UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

GEOCHEMICAL AND STATISTICAL ANALYSIS OF ANALYTICAL RESULTS FOR STREAM SEDIMENTS, PANNED CONCENTRATES FROM STREAM SEDIMENTS, ROCKS, ORES, AND WATERS COLLECTED FROM THE INDIAN HEAVEN ROADLESS AREA, SKAMANIA COUNTY, WASHINGTON

By

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STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Indian Heaven Roadless Area in the Gifford Pinchot National Forest, Skamania County, Washington. The Indian Heaven Roadless Area (06076) was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

Introduction

The Indian Heaven Roadless Area is located between Mount St. Helens and Mount Adams in Skamania County, Washington. The area is a young, basaltic volcanic field (Hammond, 1980) covering approximately 28,000 acres (see fig. 1). It is heavily wooded and the surrounding area has been clear cut for timber. Camping facilities and existing trails are heavily used, especially during the summer season. A geochemical reconnaissance of the study area was undertaken during the 1981 field season. Samples were collected by P. E. Hammond and S. E. Church. Stream-sediment sampling constituted the primary medium utilized in the study, although this data base was supplemented by data from rock samples representing specific geological units mapped within the Indian Heaven Roadless Area, from waters taken from lakes and streams draining the area, and from panned concentrates from stream sediments taken from the major drainages. Sample localities are shown in plate 1.

Field Methods

Thirty-six stream-sediment samples were collected from active streams draining areas as large as 2 mi^2 (8 km^2). Sediment samples were collected from several localities within the stream, air dried, and were sent to the laboratory for sieving and analysis.

Twelve panned concentrate samples from stream sediments were taken from the larger drainages within the roadless area. The concentrate was panned in the field, air dried, and sent to the laboratory for separations, mineral identification, and spectrographic analysis.

Twenty-five water samples were collected from all streams and lakes on a single day (July 17, 1981) to eliminate the added variance that would have occurred if samples had been collected earlier with the stream sediments over a period of several weeks. Two water samples were taken at each site. A 250 mL sample was taken for the determination of anion concentrations. The sample was collected in a 250 mL, polypropylene bottle and the pH determined with a Fisher model 107 pH meter within 24 hours of collection in the field. A second water sample was taken and filtered through a 0.4 micron filter into a 50 mL, polypropylene bottle that had been previously soaked in 1.0 N HNO_3 for 24 hours or longer before use. This sample was acidified with four drops (approximately 0.1 mL) of concentrated HNO_3 immediately following collection in the field.

Sample Preparation

The stream-sediment samples were sieved through an 80 mesh stainless steel sieve (177 micron) and the minus-80-mesh fraction was ground for spectrographic analysis. A minus-30-mesh (590 microns) stainless steel screen was used to sieve the panned concentrate from stream-sediment samples and the minus-30-mesh fraction was retained for further separation. The most magnetic fraction was removed using an electromagnet. This fraction contained magnetite and rock fragments having a high magnetite content. This fraction was discarded. The low-density fraction (specific gravity <2.8) was separated from the heavy-mineral fraction by flotation in bromoform and was discarded.

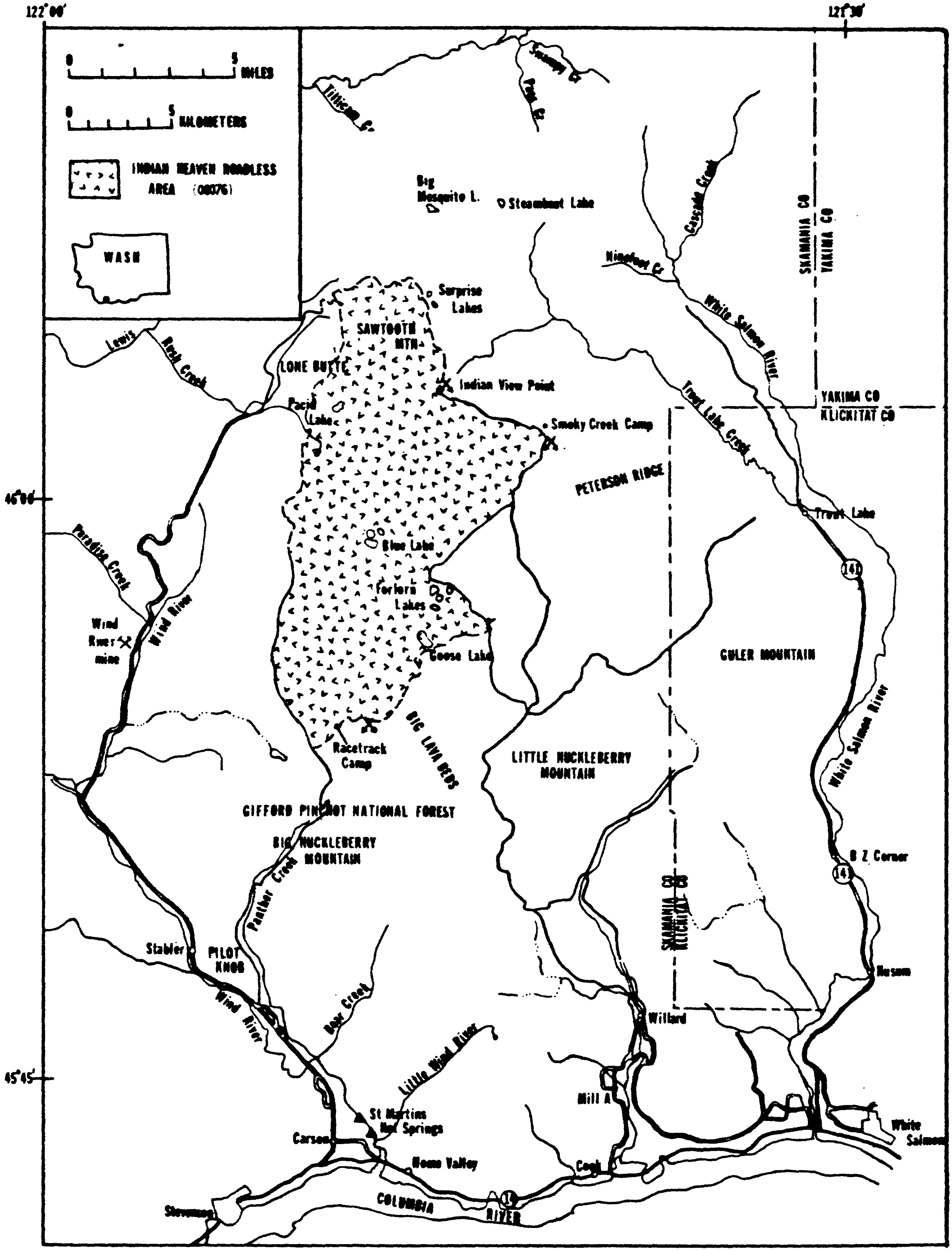

Figure 1.--Location map showing the Indian Heaven Roadless Area.

A final magnetic separation of the heavy-mineral fraction was made on the Frantz isodynamic separator at a setting of 0.6 amperes with a forward slope of 25° and a side slope of 15°. Under these conditions, a nonmagnetic, heavy-mineral fraction was separated from a more magnetic fraction. The more magnetic fraction included many of the rock fragments and most of the mafic silicates. Mineralogically, the nonmagnetic fraction contained sulfides, nonmagnetic oxides, sulfate and tungstate minerals, tourmaline, apatite, sphene, zircon, and minor trace minerals that may be indicative of mineralization. Separations for the samples were not good, and a substantial component of rock fragments, calcic plagioclase, and mafic minerals remained in the nonmagnetic, heavy-mineral fraction. The percentages of these components are given in table 6 and their effect must be taken into account when interpreting the analytical data. Following mineralogical examination of the nonmagnetic, heavy-mineral fraction, the samples were ground under acetone in an agate mortar prior to spectrographic analysis.

Mineralogical examinations of the nonmagnetic, heavy-mineral fraction of the panned concentrate from stream sediments were performed using a binocular microscope. Visual examinations of the mineralogy were made and visual estimates of the volume percent of the total nonmagnetic, heavy-mineral fraction were determined. X-ray diffraction patterns were run for minerals not readily recognized by binocular microscopic examination; the mineralogical identifications, however, should be considered tentative.

Forty background rock samples were crushed and then pulverized to about minus-80-mesh (177 microns) prior to analysis. Three mineralized samples were also analyzed.

No further sample preparation work was done on the water samples prior to analysis.

Analytical Methods

The analytical limits of detection for spectrographic analysis of stream sediments, rocks, and panned concentrates of stream sediments are given in table 1. Analytical limits for the determinations made from aqua regia leaches of the rock samples using ICP (Inductively Coupled Plasma) methods are summarized in table 2. Additional methods, studies and discussions, are given in Church (1978; 1979; 1981a) and Church and others (1982). A complete discussion of spectral interference corrections is given in Church (1981b). Analytical methods and limits of detection for waters are given in table 3 and discussions of the use of these data are given by Miller and Ficklin (1976).

Analytical results for the stream sediments are given in table 4, and analytical results for panned concentrates from stream sediments are given in table 5. Mineralogical data on the nonmagnetic, heavy-mineral fraction of the panned concentrates from stream sediments are given in table 6. Analytical results from rock and ore samples collected from the Indian Heaven area are given in tables 7 and 8. Analyses of both anion and cation concentrations in waters as well as the pH values measured in the field are given in table 9.

Analytical results obtained from rocks, ores, stream sediments, and panned concentrates from stream sediments are obtained by visual comparison of spectra derived from the unknown sample against spectra obtained from standards made from pure oxides or carbonates using a D.C. (direct current) arc emission spectrographic method (Grimes and Marranzino, 1968). Standard concentrations are geometrically spaced over any given order of magnitude of concentration and are prepared in such a way that the range of concentrations normally found in naturally occurring samples are bracketed. When comparisons are made with sample films for semiquantitative use, reported values are rounded to 100, 50, 20, 10, and so forth. Those samples whose concentrations are estimated to fall between the above values are arbitrarily given values of 70, 30, 15, 7, and so forth. The precision of the method is approximately plus or minus one reporting unit at the 83-percent confidence level and plus or minus two reporting units at the 96-percent confidence level (Motooka and Grimes, 1976). Values determined for the major elements (magnesium, calcium, iron, and titanium) are given in weight percent; all others are given in parts per million (micrograms/gram).

Analytical results obtained using ICP methods are obtained by comparison with gravimetric standard solutions and are accurate to $\pm$ 1-3% at levels 10 times the limit of detection if no significant interference is present. For further discussion of the calibration, matrix effects and analytical error caused by spectral interferences, see Church (1981b). Analytical results obtained from the water samples are made by comparison of measured intensities against linear curves defined by gravimetric standards. Cation concentrations were obtained using flameless atomic absorption methods whereas the anions were measured using anion chromatography. For further discussion of analysis of water samples, see Miller and Ficklin (1976).

Discussion

The geology of the study area is summarized in figure 2. The area is underlain by Holocene basalts and by the Tertiary andesite/basalt and volcanoclastic rocks of the Western Cascade Group (Hammond, 1980). All the analytical results, sample descriptions, and locations have been entered into a computerized rock storage system (RASS) used by the U.S. Geological Survey. The data have been processed using computer programs in a statistical package (STATPAC, VanTrump and Miesch, 1977) to provide statistical summaries and, in the case of the ICP data from rocks, histograms of observed elemental abundances (table 17). Log transforms of the data sets were used to prepare the histograms and the correlation coefficient tables and the analysis includes only unqualified values.

Only the analytical results from the ICP method from rocks are given in histograms (table 17). The reason for this is that these data are more accurate than the spectrographic results and provide better analytical resolution allowing some distinction between groups of lavas. The histograms reveal a single mode for the elements magnesium, calcium, aluminum, iron, manganese, niobium, zinc, beryllium, strontium, barium, and lanthanum whereas the transition metals vanadium and copper, cerium and phosphorous are bimodal. Chromium, cobalt, and yttrium have two visible modes but are truncated, and titanium has three modes. Correlation coefficient analysis of these data (table 18) indicate a strong correlation between elements enriched in the basaltic differentiation process (iron, titanium) with the transition metals manganese, cobalt, zinc and copper(?), strontium, and niobium reflecting pyroxene control on the liquidus. There is also a correlation between phosphorous and the rare-earth elements, as well as vanadium suggesting both magnetite and apatite control during magmatic crystallization for these elements.

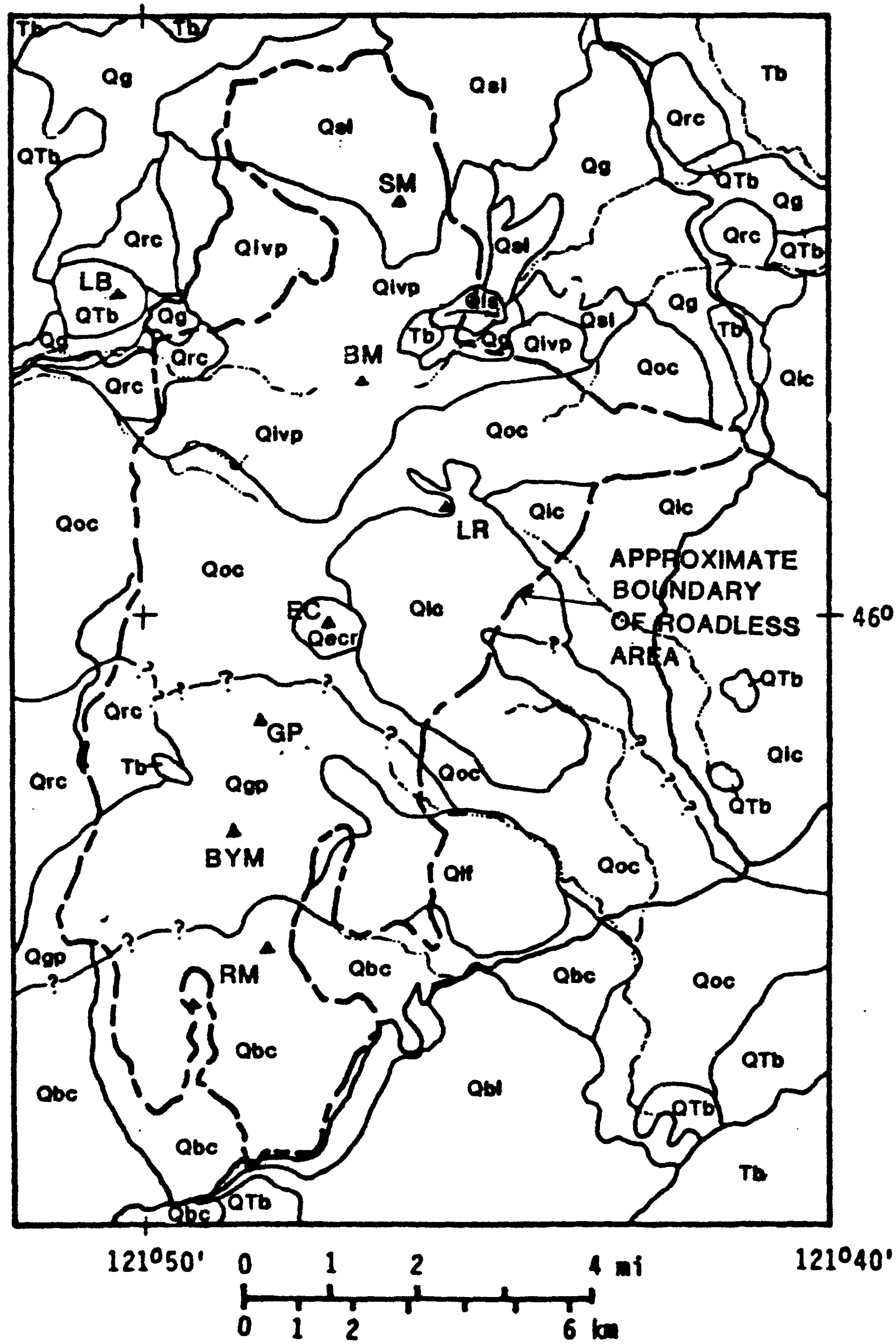

Figure 2.--Simplified geologic map of the Indian Heaven Roadless Area (P. E. Hammond, unpub. mapping, 1982). Map units are informally named.

EXPLANATION FOR FIGURE 2

- - - - - APPROXIMATE BOUNDARY OF THE INDIAN HEAVEN ROADLESS AREA (06076)

——— CONTACT--queried where uncertain

▲ VOLCANIC CENTER
- BM--Bird Mountain
- BYM--Berry Mountain
- GP--Gifford Peak
- LB--Lone Butte
- LR--Lemei Rock
- RM--Red Mountain
- SM--Sawtooth Mountain
- EC--East Crator

CORRELATION OF MAP UNITS

Surficial deposits

Unit	Name	Epoch	Period
Qls	Landslides	HOLOCENE	QUATERNARY
Qg	Glacier deposits	HOLOCENE	QUATERNARY

Lava flows of Indian Heaven volcanic field

Unit	Name	Epoch	Period
Qbl	Basalt of Big Lava Bed	PLEISTOCENE	QUATERNARY
Qlc	Basalt of Comcomly Lakes	PLEISTOCENE	QUATERNARY
Qic	Basalt of Ice Cave	PLEISTOCENE	QUATERNARY
Qecr	Basalt of East Crater	PLEISTOCENE	QUATERNARY
Qoc	Basalt of Outlaw Creek	PLEISTOCENE	QUATERNARY
Qbc	Basalt of Black Creek	PLEISTOCENE	QUATERNARY
Qfl	Andesite of Forlorn Lakes	PLEISTOCENE	QUATERNARY
Qivp	Basalt of Indian Viewpont	PLEISTOCENE	QUATERNARY
Qsl	Basalt of Surprise Lakes	PLEISTOCENE	QUATERNARY
Qgp	Basalt of Gifford Peak	PLEISTOCENE	QUATERNARY
Qrc	Basalt of Rush Creek	PLEISTOCENE	QUATERNARY
Qtb	Undifferentiated basalt, basaltic andesite and andesite	PLEISTOCENE	QUATERNARY

Western Cascade Group

Unit	Name	Epoch	Period
Tb	Undifferentiated bedrock of the Western Cascades Group	MIOCENE-OLIGOCENE-EOCENE	TERTIARY

LIST OF MAP UNITS

Qls LANDSLIDES (HOLOCENE)

Qg GLACIAL DEPOSITS (QUATERNARY) (10-30 m thick)

Lava flows of Indian Heaven volcanic field

Qbl BASALT OF BIG LAVA BED (QUATERNARY)--Phyric olivine basalt

Qlc BASALT OF COMCOMLY LAKES (QUATERNARY)--Phyric olivine basalt erupted from vent near Lemei Rock (LR)

Qic BASALT OF ICE CAVE (QUATERNARY)--Coarsely phyric olivine-plagioclase basalt erupted from vent near Lemei Rock (LR)

Qecr BASALT OF EAST CRATER (QUATERNARY)--Scoraceous phyric olivine basalt (EC)

Qoc BASALT OF OUTLAW CREEK (QUATERNARY)--Phyric olivine basalt erupted from vent near Lemei Rock (LR)

Qbc LAVA FLOWS OF BLACK CREEK (QUATERNARY)--Phyric olivine basalt, basaltic andesite and andesite erupted from Red Mountain (RM)

Qfl ANDESITE OF FORLORN LAKES (QUATERNARY)--Phyric olivine andesite erupted from vents east of Gifford Peak (GP)

Qivp BASALT OF INDIAN VIEWPOINT (QUATERNARY)--Phyric olivine basalt erupted from vents on Bird Mountain (BM)

Qsl BASALT OF SURPRISE LAKES (QUATERNARY)--Phyric olivine basalt erupted from vents on Sawtooth Mountain (SM)

Qgp BASALT OF GIFFORD PEAK (QUATERNARY)--Phyric olivine basalt erupted from vents at Gifford Peak (GP) and Berry Mountain (BYM)

Qrc BASALT OF RUSH CREEK (QUATERNARY)--Coarsely phyric olivine-plagioclase basalt erupted from East Crater

Qtb UNDIFFERENTIATED BASALT, BASALTIC ANDESITE AND ANDESITE (PLEISTOCENE-PLIOCENE)

Tb UNDIFFERENTIATED BEDROCK OF THE WESTERN CASCADES GROUP (TERTIARY)--Includes the Eagle Creek Formation, lava flows of Council Bluff, Stevens Ridge Formation and Ohanapecosh Formation (Hammond, 1980)

Evaluation of the correlation coefficient and elemental distribution data from the spectrographic analysis of the basalts (tables 14 and 15), although it is less accurate, does augment the ICP data. In addition to the transition metals listed above, increases in the concentrations of chromium and scandium accompany the iron-titanium enrichment process, and strontium, barium, and zirconium, and the rare-earth elements are also enriched during basaltic differentiation. Both of these trends may reflect shallow-level basaltic differentiation processes. The fact that transition metals that tend to form sulfides (copper, zinc, cobalt) as well as those that tend to form oxides (niobium, manganese, and chromium) are enriched is taken as evidence that none of the magmas represented have undergone any significant fractionation of sulfur dominate metal species (copper, cobalt, lead, zinc) to form a sulfur-rich hydrothermal fluid.

Evaluation of the correlation coefficient analysis and elemental abundance data from the stream-sediment medium (tables 10 and 11) indicates that this medium reflects the bedrock geochemistry of the drainage basin itself. No new geochemical associations or anomalies could be identified from these data.

Similar results are seen in the analysis of the data from waters (tables 19 and 20). There is a correlation of copper with chlorine at the 95-percent confidence level and a correlation of zinc with pH at the 99-percent confidence level. However, all values are low and are not thought to reflect anything other than bedrock geochemistry.

Analysis of the data collected from the panned concentrates from stream sediments, which includes the mineralogical data (table 6), provides important supplementary data to the analysis of geochemical processes given above. As was stated earlier, the nonmagnetic, heavy-mineral fraction contained a substantial component of mafic silicates (table 6, column 8). Inclusion of the mineralogical data in the correlation coefficient analysis (table 13) indicates a correlation at the 99-percent confidence level between mafic mineral abundance and the elements iron, titanium, chromium, manganese, cobalt, and copper, all of which are strongly partitioned into late forming, iron-rich clinopyroxenes or iron oxides during basaltic magmatic differentiation.

Analytical data from one drainage basin, a small tributary of Black Creek located on the southwest margin of the study area, contain some values in the panned concentrate sample that may be considered anomalous (Cu, 200 ppm, and Pb, 100 ppm). In evaluating these data, we were able to obtain three samples from the Wind River mine, a small sulfide-bearing vein located five miles due west of the Indian Heaven Roadless Area in the Western Cascade volcanic rocks. These three samples came from unaltered rocks near the deposit and from the vein itself. Spectrographic results from the rocks are given in table 7 and a nonmagnetic, heavy-mineral separate from the ore zone was prepared. Mineralogically, the ore sample contains 90 percent pyrite and chalcopyrite in quartz, 9 percent chrysocolla, malachite, and secondary copper ores, and perhaps some sphalerite. Spectrographic analysis of this concentrate gave the following values worthy of note: Ag, 200 ppm; As, 2000 ppm; Au, 70 ppm; Bi, 100 ppm; Co, 15 ppm; Cu, >20,000 ppm; Mo, 15 ppm; Pb, 10,000 ppm; Sb, 300 ppm; Sn, 30 ppm; and Zn, 1500 ppm. Zinc, lead, barium, and copper halos were found in the altered rocks cropping out near the deposit.

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Table 1.--Limits of detection for analytical results obtained from stream sediments, panned concentrates from stream sediments and ores, and rocks using D.C. arc emission spectrography[1]

Element	Sediment and rock sample weights (g)	Concentrate and ore sample weight (g)	Detection limit (sediments and rocks)	Detection limit (concentrates and ores)
Mg	0.010	0.005	0.02[2]	0.05[2]
Ca	↓	↓	.05	.10
Fe	↓	↓	.05	.10
Ti	↓	↓	.002	.005
V	↓	↓	10[3]	20[3]
Cr	↓	↓	10	20
Mn	↓	↓	10	20
Co	↓	↓	5	10
Ni	↓	↓	5	10
Cu	↓	↓	5	10
Zn	↓	↓	--	500
Mo	↓	↓	5	10
Ag	↓	↓	--	1
Au	↓	↓	--	20
Sn	↓	↓	--	20
Pb	↓	↓	10	20
Bi	↓	↓	--	20
As	↓	↓	--	500
Sb	↓	↓	--	200
B	↓	↓	10	20
Be	↓	↓	1	--
Sr	↓	↓	100	200
Ba	↓	↓	20	50
Sc	↓	↓	5	10
La	↓	↓	20	50
Y	↓	↓	10	20
Zr	↓	↓	10	20

[1]Direct current (D.C.) arc-spectrographic method (Grimes and Marranzino, 1968).

[2]Results for magnesium, calcium, iron, and titanium given in weight percent.

[3]Results for vanadium and all succeeding elements given in parts per million.

Table 2.--Limits of detection for analytical results obtained from rocks using Inductive Coupled Plasma (ICP) methods

Element	Wavelength	LQD[1] (μg/mL)	Lower limit of determination[2] (μg/g)
Mg	279.0	0.600	15
Ca	422.7	.080	2
Fe	259.9	.42	10
Ti	334.9	.09	2.2
Al	396.1	.150	4
P	213.6	.280	7.0
V	311.0	.011	0.28
Cr	283.5	.10	2.5
Mn	257.9	.023	0.58
Co	345.3	.150	3.5
Ni	231.6	.050	1.3
Cu	324.7	.010	.25
Zn	202.5	.010	.25
Mo	287.1	.031	.8
W	239.7	.130	3.3
Cd	226.5	.020	0.5
Ag	328.0	.015	.38
Sn	189.9	.130	3.3
Pb	220.3	.150	10
As	193.7	.170	10
Sb	217.5	.250	7
Bi	306.7	.7	20
Be	313.0	.0004	0.01
Sr	407.7	.0004	.01
Ba	455.4	.008	.2
La	398.8	.023	.6
Ce	418.6	.100	2.5
Y	371.0	.003	.75
Nb	309.4	.040	1.0

[1]Lowest quantitative determinable concentration is defined as that concentration of the element that will give a net signal equal to approximately 10 times the standard deviation of the background. The values given are those determined for the voltage biases and calibration used in this study.

[2]The lower limit of determination is the LQD times the dilution factor. For this study, one gram of sample was leached and the final solution diluted to 25 mL.

Table 3.--Limits of detection for analytical results obtained from waters using flameless atomic absorption spectrophotometry (FAAS) and ion chromatography (IC).

Element or ion	Limit of detection (µg/mL)	Method
Cu	0.001	FAAS[1]
Zn	.0005	FAAS[1]
Mo	.001	FAAS[1]
SO_4^{--}	.10	IC[2]
Cl^-	.05	IC[2]

[1]Miller and Ficklin (1976).

[2]Smee and Hall (1978).

Table 4. Analytical data from stream sediments from the Indian Heaven Roadless area

[The following qualifiers are used in reporting spectrographic data: --, no determination made; N, concentration less than the detection limit; <, detected, but present at a concentration less than the value reported; >, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

Sample	Latitude	Longitude	Mg-pct. s	Ca-pct. s	Fe-pct. s	Ti-pct. s	V-ppm s	Cr-ppm s	Mn-ppm s	Co-ppm s	Ni-ppm s
IH1902S	45 54 20	121 50 24	2.0	2.0	7	.5	200	200	1,000	30	150
IH1904S	45 56 40	121 51 14	2.0	2.0	5	.5	150	150	1,000	30	70
IH1905S	45 57 30	121 50 53	2.0	2.0	5	.5	150	150	1,000	30	100
IH1907S	45 58 32	121 52 25	2.0	2.0	5	.5	100	150	1,000	30	100
IH1908S	45 59 10	121 51 53	2.0	2.0	5	.5	100	100	1,000	30	100
IH1909S	46 0 35	121 52 0	2.0	2.0	7	.7	100	150	1,000	50	150
IH1910S	46 1 0	121 52 0	2.0	2.0	7	.5	100	150	1,500	50	100
IH1913S	46 3 14	121 49 15	2.0	2.0	7	.5	200	150	1,000	30	100
IH1914S	46 4 2	121 48 45	2.0	2.0	7	.7	200	100	1,000	30	70
IH1915S	46 4 21	121 48 35	2.0	2.0	7	.7	200	200	1,000	50	150
IH1916S	46 4 36	121 48 45	1.5	2.0	5	.3	100	70	700	20	50
IH1917S	46 4 47	121 48 55	2.0	2.0	10	1.0	200	150	1,500	50	100
IH1918S	46 5 55	121 47 15	1.5	3.0	5	.5	150	50	500	20	20
IH1919S	46 6 23	121 46 41	2.0	2.0	7	.7	200	150	700	30	70
IH1920S	46 4 40	121 45 30	1.5	2.0	5	.5	150	70	500	20	30
IH1921S	46 4 19	121 45 25	1.5	2.0	5	.5	200	70	1,000	20	50
IH1922S	46 4 9	121 45 23	1.5	2.0	5	.5	200	100	1,000	30	70
IH1923S	46 2 30	121 42 15	2.0	2.0	7	.5	200	200	1,000	50	100
IH1924S	46 2 45	121 43 15	3.0	2.0	7	.5	200	500	1,000	50	200
IH1925S	46 4 0	121 45 9	2.0	2.0	7	.5	200	150	1,000	30	70
IH1926S	46 2 55	121 45 20	2.0	2.0	7	1.0	300	100	1,000	30	50
IH1929S	46 1 0	121 42 35	2.0	2.0	7	.5	200	200	1,000	50	100
IH1930S	46 0 45	121 42 55	1.0	1.0	3	.3	100	100	700	20	50
IH1931S	46 0 20	121 43 25	1.5	1.5	5	.3	150	150	1,000	30	70
IH1932S	45 58 40	121 45 22	2.0	2.0	7	.5	200	200	1,000	50	100
IH1934S	45 56 52	121 43 20	2.0	2.0	7	.7	200	300	1,000	50	150
IH1935S	45 56 35	121 44 35	1.5	1.5	5	.5	150	150	1,000	30	100
IH1938S	45 56 7	121 46 16	1.5	2.0	5	.5	100	150	1,000	30	100
IH1939S	45 54 35	121 48 38	2.0	1.5	7	.5	100	200	1,000	50	200
IH1941S	45 57 13	121 47 37	2.0	2.0	7	.5	100	500	1,000	50	300
IH1942S	46 2 29	121 48 55	1.5	1.5	5	.3	70	150	1,000	30	100
IH1943S	46 2 37	121 48 40	1.5	1.5	5	.3	70	100	1,000	30	100
IH1944S	46 1 53	121 48 38	1.0	1.5	3	.3	70	15	500	15	20
IH1945S	46 1 18	121 48 15	1.0	1.0	3	.3	70	70	500	15	30
IH1946S	46 0 55	121 48 0	1.0	1.0	3	.3	100	100	500	20	30
IH1947S	46 0 55	121 47 52	2.0	2.0	5	.5	100	200	1,000	50	100

Table 4. Analytical data from stream sediments from the Indian Heaven Roadless area

Sample	Cu-ppm s	Mo-ppm s	Pb-ppm s	B-ppm s	Be-ppm s	Sr-ppm s	Ba-ppm s	Sc-ppm s	Y-ppm s	Zr-ppm s
IH1902S	50	N	15	10	1.5	300	200	15	20	100
IH1904S	50	N	15	10	1.5	500	200	15	20	100
IH1905S	70	N	15	10	1.5	500	300	20	20	100
IH1907S	50	N	10	10	2.0	300	200	15	20	70
IH1908S	70	N	10	10	1.5	300	200	20	20	70
IH1909S	100	N	10	10	1.5	300	200	20	20	100
IH1910S	70	N	10	10	1.5	300	150	15	20	70
IH1913S	50	N	20	10	2.0	500	200	15	20	100
IH1914S	50	N	15	10	1.5	500	200	20	20	100
IH1915S	70	N	15	10	2.0	500	200	20	30	150
IH1916S	30	N	15	10	2.0	500	200	10	20	70
IH1917S	70	N	15	10	1.5	500	200	20	20	100
IH1918S	30	N	10	10	1.5	500	200	15	20	100
IH1919S	50	N	20	10	1.5	500	200	20	20	100
IH1920S	50	N	20	10	1.5	300	200	15	20	100
IH1921S	50	N	15	10	1.5	500	200	15	20	100
IH1922S	30	N	20	10	1.5	500	200	15	20	100
IH1923S	50	N	15	10	1.5	500	200	20	30	100
IH1924S	70	N	15	10	1.5	500	200	20	30	100
IH1925S	50	N	15	10	2.0	700	200	20	30	100
IH1926S	50	N	15	10	1.5	500	200	20	30	100
IH1929S	70	N	15	10	1.5	300	200	20	30	100
IH1930S	20	N	10	10	1.5	300	200	10	15	50
IH1931S	30	N	10	10	2.0	300	200	15	20	70
IH1932S	70	N	20	10	1.0	300	200	20	30	70
IH1934S	50	N	20	10	2.0	500	200	20	30	100
IH1935S	70	N	20	10	2.0	300	200	15	30	100
IH1938S	50	N	15	10	1.5	500	200	15	20	100
IH1939S	50	10	10	10	1.5	300	200	15	20	100
IH1941S	70	N	10	10	2.0	500	200	20	20	100
IH1942S	50	N	15	10	1.5	300	200	15	20	70
IH1943S	30	N	15	10	2.0	500	200	15	15	70
IH1944S	20	N	10	10	2.0	500	200	10	10	100
IH1945S	30	N	20	10	2.0	300	200	10	10	100
IH1946S	30	N	15	10	1.5	300	150	10	10	70
IH1947S	50	N	20	10	1.5	300	200	20	20	100

Table 5. Analytical data from panned concentrates from stream sediments from the Indian Heaven Roadless area

[The following qualifiers are used in reporting spectrographic data: --, no determination made; N, concentration less than the detection limit; <, detected, but present at a concentration less than the value reported; >, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

Sample	Latitude	Longitude	Mg-pct. s	Ca-pct. s	Fe-pct. s	Ti-pct. s	V-ppm s	Cr-ppm s	Mn-ppm s	Co-ppm s	Ni-ppm s
IH1901C	45 54 35	121 52 0	5	7.0	10	1.5	200	1,000	2,000	100	300
IH1903C	45 56 5	121 51 35	5	5.0	7	.7	150	1,500	1,500	70	700
IH1906C	45 58 2	121 50 30	5	10.0	7	.7	200	2,000	1,500	70	500
IH1911C	46 1 43	121 49 55	3	5.0	7	.5	100	500	1,000	50	300
IH1912C	46 2 42	121 49 48	7	7.0	10	.7	150	1,500	2,000	100	1,000
IH1917C	46 4 50	121 48 52	5	5.0	7	1.0	200	1,000	1,500	70	500
IH1927C	46 2 45	121 45 15	10	2.0	10	.5	100	2,000	2,000	150	2,000
IH1928C	46 1 38	121 41 8	10	1.5	10	.5	100	1,000	2,000	150	1,500
IH1933C	45 58 2	121 45 0	5	2.0	7	.3	100	500	1,000	70	500
IH1936C	45 56 50	121 46 0	2	2.0	5	.7	150	500	700	20	300
IH1937C	45 57 0	121 45 55	1	10.0	5	.5	100	150	700	15	100
IH1940C	45 59 10	121 42 50	2	1.0	2	.2	50	200	500	15	200

Sample	Cu-ppm s	Pb-ppm s	B-ppm s	Sr-ppm s	Ba-ppm s	Sc-ppm s	La-ppm s	Y-ppm s	Zr-ppm s
IH1901C	200	100	20	300	1,000	100	N	100	>2,000
IH1903C	30	N	<20	N	500	70	N	30	2,000
IH1906C	70	N	<20	200	500	100	N	50	>2,000
IH1911C	50	N	<20	500	700	20	N	20	>2,000
IH1912C	100	N	<20	300	300	70	N	50	>2,000
IH1917C	30	N	<20	200	300	50	N	100	>2,000
IH1927C	100	N	<20	N	500	20	N	50	>2,000
IH1928C	100	N	20	N	1,000	20	N	70	>2,000
IH1933C	70	N	<20	1,000	1,000	15	N	20	1,500
IH1936C	30	N	<20	300	300	10	50	100	>2,000
IH1937C	50	N	20	700	500	10	100	150	>2,000
IH1940C	10	N	100	200	200	N	N	70	>2,000

Table 6. Mineralogy for the nonmagnetic, heavy-mineral fraction from panned concentrates from stream sediments from the Indian Heaven roadless area

[Abundance of minerals tentatively identified in the non-magnetic heavy fraction: - = none observed; 1 = trace present, $<1\%$; 2 = present, $>2\%$; 3 = common, $>5\%$; 4 = major, $>20\%$; 5 = dominant, $>50\%$; 6 = ubiquitous, $>85\%$.]

Sample	Latitude	Longitude	Plag.	Pyrite	Zircon	Apatite	Px/Ol/Am	Epidote	Rk Frags
IH1901C	45 54 35	121 52 0	3	3	3	--	5	--	--
IH1903C	45 56 5	121 51 35	4	--	2	--	5	--	--
IH1906C	45 58 2	121 50 30	2	--	--	4	6	--	--
IH1911C	46 1 43	121 49 55	5	3	2	--	4	--	--
IH1912C	46 2 42	121 49 48	3	--	--	--	6	--	--
IH1917C	46 4 50	121 48 52	--	--	3	4	5	--	--
IH1927C	46 2 45	121 45 15	--	--	3	--	6	--	--
IH1928C	46 1 38	121 41 8	--	--	--	--	6	--	--
IH1933C	45 58 2	121 45 0	--	--	--	--	6	--	--
IH1936C	45 56 50	121 46 0	5	2	2	--	--	3	4
IH1937C	45 57 0	121 45 55	4	3	--	4	--	--	2
IH1940C	45 59 10	121 42 50	4	--	--	--	4	--	3

Table 7. Spectrographic data from rocks and ores from the Indian Heaven Roadless area

[The following qualifiers are used in reporting spectrographic data: --, no determination made; N, concentration less than the detection limit; <, detected, but present at a concentration less than the value reported; >, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

Sample	Latitude	Longitude	Mg-pct. s	Ca-pct. s	Fe-pct. s	Ti-pct. s	V-ppm s	Cr-ppm s	Mn-ppm s	Co-ppm s	Ni-ppm s	Cu-ppm s
IH101	46 4 52	121 54 50	2.00	5.00	7	.500	200	200	1,500	50	150	150
IH102	46 5 40	121 43 30	3.00	5.00	7	1.000	150	200	1,000	50	200	30
IH103	46 6 0	121 47 40	3.00	5.00	7	.700	150	200	1,000	50	150	100
IH104	45 53 40	121 50 45	3.00	5.00	7	.500	150	200	1,000	30	100	50
IH105	46 2 55	121 42 35	2.00	5.00	5	.500	100	200	1,000	20	50	50
IH106	46 2 55	121 44 30	2.00	3.00	5	.500	100	200	1,000	30	100	20
IH107	45 57 0	121 45 55	3.00	5.00	5	.500	150	300	1,000	50	150	30
IH108	45 56 15	121 51 55	2.00	3.00	5	.500	100	200	1,000	30	100	70
IH109	46 2 25	121 45 45	3.00	5.00	7	1.000	150	300	1,500	50	150	70
IH110	46 2 10	121 46 5	3.00	5.00	7	.500	150	300	1,000	50	150	50
IH111	46 0 0	121 47 0	3.00	5.00	7	.700	150	300	1,500	70	150	100
IH112	45 56 2	121 46 55	3.00	5.00	7	.500	200	200	1,500	50	70	50
IH113	45 55 40	121 47 15	3.00	5.00	7	.500	150	200	1,500	50	70	50
IH114	45 56 5	121 48 15	3.00	3.00	7	.700	150	300	1,000	50	100	50
IH115	45 56 30	121 48 20	2.00	3.00	7	.500	150	150	1,000	30	70	50
IH116	46 4 15	121 45 5	2.00	2.00	5	.300	100	150	700	20	100	30
IH117	46 4 15	121 46 10	3.00	5.00	7	.500	150	300	1,000	50	150	50
IH118	46 2 40	121 46 30	3.00	5.00	7	.700	150	300	1,000	50	150	70
IH119	45 57 35	121 47 10	2.00	3.00	5	.500	100	100	700	20	100	50
IH120	45 57 40	121 48 40	3.00	5.00	7	.500	150	500	1,000	50	200	150
IH121	45 56 5	121 49 15	3.00	5.00	7	.700	150	200	1,000	50	150	70
IH122	45 59 10	121 42 52	3.00	5.00	7	.500	150	300	1,500	50	150	50
IH123	45 56 40	121 45 21	2.00	3.00	5	.500	100	150	1,000	30	100	70
IH124	45 54 50	121 49 45	3.00	5.00	7	1.000	200	300	1,500	50	200	100
IH125	45 58 0	121 46 45	1.50	2.00	2	.500	70	100	500	15	30	50
IH201S	46 3 5	121 50 45	3.00	5.00	7	1.000	200	500	1,500	50	200	150
IH202S	46 2 50	121 51 45	3.00	5.00	7	1.000	200	200	1,500	50	100	200
IH203S	46 2 10	121 47 30	3.00	3.00	7	1.000	200	300	1,500	50	200	200
IH204S	45 54 25	121 47 30	3.00	5.00	10	1.000	200	500	1,500	50	300	150
IH205S	46 3 55	121 46 25	3.00	5.00	7	1.000	150	300	1,000	30	200	70
IH206S	45 59 5	121 48 10	3.00	5.00	7	1.000	200	500	1,500	50	200	150
IH207S	46 1 0	121 45 0	3.00	5.00	10	.700	200	500	1,500	70	200	150
IH208S	46 1 15	121 45 40	3.00	5.00	7	.700	200	500	1,500	50	150	100
IH209S	46 2 50	121 46 30	3.00	5.00	10	>1.000	200	500	1,500	50	200	200
IH210S	46 2 20	121 46 45	3.00	5.00	7	1.000	150	500	1,000	50	200	100
IH211S	45 57 30	121 48 45	3.00	3.00	7	.700	200	500	1,000	50	200	100
IH212S	45 55 50	121 49 5	3.00	5.00	10	1.000	200	500	1,500	50	200	150
IH213S	45 56 30	121 49 7	3.00	5.00	10	1.000	200	700	1,500	50	200	100
IH214S	45 59 55	121 47 10	3.00	5.00	10	1.000	200	300	1,500	70	100	150
IH215S	46 2 10	121 46 30	5.00	5.00	7	1.000	200	500	1,500	50	300	150
NaS PIT	45 56 26	121 56 55	.15	.05	2	.200	50	10	300	10	5	50
DRIFTORF	45 56 26	121 56 55	.05	.05	3	.002	15	N	200	N	N	20,000
NR20062	45 56 26	121 56 55	.02	.05	1	.100	10	20	500	N	5	100

Table 7. Spectrographic data from rocks and ores from the Indian Heaven Roadless area

Sample	Mo-ppm s	Pb-ppm s	B-ppm s	Be-ppm s	Sr-ppm s	Ba-ppm s	Sc-ppm s	La-ppm s	Y-ppm s	Zr-ppm s
IH101	N	N	<10	N	300	70	30	N	30	70
IH102	N	N	<10	1.0	500	200	20	N	30	150
IH103	N	<10	<10	1.0	700	500	20	30	30	100
IH104	N	<10	<10	1.0	500	300	20	N	20	100
IH105	N	N	<10	1.0	500	200	20	N	20	70
IH106	N	N	<10	1.5	500	150	15	N	20	100
IH107	N	<10	<10	1.0	700	300	20	20	20	100
IH108	N	N	<10	1.0	500	200	20	N	20	100
IH109	N	N	<10	1.5	700	300	20	N	30	150
IH110	N	<10	<10	2.0	1,000	700	20	50	20	150
IH111	N	N	<10	1.0	500	200	30	N	30	100
IH112	N	N	<10	1.0	500	200	30	N	30	100
IH113	N	N	<10	1.0	500	200	30	N	30	100
IH114	N	N	<10	1.5	500	200	20	N	30	150
IH115	N	30	<10	1.5	500	300	20	N	20	150
IH116	N	N	<10	1.0	300	200	15	N	20	100
IH117	N	N	<10	1.5	1,000	700	20	30	30	150
IH118	N	N	<10	1.0	500	200	20	N	30	100
IH119	N	N	<10	1.5	500	200	15	N	20	100
IH120	N	N	<10	1.0	700	300	30	20	30	100
IH121	N	N	<10	1.5	700	300	20	N	30	150
IH122	N	N	<10	N	500	150	30	N	30	70
IH123	N	10	<10	1.5	500	200	20	N	20	100
IH124	N	N	<10	1.5	700	200	20	N	30	150
IH125	N	20	10	<1.0	300	300	10	<20	20	70
IH201S	N	N	<10	1.5	700	300	30	N	30	150
IH202S	N	N	<10	N	200	50	30	N	20	100
IH203S	N	N	<10	2.0	1,000	700	30	30	30	200
IH204S	N	N	<10	1.5	700	200	30	N	30	100
IH205S	N	N	<10	1.5	700	200	20	N	20	150
IH206S	N	N	<10	1.5	700	200	30	N	30	150
IH207S	15	<10	<10	1.0	500	200	50	N	30	100
IH208S	N	N	<10	1.0	300	150	30	N	30	100
IH209S	N	N	<10	1.5	500	500	30	N	30	150
IH210S	N	10	<10	2.0	1,000	500	30	20	30	150
IH211S	N	<10	<10	1.0	500	200	30	N	30	100
IH212S	N	<10	<10	1.5	500	200	30	N	30	150
IH213S	N	<10	<10	1.0	700	300	50	N	30	150
IH214S	N	10	<10	1.0	700	300	50	N	30	100
IH215S	N	10	<10	1.5	1,000	300	30	N	30	150
NaS PIT	N	10	100	1.5	200	50	10	N	20	100
DRIFTORE	N	500	15	N	N	30	N	N	N	N
N820062	N	<10	30	1.0	N	50	N	N	N	30

Table 8. ICP analytical data from basalts from the Indian Heaven Roadless area

[The following qualifiers are used in reporting ICP analytical data: --, no determination made; <, concentration less than the given detection limit; L, detected, but data are qualitative only.]

Sample	Latitude	Longitude	MG	CA	AL	FE	TI	V	CR	MN	CO	NB
IH101	46 4 52	121 54 50	26,000	7,800	9,200	34,000	3,600	<19.0	23.0	520	27.0	11.0
IH102	46 5 40	121 43 30	14,000	5,800	5,700	17,000	560	38.0	33.0	230	15.0	7.6
IH103	46 6 0	121 47 40	19,000	7,800	8,600	26,000	440	42.0	<12.0	360	22.0	8.8
IH104	45 53 40	121 50 45	6,200	5,500	6,200	12,000	440	43.0	31.0	120	6.2	7.2
IH105	46 2 55	121 42 35	7,100	4,600	4,500	15,000	450	36.0	11.0	150	9.8	6.7
IH106	46 2 55	121 44 30	13,000	5,700	6,600	17,000	400	26.0	18.0	230	13.0	6.1
IH107	45 57 0	121 45 55	25,000	7,000	7,900	23,000	690	39.0	N	360	20.0	9.1
IH108	45 56 15	121 51 55	9,300	3,600	2,600	10,000	670	43.0	25.0	120	9.3	7.7
IH109	46 2 25	121 45 45	24,000	6,100	5,500	25,000	1,600	24.0	N	430	22.0	8.5
IH110	46 2 10	121 46 5	19,000	7,300	6,500	19,000	900	68.0	12.0	200	17.0	12.0
IH111	46 0 0	121 47 0	12,000	7,600	9,000	25,000	2,700	54.0	49.0	250	19.0	13.0
IH112	45 56 2	121 46 55	15,000	14,000	19,000	21,000	290	13.0	N	340	16.0	5.9
IH113	45 55 40	121 47 15	14,000	13,000	19,000	20,000	490	26.0	N	300	16.0	7.3
IH114	45 56 5	121 48 15	18,000	8,000	8,100	22,000	970	33.0	N	330	19.0	8.2
IH115	45 56 30	121 48 20	2,500	4,200	4,900	10,000	1,200	43.0	18.0	73	5.4	7.5
IH116	46 4 15	121 45 5	6,000	5,100	5,900	11,000	640	36.0	12.0	130	7.8	6.7
IH117	46 4 15	121 46 10	16,000	6,400	7,300	23,000	1,100	48.0	36.0	290	16.0	9.9
IH118	46 2 40	121 46 30	20,000	4,600	5,600	21,000	2,800	<7.9	N	280	18.0	7.5
IH119	45 57 35	121 47 10	1,800	3,700	3,000	9,400	1,900	40.0	20.0	82	5.5	7.7
IH120	45 57 40	121 48 40	19,000	7,000	9,500	18,000	560	47.0	<11.0	250	18.0	9.8
IH121	45 56 5	121 49 15	11,000	8,700	10,000	16,000	970	41.0	19.0	170	14.0	8.9
IH122	45 59 10	121 42 52	24,000	10,000	15,000	25,000	1,000	13.0	N	430	23.0	6.9
IH123	45 56 40	121 45 21	890	4,600	5,200	6,300	710	47.0	20.0	46	<3.5	7.4
IH124	45 54 50	121 49 45	19,000	5,500	7,500	16,000	630	34.0	<7.6	160	15.0	7.9
IH125	45 58 0	121 46 45	340	3,900	4,200	8,500	1,200	51.0	32.0	55	4.1	8.4
IH201S	46 3 5	121 50 45	24,000	6,400	8,300	16,000	1,700	<7.9	<4.6	250	18.0	6.4
IH202S	46 2 50	121 51 45	23,000	40,000	47,000	33,000	300	15.0	42.0	650	26.0	11.0
IH203S	46 2 10	121 47 30	20,000	6,500	21,000	23,000	1,400	17.0	<6.4	310	19.0	8.2
IH204S	45 54 25	121 47 30	34,000	4,900	13,000	23,000	1,600	<8.3	<6.6	340	21.0	7.4
IH205S	46 3 55	121 46 25	19,000	3,500	8,600	14,000	790	14.0	N	190	15.0	6.1
IH206S	45 59 5	121 48 10	29,000	7,700	15,000	23,000	1,200	31.0	N	300	18.0	10.0
IH207S	46 1 0	121 45 0	21,000	6,900	13,000	16,000	890	9.8	<9.1	240	15.0	6.4
IH208S	46 1 15	121 45 40	18,000	11,000	18,000	17,000	970	9.2	<4.0	180	16.0	6.2
IH209S	46 2 50	121 46 30	8,500	8,300	12,000	9,700	1,300	14.0	14.0	110	6.9	5.7
IH210S	46 2 20	121 46 45	19,000	6,200	9,200	17,000	930	28.0	<9.6	180	15.0	7.8
IH211S	45 57 30	121 48 45	28,000	5,700	11,000	19,000	1,700	14.0	N	280	16.0	7.7
IH212S	45 55 50	121 49 5	18,000	6,800	15,000	18,000	1,400	10.0	<6.8	250	15.0	6.5
IH213S	45 56 30	121 49 7	25,000	5,500	15,000	25,000	2,800	<15.0	N	390	21.0	9.9
IH214S	45 59 55	121 47 10	7,300	9,000	16,000	10,000	980	14.0	<5.3	110	8.6	5.4
IH215S	46 2 10	121 46 30	22,000	5,500	11,000	20,000	1,100	41.0	13.0	230	17.0	9.9

Table 8. ICP analytical data from basalts from the Indian Heaven Roadless area

Sample	CU	ZN	PB	BE	SR	BA	LA	CE	Y	P
IH101	34.0	35	N	N	30	5.7	2.8	<3.8	.44	200
IH102	10.0	21	N	N	33	8.2	7.3	15.0	2.50	900
IH103	38.0	26	N	.140	88	17.0	16.0	32.0	2.00	940
IH104	17.0	17	<1.6	<.056	44	11.0	8.9	20.0	5.00	880
IH105	8.8	17	<2.2	<.052	31	10.0	8.0	18.0	5.30	890
IH106	10.0	19	N	<.040	38	9.3	6.7	14.0	2.10	850
IH107	11.0	32	N	<.069	76	15.0	12.0	24.0	1.50	910
IH108	62.0	17	<2.4	N	20	6.6	7.0	16.0	3.80	810
IH109	23.0	33	<2.0	.390	48	11.0	11.0	22.0	2.30	630
IH110	13.0	33	N	<.076	120	22.0	23.0	51.0	2.10	1,200
IH111	27.0	33	N	N	42	13.0	5.4	10.0	N	490
IH112	18.0	20	N	.120	62	11.0	5.1	9.1	2.70	420
IH113	17.0	21	18.0	.170	57	14.0	5.4	11.0	2.80	450
IH114	25.0	30	<2.2	<.073	47	8.9	10.0	21.0	4.00	1,000
IH115	12.0	18	N	<.048	27	13.0	7.3	17.0	3.00	560
IH116	26.0	21	<2.4	N	37	14.0	8.3	18.0	2.90	650
IH117	20.0	29	N	<.068	62	14.0	8.7	20.0	N	600
IH118	16.0	27	N	<.065	29	9.9	4.4	8.3	.56	190
IH119	22.0	20	<2.0	<.051	22	7.6	7.9	18.0	3.60	550
IH120	59.0	24	N	<.090	65	13.0	10.0	22.0	3.10	680
IH121	22.0	21	N	<.083	56	12.0	8.8	18.0	2.40	760
IH122	22.0	27	N	N	49	6.8	3.0	4.9	.18	250
IH123	32.0	14	<2.8	<.054	30	13.0	7.5	18.0	4.50	710
IH124	13.0	17	N	<.089	53	20.0	4.0	7.8	.47	490
IH125	13.0	19	N	<.050	27	13.0	8.8	21.0	4.30	640
IH201S	14.0	20	N	<.094	53	21.0	2.1	<3.0	N	110
IH202S	44.0	36	<11.0	<.260	110	33.0	2.9	N	3.70	240
IH203S	45.0	30	N	.380	67	89.0	12.0	26.0	.98	460
IH204S	22.0	22	N	.180	41	31.0	3.6	5.3	N	170
IH205S	10.0	18	<2.4	<.084	30	14.0	6.0	13.0	1.50	700
IH206S	24.0	27	N	.100	73	17.0	3.9	6.1	N	490
IH207S	19.0	15	<5.5	<.070	36	7.6	1.3	<1.3	N	150
IH208S	12.0	13	N	<.044	48	9.0	1.2	N	N	130
IH209S	10.0	11	N	<.080	51	14.0	4.4	9.7	2.20	640
IH210S	19.0	22	N	<.078	58	14.0	8.1	16.0	1.10	820
IH211S	26.0	22	N	.150	40	27.0	2.3	3.7	N	230
IH212S	31.0	20	N	.130	35	11.0	2.5	3.9	N	280
IH213S	25.0	32	N	.230	43	41.0	6.4	14.0	.59	300
IH214S	7.0	10	N	<.071	59	12.0	4.9	12.0	1.80	500
IH215S	29.0	25	N	<.080	56	12.0	4.1	9.0	N	470

Table 9. Analytical data from waters from the Indian Heaven Roadless area

The following qualifiers are used in reporting data: --, no determination made; <, detected, but at a concentration less than the value reported.

Sample	Latitude	Longitude	Cu-ppm aa	Zn-ppm aa	Mo-ppm aa	SO4-- ppm	Cl- ppm	pH
IH1850W	45 56 20	121 45 52	<.0010	.0029	--	.4	.7	7.3
IH1851W	45 57 46	121 44 57	<.0010	.0076	--	.9	.7	5.4
IH1852W	45 58 4	121 45 28	.0012	.0043	--	.4	.9	7.3
IH1853W	45 58 7	121 45 39	.0011	.0033	--	<.1	.6	6.6
IH1854W	45 58 13	121 45 31	.0021	.0037	--	.4	.5	6.1
IH1855W	45 58 33	121 45 14	<.0010	.0035	--	.5	.7	6.0
IH1856W	46 1 18	121 43 5	.0015	.0041	--	1.0	.9	5.8
IH1857W	46 1 9	121 41 38	<.0010	.0050	--	.1	1.2	5.9
IH1858W	46 1 50	121 41 25	<.0010	.0039	--	.7	1.5	6.7
IH1859W	46 2 11	121 42 47	.0023	.0042	--	.5	.4	6.7
IH1860W	46 2 40	121 45 20	<.0010	.0022	--	1.8	.7	7.0
IH1861W	46 3 55	121 45 10	<.0010	.0014	--	1.0	.5	7.3
IH1862W	46 5 53	121 46 41	.0016	.0033	--	.2	.7	5.9
IH1863W	46 4 0	121 48 25	<.0010	.0018	--	.3	.6	6.1
IH1864W	46 3 27	121 48 40	<.0010	.0014	--	1.8	.9	6.9
IH1865W	46 2 40	121 49 45	<.0010	.0014	--	1.3	.8	6.8
IH1866W	46 1 40	121 49 44	.0011	.0019	--	1.4	1.7	6.0
IH1867W	46 0 40	121 49 58	<.0010	.0029	--	.5	1.1	5.5
IH1868W	46 0 3	121 50 29	<.0010	.0016	--	.4	1.6	6.6
IH1869W	45 59 45	121 50 37	<.0010	.0017	--	.6	.7	6.1
IH1870W	45 59 23	121 50 39	<.0010	.0010	--	3.0	.9	6.7
IH1871W	45 58 9	121 50 19	<.0010	.0010	--	.4	.7	7.2
IH1872W	45 57 5	121 51 8	<.0010	.0010	--	.8	.7	7.2
IH1873W	45 56 7	121 51 22	.0014	.0010	--	.7	.4	7.0
IH1874W	45 54 40	121 48 5	<.0010	.0011	--	.1	.9	7.2

Table 10. Fisher-K statistics on analytical data from stream sediments from the Indian Heaven Roadless Area

[The following qualifiers are used in reporting spectrographic data: B, no determination made; N, concentration less than the detection limit; L, detected, but present at a concentration less than the value reported; T, not used; G, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

NO	COLUMN	N	H	L	G	B	T	NO OF UNQUAL VALUES	NO OF IMPROPER QUAL VALUES	MINIMUM	MAXIMUM	NO
1	S-FE%	0	0	0	0	0	0	36	0	3.0000000	10.000000	1
2	S-MG%	0	0	0	0	0	0	36	0	1.0000000	3.0000000	2
3	S-CA%	0	0	0	0	0	0	36	0	1.0000000	3.0000000	3
4	S-TI%	0	0	0	0	0	0	36	0	0.3000000	1.0000000	4
5	S-MN	0	0	0	0	0	0	36	0	500.00000	1500.0000	5
6	S-AG	36	0	0	0	0	0	0	0			6
7	S-AS	36	0	0	0	0	0	0	0			7
8	S-AU	36	0	0	0	0	0	0	0			8
9	S-B	0	0	0	0	0	0	36	0	10.000000	10.000000	9
10	S-BA	0	0	0	0	0	0	36	0	150.00000	300.00000	10
11	S-BE	0	0	0	0	0	0	36	0	1.0000000	2.0000000	11
12	S-BI	36	0	0	0	0	0	0	0			12
13	S-CD	36	0	0	0	0	0	0	0			13
14	S-CO	0	0	0	0	0	0	36	0	15.000000	50.000000	14
15	S-CR	0	0	0	0	0	0	36	0	15.000000	500.00000	15
16	S-CU	0	0	0	0	0	0	36	0	20.000000	100.00000	16
17	S-LA	36	0	0	0	0	0	0	0			17
18	S-MO	35	0	0	0	0	0	1	0	10.000000	10.000000	18
19	S-NB	36	0	0	0	0	0	0	0			19
20	S-NI	0	0	0	0	0	0	36	0	20.000000	300.00000	20
21	S-PB	0	0	0	0	0	0	36	0	10.000000	20.000000	21
22	S-SB	36	0	0	0	0	0	0	0			22
23	S-SC	0	0	0	0	0	0	36	0	10.000000	20.000000	23
24	S-SN	36	0	0	0	0	0	0	0			24
25	S-SR	0	0	0	0	0	0	36	0	300.00000	700.00000	25
26	S-V	0	0	0	0	0	0	36	0	70.000000	300.00000	26
27	S-W	36	0	0	0	0	0	0	0			27
28	S-Y	0	0	0	0	0	0	36	0	10.000000	30.000000	28
29	S-ZN	36	0	0	0	0	0	0	0			29
30	S-ZR	0	0	0	0	0	0	36	0	50.000000	150.00000	30
31	S-TH	36	0	0	0	0	0	0	0			31

Table 10. Fisher-K statistics on analytical data from stream sediments from the Indian Heaven Roadless Area

NO	COLUMN	K1 MEAN	SQRT(K2) STD DEVIATION	K2 VARIANCE	K3	G1 SKEWNESS	K4	G2 KURTOSIS	NO
1	S-FE%	5.8055556	1.5272654	2.3325397	0.1478525	0.0415035	2.4029242	0.4416538	1
2	S-MG%	1.7777778	0.4043415	0.1634921	-0.0012138	-0.0183615	0.0415478	1.5543722	2
3	S-CA%	1.8611111	0.3705423	0.1373016	-0.0197012	-0.3872395	0.0550569	2.9205215	3
4	S-TI%	0.5111111	0.1703405	0.0290159	0.0058114	1.1757816	0.0018726	2.2242458	4
5	S-MN	933.33333	230.52735	53142.857	-2218487.4	-0.1810880	4.0437280D+09	1.4318322	5
6	S-AG								6
7	S-AS								7
8	S-AU								8
9	S-B	10.000000	0.0	0.0	0.0	0.0	0.0	0.0	9
10	S-BA	200.00000	20.701967	428.57143	22689.076	2.5573018	3214285.7	17.500000	10
11	S-BE	1.6527778	0.2623913	0.0688492	0.0043009	0.2380727	-0.0030258	-0.6383244	11
12	S-BI								12
13	S-CD								13
14	S-CO	34.166667	12.218253	149.28571	463.86555	0.2543108	-29899.733	-1.3416240	14
15	S-CR	158.19444	100.55668	10111.647	2265779.1	2.2283568	6.3534358D+08	6.2139086	15
16	S-CU	51.388889	17.752711	315.15873	1480.6256	0.2646374	20315.466	0.2045352	16
17	S-LA								17
18	S-MO	10.000000							18
19	S-NB								19
20	S-NI	95.833333	56.637948	3207.8571	278048.32	1.5303746	39230647.	3.8123734	20
21	S-PB	14.861111	3.6812481	13.551587	2.2000467	0.0441008	-199.21643	-1.0847879	21
22	S-SB								22
23	S-SC	16.527778	3.5495361	12.599206	-23.430205	-0.5239156	-130.33433	-0.8210554	23
24	S-SN								24
25	S-SR	416.66667	110.84094	12285.714	252100.84	0.1851287	-1.4417112D+08	-0.9551629	25
26	S-V	149.44444	56.211054	3159.6825	57065.173	0.3212965	-4536392.8	-0.4543848	26
27	S-W								27
28	S-Y	21.388889	5.8077671	33.730159	22.222222	0.1134384	-220.24871	-0.1935872	28
29	S-ZN								29
30	S-ZR	92.500000	17.788439	316.42857	646.63866	0.1148810	234405.27	2.3410786	30
31	S-TH								31

NOTE: THE ABOVE STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY.

Table 11. Correlation coefficients for analytical data from stream sediments from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
1 (S-MG%)	2 (S-CA%)	0.6949	36
1 (S-MG%)	3 (S-FE%)	0.8596	36
1 (S-MG%)	4 (S-TI%)	0.6684	36
1 (S-MG%)	5 (S-V)	0.5311	36
1 (S-MG%)	6 (S-CR)	0.7016	36
1 (S-MG%)	7 (S-MN)	0.6803	36
1 (S-MG%)	8 (S-CO)	0.7781	36
1 (S-MG%)	9 (S-NI)	0.7162	36
1 (S-MG%)	10 (S-CU)	0.7744	36
1 (S-MG%)	11 (S-MO)	********	1
1 (S-MG%)	12 (S-PB)	0.0600	36
1 (S-MG%)	13 (S-B)	********	36
1 (S-MG%)	14 (S-BE)	-0.2057	36
1 (S-MG%)	15 (S-SR)	0.2158	36
1 (S-MG%)	16 (S-BA)	0.2076	36
1 (S-MG%)	17 (S-SC)	0.8436	36
1 (S-MG%)	18 (S-Y)	0.7472	36
1 (S-MG%)	19 (S-ZR)	0.3560	36
2 (S-CA%)	3 (S-FE%)	0.6589	36
2 (S-CA%)	4 (S-TI%)	0.6149	36
2 (S-CA%)	5 (S-V)	0.5091	36
2 (S-CA%)	6 (S-CR)	0.1934	36
2 (S-CA%)	7 (S-MN)	0.3515	36
2 (S-CA%)	8 (S-CO)	0.3877	36
2 (S-CA%)	9 (S-NI)	0.2336	36
2 (S-CA%)	10 (S-CU)	0.4891	36
2 (S-CA%)	11 (S-MO)	********	1
2 (S-CA%)	12 (S-PB)	0.0226	36
2 (S-CA%)	13 (S-B)	********	36
2 (S-CA%)	14 (S-BE)	-0.1917	36
2 (S-CA%)	15 (S-SR)	0.4243	36
2 (S-CA%)	16 (S-BA)	0.2395	36
2 (S-CA%)	17 (S-SC)	0.6436	36
2 (S-CA%)	18 (S-Y)	0.6082	36
2 (S-CA%)	19 (S-ZR)	0.4388	36
3 (S-FE%)	4 (S-TI%)	0.7580	36
3 (S-FE%)	5 (S-V)	0.6139	36
3 (S-FE%)	6 (S-CR)	0.6098	36
3 (S-FE%)	7 (S-MN)	0.6986	36
3 (S-FE%)	8 (S-CO)	0.7787	36
3 (S-FE%)	9 (S-NI)	0.6511	36
3 (S-FE%)	10 (S-CU)	0.7207	36
3 (S-FE%)	11 (S-MO)	********	1
3 (S-FE%)	12 (S-PB)	0.1053	36
3 (S-FE%)	13 (S-B)	********	36
3 (S-FE%)	14 (S-BE)	-0.1786	36
3 (S-FE%)	15 (S-SR)	0.2722	36
3 (S-FE%)	16 (S-BA)	0.0710	36
3 (S-FE%)	17 (S-SC)	0.7992	36
3 (S-FE%)	18 (S-Y)	0.7371	36
3 (S-FE%)	19 (S-ZR)	0.4032	36
4 (S-TI%)	5 (S-V)	0.6790	36
4 (S-TI%)	6 (S-CR)	0.3413	36
4 (S-TI%)	7 (S-MN)	0.4740	36
4 (S-TI%)	8 (S-CO)	0.5386	36
4 (S-TI%)	9 (S-NI)	0.3482	36
4 (S-TI%)	10 (S-CU)	0.6527	36
4 (S-TI%)	11 (S-MO)	********	1
4 (S-TI%)	12 (S-PB)	0.1696	36
4 (S-TI%)	13 (S-B)	********	36
4 (S-TI%)	14 (S-BE)	-0.2533	36
4 (S-TI%)	15 (S-SR)	0.2995	36
4 (S-TI%)	16 (S-BA)	0.1309	36
4 (S-TI%)	17 (S-SC)	0.7507	36
4 (S-TI%)	18 (S-Y)	0.5852	36
4 (S-TI%)	19 (S-ZR)	0.5713	36
5 (S-V)	6 (S-CR)	0.3040	36
5 (S-V)	7 (S-MN)	0.3052	36
5 (S-V)	8 (S-CO)	0.3067	36
5 (S-V)	9 (S-NI)	0.1356	36
5 (S-V)	10 (S-CU)	0.3402	36
5 (S-V)	11 (S-MO)	********	1
5 (S-V)	12 (S-PB)	0.3959	36
5 (S-V)	13 (S-B)	********	36
5 (S-V)	14 (S-BE)	-0.2493	36
5 (S-V)	15 (S-SR)	0.3920	36
5 (S-V)	16 (S-BA)	0.1628	36
5 (S-V)	17 (S-SC)	0.5668	36
5 (S-V)	18 (S-Y)	0.6909	36
5 (S-V)	19 (S-ZR)	0.4549	36
6 (S-CR)	7 (S-MN)	0.6074	36
6 (S-CR)	8 (S-CO)	0.8052	36
6 (S-CR)	9 (S-NI)	0.8699	36
6 (S-CR)	10 (S-CU)	0.6357	36
6 (S-CR)	11 (S-MO)	********	1
6 (S-CR)	12 (S-PB)	0.1327	36
6 (S-CR)	13 (S-B)	********	36
6 (S-CR)	14 (S-BE)	-0.1013	36
6 (S-CR)	15 (S-SR)	-0.0413	36
6 (S-CR)	16 (S-BA)	0.0461	36
6 (S-CR)	17 (S-SC)	0.6101	36
6 (S-CR)	18 (S-Y)	0.5962	36
6 (S-CR)	19 (S-ZR)	0.1348	36
7 (S-MN)	8 (S-CO)	0.7490	36
7 (S-MN)	9 (S-NI)	0.7548	36
7 (S-MN)	10 (S-CU)	0.6293	36
7 (S-MN)	11 (S-MO)	********	1
7 (S-MN)	12 (S-PB)	-0.0439	36
7 (S-MN)	13 (S-B)	********	36
7 (S-MN)	14 (S-BE)	-0.1189	36

Table 11. Correlation coefficients for analytical data from stream sediments from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
7 (S-MN)	15 (S-SR)	0.0853	36
7 (S-MN)	16 (S-BA)	0.0688	36
7 (S-MN)	17 (S-SC)	0.6108	36
7 (S-MN)	18 (S-Y)	0.5702	36
7 (S-MN)	19 (S-ZR)	0.0579	36
8 (S-CO)	9 (S-NI)	0.8364	36
8 (S-CO)	10 (S-CU)	0.7254	36
8 (S-CO)	11 (S-MO)	********	1
8 (S-CO)	12 (S-PB)	0.0001	36
8 (S-CO)	13 (S-B)	********	36
8 (S-CO)	14 (S-BE)	-0.2266	36
8 (S-CO)	15 (S-SR)	-0.0244	36
8 (S-CO)	16 (S-BA)	-0.0152	36
8 (S-CO)	17 (S-SC)	0.7587	36
8 (S-CO)	18 (S-Y)	0.6534	36
8 (S-CO)	19 (S-ZR)	0.2384	36
9 (S-NI)	10 (S-CU)	0.6808	36
9 (S-NI)	11 (S-MO)	********	1
9 (S-NI)	12 (S-PB)	-0.0451	36
9 (S-NI)	13 (S-B)	********	36
9 (S-NI)	14 (S-BE)	-0.0053	36
9 (S-NI)	15 (S-SR)	-0.0288	36
9 (S-NI)	16 (S-BA)	0.1477	36
9 (S-NI)	17 (S-SC)	0.6033	36
9 (S-NI)	18 (S-Y)	0.5274	36
9 (S-NI)	19 (S-ZR)	0.1602	36
10 (S-CU)	11 (S-MO)	********	1
10 (S-CU)	12 (S-PB)	0.0907	36
10 (S-CU)	13 (S-B)	********	36
10 (S-CU)	14 (S-BE)	-0.2731	36
10 (S-CU)	15 (S-SR)	-0.0709	36
10 (S-CU)	16 (S-BA)	0.1395	36
10 (S-CU)	17 (S-SC)	0.7722	36
10 (S-CU)	18 (S-Y)	0.6282	36
10 (S-CU)	19 (S-ZR)	0.3723	36
11 (S-MO)	12 (S-PB)	********	1
11 (S-MO)	13 (S-B)	********	1
11 (S-MO)	14 (S-BE)	********	1
11 (S-MO)	15 (S-SR)	********	1
11 (S-MO)	16 (S-BA)	********	1
11 (S-MO)	17 (S-SC)	********	1
11 (S-MO)	18 (S-Y)	********	1
11 (S-MO)	19 (S-ZR)	********	1
12 (S-PB)	13 (S-B)	********	36
12 (S-PB)	14 (S-BE)	-0.0885	36
12 (S-PB)	15 (S-SR)	0.1615	36
12 (S-PB)	16 (S-BA)	0.1253	36
12 (S-PB)	17 (S-SC)	0.1395	36
12 (S-PB)	18 (S-Y)	0.2205	36
12 (S-PB)	19 (S-ZR)	0.3344	36
13 (S-B)	14 (S-BE)	********	36
13 (S-B)	15 (S-SR)	********	36
13 (S-B)	16 (S-BA)	********	36
13 (S-B)	17 (S-SC)	********	36
13 (S-B)	18 (S-Y)	********	36
13 (S-B)	19 (S-ZR)	********	36
14 (S-BE)	15 (S-SR)	0.2489	36
14 (S-BE)	16 (S-BA)	0.0264	36
14 (S-BE)	17 (S-SC)	-0.2661	36
14 (S-BE)	18 (S-Y)	-0.1589	36
14 (S-BE)	19 (S-ZR)	0.1286	36
15 (S-SR)	16 (S-BA)	0.2787	36
15 (S-SR)	17 (S-SC)	0.2417	36
15 (S-SR)	18 (S-Y)	0.2087	36
15 (S-SR)	19 (S-ZR)	0.4486	36
16 (S-BA)	17 (S-SC)	0.3054	36
16 (S-BA)	18 (S-Y)	0.2034	36
16 (S-BA)	19 (S-ZR)	0.2732	36
17 (S-SC)	18 (S-Y)	0.7437	36
17 (S-SC)	19 (S-ZR)	0.4340	36
18 (S-Y)	19 (S-ZR)	0.3161	36

Table 12. Fisher-K statistics on analytical data from the nonmagnetic, heavy-mineral fraction from panned concentrates from stream sediments from the Indian Heaven Roadless Area

[The following qualifiers are used in reporting spectrographic data: B, no determination made; N, concentration less than the detection limit; L, detected, but present at a concentration less than the value reported; T, not used; G, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

NO	COLUMN	N	H	L	G	B	T	NO OF UNQUAL VALUES	NO OF IMPROPER QUAL VALUES	MINIMUM	MAXIMUM	NO
1	S-FE%	0	0	0	0	0	0	12	0	2.0000000	10.000000	1
2	S-MG%	0	0	0	0	0	0	12	0	1.0000000	10.000000	2
3	S-CA%	0	0	0	0	0	0	12	0	1.0000000	10.000000	3
4	S-TI%	0	0	0	0	0	0	12	0	0.2000000	1.5000000	4
5	S-MN	0	0	0	0	0	0	12	0	500.00000	2000.0000	5
6	S-AG	12	0	0	0	0	0	0	0			6
7	S-AS	12	0	0	0	0	0	0	0			7
8	S-AU	12	0	0	0	0	0	0	0			8
9	S-B	0	0	8	0	0	0	4	0	20.000000	100.00000	9
10	S-BA	0	0	0	0	0	0	12	0	200.00000	1000.0000	10
11	S-BE	12	0	0	0	0	0	0	0			11
12	S-BI	12	0	0	0	0	0	0	0			12
13	S-CD	12	0	0	0	0	0	0	0			13
14	S-CO	0	0	0	0	0	0	12	0	15.000000	150.00000	14
15	S-CR	0	0	0	0	0	0	12	0	150.00000	2000.0000	15
16	S-CU	0	0	0	0	0	0	12	0	10.000000	200.00000	16
17	S-LA	10	0	0	0	0	0	2	0	50.000000	100.00000	17
18	S-MO	12	0	0	0	0	0	0	0			18
19	S-NB	12	0	0	0	0	0	0	0			19
20	S-NI	0	0	0	0	0	0	12	0	100.00000	2000.0000	20
21	S-PB	11	0	0	0	0	0	1	0	100.00000	100.00000	21
22	S-SB	12	0	0	0	0	0	0	0			22
23	S-SC	1	0	0	0	0	0	11	0	10.000000	100.00000	23
24	S-SN	12	0	0	0	0	0	0	0			24
25	S-SR	3	0	0	0	0	0	9	0	200.00000	1000.0000	25
26	S-V	0	0	0	0	0	0	12	0	50.000000	200.00000	26
27	S-W	12	0	0	0	0	0	0	0			27
28	S-Y	0	0	0	0	0	0	12	0	20.000000	150.00000	28
29	S-ZN	12	0	0	0	0	0	0	0			29
30	S-ZR	0	0	0	10	0	0	2	0	1500.0000	2000.0000	30
31	S-TH	12	0	0	0	0	0	0	0			31

Table 12. Fisher-K statistics on analytical data from the nonmagnetic, heavy-mineral fraction from panned concentrates from stream sediments from the Indian Heaven Roadless Area

NO	COLUMN	K1 MEAN	SQRT(K2) STD DEVIATION	K2 VARIANCE	K3	G1 SKEWNESS	K4	G2 KURTOSIS	NO
1	S-FE%	7.2500000	2.4908925	6.2045455	-9.2045455	-0.5955763	8.5681818	0.2225711	1
2	S-MG%	5.0000000	2.8919952	8.3636364	14.400000	0.5953465	-14.254545	-0.2037807	2
3	S-CA%	4.7916667	3.2012663	10.248106	16.220644	0.4944276	-104.41146	-0.9941707	3
4	S-TI%	0.6500000	0.3397860	0.1154545	0.0556364	1.4182153	0.0400061	3.0012606	4
5	S-MN	1366.6667	569.42289	324242.42	-34787879.	-0.1884183	-1.6563030D+11	-1.5754337	5
6	S-AG								6
7	S-AS								7
8	S-AU								8
9	S-B	40.000000	40.000000	1600.0000	128000.00	2.0000000	10240000.	4.0000000	9
10	S-BA	566.66667	293.36088	86060.606	15175758.	0.6010959	-7.9030303D+09	-1.0670502	10
11	S-BE								11
12	S-BI								12
13	S-CD								13
14	S-CO	73.333333	46.138789	2128.7879	41196.970	0.4194370	-2259886.4	-0.4986799	14
15	S-CR	987.50000	647.41619	419147.73	1.0055966D+08	0.3705724	-1.9082145D+11	-1.0861579	15
16	S-CU	70.000000	51.168172	2618.1818	202254.55	1.5097276	21042909.	3.0697724	16
17	S-LA	75.000000	35.355339	1250.0000					17
18	S-MO								18
19	S-NB								19
20	S-NI	658.33333	572.80543	328106.06	2.8701970D+08	1.5271803	1.8796470D+11	1.7460142	20
21	S-PB	100.00000							21
22	S-SB								22
23	S-SC	44.090909	35.413146	1254.0909	29175.758	0.6569444	-1993215.9	-1.2673492	23
24	S-SN								24
25	S-SR	411.11111	275.88242	76111.111	31611111.	1.5054546	9.3325397D+09	1.6110303	25
26	S-V	133.33333	49.236596	2424.2424	15151.515	0.1269381	-5757575.8	-0.9796875	26
27	S-W								27
28	S-Y	67.500000	39.109404	1529.5455	41604.545	0.6955001	351378.79	0.1501934	28
29	S-ZN								29
30	S-ZR	1750.0000	353.55339	125000.00					30
31	S-TH								31

NOTE: THE ABOVE STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY.

Table 13. Correlation coefficients for analytical data from the nonmagnetic, heavy-mineral fraction from panned concentrates from stream sediments from the Indian Heaven Roadless Area

COLUMN	VERSUS	COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
1 (S-MG%)		2 (S-CA%)	-0.1369	12
1 (S-MG%)		3 (S-FE%)	0.7318	12
1 (S-MG%)		4 (S-TI%)	0.2440	12
1 (S-MG%)		5 (S-V)	0.2852	12
1 (S-MG%)		6 (S-CR)	0.8562	12
1 (S-MG%)		7 (S-MN)	0.8748	12
1 (S-MG%)		8 (S-CO)	0.9608	12
1 (S-MG%)		9 (S-NI)	0.9395	12
1 (S-MG%)		10 (S-CU)	0.5560	12
1 (S-MG%)		11 (S-PB)	********	1
1 (S-MG%)		12 (S-B)	-0.3019	4
1 (S-MG%)		13 (S-SR)	-0.2418	9
1 (S-MG%)		14 (S-BA)	0.3542	12
1 (S-MG%)		15 (S-SC)	0.4566	11
1 (S-MG%)		16 (S-LA)	-1.0000	2
1 (S-MG%)		17 (S-Y)	-0.3531	12
1 (S-MG%)		18 (S-ZR)	********	2
1 (S-MG%)		19 (Plag.)	-0.5580	8
1 (S-MG%)		20 (Pyrite)	0.1542	4
1 (S-MG%)		21 (Zircon)	0.7088	6
1 (S-MG%)		22 (Apatite)	********	3
1 (S-MG%)		23 (Px/Ol/Am)	0.8510	10
1 (S-MG%)		24 (Epidote)	********	1
1 (S-MG%)		25 (Rk Frags)	0.9107	3
2 (S-CA%)		3 (S-FE%)	0.3648	12
2 (S-CA%)		4 (S-TI%)	0.6349	12
2 (S-CA%)		5 (S-V)	0.6674	12
2 (S-CA%)		6 (S-CR)	0.2102	12
2 (S-CA%)		7 (S-MN)	0.2938	12
2 (S-CA%)		8 (S-CO)	0.0673	12
2 (S-CA%)		9 (S-NI)	-0.2555	12
2 (S-CA%)		10 (S-CU)	0.3682	12
2 (S-CA%)		11 (S-PB)	********	1
2 (S-CA%)		12 (S-B)	-0.6858	4
2 (S-CA%)		13 (S-SR)	0.0165	9
2 (S-CA%)		14 (S-BA)	0.1136	12
2 (S-CA%)		15 (S-SC)	0.5406	11
2 (S-CA%)		16 (S-LA)	1.0000	2
2 (S-CA%)		17 (S-Y)	0.1242	12
2 (S-CA%)		18 (S-ZR)	1.0000	2
2 (S-CA%)		19 (Plag.)	-0.5319	8
2 (S-CA%)		20 (Pyrite)	0.9121	4
2 (S-CA%)		21 (Zircon)	0.1153	6
2 (S-CA%)		22 (Apatite)	********	3
2 (S-CA%)		23 (Px/Ol/Am)	0.1276	10
2 (S-CA%)		24 (Epidote)	********	1
2 (S-CA%)		25 (Rk Frags)	-0.7494	3
3 (S-FE%)		4 (S-TI%)	0.6183	12
3 (S-FE%)		5 (S-V)	0.5993	12
3 (S-FE%)		6 (S-CR)	0.7360	12
3 (S-FE%)		7 (S-MN)	0.9057	12
3 (S-FE%)		8 (S-CO)	0.8704	12
3 (S-FE%)		9 (S-NI)	0.6564	12
3 (S-FE%)		10 (S-CU)	0.8743	12
3 (S-FE%)		11 (S-PB)	********	1
3 (S-FE%)		12 (S-B)	-0.9036	4
3 (S-FE%)		13 (S-SR)	0.1784	9
3 (S-FE%)		14 (S-BA)	0.6054	12
3 (S-FE%)		15 (S-SC)	0.4917	11
3 (S-FE%)		16 (S-LA)	********	2
3 (S-FE%)		17 (S-Y)	-0.1829	12
3 (S-FE%)		18 (S-ZR)	********	2
3 (S-FE%)		19 (Plag.)	-0.3645	8
3 (S-FE%)		20 (Pyrite)	0.5185	4
3 (S-FE%)		21 (Zircon)	0.7308	6
3 (S-FE%)		22 (Apatite)	********	3
3 (S-FE%)		23 (Px/Ol/Am)	0.6554	10
3 (S-FE%)		24 (Epidote)	********	1
3 (S-FE%)		25 (Rk Frags)	-0.0976	3
4 (S-TI%)		5 (S-V)	0.9124	12
4 (S-TI%)		6 (S-CR)	0.5291	12
4 (S-TI%)		7 (S-MN)	0.6081	12
4 (S-TI%)		8 (S-CO)	0.3938	12
4 (S-TI%)		9 (S-NI)	0.1089	12
4 (S-TI%)		10 (S-CU)	0.5136	12
4 (S-TI%)		11 (S-PB)	********	1
4 (S-TI%)		12 (S-B)	-0.7780	4
4 (S-TI%)		13 (S-SR)	-0.3075	9
4 (S-TI%)		14 (S-BA)	0.1795	12
4 (S-TI%)		15 (S-SC)	0.6694	11
4 (S-TI%)		16 (S-LA)	-1.0000	2
4 (S-TI%)		17 (S-Y)	0.3352	12
4 (S-TI%)		18 (S-ZR)	1.0000	2
4 (S-TI%)		19 (Plag.)	-0.3427	8
4 (S-TI%)		20 (Pyrite)	0.0287	4
4 (S-TI%)		21 (Zircon)	0.4811	6
4 (S-TI%)		22 (Apatite)	********	3
4 (S-TI%)		23 (Px/Ol/Am)	0.2008	10
4 (S-TI%)		24 (Epidote)	********	1
4 (S-TI%)		25 (Rk Frags)	0.1639	3
5 (S-V)		6 (S-CR)	0.6197	12
5 (S-V)		7 (S-MN)	0.5768	12
5 (S-V)		8 (S-CO)	0.4011	12
5 (S-V)		9 (S-NI)	0.1593	12
5 (S-V)		10 (S-CU)	0.4502	12
5 (S-V)		11 (S-PB)	********	1
5 (S-V)		12 (S-B)	-0.8165	4
5 (S-V)		13 (S-SR)	-0.2823	9
5 (S-V)		14 (S-BA)	0.1462	12
5 (S-V)		15 (S-SC)	0.7696	11

Table 13. Correlation coefficients for analytical data from the nonmagnetic, heavy-mineral fraction from panned concentrates from stream sediments from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
5 (S-V)	16 (S-LA)	-1.0000	2
5 (S-V)	17 (S-Y)	0.1622	12
5 (S-V)	18 (S-ZR)	1.0000	2
5 (S-V)	19 (Plag.)	-0.5156	8
5 (S-V)	20 (Pyrite)	-0.2579	4
5 (S-V)	21 (Zircon)	0.3373	6
5 (S-V)	22 (Apatite)	********	3
5 (S-V)	23 (Px/Ol/Am)	0.3847	10
5 (S-V)	24 (Epidote)	********	1
5 (S-V)	25 (Rk Frags)	0.2723	3
6 (S-CR)	7 (S-MN)	0.8747	12
6 (S-CR)	8 (S-CO)	0.8481	12
6 (S-CR)	9 (S-NI)	0.8140	12
6 (S-CR)	10 (S-CU)	0.5107	12
6 (S-CR)	11 (S-PB)	********	1
6 (S-CR)	12 (S-B)	-0.4794	4
6 (S-CR)	13 (S-SR)	-0.4327	9
6 (S-CR)	14 (S-BA)	0.1787	12
6 (S-CR)	15 (S-SC)	0.7108	11
6 (S-CR)	16 (S-LA)	-1.0000	2
6 (S-CR)	17 (S-Y)	-0.2665	12
6 (S-CR)	18 (S-ZR)	1.0000	2
6 (S-CR)	19 (Plag.)	-0.6042	8
6 (S-CR)	20 (Pyrite)	-0.1080	4
6 (S-CR)	21 (Zircon)	0.5416	6
6 (S-CR)	22 (Apatite)	********	3
6 (S-CR)	23 (Px/Ol/Am)	0.6956	10
6 (S-CR)	24 (Epidote)	********	1
6 (S-CR)	25 (Rk Frags)	0.9247	3
7 (S-MN)	8 (S-CO)	0.9477	12
7 (S-MN)	9 (S-NI)	0.7712	12
7 (S-MN)	10 (S-CU)	0.7593	12
7 (S-MN)	11 (S-PB)	********	1
7 (S-MN)	12 (S-B)	-0.7232	4
7 (S-MN)	13 (S-SR)	-0.2030	9
7 (S-MN)	14 (S-BA)	0.4264	12
7 (S-MN)	15 (S-SC)	0.6894	11
7 (S-MN)	16 (S-LA)	********	2
7 (S-MN)	17 (S-Y)	-0.1181	12
7 (S-MN)	18 (S-ZR)	1.0000	2
7 (S-MN)	19 (Plag.)	-0.5979	8
7 (S-MN)	20 (Pyrite)	0.4737	4
7 (S-MN)	21 (Zircon)	0.7707	6
7 (S-MN)	22 (Apatite)	********	3
7 (S-MN)	23 (Px/Ol/Am)	0.6837	10
7 (S-MN)	24 (Epidote)	********	1
7 (S-MN)	25 (Rk Frags)	-0.0976	3
8 (S-CO)	9 (S-NI)	0.8591	12
8 (S-CO)	10 (S-CU)	0.7192	12
8 (S-CO)	11 (S-PB)	********	1

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
8 (S-CO)	12 (S-B)	-0.5720	4
8 (S-CO)	13 (S-SR)	-0.0711	9
8 (S-CO)	14 (S-BA)	0.5225	12
8 (S-CO)	15 (S-SC)	0.5125	11
8 (S-CO)	16 (S-LA)	-1.0000	2
8 (S-CO)	17 (S-Y)	-0.3364	12
8 (S-CO)	18 (S-ZR)	********	2
8 (S-CO)	19 (Plag.)	-0.5468	8
8 (S-CO)	20 (Pyrite)	0.4297	4
8 (S-CO)	21 (Zircon)	0.7206	6
8 (S-CO)	22 (Apatite)	********	3
8 (S-CO)	23 (Px/Ol/Am)	0.7645	10
8 (S-CO)	24 (Epidote)	********	1
8 (S-CO)	25 (Rk Frags)	0.8131	3
9 (S-NI)	10 (S-CU)	0.4207	12
9 (S-NI)	11 (S-PB)	********	1
9 (S-NI)	12 (S-B)	-0.2506	4
9 (S-NI)	13 (S-SR)	-0.2453	9
9 (S-NI)	14 (S-BA)	0.1956	12
9 (S-NI)	15 (S-SC)	0.2356	11
9 (S-NI)	16 (S-LA)	-1.0000	2
9 (S-NI)	17 (S-Y)	-0.3390	12
9 (S-NI)	18 (S-ZR)	1.0000	2
9 (S-NI)	19 (Plag.)	-0.3804	8
9 (S-NI)	20 (Pyrite)	-0.3333	4
9 (S-NI)	21 (Zircon)	0.3800	6
9 (S-NI)	22 (Apatite)	********	3
9 (S-NI)	23 (Px/Ol/Am)	0.7589	10
9 (S-NI)	24 (Epidote)	********	1
9 (S-NI)	25 (Rk Frags)	0.9986	3
10 (S-CU)	11 (S-PB)	********	1
10 (S-CU)	12 (S-B)	-0.8974	4
10 (S-CU)	13 (S-SR)	0.2810	9
10 (S-CU)	14 (S-BA)	0.7101	12
10 (S-CU)	15 (S-SC)	0.2951	11
10 (S-CU)	16 (S-LA)	1.0000	2
10 (S-CU)	17 (S-Y)	-0.0404	12
10 (S-CU)	18 (S-ZR)	-1.0000	2
10 (S-CU)	19 (Plag.)	-0.5019	8
10 (S-CU)	20 (Pyrite)	0.5971	4
10 (S-CU)	21 (Zircon)	0.5972	6
10 (S-CU)	22 (Apatite)	********	3
10 (S-CU)	23 (Px/Ol/Am)	0.6290	10
10 (S-CU)	24 (Epidote)	********	1
10 (S-CU)	25 (Rk Frags)	-0.4019	3
11 (S-PB)	12 (S-B)	********	1
11 (S-PB)	13 (S-SR)	********	1
11 (S-PB)	14 (S-BA)	********	1
11 (S-PB)	15 (S-SC)	********	1
11 (S-PB)	16 (S-LA)	********	0

Table 13. Correlation coefficients for analytical data from the nonmagnetic, heavy-mineral fraction from panned concentrates from stream sediments from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
11 (S-PB)	17 (S-Y)	********	1
11 (S-PB)	18 (S-ZR)	********	0
11 (S-PB)	19 (Plag.)	********	1
11 (S-PB)	20 (Pyrite)	********	1
11 (S-PB)	21 (Zircon)	********	1
11 (S-PB)	22 (Apatite)	********	0
11 (S-PB)	23 (Px/Ol/Am)	********	1
11 (S-PB)	24 (Epidote)	********	0
11 (S-PB)	25 (Rk Frags)	********	0
12 (S-B)	13 (S-SR)	-0.7488	3
12 (S-B)	14 (S-BA)	-0.9036	4
12 (S-B)	15 (S-SC)	********	3
12 (S-B)	16 (S-LA)	********	1
12 (S-B)	17 (S-Y)	-0.5138	4
12 (S-B)	18 (S-ZR)	********	0
12 (S-B)	19 (Plag.)	0.5000	3
12 (S-B)	20 (Pyrite)	********	2
12 (S-B)	21 (Zircon)	********	1
12 (S-B)	22 (Apatite)	********	1
12 (S-B)	23 (Px/Ol/Am)	-0.8936	3
12 (S-B)	24 (Epidote)	********	0
12 (S-B)	25 (Rk Frags)	1.0000	2
13 (S-SR)	14 (S-BA)	0.6322	9
13 (S-SR)	15 (S-SC)	-0.6842	8
13 (S-SR)	16 (S-LA)	1.0000	2
13 (S-SR)	17 (S-Y)	-0.3908	9
13 (S-SR)	18 (S-ZR)	********	1
13 (S-SR)	19 (Plag.)	0.5069	7
13 (S-SR)	20 (Pyrite)	0.5449	4
13 (S-SR)	21 (Zircon)	-0.7048	4
13 (S-SR)	22 (Apatite)	********	3
13 (S-SR)	23 (Px/Ol/Am)	0.1754	7
13 (S-SR)	24 (Epidote)	********	1
13 (S-SR)	25 (Rk Frags)	-0.7327	3
14 (S-BA)	15 (S-SC)	-0.0557	11
14 (S-BA)	16 (S-LA)	1.0000	2
14 (S-BA)	17 (S-Y)	-0.3240	12
14 (S-BA)	18 (S-ZR)	-1.0000	2
14 (S-BA)	19 (Plag.)	-0.1669	9
14 (S-BA)	20 (Pyrite)	0.8335	4
14 (S-BA)	21 (Zircon)	0.1379	6
14 (S-BA)	22 (Apatite)	********	3
14 (S-BA)	23 (Px/Ol/Am)	0.3174	10
14 (S-BA)	24 (Epidote)	********	1
14 (S-BA)	25 (Rk Frags)	-0.6347	3
15 (S-SC)	16 (S-LA)	********	2
15 (S-SC)	17 (S-Y)	-0.0657	11
15 (S-SC)	18 (S-ZR)	1.0000	2
15 (S-SC)	19 (Plag.)	-0.7659	7
15 (S-SC)	20 (Pyrite)	0.4597	4
15 (S-SC)	21 (Zircon)	0.4068	6
15 (S-SC)	22 (Apatite)	********	3
15 (S-SC)	23 (Px/Ol/Am)	-0.0188	9
15 (S-SC)	24 (Epidote)	********	1
15 (S-SC)	25 (Rk Frags)	********	2
16 (S-LA)	17 (S-Y)	1.0000	2
16 (S-LA)	18 (S-ZR)	********	0
16 (S-LA)	19 (Plag.)	-1.0000	2
16 (S-LA)	20 (Pyrite)	1.0000	2
16 (S-LA)	21 (Zircon)	********	1
16 (S-LA)	22 (Apatite)	********	1
16 (S-LA)	23 (Px/Ol/Am)	********	0
16 (S-LA)	24 (Epidote)	********	1
16 (S-LA)	25 (Rk Frags)	-1.0000	2
17 (S-Y)	18 (S-ZR)	1.0000	2
17 (S-Y)	19 (Plag.)	-0.0735	8
17 (S-Y)	20 (Pyrite)	-0.2247	4
17 (S-Y)	21 (Zircon)	0.5507	6
17 (S-Y)	22 (Apatite)	********	3
17 (S-Y)	23 (Px/Ol/Am)	0.0423	10
17 (S-Y)	24 (Epidote)	********	1
17 (S-Y)	25 (Rk Frags)	-0.6118	3
18 (S-ZR)	19 (Plag.)	********	1
18 (S-ZR)	20 (Pyrite)	********	0
18 (S-ZR)	21 (Zircon)	********	1
18 (S-ZR)	22 (Apatite)	********	0
18 (S-ZR)	23 (Px/Ol/Am)	-1.0000	2
18 (S-ZR)	24 (Epidote)	********	0
18 (S-ZR)	25 (Rk Frags)	********	0
19 (Plag.)	20 (Pyrite)	-0.5050	4
19 (Plag.)	21 (Zircon)	-0.9008	4
19 (Plag.)	22 (Apatite)	********	2
19 (Plag.)	23 (Px/Ol/Am)	-0.8343	6
19 (Plag.)	24 (Epidote)	********	1
19 (Plag.)	25 (Rk Frags)	0.8131	3
20 (Pyrite)	21 (Zircon)	0.5000	3
20 (Pyrite)	22 (Apatite)	********	1
20 (Pyrite)	23 (Px/Ol/Am)	********	2
20 (Pyrite)	24 (Epidote)	********	1
20 (Pyrite)	25 (Rk Frags)	-1.0000	2
21 (Zircon)	22 (Apatite)	********	1
21 (Zircon)	23 (Px/Ol/Am)	0.6565	5
21 (Zircon)	24 (Epidote)	********	1
21 (Zircon)	25 (Rk Frags)	********	1
22 (Apatite)	23 (Px/Ol/Am)	********	2
22 (Apatite)	24 (Epidote)	********	0
22 (Apatite)	25 (Rk Frags)	********	1
23 (Px/Ol/Am)	24 (Epidote)	********	0
23 (Px/Ol/Am)	25 (Rk Frags)	********	1
24 (Epidote)	25 (Rk Frags)	********	1

Table 14. Fisher-K statistics on spectrographic data from basalts from the Indian Heaven Roadless Area

[The following qualifiers are used in reporting spectrographic data: B, no determination made; N, concentration less than the detection limit; L, detected, but present at a concentration less than the value reported; T, not used; G, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

NO	COLUMN	N	H	L	G	B	T	NO OF UNQUAL VALUES	NO OF IMPROPER QUAL VALUES	MINIMUM	MAXIMUM	NO
1	S-FE%	0	0	0	0	0	0	40	0	2.0000000	10.000000	1
2	S-MG%	0	0	0	0	0	0	40	0	1.5000000	5.0000000	2
3	S-CA%	0	0	0	0	0	0	40	0	2.0000000	5.0000000	3
4	S-TI%	0	0	0	1	0	0	39	0	0.3000000	1.0000000	4
5	S-MN	0	0	0	0	0	0	40	0	500.00000	1500.0000	5
6	S-AG	39	0	1	0	0	0	0	0			6
7	S-AS	40	0	0	0	0	0	0	0			7
8	S-AU	40	0	0	0	0	0	0	0			8
9	S-B	0	0	39	0	0	0	1	0	10.000000	10.000000	9
10	S-BA	0	0	0	0	0	0	40	0	50.000000	700.00000	10
11	S-BE	3	0	1	0	0	0	36	0	1.0000000	2.0000000	11
12	S-BI	40	0	0	0	0	0	0	0			12
13	S-CD	40	0	0	0	0	0	0	0			13
14	S-CO	0	0	0	0	0	0	40	0	15.000000	70.000000	14
15	S-CR	0	0	0	0	0	0	40	0	100.00000	700.00000	15
16	S-CU	0	0	0	0	0	0	40	0	20.000000	200.00000	16
17	S-LA	32	0	1	0	0	0	7	0	20.000000	50.000000	17
18	S-MO	39	0	0	0	0	0	1	0	15.000000	15.000000	18
19	S-NB	38	0	1	0	0	0	1	0	20.000000	20.000000	19
20	S-NI	0	0	0	0	0	0	40	0	30.000000	300.00000	20
21	S-PB	26	0	8	0	0	0	6	0	10.000000	30.000000	21
22	S-SB	40	0	0	0	0	0	0	0			22
23	S-SC	0	0	0	0	0	0	40	0	10.000000	50.000000	23
24	S-SN	40	0	0	0	0	0	0	0			24
25	S-SR	0	0	0	0	0	0	40	0	200.00000	1000.0000	25
26	S-V	0	0	0	0	0	0	40	0	70.000000	200.00000	26
27	S-W	40	0	0	0	0	0	0	0			27
28	S-Y	0	0	0	0	0	0	40	0	20.000000	30.000000	28
29	S-ZN	39	0	1	0	0	0	0	0			29
30	S-ZR	0	0	0	0	0	0	40	0	70.000000	200.00000	30
31	S-TH	40	0	0	0	0	0	0	0			31

Table 14. Fisher-K statistics on spectrographic data from basalts from the Indian Heaven Roadless Area

NO	COLUMN	K1 MEAN	SQRT(K2) STD DEVIATION	K2 VARIANCE	K3	G1 SKEWNESS	K4	G2 KURTOSIS	NO
1	S-FE%	6.9750000	1.6561850	2.7429487	-0.2962551	-0.0652138	12.115747	1.6103297	1
2	S-MG%	2.8125000	0.5738701	0.3293269	0.1110197	0.5874344	0.5269920	4.8590295	2
3	S-CA%	4.4500000	0.9857966	0.9717949	-1.3174089	-1.3751773	0.2301054	0.2436563	3
4	S-TI%	0.7153846	0.2323093	0.0539676	0.0025299	0.2017939	-0.0046620	-1.6006806	4
5	S-MN	1210.0000	295.95564	87589.744	-8812955.5	-0.3399709	-8.1852471D+09	-1.0669039	5
6	S-AG								6
7	S-AS								7
8	S-AU								8
9	S-B	10.000000							9
10	S-BA	276.75000	155.35547	24135.321	6106338.2	1.6285506	1.3874631D+09	2.3818549	10
11	S-BE	1.3055556	0.3224411	0.1039683	0.0192810	0.5751478	-0.0059375	-0.5492930	11
12	S-BI								12
13	S-CD								13
14	S-CO	45.375000	13.077064	171.00962	-1386.7788	-0.6201210	11141.158	0.3809687	14
15	S-CR	316.25000	147.36467	21716.346	1981515.7	0.6191807	-2.4738314D+08	-0.5245617	15
16	S-CU	93.250000	51.807707	2684.0385	85803.543	0.6170525	-5435296.6	-0.7544766	16
17	S-LA	23.571429	10.690450	114.28571	1857.1429	1.5200483	35428.571	2.7125000	17
18	S-MO	15.000000							18
19	S-NB	20.000000							19
20	S-NI	151.00000	60.671457	3681.0256	68968.421	0.3088140	2956374.8	0.2181835	20
21	S-PB	15.000000	8.3666003	70.000000	900.00000	1.5367225	7000.0000	1.4285714	21
22	S-SB								22
23	S-SC	25.875000	9.0502514	81.907051	869.44585	1.1728990	12493.102	1.8622060	23
24	S-SN								24
25	S-SR	595.00000	203.74695	41512.821	4488259.1	0.5306456	1.5209833D+08	0.0882592	25
26	S-V	160.50000	38.226719	1461.2821	-29783.806	-0.5331865	-1348440.5	-0.6314859	26
27	S-W								27
28	S-Y	26.750000	4.7434165	22.500000	-82.894737	-0.7766998	-745.73257	-1.4730520	28
29	S-ZN								29
30	S-ZR	119.50000	31.374496	984.35897	9435.6275	0.3055206	-674163.18	-0.6957577	30
31	S-TH								31

NOTE: THE ABOVE STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY.

Table 15. Correlation coefficients for spectrographic data from basalts from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
1 (S-MG%)	2 (S-CA%)	0.6800	40
1 (S-MG%)	3 (S-FE%)	0.6709	40
1 (S-MG%)	4 (S-TI%)	0.5862	39
1 (S-MG%)	5 (S-V)	0.7441	40
1 (S-MG%)	6 (S-CR)	0.6917	40
1 (S-MG%)	7 (S-MN)	0.6012	40
1 (S-MG%)	8 (S-CO)	0.7644	40
1 (S-MG%)	9 (S-NI)	0.6989	40
1 (S-MG%)	10 (S-CU)	0.4066	40
1 (S-MG%)	11 (S-MO)	********	1
1 (S-MG%)	12 (S-PB)	-0.6160	6
1 (S-MG%)	13 (S-B)	********	1
1 (S-MG%)	14 (S-BE)	0.0646	36
1 (S-MG%)	15 (S-SR)	0.5027	40
1 (S-MG%)	16 (S-BA)	0.2198	40
1 (S-MG%)	17 (S-SC)	0.5616	40
1 (S-MG%)	18 (S-LA)	********	7
1 (S-MG%)	19 (S-Y)	0.6147	40
1 (S-MG%)	20 (S-ZR)	0.4832	40
2 (S-CA%)	3 (S-FE%)	0.6465	40
2 (S-CA%)	4 (S-TI%)	0.4497	39
2 (S-CA%)	5 (S-V)	0.6325	40
2 (S-CA%)	6 (S-CR)	0.5313	40
2 (S-CA%)	7 (S-MN)	0.6492	40
2 (S-CA%)	8 (S-CO)	0.6768	40
2 (S-CA%)	9 (S-NI)	0.4886	40
2 (S-CA%)	10 (S-CU)	0.3588	40
2 (S-CA%)	11 (S-MO)	********	1
2 (S-CA%)	12 (S-PB)	-0.6708	6
2 (S-CA%)	13 (S-B)	********	1
2 (S-CA%)	14 (S-BE)	-0.0935	36
2 (S-CA%)	15 (S-SR)	0.3258	40
2 (S-CA%)	16 (S-BA)	0.0113	40
2 (S-CA%)	17 (S-SC)	0.5532	40
2 (S-CA%)	18 (S-LA)	-0.1317	7
2 (S-CA%)	19 (S-Y)	0.4890	40
2 (S-CA%)	20 (S-ZR)	0.1443	40
3 (S-FE%)	4 (S-TI%)	0.5208	39
3 (S-FE%)	5 (S-V)	0.8261	40
3 (S-FE%)	6 (S-CR)	0.6743	40
3 (S-FE%)	7 (S-MN)	0.7438	40
3 (S-FE%)	8 (S-CO)	0.7597	40
3 (S-FE%)	9 (S-NI)	0.6660	40
3 (S-FE%)	10 (S-CU)	0.5248	40
3 (S-FE%)	11 (S-MO)	********	1
3 (S-FE%)	12 (S-PB)	-0.3735	6
3 (S-FE%)	13 (S-B)	********	1
3 (S-FE%)	14 (S-BE)	0.0426	36
3 (S-FE%)	15 (S-SR)	0.3088	40
3 (S-FE%)	16 (S-BA)	0.0606	40

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
3 (S-FE%)	17 (S-SC)	0.7800	40
3 (S-FE%)	18 (S-LA)	0.3982	7
3 (S-FE%)	19 (S-Y)	0.6031	40
3 (S-FE%)	20 (S-ZR)	0.4138	40
4 (S-TI%)	5 (S-V)	0.6244	39
4 (S-TI%)	6 (S-CR)	0.5865	39
4 (S-TI%)	7 (S-MN)	0.5454	39
4 (S-TI%)	8 (S-CO)	0.5231	39
4 (S-TI%)	9 (S-NI)	0.5968	39
4 (S-TI%)	10 (S-CU)	0.6239	39
4 (S-TI%)	11 (S-MO)	********	1
4 (S-TI%)	12 (S-PB)	-0.6814	6
4 (S-TI%)	13 (S-B)	********	1
4 (S-TI%)	14 (S-BE)	0.3147	35
4 (S-TI%)	15 (S-SR)	0.3429	39
4 (S-TI%)	16 (S-BA)	0.0359	39
4 (S-TI%)	17 (S-SC)	0.4731	39
4 (S-TI%)	18 (S-LA)	-0.1612	7
4 (S-TI%)	19 (S-Y)	0.5073	39
4 (S-TI%)	20 (S-ZR)	0.5672	39
5 (S-V)	6 (S-CR)	0.7138	40
5 (S-V)	7 (S-MN)	0.8217	40
5 (S-V)	8 (S-CO)	0.8138	40
5 (S-V)	9 (S-NI)	0.6637	40
5 (S-V)	10 (S-CU)	0.6680	40
5 (S-V)	11 (S-MO)	********	1
5 (S-V)	12 (S-PB)	-0.3546	6
5 (S-V)	13 (S-B)	********	1
5 (S-V)	14 (S-BE)	0.0697	36
5 (S-V)	15 (S-SR)	0.2249	40
5 (S-V)	16 (S-BA)	-0.0280	40
5 (S-V)	17 (S-SC)	0.7866	40
5 (S-V)	18 (S-LA)	0.1317	7
5 (S-V)	19 (S-Y)	0.6738	40
5 (S-V)	20 (S-ZR)	0.4002	40
6 (S-CR)	7 (S-MN)	0.6063	40
6 (S-CR)	8 (S-CO)	0.6677	40
6 (S-CR)	9 (S-NI)	0.7653	40
6 (S-CR)	10 (S-CU)	0.5776	40
6 (S-CR)	11 (S-MO)	********	1
6 (S-CR)	12 (S-PB)	-0.6624	6
6 (S-CR)	13 (S-B)	********	1
6 (S-CR)	14 (S-BE)	0.0875	36
6 (S-CR)	15 (S-SR)	0.4238	40
6 (S-CR)	16 (S-BA)	0.1878	40
6 (S-CR)	17 (S-SC)	0.7113	40
6 (S-CR)	18 (S-LA)	-0.5359	7
6 (S-CR)	19 (S-Y)	0.6221	40
6 (S-CR)	20 (S-ZR)	0.3931	40
7 (S-MN)	8 (S-CO)	0.7532	40

Table 15. Correlation coefficients for spectrographic data from basalts from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
7 (S-MN)	9 (S-NI)	0.5006	40
7 (S-MN)	10 (S-CU)	0.6025	40
7 (S-MN)	11 (S-MO)	********	1
7 (S-MN)	12 (S-PB)	-0.5347	6
7 (S-MN)	13 (S-B)	********	1
7 (S-MN)	14 (S-BE)	0.0389	36
7 (S-MN)	15 (S-SR)	0.1440	40
7 (S-MN)	16 (S-BA)	-0.1808	40
7 (S-MN)	17 (S-SC)	0.7958	40
7 (S-MN)	18 (S-LA)	0.1317	7
7 (S-MN)	19 (S-Y)	0.6076	40
7 (S-MN)	20 (S-ZR)	0.2292	40
8 (S-CO)	9 (S-NI)	0.6355	40
8 (S-CO)	10 (S-CU)	0.5038	40
8 (S-CO)	11 (S-MO)	********	1
8 (S-CO)	12 (S-PB)	-0.6347	6
8 (S-CO)	13 (S-B)	********	1
8 (S-CO)	14 (S-BE)	-0.0204	36
8 (S-CO)	15 (S-SR)	0.3381	40
8 (S-CO)	16 (S-BA)	0.0726	40
8 (S-CO)	17 (S-SC)	0.7426	40
8 (S-CO)	18 (S-LA)	********	7
8 (S-CO)	19 (S-Y)	0.7669	40
8 (S-CO)	20 (S-ZR)	0.3238	40
9 (S-NI)	10 (S-CU)	0.5077	40
9 (S-NI)	11 (S-MO)	********	1
9 (S-NI)	12 (S-PB)	-0.6688	6
9 (S-NI)	13 (S-B)	********	1
9 (S-NI)	14 (S-BE)	0.2953	36
9 (S-NI)	15 (S-SR)	0.5013	40
9 (S-NI)	16 (S-BA)	0.1624	40
9 (S-NI)	17 (S-SC)	0.4904	40
9 (S-NI)	18 (S-LA)	-0.4700	7
9 (S-NI)	19 (S-Y)	0.5567	40
9 (S-NI)	20 (S-ZR)	0.5117	40
10 (S-CU)	11 (S-MO)	********	1
10 (S-CU)	12 (S-PB)	-0.7959	6
10 (S-CU)	13 (S-B)	********	1
10 (S-CU)	14 (S-BE)	0.1781	36
10 (S-CU)	15 (S-SR)	0.1066	40
10 (S-CU)	16 (S-BA)	-0.0119	40
10 (S-CU)	17 (S-SC)	0.6745	40
10 (S-CU)	18 (S-LA)	-0.1321	7
10 (S-CU)	19 (S-Y)	0.5045	40
10 (S-CU)	20 (S-ZR)	0.2100	40
11 (S-MO)	12 (S-PB)	********	0
11 (S-MO)	13 (S-B)	********	0
11 (S-MO)	14 (S-BE)	********	1
11 (S-MO)	15 (S-SR)	********	1
11 (S-MO)	16 (S-BA)	********	1
11 (S-MO)	17 (S-SC)	********	1
11 (S-MO)	18 (S-LA)	********	0
11 (S-MO)	19 (S-Y)	********	1
11 (S-MO)	20 (S-ZR)	********	1
12 (S-PB)	13 (S-B)	********	1
12 (S-PB)	14 (S-BE)	0.0533	5
12 (S-PB)	15 (S-SR)	-0.6388	6
12 (S-PB)	16 (S-BA)	-0.0450	6
12 (S-PB)	17 (S-SC)	-0.6063	6
12 (S-PB)	18 (S-LA)	********	1
12 (S-PB)	19 (S-Y)	-0.6814	6
12 (S-PB)	20 (S-ZR)	-0.0773	6
13 (S-B)	14 (S-BE)	********	0
13 (S-B)	15 (S-SR)	********	1
13 (S-B)	16 (S-BA)	********	1
13 (S-B)	17 (S-SC)	********	1
13 (S-B)	18 (S-LA)	********	0
13 (S-B)	19 (S-Y)	********	1
13 (S-B)	20 (S-ZR)	********	1
14 (S-BE)	15 (S-SR)	0.5626	36
14 (S-BE)	16 (S-BA)	0.4427	36
14 (S-BE)	17 (S-SC)	-0.1821	36
14 (S-BE)	18 (S-LA)	0.4601	7
14 (S-BE)	19 (S-Y)	-0.0261	36
14 (S-BE)	20 (S-ZR)	0.6998	36
15 (S-SR)	16 (S-BA)	0.7592	40
15 (S-SR)	17 (S-SC)	0.1687	40
15 (S-SR)	18 (S-LA)	0.4700	7
15 (S-SR)	19 (S-Y)	0.3054	40
15 (S-SR)	20 (S-ZR)	0.6000	40
16 (S-BA)	17 (S-SC)	-0.0698	40
16 (S-BA)	18 (S-LA)	0.7625	7
16 (S-BA)	19 (S-Y)	0.1324	40
16 (S-BA)	20 (S-ZR)	0.5168	40
17 (S-SC)	18 (S-LA)	-0.4700	7
17 (S-SC)	19 (S-Y)	0.6076	40
17 (S-SC)	20 (S-ZR)	0.1237	40
18 (S-LA)	19 (S-Y)	-0.3107	7
18 (S-LA)	20 (S-ZR)	0.4229	7
19 (S-Y)	20 (S-ZR)	0.2762	40

Table 16. Fisher-K statistics on ICP analytical data from basalts from the Indian Heaven Roadless Area

[The following qualifiers are used in reporting spectrographic data: B, no determination made; N, concentration less than the detection limit; L, detected, but present at a concentration less than the value reported; T, not used; G, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

NO	COLUMN	N	H	L	G	B	T	NO OF UNQUAL VALUES	NO OF IMPROPER QUAL VALUES	MINIMUM	MAXIMUM	NO
1	AG	44	0	0	0	0	0	1	0	31.000000	31.000000	1
2	AL	0	0	1	0	0	0	44	0	5.9000000	65000.000	2
3	AS	41	0	2	0	0	0	2	0	18.000000	410.00000	3
4	AU	0	0	0	0	45	0	0	0			4
5	B	44	0	0	0	0	0	1	0	3.4000000	3.4000000	5
6	BA	2	0	0	0	0	0	43	0	5.7000000	720.00000	6
7	BE	8	0	24	0	0	0	13	0	0.1000000	0.8100000	7
8	BI	43	0	1	0	0	0	1	0	1500.0000	1500.0000	8
9	CA	1	0	0	0	0	0	44	0	4.4000000	40000.000	9
10	CD	45	0	0	0	0	0	0	0			10
11	CE	5	0	3	0	0	0	37	0	3.7000000	51.000000	11
12	CO	3	0	1	0	0	0	41	0	4.1000000	27.000000	12
13	CR	15	0	11	0	0	0	19	0	11.000000	49.000000	13
14	CU	2	0	0	0	0	0	43	0	7.0000000	1200.0000	14
15	FE	0	0	2	0	0	0	43	0	6300.0000	260000.00	15
16	GE	0	0	0	0	45	0	0	0			16
17	LA	2	0	0	0	0	0	43	0	1.2000000	23.000000	17
18	MG	2	0	0	0	0	0	43	0	340.00000	34000.000	18
19	MN	1	0	1	0	0	0	43	0	46.000000	990.00000	19
20	MO	37	0	6	0	0	0	2	0	2.7000000	11.000000	20
21	NB	2	0	0	0	0	0	43	0	3.9000000	24.000000	21
22	NI	2	0	0	0	0	0	43	0	10.000000	130.00000	22
23	P	2	0	0	0	0	0	43	0	110.00000	1200.0000	23
24	PB	30	0	11	0	0	0	4	0	18.000000	630.00000	24
25	SB	44	0	1	0	0	0	0	0			25
26	SN	45	0	0	0	0	0	0	0			26
27	SR	1	0	0	0	0	0	44	0	0.0350000	130.00000	27
28	TI	1	0	1	0	0	0	43	0	140.00000	3600.0000	28
29	V	2	0	5	0	0	0	38	0	9.2000000	120.00000	29
30	W	45	0	0	0	0	0	0	0			30
31	Y	15	0	0	0	0	0	30	0	0.1800000	5.3000000	31
32	ZN	1	0	1	0	0	0	43	0	10.000000	650.00000	32

Table 16. Fisher-K statistics on ICP analytical data from basalts from the Indian Heaven Roadless Area

NO	COLUMN	K1 MEAN	SQRT(K2) STD DEVIATION	K2 VARIANCE	K3	G1 SKEWNESS	K4	G2 KURTOSIS	NO
1	AG	31.000000							1
2	AL	11332.407	11221.940	1.2593193D+08	4.7598435D+12	3.3681304	2.1609845D+17	13.626363	2
3	AS	214.00000	277.18586	76832.000					3
4	AU								4
5	B	3.4000000							5
6	BA	43.944186	126.93857	16113.401	9620264.1	4.7033380	5.8064063D+09	22.363152	6
7	BE	0.2207692	0.2287816	0.0523410	0.0186831	1.5602210	0.0041131	1.5013418	7
8	BI	1500.0000							8
9	CA	7122.3273	5774.4719	33344526.	8.5466395D+11	4.4387283	2.7929132D+16	25.119347	9
10	CD								10
11	CE	15.967568	8.8493582	78.311141	1176.0845	1.6970834	35385.804	5.7700816	11
12	CO	15.721951	5.4005329	29.165756	-49.381985	-0.3135153	-109.53186	-0.1287639	12
13	CR	24.263158	10.994150	120.87135	938.26522	0.7060583	-4278.0399	-0.2928182	13
14	CU	56.855814	179.94814	32381.332	37858995.	6.4972116	4.4516821D+10	42.455575	14
15	FE	24858.140	37622.348	1.4154411D+09	3.2428315D+14	6.0895710	7.7545826D+19	38.705693	15
16	GE								16
17	LA	6.8279070	4.0736275	16.594441	112.42129	1.6630474	1359.9165	4.9384083	17
18	MG	15477.442	8733.0186	76265615.	-1.1387192D+11	-0.1709714	-4.8646085D+15	-0.8363544	18
19	MN	278.51163	185.77628	34512.827	12484105.	1.9470925	6.0847807D+09	5.1083878	19
20	MO	6.8500000	5.8689863	34.445000					20
21	NB	8.4465116	3.1288480	9.7896899	94.892848	3.0979905	1350.6460	14.093007	21
22	NI	58.395349	28.184882	794.38760	4971.9875	0.2220656	-314194.25	-0.4978899	22
23	P	537.67442	279.76042	78265.891	5500061.3	0.2511937	-4.9728985D+09	-0.8118289	23
24	PB	200.25000	288.40986	83180.250	46099226.	1.9216014	2.5842119D+10	3.7349748	24
25	SB								25
26	SN								26
27	SR	48.362159	26.403112	697.12431	22066.267	1.1988463	1070844.3	2.2034636	27
28	TI	1100.2326	750.20152	562802.33	6.4968994D+08	1.5387651	8.0853168D+11	2.5526147	28
29	V	34.578947	21.617650	467.32279	17723.933	1.7544245	1191494.7	5.4557970	29
30	W								30
31	Y	2.4473333	1.4064603	1.9781306	0.6205679	0.2230524	-2.6971253	-0.6892729	31
32	ZN	39.581395	96.272241	9268.3444	5678241.8	6.3637138	3.5369779D+09	41.174470	32

NOTE: THE ABOVE STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY.

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

[The following qualifiers are used in reporting spectrographic data: B, no determination made; N, concentration less than the detection limit; L, detected, but present at a concentration less than the value reported; T, not used; G, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

FREQUENCY TABLE FOR VARIABLE 3 (MG)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.00	0.00
2.416E+00 - 2.583E+00	1	1	2.50	2.50	0.00	214.44
2.583E+00 - 2.749E+00	0	1	0.00	2.50	0.02	0.02
2.749E+00 - 2.916E+00	0	1	0.00	2.50	0.07	0.07
2.916E+00 - 3.083E+00	1	2	2.50	5.00	0.21	3.04
3.083E+00 - 3.249E+00	0	2	0.00	5.00	0.54	0.54
3.249E+00 - 3.416E+00	2	4	5.00	10.00	1.19	0.54
3.416E+00 - 3.583E+00	0	4	0.00	10.00	2.27	2.27
3.583E+00 - 3.749E+00	0	4	0.00	10.00	3.70	3.70
3.749E+00 - 3.916E+00	4	8	10.00	20.00	5.14	0.25
3.916E+00 - 4.083E+00	4	12	10.00	30.00	6.12	0.73
4.083E+00 - 4.249E+00	5	17	12.50	42.50	6.23	0.24
4.249E+00 - 4.416E+00	20	37	50.00	92.50	5.43	39.10
4.416E+00 - 4.583E+00	3	40	7.50	100.00	9.08	4.07
G	0	40	0.00	100.00	0.00	0.00
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 3 (MG)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
3.157E+02 XXX
4.634E+02
6.802E+02
9.985E+02 XXX
1.466E+03
2.151E+03 XXXXX
3.157E+03
4.634E+03
6.803E+03 XXXXXXXXXX
9.985E+03 XXXXXXXXXX
1.466E+04 XXXXXXXXXXXXX
2.151E+04 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
3.157E+04 XXXXXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

```
MINIMUM ANTILOG      =  3.40000E+02
MAXIMUM ANTILOG      =  3.40000E+04
GEOMETRIC MEAN       =  1.26498E+04
GEOMETRIC DEVIATION  =  2.62475E+00
VARIANCE OF LOGS     =  1.75635E-01
```

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TAPLE FOR VARIABLE 4 (CA)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.64	0.64
3.416E+00 - 3.583E+00	3	3	7.50	7.50	3.47	0.06
3.583E+00 - 3.749E+00	11	14	27.50	35.00	9.87	0.13
3.749E+00 - 3.916E+00	18	32	45.00	80.00	13.58	1.44
3.916E+00 - 4.083F+00	5	37	12.50	92.50	9.04	1.81
4.083E+00 - 4.249E+00	2	39	5.00	97.50	2.91	0.29
4.249E+00 - 4.416E+00	0	39	0.00	97.50	0.45	0.45
4.416E+00 - 4.583E+00	0	39	0.00	97.50	0.03	0.03
4.583E+00 - 4.749E+00	1	40	2.50	100.00	0.00	827.73
G	0	40	0.00	100.00	0.64	0.64
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 4 (CA)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
3.157E+03 XXXXXXXX
4.634E+03 XXXXXXXXXXXXXXXXXXXXXXXXXXXX
6.802E+03 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
9.985E+03 XXXXXXXXXXXXX
1.466E+04 XXXXX
2.151F+04
3.157E+04
4.634E+04 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 3.50000E+03
MAXIMUM ANTILOG = 4.00000E+04
GEOMETRIC MEAN = 6.64675E+03
GEOMETRIC DEVIATION = 1.54686E+00
VARIANCF OF LOGS = 3.58914E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 5 (AL)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.08	0.08
3.250E+00 - 3.417E+00	1	1	2.50	2.50	0.49	0.53
3.417E+00 - 3.583E+00	1	2	2.50	5.00	2.03	0.52
3.583E+00 - 3.750E+00	6	8	15.00	20.00	5.42	0.06
3.750E+00 - 3.917E+00	9	17	22.50	42.50	9.34	0.01
3.917E+00 - 4.083E+00	11	28	27.50	70.00	10.40	0.03
4.083E+00 - 4.250E+00	7	35	17.50	87.50	7.49	0.03
4.250E+00 - 4.417E+00	4	39	10.00	97.50	3.48	0.08
4.417E+00 - 4.583E+00	0	39	0.00	97.50	1.04	1.04
4.583E+00 - 4.750E+00	1	40	2.50	100.00	0.23	2.59
G	0	40	0.00	100.00	0.08	0.08
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 5 (AL)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
2.154E+03 XXX
3.162E+03 XXX
4.642E+03 XXXXXXXXXXXXXXX
6.813E+03 XXXXXXXXXXXXXXXXXXXXXX
1.000E+04 XXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.468E+04 XXXXXXXXXXXXXXXXXX
2.154E+04 XXXXXXXXXX
3.162E+04
4.642E+04 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 2.60000E+03
MAXIMUM ANTILOG = 4.70000E+04
GEOMETRIC MEAN = 9.07425E+03
GEOMETRIC DEVIATION = 1.76782E+00
VARIANCE OF LOGS = 6.12261E-02

Table 17. Frequency tables and histograms of ICP analvtical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 6 (FE)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.07	0.07
3.750E+00 - 3.917E+00	1	1	2.50	2.50	1.05	0.00
3.917E+00 - 4.083E+00	8	9	20.00	22.50	6.14	0.56
4.083E+00 - 4.250E+00	10	19	25.00	47.50	14.18	1.23
4.250E+00 - 4.417E+00	19	38	47.50	95.00	13.04	2.72
4.417E+00 - 4.583E+00	2	40	5.00	100.00	5.50	2.23
G	0	40	0.00	100.00	0.07	0.07
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 6 (FE)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
6.813E+03 XXX
1.000E+04 XXXXXXXXXXXXXXXXXXXX
1.468E+04 XXXXXXXXXXXXXXXXXXXXXXXXX
2.154E+04 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
3.162E+04 XXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 6.30000E+03
MAXIMUM ANTILOG = 3.40000E+04
GEOMETRIC MEAN = 1.71712E+04
GEOMETRIC DEVIATION = 1.46781E+00
VARIANCE OF LOGS = 2.77787E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 7 (TI)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.64	0.64
2.416E+00 - 2.583E+00	2	2	5.00	5.00	1.97	0.00
2.583E+00 - 2.749E+00	7	9	17.50	22.50	4.96	0.84
2.749E+00 - 2.916E+00	6	15	15.00	37.50	8.49	0.73
2.916E+00 - 3.083E+00	13	28	32.50	70.00	9.89	0.98
3.083E+00 - 3.249E+00	7	35	17.50	87.50	7.83	0.09
3.249E+00 - 3.416E+00	1	36	2.50	90.00	4.21	2.45
3.416E+00 - 3.583E+00	4	40	10.00	100.00	2.00	2.00
G	0	40	0.00	100.00	0.64	0.64
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 7 (TI)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
3.157E+02 XXXXX
4.634E+02 XXXXXXXXXXXXXXXXX
6.802E+02 XXXXXXXXXXXXXXX
9.985E+02 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.466E+03 XXXXXXXXXXXXXXXXX
2.151E+03 XXX
3.157E+03 XXXXXXXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 2.90000E+02
MAXIMUM ANTILOG = 3.60000E+03
GEOMETRIC MEAN = 9.58719E+02
GEOMETRIC DEVIATION = 1.83655E+00
VARIANCE OF LOGS = 6.96978E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 8 (V)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	5	5	12.50	12.50		
T	0	5	0.00	12.50	1.72	1.72
9.160E-01 - 1.083E+00	3	8	7.50	20.00	3.63	0.11
1.083E+00 - 1.249E+00	8	16	20.00	40.00	6.97	0.15
1.249E+00 - 1.416E+00	3	19	7.50	47.50	9.37	4.33
1.416E+00 - 1.583E+00	7	26	17.50	65.00	8.80	0.37
1.583E+00 - 1.749E+00	13	39	32.50	97.50	5.78	9.02
1.749E+00 - 1.916E+00	1	40	2.50	100.00	3.73	2.00
G	0	40	0.00	100.00	0.00	0.00
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

```
HISTOGRAM FOR VARIABLE   8 (V        )
    MIDPOINTS ARE EXPRESSED AS ANTILOGS

     9.985E+00 XXXXXXXX
     1.466E+01 XXXXXXXXXXXXXXXXXXXX
     2.151E+01 XXXXXXXX
     3.157E+01 XXXXXXXXXXXXXXXXXX
     4.634E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
     6.802E+01 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

```
MINIMUM ANTILOG      =  9.20000E+00
MAXIMUM ANTILOG      =  6.80000E+01
GEOMETRIC MEAN       =  2.73712E+01
GEOMETRIC DEVIATION  =  1.77069E+00
VARIANCE OF LOGS     =  6.15746E-02
```

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 9 (CR)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	11	11	27.50	27.50		
L	11	22	27.50	55.00		
T	0	22	0.00	55.00	21.20	21.20
9.160E-01 - 1.083E+00	3	25	7.50	62.50	4.87	0.72
1.083E+00 - 1.249E+00	2	27	5.00	67.50	4.31	1.24
1.249E+00 - 1.416E+00	7	34	17.50	85.00	3.46	3.62
1.416E+00 - 1.583E+00	4	38	10.00	95.00	2.52	0.87
1.583E+00 - 1.749E+00	2	40	5.00	100.00	3.64	0.74
G	0	40	0.00	100.00	0.00	0.00
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 9 (CR)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
9.985E+00 XXXXXXXX
1.466E+01 XXXXX
2.151E+01 XXXXXXXXXXXXXXXXX
3.157E+01 XXXXXXXXXX
4.634E+01 XXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 1.10000E+01
MAXIMUM ANTILOG = 4.90000E+01
GEOMETRIC MEAN = 2.15323E+01
GEOMETRIC DEVIATION = 1.57937E+00
VARIANCE OF LOGS = 3.93958E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 10 (MN)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.07	0.07
1.583E+00 - 1.750E+00	2	2	5.00	5.00	0.41	6.18
1.750E+00 - 1.916E+00	2	4	5.00	10.00	1.68	0.06
1.916E+00 - 2.083E+00	4	8	10.00	20.00	4.59	0.08
2.083E+00 - 2.250E+00	4	12	10.00	30.00	8.37	2.28
2.250E+00 - 2.416E+00	12	24	30.00	60.00	10.16	0.33
2.416E+00 - 2.583E+00	11	35	27.50	87.50	8.23	0.94
2.583E+00 - 2.750E+00	4	39	10.00	97.50	4.44	0.04
2.750E+00 - 2.916E+00	1	40	2.50	100.00	2.04	0.53
G	0	40	0.00	100.00	0.07	0.07
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 10 (MN)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
4.638E+01 XXXXX
6.808E+01 XXXXX
9.992E+01 XXXXXXXXXX
1.467E+02 XXXXXXXXXX
2.153E+02 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
3.160E+02 XXXXXXXXXXXXXXXXXXXXXXXXXXXX
4.638E+02 XXXXXXXXXX
6.808E+02 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 4.60000E+01
MAXIMUM ANTILOG = 6.50000E+02
GEOMETRIC MEAN = 2.13511E+02
GEOMETRIC DEVIATION = 1.80782E+00
VARIANCE OF LOGS = 6.61294E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 11 (CO)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	1	1	2.50	2.50		
T	0	1	0.00	2.50	0.16	0.16
5.830E-01 - 7.497E-01	3	4	7.50	10.00	1.07	3.52
7.497E-01 - 9.163E-01	2	6	5.00	15.00	4.30	1.23
9.163E-01 - 1.083E+00	4	10	10.00	25.00	9.67	3.32
1.083E+00 - 1.250E+00	12	22	30.00	55.00	12.14	0.00
1.250E+00 - 1.416E+00	17	39	42.50	97.50	8.51	8.46
1.416E+00 - 1.583E+00	1	40	2.50	100.00	4.15	2.39
G	0	40	0.00	100.00	0.00	0.00
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 11 (CO)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
4.638E+00 XXXXXXXX
6.808E+00 XXXXX
9.992E+00 XXXXXXXXXX
1.467E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
2.153E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
3.160E+01 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 4.10000E+00
MAXIMUM ANTILOG = 2.70000E+01
GEOMETRIC MEAN = 1.45764E+01
GEOMETRIC DEVIATION = 1.55394E+00
VARIANCE OF LOGS = 3.66466E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 12 (NB)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.01	0.01
5.830E-01 - 7.497E-01	1	1	2.50	2.50	2.12	0.59
7.497E-01 - 9.163E-01	25	26	62.50	65.00	21.29	0.65
9.163E-01 - 1.083E+00	13	39	32.50	97.50	15.76	0.48
1.083E+00 - 1.250E+00	1	40	2.50	100.00	0.81	0.04
G	0	40	0.00	100.00	0.01	0.01
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

```
HISTOGRAM FOR VARIABLE  12 (NB      )
    MIDPOINTS ARE EXPRESSED AS ANTILOGS

     4.638E+00 XXX
     6.808E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
     9.992E+00 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
     1.467E+01 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

```
MINIMUM ANTILOG      =  5.40000E+00
MAXIMUM ANTILOG      =  1.30000E+01
GEOMETRIC MEAN       =  7.88223E+00
GEOMETRIC DEVIATION  =  1.23331E+00
VARIANCE OF LOGS     =  8.29434E-03
```

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 13 (CU)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.33	0.33
7.500E-01 - 9.167E-01	1	1	2.50	2.50	1.59	0.22
9.167E-01 - 1.083E+00	8	9	20.00	22.50	5.09	1.67
1.083E+00 - 1.250E+00	7	16	17.50	40.00	9.77	0.79
1.250E+00 - 1.417E+00	14	30	35.00	75.00	11.26	0.67
1.417E+00 - 1.583E+00	6	36	15.00	90.00	7.79	0.41
1.583E+00 - 1.750E+00	2	38	5.00	95.00	3.23	0.47
1.750E+00 - 1.917E+00	2	40	5.00	100.00	0.94	1.21
G	0	40	0.00	100.00	0.33	0.33
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 13 (CU)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
6.813E+00 XXX
1.000E+01 XXXXXXXXXXXXXXXXXXXX
1.468E+01 XXXXXXXXXXXXXXXXXX
2.154E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
3.162E+01 XXXXXXXXXXXXXXX
4.642E+01 XXXXX
6.813E+01 XXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

```
MINIMUM ANTILOG     =  7.00000E+00
MAXIMUM ANTILOG     =  6.20000E+01
GEOMETRIC MEAN      =  1.97868E+01
GEOMETRIC DEVIATION =  1.69115E+00
VARIANCE OF LOGS    =  5.20676E-02
```

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 14 (ZN)

LOG LIMITS LOWER	-	UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
	N		0	0	0.00	0.00		
	L		0	0	0.00	0.00		
	T		0	0	0.00	0.00	0.04	0.04
9.160E-01	-	1.083E+00	2	2	5.00	5.00	1.16	0.60
1.083E+00	-	1.249E+00	7	9	17.50	22.50	9.02	0.45
1.249E+00	-	1.416E+00	18	27	45.00	67.50	18.35	0.01
1.416E+00	-	1.583E+00	13	40	32.50	100.00	11.44	0.21
	G		0	40	0.00	100.00	0.04	0.04
	H		0	40				
	B		0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 14 (ZN)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
9.985E+00 XXXXX
1.466E+01 XXXXXXXXXXXXXXXXXX
2.151E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
3.157E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 1.00000E+01
MAXIMUM ANTILOG = 3.60000E+01
GEOMETRIC MEAN = 2.18245E+01
GEOMETRIC DEVIATION = 1.36861E+00
VARIANCE OF LOGS = 1.85719E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 16 (BE)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	6	6	15.00	15.00		
L	24	30	60.00	75.00		
T	0	30	0.00	75.00	19.39	19.39
-1.084E+00 - -9.173E-01	2	32	5.00	80.00	9.73	6.14
-9.173E-01 - -7.507E-01	4	36	10.00	90.00	6.67	1.07
-7.507E-01 - -5.840E-01	2	38	5.00	95.00	3.06	0.37
-5.840E-01 - -4.173E-01	1	39	2.50	97.50	0.94	0.00
-4.173E-01 - -2.507E-01	1	40	2.50	100.00	0.22	2.74
G	0	40	0.00	100.00	0.00	0.00
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 16 (BE)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
9.985E-02 XXXXX
1.466E-01 XXXXXXXXXX
2.151E-01 XXXXX
3.157E-01 XXX
4.634E-01 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 1.00000E-01
MAXIMUM ANTILOG = 3.90000E-01
GEOMETRIC MEAN = 1.79211E-01
GEOMETRIC DEVIATION = 1.58925E+00
VARIANCE OF LOGS = 4.04783E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 17 (SR)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.38	0.38
1.250E+00 - 1.417E+00	2	2	5.00	5.00	2.88	0.27
1.417E+00 - 1.583E+00	12	14	30.00	35.00	9.84	0.47
1.583E+00 - 1.750E+00	14	28	35.00	70.00	14.56	0.02
1.750E+00 - 1.917E+00	9	37	22.50	92.50	9.38	0.02
1.917E+00 - 2.083E+00	3	40	7.50	100.00	2.95	0.00
G	0	40	0.00	100.00	0.38	0.38
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 17 (SR)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
2.154E+01 XXXXX
3.162E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
4.642E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
6.813E+01 XXXXXXXXXXXXXXXXXXXXXXX
1.000E+02 XXXXXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 2.00000E+01
MAXIMUM ANTILOG = 1.20000E+02
GEOMETRIC MEAN = 4.59028E+01
GEOMETRIC DEVIATION = 1.49951E+00
VARIANCE OF LOGS = 3.09582E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 18 (BA)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	1.89	1.89
7.500E-01 - 9.167E-01	6	6	15.00	15.00	4.97	0.21
9.167E-01 - 1.083E+00	12	18	30.00	45.00	9.58	0.61
1.083E+00 - 1.250E+00	14	32	35.00	80.00	11.19	0.70
1.250E+00 - 1.417E+00	3	35	7.50	87.50	7.93	3.06
1.417E+00 - 1.583E+00	3	38	7.50	95.00	3.40	0.05
1.583E+00 - 1.750E+00	1	39	2.50	97.50	0.88	0.02
1.750E+00 - 1.917E+00	0	39	0.00	97.50	0.14	0.14
1.917E+00 - 2.083E+00	1	40	2.50	100.00	0.01	69.74
G	0	40	0.00	100.00	1.89	1.89
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 18 (BA)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
6.813E+00 XXXXXXXXXXXXXXX
1.000E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.468E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
2.154E+01 XXXXXXXX
3.162E+01 XXXXXXXX
4.642E+01 XXX
6.813E+01
1.000E+02 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 5.70000E+00
MAXIMUM ANTILOG = 8.90000E+01
GEOMETRIC MEAN = 1.36512E+01
GEOMETRIC DEVIATION = 1.70012E+00
VARIANCE OF LOGS = 5.31210E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 19 (LA)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.05	0.05
-8.400E-02 - 8.267E-02	1	1	2.50	2.50	0.26	2.11
8.267E-02 - 2.493E-01	1	2	2.50	5.00	1.06	0.00
2.493E-01 - 4.160E-01	3	5	7.50	12.50	3.07	0.00
4.160E-01 - 5.827E-01	4	9	10.00	22.50	6.25	0.81
5.827E-01 - 7.493E-01	9	18	22.50	45.00	8.97	0.00
7.493E-01 - 9.160E-01	10	28	25.00	70.00	9.08	0.09
9.160E-01 - 1.083E+00	10	38	25.00	95.00	6.48	1.91
1.083E+00 - 1.249E+00	1	39	2.50	97.50	3.26	1.57
1.249E+00 - 1.416E+00	1	40	2.50	100.00	1.50	0.17
G	0	40	0.00	100.00	0.05	0.05
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 19 (LA)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
9.985E-01 XXX
1.466E+00 XXX
2.151E+00 XXXXXXXX
3.157E+00 XXXXXXXXXX
4.634E+00 XXXXXXXXXXXXXXXXXXXXXXX
6.802E+00 XXXXXXXXXXXXXXXXXXXXXXXXX
9.985E+00 XXXXXXXXXXXXXXXXXXXXXXXXX
1.466E+01 XXX
2.151E+01 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 1.20000E+00
MAXIMUM ANTILOG = 2.30000E+01
GEOMETRIC MEAN = 5.68929E+00
GEOMETRIC DEVIATION = 1.89584E+00
VARIANCE OF LOGS = 7.71732E-02

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 20 (CE)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	2	2	5.00	5.00		
L	3	5	7.50	12.50		
T	0	5	0.00	12.50	1.64	1.64
4.160E-01 - 5.827E-01	1	6	2.50	15.00	2.42	0.83
5.827E-01 - 7.493E-01	3	9	7.50	22.50	4.34	0.41
7.493E-01 - 9.160E-01	2	11	5.00	27.50	6.28	2.91
9.160E-01 - 1.083E+00	7	18	17.50	45.00	7.34	0.02
1.083E+00 - 1.249E+00	7	25	17.50	62.50	6.92	0.00
1.249E+00 - 1.416E+00	13	38	32.50	95.00	5.28	11.30
1.416E+00 - 1.583E+00	1	39	2.50	97.50	3.25	1.56
1.583E+00 - 1.749E+00	1	40	2.50	100.00	2.54	0.93
G	0	40	0.00	100.00	0.00	0.00
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 20 (CE)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
3.157E+00 XXX
4.634E+00 XXXXXXXX
6.802E+00 XXXXX
9.985E+00 XXXXXXXXXXXXXXXXXX
1.466E+01 XXXXXXXXXXXXXXXXXX
2.151E+01 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
3.157E+01 XXX
4.634E+01 XXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

```
MINIMUM ANTILOG     =  3.70000E+00
MAXIMUM ANTILOG     =  5.10000E+01
GEOMETRIC MEAN      =  1.35585E+01
GEOMETRIC DEVIATION =  1.80464E+00
VARIANCE OF LOGS    =  6.57358E-02
```

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 21 (Y)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	10	10	25.00	25.00		
L	0	10	0.00	25.00		
T	0	10	0.00	25.00	8.63	8.63
-7.500E-01 - -5.833E-01	1	11	2.50	27.50	2.67	1.05
-5.833E-01 - -4.167E-01	0	11	0.00	27.50	3.02	3.02
-4.167E-01 - -2.500E-01	3	14	7.50	35.00	3.26	0.02
-2.500E-01 - -8.333E-02	1	15	2.50	37.50	3.36	1.66
-8.333E-02 - 8.333E-02	2	17	5.00	42.50	3.32	0.53
8.333E-02 - 2.500E-01	2	19	5.00	47.50	3.14	0.41
2.500E-01 - 4.167E-01	8	27	20.00	67.50	2.84	9.41
4.167E-01 - 5.833E-01	8	35	20.00	87.50	2.45	12.57
5.833E-01 - 7.500E-01	5	40	12.50	100.00	7.31	0.73
G	0	40	0.00	100.00	0.00	0.00
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 21 (Y)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
2.154E-01 XXX
3.162E-01
4.642E-01 XXXXXXXX
6.813E-01 XXX
1.000E+00 XXXXX
1.468E+00 XXXXX
2.154E+00 XXXXXXXXXXXXXXXXXXXX
3.162E+00 XXXXXXXXXXXXXXXXXXXX
4.642E+00 XXXXXXXXXXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 1.80000E-01
MAXIMUM ANTILOG = 5.30000E+00
GEOMETRIC MEAN = 1.91769E+00
GEOMETRIC DEVIATION = 2.28255E+00
VARIANCE OF LOGS = 1.28465E-01

Table 17. Frequency tables and histograms of ICP analytical data from basalts from the Indian Heaven Roadless Area

FREQUENCY TABLE FOR VARIABLE 22 (P)

LOG LIMITS LOWER - UPPER	OBS FREQ	CUM FREQ	PERCENT FREQ	PERCENT CUM FREQ	THEOR FREQ (NORMAL DIST)	(THEOR FREQ - OBS FREQ)**2/THEOR FREQ
N	0	0	0.00	0.00		
L	0	0	0.00	0.00		
T	0	0	0.00	0.00	0.10	0.10
1.916E+00 - 2.083E+00	1	1	2.50	2.50	0.47	0.60
2.083E+00 - 2.249E+00	3	4	7.50	10.00	1.73	0.94
2.249E+00 - 2.416E+00	5	9	12.50	22.50	4.41	0.08
2.416E+00 - 2.583E+00	2	11	5.00	27.50	7.83	4.34
2.583E+00 - 2.749E+00	10	21	25.00	52.50	9.64	0.01
2.749E+00 - 2.916E+00	11	32	27.50	80.00	8.23	0.93
2.916E+00 - 3.083E+00	8	40	20.00	100.00	7.59	0.02
G	0	40	0.00	100.00	0.10	0.10
H	0	40				
B	0	40				

TOTALS LESS H AND B 40

HISTOGRAM FOR VARIABLE 22 (P)
MIDPOINTS ARE EXPRESSED AS ANTILOGS

```
9.985E+01 XXX
1.466E+02 XXXXXXXX
2.151E+02 XXXXXXXXXXXXX
3.157E+02 XXXXX
4.634E+02 XXXXXXXXXXXXXXXXXXXXXXXXX
6.802E+02 XXXXXXXXXXXXXXXXXXXXXXXXXXXX
9.985E+02 XXXXXXXXXXXXXXXXXXXX
```

THE FOLLOWING STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY

MINIMUM ANTILOG = 1.10000E+02
MAXIMUM ANTILOG = 1.20000E+03
GEOMETRIC MEAN = 4.75852E+02
GEOMETRIC DEVIATION = 1.86835E+00
VARIANCE OF LOGS = 7.36897E-02

Table 18. Correlation coefficients for ICP analytical data from basalts from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
1 (MG)	2 (CA)	0.3724	40
1 (MG)	3 (AL)	0.5209	40
1 (MG)	4 (FE)	0.8027	40
1 (MG)	5 (TI)	0.0804	40
1 (MG)	6 (V)	-0.3696	35
1 (MG)	7 (CR)	-0.0054	18
1 (MG)	8 (MN)	0.8609	40
1 (MG)	9 (CO)	0.9121	39
1 (MG)	10 (NB)	0.1701	40
1 (MG)	11 (CU)	0.1630	40
1 (MG)	12 (ZN)	0.4353	40
1 (MG)	13 (PB)	********	1
1 (MG)	14 (BE)	0.0852	10
1 (MG)	15 (SR)	0.4864	40
1 (MG)	16 (BA)	0.2205	40
1 (MG)	17 (LA)	-0.2711	40
1 (MG)	18 (CE)	-0.2896	35
1 (MG)	19 (Y)	-0.5244	30
1 (MG)	20 (P)	-0.3337	40
2 (CA)	3 (AL)	0.7970	40
2 (CA)	4 (FE)	0.5113	40
2 (CA)	5 (TI)	-0.3291	40
2 (CA)	6 (V)	-0.4052	35
2 (CA)	7 (CR)	0.3243	18
2 (CA)	8 (MN)	0.5426	40
2 (CA)	9 (CO)	0.4835	39
2 (CA)	10 (NB)	0.1524	40
2 (CA)	11 (CU)	0.1421	40
2 (CA)	12 (ZN)	0.2205	40
2 (CA)	13 (PB)	********	1
2 (CA)	14 (BE)	-0.3895	10
2 (CA)	15 (SR)	0.6764	40
2 (CA)	16 (BA)	0.1463	40
2 (CA)	17 (LA)	-0.2670	40
2 (CA)	18 (CE)	-0.1307	35
2 (CA)	19 (Y)	-0.0506	30
2 (CA)	20 (P)	-0.2520	40
3 (AL)	4 (FE)	0.5336	40
3 (AL)	5 (TI)	-0.0966	40
3 (AL)	6 (V)	-0.6568	35
3 (AL)	7 (CR)	0.2292	18
3 (AL)	8 (MN)	0.5753	40
3 (AL)	9 (CO)	0.5526	39
3 (AL)	10 (NB)	0.0133	40
3 (AL)	11 (CU)	0.1372	40
3 (AL)	12 (ZN)	0.1374	40
3 (AL)	13 (PB)	********	1
3 (AL)	14 (BE)	-0.2589	10
3 (AL)	15 (SR)	0.6070	40
3 (AL)	16 (BA)	0.4420	40
3 (AL)	17 (LA)	-0.4502	40
3 (AL)	18 (CE)	-0.4303	35
3 (AL)	19 (Y)	-0.2934	30
3 (AL)	20 (P)	-0.4731	40
4 (FE)	5 (TI)	0.1383	40
4 (FE)	6 (V)	-0.1715	35
4 (FE)	7 (CR)	0.3060	18
4 (FE)	8 (MN)	0.9616	40
4 (FE)	9 (CO)	0.9343	39
4 (FE)	10 (NB)	0.5057	40
4 (FE)	11 (CU)	0.2945	40
4 (FE)	12 (ZN)	0.7789	40
4 (FE)	13 (PB)	********	1
4 (FE)	14 (BE)	0.4089	10
4 (FE)	15 (SR)	0.5155	40
4 (FE)	16 (BA)	0.2398	40
4 (FE)	17 (LA)	-0.1161	40
4 (FE)	18 (CE)	-0.1562	35
4 (FE)	19 (Y)	-0.4902	30
4 (FE)	20 (P)	-0.2962	40
5 (TI)	6 (V)	-0.0089	35
5 (TI)	7 (CR)	0.0823	18
5 (TI)	8 (MN)	0.0673	40
5 (TI)	9 (CO)	0.0908	39
5 (TI)	10 (NB)	0.2582	40
5 (TI)	11 (CU)	0.0900	40
5 (TI)	12 (ZN)	0.2479	40
5 (TI)	13 (PB)	********	1
5 (TI)	14 (BE)	0.4321	10
5 (TI)	15 (SR)	-0.3077	40
5 (TI)	16 (BA)	0.0751	40
5 (TI)	17 (LA)	-0.2252	40
5 (TI)	18 (CE)	-0.2802	35
5 (TI)	19 (Y)	-0.4866	30
5 (TI)	20 (P)	-0.4328	40
6 (V)	7 (CR)	0.0333	17
6 (V)	8 (MN)	-0.3181	35
6 (V)	9 (CO)	-0.2448	34
6 (V)	10 (NB)	0.6119	35
6 (V)	11 (CU)	0.1187	35
6 (V)	12 (ZN)	0.3162	35
6 (V)	13 (PB)	********	1
6 (V)	14 (BE)	0.0143	8
6 (V)	15 (SR)	-0.0288	35
6 (V)	16 (BA)	-0.0380	35
6 (V)	17 (LA)	0.7337	35
6 (V)	18 (CE)	0.6358	32
6 (V)	19 (Y)	0.4263	27
6 (V)	20 (P)	0.7400	35
7 (CR)	8 (MN)	0.2723	18

Table 18. Correlation coefficients for ICP analytical data from basalts from the Indian Heaven Roadless Area

COLUMN	VERSUS COLUMN	CORRELATION COEFFICIENT	NO. OF PAIRS
7 (CR)	9 (CO)	0.2304	17
7 (CR)	10 (NB)	0.4215	18
7 (CR)	11 (CU)	0.3115	18
7 (CR)	12 (ZN)	0.3630	18
7 (CR)	13 (PB)	********	0
7 (CR)	14 (BE)	********	0
7 (CR)	15 (SR)	0.0049	18
7 (CR)	16 (BA)	0.0599	18
7 (CR)	17 (LA)	-0.2729	18
7 (CR)	18 (CE)	-0.1531	16
7 (CR)	19 (Y)	0.0810	15
7 (CR)	20 (P)	-0.3381	18
8 (MN)	9 (CO)	0.9532	39
8 (MN)	10 (NB)	0.3435	40
8 (MN)	11 (CU)	0.2982	40
8 (MN)	12 (ZN)	0.6984	40
8 (MN)	13 (PB)	********	1
8 (MN)	14 (BE)	0.5170	10
8 (MN)	15 (SR)	0.4933	40
8 (MN)	16 (BA)	0.2174	40
8 (MN)	17 (LA)	-0.1837	40
8 (MN)	18 (CE)	-0.2154	35
8 (MN)	19 (Y)	-0.4613	30
8 (MN)	20 (P)	-0.3442	40
9 (CO)	10 (NB)	0.3801	39
9 (CO)	11 (CU)	0.3597	39
9 (CO)	12 (ZN)	0.6177	39
9 (CO)	13 (PB)	********	1
9 (CO)	14 (BE)	0.4564	10
9 (CO)	15 (SR)	0.5242	39
9 (CO)	16 (BA)	0.2506	39
9 (CO)	17 (LA)	-0.1886	39
9 (CO)	18 (CE)	-0.1898	34
9 (CO)	19 (Y)	-0.5087	29
9 (CO)	20 (P)	-0.3303	39
10 (NB)	11 (CU)	0.4818	40
10 (NB)	12 (ZN)	0.7872	40
10 (NB)	13 (PB)	********	1
10 (NB)	14 (BE)	0.2335	10
10 (NB)	15 (SR)	0.3506	40
10 (NB)	16 (BA)	0.2389	40
10 (NB)	17 (LA)	0.3226	40
10 (NB)	18 (CE)	0.3116	35
10 (NB)	19 (Y)	-0.1063	30
10 (NB)	20 (P)	0.1513	40
11 (CU)	12 (ZN)	0.4596	40
11 (CU)	13 (PB)	********	1
11 (CU)	14 (BE)	0.2925	10
11 (CU)	15 (SR)	0.0744	40
11 (CU)	16 (BA)	0.1780	40
11 (CU)	17 (LA)	0.0440	40
11 (CU)	18 (CE)	-0.0036	35
11 (CU)	19 (Y)	0.0037	30
11 (CU)	20 (P)	-0.1010	40
12 (ZN)	13 (PB)	********	1
12 (ZN)	14 (BE)	0.6806	10
12 (ZN)	15 (SR)	0.3616	40
12 (ZN)	16 (BA)	0.2767	40
12 (ZN)	17 (LA)	0.2892	40
12 (ZN)	18 (CE)	0.1812	35
12 (ZN)	19 (Y)	-0.3232	30
12 (ZN)	20 (P)	0.0086	40
13 (PB)	14 (BE)	********	1
13 (PB)	15 (SR)	********	1
13 (PB)	16 (BA)	********	1
13 (PB)	17 (LA)	********	1
13 (PB)	18 (CE)	********	1
13 (PB)	19 (Y)	********	1
13 (PB)	20 (P)	********	1
14 (BE)	15 (SR)	-0.1192	10
14 (BE)	16 (BA)	0.4779	10
14 (BE)	17 (LA)	0.5578	10
14 (BE)	18 (CE)	0.5888	10
14 (BE)	19 (Y)	-0.4168	6
14 (BE)	20 (P)	0.1152	10
15 (SR)	16 (BA)	0.4829	40
15 (SR)	17 (LA)	0.1856	40
15 (SR)	18 (CE)	0.2248	35
15 (SR)	19 (Y)	-0.1000	30
15 (SR)	20 (P)	0.0875	40
16 (BA)	17 (LA)	0.1478	40
16 (BA)	18 (CE)	0.0471	35
16 (BA)	19 (Y)	-0.0962	30
16 (BA)	20 (P)	-0.1102	40
17 (LA)	18 (CE)	0.9837	35
17 (LA)	19 (Y)	0.4268	30
17 (LA)	20 (P)	0.8597	40
18 (CE)	19 (Y)	0.5325	28
18 (CE)	20 (P)	0.7867	35
19 (Y)	20 (P)	0.6040	30

Table 19. Fisher-K statistics on analytical data from waters from the Indian Heaven Roadless Area

[The following qualifiers are used in reporting spectrographic data: B, no determination made; N, concentration less than the detection limit; L, detected, but present at a concentration less than the value reported; T, not used; G, element present at a concentration greater than the upper calibration limit; and H, interfering spectra render analytical lines unusable.]

NO	COLUMN	N	H	L	G	B	T	NO OF UNQUAL VALUES	NO OF QUAL	IMPROPER VALUES	MINIMUM	MAXIMUM	NO
1	LATITUDE	0	0	0	0	0	0	25		0	45.911111	46.098055	1
2	LONGITUD	0	0	0	0	0	0	25		0	121.69028	121.85611	2
3	AA-CU	0	0	17	0	0	0	8		0	0.0011000	0.0023000	3
4	AA-ZN	0	0	0	0	0	0	25		0	0.0010000	0.0076000	4
5	AA-MO	0	0	0	0	25	0	0		0			5
6	SO4--	0	0	1	0	0	0	24		0	0.1000000	3.0000000	6
7	CL	0	0	0	0	0	0	25		0	0.4000000	1.7000000	7
8	PH	0	0	0	0	0	0	25		0	54.000000	73.000000	8

NO	COLUMN	K1 MEAN	SQRT(K2) STD DEVIATION	K2 VARIANCE	K3	G1 SKEWNESS	K4	G2 KURTOSIS	NO
1	LATITUDE	46.002367	0.0473034	0.0022376	4.7361153D-06	0.0447452	-3.3928562D-06	-0.6776376	1
2	LONGITUD	121.78534	0.0512956	0.0026312	-3.5659051D-05	-0.2641984	-7.7417304D-06	-1.1181978	2
3	AA-CU	0.0015375	4.5019837D-04	2.0267857D-07	7.8660718D-11	0.8620772	-2.1364638D-14	-0.5200916	3
4	AA-ZN	0.0026880	0.0016208	2.6269333D-06	5.0703222D-09	1.1908635	1.2889656D-11	1.8678553	4
5	AA-MO								5
6	SO4--	0.8000000	0.6678974	0.4460870	0.5486798	1.8415763	0.8098038	4.0694975	6
7	CL	0.8400000	0.3452053	0.1191667	0.0511413	1.2431960	0.0159053	1.1200370	7
8	PH	65.320000	6.0049979	36.060000	-65.563478	-0.3027774	-1544.9090	-1.1880958	8

NOTE: THE ABOVE STATISTICS ARE COMPUTED FOR THE UNQUALIFIED VALUES ONLY.

Table 20. Correlation coefficients for analytical data from waters from the Indian Heaven Roadless Area

COLUMN	VERSUS	COLUMN		CORRELATION COEFFICIENT	NO. OF PAIRS
1 (AA-CU	)	2 (AA-ZN	)	0.3280	8
1 (AA-CU	)	3 (AA-MO	)	********	0
1 (AA-CU	)	4 (SO4--	)	-0.4249	7
1 (AA-CU	)	5 (CL	)	-0.6277	8
1 (AA-CU	)	6 (PH	)	-0.1605	8
2 (AA-ZN	)	3 (AA-MO	)	********	0
2 (AA-ZN	)	4 (SO4--	)	-0.2434	24
2 (AA-ZN	)	5 (CL	)	0.0599	25
2 (AA-ZN	)	6 (PH	)	-0.5680	25
3 (AA-MO	)	4 (SO4--	)	********	0
3 (AA-MO	)	5 (CL	)	********	0
3 (AA-MO	)	6 (PH	)	********	0
4 (SO4--	)	5 (CL	)	-0.0009	24
4 (SO4--	)	6 (PH	)	0.1077	24
5 (CL	)	6 (PH	)	-0.2091	25