229	0.0 L	-1.6990	-2.6990	-5.0000	-2.2218	-2.5229	0.0 L	0.0 N	-1.5229
240	-5.0000	0.0 L	-2.3010	0.0 N	-5.0000	-3.0000	-2.1549	0.0 L	0.0 N	-1.0000
246	-4.4318	0.0 N	-2.3010	0.0 N	-5.0969	-3.0000	-3.1549	0.0 L	-3.3010	-1.1549
249	-3.8539	0.0 L	-2.5229	0.0 N	-5.0000	-3.0000	-3.1549	0.0 L	0.0 N	-1.3010
250	-3.9355	-3.8239	-2.3010	-3.0000	-5.0969	-3.0000	-3.3010	0.0 L	0.0 N	-1.0000
251	-3.6383	-3.5229	-1.6990	-2.5229	-5.0000	-2.3979	-3.0000	0.0 L	-3.5229	-1.0000
252	-2.8517	-3.8239	-2.0000	-2.8239	-5.0000	-2.0969	-2.1549	0.0 L	-3.3010	-1.0000
254	-4.2366	0.0 L	-2.0000	0.0 N	-5.3979	-1.9208	-2.8239	0.0 L	-3.3010	-1.1549
255	-3.6778	-3.0000	-1.5229	-2.5229	-5.0000	-2.0969	-2.3010	0.0 L	-3.1549	-1.3010
256	-3.4685	-2.5229	-1.5229	-2.5229	-5.0000	-1.9208	-1.8239	-2.3979	-3.1549	-1.1549
257	-3.4815	-3.1549	-1.3010	-2.6990	-4.6990	-3.0000	-2.5229	-2.3979	0.0 N	-1.1549
258	-3.3696	-2.3010	-1.1549	-1.6990	-4.5376	-1.8539	-1.6990	-2.3010	-3.0000	-1.3010
259	-3.9226	-2.5229	-1.5229	-2.5229	-4.6383	-3.0000	-2.1549	0.0 L	-3.5229	-1.3010
260	-3.9281	0.0 N	-1.5229	-2.5229	-5.0000	-2.2218	-2.5229	0.0 L	-3.5229	-1.1549
261	-3.5376	0.0 N	-1.6990	-2.5229	-4.9208	-1.7959	-2.1549	-2.3979	-3.0000	-1.0000
262	-3.9788	0.0 N	-2.0000	-2.5229	-4.7212	-2.0969	-2.8239	0.0 L	-3.0000	-1.1549
263	-3.7447	0.0 N	-1.6990	0.0 N	-4.8861	-3.0000	-2.3010	0.0 L	-3.3010	-1.0000
264	-3.6778	-4.0000	-1.3010	-2.6990	-4.6990	-3.0000	-3.1549	-2.5229	0.0 N	-1.1549
265	-3.8069	-2.8239	-2.0000	-2.5229	-4.6198	-2.3979	-2.6990	0.0 L	0.0 N	-1.1549
266	-3.2708	-3.8239	-1.0000	-2.1549	-4.7447	-2.0969	-2.3010	0.0 L	-3.0000	-1.1549
267	-3.3778	-2.6990	-1.3010	-2.1549	-4.0000	-2.0000	-2.1549	0.0 L	-3.1549	-1.1549
268	-3.2782	-2.5229	-1.6990	-2.1549	-4.1938	0.0 L	-2.5229	0.0 L	-3.5229	-1.1549
269	-3.6459	-3.3010	-1.8239	-3.0000	-4.7696	-3.0000	-3.0000	0.0 L	-3.5229	-1.1549
270	-3.3716	-2.5229	-2.0000	-2.5229	-4.1675	-3.0000	-2.8239	-2.5229	0.0 N	-1.1549
271	-2.7305	-2.5229	-1.5229	-2.1549	-4.9208	-3.0000	-2.6990	-2.3979	-3.5229	-1.3010
272	-3.3979	-3.6990	-1.6990	-2.3010	-4.8239	-3.0000	-2.8239	0.0 L	0.0 N	-1.1549
273	-3.5735	-3.6990	-2.3010	0.0 N	-4.6198	-1.9208	-1.8239	0.0 L	-2.8239	-1.3010
274	-4.8239	0.0 L	-1.6990	0.0 N	-5.2218	-3.0000	-2.8239	0.0 L	0.0 N	-0.5229
275	-4.3054	0.0 L	-2.0000	0.0 N	-5.0000	-3.0000	-3.6990	0.0 L	0.0 N	-1.3010
276	-4.1549	-3.6990	-1.5229	0.0 N	-4.7212	-1.9208	-3.0000	0.0 L	-3.3010	-1.3010
277	-4.2441	-3.6990	-2.1549	-3.0000	-4.5229	-2.6990	-2.8239	0.0 L	0.0 N	-1.3010
278	-4.0915	-3.6990	-2.3010	-3.0000	-4.5229	-2.3979	-2.6990	0.0 L	0.0 N	-1.3010

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	BE,LOG%		CO,LOG%		CR,LOG%	LA,LOG%		MN,LOG%	NB,LOG%		NI,LOG%		SR,LOG%	V,LOG%	Y,LOG%	
223	0.0	N	0.0	N	-2.6990	0.0	N	-3.5229	0.0	N	0.0	N	-1.3010	-2.3010	0.0	N
240	0.0	N	0.0	N	-2.5229	-2.3010		-3.0000	-3.1549		0.0	N	-1.3010	-2.1549	0.0	N
246	0.0	N	0.0	N	-2.5229	-2.1549		-2.6990	-3.1549		0.0	N	-0.8239	-2.1549	-2.8239	
249	0.0	N	0.0	N	-2.5229	0.0	N	-3.3010	-3.1549		0.0	N	-1.3010	-2.1549	0.0	N
250	0.0	N	0.0	N	-2.5229	-2.3010		-3.3010	-3.3010		0.0	N	-1.0000	-2.1549	0.0	N
251	0.0	N	0.0	N	-2.5229	0.0	N	-3.0000	-3.3010		0.0	N	-1.1549	-2.1549	0.0	N
252	0.0	N	0.0	N	-2.5229	-2.3010		-3.0000	-3.3010		0.0	N	-1.0000	-2.1549	0.0	N
254	0.0	N	-3.0000		-2.6990	-2.3010		-2.5229	-3.1549		0.0	N	-1.1549	-2.1549	0.0	N
255	0.0	N	0.0	N	-3.0000	0.0	N	-1.6990	0.0	N	0.0	N	-1.3010	-1.8239	0.0	N
256	0.0	N	0.0	N	-3.0000	0.0	N	-2.3010	-3.3010		0.0	N	-1.3010	-2.1549	0.0	N
257	0.0	N	0.0	N	-2.6990	0.0	N	-3.3010	-3.3010		0.0	N	-1.0000	-2.3010	0.0	N
258	0.0	N	0.0	N	-2.5229	0.0	N	-2.1549	0.0	N	0.0	N	-1.0000	-2.1549	0.0	N
259	0.0	N	0.0	N	-2.5229	0.0	N	-3.1549	0.0	N	0.0	N	-1.1549	-2.1549	0.0	N
260	0.0	N	0.0	N	-2.5229	-2.3010		-1.1549	-3.3010		0.0	N	-0.8239	-2.3010	0.0	N
261	0.0	N	0.0	N	-2.6990	-2.3010		-1.0000	-3.3010		0.0	N	-1.0000	-1.8239	0.0	N
262	0.0	N	0.0	N	-2.3010	-2.3010		-1.1549	-3.3010		0.0	N	-1.5229	-2.1549	0.0	N
263	0.0	N	0.0	N	-2.5229	-2.3010		-1.0000	-3.3010		0.0	N	-0.8239	-2.0000	0.0	N
264	0.0	N	0.0	N	-2.6990	-2.3010		-2.3010	-3.3010		0.0	N	-1.1549	-2.0000	0.0	N
265	0.0	N	0.0	N	-2.8239	0.0	N	-2.8239	-3.3010		0.0	N	-1.5229	-2.3010	0.0	N
266	0.0	N	0.0	N	-2.6990	0.0	N	-2.5229	-3.5229		0.0	N	-1.0000	-2.1549	0.0	N
267	0.0	N	0.0	N	-2.6990	-2.3010		-2.0000	0.0	N	0.0	N	-1.0000	-2.1549	0.0	N
268	0.0	N	0.0	N	-2.6990	-2.3010		-2.5229	-3.5229		0.0	N	-1.5229	-2.1549	0.0	N
269	0.0	N	0.0	N	-2.5229	-2.3010		-3.1549	0.0	N	0.0	N	-1.3010	-2.0000	0.0	N
270	0.0	N	0.0	N	-2.6990	0.0	N	-3.3010	0.0	N	0.0	N	-1.5229	-2.3010	0.0	N
271	0.0	N	0.0	N	-2.6990	0.0	N	-3.1549	0.0	N	0.0	N	-1.5229	-2.1549	0.0	N
272	0.0	N	0.0	N	-2.6990	0.0	N	-3.3010	0.0	N	0.0	N	-1.1549	-2.1549	0.0	N
273	0.0	N	-2.8239		-2.6990	0.0	N	-1.5229	-3.3010		0.0	N	-2.1549	-2.1549	0.0	N
274	0.0	N	0.0	N	-2.6990	0.0	N	-3.0000	-3.3010		0.0	N	-1.1549	-2.3010	0.0	N
275	0.0	N	0.0	N	-2.6990	0.0	N	-3.1549	-3.3010		0.0	N	-1.5229	-2.0000	0.0	N
276	0.0	N	0.0	N	-2.6990	0.0	N	-2.8239	-3.3010		0.0	N	-1.1549	-2.0000	0.0	N
277	0.0	N	0.0	N	-2.6990	0.0	N	-3.3010	0.0	N	0.0	N	-1.0000	-2.1549	0.0	N
278	0.0	N	0.0	N	-2.6990	0.0	N	-3.1549	0.0	N	0.0	N	-1.1549	-2.1549	0.0	N

SILICIFIED ROCKS, LOG PERCENT

SAMPLE	FE,LOG%	MN,LOG%	CA,LOG%	TI,LOG%
223	-1.0000	-3.1549	-1.3010	-0.5229
240	-0.1549	-2.1549	-1.1549	-0.6990
246	0.4771	-1.0000	-1.1549	-0.5229
249	-0.5229	-2.3010	-1.1549	-0.5229
250	-0.3010	-2.3010	-0.8239	-0.5229
251	0.1761	-2.3010	-1.1549	-0.5229
252	0.1761	-2.1549	-0.8239	-0.5229
254	0.1761	-2.1549	-1.3010	-0.5229
255	0.6990	-1.6990	-1.1549	-0.6990
256	0.4771	-1.8239	-1.1549	-0.6990
257	-0.5229	-2.3010	-1.1549	-0.5229
258	0.8451	-1.5229	-1.0000	-0.8239
259	0.1761	-2.1549	-1.3010	-0.5229
260	0.1761	-2.0000	-1.1549	-0.5229
261	0.3010	-1.6990	-1.0000	-0.5229
262	0.3010	-1.8239	-1.3010	-0.5229
263	-0.0000	-2.0000	-0.3010	-0.5229
264	-0.3010	-1.8239	-0.8239	-0.5229
265	-0.0000	-2.0000	-1.3010	-0.5229
266	0.3010	-1.8239	-1.0000	-0.6990
267	0.4771	-1.8239	-1.0000	-0.5229
268	-0.0000	-1.8239	-1.0000	-0.5229
269	-0.0000	-1.8239	-0.6990	-0.5229
270	-0.1549	-2.0000	-1.0000	-0.5229
271	-0.3010	-2.0000	-0.8239	-0.5229
272	-0.1549	-2.0000	-0.8239	-0.5229
273	0.8451	-1.3010	-1.5229	-0.5229
274	-0.3010	-1.6990	-1.1549	-0.5229
275	-0.6990	-1.6990	-0.8239	-0.5229
276	0.4771	-1.5229	-1.3010	-0.5229
277	0.3010	-2.0000	-1.3010	-0.5229
278	0.1761	-2.0000	-0.8239	-0.5229

PRINT REPEATED BY OPERATOR

ARGILLIZED ROCKS, PERCENT

SAMPLE	AU,%	AG,%	PB,%	BI,%	HG,%	AS,%	CU,%	ZN,%	MO,%	BA,%
12	0.000019	0.0 N	0.003000	0.0 N	0.000010	0.001000	0.005000	0.022000	0.000700	0.070000
13	0.000018	0.0 N	0.0 N	0.0 N	0.000013	0.014000	0.001000	0.006000	0.000700	0.070000
14	0.000019	0.0 N	0.0 N	0.0 N	0.000006	0.001000	0.003000	0.003000	0.0 N	0.070000
15	0.0 L	0.0 N	0.0 N	0.0 N	0.000002	0.010000	0.003000	0.0 L	0.000700	0.100000
16	0.000020	0.000030	0.002000	0.0 N	0.000006	0.008000	0.002000	0.002500	0.001000	0.050000
17	0.0 L	0.000030	0.001500	0.0 N	0.000006	0.001000	0.001000	0.004000	0.0 N	0.050000
18	0.0 L	0.000030	0.001500	0.0 N	0.000004	0.001000	0.002000	0.003500	0.000500	0.200000
19	0.000010	0.000030	0.001500	0.0 N	0.000006	0.004000	0.001500	0.0 L	0.000300	0.150000
20	0.0 L	0.000020	0.001500	0.0 N	0.000006	0.0 L	0.001500	0.002500	0.0 N	0.100000
21	0.000010	0.000030	0.001000	0.0 N	0.0 L	0.001000	0.002000	0.003000	0.000500	0.100000
22	0.0 L	0.000030	0.002000	0.0 N	0.000015	0.001000	0.001000	0.002500	0.000300	0.050000
23	0.0 L	0.000020	0.005000	0.0 N	0.000011	0.001000	0.001000	0.0 L	0.0 N	0.030000
24	0.0 L	0.000020	0.003000	0.0 N	0.000008	0.0 L	0.002000	0.0 L	0.0 N	0.150000
25	0.0 L	0.000030	0.001500	0.0 N	0.000011	0.0 L	0.002000	0.0 L	0.000300	0.200000
26	0.0 L	0.000020	0.002000	0.0 N	0.000006	0.0 L	0.002000	0.0 L	0.0 N	0.050000
27	0.000020	0.000030	0.002000	0.0 N	0.000008	0.001000	0.002000	0.0 L	0.002000	0.020000
28	0.0 L	0.000070	0.002000	0.0 N	0.000004	0.002000	0.000500	0.008000	0.001500	0.200000
29	0.000070	0.000030	0.003000	0.0 N	0.000008	0.001000	0.002000	0.004000	0.001000	0.050000
31	0.000028	0.000200	0.007000	0.0 N	0.000008	0.002000	0.003000	0.0 L	0.000700	0.150000
33	0.0 L	0.000030	0.001000	0.0 N	0.000006	0.0 L	0.001000	0.0 L	0.0 N	0.100000
40	0.000050	0.000100	0.015000	0.0 N	0.000020	0.006000	0.005000	0.0 L	0.000500	0.100000
41	0.0 L	0.000030	0.001500	0.0 N	0.000010	0.0 L	0.002000	0.0 L	0.0 N	0.020000
42	0.000010	0.000020	0.001000	0.0 N	0.000010	0.0 L	0.007000	0.0 L	0.0 N	0.150000
43	0.0 L	0.000020	0.000700	0.0 N	0.000010	0.0 L	0.001000	0.0 L	0.0 N	0.150000
44	0.000010	0.000020	0.000500	0.0 N	0.000006	0.0 L	0.002000	0.0 L	0.0 N	0.070000
46	0.0 L	0.000020	0.005000	0.0 N	0.000006	0.0 L	0.001000	0.0 L	0.0 N	0.050000
47	0.0 L	0.000020	0.000700	0.0 N	0.000006	0.001000	0.002000	0.0 L	0.0 N	0.100000
48	0.000010	0.000020	0.000500	0.0 N	0.000008	0.001000	0.005000	0.0 L	0.0 N	0.100000
49	0.0 L	0.000020	0.000700	0.0 N	0.000010	0.001000	0.003000	0.0 L	0.0 N	0.150000
50	0.000010	0.000020	0.000700	0.0 N	0.000004	0.0 L	0.002000	0.0 L	0.0 N	0.100000
51	0.0 L	0.000020	0.001000	0.0 N	0.000011	0.0 L	0.001500	0.0 L	0.0 N	0.150000
52	0.000036	0.000030	0.000200	0.0 N	0.000008	0.004000	0.001000	0.0 L	0.000300	0.010000
53	0.0 L	0.000050	0.001500	0.0 N	0.000008	0.0 L	0.003000	0.004000	0.000300	0.100000
54	0.0 L	0.000030	0.001000	0.0 N	0.000008	0.001000	0.002000	0.003000	0.005000	0.200000
55	0.0 L	0.000030	0.001000	0.0 N	0.000008	0.0 L	0.005000	0.0 L	0.000700	0.100000
56	0.000010	0.000030	0.001500	0.0 N	0.000008	0.001000	0.003000	0.008000	0.000500	0.150000
57	0.0 L	0.000030	0.001000	0.0 N	0.000006	0.001000	0.002000	0.008000	0.000300	0.150000
58	0.000010	0.000030	0.000500	0.0 N	0.000008	0.001000	0.003000	0.008000	0.000500	0.100000
59	0.0 L	0.000030	0.000700	0.0 N	0.000008	0.001000	0.005000	0.008000	0.000500	0.100000
60	0.0 L	0.000020	0.000200	0.0 N	0.000004	0.001000	0.003000	0.008000	0.0 N	0.100000
61	0.000020	0.000070	0.000200	0.0 N	0.000006	0.001000	0.002000	0.008000	0.0 N	0.030000
62	0.000010	0.000020	0.007000	0.0 N	0.000008	0.008000	0.001500	0.008000	0.001000	0.100000
70	0.000010	0.0 N	0.0 N	0.0 N	0.000006	0.004000	0.001000	0.0 L	0.000300	0.200000
71	0.000010	0.0 N	0.0 N	0.0 N	0.000006	0.001000	0.001000	0.0 L	0.0 N	0.070000
72	0.000010	0.0 N	0.002000	0.0 N	0.000006	0.001000	0.002000	0.0 L	0.000500	0.150000
73	0.000148	0.0 N	0.0 N	0.0 N	0.000004	0.001000	0.001500	0.002500	0.000500	0.070000
76	0.000018	0.0 N	0.000700	0.0 N	0.000017	0.012000	0.000700	0.0 L	0.000500	0.100000
93	0.000407	0.000030	0.020000	0.0 N	0.000011	0.006000	0.005000	0.004000	0.002000	0.030000
94	0.000010	0.000050	0.005000	0.0 N	0.000008	0.004000	0.002000	0.003000	0.001000	0.300000
95	0.000010	0.000030	0.003000	0.0 N	0.000004	0.002000	0.003000	0.003000	0.001000	0.070000

ARGILLIZED ROCKS, PERCENT

SAMPLE	BE,%	CO,%	CR,%	LA,%	MN,%	NB,%	NI,%	SR,%	V,%	Y,%
12	0.001000	0.001000	0.002000	0.010000	0.020000	0.0 N	0.0 N	0.050000	0.015000	0.001000
13	0.0 N	0.001000	0.002000	0.0 N	0.050000	0.0 N	0.0 N	0.030000	0.015000	0.001000
14	0.0 N	0.0 N	0.002000	0.0 N	0.010000	0.0 N	0.0 N	0.070000	0.010000	0.0 N
15	0.0 N	0.0 N	0.001500	0.0 N	0.030000	0.0 N	0.0 N	0.050000	0.010000	0.0 N
16	0.000050	0.001000	0.002000	0.003000	0.200000	0.000500	0.000500	0.050000	0.010000	0.001000
17	0.000050	0.001000	0.002000	0.005000	0.300000	0.0 N	0.000500	0.070000	0.007000	0.000700
18	0.000030	0.000700	0.003000	0.007000	0.070000	0.0 N	0.000300	0.200000	0.010000	0.001000
19	0.000030	0.000700	0.002000	0.007000	0.030000	0.0 N	0.000700	0.150000	0.015000	0.001500
20	0.000030	0.000700	0.002000	0.007000	0.020000	0.0 N	0.000700	0.100000	0.007000	0.000700
21	0.000050	0.000700	0.003000	0.005000	0.030000	0.000500	0.000700	0.070000	0.015000	0.001000
22	0.000050	0.000700	0.002000	0.003000	0.007000	0.0 N	0.000700	0.030000	0.007000	0.003000
23	0.000150	0.000700	0.002000	0.010000	0.007000	0.0 N	0.000300	0.150000	0.010000	0.003000
24	0.000100	0.000700	0.003000	0.010000	0.005000	0.0 N	0.000500	0.200000	0.015000	0.005000
25	0.000070	0.000500	0.002000	0.007000	0.007000	0.000500	0.000200	0.150000	0.007000	0.001500
26	0.000300	0.000500	0.002000	0.010000	0.007000	0.000500	0.000200	0.150000	0.010000	0.001000
27	0.000050	0.000700	0.001500	0.007000	0.010000	0.0 N	0.001000	0.150000	0.007000	0.000700
28	0.000030	0.000300	0.001000	0.010000	0.007000	0.000500	0.000300	0.050000	0.007000	0.000700
29	0.000030	0.000300	0.002000	0.005000	0.007000	0.0 N	0.000300	0.300000	0.010000	0.001000
31	0.000050	0.0 N	0.003000	0.005000	0.007000	0.000500	0.000200	0.070000	0.015000	0.003000
33	0.000300	0.0 N	0.003000	0.007000	0.003000	0.000500	0.000300	0.200000	0.010000	0.000500
40	0.000030	0.0 N	0.002000	0.003000	0.005000	0.0 N	0.0 N	0.200000	0.007000	0.001000
41	0.000050	0.001000	0.001500	0.005000	0.003000	0.0 N	0.000700	0.150000	0.007000	0.002000
42	0.000200	0.000700	0.002000	0.005000	0.007000	0.0 N	0.0 N	0.150000	0.010000	0.003000
43	0.000100	0.000700	0.003000	0.005000	0.003000	0.0 N	0.000700	0.050000	0.010000	0.002000
44	0.000070	0.000500	0.002000	0.007000	0.010000	0.0 N	0.000300	0.020000	0.010000	0.001500
46	0.000200	0.0 N	0.002000	0.010000	0.010000	0.000500	0.0 N	0.100000	0.010000	0.001500
47	0.000150	0.000500	0.002000	0.005000	0.003000	0.0 N	0.000300	0.070000	0.007000	0.000700
48	0.000100	0.000500	0.002000	0.007000	0.005000	0.0 N	0.000300	0.150000	0.007000	0.001000
49	0.000070	0.000500	0.003000	0.007000	0.005000	0.000500	0.000300	0.070000	0.010000	0.001000
50	0.000070	0.000500	0.002000	0.007000	0.003000	0.001000	0.0 N	0.050000	0.010000	0.000700
51	0.000050	0.000500	0.003000	0.010000	0.002000	0.0 N	0.000200	0.070000	0.010000	0.000700
52	0.000030	0.000500	0.001000	0.0 N	0.007000	0.0 N	0.000200	0.015000	0.005000	0.000500
53	0.000030	0.000700	0.003000	0.015000	0.020000	0.0 N	0.000200	0.070000	0.007000	0.000700
54	0.000030	0.001000	0.003000	0.005000	0.015000	0.000500	0.000300	0.020000	0.010000	0.001500
55	0.000030	0.001000	0.003000	0.007000	0.020000	0.000500	0.000500	0.070000	0.010000	0.000700
56	0.000030	0.000500	0.003000	0.010000	0.015000	0.000500	0.0 N	0.070000	0.007000	0.001000
57	0.000030	0.000700	0.003000	0.005000	0.010000	0.000500	0.000200	0.050000	0.007000	0.000700
58	0.000030	0.000500	0.002000	0.007000	0.007000	0.0 N	0.000500	0.100000	0.007000	0.000700
59	0.000050	0.000700	0.003000	0.010000	0.010000	0.0 N	0.001000	0.100000	0.010000	0.000700
60	0.000070	0.0 N	0.001500	0.005000	0.010000	0.000500	0.000200	0.010000	0.005000	0.000700
61	0.000200	0.0 N	0.002000	0.007000	0.010000	0.000500	0.000300	0.050000	0.010000	0.003000
62	0.000100	0.0 N	0.003000	0.005000	0.020000	0.0 N	0.000500	0.150000	0.010000	0.002000
70	0.0 N	0.0 N	0.002000	0.007000	0.003000	0.0 N	0.0 N	0.030000	0.010000	0.002000
71	0.0 N	0.0 N	0.001500	0.007000	0.002000	0.0 N	0.0 N	0.050000	0.007000	0.002000
72	0.0 N	0.0 N	0.002000	0.007000	0.015000	0.0 N	0.0 N	0.070000	0.010000	0.002000
73	0.0 N	0.0 N	0.001500	0.007000	0.005000	0.0 N	0.0 N	0.030000	0.010000	0.0 N
76	0.0 N	0.0 N	0.001500	0.007000	0.001000	0.0 N	0.0 N	0.050000	0.007000	0.001000
93	0.000100	0.000300	0.003000	0.010000	0.020000	0.0 N	0.000300	0.150000	0.015000	0.001000
94	0.000100	0.0 N	0.003000	0.005000	0.020000	0.000500	0.000300	0.030000	0.010000	0.000700
95	0.000100	0.0 N	0.002000	0.007000	0.030000	0.000500	0.000300	0.070000	0.010000	0.005000

ARGILLIZED ROCKS, PERCENT

SAMPLE	FE,%	MG,%	CA,%	TI,%
12	6.999997	0.500000	0.500000	0.200000
13	2.999998	0.500000	0.500000	0.300000
14	0.300000	0.700000	0.500000	0.300000
15	1.999999	0.500000	0.500000	0.300000
16	1.999999	0.700000	0.150000	0.500000
17	1.499999	0.700000	0.700000	0.300000
18	4.999998	0.500000	0.300000	0.500000
19	2.999998	0.500000	0.100000	0.500000
20	1.999999	0.300000	0.100000	0.500000
21	1.999999	0.700000	0.070000	0.500000
22	1.999999	1.000000	1.499999	0.300000
23	0.700000	0.700000	0.200000	0.300000
24	0.500000	0.700000	0.300000	0.300000
25	2.999998	0.500000	0.100000	0.500000
26	0.500000	0.700000	0.100000	0.500000
27	0.0 G	0.200000	0.700000	0.200000
28	4.999998	0.020000	0.050000	0.500000
29	4.999998	0.070000	0.100000	0.300000
31	6.999997	0.500000	0.150000	0.500000
33	1.499999	0.150000	0.070000	0.500000
40	6.999997	0.100000	0.070000	0.200000
41	1.999999	0.300000	0.070000	0.300000
42	4.999998	0.300000	0.070000	0.300000
43	1.999999	0.300000	0.070000	0.500000
44	2.999998	0.700000	0.070000	0.500000
46	0.200000	0.700000	0.150000	0.500000
47	2.999998	0.200000	0.100000	0.300000
48	1.999999	0.200000	0.200000	0.300000
49	1.999999	0.200000	0.100000	0.500000
50	1.499999	0.200000	0.100000	0.500000
51	0.700000	0.200000	0.200000	0.500000
52	4.999998	0.100000	0.010000	0.200000
53	2.999998	0.300000	0.100000	0.300000
54	6.999997	0.500000	0.100000	0.500000
55	6.999997	0.500000	0.100000	0.500000
56	4.999998	0.300000	0.100000	0.500000
57	2.999998	0.300000	0.100000	0.500000
58	4.999998	0.300000	0.070000	0.500000
59	4.999998	0.300000	0.070000	0.300000
60	1.000000	0.700000	0.070000	0.500000
61	1.999999	0.700000	0.070000	0.300000
62	6.999997	0.500000	0.100000	0.200000
70	1.999999	0.500000	0.100000	0.300000
71	1.000000	0.150000	0.070000	0.300000
72	2.999998	0.500000	0.200000	0.200000
73	4.999998	0.500000	0.100000	0.300000
76	2.999998	0.100000	0.100000	0.300000
93	9.999996	0.700000	0.150000	0.500000
94	2.999998	1.000000	0.200000	0.500000
95	6.999997	0.700000	0.150000	0.500000

ARGILLIZED ROCKS, PERCENT

SAMPLE	AU,%	AG,%	PB,%	BI,%	HG,%	AS,%	CU,%	ZN,%	MO,%	BA,%
96	0.000010	0.000030	0.002000	0.0 N	0.000010	0.001000	0.005000	0.004000	0.001000	0.200000
97	0.000187	0.000030	0.015000	0.0 N	0.000020	0.002000	0.000700	0.003000	0.001500	0.200000
98	0.000020	0.000030	0.010000	0.0 N	0.000020	0.001000	0.001000	0.0 L	0.000300	0.100000
99	0.000019	0.000030	0.003000	0.0 N	0.000010	0.001000	0.003000	0.003000	0.000700	0.070000
100	0.000010	0.000030	0.003000	0.0 N	0.000010	0.001000	0.001500	0.0 L	0.000700	0.200000
102	0.000010	0.000070	0.020000	0.0 N	0.000010	0.001000	0.000700	0.0 L	0.000500	0.100000
103	0.000048	0.000100	0.020000	0.0 N	0.000010	0.001000	0.003000	0.004000	0.000500	0.030000
104	0.0 L	0.000050	0.020000	0.0 N	0.000040	0.001000	0.003000	0.004000	0.000700	0.050000
105	0.000010	0.000150	0.007000	0.0 N	0.000020	0.002000	0.001000	0.003000	0.000300	0.020000
106	0.000010	0.000050	0.001500	0.0 N	0.000010	0.001000	0.000700	0.0 L	0.000300	0.070000
107	0.000020	0.000030	0.002000	0.0 N	0.000010	0.001000	0.002000	0.004000	0.000300	0.100000
108	0.000010	0.000070	0.001500	0.0 N	0.000010	0.001000	0.002000	0.008000	0.000300	0.150000
109	0.0 L	0.000050	0.001000	0.0 N	0.000010	0.001000	0.003000	0.028000	0.001000	0.200000
110	0.000017	0.000030	0.001000	0.0 N	0.000010	0.004000	0.003000	0.017500	0.001000	0.100000
111	0.000010	0.000030	0.000700	0.0 N	0.000010	0.001000	0.002000	0.0 L	0.000500	0.200000
112	0.000010	0.0 N	0.000700	0.0 N	0.000010	0.002000	0.001000	0.0 L	0.000500	0.100000
113	0.000010	0.0 N	0.000700	0.0 N	0.000010	0.002000	0.001000	0.007000	0.000500	0.070000
114	0.000010	0.0 N	0.000700	0.0 N	0.000010	0.010000	0.003000	0.005000	0.000700	0.070000
115	0.000015	0.0 N	0.000700	0.0 N	0.000010	0.0 L	0.003000	0.008000	0.000500	0.070000
122	0.0 L	0.0 L	0.005000	0.0 N	0.000010	0.002000	0.003000	0.005000	0.001000	0.007000
123	0.0 L	0.0 L	0.007000	0.0 N	0.000004	0.001000	0.000500	0.0 L	0.000500	0.030000
124	0.000037	0.0 N	0.0 N	0.0 N	0.000004	0.001000	0.000300	0.0 L	0.0 N	0.020000
125	0.000010	0.0 N	0.000700	0.0 N	0.000004	0.001000	0.001500	0.002500	0.0 N	0.020000
126	0.000016	0.0 N	0.001000	0.0 N	0.000010	0.001000	0.000700	0.003000	0.0 N	0.150000
127	0.000050	0.0 N	0.005000	0.0 N	0.000010	0.001000	0.001000	0.005000	0.0 N	0.050000
128	0.0 L	0.0 N	0.002000	0.0 N	0.000010	0.002000	0.003000	0.008000	0.000500	0.150000
131	0.0 L	0.0 N	0.005000	0.0 N	0.000004	0.002000	0.003000	0.004000	0.000500	0.100000
132	0.0 L	0.0 N	0.005000	0.0 N	0.000006	0.002000	0.007000	0.009000	0.001000	0.015000
133	0.0 L	0.0 N	0.007000	0.0 N	0.000004	0.001000	0.002000	0.004000	0.0 N	0.150000
134	0.000020	0.0 N	0.005000	0.0 N	0.000004	0.012000	0.002000	0.009000	0.000500	0.150000
135	0.0 L	0.0 N	0.000700	0.0 N	0.000006	0.001000	0.001000	0.004000	0.000500	0.150000
136	0.0 L	0.000100	0.007000	0.0 N	0.000012	0.002000	0.000500	0.004000	0.0 N	0.070000
137	0.000030	0.0 N	0.003000	0.0 N	0.000039	0.002000	0.000500	0.003000	0.0 N	0.070000
138	0.0 L	0.0 N	0.003000	0.0 N	0.000006	0.002000	0.003000	0.0 L	0.0 N	0.050000
139	0.0 L	0.0 N	0.001000	0.0 N	0.000013	0.0 L	0.000700	0.0 L	0.000300	0.070000
140	0.000040	0.0 N	0.0 N	0.0 N	0.000006	0.001000	0.002000	0.003000	0.001000	0.070000
141	0.0 L	0.000200	0.000700	0.0 N	0.000016	0.001000	0.000500	0.003000	0.000300	0.020000
143	0.000060	0.0 N	0.000700	0.0 N	0.000020	0.001000	0.000700	0.0 L	0.000500	0.050000
144	0.000110	0.0 N	0.000700	0.0 N	0.000016	0.008000	0.000700	0.0 L	0.000500	0.100000
145	0.0 L	0.0 N	0.000700	0.0 N	0.000012	0.001000	0.000500	0.003000	0.000500	0.030000
146	0.000016	0.0 N	0.000700	0.0 N	0.000013	0.001000	0.000500	0.0 L	0.000300	0.100000
147	0.000069	0.0 N	0.000700	0.0 N	0.000015	0.006000	0.003000	0.0 L	0.000700	0.050000
148	0.000098	0.0 N	0.001000	0.0 N	0.000021	0.004000	0.000700	0.0 L	0.000300	0.100000
149	0.000020	0.0 N	0.000700	0.0 N	0.000043	0.002000	0.000700	0.0 L	0.0 N	0.050000
150	0.0 L	0.0 N	0.000700	0.0 N	0.000038	0.004000	0.001000	0.0 L	0.000300	0.070000
151	0.000010	0.0 N	0.003000	0.000500	0.000024	0.006000	0.000300	0.0 L	0.000300	0.050000
152	0.0 L	0.0 N	0.003000	0.000500	0.000030	0.008000	0.000300	0.0 L	0.000300	0.070000

ARGILLIZED ROCKS, PERCENT

SAMPLE	BE,%	CO,%	CR,%	LA,%	MN,%	NB,%	NI,%	SR,%	V,%	Y,%
96	0.000100	0.0 N	0.002000	0.005000	0.030000	0.000500	0.000300	0.020000	0.010000	0.003000
97	0.000100	0.0 N	0.002000	0.005000	0.015000	0.000500	0.000300	0.030000	0.010000	0.002000
98	0.000070	0.0 N	0.002000	0.005000	0.010000	0.000500	0.000300	0.070000	0.007000	0.003000
99	0.000070	0.0 N	0.002000	0.005000	0.020000	0.000500	0.000300	0.030000	0.010000	0.002000
100	0.000150	0.0 N	0.002000	0.003000	0.020000	0.0 N	0.000300	0.070000	0.010000	0.002000
102	0.000100	0.0 N	0.002000	0.005000	0.010000	0.0 N	0.000300	0.070000	0.010000	0.002000
103	0.000070	0.000300	0.000200	0.005000	0.020000	0.0 N	0.000300	0.100000	0.010000	0.001500
104	0.000070	0.000300	0.007000	0.007000	0.010000	0.000700	0.000300	0.150000	0.015000	0.002000
105	0.000100	0.000300	0.002000	0.005000	0.010000	0.000700	0.000300	0.015000	0.010000	0.002000
106	0.000150	0.000300	0.002000	0.007000	0.010000	0.000700	0.000300	0.070000	0.007000	0.000300
107	0.000100	0.000300	0.002000	0.005000	0.010000	0.000500	0.000300	0.030000	0.005000	0.000500
108	0.000070	0.000500	0.002000	0.007000	0.010000	0.000500	0.000500	0.070000	0.005000	0.000500
109	0.000100	0.001000	0.002000	0.007000	0.030000	0.0 N	0.001000	0.100000	0.010000	0.000500
110	0.000150	0.001500	0.002000	0.010000	0.100000	0.0 N	0.001500	0.100000	0.010000	0.000700
111	0.000100	0.001000	0.002000	0.007000	0.050000	0.0 N	0.000700	0.070000	0.010000	0.005000
112	0.000150	0.001000	0.002000	0.007000	0.005000	0.0 N	0.0 N	0.070000	0.007000	0.0 N
113	0.000100	0.000700	0.001500	0.0 N	0.020000	0.0 N	0.0 N	0.020000	0.007000	0.0 N
114	0.000100	0.000700	0.002000	0.007000	0.020000	0.0 N	0.0 N	0.050000	0.007000	0.0 N
115	0.000100	0.000700	0.002000	0.005000	0.010000	0.0 N	0.0 N	0.030000	0.007000	0.0 N
122	0.000100	0.0 N	0.002000	0.007000	0.010000	0.0 N	0.0 N	0.050000	0.005000	0.0 N
123	0.000100	0.0 N	0.003000	0.010000	0.007000	0.0 N	0.0 N	0.100000	0.007000	0.0 N
124	0.000100	0.0 N	0.002000	0.005000	0.007000	0.002000	0.0 N	0.003000	0.007000	0.0 N
125	0.000100	0.0 N	0.002000	0.0 N	0.010000	0.002000	0.0 N	0.002000	0.007000	0.0 N
126	0.000100	0.0 N	0.002000	0.0 N	0.007000	0.002000	0.0 N	0.030000	0.007000	0.0 N
127	0.0 N	0.0 N	0.002000	0.010000	0.010000	0.0 N	0.0 N	0.015000	0.005000	0.0 N
128	0.0 N	0.001000	0.002000	0.007000	0.020000	0.001000	0.0 N	0.050000	0.007000	0.0 N
131	0.0 N	0.000700	0.003000	0.007000	0.015000	0.0 N	0.0 N	0.030000	0.007000	0.001000
132	0.0 N	0.000700	0.001500	0.0 N	0.020000	0.0 N	0.0 N	0.030000	0.003000	0.001500
133	0.0 N	0.0 N	0.002000	0.015000	0.007000	0.001000	0.0 N	0.070000	0.005000	0.001000
134	0.0 N	0.0 N	0.002000	0.007000	0.007000	0.001000	0.0 N	0.050000	0.007000	0.001000
135	0.0 N	0.0 N	0.003000	0.010000	0.010000	0.001000	0.0 N	0.100000	0.007000	0.001000
136	0.0 N	0.0 N	0.001000	0.007000	0.000300	0.000500	0.0 N	0.100000	0.005000	0.000700
137	0.0 N	0.0 N	0.002000	0.007000	0.007000	0.000500	0.0 N	0.070000	0.007000	0.002000
138	0.000100	0.0 N	0.001500	0.015000	0.010000	0.000500	0.0 N	0.050000	0.007000	0.001500
139	0.000100	0.0 N	0.002000	0.007000	0.010000	0.000500	0.0 N	0.030000	0.007000	0.001500
140	0.0 N	0.0 N	0.002000	0.007000	0.007000	0.000500	0.0 N	0.070000	0.007000	0.001000
141	0.0 N	0.0 N	0.001000	0.0 N	0.005000	0.000500	0.0 N	0.030000	0.007000	0.001500
143	0.000100	0.0 N	0.002000	0.0 N	0.005000	0.000500	0.0 N	0.050000	0.007000	0.002000
144	0.0 N	0.0 N	0.002000	0.005000	0.005000	0.000500	0.0 N	0.030000	0.007000	0.002000
145	0.000100	0.0 N	0.002000	0.007000	0.005000	0.000500	0.0 N	0.030000	0.007000	0.003000
146	0.0 N	0.0 N	0.002000	0.007000	0.003000	0.000500	0.0 N	0.030000	0.007000	0.002000
147	0.0 N	0.0 N	0.001500	0.007000	0.007000	0.000700	0.0 N	0.030000	0.007000	0.001500
148	0.0 N	0.0 N	0.001000	0.0 N	0.005000	0.0 N	0.0 N	0.070000	0.005000	0.001000
149	0.0 N	0.0 N	0.001500	0.007000	0.010000	0.000700	0.0 N	0.030000	0.007000	0.0 N
150	0.0 N	0.0 N	0.001000	0.010000	0.005000	0.000500	0.0 N	0.020000	0.005000	0.001000
151	0.0 N	0.0 N	0.002000	0.007000	0.000300	0.000500	0.0 N	0.100000	0.007000	0.0 N
152	0.000100	0.0 N	0.002000	0.005000	0.000500	0.000500	0.0 N	0.015000	0.007000	0.003000

ARGILLIZED ROCKS, PERCENT

SAMPLE	FE,%	MG,%	CA,%	TI,%
96	4.999998	0.700000	0.150000	0.500000
97	6.999997	0.500000	0.100000	0.300000
98	1.999999	0.700000	1.000000	0.300000
99	6.999997	1.000000	0.070000	0.500000
100	4.999998	1.000000	0.150000	0.500000
102	2.999998	0.500000	0.100000	0.300000
103	6.999997	0.200000	0.150000	0.300000
104	6.999997	0.200000	0.200000	0.700000
105	1.999999	0.300000	0.100000	0.500000
106	1.499999	0.700000	0.150000	0.500000
107	1.000000	0.500000	0.150000	0.500000
108	1.499999	0.300000	0.150000	0.500000
109	6.999997	0.500000	0.150000	0.500000
110	6.999997	0.300000	0.100000	0.300000
111	4.999998	0.500000	0.150000	0.500000
112	2.999998	0.200000	0.200000	0.200000
113	1.999999	0.500000	0.100000	0.200000
114	4.999998	0.300000	0.070000	0.200000
115	2.999998	0.500000	0.070000	0.200000
122	1.999999	0.005000	0.050000	0.200000
123	1.999999	0.100000	0.070000	0.200000
124	0.200000	0.500000	0.050000	0.300000
125	0.300000	0.500000	0.070000	0.200000
126	0.500000	0.500000	0.100000	0.300000
127	0.500000	0.700000	0.100000	0.200000
128	1.499999	0.500000	0.100000	0.300000
131	1.999999	0.700000	0.100000	0.200000
132	6.999997	0.200000	0.100000	0.150000
133	1.499999	0.500000	0.100000	0.200000
134	1.000000	0.500000	0.100000	0.200000
135	2.999998	0.500000	0.070000	0.200000
136	1.499999	0.010000	0.050000	0.300000
137	1.499999	0.300000	0.100000	0.300000
138	1.499999	0.500000	0.070000	0.300000
139	1.999999	0.700000	0.100000	0.300000
140	9.999996	0.200000	0.200000	0.150000
141	1.000000	0.200000	0.100000	0.300000
143	1.999999	0.700000	0.100000	0.300000
144	1.499999	0.700000	0.050000	0.300000
145	1.499999	0.700000	0.100000	0.300000
146	2.999998	0.200000	0.150000	0.300000
147	2.999998	0.700000	0.100000	0.300000
148	1.999999	0.700000	1.999999	0.300000
149	0.700000	0.700000	0.200000	0.300000
150	2.999998	0.700000	0.070000	0.300000
151	2.999998	0.200000	0.200000	0.300000
152	1.999999	0.700000	0.050000	0.300000

ARGILLIZED ROCKS, PERCENT

SAMPLE	AU,%	AG,%	PB,%	BI,%	HG,%	AS,%	CU,%	ZN,%	MO,%	BA,%
153	0.000019	0.0 N	0.001000	0.0 N	0.000018	0.002000	0.000500	0.004000	0.0 N	0.070000
154	0.0 L	0.0 N	0.0 N	0.0 N	0.000012	0.001000	0.001000	0.0 L	0.000300	0.050000
155	0.0 L	0.0 N	0.000500	0.0 N	0.000015	0.001000	0.001000	0.005000	0.000300	0.070000
156	0.0 L	0.0 N	0.000500	0.0 N	0.000020	0.001000	0.001000	0.005000	0.000300	0.100000
157	0.000100	0.0 N	0.000500	0.0 N	0.000016	0.012000	0.000700	0.005000	0.000300	0.200000
158	0.000167	0.0 N	0.000500	0.0 N	0.000040	0.001000	0.000700	0.006000	0.000300	0.070000
159	0.000018	0.0 N	0.0 N	0.0 N	0.000044	0.001000	0.001000	0.002500	0.000500	0.070000
160	0.000040	0.0 N	0.0 N	0.0 N	0.000052	0.012000	0.020000	0.003000	0.003000	0.007000
164	0.000090	0.0 L	0.005000	0.0 N	0.000028	0.002000	0.001500	0.0 L	0.000700	0.200000
165	0.000060	0.0 L	0.001500	0.0 N	0.000024	0.004000	0.000700	0.0 L	0.000300	0.030000
202	0.000620	0.0 N	0.005000	0.0 N	0.000004	0.006000	0.001000	0.0 L	0.001500	0.050000
203	0.000036	0.0 N	0.0 N	0.0 N	0.000004	0.006000	0.005000	0.0 L	0.000500	0.200000
204	0.000010	0.0 N	0.0 N	0.0 N	0.000004	0.0 L	0.001000	0.0 L	0.0 N	0.100000
205	0.000046	0.0 N	0.005000	0.0 N	0.0 L	0.0 L	0.000500	0.003000	0.0 N	0.200000
206	0.0 L	0.0 N	0.000300	0.0 N	0.000006	0.004000	0.003000	0.002500	0.000500	0.100000
207	0.000010	0.0 N	0.000300	0.0 N	0.000004	0.001000	0.003000	0.005000	0.000300	0.100000
208	0.0 L	0.0 N	0.000700	0.0 N	0.000010	0.001000	0.001000	0.005000	0.000300	0.100000
209	0.0 L	0.0 N	0.000500	0.0 N	0.000006	0.001000	0.002000	0.010000	0.000500	0.100000
210	0.0 L	0.0 N	0.000700	0.0 N	0.000006	0.0 L	0.002000	0.004000	0.000500	0.100000
211	0.000030	0.0 N	0.000700	0.0 N	0.000006	0.006000	0.005000	0.005000	0.0 N	0.100000
212	0.000010	0.0 N	0.000300	0.0 N	0.000008	0.001000	0.003000	0.011000	0.000700	0.100000
213	0.0 L	0.0 N	0.000300	0.0 N	0.000006	0.001000	0.002000	0.003000	0.000500	0.070000
214	0.0 L	0.0 N	0.003000	0.0 N	0.000004	0.001000	0.003000	0.019000	0.000500	0.100000
215	0.0 L	0.0 N	0.002000	0.0 N	0.000006	0.001000	0.001000	0.005000	0.000700	0.100000
216	0.0 L	0.0 N	0.001000	0.0 N	0.000006	0.001000	0.001000	0.012000	0.0 N	0.030000
217	0.0 L	0.0 N	0.000700	0.0 N	0.000004	0.001000	0.001000	0.011000	0.000500	0.050000
218	0.000010	0.0 N	0.000700	0.0 N	0.000008	0.002000	0.001000	0.007000	0.000300	0.050000
219	0.000010	0.0 N	0.000300	0.0 N	0.000004	0.001000	0.000500	0.006000	0.0 N	0.050000
224	0.0 L	0.0 N	0.0 N	0.0 N	0.000006	0.004000	0.001000	0.0 L	0.000500	0.020000
225	0.000010	0.0 N	0.000300	0.0 N	0.000008	0.008000	0.002000	0.0 L	0.000700	0.150000
226	0.0 L	0.0 N	0.000300	0.0 N	0.000006	0.010000	0.015000	0.0 L	0.000500	0.150000
227	0.0 L	0.0 N	0.005000	0.0 N	0.000010	0.012000	0.015000	0.002500	0.000500	0.020000
228	0.000010	0.0 N	0.0 N	0.0 N	0.000004	0.001000	0.001500	0.005000	0.0 N	0.700000
229	0.0 L	0.0 N	0.0 N	0.0 N	0.000004	0.001000	0.002000	0.006000	0.0 N	0.150000
230	0.0 L	0.0 N	0.005000	0.0 N	0.000004	0.010000	0.005000	0.005000	0.000300	0.050000
231	0.000010	0.000100	0.005000	0.0 N	0.000011	0.006000	0.001500	0.0 L	0.000300	0.020000
232	0.000016	0.0 N	0.001000	0.0 N	0.000006	0.008000	0.007000	0.0 L	0.000300	0.070000
233	0.000096	0.000700	0.0 N	0.0 N	0.000006	0.001000	0.003000	0.0 L	0.000300	0.200000
234	0.000020	0.0 N	0.000700	0.0 N	0.000004	0.001000	0.001000	0.005000	0.000300	0.030000
235	0.0 L	0.0 N	0.000700	0.0 N	0.000004	0.001000	0.003000	0.0 L	0.000300	0.020000
236	0.000010	0.0 L	0.000500	0.0 N	0.000017	0.001000	0.010000	0.0 L	0.000500	0.200000
237	0.0 L	0.0 N	0.005000	0.0 N	0.000006	0.001000	0.000500	0.0 L	0.001000	0.030000
238	0.0 L	0.0 N	0.005000	0.0 N	0.000010	0.001000	0.002000	0.0 L	0.000300	0.100000
239	0.000026	0.000100	0.005000	0.0 N	0.000010	0.002000	0.000700	0.0 L	0.000300	0.030000
241	0.000307	0.0 L	0.005000	0.0 N	0.000010	0.006000	0.007000	0.0 L	0.000500	0.150000
242	0.000028	0.0 N	0.000500	0.0 N	0.000020	0.001000	0.001000	0.0 L	0.000500	0.030000
243	0.000078	0.0 N	0.001000	0.0 N	0.000010	0.001000	0.005000	0.0 L	0.000500	0.100000

ARGILLIZED ROCKS, PERCENT

SAMPLE	BE,%	CO,%	CR,%	LA,%	MN,%	NB,%	NI,%	SR,%	V,%	Y,%
153	0.0 N	0.0 N	0.001500	0.010000	0.005000	0.000500	0.0 N	0.050000	0.005000	0.0 N
154	0.0 N	0.0 N	0.001500	0.007000	0.007000	0.000500	0.0 N	0.050000	0.005000	0.000700
155	0.0 N	0.0 N	0.001500	0.005000	0.007000	0.000500	0.0 N	0.050000	0.005000	0.000700
156	0.0 N	0.000700	0.002000	0.0 N	0.007000	0.000500	0.0 N	0.020000	0.007000	0.001500
157	0.000100	0.0 N	0.001500	0.0 N	0.005000	0.000500	0.0 N	0.050000	0.005000	0.0 N
158	0.000100	0.0 N	0.002000	0.0 N	0.020000	0.000500	0.0 N	0.030000	0.005000	0.0 N
159	0.000100	0.0 N	0.002000	0.0 N	0.005000	0.0 N	0.001500	0.030000	0.010000	0.0 N
160	0.000100	0.0 N	0.002000	0.0 N	0.015000	0.0 N	0.0 N	0.070000	0.020000	0.001000
164	0.000100	0.0 N	0.002000	0.0 N	0.015000	0.000700	0.0 N	0.070000	0.007000	0.002000
165	0.000100	0.0 N	0.002000	0.007000	0.003000	0.000700	0.0 N	0.030000	0.007000	0.002000
202	0.000100	0.0 N	0.003000	0.007000	0.005000	0.0 N	0.0 N	0.050000	0.005000	0.0 N
203	0.000100	0.0 N	0.002000	0.0 N	0.010000	0.0 N	0.0 N	0.020000	0.007000	0.0 N
204	0.000150	0.0 N	0.002000	0.0 N	0.007000	0.0 N	0.0 N	0.030000	0.005000	0.0 N
205	0.0 N	0.0 N	0.003000	0.005000	0.005000	0.000300	0.0 N	0.070000	0.007000	0.0 N
206	0.000100	0.001000	0.002000	0.005000	0.100000	0.0 N	0.0 L	0.050000	0.007000	0.001500
207	0.000100	0.001000	0.002000	0.005000	0.050000	0.000700	0.0 L	0.070000	0.007000	0.001500
208	0.000100	0.000700	0.001500	0.005000	0.200000	0.000500	0.0 N	0.050000	0.007000	0.001500
209	0.000100	0.001000	0.003000	0.005000	0.070000	0.000500	0.0 N	0.070000	0.007000	0.001000
210	0.000150	0.003000	0.002000	0.007000	0.070000	0.000500	0.0 L	0.070000	0.007000	0.005000
211	0.000100	0.0 N	0.002000	0.007000	0.010000	0.000700	0.0 N	0.070000	0.007000	0.002000
212	0.000150	0.003000	0.002000	0.007000	0.300000	0.0 N	0.0 L	0.050000	0.007000	0.001500
213	0.0 N	0.0 N	0.002000	0.005000	0.005000	0.0 N	0.0 N	0.030000	0.007000	0.001000
214	0.000150	0.000700	0.003000	0.007000	0.010000	0.000500	0.0 N	0.150000	0.007000	0.001000
215	0.000150	0.000700	0.002000	0.007000	0.010000	0.000500	0.0 N	0.050000	0.007000	0.001000
216	0.000150	0.001000	0.002000	0.005000	0.015000	0.0 N	0.0 N	0.030000	0.007000	0.001000
217	0.000150	0.0 N	0.002000	0.007000	0.005000	0.0 N	0.0 N	0.050000	0.007000	0.002000
218	0.000100	0.0 N	0.003000	0.005000	0.007000	0.000300	0.0 N	0.050000	0.007000	0.001500
219	0.000100	0.0 N	0.007000	0.005000	0.010000	0.0 N	0.0 N	0.050000	0.015000	0.003000
224	0.0 N	0.0 N	0.003000	0.0 N	0.015000	0.000500	0.0 N	0.007000	0.007000	0.0 N
225	0.0 N	0.0 N	0.005000	0.030000	0.010000	0.0 N	0.0 N	0.100000	0.010000	0.010000
226	0.0 N	0.0 N	0.003000	0.007000	0.005000	0.0 N	0.0 N	0.020000	0.007000	0.001000
227	0.0 N	0.0 N	0.003000	0.005000	0.001000	0.0 N	0.0 N	0.070000	0.005000	0.0 N
228	0.001000	0.0 N	0.003000	0.005000	0.007000	0.001000	0.0 N	0.030000	0.007000	0.001000
229	0.000100	0.0 N	0.003000	0.005000	0.007000	0.001000	0.0 N	0.015000	0.007000	0.003000
230	0.0 N	0.0 N	0.005000	0.007000	0.003000	0.0 N	0.0 N	0.070000	0.010000	0.001000
231	0.0 N	0.0 N	0.003000	0.007000	0.005000	0.0 N	0.0 N	0.100000	0.010000	0.001500
232	0.0 N	0.0 N	0.003000	0.005000	0.003000	0.0 N	0.0 N	0.150000	0.007000	0.0 N
233	0.0 N	0.0 N	0.003000	0.0 N	0.015000	0.000700	0.0 N	0.050000	0.010000	0.001000
234	0.000150	0.0 N	0.003000	0.007000	0.010000	0.000700	0.0 N	0.070000	0.010000	0.002000
235	0.000150	0.0 N	0.003000	0.007000	0.007000	0.000700	0.0 N	0.050000	0.007000	0.002000
236	0.0 N	0.0 N	0.002000	0.005000	0.015000	0.000700	0.0 N	0.005000	0.007000	0.0 N
237	0.0 N	0.0 N	0.003000	0.007000	0.015000	0.0 N	0.0 N	0.200000	0.010000	0.001500
238	0.000100	0.0 N	0.003000	0.005000	0.015000	0.000700	0.0 N	0.007000	0.007000	0.0 N
239	0.0 N	0.0 N	0.003000	0.0 N	0.015000	0.000700	0.0 N	0.030000	0.010000	0.0 N
241	0.0 N	0.0 N	0.003000	0.010000	0.007000	0.0 N	0.0 N	0.150000	0.010000	0.001500
242	0.000150	0.0 N	0.003000	0.005000	0.010000	0.001000	0.0 N	0.030000	0.007000	0.001000
243	0.0 N	0.0 N	0.003000	0.005000	0.010000	0.0 N	0.0 N	0.100000	0.007000	0.001000

ARGILLIZED ROCKS, PERCENT

SAMPLE	FE,%	MG,%	CA,%	TI,%
153	2.999998	0.700000	0.200000	0.300000
154	1.999999	0.700000	0.150000	0.300000
155	1.499999	0.700000	0.200000	0.300000
156	1.499999	0.700000	1.000000	0.300000
157	0.700000	0.500000	2.999998	0.300000
158	1.000000	0.700000	0.200000	0.300000
159	1.499999	0.700000	1.000000	0.200000
160	0.0 G	0.100000	0.070000	0.100000
164	2.999998	0.200000	0.150000	0.200000
165	1.499999	0.500000	0.100000	0.300000
202	6.999997	6.999997	0.150000	0.300000
203	2.999998	0.700000	0.150000	0.300000
204	0.500000	0.700000	0.150000	0.300000
205	0.300000	0.700000	0.500000	0.300000
206	1.999999	0.300000	0.300000	0.300000
207	2.999998	0.500000	0.500000	0.300000
208	0.700000	0.500000	0.200000	0.300000
209	1.999999	0.700000	0.200000	0.300000
210	2.999998	0.700000	0.500000	0.300000
211	1.999999	0.700000	0.500000	0.300000
212	4.999998	0.200000	0.500000	0.300000
213	2.999998	0.500000	0.200000	0.300000
214	2.999998	0.700000	0.500000	0.300000
215	1.999999	0.500000	0.300000	0.300000
216	4.999998	0.700000	0.300000	0.300000
217	2.999998	0.500000	0.300000	0.300000
218	1.999999	0.500000	0.300000	0.200000
219	2.999998	0.700000	0.300000	0.300000
224	1.999999	0.700000	0.030000	0.300000
225	9.999996	0.500000	0.050000	0.200000
226	4.999998	0.003000	0.070000	0.300000
227	4.999998	0.000700	0.070000	0.200000
228	0.300000	0.300000	0.030000	0.300000
229	1.499999	0.700000	0.030000	0.300000
230	2.999998	0.200000	0.050000	0.300000
231	2.999998	0.300000	0.070000	0.300000
232	2.999998	0.015000	0.070000	0.200000
233	2.999998	0.700000	0.070000	0.300000
234	0.500000	0.500000	0.500000	0.300000
235	0.500000	0.500000	0.300000	0.300000
236	4.999998	0.500000	0.030000	0.300000
237	0.0 G	0.050000	0.100000	0.200000
238	0.300000	0.700000	0.030000	0.300000
239	1.999999	0.700000	1.000000	0.300000
241	6.999997	0.500000	0.100000	0.300000
242	1.999999	0.700000	0.030000	0.300000
243	2.999998	0.500000	0.070000	0.200000

ARGILLIZED ROCKS, PERCENT

SAMPLE	AU,%	AG,%	PB,%	BI,%	HG,%	AS,%	CU,%	ZN,%	MO,%	BA,%
244	0.0 L	0.0 N	0.000300	0.0 N	0.000004	0.001000	0.000500	0.0 L	0.0 N	0.030000
245	0.000117	0.0 L	0.005000	0.0 N	0.000006	0.006000	0.001500	0.0 L	0.001000	0.050000
247	0.000010	0.0 N	0.005000	0.0 N	0.000010	0.008000	0.003000	0.0 L	0.001000	0.070000
248	0.000010	0.000100	0.010000	0.0 N	0.000080	0.001000	0.005000	0.0 L	0.000700	0.050000
253	0.000010	0.0 N	0.000700	0.0 N	0.000004	0.001000	0.001500	0.0 L	0.0 N	0.100000

ARGILLIZED ROCKS, PERCENT

SAMPLE	BE,%	CO,%	CR,%	LA,%	MN,%	NB,%	NI,%	SR,%	V,%	Y,%
244	0.000150	0.0 N	0.003000	0.005000	0.005000	0.001000	0.0 N	0.030000	0.007000	0.0 N
245	0.0 N	0.0 N	0.005000	0.010000	0.007000	0.0 N	0.0 N	0.200000	0.007000	0.001000
247	0.0 N	0.0 N	0.003000	0.010000	0.005000	0.0 N	0.0 N	0.150000	0.010000	0.0 N
248	0.000150	0.0 N	0.003000	0.005000	0.010000	0.000700	0.0 N	0.100000	0.007000	0.001000
253	0.0 N	0.0 N	0.003000	0.0 N	0.005000	0.000500	0.0 N	0.070000	0.007000	0.0 N

ARGILLIZED ROCKS, PERCENT

SAMPLE	FE,%	MG,%	CA,%	TI,%
244	0.070000	0.300000	0.070000	0.200000
245	0.0 G	0.100000	0.070000	0.200000
247	0.0 G	0.500000	0.070000	0.200000
248	1.499999	0.700000	0.300000	0.300000
253	1.999999	0.300000	0.070000	0.300000

ARGILLIZED ROCKS, PPM

SAMPLE	AU,PPM	AG,PPM	PB,PPM	BI,PPM	HG,PPM	AS,PPM	CU,PPM	ZN,PPM	MO,PPM	BA,PPM
12	0.19	0.0 N	30.00	0.0 N	0.10	10.00	50.00	220.00	7.00	700.00
13	0.18	0.0 N	0.0 N	0.0 N	0.13	140.00	10.00	60.00	7.00	700.00
14	0.19	0.0 N	0.0 N	0.0 N	0.06	10.00	30.00	30.00	0.0 N	700.00
15	0.0 L	0.0 N	0.0 N	0.0 N	0.02	100.00	30.00	0.0 L	7.00	1000.00
16	0.20	0.30	20.00	0.0 N	0.06	80.00	20.00	25.00	10.00	500.00
17	0.0 L	0.30	15.00	0.0 N	0.06	10.00	10.00	40.00	0.0 N	500.00
18	0.0 L	0.30	15.00	0.0 N	0.04	10.00	20.00	35.00	5.00	2000.00
19	0.10	0.30	15.00	0.0 N	0.06	40.00	15.00	0.0 L	3.00	1500.00
20	0.0 L	0.20	15.00	0.0 N	0.06	0.0 L	15.00	25.00	0.0 N	1000.00
21	0.10	0.30	10.00	0.0 N	0.0 L	10.00	20.00	30.00	5.00	1000.00
22	0.0 L	0.30	20.00	0.0 N	0.15	10.00	10.00	25.00	3.00	500.00
23	0.0 L	0.20	50.00	0.0 N	0.11	10.00	10.00	0.0 L	0.0 N	300.00
24	0.0 L	0.20	30.00	0.0 N	0.08	0.0 L	20.00	0.0 L	0.0 N	1500.00
25	0.0 L	0.30	15.00	0.0 N	0.11	0.0 L	20.00	0.0 L	3.00	2000.00
26	0.0 L	0.20	20.00	0.0 N	0.06	0.0 L	20.00	0.0 L	0.0 N	500.00
27	0.20	0.30	20.00	0.0 N	0.08	10.00	20.00	0.0 L	20.00	200.00
28	0.0 L	0.70	20.00	0.0 N	0.04	20.00	5.00	80.00	15.00	2000.00
29	0.70	0.30	30.00	0.0 N	0.08	10.00	20.00	40.00	10.00	500.00
31	0.28	2.00	70.00	0.0 N	0.08	20.00	30.00	0.0 L	7.00	1500.00
33	0.0 L	0.30	10.00	0.0 N	0.06	0.0 L	10.00	0.0 L	0.0 N	1000.00
40	0.50	1.00	150.00	0.0 N	0.20	60.00	50.00	0.0 L	5.00	1000.00
41	0.0 L	0.30	15.00	0.0 N	0.10	0.0 L	20.00	0.0 L	0.0 N	200.00
42	0.10	0.20	10.00	0.0 N	0.10	0.0 L	70.00	0.0 L	0.0 N	1500.00
43	0.0 L	0.20	7.00	0.0 N	0.10	0.0 L	10.00	0.0 L	0.0 N	1500.00
44	0.10	0.20	5.00	0.0 N	0.06	0.0 L	20.00	0.0 L	0.0 N	700.00
46	0.0 L	0.20	50.00	0.0 N	0.06	0.0 L	10.00	0.0 L	0.0 N	500.00
47	0.0 L	0.20	7.00	0.0 N	0.06	10.00	20.00	0.0 L	0.0 N	1000.00
48	0.10	0.20	5.00	0.0 N	0.08	10.00	50.00	0.0 L	0.0 N	1000.00
49	0.0 L	0.20	7.00	0.0 N	0.10	10.00	30.00	0.0 L	0.0 N	1500.00
50	0.10	0.20	7.00	0.0 N	0.04	0.0 L	20.00	0.0 L	0.0 N	1000.00
51	0.0 L	0.20	10.00	0.0 N	0.11	0.0 L	15.00	0.0 L	0.0 N	1500.00
52	0.36	0.30	2.00	0.0 N	0.08	40.00	10.00	0.0 L	3.00	100.00
53	0.0 L	0.50	15.00	0.0 N	0.08	0.0 L	30.00	40.00	3.00	1000.00
54	0.0 L	0.30	10.00	0.0 N	0.08	10.00	20.00	30.00	50.00	2000.00
55	0.0 L	0.30	10.00	0.0 N	0.08	0.0 L	50.00	0.0 L	7.00	1000.00
56	0.10	0.30	15.00	0.0 N	0.08	10.00	30.00	80.00	5.00	1500.00
57	0.0 L	0.30	10.00	0.0 N	0.06	10.00	20.00	80.00	3.00	1500.00
58	0.10	0.30	5.00	0.0 N	0.08	10.00	30.00	80.00	5.00	1000.00
59	0.0 L	0.30	7.00	0.0 N	0.08	10.00	50.00	80.00	5.00	1000.00
60	0.0 L	0.20	2.00	0.0 N	0.04	10.00	30.00	80.00	0.0 N	1000.00
61	0.20	0.70	2.00	0.0 N	0.06	10.00	20.00	80.00	0.0 N	300.00
62	0.10	0.20	70.00	0.0 N	0.08	80.00	15.00	80.00	10.00	1000.00
70	0.10	0.0 N	0.0 N	0.0 N	0.06	40.00	10.00	0.0 L	3.00	2000.00
71	0.10	0.0 N	0.0 N	0.0 N	0.06	10.00	10.00	0.0 L	0.0 N	700.00
72	0.10	0.0 N	20.00	0.0 N	0.06	10.00	20.00	0.0 L	5.00	1500.00
73	1.48	0.0 N	0.0 N	0.0 N	0.04	10.00	15.00	25.00	5.00	700.00
76	0.18	0.0 N	7.00	0.0 N	0.17	120.00	7.00	0.0 L	5.00	1000.00
93	4.07	0.30	200.00	0.0 N	0.11	60.00	50.00	40.00	20.00	300.00
94	0.10	0.50	50.00	0.0 N	0.08	40.00	20.00	30.00	10.00	3000.00
95	0.10	0.30	30.00	0.0 N	0.04	20.00	30.00	30.00	10.00	700.00

47 mm

ARGILLIZED ROCKS, PPM

SAMPLE	BE,PPM	CO,PPM	CR,PPM	LA,PPM	MN,PPM	NB,PPM	NI,PPM	SR,PPM	V,PPM	Y,PPM
12	10.00	10.00	20.00	100.00	200.00	0.0 N	0.0 N	500.00	150.00	10.00
13	0.0 N	10.00	20.00	0.0 N	500.00	0.0 N	0.0 N	300.00	150.00	10.00
14	0.0 N	0.0 N	20.00	0.0 N	100.00	0.0 N	0.0 N	700.00	100.00	0.0 N
15	0.0 N	0.0 N	15.00	0.0 N	300.00	0.0 N	0.0 N	500.00	100.00	0.0 N
16	0.50	10.00	20.00	30.00	2000.00	5.00	5.00	500.00	100.00	10.00
17	0.50	10.00	20.00	50.00	3000.00	0.0 N	5.00	700.00	70.00	7.00
18	0.30	7.00	30.00	70.00	700.00	0.0 N	3.00	2000.00	100.00	10.00
19	0.30	7.00	20.00	70.00	300.00	0.0 N	7.00	1500.00	150.00	15.00
20	0.30	7.00	20.00	70.00	200.00	0.0 N	7.00	1000.00	70.00	7.00
21	0.50	7.00	30.00	50.00	300.00	5.00	7.00	700.00	150.00	10.00
22	0.50	7.00	20.00	30.00	70.00	0.0 N	7.00	300.00	70.00	30.00
23	1.50	7.00	20.00	100.00	70.00	0.0 N	3.00	1500.00	100.00	30.00
24	1.00	7.00	30.00	100.00	50.00	0.0 N	5.00	2000.00	150.00	50.00
25	0.70	5.00	20.00	70.00	70.00	5.00	2.00	1500.00	70.00	15.00
26	3.00	5.00	20.00	100.00	70.00	5.00	2.00	1500.00	100.00	10.00
27	0.50	7.00	15.00	70.00	100.00	0.0 N	10.00	1500.00	70.00	7.00
28	0.30	3.00	10.00	100.00	70.00	5.00	3.00	500.00	70.00	7.00
29	0.30	3.00	20.00	50.00	70.00	0.0 N	3.00	3000.00	100.00	10.00
31	0.50	0.0 N	30.00	50.00	70.00	5.00	2.00	700.00	150.00	30.00
33	3.00	0.0 N	30.00	70.00	30.00	5.00	3.00	2000.00	100.00	5.00
40	0.30	0.0 N	20.00	30.00	50.00	0.0 N	0.0 N	2000.00	70.00	10.00
41	0.50	10.00	15.00	50.00	30.00	0.0 N	7.00	1500.00	70.00	20.00
42	2.00	7.00	20.00	50.00	70.00	0.0 N	0.0 N	1500.00	100.00	30.00
43	1.00	7.00	30.00	50.00	30.00	0.0 N	7.00	500.00	100.00	20.00
44	0.70	5.00	20.00	70.00	100.00	0.0 N	3.00	200.00	100.00	15.00
46	2.00	0.0 N	20.00	100.00	100.00	5.00	0.0 N	1000.00	100.00	15.00
47	1.50	5.00	20.00	50.00	30.00	0.0 N	3.00	700.00	70.00	7.00
48	1.00	5.00	20.00	70.00	50.00	0.0 N	3.00	1500.00	70.00	10.00
49	0.70	5.00	30.00	70.00	50.00	5.00	3.00	700.00	100.00	10.00
50	0.70	5.00	20.00	70.00	30.00	10.00	0.0 N	500.00	100.00	7.00
51	0.50	5.00	30.00	100.00	20.00	0.0 N	2.00	700.00	100.00	7.00
52	0.30	5.00	10.00	0.0 N	70.00	0.0 N	2.00	150.00	50.00	5.00
53	0.30	7.00	30.00	150.00	200.00	0.0 N	2.00	700.00	70.00	7.00
54	0.30	10.00	30.00	50.00	150.00	5.00	3.00	200.00	100.00	15.00
55	0.30	10.00	30.00	70.00	200.00	5.00	5.00	700.00	100.00	7.00
56	0.30	5.00	30.00	100.00	150.00	5.00	0.0 N	700.00	70.00	10.00
57	0.30	7.00	30.00	50.00	100.00	5.00	2.00	500.00	70.00	7.00
58	0.30	5.00	20.00	70.00	70.00	0.0 N	5.00	1000.00	70.00	7.00
59	0.50	7.00	30.00	100.00	100.00	0.0 N	10.00	1000.00	100.00	7.00
60	0.70	0.0 N	15.00	50.00	100.00	5.00	2.00	100.00	50.00	7.00
61	2.00	0.0 N	20.00	70.00	100.00	5.00	3.00	500.00	100.00	30.00
62	1.00	0.0 N	30.00	50.00	200.00	0.0 N	5.00	1500.00	100.00	20.00
70	0.0 N	0.0 N	20.00	70.00	30.00	0.0 N	0.0 N	300.00	100.00	20.00
71	0.0 N	0.0 N	15.00	70.00	20.00	0.0 N	0.0 N	500.00	70.00	20.00
72	0.0 N	0.0 N	20.00	70.00	150.00	0.0 N	0.0 N	700.00	100.00	20.00
73	0.0 N	0.0 N	15.00	70.00	50.00	0.0 N	0.0 N	300.00	100.00	0.0 N
76	0.0 N	0.0 N	15.00	70.00	10.00	0.0 N	0.0 N	500.00	70.00	10.00
93	1.00	3.00	30.00	100.00	200.00	0.0 N	3.00	1500.00	150.00	10.00
94	1.00	0.0 N	30.00	50.00	200.00	5.00	3.00	300.00	100.00	7.00
95	1.00	0.0 N	20.00	70.00	300.00	5.00	3.00	700.00	100.00	50.00

ARGILLIZED ROCKS, PPM

SAMPLE	FE,PPM	MG,PPM	CA,PPM	TI,PPM
12	69999.94	5000.00	5000.00	2000.00
13	29999.98	5000.00	5000.00	3000.00
14	3000.00	7000.00	5000.00	3000.00
15	19999.99	5000.00	5000.00	3000.00
16	19999.99	7000.00	1500.00	5000.00
17	14999.99	7000.00	7000.00	3000.00
18	49999.98	5000.00	3000.00	5000.00
19	29999.98	5000.00	1000.00	5000.00
20	19999.99	3000.00	1000.00	5000.00
21	19999.99	7000.00	700.00	5000.00
22	19999.99	10000.00	14999.99	3000.00
23	7000.00	7000.00	2000.00	3000.00
24	5000.00	7000.00	3000.00	3000.00
25	29999.98	5000.00	1000.00	5000.00
26	5000.00	7000.00	1000.00	5000.00
27	0.0 G	2000.00	7000.00	2000.00
28	49999.98	200.00	500.00	5000.00
29	49999.98	700.00	1000.00	3000.00
31	69999.94	5000.00	1500.00	5000.00
33	14999.99	1500.00	700.00	5000.00
40	69999.94	1000.00	700.00	2000.00
41	19999.99	3000.00	700.00	3000.00
42	49999.98	3000.00	700.00	3000.00
43	19999.99	3000.00	700.00	5000.00
44	29999.98	7000.00	700.00	5000.00
46	2000.00	7000.00	1500.00	5000.00
47	29999.98	2000.00	1000.00	3000.00
48	19999.99	2000.00	2000.00	3000.00
49	19999.99	2000.00	1000.00	5000.00
50	14999.99	2000.00	1000.00	5000.00
51	7000.00	2000.00	2000.00	5000.00
52	49999.98	1000.00	100.00	2000.00
53	29999.98	3000.00	1000.00	3000.00
54	69999.94	5000.00	1000.00	5000.00
55	69999.94	5000.00	1000.00	5000.00
56	49999.98	3000.00	1000.00	5000.00
57	29999.98	3000.00	1000.00	5000.00
58	49999.98	3000.00	700.00	5000.00
59	49999.98	3000.00	700.00	3000.00
60	10000.00	7000.00	700.00	5000.00
61	19999.99	7000.00	700.00	3000.00
62	69999.94	5000.00	1000.00	2000.00
70	19999.99	5000.00	1000.00	3000.00
71	10000.00	1500.00	700.00	3000.00
72	29999.98	5000.00	2000.00	2000.00
73	49999.98	5000.00	1000.00	3000.00
76	29999.98	1000.00	1000.00	3000.00
93	99999.94	7000.00	1500.00	5000.00
94	29999.98	10000.00	2000.00	5000.00
95	69999.94	7000.00	1500.00	5000.00

ARGILLIZED ROCKS, PPM

SAMPLE	BE,PPM	CO,PPM	CR,PPM	LA,PPM	MN,PPM	NB,PPM	NI,PPM	SR,PPM	V,PPM	Y,PPM
96	1.00	0.0 N	20.00	50.00	300.00	5.00	3.00	200.00	100.00	30.00
97	1.00	0.0 N	20.00	50.00	150.00	5.00	3.00	300.00	100.00	20.00
98	0.70	0.0 N	20.00	50.00	100.00	5.00	3.00	700.00	70.00	30.00
99	0.70	0.0 N	20.00	50.00	200.00	5.00	3.00	300.00	100.00	20.00
100	1.50	0.0 N	20.00	30.00	200.00	0.0 N	3.00	700.00	100.00	20.00
102	1.00	0.0 N	20.00	50.00	100.00	0.0 N	3.00	700.00	100.00	20.00
103	0.70	3.00	2.00	50.00	200.00	0.0 N	3.00	1000.00	100.00	15.00
104	0.70	3.00	70.00	70.00	100.00	7.00	3.00	1500.00	150.00	20.00
105	1.00	3.00	20.00	50.00	100.00	7.00	3.00	150.00	100.00	20.00
106	1.50	3.00	20.00	70.00	100.00	7.00	3.00	700.00	70.00	3.00
107	1.00	3.00	20.00	50.00	100.00	5.00	3.00	300.00	50.00	5.00
108	0.70	5.00	20.00	70.00	100.00	5.00	5.00	700.00	50.00	5.00
109	1.00	10.00	20.00	70.00	300.00	0.0 N	10.00	1000.00	100.00	5.00
110	1.50	15.00	20.00	100.00	1000.00	0.0 N	15.00	1000.00	100.00	7.00
111	1.00	10.00	20.00	70.00	500.00	0.0 N	7.00	700.00	100.00	50.00
112	1.50	10.00	20.00	70.00	50.00	0.0 N	0.0 N	700.00	70.00	0.0 N
113	1.00	7.00	15.00	0.0 N	200.00	0.0 N	0.0 N	200.00	70.00	0.0 N
114	1.00	7.00	20.00	70.00	200.00	0.0 N	0.0 N	500.00	70.00	0.0 N
115	1.00	7.00	20.00	50.00	100.00	0.0 N	0.0 N	300.00	70.00	0.0 N
122	1.00	0.0 N	20.00	70.00	100.00	0.0 N	0.0 N	500.00	50.00	0.0 N
123	1.00	0.0 N	30.00	100.00	70.00	0.0 N	0.0 N	1000.00	70.00	0.0 N
124	1.00	0.0 N	20.00	50.00	70.00	20.00	0.0 N	30.00	70.00	0.0 N
125	1.00	0.0 N	20.00	0.0 N	100.00	20.00	0.0 N	20.00	70.00	0.0 N
126	1.00	0.0 N	20.00	0.0 N	70.00	20.00	0.0 N	300.00	70.00	0.0 N
127	0.0 N	0.0 N	20.00	100.00	100.00	0.0 N	0.0 N	150.00	50.00	0.0 N
128	0.0 N	10.00	20.00	70.00	200.00	10.00	0.0 N	500.00	70.00	0.0 N
131	0.0 N	7.00	30.00	70.00	150.00	0.0 N	0.0 N	300.00	70.00	10.00
132	0.0 N	7.00	15.00	0.0 N	200.00	0.0 N	0.0 N	300.00	30.00	15.00
133	0.0 N	0.0 N	20.00	150.00	70.00	10.00	0.0 N	700.00	50.00	10.00
134	0.0 N	0.0 N	20.00	70.00	70.00	10.00	0.0 N	500.00	70.00	10.00
135	0.0 N	0.0 N	30.00	100.00	100.00	10.00	0.0 N	1000.00	70.00	10.00
136	0.0 N	0.0 N	10.00	70.00	3.00	5.00	0.0 N	1000.00	50.00	7.00
137	0.0 N	0.0 N	20.00	70.00	70.00	5.00	0.0 N	700.00	70.00	20.00
138	1.00	0.0 N	15.00	150.00	100.00	5.00	0.0 N	500.00	70.00	15.00
139	1.00	0.0 N	20.00	70.00	100.00	5.00	0.0 N	300.00	70.00	15.00
140	0.0 N	0.0 N	20.00	70.00	70.00	5.00	0.0 N	700.00	70.00	10.00
141	0.0 N	0.0 N	10.00	0.0 N	50.00	5.00	0.0 N	300.00	70.00	15.00
143	1.00	0.0 N	20.00	0.0 N	50.00	5.00	0.0 N	500.00	70.00	20.00
144	0.0 N	0.0 N	20.00	50.00	50.00	5.00	0.0 N	300.00	70.00	20.00
145	1.00	0.0 N	20.00	70.00	50.00	5.00	0.0 N	300.00	70.00	30.00
146	0.0 N	0.0 N	20.00	70.00	30.00	5.00	0.0 N	300.00	70.00	20.00
147	0.0 N	0.0 N	15.00	70.00	70.00	7.00	0.0 N	300.00	70.00	15.00
148	0.0 N	0.0 N	10.00	0.0 N	50.00	0.0 N	0.0 N	700.00	50.00	10.00
149	0.0 N	0.0 N	15.00	70.00	100.00	7.00	0.0 N	300.00	70.00	0.0 N
150	0.0 N	0.0 N	10.00	100.00	50.00	5.00	0.0 N	200.00	50.00	10.00
151	0.0 N	0.0 N	20.00	70.00	3.00	5.00	0.0 N	1000.00	70.00	0.0 N
152	1.00	0.0 N	20.00	50.00	5.00	5.00	0.0 N	150.00	70.00	30.00

ARGILLIZED ROCKS, PPM

SAMPLE	FE,PPM	MG,PPM	CA,PPM	TI,PPM
96	49999.98	7000.00	1500.00	5000.00
97	69999.94	5000.00	1000.00	3000.00
98	19999.99	7000.00	10000.00	3000.00
99	69999.94	10000.00	700.00	5000.00
100	49999.98	10000.00	1500.00	5000.00
102	29999.98	5000.00	1000.00	3000.00
103	69999.94	2000.00	1500.00	3000.00
104	69999.94	2000.00	2000.00	7000.00
105	19999.99	3000.00	1000.00	5000.00
106	14999.99	7000.00	1500.00	5000.00
107	10000.00	5000.00	1500.00	5000.00
108	14999.99	3000.00	1500.00	5000.00
109	69999.94	5000.00	1500.00	5000.00
110	69999.94	3000.00	1000.00	3000.00
111	49999.98	5000.00	1500.00	5000.00
112	29999.98	2000.00	2000.00	2000.00
113	19999.99	5000.00	1000.00	2000.00
114	49999.98	3000.00	700.00	2000.00
115	29999.98	5000.00	700.00	2000.00
122	19999.99	50.00	500.00	2000.00
123	19999.99	1000.00	700.00	2000.00
124	2000.00	5000.00	500.00	3000.00
125	3000.00	5000.00	700.00	2000.00
126	5000.00	5000.00	1000.00	3000.00
127	5000.00	7000.00	1000.00	2000.00
128	14999.99	5000.00	1000.00	3000.00
131	19999.99	7000.00	1000.00	2000.00
132	69999.94	2000.00	1000.00	1500.00
133	14999.99	5000.00	1000.00	2000.00
134	10000.00	5000.00	1000.00	2000.00
135	29999.98	5000.00	700.00	2000.00
136	14999.99	100.00	500.00	3000.00
137	14999.99	3000.00	1000.00	3000.00
138	14999.99	5000.00	700.00	3000.00
139	19999.99	7000.00	1000.00	3000.00
140	99999.94	2000.00	2000.00	1500.00
141	10000.00	2000.00	1000.00	3000.00
143	19999.99	7000.00	1000.00	3000.00
144	14999.99	7000.00	500.00	3000.00
145	14999.99	7000.00	1000.00	3000.00
146	29999.98	2000.00	1500.00	3000.00
147	29999.98	7000.00	1000.00	3000.00
148	19999.99	7000.00	19999.99	3000.00
149	7000.00	7000.00	2000.00	3000.00
150	29999.98	7000.00	700.00	3000.00
151	29999.98	2000.00	2000.00	3000.00
152	19999.99	7000.00	500.00	3000.00

ARGILLIZED ROCKS, PPM

SAMPLE	AU,PPM	AG,PPM	PB,PPM	BI,PPM	HG,PPM	AS,PPM	CU,PPM	ZN,PPM	MO,PPM	BA,PPM
153	0.19	0.0 N	10.00	0.0 N	0.18	20.00	5.00	40.00	0.0 N	700.00
154	0.0 L	0.0 N	0.0 N	0.0 N	0.12	10.00	10.00	0.0 L	3.00	500.00
155	0.0 L	0.0 N	5.00	0.0 N	0.15	10.00	10.00	50.00	3.00	700.00
156	0.0 L	0.0 N	5.00	0.0 N	0.20	10.00	10.00	50.00	3.00	1000.00
157	1.00	0.0 N	5.00	0.0 N	0.16	120.00	7.00	50.00	3.00	2000.00
158	1.67	0.0 N	5.00	0.0 N	0.40	10.00	7.00	60.00	3.00	700.00
159	0.18	0.0 N	0.0 N	0.0 N	0.44	10.00	10.00	25.00	5.00	700.00
160	0.40	0.0 N	0.0 N	0.0 N	0.52	120.00	200.00	30.00	30.00	70.00
164	0.90	0.0 L	50.00	0.0 N	0.28	20.00	15.00	0.0 L	7.00	2000.00
165	0.60	0.0 L	15.00	0.0 N	0.24	40.00	7.00	0.0 L	3.00	300.00
202	6.20	0.0 N	50.00	0.0 N	0.04	60.00	10.00	0.0 L	15.00	500.00
203	0.36	0.0 N	0.0 N	0.0 N	0.04	60.00	50.00	0.0 L	5.00	2000.00
204	0.10	0.0 N	0.0 N	0.0 N	0.04	0.0 L	10.00	0.0 L	0.0 N	1000.00
205	0.46	0.0 N	50.00	0.0 N	0.0 L	0.0 L	5.00	30.00	0.0 N	2000.00
206	0.0 L	0.0 N	3.00	0.0 N	0.06	40.00	30.00	25.00	5.00	1000.00
207	0.10	0.0 N	3.00	0.0 N	0.04	10.00	30.00	50.00	3.00	1000.00
208	0.0 L	0.0 N	7.00	0.0 N	0.10	10.00	10.00	50.00	3.00	1000.00
209	0.0 L	0.0 N	5.00	0.0 N	0.06	10.00	20.00	100.00	5.00	1000.00
210	0.0 L	0.0 N	7.00	0.0 N	0.06	0.0 L	20.00	40.00	5.00	1000.00
211	0.30	0.0 N	7.00	0.0 N	0.06	60.00	50.00	50.00	0.0 N	1000.00
212	0.10	0.0 N	3.00	0.0 N	0.08	10.00	30.00	110.00	7.00	1000.00
213	0.0 L	0.0 N	3.00	0.0 N	0.06	10.00	20.00	30.00	5.00	700.00
214	0.0 L	0.0 N	30.00	0.0 N	0.04	10.00	30.00	190.00	5.00	1000.00
215	0.0 L	0.0 N	20.00	0.0 N	0.06	10.00	10.00	50.00	7.00	1000.00
216	0.0 L	0.0 N	10.00	0.0 N	0.06	10.00	10.00	120.00	0.0 N	300.00
217	0.0 L	0.0 N	7.00	0.0 N	0.04	10.00	10.00	110.00	5.00	500.00
218	0.10	0.0 N	7.00	0.0 N	0.08	20.00	10.00	70.00	3.00	500.00
219	0.10	0.0 N	3.00	0.0 N	0.04	10.00	5.00	60.00	0.0 N	500.00
224	0.0 L	0.0 N	0.0 N	0.0 N	0.06	40.00	10.00	0.0 L	5.00	200.00
225	0.10	0.0 N	3.00	0.0 N	0.08	80.00	20.00	0.0 L	7.00	1500.00
226	0.0 L	0.0 N	3.00	0.0 N	0.06	100.00	150.00	0.0 L	5.00	1500.00
227	0.0 L	0.0 N	50.00	0.0 N	0.10	120.00	150.00	25.00	5.00	200.00
228	0.10	0.0 N	0.0 N	0.0 N	0.04	10.00	15.00	50.00	0.0 N	7000.00
229	0.0 L	0.0 N	0.0 N	0.0 N	0.04	10.00	20.00	60.00	0.0 N	1500.00
230	0.0 L	0.0 N	50.00	0.0 N	0.04	100.00	50.00	50.00	3.00	500.00
231	0.10	1.00	50.00	0.0 N	0.11	60.00	15.00	0.0 L	3.00	200.00
232	0.16	0.0 N	10.00	0.0 N	0.06	80.00	70.00	0.0 L	3.00	700.00
233	0.96	7.00	0.0 N	0.0 N	0.06	10.00	30.00	0.0 L	3.00	2000.00
234	0.20	0.0 N	7.00	0.0 N	0.04	10.00	10.00	50.00	3.00	300.00
235	0.0 L	0.0 N	7.00	0.0 N	0.04	10.00	30.00	0.0 L	3.00	200.00
236	0.10	0.0 L	5.00	0.0 N	0.17	10.00	100.00	0.0 L	5.00	2000.00
237	0.0 L	0.0 N	50.00	0.0 N	0.06	10.00	5.00	0.0 L	10.00	300.00
238	0.0 L	0.0 N	50.00	0.0 N	0.10	10.00	20.00	0.0 L	3.00	1000.00
239	0.26	1.00	50.00	0.0 N	0.10	20.00	7.00	0.0 L	3.00	300.00
241	3.07	0.0 L	50.00	0.0 N	0.10	60.00	70.00	0.0 L	5.00	1500.00
242	0.28	0.0 N	5.00	0.0 N	0.20	10.00	10.00	0.0 L	5.00	300.00
243	0.78	0.0 N	10.00	0.0 N	0.10	10.00	50.00	0.0 L	5.00	1000.00

ARGILLIZED ROCKS, PPM

SAMPLE	BE,PPM	CO,PPM	CR,PPM	LA,PPM	MN,PPM	NB,PPM	NI,PPM	SR,PPM	V,PPM	Y,PPM
153	0.0 N	0.0 N	15.00	100.00	50.00	5.00	0.0 N	500.00	50.00	0.0 N
154	0.0 N	0.0 N	15.00	70.00	70.00	5.00	0.0 N	500.00	50.00	7.00
155	0.0 N	0.0 N	15.00	50.00	70.00	5.00	0.0 N	500.00	50.00	7.00
156	0.0 N	7.00	20.00	0.0 N	70.00	5.00	0.0 N	200.00	70.00	15.00
157	1.00	0.0 N	15.00	0.0 N	50.00	5.00	0.0 N	500.00	50.00	0.0 N
158	1.00	0.0 N	20.00	0.0 N	200.00	5.00	0.0 N	300.00	50.00	0.0 N
159	1.00	0.0 N	20.00	0.0 N	50.00	0.0 N	15.00	300.00	100.00	0.0 N
160	1.00	0.0 N	20.00	0.0 N	150.00	0.0 N	0.0 N	700.00	200.00	10.00
164	1.00	0.0 N	20.00	0.0 N	150.00	7.00	0.0 N	700.00	70.00	20.00
165	1.00	0.0 N	20.00	70.00	30.00	7.00	0.0 N	300.00	70.00	20.00
202	1.00	0.0 N	30.00	70.00	50.00	0.0 N	0.0 N	500.00	50.00	0.0 N
203	1.00	0.0 N	20.00	0.0 N	100.00	0.0 N	0.0 N	200.00	70.00	0.0 N
204	1.50	0.0 N	20.00	0.0 N	70.00	0.0 N	0.0 N	300.00	50.00	0.0 N
205	0.0 N	0.0 N	30.00	50.00	50.00	3.00	0.0 N	700.00	70.00	0.0 N
206	1.00	10.00	20.00	50.00	1000.00	0.0 N	0.0 L	500.00	70.00	15.00
207	1.00	10.00	20.00	50.00	500.00	7.00	0.0 L	700.00	70.00	15.00
208	1.00	7.00	15.00	50.00	2000.00	5.00	0.0 N	500.00	70.00	15.00
209	1.00	10.00	30.00	50.00	700.00	5.00	0.0 N	700.00	70.00	10.00
210	1.50	30.00	20.00	70.00	700.00	5.00	0.0 L	700.00	70.00	50.00
211	1.00	0.0 N	20.00	70.00	100.00	7.00	0.0 N	700.00	70.00	20.00
212	1.50	30.00	20.00	70.00	3000.00	0.0 N	0.0 L	500.00	70.00	15.00
213	0.0 N	0.0 N	20.00	50.00	50.00	0.0 N	0.0 N	300.00	70.00	10.00
214	1.50	7.00	30.00	70.00	100.00	5.00	0.0 N	1500.00	70.00	10.00
215	1.50	7.00	20.00	70.00	100.00	5.00	0.0 N	500.00	70.00	10.00
216	1.50	10.00	20.00	50.00	150.00	0.0 N	0.0 N	300.00	70.00	10.00
217	1.50	0.0 N	20.00	70.00	50.00	0.0 N	0.0 N	500.00	70.00	20.00
218	1.00	0.0 N	30.00	50.00	70.00	3.00	0.0 N	500.00	70.00	15.00
219	1.00	0.0 N	70.00	50.00	100.00	0.0 N	0.0 N	500.00	150.00	30.00
224	0.0 N	0.0 N	30.00	0.0 N	150.00	5.00	0.0 N	70.00	70.00	0.0 N
225	0.0 N	0.0 N	50.00	300.00	100.00	0.0 N	0.0 N	1000.00	100.00	100.00
226	0.0 N	0.0 N	30.00	70.00	50.00	0.0 N	0.0 N	200.00	70.00	10.00
227	0.0 N	0.0 N	30.00	50.00	10.00	0.0 N	0.0 N	700.00	50.00	0.0 N
228	10.00	0.0 N	30.00	50.00	70.00	10.00	0.0 N	300.00	70.00	10.00
229	1.00	0.0 N	30.00	50.00	70.00	10.00	0.0 N	150.00	70.00	30.00
230	0.0 N	0.0 N	50.00	70.00	30.00	0.0 N	0.0 N	700.00	100.00	10.00
231	0.0 N	0.0 N	30.00	70.00	50.00	0.0 N	0.0 N	1000.00	100.00	15.00
232	0.0 N	0.0 N	30.00	50.00	30.00	0.0 N	0.0 N	1500.00	70.00	0.0 N
233	0.0 N	0.0 N	30.00	0.0 N	150.00	7.00	0.0 N	500.00	100.00	10.00
234	1.50	0.0 N	30.00	70.00	100.00	7.00	0.0 N	700.00	100.00	20.00
235	1.50	0.0 N	30.00	70.00	70.00	7.00	0.0 N	500.00	70.00	20.00
236	0.0 N	0.0 N	20.00	50.00	150.00	7.00	0.0 N	50.00	70.00	0.0 N
237	0.0 N	0.0 N	30.00	70.00	150.00	0.0 N	0.0 N	2000.00	100.00	15.00
238	1.00	0.0 N	30.00	50.00	150.00	7.00	0.0 N	70.00	70.00	0.0 N
239	0.0 N	0.0 N	30.00	0.0 N	150.00	7.00	0.0 N	300.00	100.00	0.0 N
241	0.0 N	0.0 N	30.00	100.00	70.00	0.0 N	0.0 N	1500.00	100.00	15.00
242	1.50	0.0 N	30.00	50.00	100.00	10.00	0.0 N	300.00	70.00	10.00
243	0.0 N	0.0 N	30.00	50.00	100.00	0.0 N	0.0 N	1000.00	70.00	10.00

ARGILLIZED ROCKS, PPM

SAMPLE	FE,PPM	MG,PPM	CA,PPM	TI,PPM
153	29999.98	7000.00	2000.00	3000.00
154	19999.99	7000.00	1500.00	3000.00
155	14999.99	7000.00	2000.00	3000.00
156	14999.99	7000.00	10000.00	3000.00
157	7000.00	5000.00	29999.98	3000.00
158	10000.00	7000.00	2000.00	3000.00
159	14999.99	7000.00	10000.00	2000.00
160	0.0 G	1000.00	700.00	1000.00
164	29999.98	2000.00	1500.00	2000.00
165	14999.99	5000.00	1000.00	3000.00
202	69999.94	69999.94	1500.00	3000.00
203	29999.98	7000.00	1500.00	3000.00
204	5000.00	7000.00	1500.00	3000.00
205	3000.00	7000.00	5000.00	3000.00
206	19999.99	3000.00	3000.00	3000.00
207	29999.98	5000.00	5000.00	3000.00
208	7000.00	5000.00	2000.00	3000.00
209	19999.99	7000.00	2000.00	3000.00
210	29999.98	7000.00	5000.00	3000.00
211	19999.99	7000.00	5000.00	3000.00
212	49999.98	2000.00	5000.00	3000.00
213	29999.98	5000.00	2000.00	3000.00
214	29999.98	7000.00	5000.00	3000.00
215	19999.99	5000.00	3000.00	3000.00
216	49999.98	7000.00	3000.00	3000.00
217	29999.98	5000.00	3000.00	3000.00
218	19999.99	5000.00	3000.00	2000.00
219	29999.98	7000.00	3000.00	3000.00
224	19999.99	7000.00	300.00	3000.00
225	99999.94	5000.00	500.00	2000.00
226	49999.98	30.00	700.00	3000.00
227	49999.98	7.00	700.00	2000.00
228	3000.00	3000.00	300.00	3000.00
229	14999.99	7000.00	300.00	3000.00
230	29999.98	2000.00	500.00	3000.00
231	29999.98	3000.00	700.00	3000.00
232	29999.98	150.00	700.00	2000.00
233	29999.98	7000.00	700.00	3000.00
234	5000.00	5000.00	5000.00	3000.00
235	5000.00	5000.00	3000.00	3000.00
236	49999.98	5000.00	300.00	3000.00
237	0.0 G	500.00	1000.00	2000.00
238	3000.00	7000.00	300.00	3000.00
239	19999.99	7000.00	10000.00	3000.00
241	69999.94	5000.00	1000.00	3000.00
242	19999.99	7000.00	300.00	3000.00
243	29999.98	5000.00	700.00	2000.00

ARGILLIZED ROCKS, PPM

SAMPLE	AU,PPM	AG,PPM	PB,PPM	BI,PPM	HG,PPM	AS,PPM	CU,PPM	ZN,PPM	MO,PPM	BA,PPM
244	0.0 L	0.0 N	3.00	0.0 N	0.04	10.00	5.00	0.0 L	0.0 N	300.00
245	1.17	0.0 L	50.00	0.0 N	0.06	60.00	15.00	0.0 L	10.00	500.00
247	0.10	0.0 N	50.00	0.0 N	0.10	80.00	30.00	0.0 L	10.00	700.00
248	0.10	1.00	100.00	0.0 N	0.80	10.00	50.00	0.0 L	7.00	500.00
253	0.10	0.0 N	7.00	0.0 N	0.04	10.00	15.00	0.0 L	0.0 N	1000.00

ARGILLIZED ROCKS, PPM

SAMPLE	BE,PPM	CO,PPM	CR,PPM	LA,PPM	MN,PPM	NB,PPM	NI,PPM	SR,PPM	V,PPM	Y,PPM
244	1.50	0.0 N	30.00	50.00	50.00	10.00	0.0 N	300.00	70.00	0.0 N
245	0.0 N	0.0 N	50.00	100.00	70.00	0.0 N	0.0 N	2000.00	70.00	10.00
247	0.0 N	0.0 N	30.00	100.00	50.00	0.0 N	0.0 N	1500.00	100.00	0.0 N
248	1.50	0.0 N	30.00	50.00	100.00	7.00	0.0 N	1000.00	70.00	10.00
253	0.0 N	0.0 N	30.00	0.0 N	50.00	5.00	0.0 N	700.00	70.00	0.0 N

ARGILLIZED ROCKS, PPM

SAMPLE	FE,PPM	MG,PPM	CA,PPM	TI,PPM
244	700.00	3000.00	700.00	2000.00
245	0.0 G	1000.00	700.00	2000.00
247	0.0 G	5000.00	700.00	2000.00
248	14999.99	7000.00	3000.00	3000.00
253	19999.99	3000.00	700.00	3000.00

PRINT REPEATED BY OPERATOR

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	AU,LOG%	AG,LOG%	PB,LOG%	BI,LOG%	HG,LOG%	AS,LOG%	CU,LOG%	ZN,LOG%	MO,LOG%	BA,LOG%
12	-4.7212	0.0 N	-2.5229	0.0 N	-5.0000	-3.0000	-2.3010	-1.6576	-3.1549	-1.1549
13	-4.7447	0.0 N	0.0 N	0.0 N	-4.8861	-1.8539	-3.0000	-2.2218	-3.1549	-1.1549
14	-4.7212	0.0 N	0.0 N	0.0 N	-5.2218	-3.0000	-2.5229	-2.5229	0.0 N	-1.1549
15	0.0 L	0.0 N	0.0 N	0.0 N	-5.6990	-2.0000	-2.5229	0.0 L	-3.1549	-1.0000
16	-4.6990	-4.5229	-2.6990	0.0 N	-5.2218	-2.0969	-2.6990	-2.6021	-3.0000	-1.3010
17	0.0 L	-4.5229	-2.8239	0.0 N	-5.2218	-3.0000	-3.0000	-2.3979	0.0 N	-1.3010
18	0.0 L	-4.5229	-2.8239	0.0 N	-5.3979	-3.0000	-2.6990	-2.4559	-3.3010	-0.6990
19	-5.0000	-4.5229	-2.8239	0.0 N	-5.2218	-2.3979	-2.8239	0.0 L	-3.5229	-0.8239
20	0.0 L	-4.6990	-2.8239	0.0 N	-5.2218	0.0 L	-2.8239	-2.6021	0.0 N	-1.0000
21	-5.0000	-4.5229	-3.0000	0.0 N	0.0 L	-3.0000	-2.6990	-2.5229	-3.3010	-1.0000
22	0.0 L	-4.5229	-2.6990	0.0 N	-4.8239	-3.0000	-3.0000	-2.6021	-3.5229	-1.3010
23	0.0 L	-4.6990	-2.3010	0.0 N	-4.9586	-3.0000	-3.0000	0.0 L	0.0 N	-1.5229
24	0.0 L	-4.6990	-2.5229	0.0 N	-5.0969	0.0 L	-2.6990	0.0 L	0.0 N	-0.8239
25	0.0 L	-4.5229	-2.8239	0.0 N	-4.9586	0.0 L	-2.6990	0.0 L	-3.5229	-0.6990
26	0.0 L	-4.6990	-2.6990	0.0 N	-5.2218	0.0 L	-2.6990	0.0 L	0.0 N	-1.3010
27	-4.6990	-4.5229	-2.6990	0.0 N	-5.0969	-3.0000	-2.6990	0.0 L	-2.6990	-1.6990
28	0.0 L	-4.1549	-2.6990	0.0 N	-5.3979	-2.6990	-3.3010	-2.0969	-2.8239	-0.6990
29	-4.1549	-4.5229	-2.5229	0.0 N	-5.0969	-3.0000	-2.6990	-2.3979	-3.0000	-1.3010
31	-4.5528	-3.6990	-2.1549	0.0 N	-5.0969	-2.6990	-2.5229	0.0 L	-3.1549	-0.8239
33	0.0 L	-4.5229	-3.0000	0.0 N	-5.2218	0.0 L	-3.0000	0.0 L	0.0 N	-1.0000
40	-4.3010	-4.0000	-1.8239	0.0 N	-4.6990	-2.2218	-2.3010	0.0 L	-3.3010	-1.0000
41	0.0 L	-4.5229	-2.8239	0.0 N	-5.0000	0.0 L	-2.6990	0.0 L	0.0 N	-1.6990
42	-5.0000	-4.6990	-3.0000	0.0 N	-5.0000	0.0 L	-2.1549	0.0 L	0.0 N	-0.8239
43	0.0 L	-4.6990	-3.1549	0.0 N	-5.0000	0.0 L	-3.0000	0.0 L	0.0 N	-0.8239
44	-5.0000	-4.6990	-3.3010	0.0 N	-5.2218	0.0 L	-2.6990	0.0 L	0.0 N	-1.1549
46	0.0 L	-4.6990	-2.3010	0.0 N	-5.2218	0.0 L	-3.0000	0.0 L	0.0 N	-1.3010
47	0.0 L	-4.6990	-3.1549	0.0 N	-5.2218	-3.0000	-2.6990	0.0 L	0.0 N	-1.0000
48	-5.0000	-4.6990	-3.3010	0.0 N	-5.0969	-3.0000	-2.3010	0.0 L	0.0 N	-1.0000
49	0.0 L	-4.6990	-3.1549	0.0 N	-5.0000	-3.0000	-2.5229	0.0 L	0.0 N	-0.8239
50	-5.0000	-4.6990	-3.1549	0.0 N	-5.3979	0.0 L	-2.6990	0.0 L	0.0 N	-1.0000
51	0.0 L	-4.6990	-3.0000	0.0 N	-4.9586	0.0 L	-2.8239	0.0 L	0.0 N	-0.8239
52	-4.4437	-4.5229	-3.6990	0.0 N	-5.0969	-2.3979	-3.0000	0.0 L	-3.5229	-2.0000
53	0.0 L	-4.3010	-2.8239	0.0 N	-5.0969	0.0 L	-2.5229	-2.3979	-3.5229	-1.0000
54	0.0 L	-4.5229	-3.0000	0.0 N	-5.0969	-3.0000	-2.6990	-2.5229	-2.3010	-0.6990
55	0.0 L	-4.5229	-3.0000	0.0 N	-5.0969	0.0 L	-2.3010	0.0 L	-3.1549	-1.0000
56	-5.0000	-4.5229	-2.8239	0.0 N	-5.0969	-3.0000	-2.5229	-2.0969	-3.3010	-0.8239
57	0.0 L	-4.5229	-3.0000	0.0 N	-5.2218	-3.0000	-2.6990	-2.0969	-3.5229	-0.8239
58	-5.0000	-4.5229	-3.3010	0.0 N	-5.0969	-3.0000	-2.5229	-2.0969	-3.3010	-1.0000
59	0.0 L	-4.5229	-3.1549	0.0 N	-5.0969	-3.0000	-2.3010	-2.0969	-3.3010	-1.0000
60	0.0 L	-4.6990	-3.6990	0.0 N	-5.3979	-3.0000	-2.5229	-2.0969	0.0 N	-1.0000
61	-4.6990	-4.1549	-3.6990	0.0 N	-5.2218	-3.0000	-2.6990	-2.0969	0.0 N	-1.5229
62	-5.0000	-4.6990	-2.1549	0.0 N	-5.0969	-2.0969	-2.8239	-2.0969	-3.0000	-1.0000
70	-5.0000	0.0 N	0.0 N	0.0 N	-5.2218	-2.3979	-3.0000	0.0 L	-3.5229	-0.6990
71	-5.0000	0.0 N	0.0 N	0.0 N	-5.2218	-3.0000	-3.0000	0.0 L	0.0 N	-1.1549
72	-5.0000	0.0 N	-2.6990	0.0 N	-5.2218	-3.0000	-2.6990	0.0 L	-3.3010	-0.8239
73	-3.8297	0.0 N	0.0 N	0.0 N	-5.3979	-3.0000	-2.8239	-2.6021	-3.3010	-1.1549
76	-4.7447	0.0 N	-3.1549	0.0 N	-4.7696	-1.9208	-3.1549	0.0 L	-3.3010	-1.0000
93	-3.3904	-4.5229	-1.6990	0.0 N	-4.9586	-2.2218	-2.3010	-2.3979	-2.6990	-1.5229
94	-5.0000	-4.3010	-2.3010	0.0 N	-5.0969	-2.3979	-2.6990	-2.5229	-3.0000	-0.5229
95	-5.0000	-4.5229	-2.5229	0.0 N	-5.3979	-2.6990	-2.5229	-2.5229	-3.0000	-1.1549

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	BE,LOG%	CO,LOG%	CR,LOG%	LA,LOG%	MN,LOG%	NB,LOG%	NI,LOG%	SR,LOG%	V,LOG%	Y,LOG%
12	-3.0000	-3.0000	-2.6990	-2.0000	-1.6990	0.0 N	0.0 N	-1.3010	-1.8239	-3.0000
13	0.0 N	-3.0000	-2.6990	0.0 N	-1.3010	0.0 N	0.0 N	-1.5229	-1.8239	-3.0000
14	0.0 N	0.0 N	-2.6990	0.0 N	-2.0000	0.0 N	0.0 N	-1.1549	-2.0000	0.0 N
15	0.0 N	0.0 N	-2.8239	0.0 N	-1.5229	0.0 N	0.0 N	-1.3010	-2.0000	0.0 N
16	-4.3010	-3.0000	-2.6990	-2.5229	-0.6990	-3.3010	-3.3010	-1.3010	-2.0000	-3.0000
17	-4.3010	-3.0000	-2.6990	-2.3010	-0.5229	0.0 N	-3.3010	-1.1549	-2.1549	-3.1549
18	-4.5229	-3.1549	-2.5229	-2.1549	-1.1549	0.0 N	-3.5229	-0.6990	-2.0000	-3.0000
19	-4.5229	-3.1549	-2.6990	-2.1549	-1.5229	0.0 N	-3.1549	-0.8239	-1.8239	-2.8239
20	-4.5229	-3.1549	-2.6990	-2.1549	-1.6990	0.0 N	-3.1549	-1.0000	-2.1549	-3.1549
21	-4.3010	-3.1549	-2.5229	-2.3010	-1.5229	-3.3010	-3.1549	-1.1549	-1.8239	-3.0000
22	-4.3010	-3.1549	-2.6990	-2.5229	-2.1549	0.0 N	-3.1549	-1.5229	-2.1549	-2.5229
23	-3.8239	-3.1549	-2.6990	-2.0000	-2.1549	0.0 N	-3.5229	-0.8239	-2.0000	-2.5229
24	-4.0000	-3.1549	-2.5229	-2.0000	-2.3010	0.0 N	-3.3010	-0.6990	-1.8239	-2.3010
25	-4.1549	-3.3010	-2.6990	-2.1549	-2.1549	-3.3010	-3.6990	-0.8239	-2.1549	-2.8239
26	-3.5229	-3.3010	-2.6990	-2.0000	-2.1549	-3.3010	-3.6990	-0.8239	-2.0000	-3.0000
27	-4.3010	-3.1549	-2.8239	-2.1549	-2.0000	0.0 N	-3.0000	-0.8239	-2.1549	-3.1549
28	-4.5229	-3.5229	-3.0000	-2.0000	-2.1549	-3.3010	-3.5229	-1.3010	-2.1549	-3.1549
29	-4.5229	-3.5229	-2.6990	-2.3010	-2.1549	0.0 N	-3.5229	-0.5229	-2.0000	-3.0000
31	-4.3010	0.0 N	-2.5229	-2.3010	-2.1549	-3.3010	-3.6990	-1.1549	-1.8239	-2.5229
33	-3.5229	0.0 N	-2.5229	-2.1549	-2.5229	-3.3010	-3.5229	-0.6990	-2.0000	-3.3010
40	-4.5229	0.0 N	-2.6990	-2.5229	-2.3010	0.0 N	0.0 N	-0.6990	-2.1549	-3.0000
41	-4.3010	-3.0000	-2.8239	-2.3010	-2.5229	0.0 N	-3.1549	-0.8239	-2.1549	-2.6990
42	-3.6990	-3.1549	-2.6990	-2.3010	-2.1549	0.0 N	0.0 N	-0.8239	-2.0000	-2.5229
43	-4.0000	-3.1549	-2.5229	-2.3010	-2.5229	0.0 N	-3.1549	-1.3010	-2.0000	-2.6990
44	-4.1549	-3.3010	-2.6990	-2.1549	-2.0000	0.0 N	-3.5229	-1.6990	-2.0000	-2.8239
46	-3.6990	0.0 N	-2.6990	-2.0000	-2.0000	-3.3010	0.0 N	-1.0000	-2.0000	-2.8239
47	-3.8239	-3.3010	-2.6990	-2.3010	-2.5229	0.0 N	-3.5229	-1.1549	-2.1549	-3.1549
48	-4.0000	-3.3010	-2.6990	-2.1549	-2.3010	0.0 N	-3.5229	-0.8239	-2.1549	-3.0000
49	-4.1549	-3.3010	-2.5229	-2.1549	-2.3010	-3.3010	-3.5229	-1.1549	-2.0000	-3.0000
50	-4.1549	-3.3010	-2.6990	-2.1549	-2.5229	-3.0000	0.0 N	-1.3010	-2.0000	-3.1549
51	-4.3010	-3.3010	-2.5229	-2.0000	-2.6990	0.0 N	-3.6990	-1.1549	-2.0000	-3.1549
52	-4.5229	-3.3010	-3.0000	0.0 N	-2.1549	0.0 N	-3.6990	-1.8239	-2.3010	-3.3010
53	-4.5229	-3.1549	-2.5229	-1.8239	-1.6990	0.0 N	-3.6990	-1.1549	-2.1549	-3.1549
54	-4.5229	-3.0000	-2.5229	-2.3010	-1.8239	-3.3010	-3.5229	-1.6990	-2.0000	-2.8239
55	-4.5229	-3.0000	-2.5229	-2.1549	-1.6990	-3.3010	-3.3010	-1.1549	-2.0000	-3.1549
56	-4.5229	-3.3010	-2.5229	-2.0000	-1.8239	-3.3010	0.0 N	-1.1549	-2.1549	-3.0000
57	-4.5229	-3.1549	-2.5229	-2.3010	-2.0000	-3.3010	-3.6990	-1.3010	-2.1549	-3.1549
58	-4.5229	-3.3010	-2.6990	-2.1549	-2.1549	0.0 N	-3.3010	-1.0000	-2.1549	-3.1549
59	-4.3010	-3.1549	-2.5229	-2.0000	-2.0000	0.0 N	-3.0000	-1.0000	-2.0000	-3.1549
60	-4.1549	0.0 N	-2.8239	-2.3010	-2.0000	-3.3010	-3.6990	-2.0000	-2.3010	-3.1549
61	-3.6990	0.0 N	-2.6990	-2.1549	-2.0000	-3.3010	-3.5229	-1.3010	-2.0000	-2.5229
62	-4.0000	0.0 N	-2.5229	-2.3010	-1.6990	0.0 N	-3.3010	-0.8239	-2.0000	-2.6990
70	0.0 N	0.0 N	-2.6990	-2.1549	-2.5229	0.0 N	0.0 N	-1.5229	-2.0000	-2.6990
71	0.0 N	0.0 N	-2.8239	-2.1549	-2.6990	0.0 N	0.0 N	-1.3010	-2.1549	-2.6990
72	0.0 N	0.0 N	-2.6990	-2.1549	-1.8239	0.0 N	0.0 N	-1.1549	-2.0000	-2.6990
73	0.0 N	0.0 N	-2.8239	-2.1549	-2.3010	0.0 N	0.0 N	-1.5229	-2.0000	0.0 N
76	0.0 N	0.0 N	-2.8239	-2.1549	-3.0000	0.0 N	0.0 N	-1.3010	-2.1549	-3.0000
93	-4.0000	-3.5229	-2.5229	-2.0000	-1.6990	0.0 N	-3.5229	-0.8239	-1.8239	-3.0000
94	-4.0000	0.0 N	-2.5229	-2.3010	-1.6990	-3.3010	-3.5229	-1.5229	-2.0000	-3.1549
95	-4.0000	0.0 N	-2.6990	-2.1549	-1.5229	-3.3010	-3.5229	-1.1549	-2.0000	-2.3010

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	FE,LOG%	MN,LOG%	CA,LOG%	TI,LOG%
12	0.8451	-0.3010	-0.3010	-0.6990
13	0.4771	-0.3010	-0.3010	-0.5229
14	-0.5229	-0.1549	-0.3010	-0.5229
15	0.3010	-0.3010	-0.3010	-0.5229
16	0.3010	-0.1549	-0.8239	-0.3010
17	0.1761	-0.1549	-0.1549	-0.5229
18	0.6990	-0.3010	-0.5229	-0.3010
19	0.4771	-0.3010	-1.0000	-0.3010
20	0.3010	-0.5229	-1.0000	-0.3010
21	0.3010	-0.1549	-1.1549	-0.3010
22	0.3010	-0.0000	0.1761	-0.5229
23	-0.1549	-0.1549	-0.6990	-0.5229
24	-0.3010	-0.1549	-0.5229	-0.5229
25	0.4771	-0.3010	-1.0000	-0.3010
26	-0.3010	-0.1549	-1.0000	-0.3010
27	0.0 G	-0.6990	-0.1549	-0.6990
28	0.6990	-1.6990	-1.3010	-0.3010
29	0.6990	-1.1549	-1.0000	-0.5229
31	0.8451	-0.3010	-0.8239	-0.3010
33	0.1761	-0.8239	-1.1549	-0.3010
40	0.8451	-1.0000	-1.1549	-0.6990
41	0.3010	-0.5229	-1.1549	-0.5229
42	0.6990	-0.5229	-1.1549	-0.5229
43	0.3010	-0.5229	-1.1549	-0.3010
44	0.4771	-0.1549	-1.1549	-0.3010
46	-0.6990	-0.1549	-0.8239	-0.3010
47	0.4771	-0.6990	-1.0000	-0.5229
48	0.3010	-0.6990	-0.6990	-0.5229
49	0.3010	-0.6990	-1.0000	-0.3010
50	0.1761	-0.6990	-1.0000	-0.3010
51	-0.1549	-0.6990	-0.6990	-0.3010
52	0.6990	-1.0000	-2.0000	-0.6990
53	0.4771	-0.5229	-1.0000	-0.5229
54	0.8451	-0.3010	-1.0000	-0.3010
55	0.8451	-0.3010	-1.0000	-0.3010
56	0.6990	-0.5229	-1.0000	-0.3010
57	0.4771	-0.5229	-1.0000	-0.3010
58	0.6990	-0.5229	-1.1549	-0.3010
59	0.6990	-0.5229	-1.1549	-0.5229
60	-0.0000	-0.1549	-1.1549	-0.3010
61	0.3010	-0.1549	-1.1549	-0.5229
62	0.8451	-0.3010	-1.0000	-0.6990
70	0.3010	-0.3010	-1.0000	-0.5229
71	-0.0000	-0.8239	-1.1549	-0.5229
72	0.4771	-0.3010	-0.6990	-0.6990
73	0.6990	-0.3010	-1.0000	-0.5229
76	0.4771	-1.0000	-1.0000	-0.5229
93	1.0000	-0.1549	-0.8239	-0.3010
94	0.4771	-0.0000	-0.6990	-0.3010
95	0.8451	-0.1549	-0.8239	-0.3010

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	AU,LOG%	AG,LOG%	PB,LOG%	BI,LOG%	HG,LOG%	AS,LOG%	CU,LOG%	ZN,LOG%	MO,LOG%	BA,LOG%
96	-5.0000	-4.5229	-2.6990	0.0 N	-5.0000	-3.0000	-2.3010	-2.3979	-3.0000	-0.6990
97	-3.7282	-4.5229	-1.8239	0.0 N	-4.6990	-2.6990	-3.1549	-2.5229	-2.8239	-0.6990
98	-4.6990	-4.5229	-2.0000	0.0 N	-4.6990	-3.0000	-3.0000	0.0 L	-3.5229	-1.0000
99	-4.7212	-4.5229	-2.5229	0.0 N	-5.0000	-3.0000	-2.5229	-2.5229	-3.1549	-1.1549
100	-5.0000	-4.5229	-2.5229	0.0 N	-5.0000	-3.0000	-2.8239	0.0 L	-3.1549	-0.6990
102	-5.0000	-4.1549	-1.6990	0.0 N	-5.0000	-3.0000	-3.1549	0.0 L	-3.3010	-1.0000
103	-4.3188	-4.0000	-1.6990	0.0 N	-5.0000	-3.0000	-2.5229	-2.3979	-3.3010	-1.5229
104	0.0 L	-4.3010	-1.6990	0.0 N	-4.3979	-3.0000	-2.5229	-2.3979	-3.1549	-1.3010
105	-5.0000	-3.8239	-2.1549	0.0 N	-4.6990	-2.6990	-3.0000	-2.5229	-3.5229	-1.6990
106	-5.0000	-4.3010	-2.8239	0.0 N	-5.0000	-3.0000	-3.1549	0.0 L	-3.5229	-1.1549
107	-4.6990	-4.5229	-2.6990	0.0 N	-5.0000	-3.0000	-2.6990	-2.3979	-3.5229	-1.0000
108	-5.0000	-4.1549	-2.8239	0.0 N	-5.0000	-3.0000	-2.6990	-2.0969	-3.5229	-0.8239
109	0.0 L	-4.3010	-3.0000	0.0 N	-5.0000	-3.0000	-2.5229	-1.5528	-3.0000	-0.6990
110	-4.7696	-4.5229	-3.0000	0.0 N	-5.0000	-2.3979	-2.5229	-1.7570	-3.0000	-1.0000
111	-5.0000	-4.5229	-3.1549	0.0 N	-5.0000	-3.0000	-2.6990	0.0 L	-3.3010	-0.6990
112	-5.0000	0.0 N	-3.1549	0.0 N	-5.0000	-2.6990	-3.0000	0.0 L	-3.3010	-1.0000
113	-5.0000	0.0 N	-3.1549	0.0 N	-5.0000	-2.6990	-3.0000	-2.1549	-3.3010	-1.1549
114	-5.0000	0.0 N	-3.1549	0.0 N	-5.0000	-2.0000	-2.5229	-2.3010	-3.1549	-1.1549
115	-4.8239	0.0 N	-3.1549	0.0 N	-5.0000	0.0 L	-2.5229	-2.0969	-3.3010	-1.1549
122	0.0 L	0.0 L	-2.3010	0.0 N	-5.0000	-2.6990	-2.5229	-2.3010	-3.0000	-2.1549
123	0.0 L	0.0 L	-2.1549	0.0 N	-5.3979	-3.0000	-3.3010	0.0 L	-3.3010	-1.5229
124	-4.4318	0.0 N	0.0 N	0.0 N	-5.3979	-3.0000	-3.5229	0.0 L	0.0 N	-1.6990
125	-5.0000	0.0 N	-3.1549	0.0 N	-5.3979	-3.0000	-2.8239	-2.6021	0.0 N	-1.6990
126	-4.7959	0.0 N	-3.0000	0.0 N	-5.0000	-3.0000	-3.1549	-2.5229	0.0 N	-0.8239
127	-4.3010	0.0 N	-2.3010	0.0 N	-5.0000	-3.0000	-3.0000	-2.3010	0.0 N	-1.3010
128	0.0 L	0.0 N	-2.6990	0.0 N	-5.0000	-2.6990	-2.5229	-2.0969	-3.3010	-0.8239
131	0.0 L	0.0 N	-2.3010	0.0 N	-5.3979	-2.6990	-2.5229	-2.3979	-3.3010	-1.0000
132	0.0 L	0.0 N	-2.3010	0.0 N	-5.2218	-2.6990	-2.1549	-2.0458	-3.0000	-1.8239
133	0.0 L	0.0 N	-2.1549	0.0 N	-5.3979	-3.0000	-2.6990	-2.3979	0.0 N	-0.8239
134	-4.6990	0.0 N	-2.3010	0.0 N	-5.3979	-1.9208	-2.6990	-2.0458	-3.3010	-0.8239
135	0.0 L	0.0 N	-3.1549	0.0 N	-5.2218	-3.0000	-3.0000	-2.3979	-3.3010	-0.8239
136	0.0 L	-4.0000	-2.1549	0.0 N	-4.9208	-2.6990	-3.3010	-2.3979	0.0 N	-1.1549
137	-4.5229	0.0 N	-2.5229	0.0 N	-4.4089	-2.6990	-3.3010	-2.5229	0.0 N	-1.1549
138	0.0 L	0.0 N	-2.5229	0.0 N	-5.2218	-2.6990	-2.5229	0.0 L	0.0 N	-1.3010
139	0.0 L	0.0 N	-3.0000	0.0 N	-4.8861	0.0 L	-3.1549	0.0 L	-3.5229	-1.1549
140	-4.3979	0.0 N	0.0 N	0.0 N	-5.2218	-3.0000	-2.6990	-2.5229	-3.0000	-1.1549
141	0.0 L	-3.6990	-3.1549	0.0 N	-4.7959	-3.0000	-3.3010	-2.5229	-3.5229	-1.6990
143	-4.2218	0.0 N	-3.1549	0.0 N	-4.6990	-3.0000	-3.1549	0.0 L	-3.3010	-1.3010
144	-3.9586	0.0 N	-3.1549	0.0 N	-4.7959	-2.0969	-3.1549	0.0 L	-3.3010	-1.0000
145	0.0 L	0.0 N	-3.1549	0.0 N	-4.9208	-3.0000	-3.3010	-2.5229	-3.3010	-1.5229
146	-4.7959	0.0 N	-3.1549	0.0 N	-4.8861	-3.0000	-3.3010	0.0 L	-3.5229	-1.0000
147	-4.1580	0.0 N	-3.1549	0.0 N	-4.8239	-2.2218	-2.5229	0.0 L	-3.1549	-1.3010
148	-4.0088	0.0 N	-3.0000	0.0 N	-4.6778	-2.3979	-3.1549	0.0 L	-3.5229	-1.0000
149	-4.6990	0.0 N	-3.1549	0.0 N	-4.3665	-2.6990	-3.1549	0.0 L	0.0 N	-1.3010
150	0.0 L	0.0 N	-3.1549	0.0 N	-4.4202	-2.3979	-3.0000	0.0 L	-3.5229	-1.1549
151	-5.0000	0.0 N	-2.5229	-3.3010	-4.6198	-2.2218	-3.5229	0.0 L	-3.5229	-1.3010
152	0.0 L	0.0 N	-2.5229	-3.3010	-4.5229	-2.0969	-3.5229	0.0 L	-3.5229	-1.1549

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	BE,LOG%	CO,LOG%	CR,LOG%	LA,LOG%	MN,LOG%	NB,LOG%	NI,LOG%	SR,LOG%	V,LOG%	Y,LOG%
96	-4.0000	0.0 N	-2.6990	-2.3010	-1.5229	-3.3010	-3.5229	-1.6990	-2.0000	-2.5229
97	-4.0000	0.0 N	-2.6990	-2.3010	-1.8239	-3.3010	-3.5229	-1.5229	-2.0000	-2.6990
98	-4.1549	0.0 N	-2.6990	-2.3010	-2.0000	-3.3010	-3.5229	-1.1549	-2.1549	-2.5229
99	-4.1549	0.0 N	-2.6990	-2.3010	-1.6990	-3.3010	-3.5229	-1.5229	-2.0000	-2.6990
100	-3.8239	0.0 N	-2.6990	-2.5229	-1.6990	0.0 N	-3.5229	-1.1549	-2.0000	-2.6990
102	-4.0000	0.0 N	-2.6990	-2.3010	-2.0000	0.0 N	-3.5229	-1.1549	-2.0000	-2.6990
103	-4.1549	-3.5229	-3.6990	-2.3010	-1.6990	0.0 N	-3.5229	-1.0000	-2.0000	-2.8239
104	-4.1549	-3.5229	-2.1549	-2.1549	-2.0000	-3.1549	-3.5229	-0.8239	-1.8239	-2.6990
105	-4.0000	-3.5229	-2.6990	-2.3010	-2.0000	-3.1549	-3.5229	-1.8239	-2.0000	-2.6990
106	-3.8239	-3.5229	-2.6990	-2.1549	-2.0000	-3.1549	-3.5229	-1.1549	-2.1549	-3.5229
107	-4.0000	-3.5229	-2.6990	-2.3010	-2.0000	-3.3010	-3.5229	-1.5229	-2.3010	-3.3010
108	-4.1549	-3.3010	-2.6990	-2.1549	-2.0000	-3.3010	-3.3010	-1.1549	-2.3010	-3.3010
109	-4.0000	-3.0000	-2.6990	-2.1549	-1.5229	0.0 N	-3.0000	-1.0000	-2.0000	-3.3010
110	-3.8239	-2.8239	-2.6990	-2.0000	-1.0000	0.0 N	-2.8239	-1.0000	-2.0000	-3.1549
111	-4.0000	-3.0000	-2.6990	-2.1549	-1.3010	0.0 N	-3.1549	-1.1549	-2.0000	-2.3010
112	-3.8239	-3.0000	-2.6990	-2.1549	-2.3010	0.0 N	0.0 N	-1.1549	-2.1549	0.0 N
113	-4.0000	-3.1549	-2.8239	0.0 N	-1.6990	0.0 N	0.0 N	-1.6990	-2.1549	0.0 N
114	-4.0000	-3.1549	-2.6990	-2.1549	-1.6990	0.0 N	0.0 N	-1.3010	-2.1549	0.0 N
115	-4.0000	-3.1549	-2.6990	-2.3010	-2.0000	0.0 N	0.0 N	-1.5229	-2.1549	0.0 N
122	-4.0000	0.0 N	-2.6990	-2.1549	-2.0000	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
123	-4.0000	0.0 N	-2.5229	-2.0000	-2.1549	0.0 N	0.0 N	-1.0000	-2.1549	0.0 N
124	-4.0000	0.0 N	-2.6990	-2.3010	-2.1549	-2.6990	0.0 N	-2.5229	-2.1549	0.0 N
125	-4.0000	0.0 N	-2.6990	0.0 N	-2.0000	-2.6990	0.0 N	-2.6990	-2.1549	0.0 N
126	-4.0000	0.0 N	-2.6990	0.0 N	-2.1549	-2.6990	0.0 N	-1.5229	-2.1549	0.0 N
127	0.0 N	0.0 N	-2.6990	-2.0000	-2.0000	0.0 N	0.0 N	-1.8239	-2.3010	0.0 N
128	0.0 N	-3.0000	-2.6990	-2.1549	-1.6990	-3.0000	0.0 N	-1.3010	-2.1549	0.0 N
131	0.0 N	-3.1549	-2.5229	-2.1549	-1.8239	0.0 N	0.0 N	-1.5229	-2.1549	-3.0000
132	0.0 N	-3.1549	-2.8239	0.0 N	-1.6990	0.0 N	0.0 N	-1.5229	-2.5229	-2.8239
133	0.0 N	0.0 N	-2.6990	-1.8239	-2.1549	-3.0000	0.0 N	-1.1549	-2.3010	-3.0000
134	0.0 N	0.0 N	-2.6990	-2.1549	-2.1549	-3.0000	0.0 N	-1.3010	-2.1549	-3.0000
135	0.0 N	0.0 N	-2.5229	-2.0000	-2.0000	-3.0000	0.0 N	-1.0000	-2.1549	-3.0000
136	0.0 N	0.0 N	-3.0000	-2.1549	-3.5229	-3.3010	0.0 N	-1.0000	-2.3010	-3.1549
137	0.0 N	0.0 N	-2.6990	-2.1549	-2.1549	-3.3010	0.0 N	-1.1549	-2.1549	-2.6990
138	-4.0000	0.0 N	-2.8239	-1.8239	-2.0000	-3.3010	0.0 N	-1.3010	-2.1549	-2.8239
139	-4.0000	0.0 N	-2.6990	-2.1549	-2.0000	-3.3010	0.0 N	-1.5229	-2.1549	-2.8239
140	0.0 N	0.0 N	-2.6990	-2.1549	-2.1549	-3.3010	0.0 N	-1.1549	-2.1549	-3.0000
141	0.0 N	0.0 N	-3.0000	0.0 N	-2.3010	-3.3010	0.0 N	-1.5229	-2.1549	-2.8239
143	-4.0000	0.0 N	-2.6990	0.0 N	-2.3010	-3.3010	0.0 N	-1.3010	-2.1549	-2.6990
144	0.0 N	0.0 N	-2.6990	-2.3010	-2.3010	-3.3010	0.0 N	-1.5229	-2.1549	-2.6990
145	-4.0000	0.0 N	-2.6990	-2.1549	-2.3010	-3.3010	0.0 N	-1.5229	-2.1549	-2.5229
146	0.0 N	0.0 N	-2.6990	-2.1549	-2.5229	-3.3010	0.0 N	-1.5229	-2.1549	-2.6990
147	0.0 N	0.0 N	-2.8239	-2.1549	-2.1549	-3.1549	0.0 N	-1.5229	-2.1549	-2.8239
148	0.0 N	0.0 N	-3.0000	0.0 N	-2.3010	0.0 N	0.0 N	-1.1549	-2.3010	-3.0000
149	0.0 N	0.0 N	-2.8239	-2.1549	-2.0000	-3.1549	0.0 N	-1.5229	-2.1549	0.0 N
150	0.0 N	0.0 N	-3.0000	-2.0000	-2.3010	-3.3010	0.0 N	-1.6990	-2.3010	-3.0000
151	0.0 N	0.0 N	-2.6990	-2.1549	-3.5229	-3.3010	0.0 N	-1.0000	-2.1549	0.0 N
152	-4.0000	0.0 N	-2.6990	-2.3010	-3.3010	-3.3010	0.0 N	-1.8239	-2.1549	-2.5229

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	FE,LOG%	MN,LOG%	CA,LOG%	TI,LOG%
96	0.6990	-0.1549	-0.8239	-0.3010
97	0.8451	-0.3010	-1.0000	-0.5229
98	0.3010	-0.1549	-0.0000	-0.5229
99	0.8451	-0.0000	-1.1549	-0.3010
100	0.6990	-0.0000	-0.8239	-0.3010
102	0.4771	-0.3010	-1.0000	-0.5229
103	0.8451	-0.6990	-0.8239	-0.5229
104	0.8451	-0.6990	-0.6990	-0.1549
105	0.3010	-0.5229	-1.0000	-0.3010
106	0.1761	-0.1549	-0.8239	-0.3010
107	-0.0000	-0.3010	-0.8239	-0.3010
108	0.1761	-0.5229	-0.8239	-0.3010
109	0.8451	-0.3010	-0.8239	-0.3010
110	0.8451	-0.5229	-1.0000	-0.5229
111	0.6990	-0.3010	-0.8239	-0.3010
112	0.4771	-0.6990	-0.6990	-0.6990
113	0.3010	-0.3010	-1.0000	-0.6990
114	0.6990	-0.5229	-1.1549	-0.6990
115	0.4771	-0.3010	-1.1549	-0.6990
122	0.3010	-2.3010	-1.3010	-0.6990
123	0.3010	-1.0000	-1.1549	-0.6990
124	-0.6990	-0.3010	-1.3010	-0.5229
125	-0.5229	-0.3010	-1.1549	-0.6990
126	-0.3010	-0.3010	-1.0000	-0.5229
127	-0.3010	-0.1549	-1.0000	-0.6990
128	0.1761	-0.3010	-1.0000	-0.5229
131	0.3010	-0.1549	-1.0000	-0.6990
132	0.8451	-0.6990	-1.0000	-0.8239
133	0.1761	-0.3010	-1.0000	-0.6990
134	-0.0000	-0.3010	-1.0000	-0.6990
135	0.4771	-0.3010	-1.1549	-0.6990
136	0.1761	-2.0000	-1.3010	-0.5229
137	0.1761	-0.5229	-1.0000	-0.5229
138	0.1761	-0.3010	-1.1549	-0.5229
139	0.3010	-0.1549	-1.0000	-0.5229
140	1.0000	-0.6990	-0.6990	-0.8239
141	-0.0000	-0.6990	-1.0000	-0.5229
143	0.3010	-0.1549	-1.0000	-0.5229
144	0.1761	-0.1549	-1.3010	-0.5229
145	0.1761	-0.1549	-1.0000	-0.5229
146	0.4771	-0.6990	-0.8239	-0.5229
147	0.4771	-0.1549	-1.0000	-0.5229
148	0.3010	-0.1549	0.3010	-0.5229
149	-0.1549	-0.1549	-0.6990	-0.5229
150	0.4771	-0.1549	-1.1549	-0.5229
151	0.4771	-0.6990	-0.6990	-0.5229
152	0.3010	-0.1549	-1.3010	-0.5229

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	AU,LOG%	AG,LOG%	PB,LOG%	BI,LOG%	HG,LOG%	AS,LOG%	CU,LOG%	ZN,LOG%	MO,LOG%	BA,LOG%
153	-4.7212	0.0 N	-3.0000	0.0 N	-4.7447	-2.6990	-3.3010	-2.3979	0.0 N	-1.1549
154	0.0 L	0.0 N	0.0 N	0.0 N	-4.9208	-3.0000	-3.0000	0.0 L	-3.5229	-1.3010
155	0.0 L	0.0 N	-3.3010	0.0 N	-4.8239	-3.0000	-3.0000	-2.3010	-3.5229	-1.1549
156	0.0 L	0.0 N	-3.3010	0.0 N	-4.6990	-3.0000	-3.0000	-2.3010	-3.5229	-1.0000
157	-4.0000	0.0 N	-3.3010	0.0 N	-4.7959	-1.9208	-3.1549	-2.3010	-3.5229	-0.6990
158	-3.7773	0.0 N	-3.3010	0.0 N	-4.3979	-3.0000	-3.1549	-2.2218	-3.5229	-1.1549
159	-4.7447	0.0 N	0.0 N	0.0 N	-4.3565	-3.0000	-3.0000	-2.6021	-3.3010	-1.1549
160	-4.3979	0.0 N	0.0 N	0.0 N	-4.2840	-1.9208	-1.6990	-2.5229	-2.5229	-2.1549
164	-4.0458	0.0 L	-2.3010	0.0 N	-4.5528	-2.6990	-2.8239	0.0 L	-3.1549	-0.6990
165	-4.2218	0.0 L	-2.8239	0.0 N	-4.6198	-2.3979	-3.1549	0.0 L	-3.5229	-1.5229
202	-3.2076	0.0 N	-2.3010	0.0 N	-5.3979	-2.2218	-3.0000	0.0 L	-2.8239	-1.3010
203	-4.4437	0.0 N	0.0 N	0.0 N	-5.3979	-2.2218	-2.3010	0.0 L	-3.3010	-0.6990
204	-5.0000	0.0 N	0.0 N	0.0 N	-5.3979	0.0 L	-3.0000	0.0 L	0.0 N	-1.0000
205	-4.3372	0.0 N	-2.3010	0.0 N	0.0 L	0.0 L	-3.3010	-2.5229	0.0 N	-0.6990
206	0.0 L	0.0 N	-3.5229	0.0 N	-5.2218	-2.3979	-2.5229	-2.6021	-3.3010	-1.0000
207	-5.0000	0.0 N	-3.5229	0.0 N	-5.3979	-3.0000	-2.5229	-2.3010	-3.5229	-1.0000
208	0.0 L	0.0 N	-3.1549	0.0 N	-5.0000	-3.0000	-3.0000	-2.3010	-3.5229	-1.0000
209	0.0 L	0.0 N	-3.3010	0.0 N	-5.2218	-3.0000	-2.6990	-2.0000	-3.3010	-1.0000
210	0.0 L	0.0 N	-3.1549	0.0 N	-5.2218	0.0 L	-2.6990	-2.3979	-3.3010	-1.0000
211	-4.5229	0.0 N	-3.1549	0.0 N	-5.2218	-2.2218	-2.3010	-2.3010	0.0 N	-1.0000
212	-5.0000	0.0 N	-3.5229	0.0 N	-5.0969	-3.0000	-2.5229	-1.9586	-3.1549	-1.0000
213	0.0 L	0.0 N	-3.5229	0.0 N	-5.2218	-3.0000	-2.6990	-2.5229	-3.3010	-1.1549
214	0.0 L	0.0 N	-2.5229	0.0 N	-5.3979	-3.0000	-2.5229	-1.7212	-3.3010	-1.0000
215	0.0 L	0.0 N	-2.6990	0.0 N	-5.2218	-3.0000	-3.0000	-2.3010	-3.1549	-1.0000
216	0.0 L	0.0 N	-3.0000	0.0 N	-5.2218	-3.0000	-3.0000	-1.9208	0.0 N	-1.5229
217	0.0 L	0.0 N	-3.1549	0.0 N	-5.3979	-3.0000	-3.0000	-1.9586	-3.3010	-1.3010
218	-5.0000	0.0 N	-3.1549	0.0 N	-5.0969	-2.6990	-3.0000	-2.1549	-3.5229	-1.3010
219	-5.0000	0.0 N	-3.5229	0.0 N	-5.3979	-3.0000	-3.3010	-2.2218	0.0 N	-1.3010
224	0.0 L	0.0 N	0.0 N	0.0 N	-5.2218	-2.3979	-3.0000	0.0 L	-3.3010	-1.6990
225	-5.0000	0.0 N	-3.5229	0.0 N	-5.0969	-2.0969	-2.6990	0.0 L	-3.1549	-0.8239
226	0.0 L	0.0 N	-3.5229	0.0 N	-5.2218	-2.0000	-1.8239	0.0 L	-3.3010	-0.8239
227	0.0 L	0.0 N	-2.3010	0.0 N	-5.0000	-1.9208	-1.8239	-2.6021	-3.3010	-1.6990
228	-5.0000	0.0 N	0.0 N	0.0 N	-5.3979	-3.0000	-2.8239	-2.3010	0.0 N	-0.1549
229	0.0 L	0.0 N	0.0 N	0.0 N	-5.3979	-3.0000	-2.6990	-2.2218	0.0 N	-0.8239
230	0.0 L	0.0 N	-2.3010	0.0 N	-5.3979	-2.0000	-2.3010	-2.3010	-3.5229	-1.3010
231	-5.0000	-4.0000	-2.3010	0.0 N	-4.9586	-2.2218	-2.8239	0.0 L	-3.5229	-1.6990
232	-4.7959	0.0 N	-3.0000	0.0 N	-5.2218	-2.0969	-2.1549	0.0 L	-3.5229	-1.1549
233	-4.0177	-3.1549	0.0 N	0.0 N	-5.2218	-3.0000	-2.5229	0.0 L	-3.5229	-0.6990
234	-4.6990	0.0 N	-3.1549	0.0 N	-5.3979	-3.0000	-3.0000	-2.3010	-3.5229	-1.5229
235	0.0 L	0.0 N	-3.1549	0.0 N	-5.3979	-3.0000	-2.5229	0.0 L	-3.5229	-1.6990
236	-5.0000	0.0 L	-3.3010	0.0 N	-4.7696	-3.0000	-2.0000	0.0 L	-3.3010	-0.6990
237	0.0 L	0.0 N	-2.3010	0.0 N	-5.2218	-3.0000	-3.3010	0.0 L	-3.0000	-1.5229
238	0.0 L	0.0 N	-2.3010	0.0 N	-5.0000	-3.0000	-2.6990	0.0 L	-3.5229	-1.0000
239	-4.5850	-4.0000	-2.3010	0.0 N	-5.0000	-2.6990	-3.1549	0.0 L	-3.5229	-1.5229
241	-3.5129	0.0 L	-2.3010	0.0 N	-5.0000	-2.2218	-2.1549	0.0 L	-3.3010	-0.8239
242	-4.5528	0.0 N	-3.3010	0.0 N	-4.6990	-3.0000	-3.0000	0.0 L	-3.3010	-1.5229
243	-4.1079	0.0 N	-3.0000	0.0 N	-5.0000	-3.0000	-2.3010	0.0 L	-3.3010	-1.0000

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	BE,LOG%	CO,LOG%	CR,LOG%	LA,LOG%	MN,LOG%	NB,LOG%	NI,LOG%	SR,LOG%	V,LOG%	Y,LOG%
153	0.0 N	0.0 N	-2.8239	-2.0000	-2.3010	-3.3010	0.0 N	-1.3010	-2.3010	0.0 N
154	0.0 N	0.0 N	-2.8239	-2.1549	-2.1549	-3.3010	0.0 N	-1.3010	-2.3010	-3.1549
155	0.0 N	0.0 N	-2.8239	-2.3010	-2.1549	-3.3010	0.0 N	-1.3010	-2.3010	-3.1549
156	0.0 N	-3.1549	-2.6990	0.0 N	-2.1549	-3.3010	0.0 N	-1.6990	-2.1549	-2.8239
157	-4.0000	0.0 N	-2.8239	0.0 N	-2.3010	-3.3010	0.0 N	-1.3010	-2.3010	0.0 N
158	-4.0000	0.0 N	-2.6990	0.0 N	-1.6990	-3.3010	0.0 N	-1.5229	-2.3010	0.0 N
159	-4.0000	0.0 N	-2.6990	0.0 N	-2.3010	0.0 N	-2.8239	-1.5229	-2.0000	0.0 N
160	-4.0000	0.0 N	-2.6990	0.0 N	-1.8239	0.0 N	0.0 N	-1.1549	-1.6990	-3.0000
164	-4.0000	0.0 N	-2.6990	0.0 N	-1.8239	-3.1549	0.0 N	-1.1549	-2.1549	-2.6990
165	-4.0000	0.0 N	-2.6990	-2.1549	-2.5229	-3.1549	0.0 N	-1.5229	-2.1549	-2.6990
202	-4.0000	0.0 N	-2.5229	-2.1549	-2.3010	0.0 N	0.0 N	-1.3010	-2.3010	0.0 N
203	-4.0000	0.0 N	-2.6990	0.0 N	-2.0000	0.0 N	0.0 N	-1.6990	-2.1549	0.0 N
204	-3.8239	0.0 N	-2.6990	0.0 N	-2.1549	0.0 N	0.0 N	-1.5229	-2.3010	0.0 N
205	0.0 N	0.0 N	-2.5229	-2.3010	-2.3010	-3.5229	0.0 N	-1.1549	-2.1549	0.0 N
206	-4.0000	-3.0000	-2.6990	-2.3010	-1.0000	0.0 N	0.0 L	-1.3010	-2.1549	-2.8239
207	-4.0000	-3.0000	-2.6990	-2.3010	-1.3010	-3.1549	0.0 L	-1.1549	-2.1549	-2.8239
208	-4.0000	-3.1549	-2.8239	-2.3010	-0.6990	-3.3010	0.0 N	-1.3010	-2.1549	-2.8239
209	-4.0000	-3.0000	-2.5229	-2.3010	-1.1549	-3.3010	0.0 N	-1.1549	-2.1549	-3.0000
210	-3.8239	-2.5229	-2.6990	-2.1549	-1.1549	-3.3010	0.0 L	-1.1549	-2.1549	-2.3010
211	-4.0000	0.0 N	-2.6990	-2.1549	-2.0000	-3.1549	0.0 N	-1.1549	-2.1549	-2.6990
212	-3.8239	-2.5229	-2.6990	-2.1549	-0.5229	0.0 N	0.0 L	-1.3010	-2.1549	-2.8239
213	0.0 N	0.0 N	-2.6990	-2.3010	-2.3010	0.0 N	0.0 N	-1.5229	-2.1549	-3.0000
214	-3.8239	-3.1549	-2.5229	-2.1549	-2.0000	-3.3010	0.0 N	-0.8239	-2.1549	-3.0000
215	-3.8239	-3.1549	-2.6990	-2.1549	-2.0000	-3.3010	0.0 N	-1.3010	-2.1549	-3.0000
216	-3.8239	-3.0000	-2.6990	-2.3010	-1.8239	0.0 N	0.0 N	-1.5229	-2.1549	-3.0000
217	-3.8239	0.0 N	-2.6990	-2.1549	-2.3010	0.0 N	0.0 N	-1.3010	-2.1549	-2.6990
218	-4.0000	0.0 N	-2.5229	-2.3010	-2.1549	-3.5229	0.0 N	-1.3010	-2.1549	-2.8239
219	-4.0000	0.0 N	-2.1549	-2.3010	-2.0000	0.0 N	0.0 N	-1.3010	-1.8239	-2.5229
224	0.0 N	0.0 N	-2.5229	0.0 N	-1.8239	-3.3010	0.0 N	-2.1549	-2.1549	0.0 N
225	0.0 N	0.0 N	-2.3010	-1.5229	-2.0000	0.0 N	0.0 N	-1.0000	-2.0000	-2.0000
226	0.0 N	0.0 N	-2.5229	-2.1549	-2.3010	0.0 N	0.0 N	-1.6990	-2.1549	-3.0000
227	0.0 N	0.0 N	-2.5229	-2.3010	-3.0000	0.0 N	0.0 N	-1.1549	-2.3010	0.0 N
228	-3.0000	0.0 N	-2.5229	-2.3010	-2.1549	-3.0000	0.0 N	-1.5229	-2.1549	-3.0000
229	-4.0000	0.0 N	-2.5229	-2.3010	-2.1549	-3.0000	0.0 N	-1.8239	-2.1549	-2.5229
230	0.0 N	0.0 N	-2.3010	-2.1549	-2.5229	0.0 N	0.0 N	-1.1549	-2.0000	-3.0000
231	0.0 N	0.0 N	-2.5229	-2.1549	-2.3010	0.0 N	0.0 N	-1.0000	-2.0000	-2.8239
232	0.0 N	0.0 N	-2.5229	-2.3010	-2.5229	0.0 N	0.0 N	-0.8239	-2.1549	0.0 N
233	0.0 N	0.0 N	-2.5229	0.0 N	-1.8239	-3.1549	0.0 N	-1.3010	-2.0000	-3.0000
234	-3.8239	0.0 N	-2.5229	-2.1549	-2.0000	-3.1549	0.0 N	-1.1549	-2.0000	-2.6990
235	-3.8239	0.0 N	-2.5229	-2.1549	-2.1549	-3.1549	0.0 N	-1.3010	-2.1549	-2.6990
236	0.0 N	0.0 N	-2.6990	-2.3010	-1.8239	-3.1549	0.0 N	-2.3010	-2.1549	0.0 N
237	0.0 N	0.0 N	-2.5229	-2.1549	-1.8239	0.0 N	0.0 N	-0.6990	-2.0000	-2.8239
238	-4.0000	0.0 N	-2.5229	-2.3010	-1.8239	-3.1549	0.0 N	-2.1549	-2.1549	0.0 N
239	0.0 N	0.0 N	-2.5229	0.0 N	-1.8239	-3.1549	0.0 N	-1.5229	-2.0000	0.0 N
241	0.0 N	0.0 N	-2.5229	-2.0000	-2.1549	0.0 N	0.0 N	-0.8239	-2.0000	-2.8239
242	-3.8239	0.0 N	-2.5229	-2.3010	-2.0000	-3.0000	0.0 N	-1.5229	-2.1549	-3.0000
243	0.0 N	0.0 N	-2.5229	-2.3010	-2.0000	0.0 N	0.0 N	-1.0000	-2.1549	-3.0000

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	FE,LOG%	MN,LOG%	CA,LOG%	TI,LOG%
153	0.4771	-0.1549	-0.6990	-0.5229
154	0.3010	-0.1549	-0.8239	-0.5229
155	0.1761	-0.1549	-0.6990	-0.5229
156	0.1761	-0.1549	-0.0000	-0.5229
157	-0.1549	-0.3010	0.4771	-0.5229
158	-0.0000	-0.1549	-0.6990	-0.5229
159	0.1761	-0.1549	-0.0000	-0.6990
160	0.0 G	-1.0000	-1.1549	-1.0000
164	0.4771	-0.6990	-0.8239	-0.6990
165	0.1761	-0.3010	-1.0000	-0.5229
202	0.8451	0.8451	-0.8239	-0.5229
203	0.4771	-0.1549	-0.8239	-0.5229
204	-0.3010	-0.1549	-0.8239	-0.5229
205	-0.5229	-0.1549	-0.3010	-0.5229
206	0.3010	-0.5229	-0.5229	-0.5229
207	0.4771	-0.3010	-0.3010	-0.5229
208	-0.1549	-0.3010	-0.6990	-0.5229
209	0.3010	-0.1549	-0.6990	-0.5229
210	0.4771	-0.1549	-0.3010	-0.5229
211	0.3010	-0.1549	-0.3010	-0.5229
212	0.6990	-0.6990	-0.3010	-0.5229
213	0.4771	-0.3010	-0.6990	-0.5229
214	0.4771	-0.1549	-0.3010	-0.5229
215	0.3010	-0.3010	-0.5229	-0.5229
216	0.6990	-0.1549	-0.5229	-0.5229
217	0.4771	-0.3010	-0.5229	-0.5229
218	0.3010	-0.3010	-0.5229	-0.6990
219	0.4771	-0.1549	-0.5229	-0.5229
224	0.3010	-0.1549	-1.5229	-0.5229
225	1.0000	-0.3010	-1.3010	-0.6990
226	0.6990	-2.5229	-1.1549	-0.5229
227	0.6990	-3.1549	-1.1549	-0.6990
228	-0.5229	-0.5229	-1.5229	-0.5229
229	0.1761	-0.1549	-1.5229	-0.5229
230	0.4771	-0.6990	-1.3010	-0.5229
231	0.4771	-0.5229	-1.1549	-0.5229
232	0.4771	-1.8239	-1.1549	-0.6990
233	0.4771	-0.1549	-1.1549	-0.5229
234	-0.3010	-0.3010	-0.3010	-0.5229
235	-0.3010	-0.3010	-0.5229	-0.5229
236	0.6990	-0.3010	-1.5229	-0.5229
237	0.0 G	-1.3010	-1.0000	-0.6990
238	-0.5229	-0.1549	-1.5229	-0.5229
239	0.3010	-0.1549	-0.0000	-0.5229
241	0.8451	-0.3010	-1.0000	-0.5229
242	0.3010	-0.1549	-1.5229	-0.5229
243	0.4771	-0.3010	-1.1549	-0.6990

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	AU,LOG%	AG,LOG%	PB,LOG%	BI,LOG%	HG,LOG%	AS,LOG%	CU,LOG%	ZN,LOG%	MO,LOG%	BA,LOG%
244	0.0 L	0.0 N	-3.5229	0.0 N	-5.3979	-3.0000	-3.3010	0.0 L	0.0 N	-1.5229
245	-3.9318	0.0 L	-2.3010	0.0 N	-5.2218	-2.2218	-2.8239	0.0 L	-3.0000	-1.3010
247	-5.0000	0.0 N	-2.3010	0.0 N	-5.0000	-2.0969	-2.5229	0.0 L	-3.0000	-1.1549
248	-5.0000	-4.0000	-2.0000	0.0 N	-4.0969	-3.0000	-2.3010	0.0 L	-3.1549	-1.3010
253	-5.0000	0.0 N	-3.1549	0.0 N	-5.3979	-3.0000	-2.8239	0.0 L	0.0 N	-1.0000

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	BE,LOG%	CO,LOG%	CR,LOG%	LA,LOG%	MN,LOG%	NB,LOG%	NI,LOG%	SR,LOG%	V,LOG%	Y,LOG%
244	-3.8239	0.0 N	-2.5229	-2.3010	-2.3010	-3.0000	0.0 N	-1.5229	-2.1549	0.0 N
245	0.0 N	0.0 N	-2.3010	-2.0000	-2.1549	0.0 N	0.0 N	-0.6990	-2.1549	-3.0000
247	0.0 N	0.0 N	-2.5229	-2.0000	-2.3010	0.0 N	0.0 N	-0.8239	-2.0000	0.0 N
248	-3.8239	0.0 N	-2.5229	-2.3010	-2.0000	-3.1549	0.0 N	-1.0000	-2.1549	-3.0000
253	0.0 N	0.0 N	-2.5229	0.0 N	-2.3010	-3.3010	0.0 N	-1.1549	-2.1549	0.0 N

ARGILLIZED ROCKS, LOG PERCENT

SAMPLE	FE,LOG%	MN,LOG%	CA,LOG%	TI,LOG%
244	-1.1549	-0.5229	-1.1549	-0.6990
245	0.0 G	-1.0000	-1.1549	-0.6990
247	0.0 G	-0.3010	-1.1549	-0.6990
248	0.1761	-0.1549	-0.5229	-0.5229
253	0.3010	-0.5229	-1.1549	-0.5229

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Table 4

Table 4

Appendix K

Statistical data, 129 silicified rock samples from the Combination - January cuts

Element	% of samples below detection threshold	Geometric mean, X (log %)	Geometric standard deviations (log %)	Cohen's mean, X (log %)	Cohen's standard deviation, σ (log %)	Sichel's X, ppm
Au	0.8	-3.87	0.57	-3.88	0.58	3.2
Ag	35	-3.51	0.45	-4.32	1.21	20
Pb	0.8	-1.73	0.45	-1.75	0.49	330
Bi	65	—	—	—	—	—
Hg	0	-4.86	0.30	—	—	0.18
As	7.0	-2.49	0.49	-2.55	0.52	58
Cu	0	-2.78	0.42	—	—	27
Zr	72	—	—	—	—	—
Mo	54	-3.23	—	—	—	—
Ba	0	-1.20	0.21	—	—	700
Be	88	—	—	—	—	—
Co	95	—	—	—	—	—
Cr	2	-2.79	0.22	-2.82	0.26	18
La	64	—	—	—	—	—
Mn	0.8	-2.77	0.64	-2.78	0.66	52
Nb	67	—	—	—	—	—
Ni	91	—	—	—	—	—
Sr	0	-1.28	0.31	—	—	670
V	0	-2.20	0.18	—	—	68
Y	82	—	—	—	—	—
Fe	1.6 (6)	-0.01	0.52	0.01	0.54	22000
Mg	7	-1.94	0.46	-2.10	0.73	320
Ca	0	-1.16	0.31	—	—	880
Ti	0	-0.63	0.14	—	—	2500

Table H

Appendix L

Statistical data, 149 argillized rock samples from the Combination - January cuts

Element	% of samples below detection threshold	Geometric mean, % (log %)	Geometric standard deviations (log %)	Cohen's mean, % (log %)	Cohen's standard deviations (log %)	Sichel's $\hat{t}$, ppm
Au	40	-4.64	0.43	-4.95	0.55	0.25
Ag	58	—	—	—	—	—
Pb	11	-2.81	0.48	-2.95	0.60	29
Bi	98.7	—	—	—	—	—
Hg	1.3	-5.05	0.28	-5.06	0.29	0.11
As	13	-2.72	0.37	-2.95	0.45	19
Cu	0	-2.78	0.35	—	—	23
Zn	47	-2.30	0.24	-2.58	0.37	38
Mo	26	-3.28	0.24	-3.41	0.31	5.1
Ba	0	-1.12	0.33	—	—	1000
Be	32	-4.04	0.28	-4.31	0.47	0.88
Co	60	—	—	—	—	—
Cr	0	-2.66	0.17	—	—	23
La	15	-2.18	0.14	-2.26	0.23	63
Mn	0	-2.02	0.46	—	—	170
Nb	47	-3.22	0.15	-3.52	0.36	4.3
Ni	65	—	—	—	—	—
Sr	0	-1.28	0.36	—	—	730
V	0	-2.11	0.13	—	—	82
Y	22	-2.88	0.25	-3.09	0.46	14
Fe	3.4(6)	0.34	0.39	0.37	0.41	37000
Mg	0	-0.44	0.47	—	—	6600
Ca	0	-0.87	0.39	—	—	2000
Ti	0	-0.51	0.14	—	—	3300

Tellurium and antimony maps are not included because replicate analyses indicated that sample preparation and extraction problems affected the atomic absorption and colorimetric analyses for these elements. Replicate determinations resulted in values from 10 to as much as 100 times higher than the first determinations. Possibly tellurium and antimony in these rocks are very finely divided and were not quantitatively liberated from the quartz matrix with the original grinding and extraction procedure. Unfortunately, the original splits for many samples were depleted before this problem was satisfactorily solved, so the limited newer data are not worth examining in detail. The data available suggest, however, that both tellurium and antimony are enriched in metallized silicified rocks relative to surrounding argillized rocks.

Maps were not prepared for tin and cadmium, the two remaining potential indicator elements (ignoring selenium), because only 17 of the 278 samples from the cuts had 3 ppm or more of tin, and none of the samples had as much as 50 ppm of cadmium.

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Gold

All but three high gold values (greater than or equal to 3 ppm) and most intermediate gold values (1 to 2.9 ppm) are in silicified rocks (pl. 4). The three high values in argillized rocks are all from fault or shear zones adjacent to silicified zones (see locs. 5, 6, and 18, pl. 4). Of the six intermediate values in argillized rocks, two are from fault zones between argillized and silicified rocks (loc. 9 and fault at loc. 6), and two more are within 5 feet of silicified zones, but are not associated with prominent structures (locs. 4 and 19). The remaining two intermediate values, at locality 3, are at least 20 to 30 feet southwest of the nearest silicified rock contact exposed in the wall of the cut or projected along the floor of the cut toward locality 4, and are not associated with structures. All remaining samples from argillized rocks have less than 1 ppm gold; many have less than 0.1 ppm. (The detection threshold for gold for samples from the cuts is 0.1 ppm, whereas it is 0.02 ppm for the unaltered dacite samples and unoxidized silicified rocks discussed in the previous section).

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The histograms reflect the substantially different amounts of gold in oxidized silicified versus oxidized argillized rocks. The geometric mean for silicified rocks, 1.3 ppm, is more than 10 times that determined for argillized rocks, 0.11 ppm. The frequency distribution for silicified rocks is relatively symmetrical, with a rather broad peak between -4.00 and -3.50 log percent (between approximately 1 and 3 ppm). If ore samples had been available from the 12 locations at which old stopes intersect the walls of the cuts, the upper tail of the histogram, representing values of 10 ppm or more, would presumably be somewhat larger. A large number of values appear at the left end of each gold histogram, just above the detection threshold. Most of the readings that contribute to these large frequencies in the class interval immediately above the detection threshold are readings of "0.1 ppm." In fact, 44 of the 278 samples were read as 0.1 ppm, whereas only 17 samples were read between 0.1 and 0.2 ppm. This suggests that analytical discrimination was poor for samples near the detection threshold. Consequently, both readings of "0.1 ppm" and "less than 0.1 ppm" are given the same symbol on the map.

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Although silicification is by far the most important feature associated with relatively high gold values, the silicified zones do not show uniformly high values. The west edge of the vein system, exposed between localities 7 and 10 and on the wall to the west and north of the January shaft, shows the lowest values. The small silicified bodies at localities 14 and 15 also show low values. Along the wall between localities 2 and 5, even though the overall gold tenor is relatively high, many adjacent samples have substantially different amounts of gold. Moving southeastward along the vein system, individual exposures are unpredictable: relatively high values appear in the vicinity of locality 12, low values at locality 16, and high values again east of locality 19. Localities 18 and 20 are each represented by only one sample; more information would be needed to categorize these outcrops. The geochemical profile, which includes locality 12, shows nearly the maximum anomaly contrast that one would expect to see between metallized silicified rocks and argillized rocks, unless the sampling encountered ore-grade material. The geochemical profile also shows a sharp break within the large silicified zone at locality 12, produced by an isolated very low reading. Variations in values for the six samples between localities 6 and 7 provide another example. Irregularities like this apparently must be expected; such irregularities are a potential source of error when determining the average gold content of the silicified zones.

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Geologic processes must account for most of the abrupt variations in gold values, producing bunches of gold at the scale of an outcrop and even within a hand specimen. Before the oxidized-rock samples were processed for analysis, we removed and saved a 0.5- to 1-kg hand specimen from each sample. These hand specimens may be considered replicate samples from each of the localities shown on plates 3-~~13~~5. We obtained gold analyses for the replicate samples from 88 of the 129 oxidized silicified rock localities. We compared the original sample and replicate sample data for 65 of these localities, which showed 1 ppm gold or more in both the original analyses and the replicate analyses; analytical error is substantially lower above 1 ppm than below 1 ppm. Using Garret's (1969) method for comparing combined sampling and analytical error[1] to overall data variability by ~~utilizing~~ means of an F-test,

[1] The terms "sampling variance" and "sampling error" refer to variation introduced into the data by samples or analytical portions of samples that are not truly representative of the localities from which they were taken. The terms "analytical variance" and "analytical error," on the other hand, refer to variation introduced into the data by imprecision in the laboratory analytical procedure.

σ_{SA}^2 (combined sampling and analytical variance) is 0.058, σ_D^2 (data variance) is 0.11, and the value of F calculated is 1.90. Tables of the F distribution give 3.92 for degrees of freedom 1,128 at the 95-percent-confidence level (1.34 at the 75-percent-confidence level). Since our calculated F does not exceed 3.92, we must conclude that

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chances are greater than one in 20 (but less than one in four) that combined sampling and analytical variance is responsible for the variability seen in samples containing more than 1 ppm gold. Sampling error related to removal of material from an outcrop or face is therefore an appreciable problem.

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Sampling error related to removal of an analytical portion from a crushed, ground, and mixed sample may contribute to variations in gold values also. Gold for atomic absorption analysis was extracted from only 2 grams of sample, an analytical portion very much smaller than the field sample, which was 2 to 3 kg. Gold was separated from approximately one-half-kilogram portions of the three samples having the highest gold values: the largest gold particle recovered was a thick flake 0.07 mm in diameter (W. J. Keith, unpub. data). Applicable here is the diagram prepared by Clifton, Hunter, Swanson, and Phillips (1969, p. C8) relating gold particle mass (and particle dismeter, for both spheres and flakes) to size of analytical portion expected to contain 20 gold particles for samples of various true grades.[1] Their diagram shows that sampling error is acceptable for 0.07 mm flakes only if the true grade is larger than about 10 ppm. Gold flakes not quite twice as large (0.125 mm) or gold spheres of about the same diameter (0.062 mm) would produce sampling error for rocks having a true grade less than about 30 ppm, which is nearly the same as the highest reading (29 ppm) obtained in this study. Most of the gold is probably smaller than 0.07 mm and most 2-gram analytical portions probably contain more than 20 particles of gold, but it is likely that a relatively few

[1] If a sample contains 20 particles of gold, it is 95 percent probable that the true gold value will be within a range of values from approximately 50 percent more to approximately 50 percent less than the value obtained by chemical analysis (Clifton and others, 1969).

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larger gold particles significantly affect the readings for some samples. The replicate samples described above and unaltered dacite, unoxidized silicified dacite, and unoxidized average-grade ore samples were analysed using a 10-gram analytical portion. With an analytical portion of this size 0.062-mm gold spheres (or 0.125-mm gold flakes) would produce sampling error at true grades below about 6 ppm, and 0.062-mm gold flakes would produce sampling error only at true grades below about 0.8 ppm. We can expect, then, that in silicified rocks with enough gold to be of economic interest, sampling error due to removal of an analytical portion from a crushed, ground, and mixed sample should be a minor problem when using 10-gram or larger analytical portions.

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The results described above indicate that any program meant to determine grades and tonnages of the low-tenor silicified rocks in the Combination-January area must be designed with ~~caution.~~ care. Gold analyses by atomic absorption probably should be done using 10-gram analytical portions. Fire assay, utilizing 29.167 grams of sample, would also be appropriate. Since the main objective of this report is delineating indicator elements for gold, some error related to field sampling and removal of analytical portions is not objectionable, but for a more precise determination of ore grade, more careful field sampling and analysis would be necessary. The replicate sample results indicate, however, that in this study we cannot attach a great deal of significance to the exact gold value determined for any given sample.

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With the foregoing discussion in mind, it is of interest to estimate the grade of unmined silicified rock exposed in the cuts, using the data at hand. The geometric means calculated for various elements in the several data sets discussed in this report are suitable for comparison with one another, but Sichel's t provides a better estimate of true abundance than the geometric mean (see introduction, p. 20). For the silicified rocks of the cuts, t is 3.0 ppm. With 95-percent confidence, the true abundance should be between 2.4 and 3.8 ppm (confidence interval calculated by method of Aitchison and Brown, 1963, p. 50). One part per million gold is equivalent to 0.0291667 ounce troy [$1] per short ton; specifically, 3 ppm is equivalent to 0.088 ounce per ton and the corresponding confidence interval is 0.070 to 0.11 ounce per ton. These amounts of gold, although subeconomic, are large enough to commend further exploration and evaluation of the remaining vein material.

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Lead

Silicified rock samples show many high lead values (200 ppm or more) and intermediate lead values (70 to 150 ppm), whereas argillized rock samples show only 5 high values and 10 intermediate values (pl. 5). Some of the intermediate values in argillized rocks are adjacent to silicified zones, as at locality 12 and near localities 10 and 18. An intermediate value appears in a shear zone adjacent to silicified rock at locality 15, and a high value appears in a fault zone adjacent to silicified rock at locality 4. Four of the five high values for argillized rocks are grouped together north of locality 4. This group of relatively high-lead samples has no distinctive structural or alteration feature associated with it.

The anomaly contrast shown by the profile is representative of what one might expect along any traverse across the strike of the silicified zones in the vicinity of the cuts. The anomaly contrast is as strong as that for gold itself, and in some possible profiles it might well be stronger.

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Consistently high lead values appear within the silicified zones in the areas characterized by high gold values. Between localities 7 and 10, scattered high lead values accompany intermediate gold values. Other smaller silicified outcrops all show some degree of consistency between gold and lead values, but it would be difficult to predict gold tenor from lead readings. The histogram for silicified rocks (pl. 4) shows large frequencies in four class intervals above the geometric mean: 200, 300, 500, and 700 ppm, so the frequency distribution looks skewed toward the higher values, with a very small upper tail above 700 ppm. The frequency distribution for gold, by comparison, shows a long, relatively smoothly declining upper tail above the geometric mean. Thus even though an area may show some very high gold values, along with some high and intermediate values, almost all the lead readings are between 200 and 700 ppm. Lead values from oxidized silicified rocks therefore give no idea about the highest gold values to be anticipated, but on the other hand, lead values of 200 ppm or larger indicate that gold values of at least 1 ppm will be found nearby (locality 16 is an exception). A different method of chemical analysis offering greater analytical precision for rocks with true lead values between 100 and 1,000 ppm might improve the correlation between gold and lead for individual samples, but geologic factors, rather than analytical precision, may account for the limited range of variation for lead in relatively gold-rich samples (see interpretation section, p. 82-82a). The apparent "ceiling" on lead values has an advantage for geochemical exploration, in that lead might well show broader, less ragged anomalies over potential gold ore bodies than would gold itself.

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Silver

All high silver values (greater than or equal to 10 ppm) appear in silicified rocks (pl. ~~6~~ 4). All intermediate values (3 to 7 ppm) but one are also in silicified rocks; the single exception appears at locality 17 in argillized rocks associated with a fault zone. Of the 8 low values (between 1 and 2 ppm) in argillized rocks, 3 are adjacent to silicified zones (loc~~alities~~ality 12, 13, and 19), and one other is in a fault zone (southeast of loc~~ality~~ality 17). Almost all the oxidized argillized samples and 48 of the oxidized silicified rock samples (37 percent) bear less than 1 ppm silver. Obviously, no notable silver halo exists in argillized rocks. The geochemical profile shows anomaly contrast typical of what might be expected many places in the cuts. One can anticipate that profiles run northeast of the January shaft, however, might produce anomalies twice as strong as those shown on ~~the~~ profile AA'. The gold and silver patterns in the silicified zones are grossly similar, even though larger areas within the zones show relatively low silver values.

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The semiquantitative spectrographic data available for silver ~~is~~ are not precise enough to allow a good determination of silver tenor in the oxidized silicified rocks. Even an approximate estimate is not possible because the detection threshold for 26 of the silicified rock samples (20 percent) was 1 ppm, due to spectral interference, rather than the usual 0.1 ppm. In calculating the geometric mean for the silicified rocks by Cohen's method, the lower of these two detection limits, 0.1 ppm was used, possibly biasing the result toward low values. Furthermore, the histogram for silver in silicified rocks is very irregular; possibly more data with higher analytical precision would show a polymodal frequency distribution. The resulting geometric mean shown with the histogram on plate 6 has such a large standard deviation associated with it that it has little meaning. The data ~~does~~ suggest, however, that fire assays of samples taken northeast of the January shaft should show some silver values as high as 1 ~~oz~~ ounce troy per short ton.[1]

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[1] One part per million by weight is equal to 0.0291667 ~~oz~~ ounce troy per short ton.

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Bismuth

Only two oxidized argillized rock samples yielded detectable amounts of bismuth (5 ppm). Readings from 45 oxidized ~~Forty-five~~ silicified samples range ~~show readings ranging~~ from 5 to as much as 200 ppm, but the majority of the silicified samples (65 percent) also have less than 5 ppm bismuth. Clearly, the 5-ppm detection threshold provided by the semiquantitative spectrographic technique employed is too high to provide enough data for many conclusions about geochemical relationships. Bismuth cannot be fully evaluated as an indicator element for gold, but it obviously shows a strong preference for silicified zones, and most of the intermediate and high bismuth values appear northeast of the January mine shaft, in an area characterized by intermediate and high gold values (pl. 4).

Only three readings above the detection threshold appear along the geochemical profile line, so the profile for bismuth is not included with plate 4.

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Mercury

The oxidized silicified rocks of the cuts contain more mercury than do the oxidized argillized rocks. The averages for the two data sets are not greatly different (see histograms on pl. ~~8~~ 4), but they are significant statistically, at the 99-percent-confidence level. Plate ~~8~~ 4 bears this difference out for most of the area of the cuts: silicified rocks along the south and west sides of the largest cut, continuing into the area northeast of the January shaft, have many intermediate (0.11 to 0.30 ppm) and high (greater than 0.30 ppm) mercury values. Throughout the southeastern cut (loc~~ality~~ 16 to loc~~ality~~ ~~8~~ 20), silicified and argillized rocks are similar. The silicified rock east of locality ~~10~~ 19 has intermediate to high gold values, but it is expressed no more distinctly on the mercury map than is locality 16. On the other hand, the area northeast of the January shaft with high gold values certainly has the most mercury. The consistently intermediate to high mercury values south of locality ~~9~~ 4 and between localities ~~9~~ 3 and ~~11~~ 4 [~~furthermore,~~] suggest that mercury halos may extend 30 to 35 feet into argillized rocks from silicified zone contacts in gold-bearing areas. The width of this possible halo, however, is small relative to the width of the adjacent silicified zone: about 90 feet at locality ~~9~~ 4. Also, the geochemical profile reveals that the anomaly contrast is very low.

The histograms jointly show that the total range of mercury values is barely two orders of magnitude, compared to at least three, and probably four orders of magnitude for gold, so one cannot expect mercury anomalies to be very strong. Under these circumstances, relatively narrow halos extending into argillized rocks are not particularly valuable for reconnaissance sampling. They might be of minor value for a detailed sampling program in a small area.

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Arsenic

The Gutzeit colorimetric method used for arsenic determination has a reporting interval that becomes larger with increasing values, but is arithmetic within certain ranges of values. Some problems result when subdivision of the data into ranges of values for the histogram and for the geochemical map. Values reported for the oxidized rocks of plate ~~8~~ 5 are: less than 10, 10, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200, and 250 ppm. Corresponding log percent figures are: less than -3.000, -3.000, -2.699, -2.398, -2.222, -2.097, -2.000, -1.921, -1.854, -1.796, -1.744, -1.699, and -1.602. Within this range of values the interval is arithmetic except for the upper and lower ends of the range. The histograms (pl. ~~8~~ 5) are based on the logarithms of the reported values, however, to avoid overemphasizing values of 200 ppm or more, and to make the histograms more easily comparable with those on the other plates. The resulting histograms, with class intervals determined by Sturges' rule, have null class intervals below -2.500 log percent. Other class intervals, determined arbitrarily, will not eliminate the problem unless one reduces the number of class intervals to three or four, and this, in turn, eliminates variations shown in the upper parts of the histograms. Such treatment also subdues the fact that a disproportionate number of values for both silicified and argillized rocks were read as 10 ppm; "10 ppm" was reported for 49 of the 129 silicified rocks (38 percent), and 74 of the 149 argillized rocks (49.7 percent), whereas "less than 10 ppm" was reported for only 7.0 percent of the silicified rocks and 12.8 percent of the argillized rocks. Analytical discrimination was apparently poor near the detection threshold for

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the Gutzeit colorimetric test. Readings of less than 10 ppm and 10 ppm are therefore given the same symbol on plate 15. This same problem arose with gold readings near the gold detection threshold of 0.1 ppm, and was treated similarly.

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61b (p. 61c follows)
~~50a~~ (p. ~~51~~ follows) 61A

The geometric means indicate that oxidized silicified rocks have about twice as much arsenic, overall, as do oxidized argillized rocks. Since the problems with reporting interval and analytical discrimination produce discontinuities among the smaller data values, as shown by the histograms, the validity of these geometric means is questionable. The percentages of samples read as "less than 10," "10," "20," and "40" ppm, however, are generally similar for the two data sets, so improved analyses would likely have similar effects on both frequency distributions and both geometric means. The upper parts of the two frequency distributions, clearly different, probably would not be substantially changed. Both geometric means would likely be decreased with better analyses, but the difference between them would probably not be changed much.

Although oxidized silicified rocks contain more arsenic than oxidized argillized rocks, as is the case for the preceding elements, the relationship between arsenic and gold is not consistent (compare pl. 5 with pl. 4). Intermediate (60 to 80 ppm) and high (100 ppm or more) arsenic values accompany moderate to high gold values for most, but by no means all, samples northeast of the January shaft. Arsenic values are relatively lower than gold values for the area between localities 6 and 7, relatively higher than gold values for the area between localities 8 and 10, relatively lower in the vicinity of locality 12, and relatively higher at locality 16. The other silicified rock outcrops show a few samples with concordant gold and arsenic values, but these are but a small percentage of the silicified rock samples.

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 (p. 62 follows)

Intermediate and high arsenic values appear at many localities in oxidized argillized rocks. Some are associated with fault zones and shear zones, but many are not. Halos around silicified zones do not exist. The geochemical profile shown is typical for argillized rock areas, but gold-bearing silicified rocks could show greater arsenic anomaly contrast in profiles taken at some other locations. With the small range of variation in the data, however, even a profile taken in the northwestern part of the cuts would show only modest anomaly contrast. For geochemical exploration, arsenic is not reliable as an indicator for gold.

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Copper

The maps for copper and gold (pls. ~~10~~ 5 and 4) are dissimilar except for a group of high-gold samples in the vicinity of locality ~~20~~ 1 that also show high copper values. The histograms for oxidized silicified rocks and argillized rocks are much the same, and the two data sets have nearly the same range of values. The geometric means and deviations are not significantly different statistically at the 95-percent-confidence level~~, and the geometric standard deviations are not much different~~. Throughout the map area, fault zones and shear zones are not particularly favorable to high copper values relative to less broken ground.

Obviously copper cannot be used as an indicator element for gold in ~~this~~ oxidized silicified rocks. The geochemical profile (pl. ~~10~~ 5) bears this out. The question arises whether some areas of argillized rock with intermediate and high copper values, such as those between localities ~~12~~ 10 and ~~15~~ 12 and between localities 16 and 17 represent a halo. One or more longer profiles across strike would be helpful in answering this question, but the low values between localities ~~9~~ 3 and ~~11~~ 4 and the lack of a systematic decrease in values from locality ~~15~~ 12 to locality ~~19~~ 11 indicate that a halo is not consistently developed.

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Molybdenum

Most silicified outcrops show only a few scattered intermediate and high molybdenum values with no consistent relationship to gold values. Some intermediate (7 to 10 ppm) and high (15 ppm or more) molybdenum values are scattered throughout the high-gold area northeast of the January shaft (pl. ~~11~~ 5), The overall tenor of molybdenum is higher in oxidized argillized rocks than it is in oxidized silicified rocks. The intermediate and high molybdenum values in argillized rocks are also scattered, but about half of these values are associated with faults and shear zones (west of loc. 2, at loc. 5, near loc. 6, north of loc. 13, near loc. 14, and south of loc. 16). No coherent halo is developed in argillized rocks. The geochemical profile demonstrates that molybdenum values cannot be predicted on the basis of alteration and structural criteria.

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Zinc

Except for a few scattered intermediate (50 to 90 ppm) and high (100 ppm or more) values, zinc is relatively scarce in the oxidized silicified rocks (pl. ~~12~~ 5). Intermediate zinc values appear near silicified zones between localities ~~12~~ 10 and ~~19~~ 11, 16 and 17, and at locality ~~11~~ 3, suggesting that zinc may form a geochemical halo. As is the case with copper, however, other areas near gold-bearing silicified rocks, particularly between localities ~~15~~ 11 and ~~19~~ 12 and between localities ~~9~~ 3 and ~~11~~ 4 are not enriched in zinc, so again a halo is not consistently developed. The group of intermediate and high values found along the cut wall east of locality 14 and 100 feet northeast of locality ~~18~~ 13 show no systematic relationship to faults or shear zones.

The geochemical profile for zinc is not particularly informative, so it is not included with plate ~~12~~ 5.

Iron (pl. ~~15~~) will be considered in the next section of the report.

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Interpretation of the geochemical maps:

Separating effects of hypogene and supergene processes

General

The distribution of gold and other ore-related metals in the Combination-January cuts is the result of two processes: hydrothermal alteration culminating in metallization, and oxidation. Here metallization is a primary (and epigenetic) geochemical dispersion process, whereas oxidation and accompanying dissolution and redeposition of the epigenetic elements constitute a secondary geochemical dispersion process. The following section describes the evidence for and the degree to which the map pattern for each element is the result of secondary rather than primary dispersion processes.

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Mobility of elements in the zone of oxidation

The Goldfield hydrothermally altered rocks, both silicified and argillized, have ubiquitous pyrite (Ransome, 1909, p. 113-114; and our observations), which makes strong supergene alteration possible. In the prevailing arid climate, surface water descends to the water table, reacting with pyrite above the water table to yield Fe^{2+}, Fe^{3+}, HSO_4^-, and $SO_4^=$. Usually most of the iron reacts further to form limonite minerals (goethite, FeO(OH), and hematite, Fe_2O_3). Where ore is exposed to meteoric waters, other sulfides and sulfosalts are also oxidized to yield metal cations and sulfate ion ($SO_4^=$). Studies on mine waters (Baas Becking and others, 1960; Sato, 1960) and on experimental oxidation of iron and manganese (Sato, 1960) indicate that Eh values in oxidizing sulfide ore deposits may be as high as +0.6 to +0.86 volt with low accompanying pH values of 2 to 3. Any metal whose compounds (hydroxide, carbonate, chloride, and particularly sulfate) are soluble[1] in these relatively high-Eh and low-pH aqueous solutions will be more or less mobile in this environment. Highly mobile (soluble) elements, such as copper, may be thoroughly leached, destroying their primary dispersion patterns. Metals having intermediate mobility, such as molybdenum, are transported only short distances and precipitated, some along with limonite. Some metal cations are easily reduced to the native metal and precipitated (mercury), or form stable compounds that remain essentially in place

[1] Garrels and Christ (1965) consider a species with an activity of 10^{-6}m or greater soluble in the framework of geologic processes.

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(lead). The latter elements should reveal relict primary dispersion patterns. Copper, and silver to a lesser extent, may be redeposited below the water table to form a supergene enrichment zone. The samples from the cuts at Goldfield, however, lie approximately in a plane parallel to the ground surface and within the upper part of the oxidized zone, so supergene enrichment effects can be ruled out. Ransome (1909, p. 170-174), in describing Goldfield oxidized ores and changes in the ores with depth, does not mention supergene enrichment at or near the water table, but we have found indications that supergene enrichment occurs at least locally (p. ~~91~~ 109). Leaching effects should be essentially the same in rocks of the cuts as at the ground surface.

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A number of authors give relative mobilities for many of the metals being considered here. ~~Figure 7~~ Table 5 summarizes information given

~~Figure 7 near here~~ TABLE 5 NEAR HERE

by three authors, who have in turn assembled data from other sources. The figure shows that we may expect zinc to be highly mobile, copper and molybdenum to be moderately to highly mobile, silver and gold to be moderately mobile, arsenic to be immobile to moderately mobile, and lead, bismuth, antimony, and tellurium to be immobile. Krauskopf (1967) and Hawkes and Webb (1962) agree that Hg should show low mobility in solution, but Hawkes and Webb indicate that Hg may be very mobile in the vapor phase.

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Table 5 -- Relative mobilities of various metals during oxidation

Mobility		Reference: Kraus-kopf (1967)	Hawkes and Webb (1962)	Andrews-Jones (1968) // Oxidizing	Andrews-Jones (1968) // Acid
High	Very high	Zn	Cu	—	—
			Zn		Mo
	High	Cu	Mo	Mo	Zn
				Zn	Cu, Hg, Ag, Au
Medium		Ag	Mo	Cu, Hg, Ag, Au	
		Au 2/	Au (?)	As	As
			Fe		
Low	Low	Au 2/	Pb	Pb	Pb, Bi,
		Pb	As	Bi	Sb
		Hg	Hg	Sb	Fe, Mn
			Bi (?)		
	Very low	Fe	Ag (?)	Fe, Mn	
			Fe	Te	Te
		Mn	Mn		

1/ Taken from Table 1 of Andrews-Jones, "relative mobilities of the elements in the supergene environment," data from Perel'man (1967), Hawkes and Webb (1962), and Ginzburg (1960). Environmental conditions categorized on Table 1 include oxidizing, acid, neutral to alkaline, and reducing. Both oxidizing and acid appear to apply to oxidizing sulfide ore deposits in a desert area.

2/ Krauskopf (1967, p. 525) concludes on the basis of laboratory data and thermodynamic calculations that "... appreciable transportation of gold should be a rare and local phenomenon..." See also Cloke and Kelly (1964).

During oxidation, groundwater passing through rocks bearing pyrite and other sulfide minerals dissolves and carries away mobile elements, accomplishing leaching. Where such ground water encounters mine workings, it evaporates, leaving coatings and crusts of hydrated sulfates which incorporate the metals actively being leached (see for example Lovering, in Morris and Lovering, 1952). Such coatings are common on the walls of mine workings beneath oxidizing sulfide ore bodies, and hydrated iron sulfates are usually the most abundant constituents of the coatings; these hydrated iron sulfates, formed from iron released by the oxidation of pyrite, are intermediate products that are eventually converted to hematite and goethite (Blanchard, 1968, p. 51-55). Eight samples of secondary hydrated sulfates from walls of workings in the Florence mine (table 6 and fig. 2) contain relatively large amounts of copper and zinc, lesser but

TABLE 6 NEAR HERE

notable amounts of bismuth and molybdenum, and cobalt, nickel, and manganese as well. None of the seven hydrated iron sulfate samples contain as much as 1 ppm silver, but the gypsum sample contains 3 ppm silver. None of the samples has as much as 7 ppm lead. The detection thresholds for gold (15 ppm), arsenic (200 ppm), antimony (100 ppm), and tellurium (1,000 ppm) are too high to allow significant amounts to be recognized, except for antimony in gypsum (700 ppm). All the sulfates sampled except gypsum are readily soluble in water, so they were separated and cleaned by hand picking; consequently not enough material was available for extensive chemical testing.

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Table 6.

Spectrographic analyses of supergene hydrated sulfates, Florence mine

Sample	Mineralogy	Ag	Bi	Cu	Mo	Zn
F-250-8	Halotrichite $(Fe,Mg)Al_2(SO_4)_4 \cdot 22H_2O$	N (1)	10	15000	30	1500
F-350-1A	Halotrichite	N (1)	20	5000	15	700
F-350-1B	Melanterite $FeSO_4 \cdot 7H_2O$	N (1)	30	700	N(2)	1000
F-350-4A	Copiapite $(Fe,Mg)Fe_4(SO_4)_6(OH)_2 \cdot 20H_2O$	N(1)	20	3000	10	1500
F-350-4B	Halotrichite-coquimbite mixture $Fe_2(SO_4)_3 \cdot 9H_2O$	N(1)	50	2000	10	1000
F-350-8B	Halotrichite-rozenite mixture $FeSO_4 \cdot 4H_2O$	N(1)	10	50	N(2)	3000
F-350-9C	Rozenite $FeSO_4 \cdot 4H_2O$	N(1)	N(7)	200	7	2000
F-350-3A	Gypsum $CaSO_4 \cdot 2H_2O$	3	70	100	N(2)	N(100)

Headnote ~~Notes:~~

N = not detected at limit of detection, which is given in parentheses in ppm. All other figures in ppm. Data for other ore-related elements are: Au, N(15) for all samples; Pb, N(7) for all samples; As, N(200) for all samples; Cd, N(50) for all samples; Sb, N(100) for all samples except 700 for F-350-3A; Sn, N(7) for all samples, Te, N(1000) for all samples. Other elements present in notable amounts include Mn (30-300), except for F-350-3A (with 3), Co (50-1000), except for F-350-3A (with N(2)), Ni (15-50 except for F-350-3A (with N(1)).

~~Samples dried for at~~

[Analyst H. Bastron.

The workings in the Florence mine generally follow a north-trending silicified zone which forms the southern extension of the Combination vein system, as previously mentioned. The silicified zone and ore shoots within it dip steeply, and the Florence shaft passes close to the silicified zone from the surface all the way down to the 350-foot (7th) level. Silicified rock is oxidized to the 100-foot (2d) level, but little oxidation appears on the 150-foot (3d) level and none below it (Ransome, 1909, p. 227). A small flow of water has entered the 350-foot level since at least 1908 (Ransome, 1909, p. 230). Sample localities F-350-3 and F-350-4 are crusts from the only part of the mine that was wet at the time of sampling. The sulfates at localities F-350-8 and F-350-9 form incrustations also; this part of the mine was probably wet at some time in the past. Localities F-250-8 and F-350-1 yielded fluffy efflorescences typical of most of the mine; these apparently form in dry parts of the mine as small quantities of ground water reach the walls and evaporate.

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The sulfate sample localities are related to known ore bodies as follows. Sample F-250-8 lies between 50 and 100 feet beneath and to the east of the stope developed in the Sweeney lease, one of the largest single ore bodies in the district (Ransome, 1909, p. 154, 225-228; Newmont Mining Corporation, unpublished maps). Localities F-350-3 and F-350-4 lie about 120 to 200 feet from the Sweeney stope, being a few tens of feet to the south and east of a vertical projection of the stope to the 350-foot level. Another smaller stope lies approximately 60 to 100 feet above and immediately to the south of these two sample localities. A stope approximately 250 feet above the localities was entirely of oxidized ore (Ransome, 1909, p. 228). Locality F-350-1 is from the wall of a stope along a fault that may continue to the northeast into the Engineers' lease (Ransome, 1909, pl. XXXV, p. 232). Localities F-350-8B and F-350-9C lie between 120 and 230 feet below and to the west of the Sweeney stope. No ore bodies are known to have been mined from the ground immediately above these samples.

Most of the mine workings from which the sulfates came were made between 1903 and 1905 (Ransome, 1909, p. 225-226 and plate XXXV; M. C. Duffy, oral commun., 1966). The tunnel from which samples F-350-8B and F-350-9C came (fig. 3) is a crosscut driven about 1919 (Searles, 1948, p. 20). Thus the sulfate coatings, which were sampled in September 1966, are the result of 47 years to over 60 years of supergene leaching of low-grade unmined silicified rocks, and possibly unknown small bodies of high-grade ore.

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Comparing amounts of elements shown in table 6 with amounts shown in figure 6, the potential indicator elements for gold can be qualitatively arranged in order of decreasing mobility as follows: zinc, molybdenum, copper, bismuth, silver, lead. Information is inadequate or lacking for gold, arsenic, and mercury. This arrangement must be approximate because geochemical information is lacking for average-grade ores taken from the Florence mine. Silver was unusually scarce in ores from the Florence (Ransome, 1909, p. 230), so silver might be more mobile than indicated.

Secondary sulfates such as those analyzed here were used by Lovering (in Morris and Lovering, 1952) to determine supergene mobilities of gold, silver, lead, copper, and zinc in the Tintic district, Utah. His results generally agree with ours, even though his samples contained larger amounts of these metals, and he considered differences in mobility related to several different wall rock environments.

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Iron and managanese

Iron and manganese are included in table 5 because they are both easily oxidized and precipitated as hematitie, goethite, and various manganese oxides and hydroxides. Several other elements, among them arsenic, copper, molybdenum, and zinc, may be precipitated with these minerals or adsorbed by them (Hawkes and Webb, 1962, p. 162-177). Since these four elements are potential indicator elements for gold, it is appropriate here to discuss the distribution of iron and manganese in the rocks of the Combination-January cuts.

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Iron does not seem to show consistent preferences for any lithology or structural environment. Many high and very high iron values are associated with fault zones, but the majority of such values are not (see pl. ~~13~~ 5). The most important thing to note is that unaltered dacite, unoxidized silicified dacite, and unoxidized average-grade ores contain 4.3, 4.7, and 6.8 percent iron, respectively (geometric means, see fig. 6 and tables 1 and 2), but the oxidized silicified dacite and oxidized argillized dacite of the cuts average only 1.0 and 2.3 percent iron, respectively (see histograms, pl. ~~13~~ 5 and ~~1~~ column, tables 3 and 4). This means that even though hematite and limonite stain many of the rocks of the cuts conspicuously, much iron has been removed. Figure 6 shows that essentially all iron is retained during hydrothermal alteration and ore deposition except in the high-grade ores, which occurred in relatively small volumes; the iron removed from the cuts, therefore, must have been leached during oxidation. In the few unoxidized argillized rocks we have examined from the Florence mine and elsewhere in the Goldfield altered area, pyrite mostly replaces former mafic minerals, just as it does in unoxidized silicified rocks. Before oxidation, therefore, the amounts of iron in silicified and argillized rocks must have been similar, so that the oxidized silicified rocks were more strongly leached than the oxidized argillized rocks. The most likely explanation for this is that numerous small postalteration fractures remain open in the oxidized silicified rocks, whereas in oxidized argillized rocks they are squeezed shut. These small fractures have diverse orientations and

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are easily visible in the silicified rocks along the cut walls. Locally they are so abundant that from a distance the rock looks brecciated. The same small fractures in argillized rocks, on the other hand, are much tighter and can only be seen readily on freshly excavated surfaces. The histograms show that both oxidized silicified and argillized rocks have a wide range of iron values. Probably differences in porosity, permeability, and other properties affecting movement of ground water and reactivity of ground-water solutions would have to be considered to explain details of the iron distribution map. The present petrographic division of the data, in spite of the obvious differences in physical properties between silicified and argillized rocks,[1] is

[1] An exception is the advanced argillic rocks (12 samples), included with silicified rocks because of their alunite-bearing mineral assemblages. These rocks appear physically similar to argillized rocks (see p. ~~36~~ 32).

inadequate for evaluating these factors. Clearly iron, even though it is quite immobile once it forms limonite, has undergone considerable redistribution during oxidation at Goldfield. It will be useful to compare the iron map with the maps for potential indicator elements to assess the extent of supergene dispersion of each element.

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Manganese should behave in the same way iron does during oxidation (see table 5). Manganese, like iron, is depleted in oxidized silicified rocks (geometric mean 17 ppm, Sichel's t 52 ppm) relative to oxidized argillized rocks (geometric mean 96 ppm, Sichel's t 170 ppm) (see table 4), but manganese, unlike iron, is strongly and progressively depleted during hydrothermal alteration and ore deposition (see fig. 6 and discussion, p. 28). It seems likely that manganese was removed from both silicified and argillized rocks of the cuts during hydrothermal alteration, and probably more was removed at that time from silicified rocks. The secondary sulfates previously described show 100 to 300 ppm manganese, which indicates some movement during oxidation. Manganese therefore was probably removed during both hypogene and supergene alteration so that it is of little use for determining whether other elements have undergone supergene redistribution; consequently a manganese distribution map is not included, and manganese will not be considered further.

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Correlation matrices

Finally, before discussing individual potential indicator elements, it is convenient to introduce correlation matrices for these elements and iron (fig. 8). A correlation matrix facilitates making comparisons

FIGURE 8 NEAR HERE

between the various elements and visualizing the results. The statistical methods used to generate each matrix were discussed on p. 21-21a. Further discussion of the meaning of numbers given in the matrices follows. The upper triangle of each matrix gives the correlation coefficients. The lower triangle gives the number of data pairs used for calculating each coefficient; where either or both values of a data pair were outside the detection limits, that data pair was rejected. The maximum correlation coefficient is 1.0, corresponding to perfect correlation, in which case ranked lists of samples for each of the two elements being compared would be identical. A correlation coefficient of zero indicates complete absence of correlation, and a coefficient of -1.0 indicates perfect negative correlation, in which case ranked lists would be exactly reversed. By no means are all the positive correlation coefficients large enough to constitute significant positive correlations, or are all the negative correlation coefficients close enough to -1 to constitute significant negative correlations. As the number of data pairs increases, however, the smallest coefficient that may be considered significant at a given statistical confidence level becomes progressively

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~~66 (p. 66a follows)~~

(p. 77a-c follows)

~~Data~~

Figure 8a

Correlation diagrams for oxidized silicified and argillized rocks from the Condihaven - January area

Spearman correlation coefficients for silicified rocks

(129 samples)

	Au	Pb	Ag	Bi	Hg	As	Cu	Mo	Zn	Fe
Au		0.56	0.18	0.42	0.46	0.06	0.21	-0.19	-0.36	0.02
Pb	127		0.0	0.27	0.21	0.14	0.11	-0.16	-0.25	0.03
Ag	83	84		0.50	0.41	0.09	0.29	-0.16	0.35	-0.06
Bi	45	45	45		0.24	0.19	0.20	-0.02	0.0	-0.22
Hg	128	128	54	46		0.16	0.15	-0.05	-0.20	-0.06
As	117	117	76	43	120		0.1[illegible]	0.[illegible]	0.27	0.28
Cu	128	128	84	45	129	120		0.40	0.09	0.46
Mo	54	54	37	22	60	56	60		0.12	0.42
Zn	35	35	18	11	36	36	36	21		0.17
Fe	126	126	32	44	127	118	127	58	35	

Correlation coefficients

Numbers of data pairs

Correlation coefficient not significant at 95% confidence level

Correlation coefficient significant at 95% confidence level but not at 99% confidence level

Correlation coefficient significant at 99% confidence level.

Figure 8b, continued

Spearman Correlation coefficients for argillized rocks
(149 samples)

	Au	Pb	Ag	Bi	Hg	As	Cu	Mo	Zn	Fe
Au		0.22	0.27	—	0.24	0.17	-0.10	0.12	-0.25	0.02
Pb	76		0.40	—	0.12	0.19	0.04	0.30	-0.23	0.12
Ag	36	61		—	0.23	0.17	-0.06	-0.30	0.05	0.22
Bi	1	2	0		—	—	—	—	—	—
Hg	87	130	61	2		0.14	-0.20	-0.16	-0.17	0.03
As	83	114	48	2	129		0.10	0.13	-0.06	0.21
Cu	99	132	62	2	147	130		0.33	0.17	0.43
Mo	69	97	43	2	109	104	110		-0.14	0.60
Zn	44	71	32	0	77	74	70	61		0.14
Fe	85	126	61	2	142	125	144	105	78	

Numbers of data pairs

Correlation coefficients

smaller. Coefficients statistically significant at the 99-percent-confidence level, and coefficients statistically significant at the 95-percent-confidence level but not at the 99-percent-confidence level are each designated in the matrix. All other coefficients are taken to indicate no significant correlation. The numerical value of a given correlation coefficient is of little importance; the important thing is whether it is large enough, considering the number of data pairs used, to indicate a significant degree of positive or negative correlation. The statistical confidence levels provide arbitrary but objectively defined cut-offs for deciding which correlation coefficients are large enough to consider geologically important. Coefficients significant at the 95-percent-confidence level are taken to indicate a meaningful association or correlation in the geologic context, and coefficients significant at the 99-percent-confidence level are taken to indicate a strong correlation.

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77c ~~(p. 67 follows)~~

In the following discussion gold is presented first, and the remaining ore-related elements are presented in order of increasingly strong supergene leaching and redistribution. We used the same order in the previous section, so that it is easy to compare the sections. The position of bismuth in this order is rather arbitrary because most of the analytical data for bismuth falls below the detection threshold.

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Interpretation of data for the potential indicator elements

Gold

The gold distribution pattern in the Combination-January cuts (pl. 4) is mainly the result of hypogene dispersion processes little modified by supergene dispersion, and therefore is essentially a relict primary dispersion pattern. Plate 1 shows that some parts of productive silicified zones were not ore grade, but most of the ore, whether primary or oxidized (above 130 to 180 feet depth) was from silicified zones. The fact that moderate and high gold values in the cuts are almost entirely within silicified zones indicates that the gold map pattern is essentially a hypogene dispersion pattern. The low-tenor oxidized silicified rocks of the cuts may be thought of as belonging to a hypogene gold aureole connecting and extending outward from the ore bodies but restricted to the silicified zones. The fact that the ore bodies had assay walls (Ransome, 1909, p. 213, 218; Collins, 1907b, p. 435) is consistent with this conclusion.

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Some supergene movement of gold might be expected, since gold is thought to be capable of at least an intermediate degree of mobility (table 5), but supergene dispersion has not greatly modified the relict primary dispersion pattern. Both Ransome (1909, p. 170-174, 216) and Spurr (1905, p. 138) felt that the gold of rich oxidized ores, some of which occurred with limonite in fractures, was concentrated to some degree during oxidation, but even where notable enrichment occurred rich sulfide ore probably existed previously. All the gold-bearing samples found along faults in oxidized argillized rocks (three high and two intermediate gold values) have high iron contents due to abundant hematite or hematite-goethite mixtures (see loc. 6 (two samples), 5, 9, and 18, pl. 4 and ~~13~~ 5). The abundant ferric oxide and hydroxide indicate that the high Eh's (0.9 volt or more) and low pH's (less than 2 to 5) necessary to dissolve gold may well have developed at these localities (see Cloke and Kelly, 1964). These faults may have formed, however, before hypogene activity ceased; if so, gold might have been transported to these sites by either hypogene or supergene processes, or both, since hypogene gold left along faults might be particularly susceptible to supergene mobilization. The correlation diagrams (fig. 8), furthermore, show no significant gold-iron correlation for either silicified or argillized rocks, indicating that supergene dispersion of gold cannot be generally important, even if gold moves short distances to produce enrichment along fractures. This result agrees with Cloke and Kelly's (1964) data on gold solubility and Krauskopf's (1967) calculations and conclusion that significant migration

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 (p. 80a follows)

of gold occurs only locally and for short distances. Even if gold moves as much as a few feet, the effects would not be visible at the scale of sampling of a geochemical exploration program.

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Lead

The map patterns for lead is a relict primary dispersion pattern; the patterns for gold and lead are very much similar (pl~~s~~. 4 ~~and 5~~). Lead is generally thought to be immobile during oxidation (table 5) because it forms a very stable sulfate (anglesite, $PbSO_4$) and carbonate (cerussite, $PbCO_3$). It is not found in supergene sulfates from the Florence mine (p. ~~59, 63~~ 70, 74). Anglesite is likely the predominant lead-bearing mineral in the oxidized zone. Lead values tend to show smaller changes between adjacent samples than do gold values (compare geochemical profiles, pl~~s~~. 4 ~~and 5~~), indicating that lead is more evenly distributed through the rocks than gold is. Since lead should be less mobile than gold during oxidation; we infer that this is mainly, if not entirely, a hypogene rather than supergene feature. The correlation diagrams show that gold and lead are correlated in argillized rocks and strongly correlated in silicified rocks.

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Two features shown by the histograms for lead (pl. 4) are presumably the result of hypogene processes: the negatively skewed distribution of logarithms of lead values in oxidized silicified rocks, mentioned earlier (p. 57), and the bimodal distribution of lead in oxidized argillized rocks. The histogram for gold in silicified rocks has a distinct upper tail which would be even better developed if mined-out ore bodies intersected by the cuts had been sampled. With the strong correlation between lead and gold in oxidized silicified rocks and the similarity between the lead and gold maps, we would expect the histogram for lead to show a better developed upper tail. The histogram for lead in oxidized silicified rocks shows instead a sharp drop above 700 ppm, with very few values of 1,000 ppm or more. Figure 6 shows that few values greater than 1,000 ppm occur in either average-grade or high-grade ores. Amounts of lead in these two groups of samples are similar, whereas all other ore-related elements show at least some enrichment in the high-grade ores, and most show considerable enrichment. Another manifestation of this apparent ceiling on lead values was the paucity of lead-bearing minerals in the ores, although some lead production is recorded (U.S. Geol. Survey, 1912-1924, U.S. Bur. Mines, 1934-1946). Ransome (1909, p. 112) reported galena from only a few localities in the main district. No lead minerals have been reported in either oxidized or unoxidized ores of the Combination and January mines. Preliminary microprobe examination of one unoxidized average-grade ore sample by C. G. Czamanske shows that neither stibioluzonite nor tetrahedrite-tennantite contains as much as 0.1

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 (82a follows)

percent lead, but bismuthinite may contain amounts on the order of 0.5 percent. The relative scarcity of lead thus seems to be characteristic of the Goldfield district and most likely relates to lack of available lead at the source of the ore-bearing solutions. Ores obtained in the deeper, eastern parts of the district contained considerable copper and tin (Searls, 1948, p. 17-18; Wilson, 1944), suggesting some zoning of those metals, but lack of information on lead content of the ores makes it impossible to evaluate zoning in the district with respect to lead.

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 (p. 83 follows

Regarding the bimodal frequency distribution of lead in oxidized argillized rocks, the lower mode lies below the average amount of lead in unaltered dacite (17 ppm or -2.8 log percent), and the upper mode lies above it, so some rocks have been depleted and other rocks have been enriched in lead. The dacite represented by the lower mode was probably leached of lead during the hydrothermal activity that produced argillization. Most of the values comprising the upper mode, in the range 20 to 150 ppm, are found in fault zones or within 10 feet of silicified zones or fault zones. The 20 to 150 ppm values near silicified zones likely represent a narrow hypogene aureole extending from the silicified zones a short distance into the argillized zones. If most of the faults originated during the later stages of hydrothermal alteration, the values associated with these structures could also represent low-tenor hypogene metallization. We have no explanation for localities enriched in lead but devoid of structure, such as that north of locality 6 where four high values appear. We infer that igneous lead was leached from the dacite during the earlier stages of hydrothermal activity, and ore lead was added locally to the resulting argillized rocks during the later stages of hydrothermal activity. Other ore-related elements may have had a similar history in argillized rocks, but if so, ranges of values, detection limits, and supergene redistribution effects obscure the bimodal frequency distributions.

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Silver

Almost all intermediate and high silver values are found in the silicified zones, with the highest values in the same general areas as those in which high gold values occur. This fact argues against much supergene movement of silver, even though silver often shows at least moderate supergene mobility (table 5). Supergene silver mobility is relatively low at the Florence mine, as deduced from the analyses of secondary sulfates (p. ~~59, 60~~ 70, 74). Ransome (1909, p. 119-120, 171) reported chlorargyrite (cerargyrite, AgCl) and probable minor embolite (Ag(Cl, Br)) in the oxidized zone at Black Butte and McMahon Ridge, 3 miles northeast of the main district. Much of the ore in that part of the Goldfield altered area was oxidized, and yet it generally had higher silver-to-gold ratios than did ores from the main district (Ransome, 1909, p. 246-251). Schaller (1941) reported probable minor iodyrite in oxidized ore that likely came from the Combination-January area. Burgess (1911) reported silver halides in the Tonopah district, 25 miles north of Goldfield. In the upper part of the oxidized zone at Tonopah, silver was not carried far from the original sulfide ore before it was precipitated as chlorargyrite, the most abundant silver halide mineral. Boyle (1968, p. 188-207) indicates that much silver should remain in the oxidized zones of sulfide ore deposits in semiarid and arid areas, with silver halides the most abundant silver minerals in the upper parts of the oxidized zones. The foregoing observations point to a relatively low supergene mobility for silver in the oxidized zone at Goldfield, and indicate that the silver map shows essentially a relict hypogene pattern.

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Silver and iron are positively correlated in oxidized argillized rocks, indicating some movement of silver and redeposition with limonite. Silver must therefore be more mobile than lead. The supergene mobility of silver relative to gold is difficult to determine based on association with limonite, because gold is associated with abundant limonite minerals at several conspicuous localities, but overall, gold and iron are not correlated (see p. ~~70~~ 80).

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Although high gold and silver values occur in the same areas, gold and silver show no significant correlation in oxidized silicified rocks or argillized rocks, and this is probably mainly a hypogene feature. Wilson (1944) analyzed silicified rock samples from the Goldfield Consolidated main vein (Jumbo Extension mine, 830-foot level), Clermont vein (Clermont mine, 225-foot level), and from two surface localities, one of which is on the Jumbo vein (p. 6). He found a consistent relationship between gold and silver in the vein on the Jumbo Extension 830-foot level but found no consistent relationship at the other three localities. We can gain some information by comparing other ore-related elements with gold and silver in oxidized silicified rocks. Bismuth, mercury, and copper all show residual highs northeast of the January shaft in spite of supergene effects, important particularly in the case of copper. These three elements correlate with both gold and silver, but gold-silver and lead-silver correlations are conspicuously missing from this tightly knit group of undoubtedly hypogene element associations, suggesting that the variations in gold-silver ratio have a significant hypogene component.

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Figure 9, designed to explore the lack of gold-silver correlation further, is a plot of gold-silver ratio against gold value for all samples from the Combination-January cuts that have detectable amounts of both gold and silver. The gold-silver ratios have a wide range (15:1 to 1:50), and the plotted points show considerable scatter, which accords with the lack of statistical correlation. Analytical error for both gold and silver likely accounts for a good deal of the scatter, as the one-standard-deviation "boxes" accompanying figure 9 show. Sampling error related to removal of analytical portions may

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Figure 9 near here

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be a problem for gold (see p. ~~42-42a~~ 52-53a) in addition to usual analytical error. Supergene redistribution of both elements, even though we consider it insignificant in terms of the geochemical maps, probably also accounts for some of the scatter, since leaching may have changed the original gold-silver ratios more or less in some samples. The correlation data discussed above suggest~~s~~ that a significant part of the data scatter is also due to differences in the proportion of gold and silver deposited by the ore-bearing fluids, but sampling and analytical error aside, we cannot determine precisely how important supergene versus hypogene effects were in producing the wide range of gold-silver ratios without being able to compare gold-silver ratios for oxidized and unoxidized portions of individual ore bodies in the Combination-January vein system.

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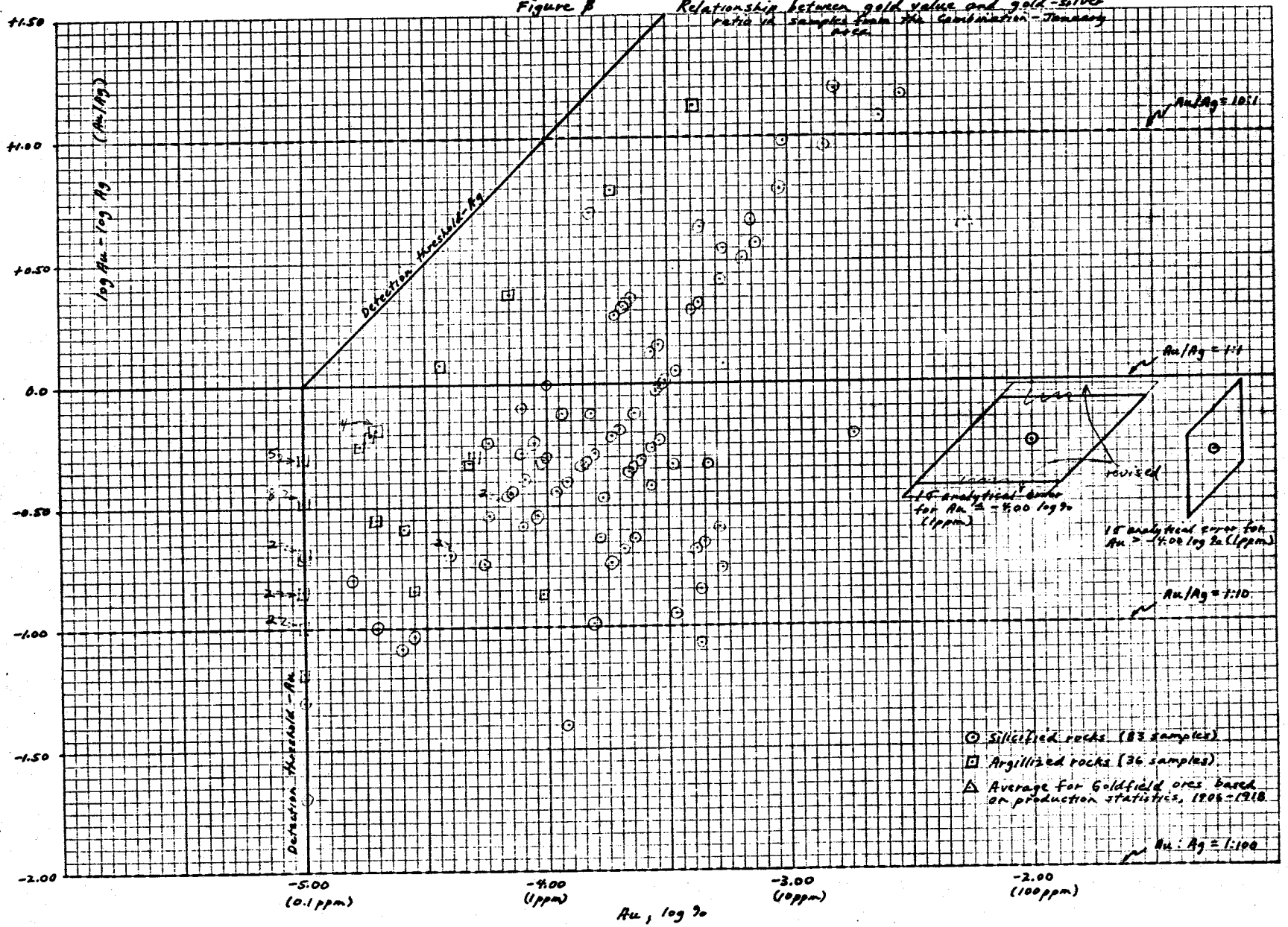
Figure 9

Relationship between gold value and gold-silver ratio vs. samples from the Combination - January 1952.



Although figure 9 shows a wide range of gold-silver ratios, the ratios generally increase with increasing gold values; if a significant part of the data scatter is due to hypogene processes, this trend is probably also the result of hypogene processes. The high ratios at high gold values cannot be satisfactorily explained by supergene leaching of silver relative to gold in richer ores, because production data from Ransome (1909) and from U.S. Geological Survey statistics (1903-1918) indicate that high gold-silver ratios were characteristic of most ore-grade material from the main district whether oxidized or unoxidized,[1] as shown in table 7. If the increase in gold-silver

[1] The reverse is true for some ores from mines in outlying areas (Ransome, 1909, p. 171-172, 250).

TABLE 7 NEAR HERE

ratios with increasing gold values is indeed due to hypogene processes, the ore-mineral paragenesis should reflect this increase.

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Table 7. Gold-silver ratios in ~~some~~ Goldfield ores

Au value, ppm	Au:Ag	Amount of ore	Location of ore, and remarks	Reference
693	7.55:1	1166 short tons	Upper levels of the Combination mine, best ore processed before 1905 (mostly oxidized).	Ransome, 1909, p.171
1880	20:1	59 short tons	Upper levels of the Combination mine, best of the above lot of 1166 tons (entirely oxidized).	ibid, p.171
3460	28.8:1	Unknown	Florence mine, 250-foot level, unoxidized.	ibid, p.230
20,000 (2%)	8:1	Unknown	Composite sample of 9 lots of ore from the Mohawk mine (early 1907). These and following Mohawk mine samples unoxidized.	ibid, p. 167
4500 – 12,400	5.0:1 to 12.9:1	Unknown but small	9 analyses of rich ore from the Mohawk mine. Analyses made on material recovered from ore thieves.	ibid, p. 167, 169
12,200 – 14,900	4.4:1 to 5.5:1	Unknown	6 analyses of rich ore from 220-foot level, Hayes-Monnette workings, Mohawk mine.	ibid, p. 169
20,900	8.1:1	47.8 short tons	Carload of ore shipped from Hayes-Monnette lease, Mohawk mine, January 1907, the richest carload of ore ever shipped out of the district.	ibid, p.172
23	1:4	Hand sample	Combination mine, 230-foot level, unoxidized.	ibid, p. 166
53.5	4.46:1	3,776,609 short tons	Based on total production for ~~period~~ 1906-1918, the main productive period. Mostly unoxidized.	U.S. Geological Survey, 1906-1918, Mineral Resources of the United States [annual volumes].

Tolman and Ambrose (1934) determined the ore mineral paragenesis as: pyrite and marcasite, followed by famatinite (stibioluzonite), tennantite, and sphalerite, followed by bismuthinite, followed by goldfieldite, followed by gold-silver tellurides and native gold, with considerable overlap between adjacent minerals in the sequence. They found at least small amounts of tennantite associated with stibioluzonite in all the high-grade ore specimens they examined, but in a figure showing sequence of precipitation of the ore metals, they show both silver and gold being precipitated simultaneously at the end of the ore paragenesis, implying that virtually all of the silver accompanied gold late in the depositional sequence. According to Goldschmidt (1954, p. 190, 194), tennantite-tetrahedrite series minerals may bear even more silver than galena. In the average-grade ores we examined, which all contain more silver than gold, pyrite and stibioluzonite are generally the only abundant minerals that belong to the ore-mineral sequence, but in several samples, subordinate amounts of tetrahedrite-tennantite are associated with the stibioluzonite. Except for small amounts of bismuthinite and very small amounts of native gold, none of the other minerals characteristic of rich ores appear in the average-grade samples. Preliminary microprobe analyses suggest that tetrahedrite-tennantite is indeed an important host mineral for silver in the Goldfield ores, although the silver content of the tetrahedrite-tennantite is variable. Concentrations of 0.5 to 1.5 percent silver are common in tetrahedrite-tennantite, whereas stibioluzonite contains less than 0.1 percent.

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We suggest that silver, mainly in tetrahedrite-tennantite, was deposited early in the ore-metal sequence, accompanying copper. Copper and bismuth continued into the middle of the sequence, but overlapped gold (and, by inference, lead), which were deposited late along with lesser amounts of silver. With this suggested two-stage introduction of silver, most of the silver in many of the ores could have been introduced early in the paragenesis. Also, the amount of gold introduced late in the paragenesis at any given spot could have been largely independent of the amount of silver introduced earlier. Bismuth, deposited in the middle of the paragenesis, and copper, deposited both early and in the middle, overlap both early silver and late gold and middle-to-late lead, producing several positive correlations between silver, bismuth, and copper, and between gold, lead, bismuth, and copper, but no correlation between gold and silver or lead and silver associated with hypogene aureoles in ore-bearing silicified rocks.

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Figure 9 shows that in oxidized argillized rocks, the gold-silver ratio is generally higher than it is for oxidized silicified rocks with comparable amounts of gold. No sulfide mineral other than pyrite has been reported from unoxidized argillized rocks, nor have we observed any sulfide other than pyrite in our few observations of unoxidized argillized rocks in the Florence mine and elsewhere in the Goldfield altered area. Possibly the small amounts of lead, gold, and silver in these rocks were all introduced by ore-bearing fluids late in the paragenesis, explaining the high gold-silver ratios, but leaving unexplained the lack of correlation between gold and silver that persists in oxidized argillized rocks. In argillized rocks silver correlates with iron, indicating different behavior, and possibly greater supergene mobility, than it shows in silicified rocks, where it probably forms silver halides nearly in place. The strong lead-silver correlation in argillized rocks may also be due wholly or partly to supergene processes. Silver may be associated with lead-bearing oxidation products such as anglesite ($PbSO_4$) or plumbojarosite ($PbFe_6(SO_4)_4(OH)_{12}$) instead of silver halides (see Boyle, 1968, p. 192-195). Since lead moved little during oxidation, presumably the silver associated with lead moved to the sites of oxidizing lead-bearing minerals. Distances the silver moved, however, would not necessarily have to have been very large.

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Bismuth

Our data show that bismuth correlates with gold, lead, and silver in the Combination-January area in spite of oxidation (fig. 8). Wilson (1944) noted that bismuth correlated with gold, silver, and tin in vein material from the 830-foot level of the Jumbo Extension mine, but these correlations did not exist at any of the other three localities he sampled (p. 6). Our bismuth and silver maps are similar (pls. 6 and 7), although more samples have undetectably small amounts of bismuth than is the case with silver. With the large number of samples having amounts of bismuth below the detection threshold, effects of oxidation are difficult to evaluate. There are only two oxidized argillized samples with detectable amounts of bismuth, so correlation coefficients cannot be calculated for argillized rocks. Since bismuth in silicified zones, however, correlates with gold, lead, and silver, which all show essentially relict hypogene dispersion patterns, plate 7 must also show essentially a relict hypogene pattern, as one might predict from figure 8. On the other hand, Ransome (1909, p. 121-123, 213, 219) reported bismite (Bi_2O_3) in oxidized ore, in some cases partially filling prismatic cavities in quartz left by leaching of bismuthinite (Bi_2S_3). The supposed bismite was subsequently reidentified by Schaller (1941) as bismoclite (BiOCl), another secondary bismuth mineral. Ransome's observations thus indicate partial removal of bismuth during oxidation, as do bismuth contents of the secondary sulfate samples (p. 59). Better data for bismuth, therefore, might well reveal some definite supergene effects. Analyses with a detection limit at least an order of magnitude lower than ours (at least 0.5 ppm instead of 5 ppm) would probably be necessary to provide adequate data for bismuth.

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Mercury

Mercury correlates strongly with gold, lead, and silver in oxidized silicified rocks and with gold and silver in oxidized argillized rocks (fig. 8), indicating that hypogene processes were important in producing the features seen on the mercury map (pl. 4). These relationships are somewhat difficult to appreciate by visual comparison of the mercury map with the gold, lead, and silver maps, due to the rather small total range of mercury values and strongly overlapping ranges for silicified and argillized rocks (see histograms, pl. 7). In oxidized silicified rocks Mercury also correlates with copper, as do silver and gold; much copper was leached during oxidation, but enough remains to give correlations with these three ore-related elements (see p. 107). Mercury thus forms a hypogene dispersion aureole extending outward from the ore bodies but restricted to silicified rocks, just as gold, lead, and silver do.

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In the case of mercury, we must not only consider whether secondary dispersion took place, but also how it took place. Mercury is unique in that secondary dispersion can occur by diffusion of mercury gas. Mercury probably has low mobility in the low pH and moderate to high Eh solutions that must have been involved in oxidation at Goldfield (Krauskopf, 1967, p. 516). Diffusion of mercury gas, therefore, should account for most posthydrothermal movement of mercury away from the silicified zones at Goldfield. Migration of mercury gas conceivably could have become more important than hypogene dispersion as hydrothermal activity waned, and could have continued to the present, regardless of when oxidation took place. If various sulfide minerals, however, carried most of the mercury in the ores, then little mercury would have been free to disperse until the sulfides were destroyed by oxidation.

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Although some of the features of the geochemical map and some of the element correlations may be explained by gaseous diffusion, we believe that hypogene dispersion alone provides an adequate explanation. Gaseous diffusion of mercury might explain the fact that differences in mercury values between adjacent samples in the cuts are mostly rather small, diffusion having evened out sharp variations. On the other hand, the lack of distinct gradients outward from silicified zones argues against extensive supergene migration of mercury gas. Intermediate and high mercury values between localities 3 and 4 may represent a narrow mercury halo around the silicified zone exposed in the cut wall northwest of locality 4 (see p. 61). This is the only area within the cuts showing a halo, but it is, after all, adjacent to a particularly wide segment of the Combination-January vein system (pls. 1 and 2) and the vein material to the northwest is definitely enriched in mercury. Explaining the narrow mercury halo between localities 3 and 4 as due solely to diffusion, however, raises another problem besides lack of evidence for a diffusion gradient: it is hard to understand how several samples at localities 5 and 6 escaped being enriched in mercury.

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Regarding ways in which various element correlations could result from gaseous diffusion, mercury is correlated with gold in oxidized argillized, as well as oxidized silicified rocks; this could be due either to hypogene association, or to amalgamation of gaseous mercury with native gold, or both. But mercury is also strongly correlated with silver in both silicified argillized rocks, and free native silver has not been reported in any oxidized Goldfield ores (Ransome, 1909, p. 171). Silver in the oxidized zone is probably present mainly as silver halides, or, in argillized rocks, it may be associated with oxidized-zone lead-bearing minerals (p. ~~78~~ 92). We do not know how silver and mercury might be associated mineralogically in the oxidized zone. Thus the mercury-gold and mercury-silver correlations may or may not be the result of gaseous diffusion of mercury, but the mercury-silver correlations may probably are not. Gold and silver, regardless of whether ~~in~~ they have experienced some supergene movement, probably still show dominantly hypogene patterns, so whether or not gaseous diffusion played an important role, the mercury-gold and mercury-silver associations in these rocks cannot be taken as evidence for supergene dispersion of mercury. Mercury shows negative correlations with copper and molybdenum in argillized rocks: both copper and molybdenum have undergone considerable supergene redistribution in argillized rocks, as will be explained later (p. ~~88-88a, 92-93a~~ 105-112). If gaseous diffusion effects were predominant, we would expect to see fewer and weaker correlations between mercury and other metals in oxidized silicified rocks, and no significant correlations, except

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possibly with gold and less likely with silver, in oxidized argillized rocks. We infer that hypogene dispersion features dominate the mercury map.

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 (p. 98 follows)

With the strong association between mercury and gold, lead, and silver in silicified rocks, the lack of correlation between mercury and bismuth is surprising. Published descriptions of mineral paragenesis are of no help because mercury-bearing minerals have not been reported from any part of the main district, even from high-grade ores, although mercury definitely was enriched in the ores (fig. ~~1~~ 6, and Ransome, 1909, p. 113). Relatively large amounts of mercury are known to occur in tetrahedrite-tennantite (Ramdohr, 1969, p. 554; Chan, 1969), which could explain the correlation with silver, which also occurs in tetrahedrite-tennantite, but does not explain the association with gold and lead. Without a detailed investigation of the amounts of mercury in all the various ore minerals, we cannot attempt further explanation.

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The analytical data for unoxidized silicified rocks, average-grade ores, and high-grade ores (fig. ~~5~~ 6) show much more mercury in these groups of samples than in rocks from the cuts. One might conclude that much mercury has been lost from the oxidized silicified rocks of the cuts, presumably by secondary migration. We hesitate to compare the data of figure ~~5~~ 6, however, with that for the cuts because the low-grade ore samples, Florence mine samples, and unaltered dacite samples were prepared by a different laboratory using different procedures than samples from the cuts (the high-grade samples were hand-ground). Different sample preparation procedures can produce greatly different mercury yield from the same sample, due to loss of mercury during grinding (Crosby, 1969, p. 189-191). Relative differences between samples done by a given method tend to be retained if the samples are treated differently and rerun, even though absolute amounts of mercury obtained may be considerably different. Thus there should be no problem making comparisons between rocks from the cuts and between the groups of samples shown on figure ~~5~~ 6, but we cannot compare the former body of data ~~to~~ with the latter one. change OK, RGa

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Secondary dispersion of mercury to form anomalies in soil or other overburden above ore bodies is very common and has been documented in many studies, but holds little promise as a geochemical exploration technique at Goldfield. To produce these anomalies, mercury is transported as gas, in solution, or by mechanical movement of mineral and rock fragments, the relative importance of these three mechanisms varying from place to place, depending on permeability and adsorptive capacity of the soil or overburden, climate, and topography (Koksoy and Bradshaw, 1969). Often primary dispersion aureoles exist along with the secondary halos, but not in every case, even if secondary halos in soil are well developed (see particularly Friedrich and Hawkes, 1966). The Goldfield ore bodies are in the category of deposits with limited primary dispersion of mercury, because hypogene aureoles are essentially restricted to silicified rocks, and gas-phase dispersion has not substantially modified the primary dispersion pattern. Similar relationships have been observed in several other districts: Pachuco Real del Monte, Mexico (Friedrich and Hawkes, 1966), Achisai, Kazakhstan (Furzov, 1958), Ivrindi, Turkey (Bradshaw and Koksoy, 1968), and probably Cripple Creek (Gott and others, 1967). We did not attempt a soil survey for mercury in the Combination-January area because much of the surrounding area is covered with mine dumps or otherwise disturbed. Since mercury at Goldfield probably does not move in solution during oxidation, and since relatively little has moved in the gas phase, mechanical dispersal of mercury-bearing silicified rock detritus is the only way that soil anomalies could form. Low to moderate topographic relief throughout the altered area and low

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~~83~~ 84 (p. ~~83a~~ follows)

anomaly contrast between oxidized metallized silicified rocks and surrounding oxidized argillized rocks thus become two factors that limit the possibilities for developing mercury soil anomalies at Goldfield.

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~~83a~~ (p. ~~84~~ follows)
~~[illegible]~~ 100a ~~[illegible]~~ 101

Arsenic

Arsenic is the first element to be discussed that shows a strong correlation with iron, indicating significant supergene redistribution. The arsenic map, however, also shows at least one definite relict hypogene feature: a group of high and intermediate arsenic values in silicified rocks northeast of the January shaft, an area with particularly high gold, lead, silver, bismuth, and mercury. This relict hypogene feature is less pronounced than it was for the forgoing elements, and a lack of correlation with gold, lead, silver, and bismuth results, although correlation with mercury persists. As noted previously (p. 61c), silicified rocks in other parts of the cuts do not show a consistent relationship between gold and arsenic. Silicified rocks have enough residual arsenic so that their average arsenic content is higher than the average arsenic content of argillized rocks, as is the case with the preceding dominantly hypogene elements. More severe leaching can reduce the average amount of an element in silicified rocks to a figure below that for argillized rocks, as is the case with iron (see p. 15). We conclude that arsenic has undergone some supergene redistribution throughout the area, although the hypogene pattern has not been completely erased northeast of the January shaft.

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The arsenic-copper and arsenic-molybdenum correlations in oxidized silicified rocks are of interest because both copper and molybdenum have also been partly leached during oxidation, as will be described later. The copper and arsenic in oxidized silicified rocks were both derived from stibioluzonite,[1] which was relatively abundant even in low-grade ores and also from smaller amounts of tetrahedrite-tennantite. Stibioluzonite and tetrahedrite-tennantite in the silicified rocks were oxidized along with pyrite, releasing iron and antimony along with the copper and arsenic. No molybdenum minerals have been reported in the ores, so without analyses for individual ore minerals the paragenetic relationships of molybdenum are unknown. Even though considerable iron was removed from silicified rocks during oxidation [~~(p. 84)~~], enough remained to produce the strong iron-copper-arsenic-molybdenum association, which must be due to sorption of all three elements on limonite (note the strong copper-iron and molybdenum-iron correlations in silicified rocks), and probably also to coprecipitation of hydrated iron arsenates (particularly scorodite, $Fe(AsO4)\cdot 2H_2O$), copper and copper-iron arsenates and hydrated arsenates, and possibly hydrated iron molybdate (ferrimolybdite, $Fe(MoO_4)_3\cdot 8H_2O$) with limonite.

[1] Ransome's analysis of famatinite (stibioluzonite) shows almost 50 percent Cu_3AsS_4, the remainder of the mineral being Cu_3SbS_4 (Ransome, 1909, p. 118-119).

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It is puzzling that arsenic does not correlate with copper and molybdenum in oxidized argillized rocks, especially since copper and molybdenum are strongly correlated there, and all three metals are again strongly correlated with iron. As mentioned earlier, we have never seen any sulfide other than pyrite in argillized rocks. Thus, any small amounts of arsenic and copper introduced into argillized rocks during hypogene metallization may have existed in forms other than stibioluzonite and tetrahedrite-tennantite, and whatever mineral phases these were, perhaps they did not behave as stibioluzonite and tetrahedrite-tennantite did during supergene leaching. The mineralogic composition of the argillized rocks, particularly the greater abundance of clays relative to silicified rocks, may also have affected the mechanism of redeposition of arsenic and copper in the oxidized zone as the water table moved downward, although arsenic and copper are not associated with any particular clay mineral (p. ~~88-88a~~ 108-108a, fig. 10).

Conditions in argillized rocks during oxidation probably favored formation of secondary lead-arsenic minerals, which could account for the lead-arsenic correlation in argillized rocks.

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Copper

With the exception of the high values in silicified rocks northeast of the January shaft, copper values in oxidized silicified and argillized rocks look similar (pl. ~~10~~ 5). Average copper values for oxidized silicified and argillized rocks are indeed essentially the same, and the histograms (pl. ~~10~~ 5) confirm that the ranges of values for the two groups of rocks are similar.

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Copper was the most abundant metal in both average and high-grade ores, and since the ores and their associated hypogene gold, lead, and silver aureoles were restricted to silicified rocks, the silicified rocks surely contained more copper than did argillized rocks prior to oxidation. Copper is relatively abundant in the unoxidized silicified rocks of the Florence mine (300 ppm geometric mean, fig. 6). Before oxidation, silicified rocks of the Combination-January cuts likely had at least as much copper as the Florence mine silicified rocks, and locally more. The average copper contents of oxidized silicified rocks (geometric mean 16.4 ppm) and oxidized argillized rocks (geometric mean 16.7 ppm) are not much above the 10 ppm copper found in unaltered dacite (fig. 6). Obviously considerable copper has been leached from silicified rocks during oxidation: more, no doubt, than for any element yet discussed. Whether the oxidized argillized rocks have also suffered overall removal of copper cannot be determined without unoxidized argillized rocks for comparison.

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Copper correlates strongly with iron in both oxidized silicified and argillized rocks, another indication that copper has undergone considerable supergene redistribution. Arsenic and molybdenum also correlate strongly with iron in both oxidized silicified and argillized rocks, and copper correlates with both these elements in silicified rocks and with molybdenum in argillized rocks to form an arsenic-copper-molybdenum-iron supergene association. We can offer no detailed explanation for the strong negative correlation between copper and mercury in oxidized argillized rocks. The ultimate cause is presumably greater supergene movement of copper relative to mercury. Many geochemical field studies, as well as laboratory studies on the solution chemistry of copper, have shown that copper is moderately to highly mobile in oxidizing sulfide ores (table 5 and Garrels and Christ, 1965, p. 240). Behavior of copper at Goldfield is no exception, judging from rocks of the Combination-January cuts and from the Florence mine secondary sulfates (p. ~~59, 63~~ 70, 74).

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In spite of the relatively high mobility of copper, hypogene element associations in oxidized silicified rocks have not been completely destroyed, as shown by the ~~Once again,~~ high values that appear northeast of the January shaft (pl. ~~10~~ 5) associated with high gold, lead, silver, bismuth, mercury, and arsenic values. Furthermore, ~~and~~ correlations between copper and gold, silver, and mercury persist. As explained above, the copper-arsenic association is due primarily to their mutual association with limonite and therefore is mainly a supergene phenomenon, but hypogene association may contribute to this correlation indirectly in that both copper and arsenic were locally released from ores together in relatively large amounts, and consequently large amounts of both elements found their way into the limonite formed at these localities. Hypogene association could also contribute directly to the copper-arsenic correlation if the rocks northeast of the January shaft contain relict (unoxidized) disseminated stibioluzonite and tetrahedrite-tennantite. If unoxidized sulfides exist in the samples from the cuts, however, they must be fine grained and their amounts must be small, because we have not seen sulfide grains in the rocks, and we are convinced that substantial proportions of the iron, copper, and arsenic present before oxidation have been removed by supergene leaching. The copper remaining with gold, silver, and mercury must not be associated with limonite, because none of these three elements correlate with iron. This copper could occur as azurite ($Cu_3(CO_3)_2(OH)_2$), or malachite ($Cu_2(CO_3)(OH)_2$), both reported by Ransome (1909, p. 108-109, 216) as rarely staining some oxidized and partly oxidized ores. It is unlikely that much copper resides in

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these two minerals, however, because pH values of solutions in the oxidized zone at Goldfield probably were generally too low to form them (Garrels and Christ, 1965, p. 240). We have not seen chrysocolla ($CuSiO_3 \cdot 2H_2O$) or turquoise-group minerals (particularly turquoise, $CuAl_6(PO_4)_4(OH)_8 \cdot 4H_2O$, and chalcosiderite, $CuFe_6(PO_4)_4(OH)_8 \cdot 4H_2O$), and as far as we know none of these minerals have been previously reported. Of the 39 oxidized silicified rock samples we X-rayed, 30 contained kaolinite, and 9 were free of kaolinite. Average amounts of copper for these kaolinite-bearing and kaolinite-free samples are essentially the same and both are very close to the average for all 129 silicified rock samples. Copper thus is not notably associated with clay in the oxidized silicified rocks, and the form of copper in these rocks remains unidentified.

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In the oxidized argillized rocks copper and other elements that were mobile during oxidation could be associated with clays as well as with limonite, because clay minerals are capable of ion exchange and sorption (Grim, 1968, p. 185-233; Carroll, 1959); however, we do not see this association. The argillized rocks of the Combination-January area all contain kaolinite and illite in various proportions, and 22 samples from the area north of locality 18 contain montmorillonite as well (pl. 2). Although pH of solution, clay-mineral particle size, and metal-ion concentration all effect the amount of metal sorbed by clays, capacity of the common clays to sorb copper, molybdenum, and zinc generally increases in the following order: kaolinite, illite, montmorillonite (Heydemann, 1959; Jones, 1957; Chu, 1969). Montmorillonite is particularly effective in sorbing many ore metals, mainly because of its large cation exchange capacity (Perel'man, 1967, p. 100). Cation exchange is important in the sorption of copper and zinc, whereas anion exchange is important for molybdenum and arsenic, which form molybdate (MoO_4^{-2}) and arsenate (AsO_4^{-3}) ions in solution. Molybdate and arsenate, however, readily form very insoluble compounds with ferric iron (ferrimolybdite, $Fe_2(MoO_4)_3 \cdot 8H_2O$, and scorodite, $Fe(AsO_4) \cdot 2H_2O$) so that we would expect the clays to be less important than iron in determining the supergene redistribution of these two metals. In the oxidized argillized rocks kaolinite, illite, and montmorillonite occur in various proportions; total clay contents generally are between 20 and 60 percent. Ideally, we should compare copper, molybdenum, and zinc abundances in rocks with known amounts

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 (p. 108a follows)

of each clay mineral. Clay mineral percentages are difficult to estimate accurately, however, so we have merely divided the argillized rocks into three groups, as follows: montmorillonite-bearing, montmorillonite-free with illite dominant over kaolinite, and montmorillonite-free with kaolinite dominant over illite. The groups include only samples that we X-rayed in the course of our petrographic examinations. Figure 10 gives the results. Data for iron ~~is~~ are included

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Figure 10 near here

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for comparison; the three groups of samples have similar iron contents. Arsenic, copper, molybdenum, and zinc do not show significant differences between the three data sets, with the possible exception of zinc in kaolinite-dominant rocks. Since the average for zinc in these rocks may not be much below the detection threshold at -2.60 log percent (25 ppm), we cannot say definitely that clay content has an effect on zinc. Although the three data sets are not as precisely defined as we would like them to be with respect to relative amounts of the various clay minerals, we conclude that the clay content of argillized rock has little effect on supergene redistribution of the above four elements. At least, abundance of iron must be much more important than clay content.

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 [redacted]

Figure 7

Cu, Fe, Mo, Zn, and Fe contents of argillized rocks with various clay contents

1 = argillized rocks, kaolinite dominant clay mineral (19 samples)

2 = argillized rocks, illite (or K-mica) dominant clay mineral (17 samples)

3 = argillized rocks, montmorillonite-bearing, with kaolinite and illite (17 samples)

4 = all argillized rocks from Combination-January area (149 samples)

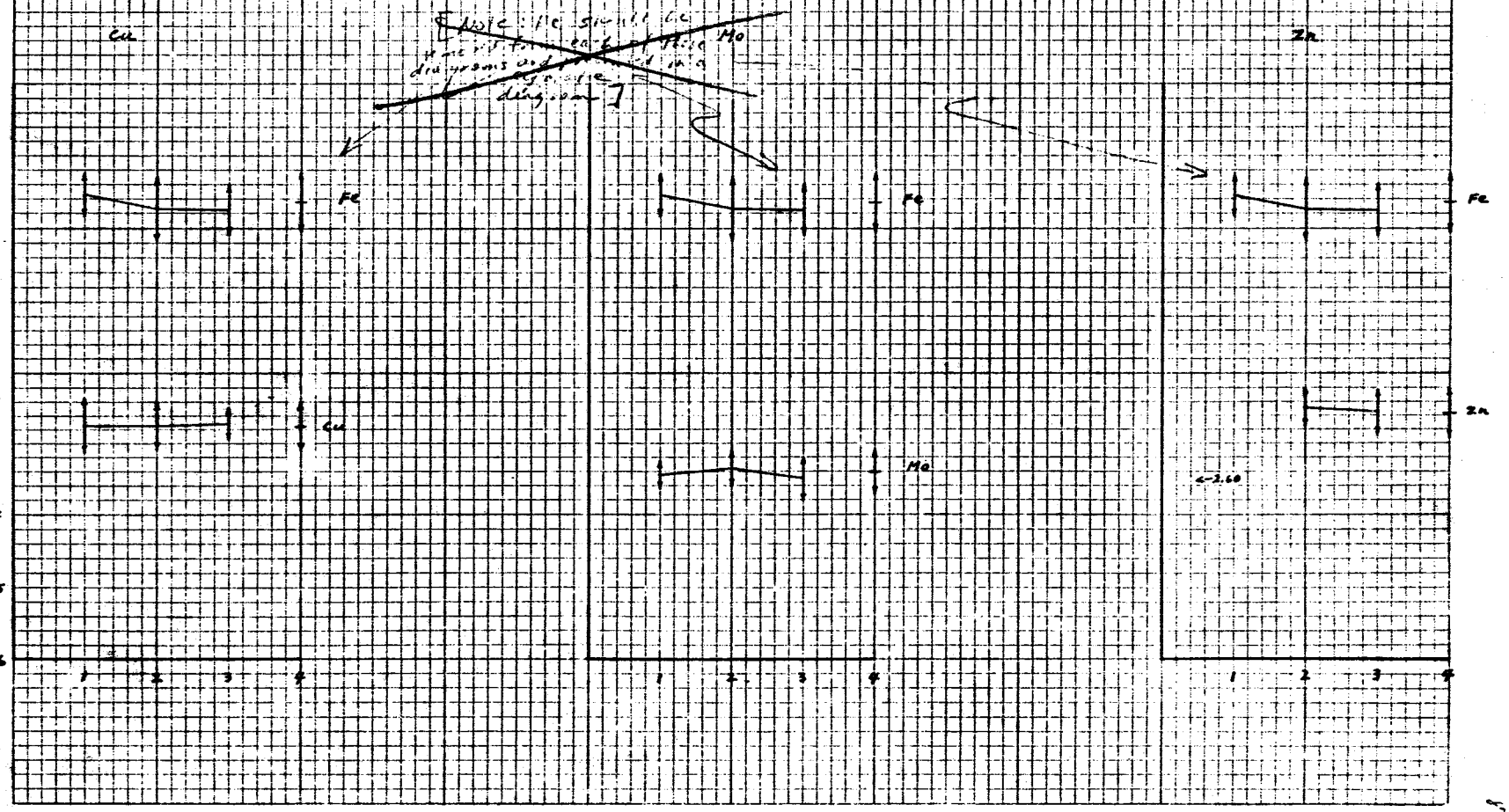
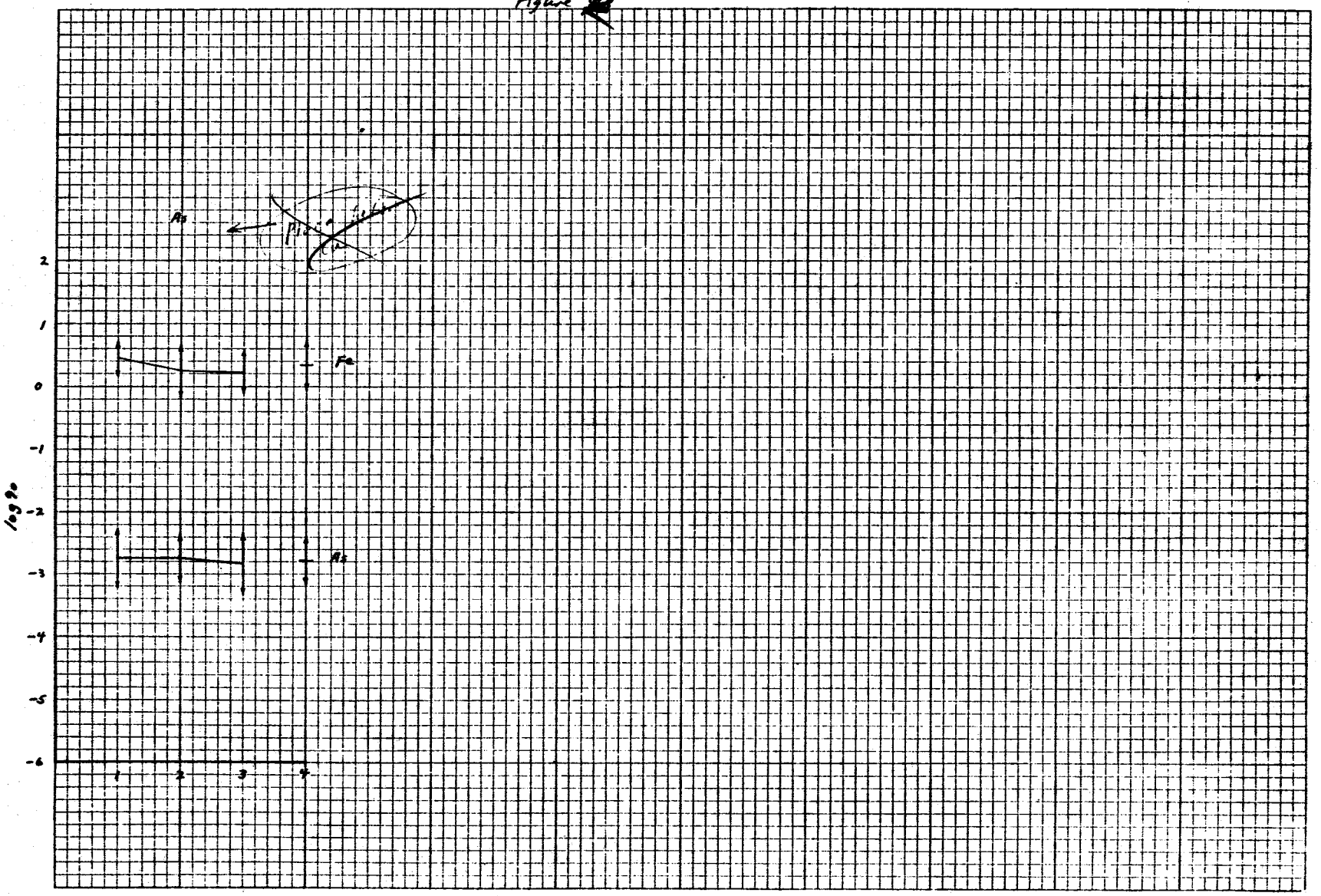


Figure 14



Questions worth considering are what happened to the copper that was leached from the oxidized silicified rocks, and why it did not form a supergene halo. Copper commonly forms zones of supergene enrichment immediately below the water table. No such zone has been reported in the mines at Goldfield, but some enrichment probably escaped notice because copper content was irrelevant in determining the worth of near-surface ores. Covellite (CuS) largely replaces tetrahedrite-tennantite and partly replaces stibioluzonite in two of our unoxidized average-grade ore samples, showing that some supergene enrichment of copper took place at least locally. Perhaps not enough ore has been oxidized to produce a pronounced supergene enrichment zone; the pre-Siebert Formation and present-day erosion surfaces in the Combination-January area probably truncate the upper parts of the lodes. Even if part of the copper from metallized silicified rocks moved laterally into the surrounding argillized rocks during oxidation, copper values are not consistently high in argillized rocks, being related particularly to limonite distribution, so that copper does not form a distinct and coherent supergene halo around ore-bearing oxidized silicified rocks. We have no way of knowing whether a hypogene copper aureole extended into the argillized rocks, but even if it did it was destroyed during oxidation. Perhaps if the lodes were more deeply eroded, we would see greater development of a supergene enrichment zone or a supergene halo, or both.

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Molybdenum

Some high molybdenum values occur northeast of the January shaft along with all the preceding elements, but features of the molybdenum map are largely the result of supergene redistribution (pl. 5). The relict hypogene association shown by rocks northeast of the January shaft is so weak that molybdenum shows no correlations with gold, lead, silver, bismuth, or mercury in oxidized silicified rocks (fig. 8). This is probably due both to greater supergene mobility of molybdenum than any previously discussed element and to lack of pronounced enrichment of molybdenum in the ores. Although molybdenum is not as strongly enriched in the ores as are many other ore-related elements (fig. 6), during metallization molybdenum probably was somewhat enriched in silicified rocks relative to argillized rocks. The histograms show that oxidized silicified rocks contain less molybdenum than oxidized argillized rocks, although an average was not calculated for oxidized silicified rocks because ~~slightly~~ less than half the silicified samples contained detectable molybdenum. The best evidence for substantial supergene mobility of molybdenum, however, is the similar behavior of molybdenum and iron.

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The association between molybdenum and iron is as strong or stronger than the association between copper and iron; it is strong enough to be readily visible by comparing the molybdenum and iron geochemical maps and profiles (pls. ~~11 and 13~~ 5). Possible supergene minerals producing these associations have already been discussed in the section on arsenic, the most important molybdenum mineral probably being ferrimolybdite ($Fe_2(MoO_4)_3 \cdot 8H_2O$). Jones (1957) showed that hydrous ferric oxide is highly effective in sorbing molybdate ($MoO_4^{=}$) anions from acid solutions. Significant amounts of molybdenum in the Florence mine supergene sulfates (p. ~~62~~ 70, table 2) show that water moving downward through oxidizing rocks does indeed contain molybdenum. We conclude that molybdenum, like copper, is relatively mobile in the oxidized zone, at least until solutions carrying it come in contact with limonite. The correlation matrix for oxidized argillized rocks ~~however~~ shows one important difference between the supergene behavior of copper and molybdenum: the strong lead-molybdenum correlation. This correlation could be due to formation of wulfenite ($PbMoO_4$), which, although not reported at Goldfield, is a common secondary mineral in oxidized ore deposits containing lead. Takahashi (1960, p. 1105-1108) and Williams (1963, p. 1121-1122) have shown, however, that wulfenite is only conditionally stable in an oxidizing environment with sulfate and carbonate present. Since we do not know the mineral forms of lead and molybdenum in either silicified or argillized rocks prior to oxidation, we cannot investigate the lead-molybdenum correlation further, nor can we determine why lead and molybdenum are correlated in

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oxidized argillized rocks but definitely are not correlated in oxidized silicified rocks. Molybdenum shows no correlation with calcium in either silicified or argillized rocks (not shown on fig. ~~7~~ 8); so powellite ($CaMoO_4$) must not be an important supergene molybdenum mineral at Goldfield.

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The relatively high supergene mobility of molybdenum presumably produced the negative molybdenum-mercury and molybdenum-silver correlations, just as relatively high supergene mobility of copper presumably produced the strong negative copper-mercury correlation.

Zinc

No vestiges of the strong hypogene metal concentrations northeast of the January shaft remain (pl. 5). The hypogene behavior of zinc must have been similar to that of the other ore-related elements (fig. 6), and consequently it must have been enriched in the silicified rocks during metallization. Sphalerite (ZnS) appeared as a minor constituent in ores of the Combination mine (Collins, 1907a, p. 398). The histograms show that zinc, rather than being abundant in the oxidized silicified rocks, is depleted in oxidized silicified rocks relative to oxidized argillized rocks. Furthermore, zinc shows no positive correlations with any of the preceding elements but does show negative correlations with gold in silicified rocks and lead in argillized rocks (fig. 8). Both the latter elements have experienced only minor supergene redistribution. We conclude that zinc has been strongly leached from the rocks of the cuts and leached more strongly from the silicified rocks.

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The geochemical map (pl. ~~22~~ 5) shows that the distribution of zinc in argillized rocks near silicified zones is too erratic to form a distinct halo. Zinc may be coprecipitated with limonite (Hawkes and Webb, 1962, p. 55, 164, 377), but here zinc shows no correlation with iron, so it has not been partially retained in the oxidized zone by copreciptation with limonite or sorption by limonite, as have arsenic, copper, and molybdenum. Sorption by clays probably was not effective in retaining zinc in the oxidized zone (p. ~~89-89a~~ 108-108a).

Apparently zinc was more mobile during oxidation than any other element considered in this study. The relatively large amounts of zinc in the Florence mine supergene sulfates attest to this high mobility (p. ~~59, 63~~ 70, 74, and table 2). High supergene mobility for zinc is in accordance with results of previous work summarized in table 5.

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Discussion of indicator elements for gold and methods of geochemical sampling

Geochemical exploration in the vicinity of Goldfield should concentrate on the numerous silicified zones well exposed throughout the hydrothermally altered area. High values for gold, lead, silver, bismuth, and mercury, the elements showing dominantly relict hypogene dispersion patterns, are found mostly in silicified rocks. Even though all these elements except bismuth show at least a few intermediate and high values in argillized rocks, none of them consistently form hypogene aureoles extending a significant distance into argillized rocks. They do, however, form aureoles surrounding ore bodies within silicified rocks. The geochemical profiles constructed for gold, lead, and silver show that these elements in particular form aureoles that contrast sharply with much lower values found in adjacent argillized rocks. None of the elements that were notably leached and redistributed during oxidation, including arsenic, copper, molybdenum, and zinc, have moved outward from oxidized ore-bearing silicified zones into the surrounding oxidized argillized rocks to form distinct supergene halos. Hence bedrock sampling should be restricted to silicified rocks.

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Three of the nine ore-related metals considered in this report are potentially useful guides to ore for geochemical prospecting; usefulness of the remaining six metals is more or less limited. Gold analyses are indispensable as a guide to ore. Lead is reliable as an ore guide and should be particularly useful for reconnaissance sampling programs, because lead is even less mobile than gold during oxidation, and its aureoles are characterized by less sample-to-sample variation than accompanying gold. Silver analyses are also worthwhile because gold-silver ratios vary considerably, and amounts of silver cannot be predicted from gold or lead values. Amounts of silver exceeded associated amounts of gold in some ores, particularly in mines away from the main district (Ransome, 1909, p. 171-172), so potential ore bodies might well be missed if silver were not determined. We consider mercury optional in a geochemical survey because its aureoles are not distinguished by outstandingly high values. Information on mercury distribution might be more interesting in other parts of the Goldfield altered area than it is in the Combination-January area, because Ransome (1909, p. 113) reported mercury showings at an otherwise unmetallized locality about 4 miles northeast of the main district. Our data is inadequate to fully evaluate bismuth, so we cannot determine how useful bismuth might be in a geochemical survey. Arsenic, copper, and molybdenum are too strongly leached to detect anything but a fairly near-surface, extensive, and relatively high-grade ore occurrence such as that northeast of the January shaft; that is, an occurrence that likely would have been discovered already. Zinc is

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 (p. 115a follows)

so strongly leached during oxidation that it seems useless. We cannot rule out the possibility that arsenic, copper, molybdenum, or zinc could form well-developed supergene halos extending into oxidized argillized rocks around ore bodies in other parts of the Goldfield altered area, but from the results of this study, we cannot commend a sampling program for these elements utilizing bedrock samples from argillized rocks.

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 (p. 116 follows)

Realizing that our data are derived from only a small part of the Goldfield altered area, we tentatively suggest the following minimum gold, lead, and silver values to be considered anomalous for bedrock samples from silicified zones. A geochemical survey should not miss any significant anomalies if gold values equal to or greater than 0.3 ppm, lead values equal to or greater than 70 ppm, and silver values equal to or greater than 1 ppm are considered anomalous. Values in the ranges of "high" values shown on plates 4, 5, and 6 (3 ppm or more for gold, 200 ppm or more for lead, and 10 ppm or more for silver) should certainly be worthy of further investigation. Treating a large number of samples from the entire Goldfield altered area to determine geochemical background and anomalous values is beyond the scope of this report and is the subject of additional work.

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In many areas visible concentrations of limonite minerals are a good guide to anomalous amounts of metals, but at Goldfield usefulness of this guide is limited. Qualitative comparison between iron content and relatively intense color of either red (hematite dominant) or yellow-red (goethite dominant) hue (Goddard and others, 1948) indicates that intense color and iron content are definitely well correlated. Unfortunately iron content is not correlated with gold, lead, silver, bismuth, or mercury content in silicified rocks (see fig. 8). Thus, although limonite-rich samples are likely to have larger amounts of arsenic, copper, or molybdenum than limonite-poor samples nearby, they will not necessarily have large amounts of gold, lead, silver, bismuth, or mercury. We expect that a sampling program utilizing limonite-rich altered rocks or limonite scrapings from fractures, and analyzing for arsenic, copper, or molybdenum, would produce results difficult to interpret. At many localities silicified zones are so numerous that the source of anomalous arsenic, copper, or molybdenum could be hard to find, particularly if the highest values showed up in argillized rocks; detailed sampling for gold would then be required. A better approach would be to selectively sample silicified rocks, collecting limonite-rich samples wherever they are available, but taking care not to ignore silicified zones showing little limonite. The limonite-rich samples could be tested for unusual amounts of arsenic, copper, and molybdenum in addition to gold, lead, and silver. Such samples should be just as likely to show anomalous gold, lead, and silver as limonite-poor silicified rocks. Whether the information gained over doing gold, lead, and silver alone would be worth the cost of the additional arsenic, copper, and molybdenum analyses is open to question.

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We doubt that soil sampling surveys would be of much use in the Goldfield altered area. Should such a survey be undertaken in one of the more poorly exposed parts of the area, the anomaly contrast between oxidized silicified and oxidized argillized rocks shown by such ~~the~~ geochemical profile~~s~~ give~~s~~ an indication of the maximum anomaly contrast that might be encountered, assuming mainly mechanical dispersal of the ore-related elements in colluvium. Lead would be the best indicator in a colluvial-soil survey. Soil-covered parts of the Goldfield altered area appear to be dominantly of colluvial origin, although residual soils that are actually soft argillized rocks appear locally.

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The consulting field remains in the doldrums. Some months ago, I t ought that the election would provide the investment confidence which has been lacking. N w, I am counting on the end of the V et Nam problem. Should that fail, there is no answer except to await the unexpected.

Kitty and I would love to have you stop bye and see us in Reno, at any time; of that does not work, the chances are that I will be in Sunnyvale, one of these days, checking on three grandchildren, and if so, how about a session and lunch.

My very best to you and your good wife who coded the geochemical data so efficiently.

Sincerely,

David LeCount Evans

January 21, 1973

Dr. Roger P. Ashley,
U. S. Geological Survey,
345 Middlefield Road,
Menlo Park,
California 94025.

Dear Roger:

Your consideration and thoughtfullness, as reflected in the copy of your open-file report on ore-related elements at Goldfield, has indeed been appreciated.

Report and maps arrived on Friday and I am slowly and methodically going over it. Knowing me, as I hope you do, there are parts, under "Statistical Methods", which lose me. However, except for that section, which is an indication of my age and the fact that my 'continuing education' has not included that field, I am following the rest with great interest.

Believe me, it is a welcome addition to my personal files and will be of real help, inasmuch as interest in Goldfield and its dormant, low grade but economic potential remains very much alive.

Some months ago I spent a lot of time with the material you so kindly provided, working out structural and alteration patterns (in an ex-company geologist manner) and hoping that Harold would proceed. Nothing new has been heard and I can only conclude that negotiations failed.

Since last seeing you there have been other 'tangents' to keep me off the streets and away from the pool halls. None pays any bills but I believe that given time the desk 'experience' will be productive.

The absolute dating of plutons, starting from the California maps released by the Survey and adding a wealth of material available for Nevada, Oregon and Idaho, provides a different approach to Nevada lineaments and how one might prospect; and, of course, the new Plate Tectonics and ocean floor spreading with its subduction zone has caused sleepless nights.

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