UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

GEOCHEMICAL RESULTS FROM A ROCK GEOCHEMICAL SURVEY IN THE MOUNT BELKNAP CALDERA VICINITY, UTAH

By

Robert E. Tucker, William R. Miller, J. M. Motooka

Open-File Report 81-575

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards.

CONTENTS

ILLUSTRATIONS

CONTENTS--continued

TABLES

APPENDIX

ABSTRACT

Rock, stream-sediment, and hydrogeochemical surveys were conducted in the Mount Belknap caldera area, south-central Utah, during the summer of 1979. The presence of leucocratic rocks and relatively high concentrations of the elements Nb, Be, Ga, Y, Pb, Sn, Mo, and F with corresponding low concentrations of the elements Ba, Mg, Ca, Fe, Sr, and Cu suggests that late phase, highly differentiated felsic magmas were intruded and(or) erupted in the caldera vicinity. The presence of Mo and Sn in the rocks and F in the water samples suggest that the ore elements were concentrated, first in residual fluids in the magma and possibly later in epigenetic mineral deposits. The data suggest several target areas for further exploration.

ACKNOWLEDGMENTS

J.F. Guadagnoli and J.D. Tucker assisted with the sample collection and preparation of samples. D.W. Rutherford, G.N. Breit and M.L. Tuttle assisted with the statistical analysis. Discussions with T.A. Steven, C.G. Cunningham and J.D. Tucker on the geology and geochemistry of the area were extremely helpful.

INTRODUCTION

The Mount Belknap caldera is located in the Tushar Mountains, approximately 20 kilometers (12 miles) northeast of Beaver, Utah (Figure 1). Geochemical studies utilizing water, rock, and stream-sediment samples were conducted in an area of approximately 310 square kilometers (125 square miles) in and around the Mount Belknap caldera. This report discusses one aspect of the investigation, namely the rock geochemistry.

The results of geological and geochemical studies of the Mount Belknap caldera and vicinity indicate that potentially economic prophyry-type molybdenum deposits may exist in or near the caldera and that vein-type uranium deposits may be associated with some of the porphyry-type deposits. Rock geochemistry is a possible tool in exploring for porphyry-type molybdenum deposits that may occur at depth and provides insight into the geochemical processes evolved in their deposition. For this survey 18 elements were examined with respect to the enrichment and depletion patterns that were found in the rocks. These elements were chosen because of their characteristic occurrence in highly differentiated leucocratic igneous rocks which commonly are associated with significant concentrations of molybdenum.

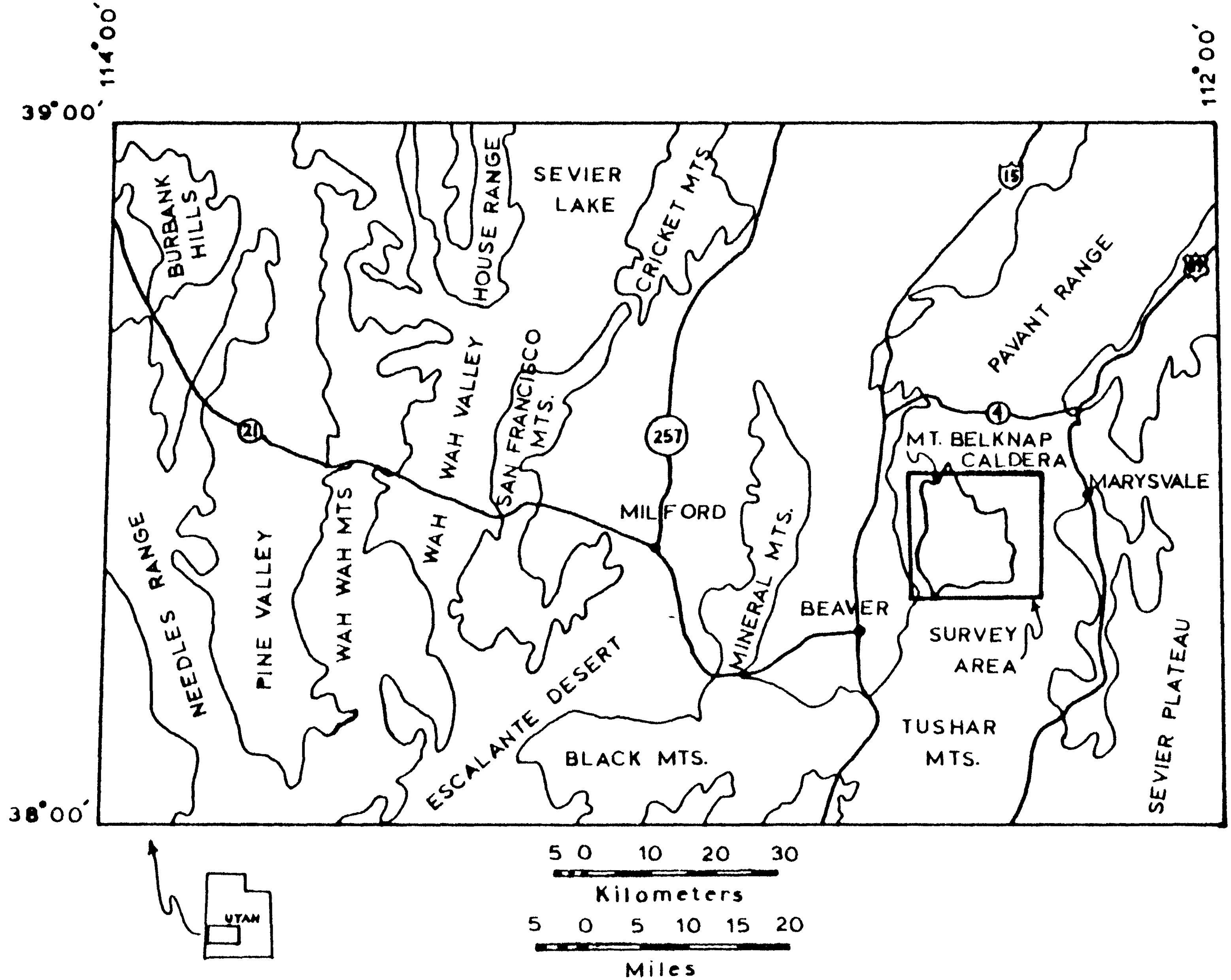


Figure 1.-- Index map of the Mount Belknap caldera survey area, from the Richfield 1° by 2° quadrangle, Utah.

GENERAL GEOLOGY

The Mount Belknap caldera is located in the High Plateaus subprovince of the Colorado Plateau near its boundary with the Basin and Range province. The caldera covers an area of approximately 190 square kilometers (75 square miles), within the Marysvale volcanic field (Cunningham and Steven, 1979d). Paleozoic and Mesozoic limestones and sandstones underlie the volcanics and are exposed in the eastern face of the Tushar Mountains, east of the Mount Belknap caldera. The unconformably overlying Bullion Canyon Volcanics consist of intermediate composition lava flows, ash flow tuffs and related volcano-clastic deposits that were erupted between 35 and 22 m.y. ago (Steven, Cunningham, Naeser and Mennert, 1978). These rocks are overlain by the rhyolitic Mount Belknap Volcanics, which was extruded between 22 and 16 m.y. ago (Steven, Cunningham, Naeser, and Mehnert, 1978). Basin and Range faulting probably began during eruptions of the Mount Belknap Volcanics (Steven, Cunningham, and Rowley, 1978). The volcanic activity of the area is summarized in Table 1. Ages are based on fission-track data for zircon and apatite and K-Ar ages for alunite, natroalunite, biotite, plagioclase, and sanidine (Steven, Cunningham, and Rowley, 1978). A generalized geological map of the Mount Belknap caldera vicinity is given in Figure 2. A correlation of map units is given in Figure 3. A more complete discussion of the volcanic units in the area is given in Cunningham and Steven (1978a, 1979a, 1979b, 1979c, 1979d, 1979e, and 1980), Steven (1977), Steven, Cunningham, Naeser, and Mennert (1978), Steven and Cunningham (1980), McNair (1951), and Fleck, Anderson, and Rowley (1975).

Mining in the Marysvale area began in 1868 when gold was discovered in Bullion Canyon. A summary of the sporadic mining activity since then is given in Table 2.

Table 1.--Summary of volcanic activity

20 m.y. to present--	Basin and Range extensional tectonism and faulting; some episodic rhyolitic and basaltic volcanism.
22-16 m.y. ago------	Mount Belknap Volcanics--silicic alkalic rhyolitic lava flows, ash flow tuffs, and volcanoclastic deposits and associated intrusive rocks.
About 23 m.y. ago---	Quartz monzonite stocks emplaced in Bullion Canyon Volcanics.
35-22 m.y. ago------	Bullion Canyon Volcanics--Intermediate composition lava flows, volcanic breccia, ash flow tuffs and volcaniclastic deposits.

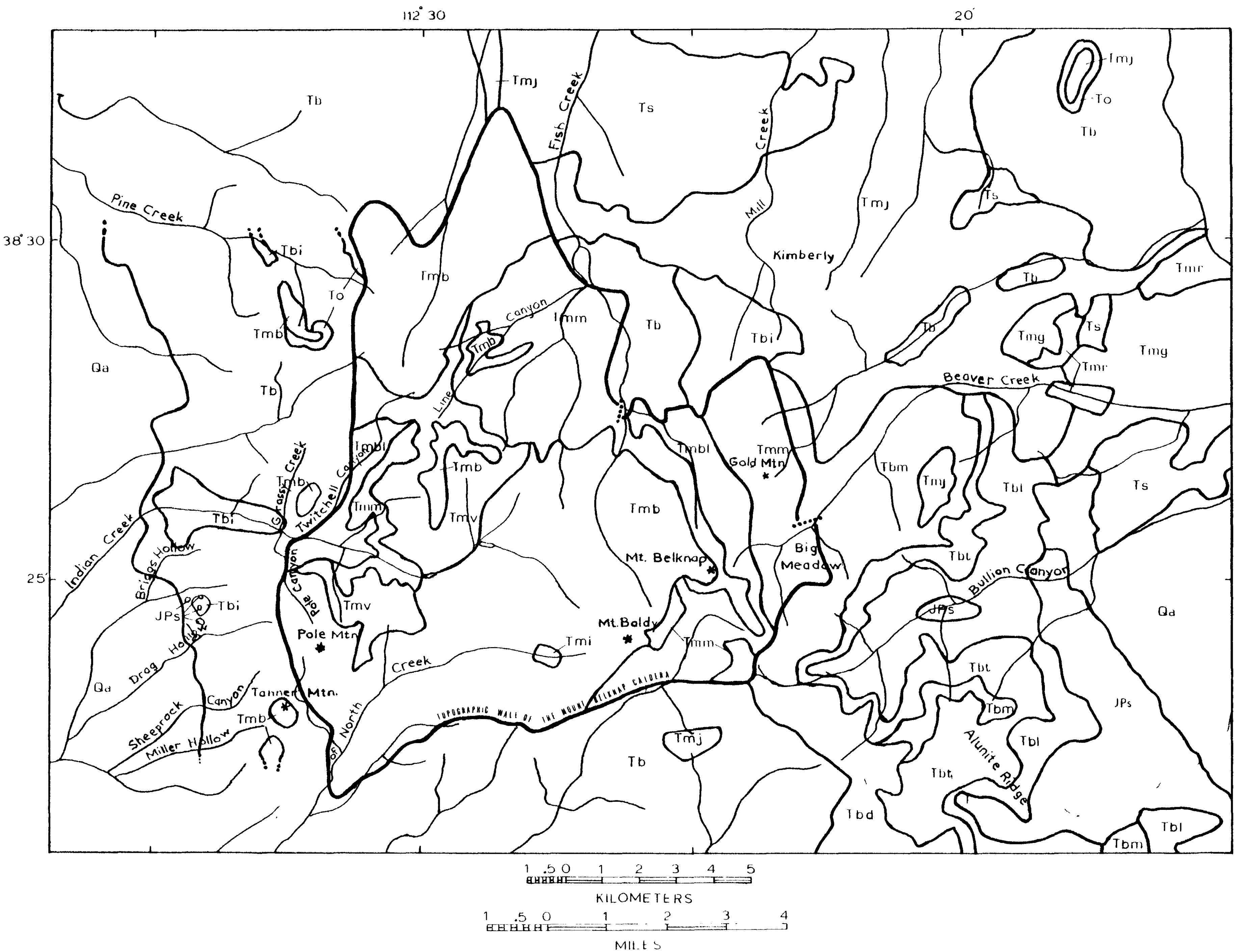


Figure 2.--Generalized geological map of the Mount Belknap caldera vicinity (After Steven, 1977; Cunningham and Steven, 1978a, 1979a, 1979b, 1980; Steven and Cunningham, 1980)

DESCRIPTION OF MAP UNITS

Qa ALLUVIAL DEPOSITS (HOLOCENE)--Silts, sands, and gravels in alluvial fans, alluvial slope wash, and stream alluvium.

Ts SEVIER RIVER FORMATION, LOWER PART (PLIOCENE AND MIOCENE)--Fluviatile gravels, sands, and silts, with interlayered ash--fall tuffs

MOUNT BELKNAP VOLCANICS (MIOCENE)

Tmi Intrusive rocks--Several small porphyritic quartz latitic to rhyolitic stocks containing scattered phenocrysts of quartz, plagioclase, and sanidine in a finely granular mossic of alkali feldspar and quartz

Tmg Gray Hills Rhyolite Member--Light-gray, spherulitically devitrified alkali-rhyolite lava flows containing sparse sanidine phenocrysts. Contorted flow layering is characteristic

Tmr Red Hills Tuff Member--Crystal-poor, welded, white and red alkali-rhyolite ash-flow tuff containing 7-8 percent phenocrysts of anorthoclase, quartz, sodic plagioclase, and minor biotite

Tmj Joe Lott Tuff Member--Crystal-poor welded alkali rhyolite ash-flow tuff containing about 1.5 percent phenocrysts of quartz, plagioclase, and sanidine, with traces of biotite

Tmb Mount Baldy Rhyolite Member--Crystal-poor rhyolite lava flows consisting largely of a fine granular mosaic of quartz and alkali feldspar, and minor plagioclase, biotite, and hematite. Contorted flow layers are common

Tmv	Volcaniclastic rocks--Dominantly laharic mud-flow breccias from nearby lava flows of the Mount Baldy Rhyolite Member (Tmb). Some landslide debris and fluviatile sands and gravels are included
Tmm	Middle tuff member--Crystal-poor rhyolite welded ash-flow tuff, closely similar to that in the outflow Joe Lott Member (Tmj)
Tmbl	Blue Lake Rhyolite Member--Crystal-poor rhyolite flows, closely similar to those in the Mount Baldy Rhyolite Member (Tmb)
To	OSIRIS TUFF (MIOCENE)--Gray and reddish-brown, densley welded, crystal-rich ash-flow tuff phenocrysts consist of andesine (25 percent), biotite (2 percent), and 1 percent each of sanidine, pyroxene, and Fe-Ti oxides. K-Ar age is about 22 m.y. (Fleck and others 1975)
	BILLION CANYON VOLCANICS (MIOCENE AND OLIGOCENE)
Tbi	Intrusive rocks--Strongly porphyritic to equigranular, fine-to medium-graned quartz monzonite, containing approximately equal proportions of plagioclase and orthoclase, as much as 30 percent quartz, plus augite, hornblende, and biotite. Minor accessory minerals are spatite, zircon, and Fe-Ti oxides
Tbd	Delano Peak Tuff Member--Densley welded crystal-rich quartz latite ash-flow tuff containing phenocrysts of plagioclase (32 percent), hornblende (9 percent), Fe-Ti oxide minerals (4 percent), and less than 1 percent each of quartz, biotite, and apatite

Tbm Middle member--Mostly light-gray and brown rhyodacite lava flows, flow breccia, and volcanic mud-flow breccia that lie between the overlying Delano Peak Tuff Member (Tbd) and underlying Three Creeks Tuff Member (Tbt)

Tbt Three Creeks Tuff Member (Oligocene)--Densely welded light-gray and brown, crystal-rich quartz latite ash-flow tuff containing phenocrysts of plagioclase (35 percent), hornblende (9 percent), biotite (3 percent), and quartz (2 percent). Fe-Ti oxide minerals, sanidine, and other accessory minerals occur in traces. K-Ar age is 27 m.y. (Steven, Cunningham, Naeser, and Mehnert, 1977)

Tbl Lower member--Mostly volcanic mudflow breccia, flow breccia, and tuffaceous sedimentary rocks that occur below the Three Creeks Tuff Member (Tbt)

UNDIVIDED JURASSIC, TRIASSIC AND PERMIAN SEDIMENTARY ROCKS

JPS Includes the Jurassic Arapien Formation, Jurassic and Triassic Navajo Sandstone, Triassic Chinle Formation and its Shinarump Member, at the base are Moenkopi Formation, Permian Kaibab Limestone, Toroweap Formation, and the Queantoweap Sandstone of McNair (1951).

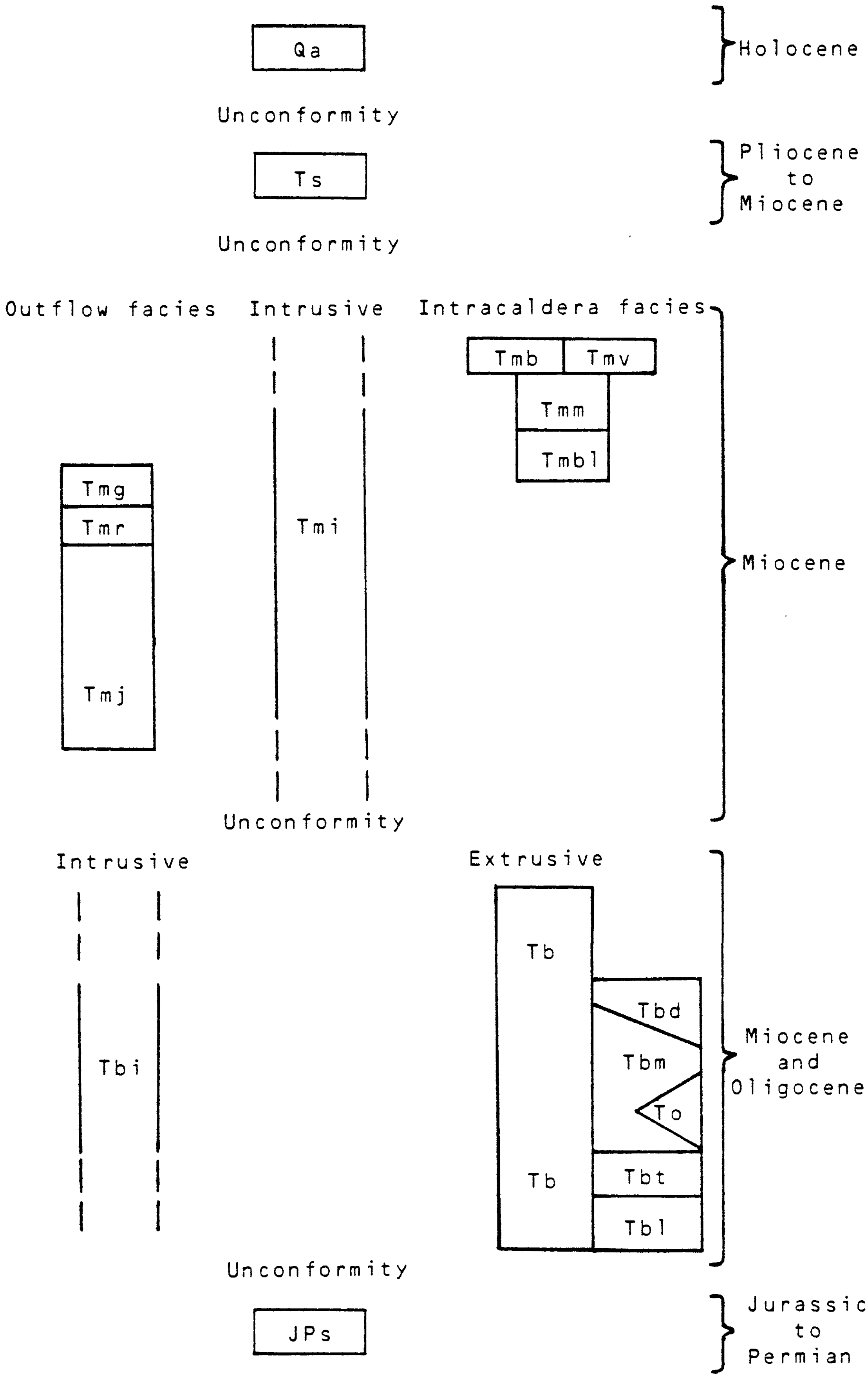


Figure 3.--Correlation of map units.

Table 2.--Mining history

Year	History
1868	Precious and base metals discovered in Bullion Canyon. Manto deposits later discovered in Mesozoic sedimentary rocks.
1890	Small gold and silver deposits discovered throughout Tushar Mountains.
1900	Kimberly deposits developed, richest precious metal deposits in the region.
1910	Alunite discovered, mined for potash during World War I and aluminum during World War II.
1949	Uranuim discovered in vein deposits north of Marysvale.
Present	Sporadic mining in the region, however, exploration for uranium, porphyry-type molybdenum deposits, precious and base metals is being actively pursued.

Sampling and analytical techniques and analysis of variance

During the summer of 1979, rock samples were collected in and near the Mount Belknap caldera. Two sets of rock samples were collected: objective samples were collected from randomly selected outcrops at a density of one sample per 0.64 square kilometer (0.25 square mile), and subjective samples were collected from veins, tailing piles and altered areas on the basis of possible economic interest. Sample numbers within the 300 or 600 series are subjective samples, all other sample numbers are of objective samples.

The 7 1/2-minute quadrangle maps of the survey area were divided into cells using a 0.8-kilometer grid length. Each 0.64-square-kilometer cell was then divided into 4 squares, defined as subcells. One subcell was randomly selected from each cell for field collection (Figure 4). In the field, an accessable outcrop was selected from within the designated subcell. The sample site consisted of an area of approximately 1 square meter for both the objective and subjective samples. Weathering surfaces were removed and 300-600 grams of fresh rock chips were placed in cotton sacks. Nine outcrops were sampled in duplicate from sites located 10-30 meters (30-100 feet) from the original site. If the designated subcell did not contain an outcrop, an alternate subcell, from the same cell was sampled. A total of 451 objective samples and 64 subjective samples were collected from within the study area (Figure 5).

Each sample was analyzed semiquantitatively for 30 elements by a D.C. arc, six-step optical emission spectrograph. All values are reported as log intervals, (that is, 1.5, 2, 3, 5, 7, 10), which approximates the geometric midpoints of the concentration ranges. Motooka and Grimes (1976) have shown the precision of the reported value to be within an adjoining interval on either side of the reported value 83 percent of the time, and within two

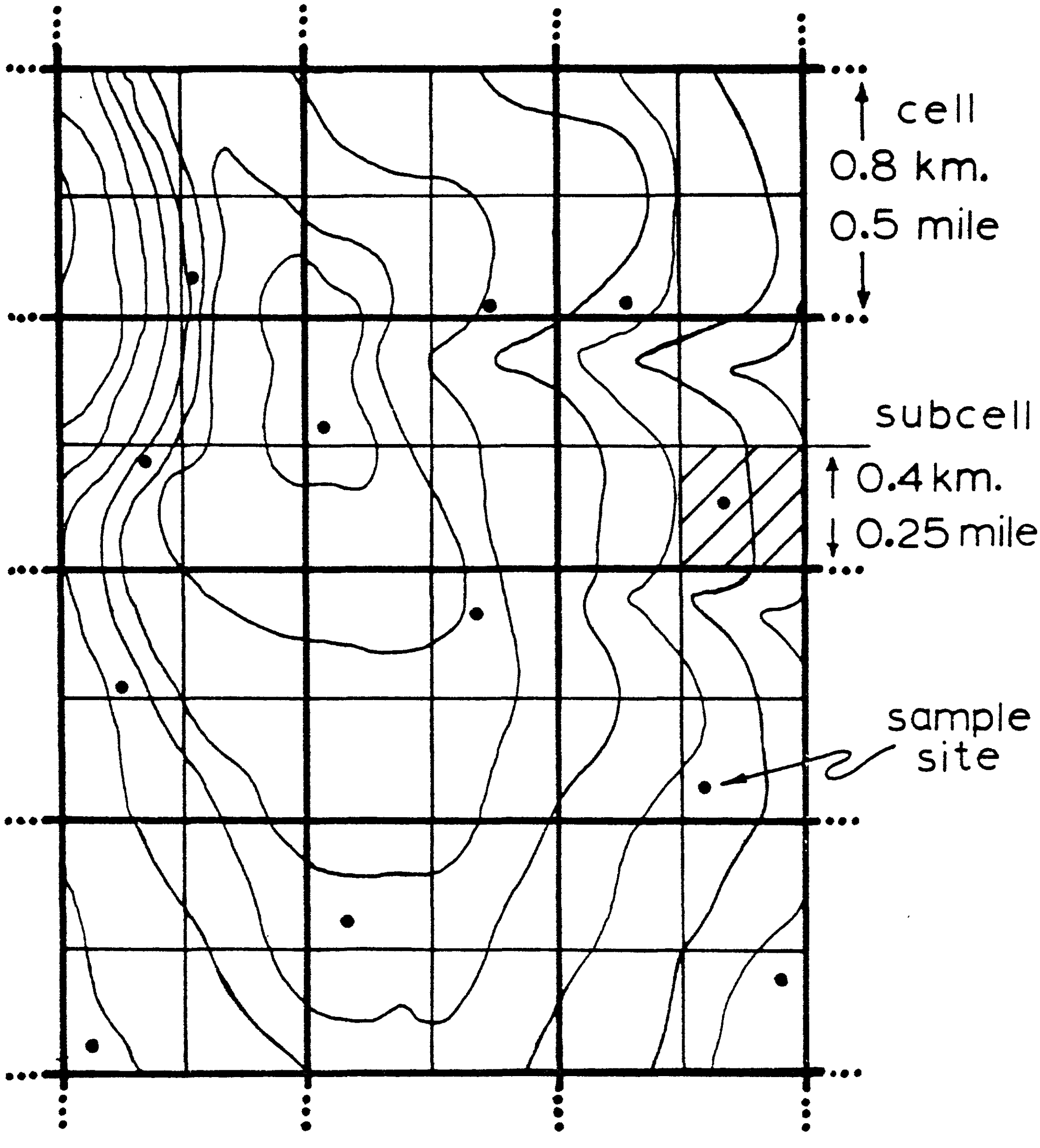


Figure 4.--Graphical representation of the sampling design.

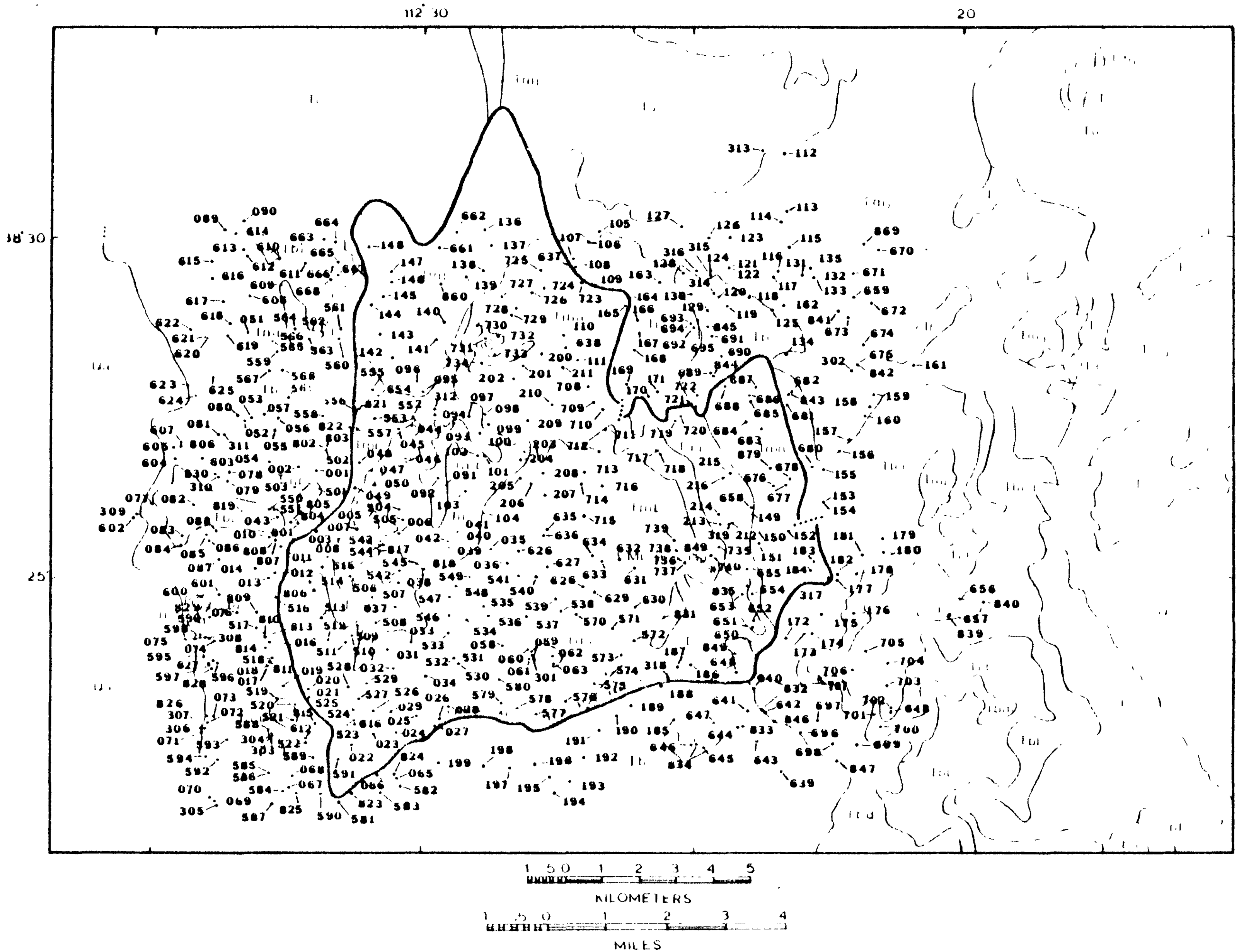


Figure 5.--Sample site location map, Mount Belknap caldera vicinity. The topographic wall of the Mount Belknap caldera is outlined.

adjoining intervals on either side of the value 96 percent of the time. The analytical results for 22 elements are given in Appendix 1. Appendix 2 lists eight elements which had fewer than 15 detected concentrations. The analytical results for the objective samples are summarized in Table 3.

The variance within the sample set was analysed to determine the variance between the different levels of the sampling design and to obtain a better understanding of the geochemical trends. The variance was analysed at 5 levels. The first level measures the variance between the rhyolites and the latites. The second level measures the variance between the 0.64-square-kilometer cells, defined as the regional variance. The third level measures how well subcell samples from the same rock type represent the composition of the entire cell. The fourth level measures the variance that exists within a given outcrop. The fifth level measures the analytical variance. Samples used in these different analyses of variance are listed in Table 4.

Elemental concentrations that were detected but were less than the detection limit were given values equal to one log interval below the detection limit. Elemental concentrations that were not detected were assigned values three log intervals below the detection limit. Elemental concentrations greater than the highest standard were assigned a value one log interval greater than the highest standard. Twelve elements have more than 20 percent unqualified data and were used in the analysis of variance (Hoffman and others, 1979). The data were logarithmically transformed prior to performing the analysis of variance. The five-level analysis of variance was performed with 64 objective samples using the computer STATPAC programs. The variance components are shown on Table 5 and Figure 6.

Iron, magnesium, calcium, titanium, barium, beryllium, and lead have their highest variance components in level 1 or between rock type which

Table 3.-- Summary of analytical results for objective samples

Element *		Maximum	Mean	Geometric mean	Standard deviation	Geometric deviation	Valid **	L **	N **	G **
Fe 0.05%	0.05	10	2.99	1.68	3.28	3.01	449	1	1	0
Mg 0.02%	0.02	7	1.08	0.341	1.54	5.14	440	11	0	0
Ca 0.05%	0.05	10	1.35	0.387	1.83	5.60	429	22	0	0
Ti 0.002%	0.01	1	0.466	0.313	0.375	2.65	449	0	0	2
Mn 10ppm	10.	5000	667.	464.	562.	2.73	448	1	0	2
Ag 0.5ppm	0.5	15	0.629	0.205	1.01	2.21	50	195	206	0
Ba 20ppm	20.	5000	640.	223.	794.	4.90	436	13	2	0
Be 1ppm	1.	70	9.19	5.88	7.74	2.89	440	8	3	0
Co 5ppm	5.	70	12.3	3.10	13.2	4.26	178	1	272	0
Cr 20ppm	20.	500	46.8	21.7	80.5	3.12	194	107	150	0
Cu 5ppm	5.	100	19.1	5.72	22.2	4.89	210	90	151	0
La 20ppm	20.	300	59.0	49.1	30.5	1.93	423	5	23	0
Mo 5ppm	5.	20	5.78	2.07	2.20	2.50	150	37	264	0
Nb 20ppm	20.	100	41.5	31.2	20.9	2.10	318	95	38	0
Ni 5ppm	5.	100	14.8	5.57	18.6	3.74	160	190	101	0
Pb 10ppm	10.	150	42.6	34.1	23.4	2.07	431	7	13	0
Sn 10ppm	10.	15	10.0	4.08	0.235	1.55	24	129	298	0
Sr 100ppm	100.	2000	329.	115.	334.	4.20	200	43	208	0
V 20ppm	20.	500	97.1	22.1	98.1	4.28	172	29	250	0
Y 10ppm	10.	100	31.8	28.3	13.3	1.69	436	7	8	0
Zr 50ppm	70.	1000	222.	207.	99.4	1.45	451	0	0	0
Ga 10ppm	10.	70	29.4	26.2	10.9	1.73	433	1	17	0

* concentration is the detection limit

**Valid, number of samples without qualified data; L, concentration less than the lowest standard; N, no detectable concentration; G, concentration greater than the highest standard.

Table 4.--Duplicate samples used in analysis of variance

Subcell duplicates		Site duplicates		Analytical duplicates *
Rhyolite	Latite	Rhyolite	Latite	
035	017	040	153	059
036	018	041	154	061
044	053	121	550	063
045	057	122	551	065
183	089	132	565	175
184	614	133	566	180
204	173	531	693	182
205	174	532	694	194
510	519	736		196
511	520	737		198
540	606			210
541	607			583
548	612			
549	613			
577	620			
578	621			
732				
733				

* Analytical duplicates were samples analyzed twice.

Table 5.-- Variance components as percentages of total variance and the significance of F-ratios derived from the variance components

Element	Hierarchical Level				
	Rock type	Regional	Within cell	Outcrop	Analytical
Fe ---	65.1 *	28.7 *	0.92	0.0	5.26
Mg ---	57.6 *	36.1 *	0.0	4.17	2.22
Ca ---	61.0 *	28.6 *	0.0	9.53 *	0.85
Ti ---	68.0 *	20.1 *	7.15	0.0	4.77
Mn ---	0.0	75.3 *	15.3	2.15	7.22
Ba ---	86.5 *	11.7 *	0.0	0.66	1.12
Be ---	78.7 *	9.34	8.58	0.07	3.33
La ---	0.0	55.0 *	13.6	0.0	31.4
Pb ---	41.8 *	28.6 *	20.0 *	0.0	9.62
Y ----	1.52	55.3 *	0.0	37.3 *	5.94
Zr ---	0.91	30.9	0.0	13.3	54.9
Ga ---	23.2 *	53.3 *	0.0	2.00	21.5

* Indicates the difference between hierarchical levels is significant at the 0.01 significance level.

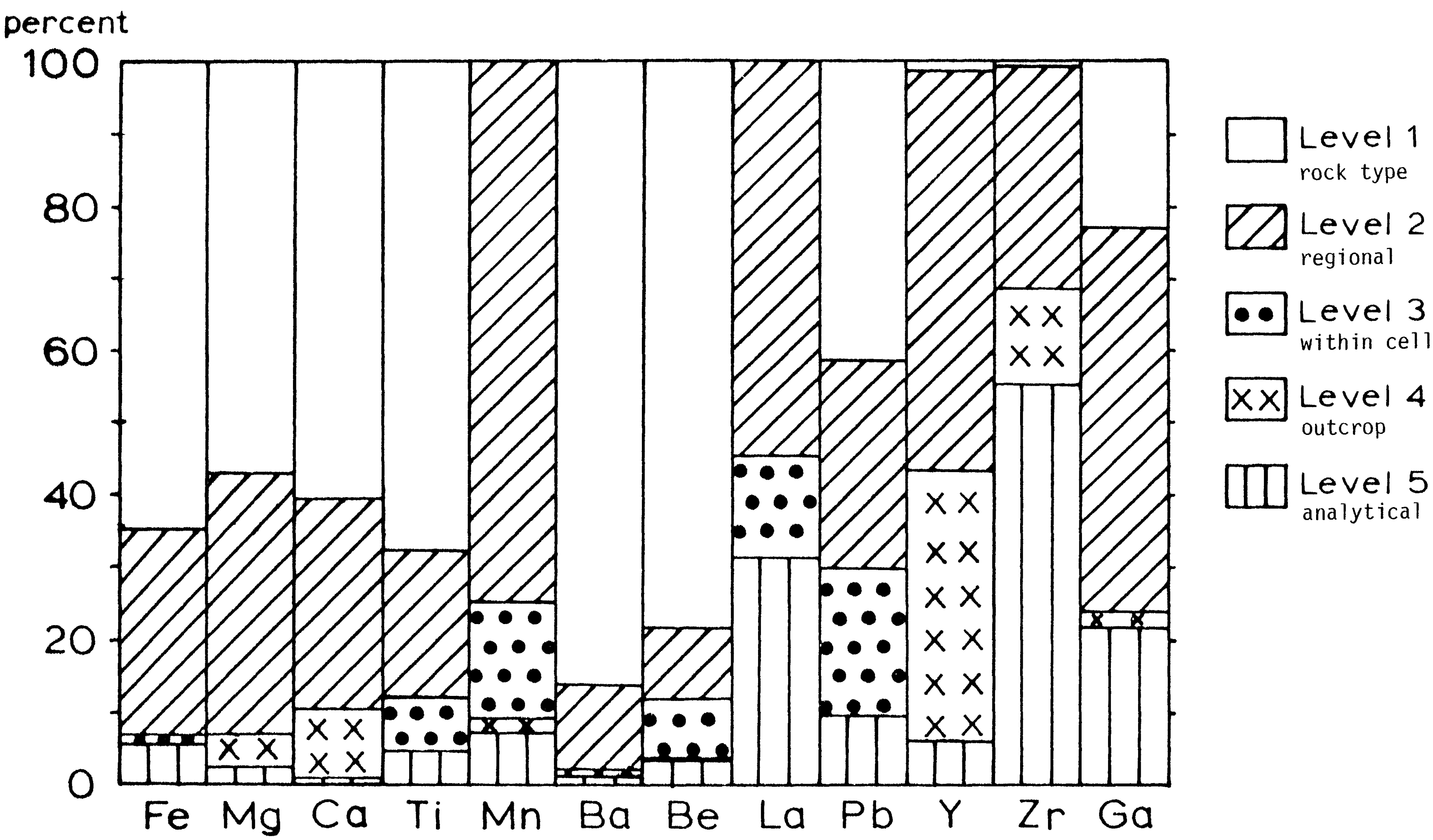


Figure 6.-- Graphical representation of the variance components between the hierarchical levels.

indicates that these elements are distributed primarily as a function of rock type. Manganese, lanthanum, zirconium, and yttrium have variance components less than 2 percent of the total variance for this level. This indicates that differences between rock unit for these elements can not be detected by this survey. Level 2 is a measure of the variability between the 0.64-square-kilometer cells or a regional variance. Manganese, lanthanum, yttrium, and gallium have their highest variance components in level 2, indicating that a spatial relationship is important to the distribution of these elements within the rock type. Level 3 is a measure of the variance within a cell. All the elements have low variance components in this level but magnesium, calcium, barium, zirconium, gallium, and iron have variance components less than one percent of the total variance. This indicates that there is not significant variance within the 0.64-square-kilometer cells. Level 4 is a measure of the variance that occurs at a sample site. Yttrium has a high variance component in this level, which indicates that there is a large variability over a small area. Iron, titanium, lanthanum, lead, barium, and beryllium have variance components less than one percent of the total variance, which indicates that these elements have low variability occurring at an outcrop. Level 5 is a measure of the analytical precision. Only zirconium has its highest variance component in this level, which indicates that it will be difficult to detect zironium variation throughout the survey area. The other elements have low variance components in this level, which indicates the analytical techniques had adequate precision. The analysis of variance results given in Table 5 show that most of the elements used in this survey have significant regional variations.

GEOCHEMISTRY OF THE ROCKS

Rock geochemistry can be useful in mineral exploration and for gaining an understanding of the geological and geochemical processes that have taken place in an area. Careful geochemical studies of known porphyry-type molybdenum and tin deposits have identified many characteristics useful for exploration (Wallace and others, 1978; Sharp, 1978; Sheraton and Black, 1973; Sillitor, Halls, and Grant, 1975; Groves and McCarthy, 1978; Groves and Taylor, 1973; Van Alstine, 1976; Dagger, 1972; Tischendorf, 1972; and Hosking, 1965). There are five important characteristics: (1) a history of volcanic and(or) intrusive activity where rocks of leucocratic, alkali rhyolitic or granitic composition are present; (2) presence of anomalous concentrations of a suite of elements including F, Ga, U, Mo, Sn, Li, Rb, Be, Y, Pb, Zn, Bi, Nb, and Mn; (3) the depletion of certain elements from the magma such as Fe, Ti, Ba, Sr, Mg, Ce, La, Al, Cu, and Zr, with subsequent paucity of dark minerals; (4) proximity to major crustal lineaments; and (5) association with high-flourine belts. The porphyry molybdenum systems of Climax, Henderson, Urad, and Questa meet many of these criteria as do the newly discovered porphyry molybdenum deposit at Pine Grove in the Wah Wah Mountains, Utah, and the mineralized areas associated with the Mount Belknap caldera region being discussed here. Careful geologic and geochemical studies conducted in the Mount Belknap caldera and around Alunite Ridge by Steven, Cunningham, and Machette, (1980); Steven and Cunningham, (1979) and Cunningham and Steven (1978b and 1978c) suggest that in this area vein-type uranium deposits may be high-level indicators of underlying porphyry-type molybdenum systems.

The degree to which the mineralizing solutions fed by residual fluids are channelled or trapped above a source pluton will affect the mineralogy and the type of mineral deposits formed. Deposition is controlled by factors such as pressure, thermal gradient, complexing ions, pH, and Eh (Wallace and others, 1978; Tischendorf, 1972; and Hosking, 1965). The resulting reactions commonly form concentration haloes imprinted onto a host rock; the form and extent of such haloes depend on the complex interaction of such factors as (1) elemental concentrations, (2) thermal gradient and cooling history, (3) wall rock mineralogy, and (4) degree of fracturing in the host rock (Groves and McCarthy, 1978; Wallace and others, 1978; Dagger, 1972; Tischendorf, 1972; Hosking, 1965, and Tucker and others, 1981). For porphyry molybdenum systems, molybdenite is found in the central zone with consecutively larger haloes of Bi, Sn, and W (Wallace and others, 1978). Figure 7 depicts idealized elemental halo patterns associated with the emplacement of a highly differentiated leucocratic body containing significant concentrations of the elements Mo and Sn. These haloes can express themselves as enrichments of certain elements and depletions in other elements. The geochemical interrelationships of these elements can be used to locate areas of anomalously low concentrations as well as areas of anomalously high concentrations.

A correlation matrix is given in Table 6. The significant correlation coefficients with varying degrees of freedom for the 0.05 and 0.01 levels of significance are given in Table 7. Two distinct suites of elements emerge from the correlation matrix. The first suite consists of the elements Nb, Pb, Y, Ga, and Be which have significant correlation at the 0.05 level with Mo. The second suite consists of the elements Mg, Ca, Ti, Mn, Ba, Cr, Cu, Ni, and Sr which have significant correlation with Fe and the 0.05 level. Sn and Ag have no significant correlation with any elements, which may be attributed to the small number of samples having measurable concentrations of these elements. The two suites can also be distinugished when single-element plots are examined. High concentrations of Nb, Be, Ga, Y, Pb, and Sn are associated

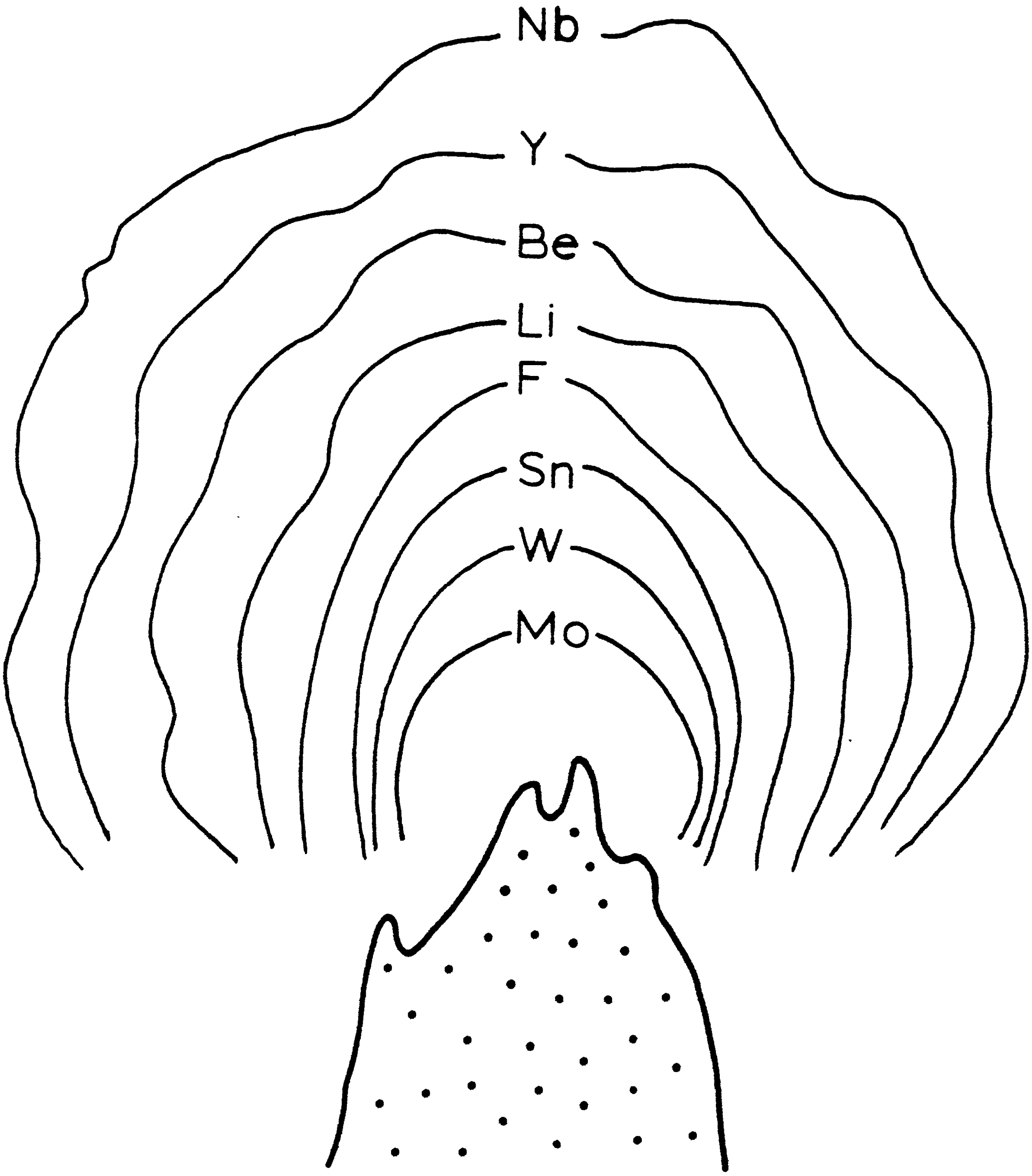


Figure 7.--Idealized cross section of elemental dispersion along thermal gradients around an ore bearing felsic body. Summarized from Wallace and others (1978); Groves and McCarthy (1978); and Tischendorf (1973).

Table 6.--Correlation coefficients for rock data

	Fe	Mg	Ca	Ti	Mn	Ag	Ba	Be	Co	Cr	Cu	La	Mo	Nb	Ni	Pb	Sn	Sr	V	Y	Zr	Ga
Fe	3.28	0.84	0.83	0.75	0.37	-0.12	0.68	-0.56	0.01	0.52	0.73	0.07	-0.28	-0.46	0.61	-0.30	0.35	0.50	0.16	-0.08	-0.09	0.02
Mg	440	1.55	0.78	0.71	0.36	-0.14	0.68	-0.54	-0.03	0.54	0.68	0.08	-0.31	-0.53	0.64	-0.28	-0.00	0.39	0.14	-0.08	-0.06	0.02
Ca	429	425	1.85	0.71	0.36	-0.14	0.68	-0.54	0.02	0.48	0.58	0.03	-0.31	-0.51	0.48	-0.31	-0.09	0.38	0.17	-0.09	-0.10	-0.01
Ti	446	438	427	0.37	0.23	-0.01	0.78	-0.60	-0.02	0.35	0.50	0.21	-0.26	-0.57	0.50	-0.26	-0.10	0.46	0.06	-0.06	0.10	0.04
Mn	446	438	426	445	482.	-0.14	0.21	-0.05	-0.08	0.37	0.42	0.04	0.13	0.12	0.39	0.12	0.04	0.16	0.04	0.27	-0.02	0.12
Ag	50	50	46	50	50	2.85	0.05	-0.14	0.43	0.07	-0.12	0.29	0.16	-0.34	-0.46	0.16	*****	-0.17	0.10	0.09	-0.05	0.07
Ba	435	427	416	434	433	49	799.	-0.59	0.00	0.30	0.43	0.23	-0.27	-0.65	0.30	-0.22	0.19	0.36	0.08	-0.08	0.04	0.06
Be	438	433	421	438	438	48	426	7.72	0.07	-0.29	-0.42	-0.07	0.25	0.49	-0.43	0.44	0.12	-0.42	-0.02	0.27	0.02	0.05
Co	178	174	168	176	178	18	172	174	11.2	0.01	-0.03	0.10	0.04	0.17	0.05	0.08	*****	0.09	0.51	0.21	-0.04	0.11
Cr	193	187	186	192	192	20	192	184	82	104.	0.57	0.06	-0.14	-0.31	0.73	-0.13	*****	0.21	0.17	0.06	0.02	0.06
Cu	201	205	205	209	207	24	209	200	90	170	24.0	0.04	-0.27	-0.42	0.63	-0.19	*****	0.37	0.14	0.02	0.01	0.16
La	421	418	411	421	420	44	409	418	169	178	197	29.7	-0.02	-0.27	0.16	0.23	0.10	-0.03	0.02	0.39	0.25	0.29
Mo	149	146	136	149	149	22	145	146	57	58	60	136	3.30	0.29	-0.05	0.20	0103	-0.22	-0.01	0.37	0.08	0.17
Nb	316	313	302	316	317	38	304	317	122	72	85	305	124	18.6	-0.55	0.18	0.13	-0.34	0.07	0.27	-0.08	0.10
Ni	160	160	159	159	159	8	160	156	68	147	150	156	37	47	21.9	-0.18	*****	0.24	0.09	0.10	-0.02	0.22
Pb	429	425	415	429	428	47	418	425	173	181	199	416	145	310	155	22.9	0.01	-0.19	-0.09	0.29	0.10	0.47
Sn	24	24	24	23	24	1	24	24	5	1	4	24	16	24	1	23	1.02	*****	*****	0.09	-0.07	0.03
Sr	199	196	199	199	198	20	197	193	85	156	181	197	56	82	145	196	3	321.	0.23	-0.10	-0.05	0.16
V	172	170	165	170	172	22	169	169	153	82	90	167	53	117	67	169	4	87	83.0	0.01	-0.09	-0.05
Y	434	429	420	433	434	45	421	430	174	183	199	422	142	316	157	426	24	198	170	12.9	0.20	0.21
Zr	449	440	429	448	448	50	436	440	178	194	210	423	150	318	160	431	24	200	172	436	99.4	0.10
Ga	431	427	419	430	430	45	418	427	172	181	198	422	142	313	157	426	24	198	170	432	433	10.3

Note: the diagonal underscored numbers of the correlation matrix contains the standard deviation of the variable for only the valid pairs; the numbers below the line denote the valid pairs used in the correlation matrix calculations; ***** denotes that no correlation coefficient was calculated. The "Degrees of Freedom" column in Table 7 corresponds to the number of valid pair in this table.

Table 7 --Correlation coefficients at the 5% and 1% levels of significance

Degrees of Freedom	5%	1%	Degrees of Freedom	5%	1%
1	.997	1.000	24	.388	.496
2	.950	.990	25	.381	.487
3	.878	.959	26	.374	.478
4	.811	.917	27	.367	.470
5	.754	.874	28	.361	.463
6	.707	.834	29	.355	.456
7	.666	.798	30	.349	.449
8	.632	.765	35	.325	.418
9	.602	.735	40	.304	.393
10	.576	.708	45	.288	.372
11	.553	.684	50	.273	.354
12	.532	.661	60	.250	.325
13	.514	.641	70	.232	.302
14	.497	.623	80	.217	.283
15	.482	.606	90	.205	.267
16	.468	.590	100	.195	.254
17	.456	.575	125	.174	.228
18	.444	.561	150	.159	.208
19	.433	.549	200	.138	.181
20	.423	.537	300	.133	.148
21	.413	.526	400	.098	.128
22	.404	.515	500	.088	.115
23	.396	.505	1000	.062	.081

From Snedecor and Cochran (1967), p. 557.

with the Mount Belknap Volcanics within the caldera (Figures 8, 9, 10, 11, 12, and 13). In contrast, high concentrations of Ba, Cu, Mg, Ca, Fe, Sr, Ni, and Cr are found outside the caldera, within the Bullion Canyon Volcanics (Figures 14, 15, 16, 17, 18, 19, 20, and 21). Molybdenum, Ag, Mn, and La show no definite trends (Figures 22, 23, 24, and 25).

The single-element plots indicate that there have been significant depletions of the elements Mg, Ca, Fe, and Sr from the Bullion Canyon Volcanics in an extensive area from Indian Creek, south to the North Fork of North Creek (Figures 16, 17, 18, and 19). The elemental depletions tend to cluster in two areas. The largest area of depletions is located in an area bordered by Briggs Hollow on the north, Pole Canyon on the east and Drag Hollow on the south. This area is designated the Dray Hollow geochemical anomaly. In the vicinity of Tanner Mountain, south of the Dray Hollow geochemical anomaly, an anomalous area bounded by Sheeprock canyon on the north, Merchant Hollow on the south, and possibly Pole Creek on the east is characterized by depletions in the elements Ca, Fe, Sr, and Ba. The depletions of these elements within the Drag Hollow and Tanner Mountain geochemical anomalies may be the results of hydrothermal alteration.

At places the geochemical anomalies identified by this survey (Figure 26) show enrichments of certain elements such as Be, Y, Mn, Pb, Mo, Sn, Ag, Ga or Nb and in the same general area characterized by depletions in other elements such as Mg, Ca, Ba, and Fe. Some high Ga concentrations tend to cluster within the geochemical anomalies (Figure 9). Mo and Ag are only slightly enriched in objective samples within the Drag Hollow and Tanner Mountain anomalies, but are more strongly enriched in subjective samples from the same areas (Figures 22 and 23). Y and Pb are depleted within these geochemical anomalies also (Figures 11 and 12).

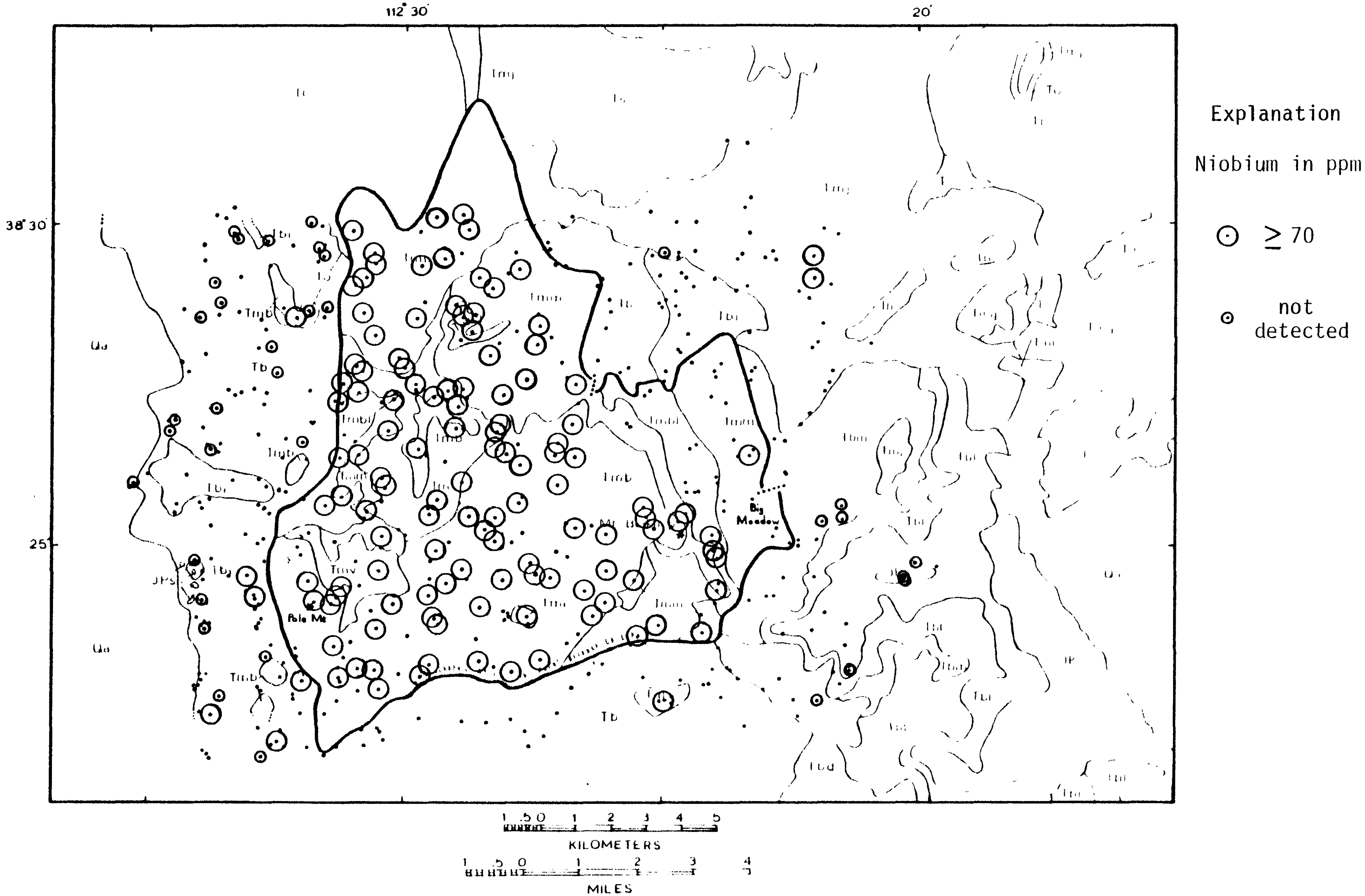


Figure 8.--Distribution of anomalous niobium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

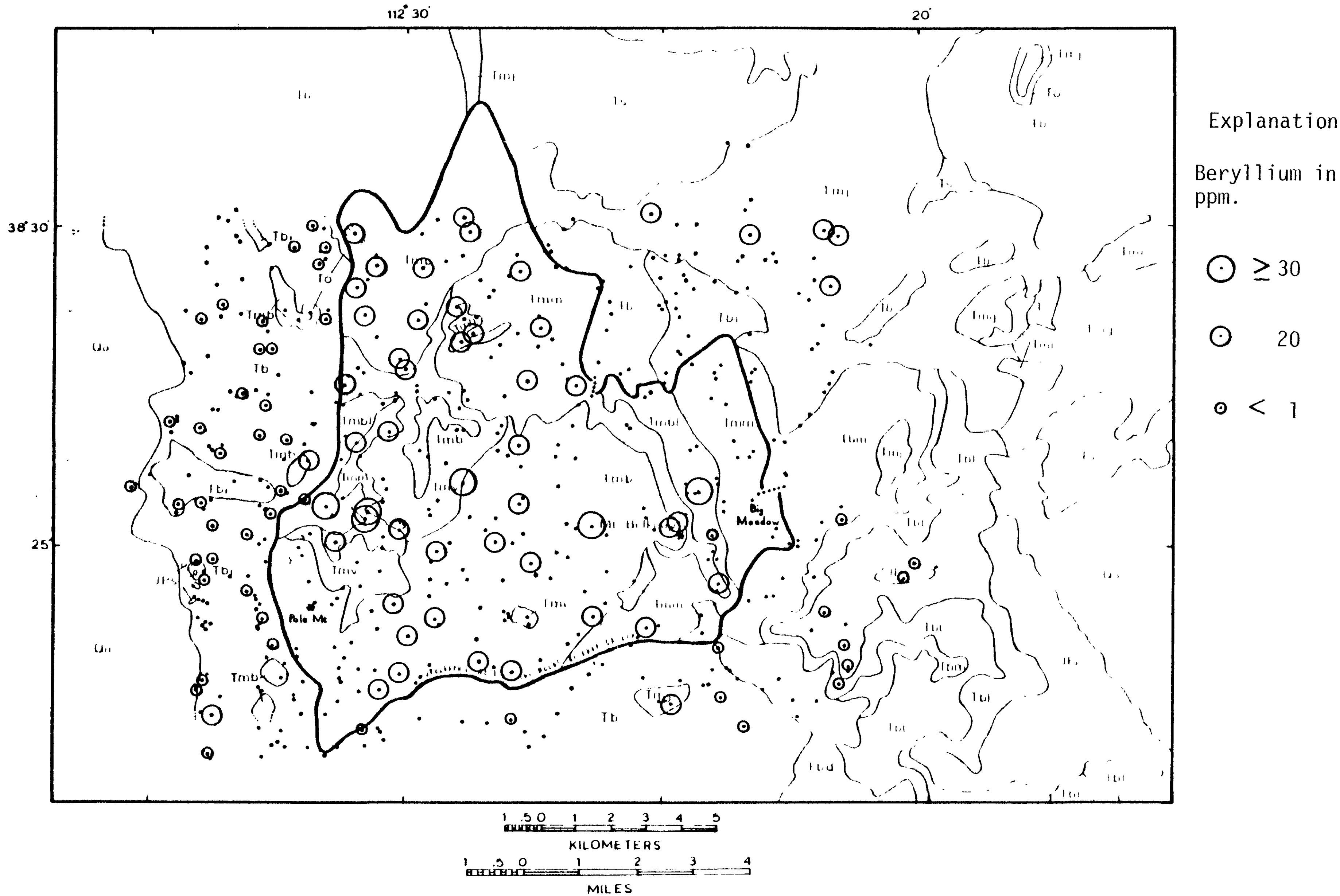
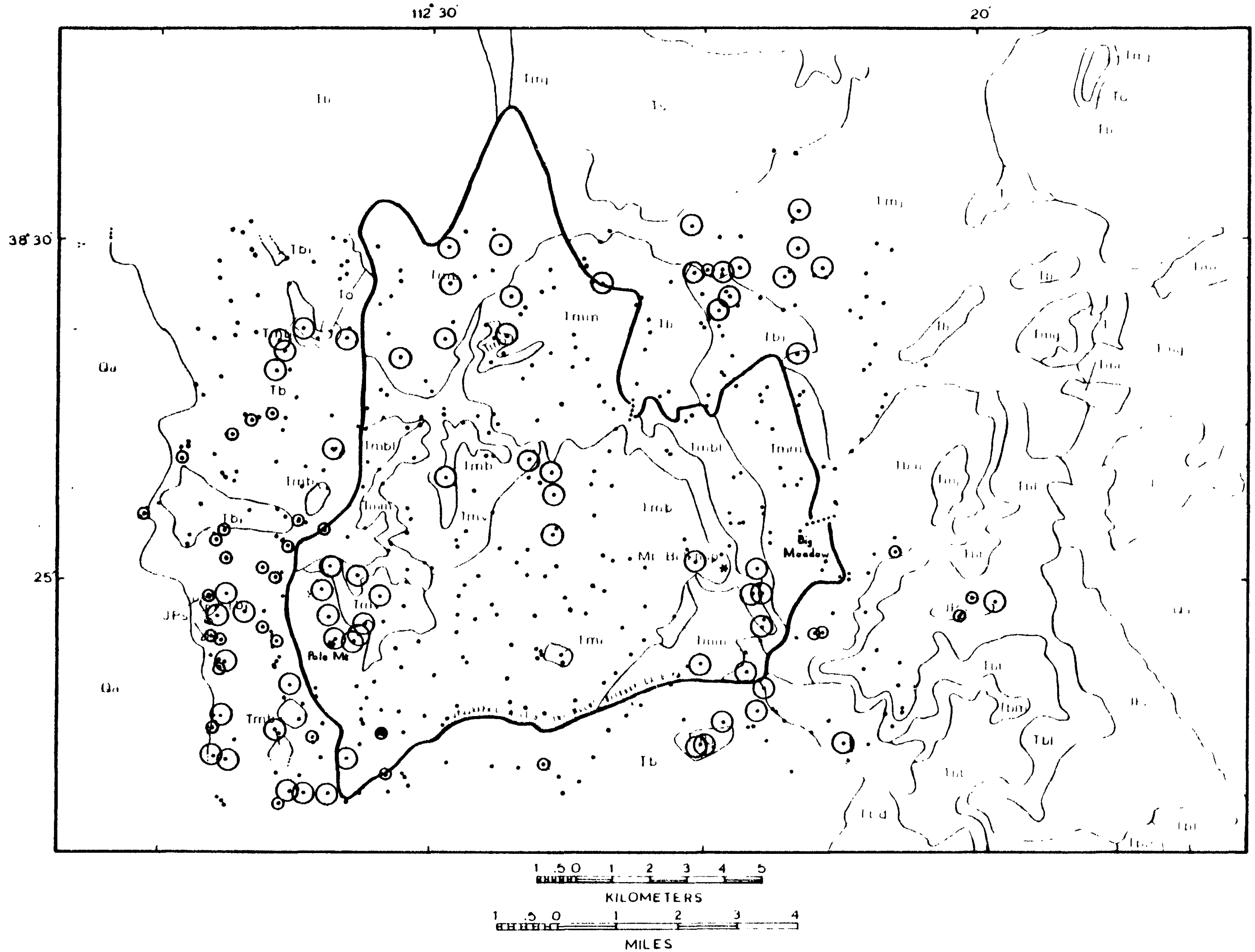


Figure 9.--Distribution of anomalous beryllium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.



Explanation

Gallium in ppm.

○ ≥50

∘ <10

Figure 10.--Distribution of anomalous gallium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units

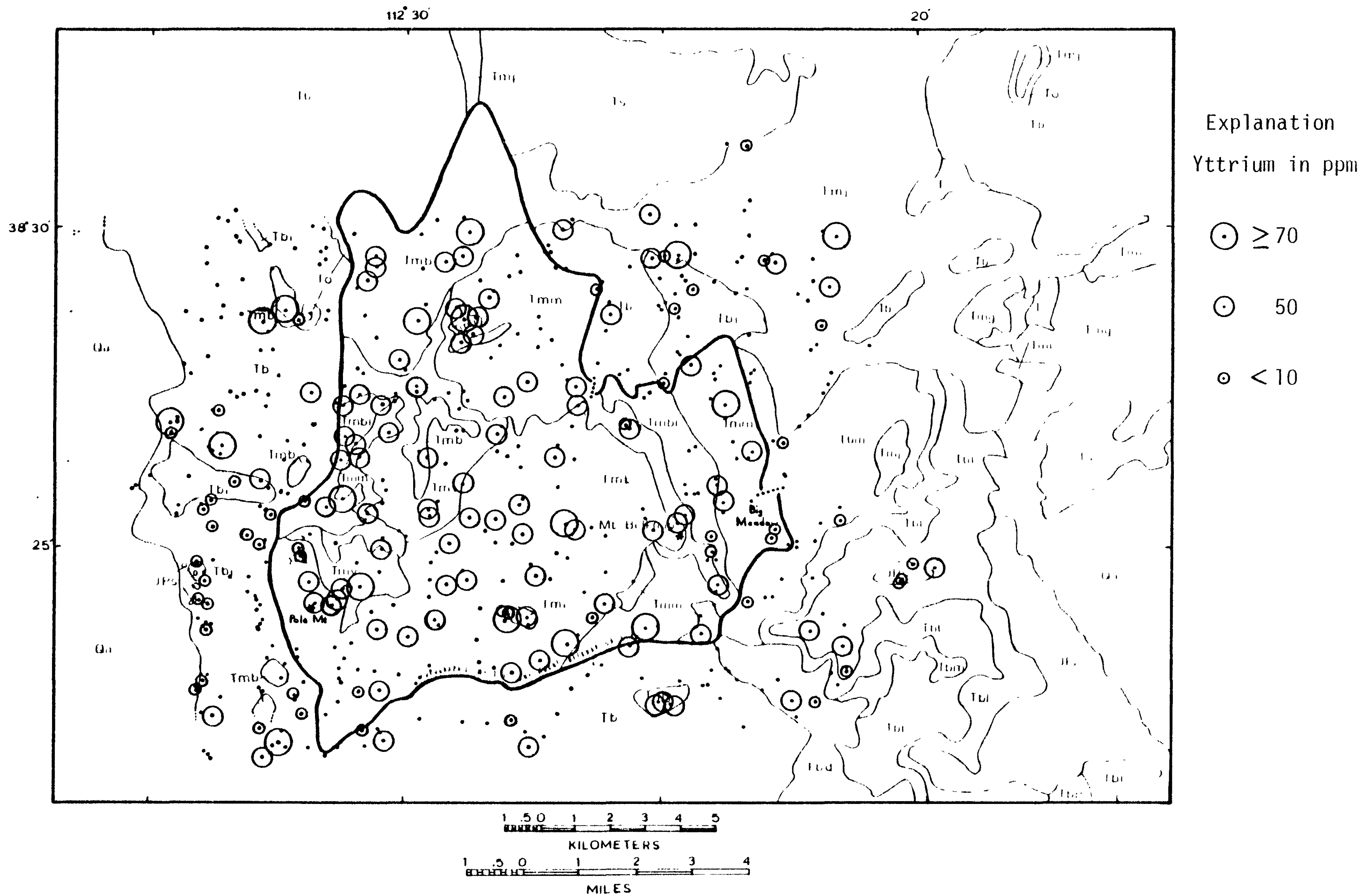


Figure 11.--Distrubution of anomalous yttrium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

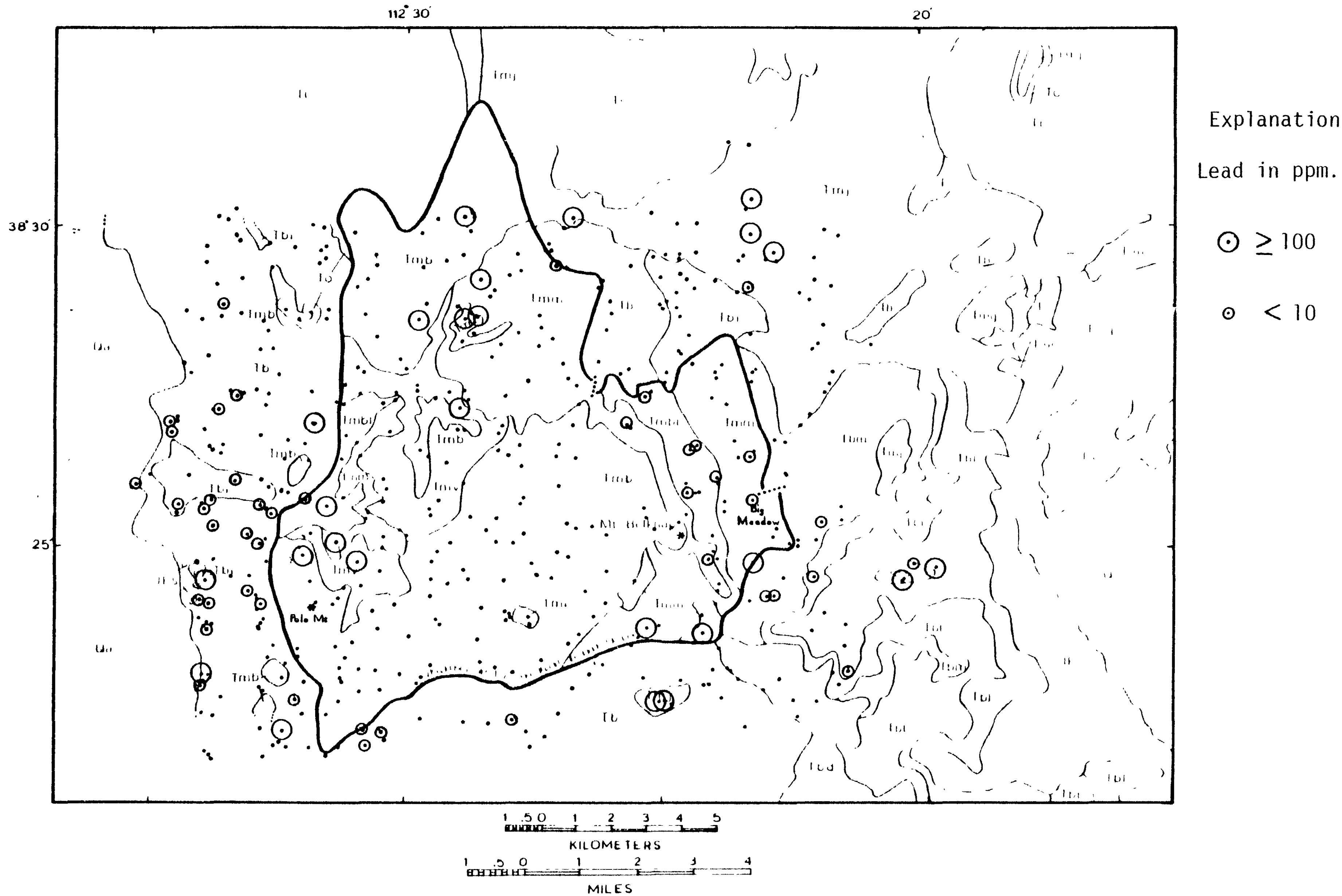


Figure 12.--Distribution of anomalous lead concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

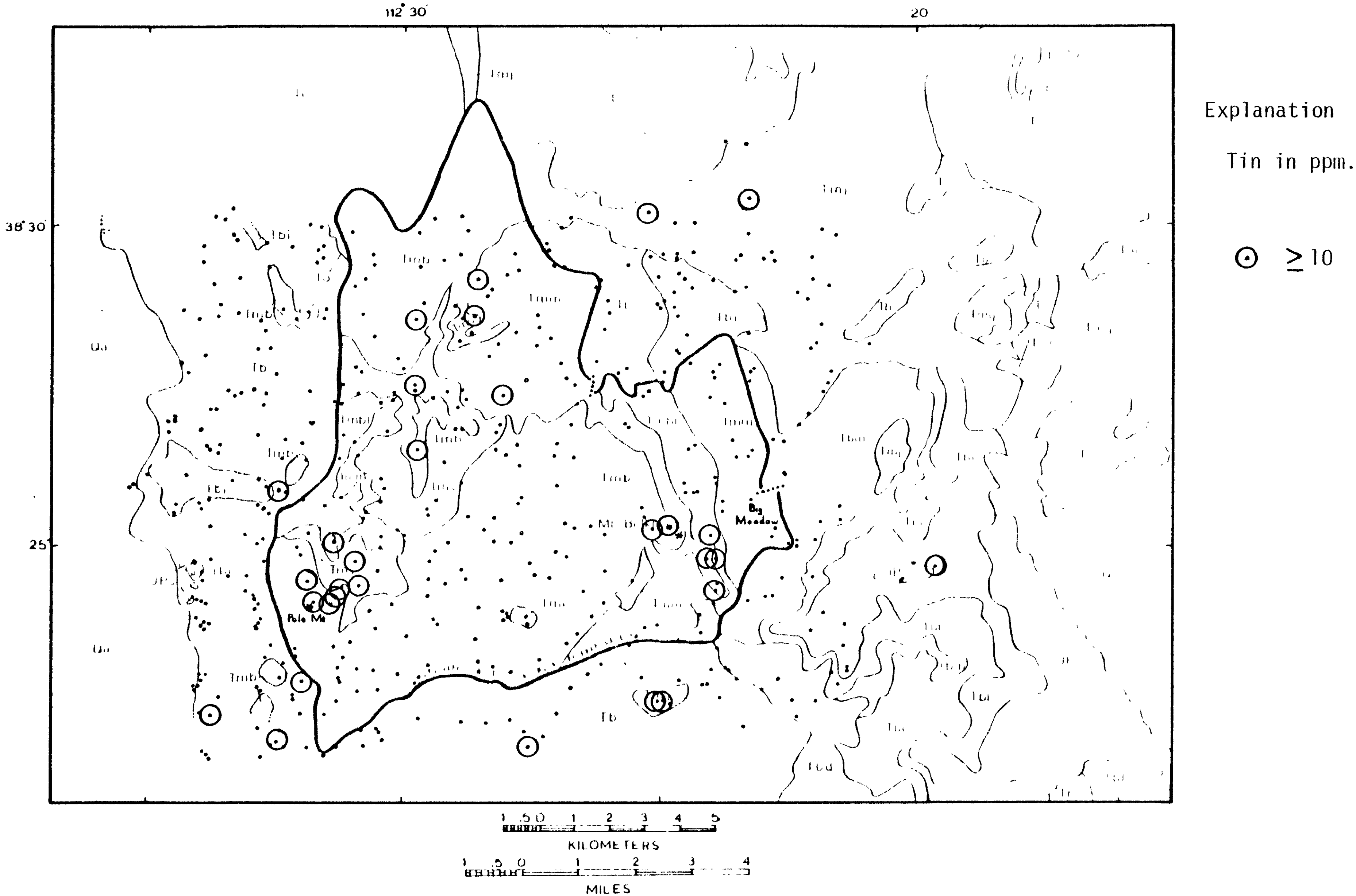


Figure 13.--Distribution of anomalous tin concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

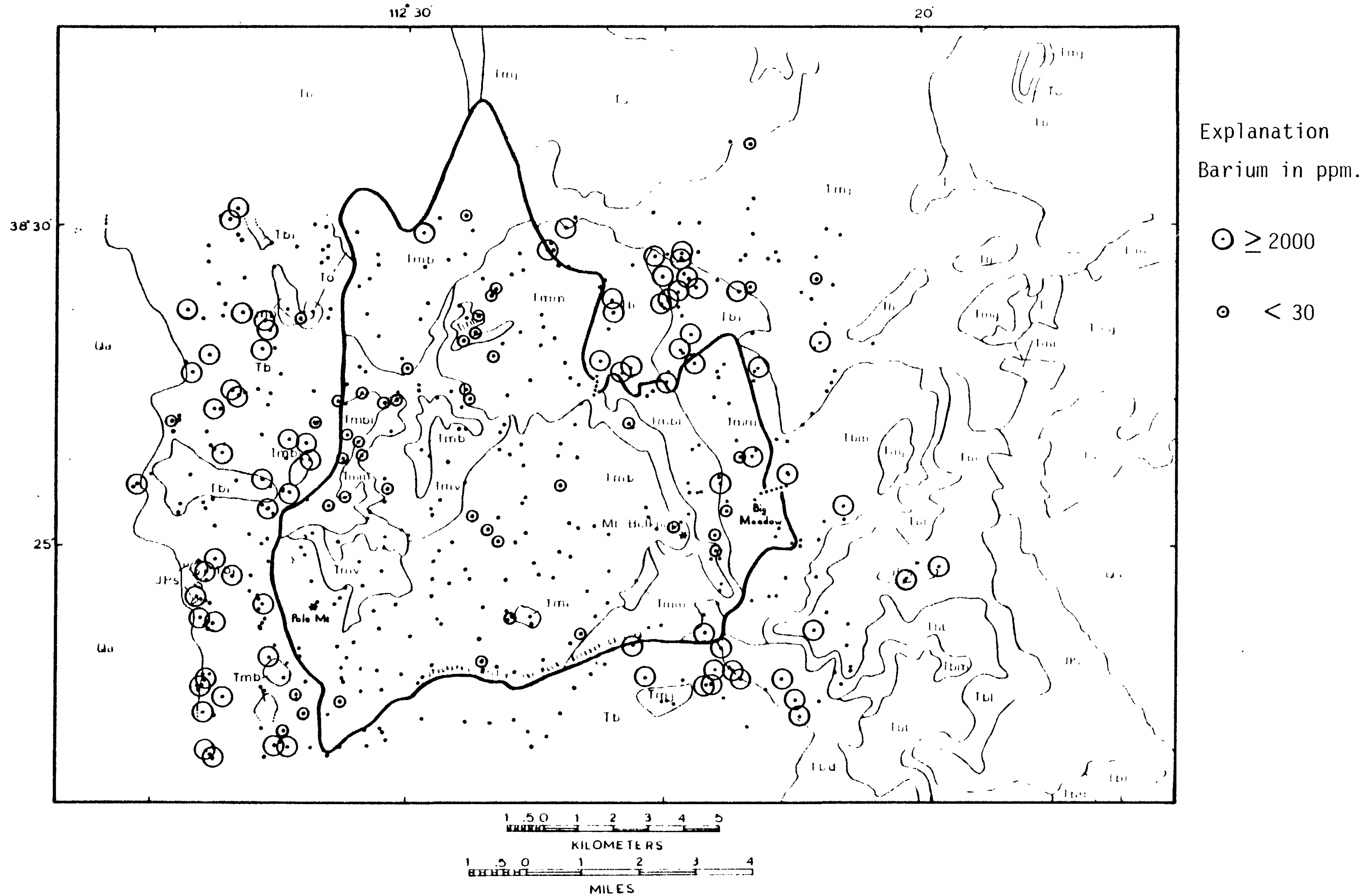


Figure 14.--Distribution of anomalous barium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

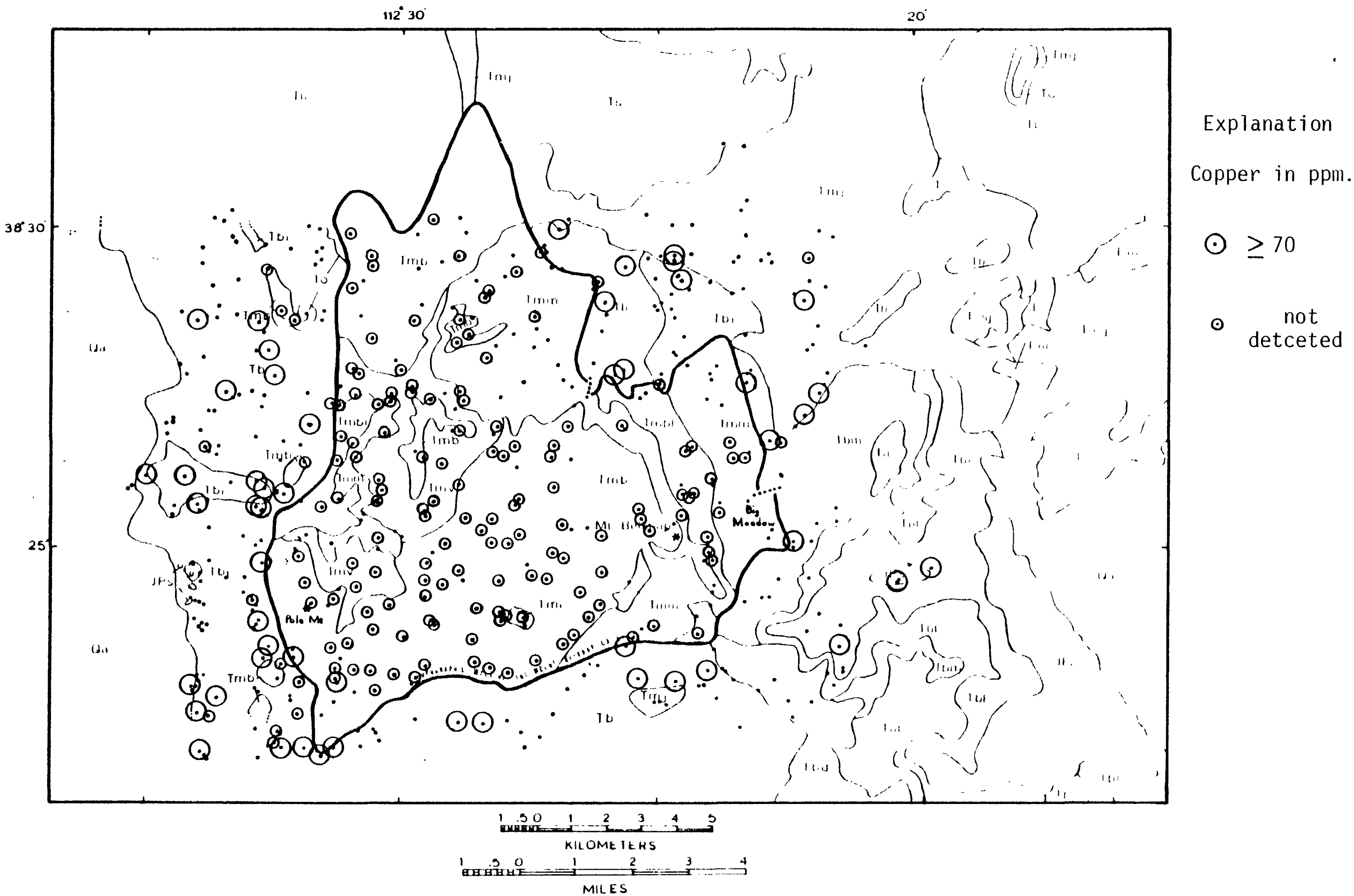


Figure 15.--Distribution of anomalous copper concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

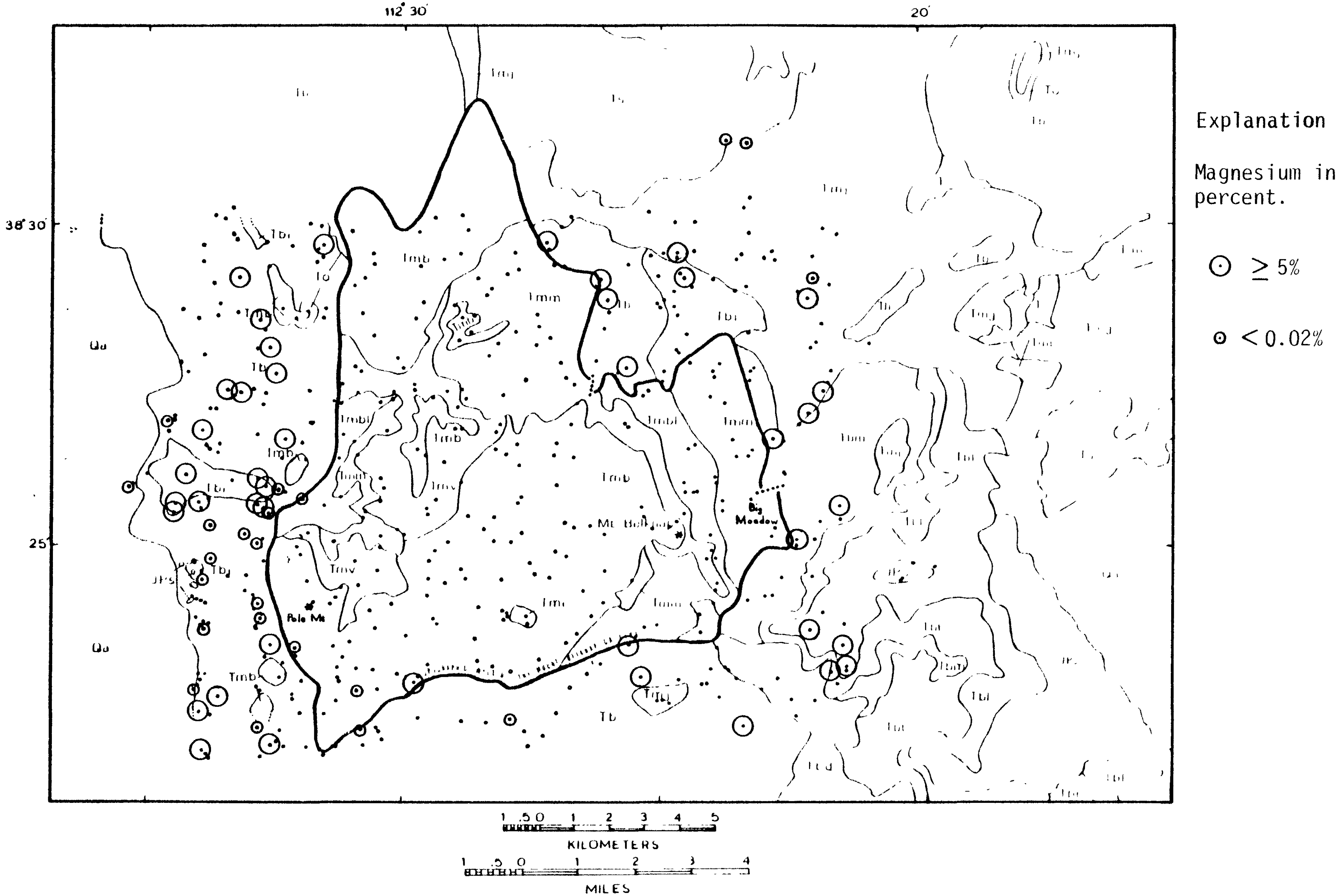


Figure 16.--Distribution of anomalous magnesium concentrations in the Mount Belknap caldera area Utah. See figure 2 for description of geologic units.

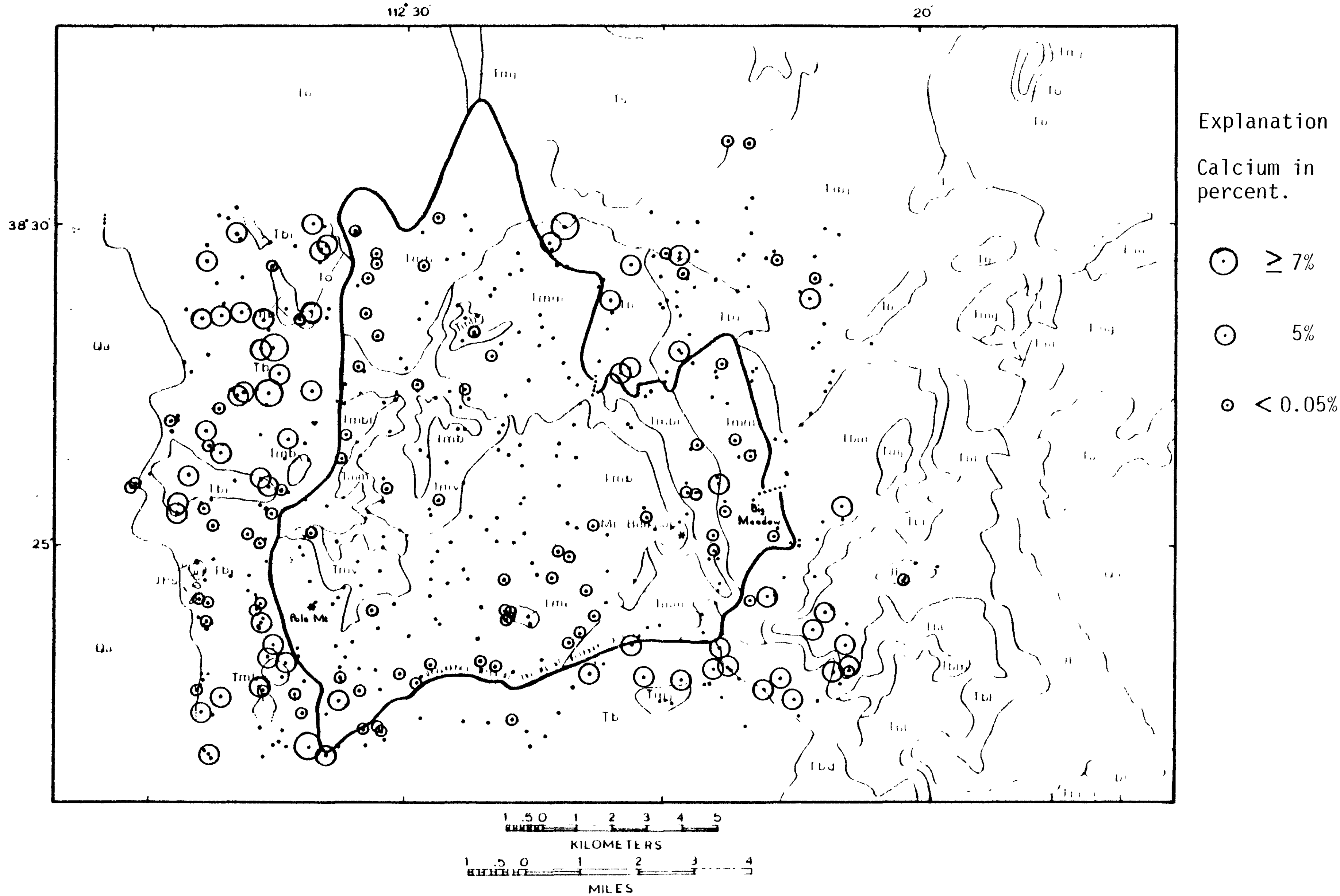


Figure 17.--Distribution of anomalous calcium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

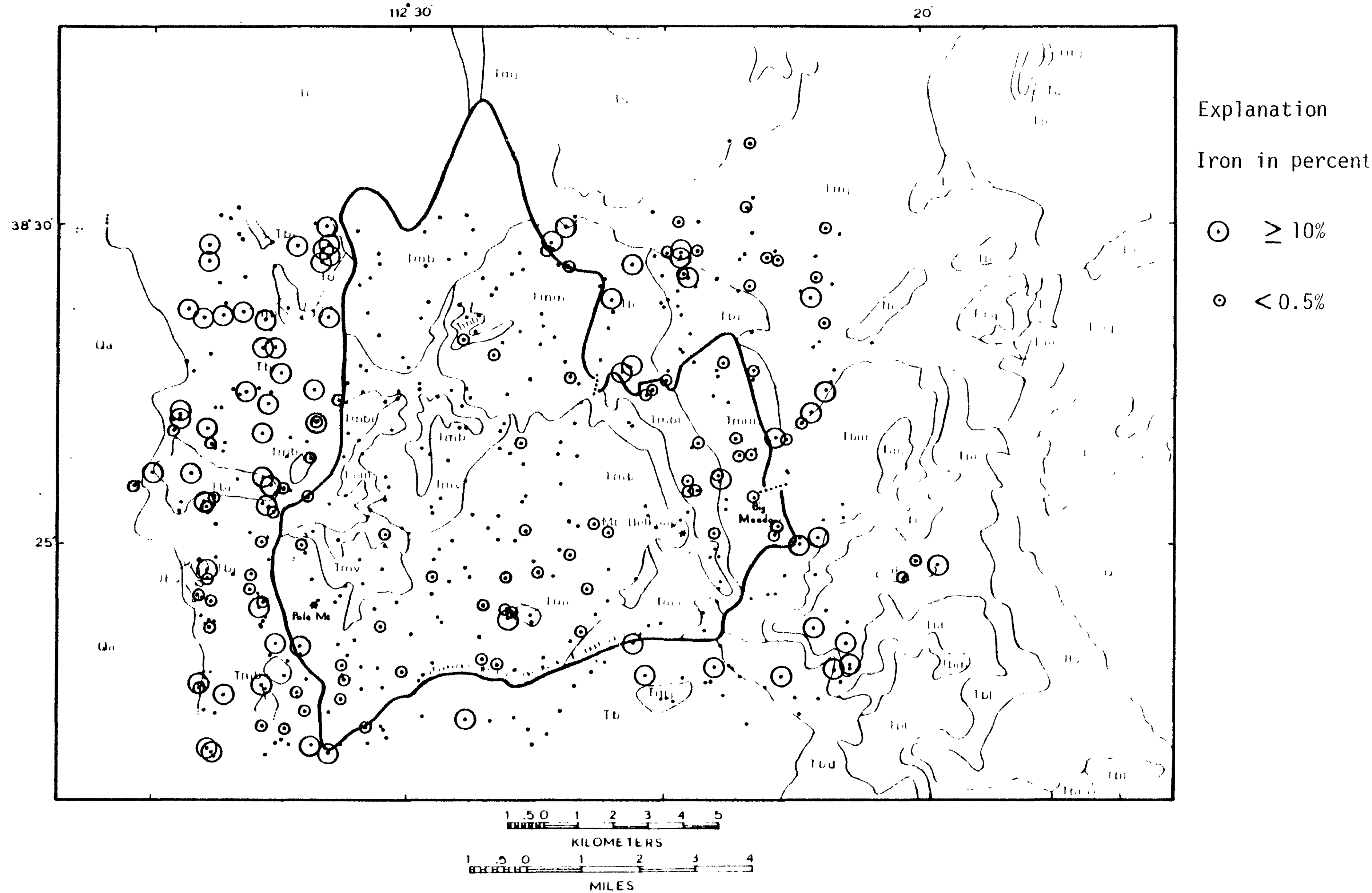


Figure 18.--Distribution of anomalous iron concentrations in the Mount Belknap caldera area, Utah. See figure 2 for desctiption of geologic units.

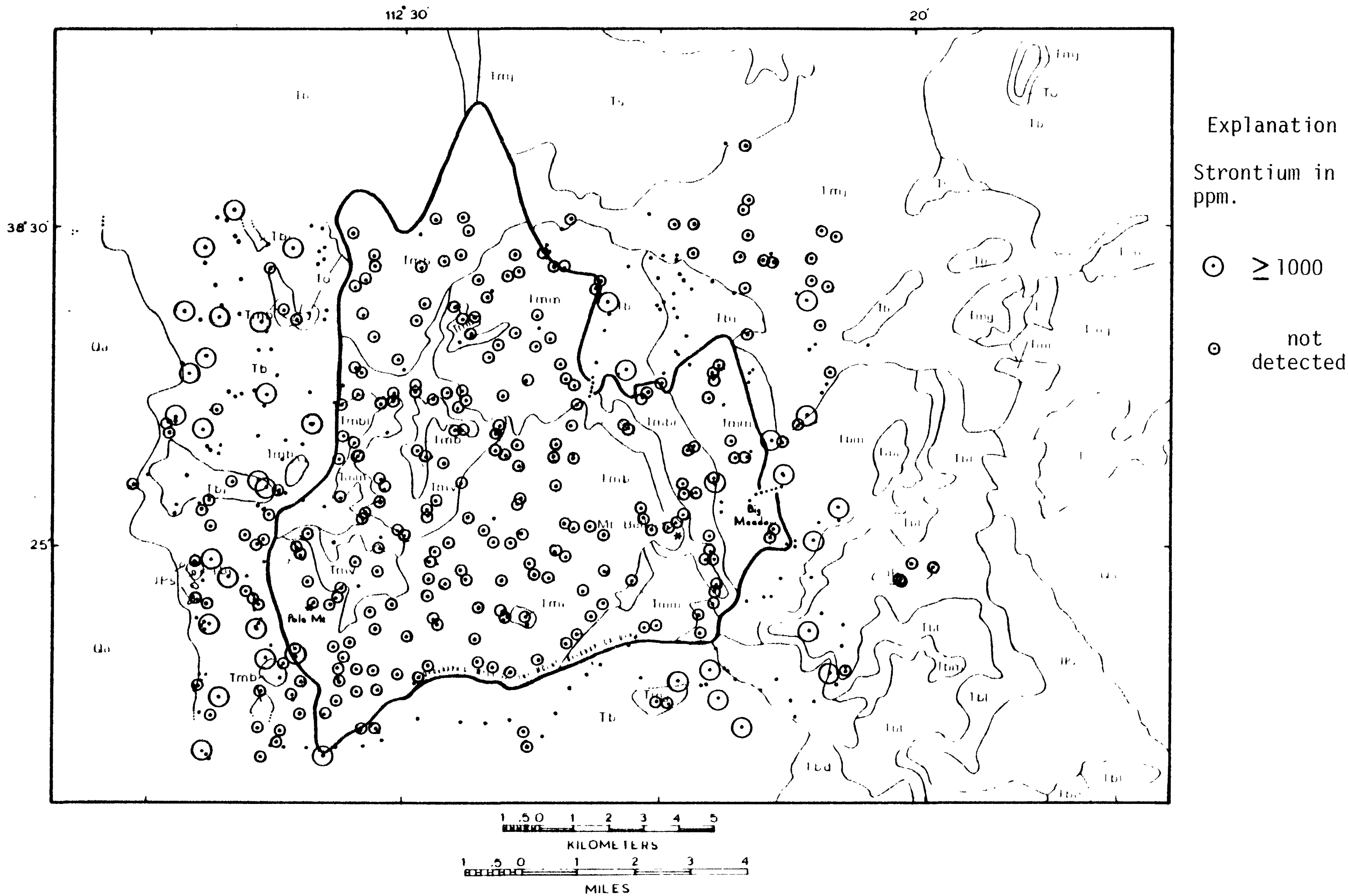


Figure 19.--Distribution of anomalous strontium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

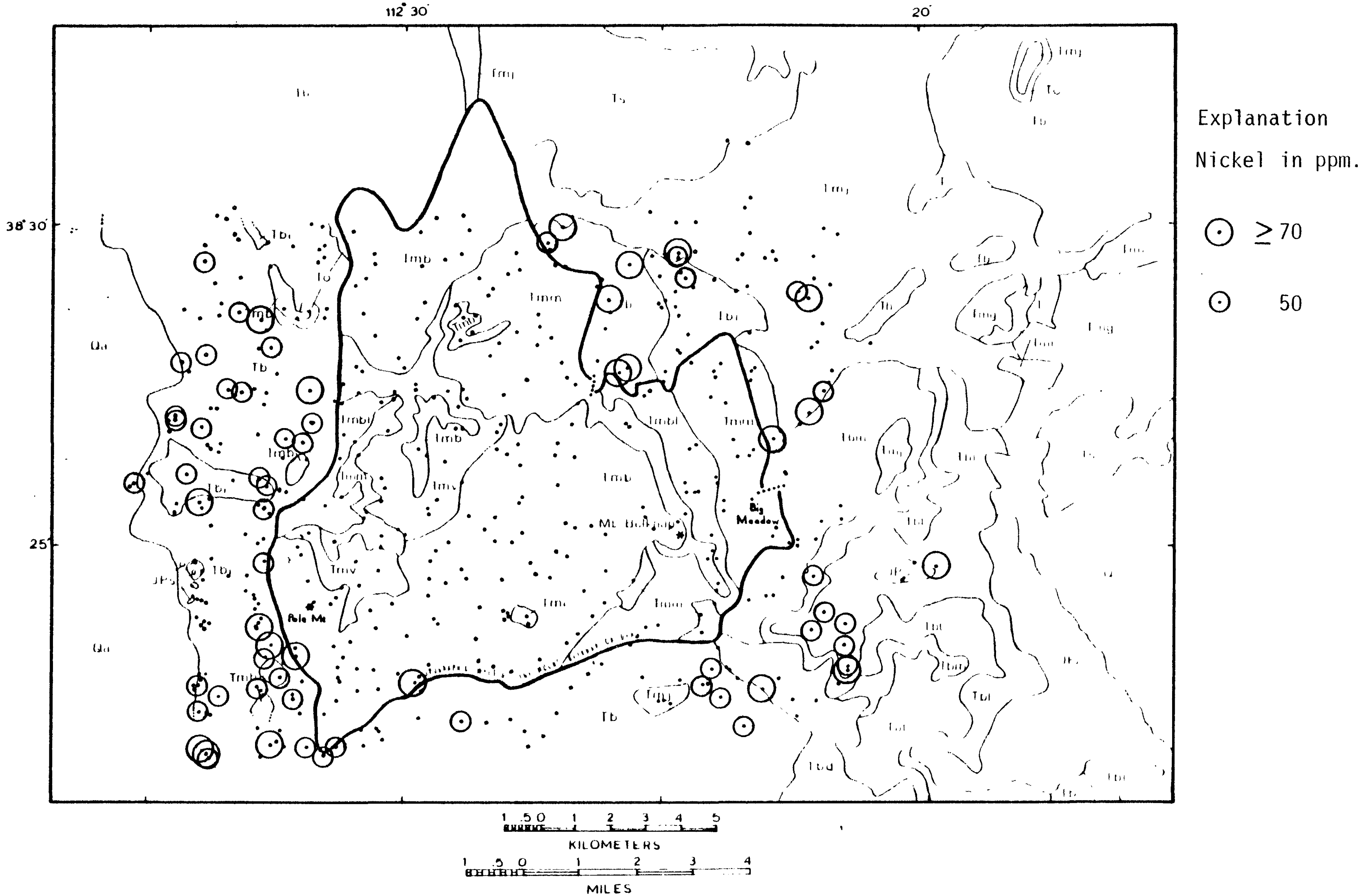


Figure 20.--Distribution of anomalous nickel concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units. Distribution of low concentrations is very similar to copper and strontium distributions.

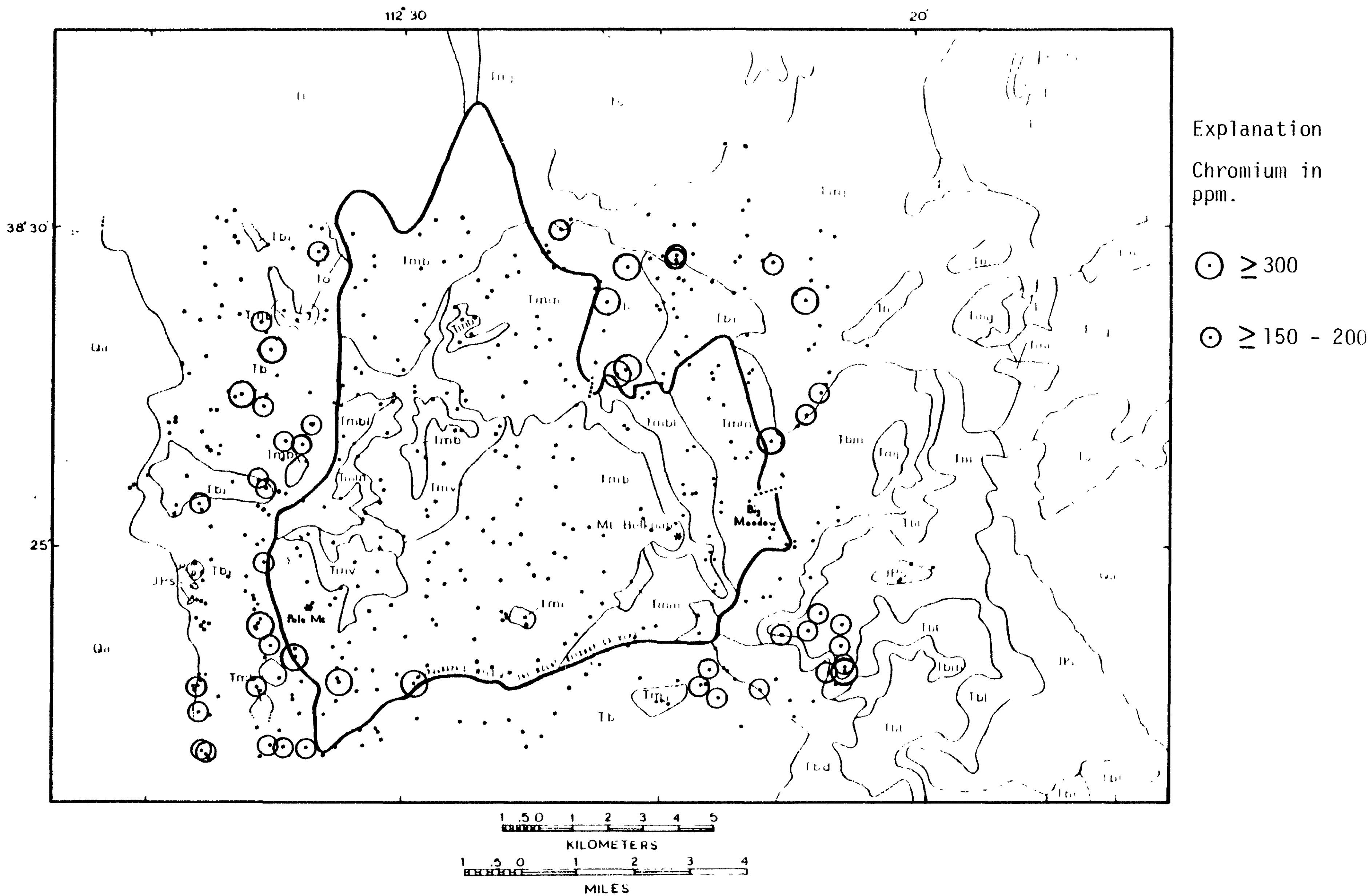


Figure 21.--Distribution of anomalous chromium concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units. The distribution of low concentrations is very similar to copper and strontium distributions.

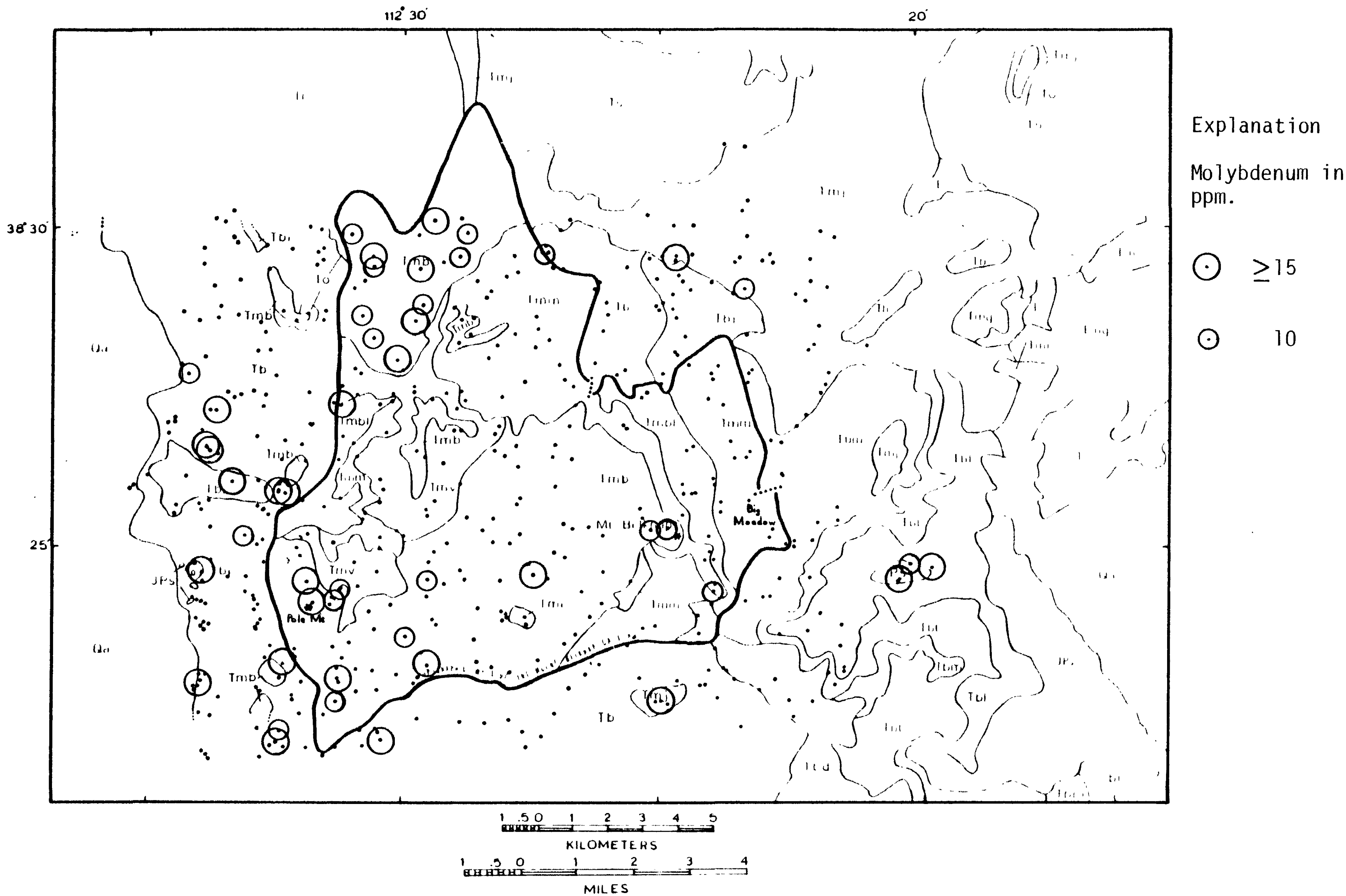


Figure 22.-Distribution of anomalous molybdenum concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

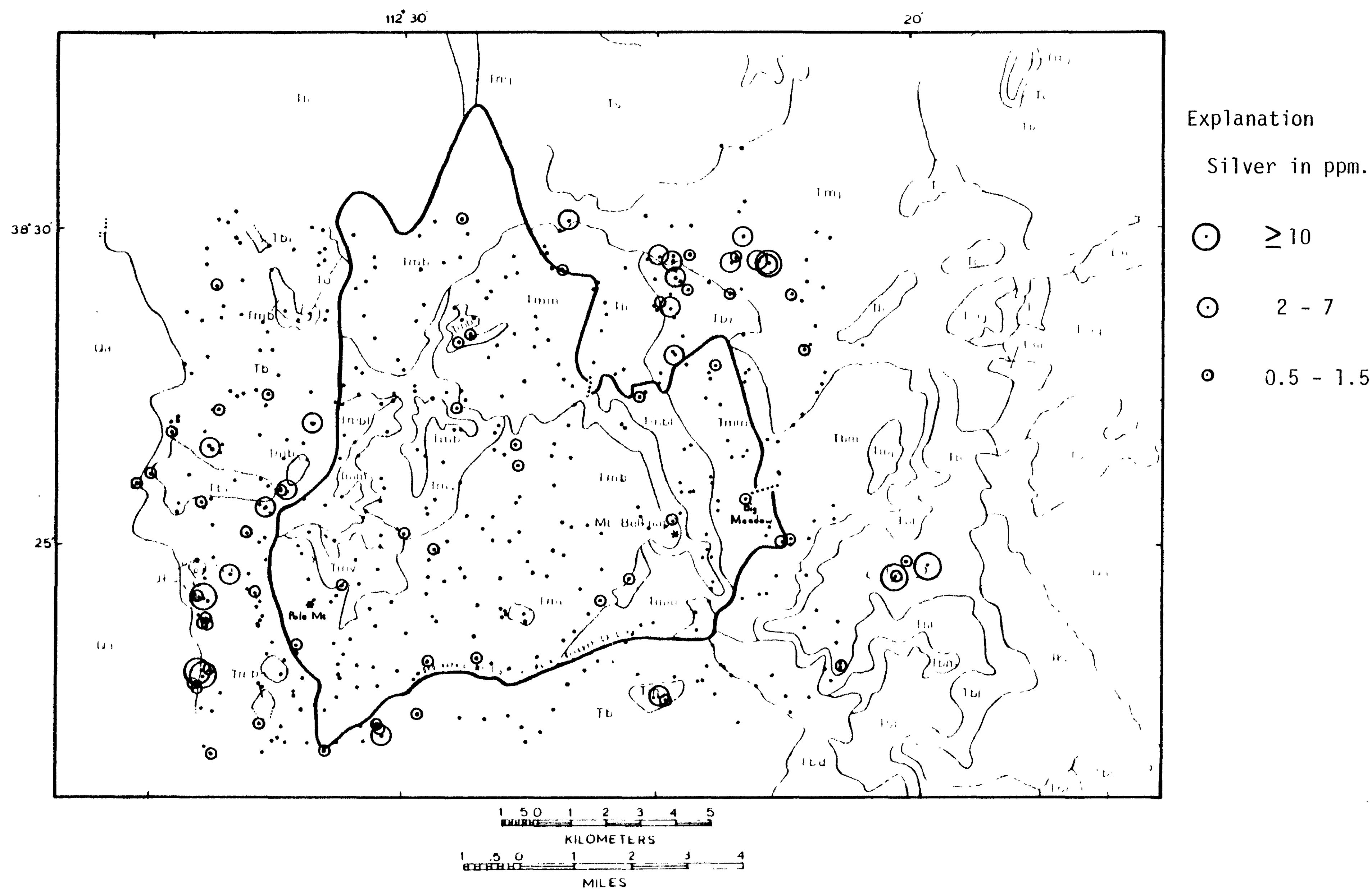


Figure 23.--Distribution of anomalous silver concentrations in the Mount Belknap caldera area, Utah. See figure 2 for descriptions of geologic units.

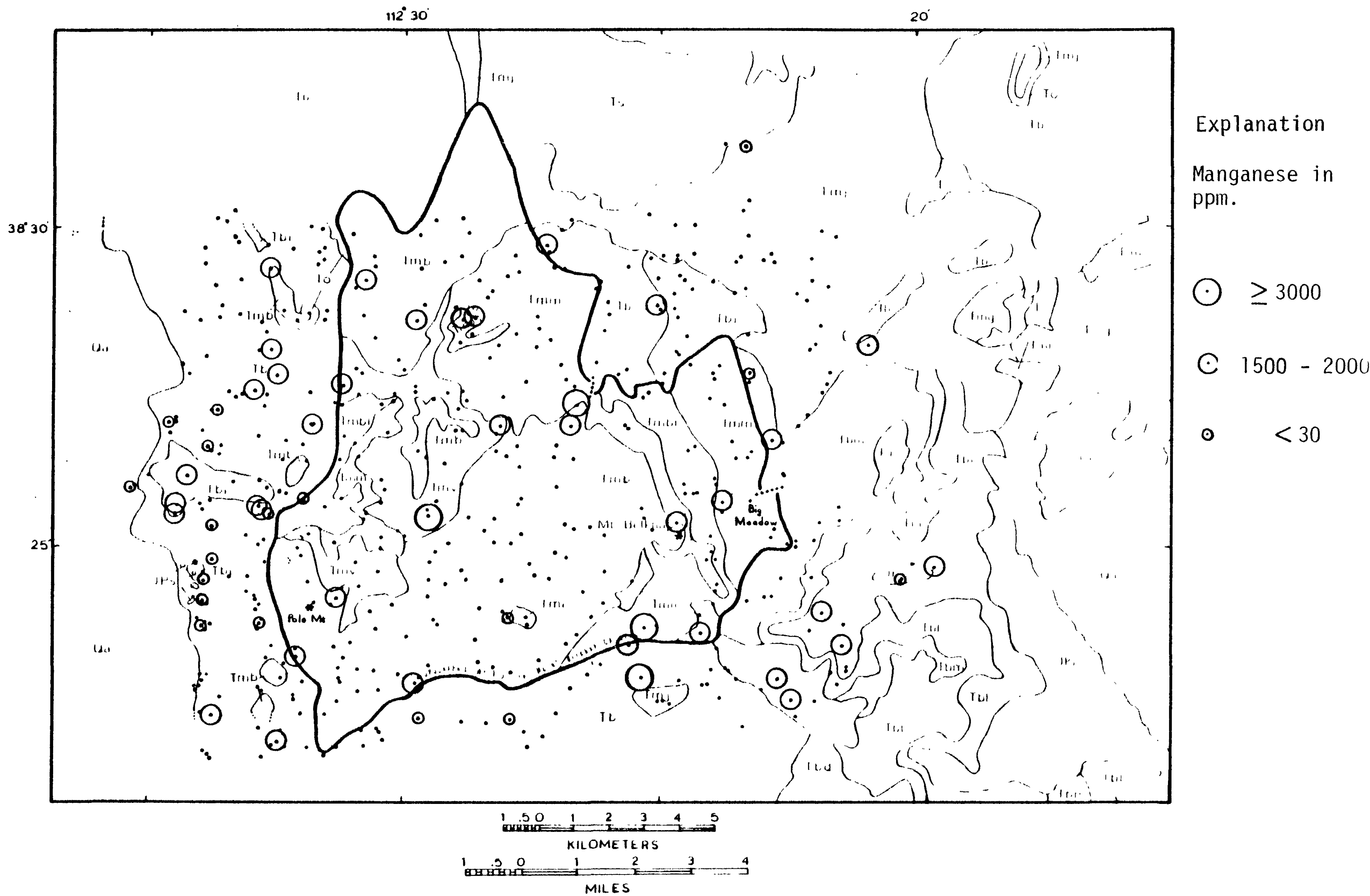


Figure 24.--Distribution of anomalous manganese concentrations in the Mount Belknap caldera area, Utah. See figure 2 for discription of geologic units.

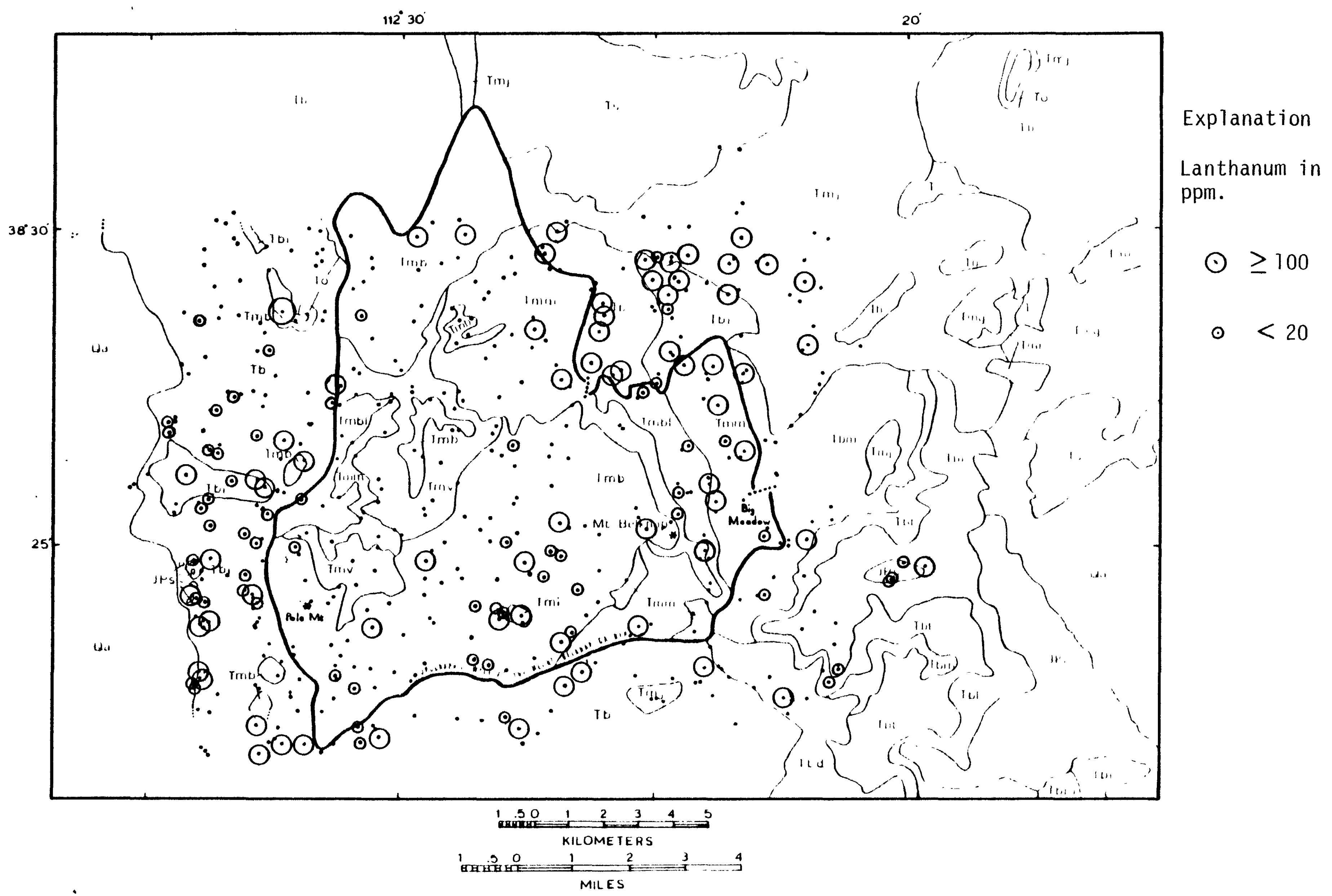


Figure 25.--Distribution of anomalous lanthanum concentrations in the Mount Belknap caldera area, Utah. See figure 2 for description of geologic units.

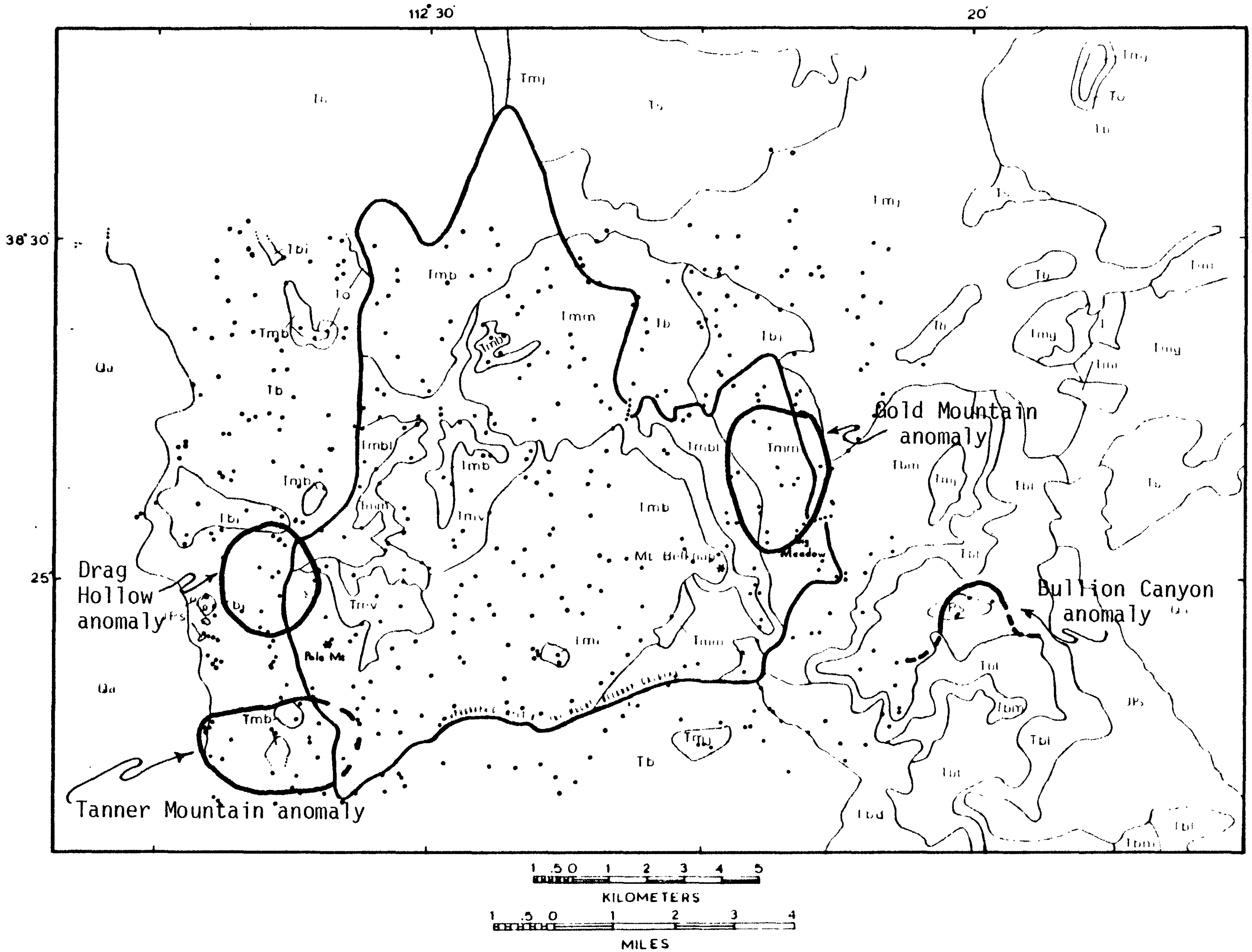


Figure 26.--Aeral distribution of geochemical anomalies described in this report.

Another geochemical anomaly centered on Gold Mountain in the eastern part of the caldera, is designated the Gold Mountain geochemical anomaly. Pb and to some degree Nb are depleted from rhyolite samples within this anomaly (Figure 12 and 8) and Ba, Ca, Fe, La, and Sr are slightly enriched. High concentrations of Mo have been noted in samples collected from a breccia pipe and a tailings pile on Gold Mountain (Cunningham and Steven, 1979c). These geochemical trends are opposite to those described in the Dray Hollow and Tanner Mountain geochemical anomalies, which may reflect possible factors such as differences in the level of intrusive emplacement, present level of erosion, chemical composition of the host rocks, or in the degree of fracturing and the composition of any circulating hydrothermal fluids.

Multivariant analysis applied to the rock data

The present chemical compositions of the rocks in the study area probably have resulted from a complex geochemical history, with the original composition having been modified by subsequent hydrothermal activity and other geochemical processes. In this instance, Q-mode factor analysis techniques have been used to gain a better understanding of the complex interrelationships that exist in the data. Q-mode factor analysis is a mathematical technique that calculates a group of end-member compositions that approximately describe the variations within the multispecie data. Background information on factor analysis can be found in Davis (1973) and Klovan and Imbrie (1971). Q-mode factor analysis demonstrates that certain end-member compositions or factors exist, but does not attach any significance to them. The interpretation of the factors and their geological significance is a subjective process which relies on the user's knowledge of the geological and geochemical processes that may have affected the area. Information on the use and application of factor analysis to geochemical studies can be found in

Miller and others (1979 and 1980) and Tucker and others (1980). Q-mode factor analysis was performed on the data using the U.S. Geological Survey's STATPAC library system. The raw data for 18 elements were log transformed prior to Q-mode factor analysis. A four-factor model which explains 95.1 percent of the total variance was used in interpreting the data. Table 8 presents the factor-score matrix. The factor scores, by sample site, are given in Tucker (1981).

Factors 1 and 2

The variations explained by factors 1 and 2 are interpreted to be due to lithologic controls. Factor 1 explains 49.0 percent of the total variance. The highest scores for Nb, Be, Ga, Pb, Y, La, and Mn are in this factor. This geochemical suite of elements is interpreted to be associated with rhyolitic-composition rocks. The highest factor scores occur for samples 035, 040, 715, 098, 037, 577, 644, 724, 041, 636, 733, 648, 094, 731, 050, and 529 respectively, all with scores greater than 0.92 (Figure 27). The distribution of high factor 1 scores is restricted to within the caldera, with the exception of a few sites that are underlain by outflow facies.

Factor 2 explains 41.6 percent of the total variance. The highest scores for Sr, Cu, Ca, Mg, Ba, Fe, Cr, and Ni are in this factor. This geochemical suite of elements is interpreted to be associated with intermediate-composition volcanic rocks. The highest factor scores occur for samples 618, 663, 179, 612, 569, 080, 561, 084, 561, 084, 610, 083, 613, and 521 respectively, all with scores less than -0.93 (Figure 28). The high factor scores for factor 2 are found outside the caldera and within the lava flows of the Bullion Canyon Volcanics. It is significant that many samples within the Dray Hollow and Tanner Mountain geochemical anomalies are not represented by high factor scores for factor 2, even though the rocks exposed here are Bullion Canyon Volcanics.

Table 8.--Factor score matrix

Constituent	Factor 1	2	3	4
Fe	0.190	-0.277	0.209	-0.256
Mg	0.062	-0.325	-0.110	0.029
Ca	0.008	-0.346	-0.154	0.155
Mn	0.228	-0.171	0.059	-0.136
Ag	0.068	0.012	0.224	-0.197
Ba	0.001	-0.325	0.222	-0.134
Be	0.382	0.039	0.124	-0.304
Cr	-0.105	-0.259	0.161	-0.064
Cu	-0.158	-0.390	0.182	-0.010
La	0.235	-0.150	-0.194	0.204
Mo	0.090	0.071	0.785	0.540
Nb	0.482	0.126	0.095	-0.233
Ni	-0.049	-0.298	0.041	-0.165
Pb	0.340	-0.088	-0.064	0.210
Sn	0.259	0.110	-0.161	0.411
Sr	-0.144	-0.391	-0.123	0.276
Y	0.315	-0.134	-0.101	0.008
Ga	0.349	-0.141	-0.155	0.187

Underlined scores are significant in factor interpretation.

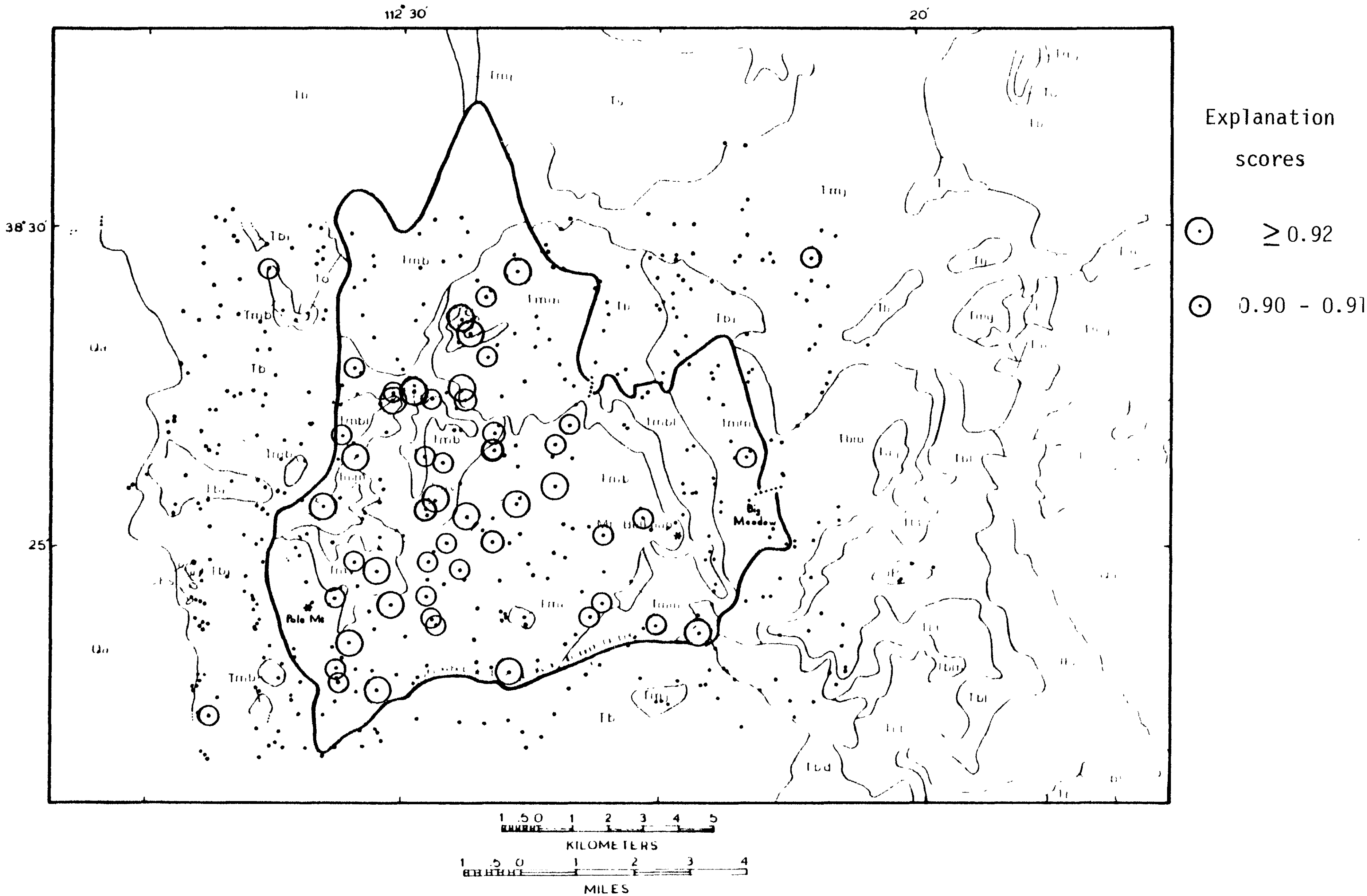


Figure 27.--Distribution of scores for factor 1. See figure 2 for description of geologic units.

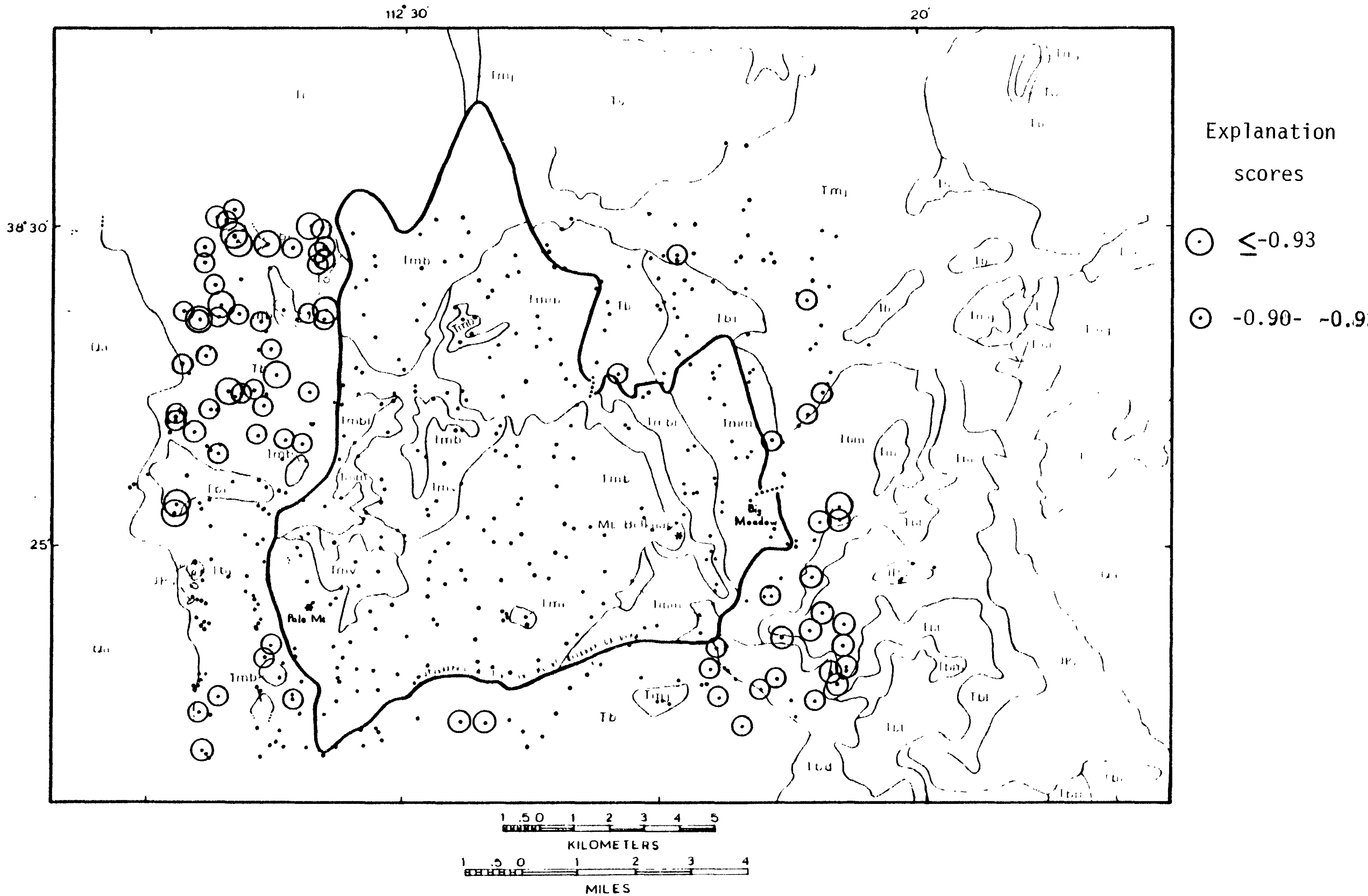


Figure 28.--Distribution of scores for factor 2. See figure 2 for description of geologic units.

Factor 3

Factors 3 and 4 consist of significant scores for elements commonly associated with ore deposits. Factor 3 explains 3.2 percent of the total variance. The highest scores for Mo and Ag occur in this factor. Other elements that have significant scores in this factor are Ba, Fe, Cu, Cr, Be, and Nb. Factor 3 is interpreted as reflecting the suite of elements commonly associated with molybdenum mineralization. The highest factor scores occur in samples 014, 657, 066, 013, 656, 087, 604, and 023 with scores greater than 0.54 (Figure 29). The largest clustering of high scores occurs within the Drag Hollow geochemical anomaly. Several high scores also occur within the Tanner Mountain geochemical anomaly. Samples 656 and 657 are in Bullion Canyon, and have high scores for factor 3. This area is very near a postulated porphyry molybdenum system (Steven, Cunningham, and Machette, 1980; Cunningham and Steven, 1979b). Limited sampling was done in this area; therefore the data are insufficient to support confident interpretation.

The elements associated with the anomalies are those characteristically associated with highly differentiated, leucocratic intrusive igneous bodies that may have accompanied economic concentrations of molybdenum. Lesser factor scores occurring within the caldera are generally associated with the Mount Baldy Rhyolite Member, which contains concentrations of Mo, Sn, Ga, and Pb and probably was derived from a highly differentiated magma chamber. This implies that many of the factors indicative of ore-element concentration existed, and that the Mount Baldy Rhyolite Member may represent a pressure-releasing phase of a highly differentiated residual fluid. It is not known to what extent this eruptive phase is representative of the total volume of the concentrated residual fluids. What is significant, is that the differentiation processes have occurred, and porphyry-type molybdenum deposits could have formed if the differentiated residual fluids were trapped at depth.

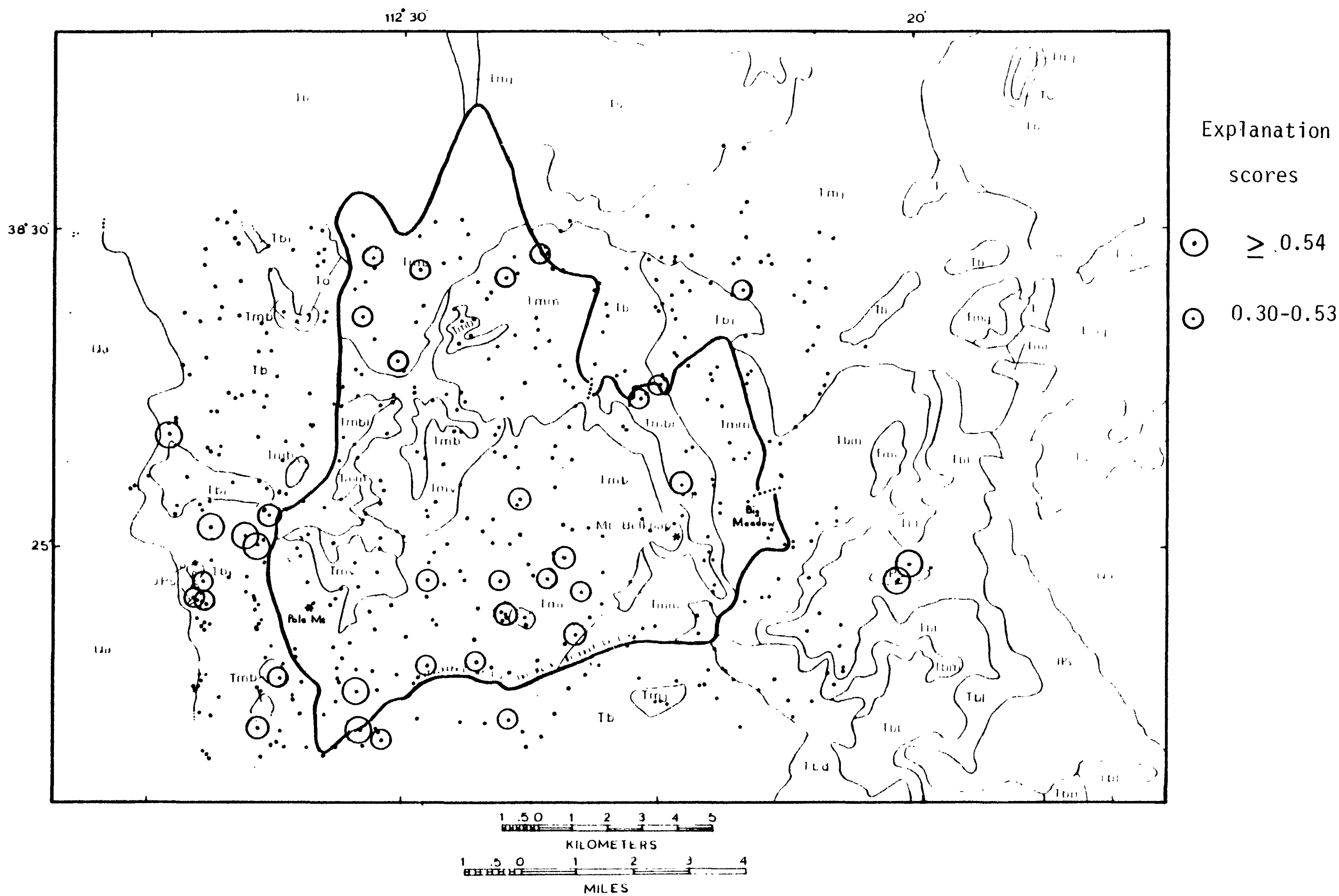


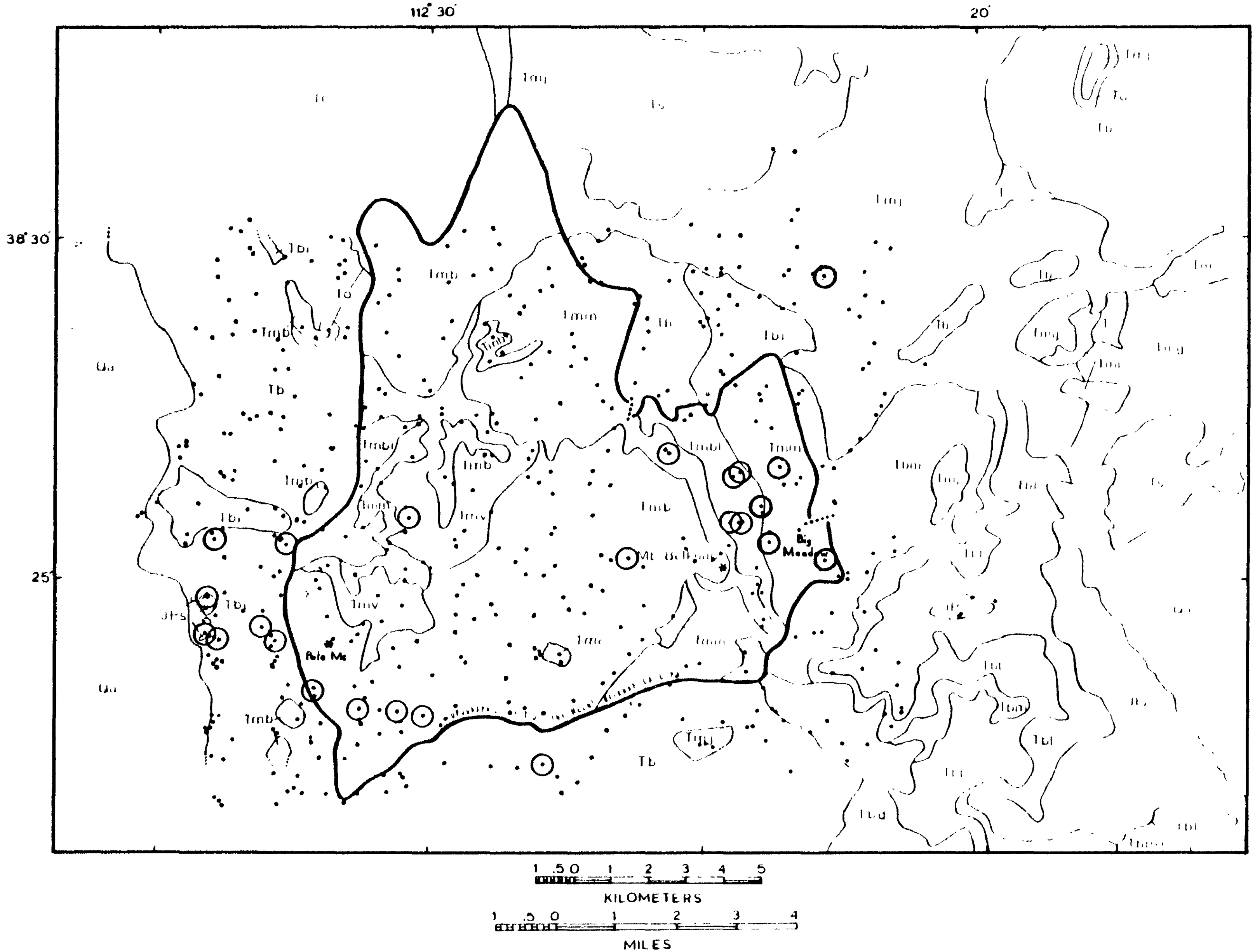
Figure 29.--Distribution of scores for factor 3. See figure 2 for description of geologic units.

Factor 4

Factor 4 explains 1.3 percent of the total variance. Constituents with high scores in this factor are Fe, Mn, Ag, Ba, Be, and Nb. The highest factor scores occur in samples 074, 011, 075, 016, and 600 respectively, with negative scores less than -0.30 (Figure 30). The interpretation of this factor is difficult, but may represent a halo surrounding a porphyry-type molybdenum deposit. For the Drag Hollow geochemical anomaly, the anomalous factor-4 scores tend to be associated with the secondary anomalous factor-3 scores. The Gold Mountain anomaly contains a clustering of high factor-4 scores. These scores center over a depletion in Pb and Nb. Factor 4 suggests that a differentiated body may exist under the Gold Mountain geochemical anomaly, although the geochemical signature at the present surface may be a composite of many factors such as erosional level, host rock composition, fracture control, and so forth.

Conclusions

The Mount Belknap caldera and vicinity exhibits many of the geological and geochemical characteristics indicating a potential for porphyry-type molybdenum deposits. The Drag Hollow, Tanner Mountain, Gold Mountain, and Bullion Canyon anomalies contain many of the geochemical characteristics associated with the emplacement of leucocratic, highly-differentiated rhyolitic intrusive bodies. The difference in major and trace element distributions within these geochemical anomalies can be attributed to a variety of factors such as depth of intrusive emplacement, subsequent erosion, host rock composition, degree of fracturing in the host rock, thermal gradient and pressure gradient. There is the possibility that the residual fluids were erupted or dispersed, and no significant concentrations of the ore elements occurred. The geochemistry of the Mount Baldy Rhyolite Member indicates that



Explanation

scores

⊙ ≤ -0.2

Figure 30.--Distribution of scores for factor 4. See figure 2 for discription of geologic units.

this eruptive facies was from a highly-differentiated magma chamber containing high concentrations of the ore elements.

Q-mode factor analysis was able to separate, to some degree, the various geochemical contributions that have affected the original chemical composition of the rocks. A four-factor model was used to interpret the multielement data. Factors 1 and 2 defined geochemical suites interpreted as representing lithologic differences between the rhyolites and intermediate-composition volcanic rocks. Factor 3 defined a geochemical suite of elements that can be interpreted as representing molybdenum mineralization. Factor 3 has a clustering of high scores within the Drag Hollow, The Tanner Mountain, and the Bullion Canyon anomalies. Factor 4 defines a geochemical suite of elements that may be interpreted to represent an upper level halo above a porphyry-type molybdenum system. This factor defined the Gold Mountain anomaly and seems to complement the elemental suite defined by factor 3.

A hydrogeochemical survey completed concurrently with the rock geochemical survey also indicated the potential for porphyry-type molybdenum deposits in the Mount Belknap caldera vicinity (Tucker and others, 1980). The Big Meadow hydrogeochemical anomaly is located just south of the Gold Mountain rock geochemical anomaly. The Grassy Creek hydrogeochemical anomaly is located slightly north of the Drag Hollow rock geochemical anomaly. The slight displacement of the hydrogeochemical anomalies with respect to the rock geochemical anomalies may reflect present structural control of water flow or structural control related to the release of fluids during the emplacement of a body at depth.

The geology and geochemistry of the Mount Belknap caldera and vicinity suggest that highly differentiated leucocratic magmas were intruded and(or) erupted in and around the caldera. The Drag Hollow, Tanner Mountain, Gold

Mountain, and Bullion Canyon geochemical anomalies exhibit many of the characteristics associated with the emplacement of highly-differentiated residual fluids from these magmas, which may have deposited economic concentrations of Mo. These anomalous areas represent potential targets for future porphyry-type molybdenum mineral exploration.

References Cited

Cunningham, C. G., and Steven, T. A., 1978a, Geologic map of the Delano peak NW quadrangle, west-central Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-967, scale 1:24,000.

_______1978b, Postulated model of uranium occurrence in the central mining area, Marysvale District, west-central Utah: U.S. Geological Survey Open-File Report 78-1093, 19 p.

_______1979a, Geologic map of the Delano Peak NE quadrangle, west-central Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1105, scale 1:24,000.

_______1979b, Geologic map of the Deer Trail Mountain-Alunite Ridge Mining area, west-central Utah: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-1230, scale 1:24,000

_______1979c, Environments favorable for the occurrence of uranium within the Mount Belknap caldera, Beaver Valley and Sevier River Valley, west-central Utah: U.S. Geological Survey Open-File Report 79-434, 15 p.

_______1979d, Mount Belknap and Red Hills calderas, and associated rocks, Marysvale volcanic field, west-central Utah: U.S. Geological Survey Bulletin 1468, 34 p.

_______1979e, Uranium in the central mining area, Marysvale District, west-central Utah: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-1177, scale 1:24,000

Cunningham, C. G., and Steven, T. A., 1980, Geologic map of the Beaver NE quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1191, scale 1:24,000

Dagger, G. W., 1972, Genesis of the Mount Plesant tungston-molybdenum-bismuth deposit, New Brunswick, Canada: Transactions of the Institution of Mining and Metallurgy, v. 82B, p. B73-B102.

Davis, J. C., 1973, Statistics and data analysis in geology: New York, John Wiley and Son, Inc. 550 p.

Fleck, R. J., Anderson, J. J., and Rowley, P. D., 1975, Chronology of mid-Tertiary volcanism in High Plateaus region of Utah, in Cenozoic geology of southwestern High Plateaus of Utah: Geological Society of America Special Paper 160, p. 53-62.

Groves, D. I., and McCarthy, T. S., 1978, Fractional crystallization and the origin of tin deposits in granitoids Mineral. Deposita, v. 13, p. 11-26

Groves, D. I., and Taylor, R. G., 1973, Greisenization and mineralization at Anchor Tin mine, northeast Tasmania: Transactions of the Institution of Mining and Metallurgy, v. 82B, p. 135-146.

Hoffman, J. D., Brew, D. A., Forn, C. L., and Johnson, B. R., 1979, Chemical variability of a metavolcanic rock unit in the Tracy Arm-Fords Terror Wilderness study area, Alaska, and the definition of background values for geochemical purposes, in Shorter Contributions to Geochemistry 1979, U.S. Geological Survey Professional Paper 1129A-A-I, p. D1-E9.

Hosking, K. F. G., 1965, The search for tin: Mining Magazine, v. 113, p. 368-382.

Klovan, J. E., and Imbrie, J., 1971, An algorithm and Fortran-IV program for large-scale Q-mode factor analysis and calculation of factor scores: Journal of the International Association of Mathematical Geology, v. 3, no. 1, p. 61-77.

McNair, A. H., 1951, Paleozoic stratigraphy of northwestern Arizona: American Association of Petroleum Geologists Bulletin, v. 35, no. 3, p. 525-526

Miller, W. R., McHugh, J. B., and Ficklin, W. H., 1979, Possible uranium mineralization, Mineral Mountains, Utah: U.S. Geological Survey Open-File Report 79-1354, 44 p.

_______1980, Possible uranium mineralization, Beaver Basin, Utah: U.S. Geological Survey Open-File Report 80-508, 35 p.

Motooka, J. M., and Grimes, D. J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analysis: U.S. Geological Survey Circular 738, 25 p.

Sharp, J. E., 1978, A molybdenum mineralized breccia pipe complex, Redwell, Colorado: Economic Geology, v. 73, p. 369-382.

Sheraton, J. W., and Black, L. P., 1973, Geochemistry of mineralized granitic rocks of northeast Queensland: Journal of Geochemical Exploration, v. 2, p. 331-348

Sillitoe, R. H., Halls, C., and Grant, J. N., 1975, Porphyry tin deposits in Bolivia: Economic Geology, v. 70, p. 913-917.

Snedecor, G. W., and Cockran, W. G., 1967, Statistical Methods: Iowa State University Press, Ames 6th edit., 593 p.

Steven, T. A., 1977, Geologic map of the Sevier SW quadrangle, west-central Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-962, scale 1:24,000.

Steven, T. A., and Cunningham, C. G., 1979, Uranium potential of the Big John caldera, Beaver County, Utah: U.S. Geological Survey Open-File Report 79-527, 16 p.

_______1980, Geologic map of the Sevier SE quadrangle, west-central Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1109, scale 1:24,000.

Steven, T. A., Cunningham, C. G., and Machette, 1980, Intergrated uranium systems in the Marysvale volcanic field, west-central Utah: U.S. Geological Survey Open-File Report 80-524, 39 p.

Steven, T. A., Cunningham, C. G., Naeser, C. W., and Mehnert, H. H., 1978, Revised stratigraphy and radiometric ages of volcanic rocks and mineral deposits in the Marysvale area, west-central Utah: U.S. Geological Survey Bulletin 1469, 40 p.

Steven, T. A., Cunningham, C. G., and Rowley, P. D., 1978, Geology and mineralization in the Marysvale mining area, west-central Utah, in Guidebook to mineral deposits of southwestern Utah: Utah Geological Association Publication 7, p. 67-70.

Tischendorf, G., 1972, The metallogenetic basis of tin exploration in the Erzgebirge: Transactions of the Institution of Mining and Metallurgy, v. 82B, p. 9-24.

Tucker, J. D., Miller, W. R., Motooka, J. M., and Hubert, A. E., 1981, A rock and stream sediment concentrate survey over a known Mo-Sn anomaly in the southern Wah Wah Mountains, Utah: U.S. Geological Survey Open-File Report 81-576, 70 p.

Tucker, R. E., Miller, W. R., and McHugh, J. B., 1980, Geochemical results from a natural waters study in the Mount Belknap caldera and vicinity, Utah: U.S. Geological Survey Open-File Report 80-1051, 53 p.

Tucker, R. E., 1981, A rock and hydrogeochemical survey of the Mount Belknap caldera area, Utah: Masters Thesis, Colorado School of Mines (in press).

Van Alstine, R. E., 1976, Continental rifts and lineaments associated with major fluorspar districts: Economic Geology, v. 71, p. 977-987.

Wallace, S. R., Mackenzie, W. B., Blair, R. G., and Muncaster, N. K., 1978, Geology of the Urad and Henderson Molybdenite deposits, Clear Creek County, Colorado, with a section on a comparison of these deposits with those at Climax, Colorado: Economic Geology, v. 73, p. 325-368.

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity

Explanation; map units are listes next to sample numbers; concentrations are the detection limits.

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
001 Tb	38 26 35	112 31 59	5.00	2.00	2.00	1.000	700	<.5	2,000
002 Tb	38 26 39	112 32 18	5.00	5.00	5.00	1.000	700	<.5	2,000
003 Tmb	38 25 40	112 32 3	.20	<.02	.10	1.000	15	N	1,500
005 Tmbl	38 25 42	112 31 8	2.00	.10	.10	.500	700	N	<20
006 Tmm	38 25 40	112 30 23	1.00	.20	.10	.200	700	N	70
007 Tmbl	38 25 42	112 31 8	1.00	.10	.10	.100	1,000	N	<20
008 Tmbl	38 25 36	112 31 30	1.00	.20	.50	.200	500	<.5	N
010 Tb	38 25 34	112 32 50	5.00	5.00	3.00	.500	2,000	N	1,500
011 Tmb	38 25 28	112 32 34	.20	<.02	<.05	1.000	30	N	500
012 Tb	38 25 4	112 32 42	2.00	.30	.20	.500	200	<.5	1,000
013 Tb	38 24 59	112 32 49	.50	<.02	<.05	1.000	50	<.5	200
014 Tb	38 25 9	112 33 3	1.00	.02	<.05	1.000	150	1.5	100
016 Tb	38 24 4	112 32 47	.50	<.02	<.05	1.000	50	N	200
017 Tb	38 23 43	112 32 49	2.00	1.00	2.00	.500	700	N	1,000
018 Tb	38 23 44	112 32 50	2.00	1.00	2.00	.500	500	N	500
019 Tb	38 23 25	112 32 33	10.00	5.00	5.00	1.000	700	N	1,000
020 Tmb	38 23 25	112 32 4	.50	.02	.10	.200	150	.5	100
021 Tmb	38 23 17	112 31 59	10.00	2.00	5.00	1.000	1,500	N	1,500
022 Tmb	38 22 29	112 31 16	.50	.10	1.00	.100	300	<.5	<20
023 Tmb	38 22 45	112 30 52	1.00	.02	<.05	.020	150	<.5	200
024 Tmb	38 22 48	112 30 25	1.00	.05	.10	.050	500	<.5	70
025 Tmb	38 23 3	112 30 4	.50	.05	.05	.100	150	<.5	50
026 Tmv	38 23 1	112 29 42	1.00	.05	.05	.200	200	N	50
027 Tb	38 22 54	112 29 47	5.00	5.00	3.00	1.000	1,500	N	1,500
028 Tmb	38 23 16	112 29 22	1.00	.05	.05	.200	500	.5	50
029 Tmb	38 23 5	112 30 26	1.00	.20	.20	.100	200	<.5	70
031 Tmb	38 23 57	112 30 37	1.00	.05	.05	.200	700	N	50
032 Tmb	38 23 40	112 30 26	.50	.20	.20	.200	200	<.5	150
033 Tmb	38 24 6	112 30 7	1.00	.10	.10	.200	500	N	50
034 Tmb	38 23 36	112 29 54	1.00	.10	2.00	.100	1,000	N	50
035 Tmb	38 25 25	112 28 43	1.00	.20	.10	.100	500	<.5	30
036 Tmb	38 25 13	112 28 26	1.00	.20	.50	.200	500	<.5	30
037 Tmb	38 24 36	112 30 29	1.00	.20	.10	.500	1,000	<.5	50
038 Tmm	38 24 59	112 30 23	1.00	.50	.50	.500	1,000	N	100
039 Tmv	38 25 31	112 29 32	1.00	.20	.10	.050	5,000	N	100
040 Tmb	38 25 40	112 29 20	1.00	.10	.05	.200	700	N	50
041 Tmb	38 25 41	112 29 21	1.00	.10	.10	.200	1,000	N	70
042 Tmv	38 25 35	112 29 33	1.00	.20	.20	.100	1,000	<.5	70
043 Tbi	38 25 54	112 32 40	10.00	5.00	5.00	1.000	700	N	1,500
044 Tmbl	38 27 15	112 30 11	1.00	.10	.10	.100	300	<.5	20
045 Tmbl	38 27 11	112 30 26	1.00	.10	1.00	.100	700	N	<20
046 Tmm	38 26 48	112 30 21	1.00	.50	.30	.200	500	<.5	70
047 glas	38 26 36	112 30 59	1.00	.10	2.00	.050	1,000	N	<20
048 Tmbl	38 26 41	112 31 10	1.00	.20	.05	.200	500	N	<20
049 Tmv	38 26 21	112 31 11	1.50	.20	.05	.200	1,000	N	<20

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
001 Tb	3.0	30.00	200	50	70	<5	N	50
002 Tb	1.0	5.00	150	50	100	N	<20	50
003 Tmb	<1.0	N	30	5	N	N	30	<5
005 Tmbl	10.0	20.00	N	<5	50	N	70	N
006 Tmm	10.0	5.00	N	N	50	5	50	<5
007 Tmbl	15.0	N	N	N	70	N	70	<5
008 Tmbl	50.0	30.00	N	N	50	N	70	<5
010 Tb	3.0	20.00	50	<5	30	N	<20	30
011 Tmb	1.0	7.00	<20	5	N	N	20	<5
012 Tb	7.0	N	100	20	50	N	30	30
013 Tb	5.0	N	<20	<5	N	5	<20	N
014 Tb	N	N	30	10	N	10	<20	N
016 Tb	2.0	20.00	20	7	N	N	<20	N
017 Tb	5.0	30.00	<20	7	100	N	20	<5
018 Tb	7.0	N	<20	20	100	N	30	<5
019 Tb	1.0	15.00	200	70	70	N	<20	70
020 Tmb	10.0	10.00	<20	<5	50	N	50	<5
021 Tmb	2.0	N	500	70	70	7	<20	100
022 Tmb	15.0	N	N	15	50	10	30	<5
023 Tmb	5.0	20.00	50	<5	N	5	30	<5
024 Tmb	20.0	50.00	<20	N	50	N	70	<5
025 Tmb	15.0	30.00	<20	N	30	N	50	<5
026 Tmv	15.0	N	<20	N	30	7	70	<5
027 Tb	2.0	N	500	50	70	5	20	70
028 Tmb	20.0	N	<20	N	50	15	70	<5
029 Tmb	15.0	N	<20	N	50	N	70	<5
031 Tmb	15.0	N	N	N	30	N	50	<5
032 Tmb	10.0	N	<20	N	100	N	70	N
033 Tmb	20.0	N	<20	N	50	7	70	N
034 Tmb	20.0	30.00	N	N	50	10	50	N
035 Tmb	10.0	N	N	N	50	N	100	N
036 Tmb	15.0	N	<20	N	30	N	70	<5
037 Tmb	15.0	N	N	N	70	N	70	N
038 Tmm	15.0	N	N	<5	70	N	50	<5
039 Tmv	15.0	N	N	N	70	N	70	N
040 Tmb	10.0	N	N	N	50	N	70	N
041 Tmb	10.0	N	N	N	50	N	70	N
042 Tmv	10.0	20.00	N	N	70	N	50	N
043 Tbi	3.0	5.00	150	70	100	5	20	50
044 Tmbl	15.0	20.00	N	N	30	N	70	<5
045 Tmbl	15.0	N	N	N	50	7	30	N
046 Tmm	20.0	20.00	N	N	70	N	70	<5
047 glas	20.0	N	N	N	30	7	50	<5
048 Tmbl	15.0	N	N	N	70	N	50	<5
049 Tmv	10.0	N	N	N	50	N	70	<5

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
001 Tb	30	N	700	N	30	200	30
002 Tb	30	N	700	200	30	200	30
003 Tmb	<10	N	300	N	10	300	N
005 Tmbl	30	N	N	<20	70	500	30
006 Tmm	70	<10	N	<20	30	200	30
007 Tmbl	50	N	N	N	50	300	30
008 Tmbl	150	<10	N	<20	50	300	20
010 Tb	10	N	200	70	30	100	15
011 Tmb	N	N	N	<20	N	70	N
012 Tb	30	N	<100	N	30	200	20
013 Tb	10	N	N	N	N	200	N
014 Tb	N	N	N	N	N	200	N
016 Tb	N	N	<100	<20	20	200	N
017 Tb	30	N	200	70	30	200	30
018 Tb	30	N	200	N	30	300	30
019 Tb	30	N	500	200	30	200	50
020 Tmb	20	N	N	<20	30	200	20
021 Tmb	20	N	1,000	300	30	200	30
022 Tmb	70	N	100	N	30	100	30
023 Tmb	20	N	N	<20	10	200	<10
024 Tmb	50	<10	N	<20	50	200	30
025 Tmb	20	N	N	<20	30	200	30
026 Tmv	70	<10	N	N	30	200	30
027 Tb	50	N	500	N	30	500	30
028 Tmb	70	<10	N	N	30	200	30
029 Tmb	20	N	N	N	30	200	20
031 Tmb	70	N	N	N	30	200	30
032 Tmb	15	<10	N	<20	50	500	30
033 Tmb	70	<10	N	N	30	100	30
034 Tmb	50	N	100	<20	50	200	20
035 Tmb	50	<10	N	N	50	500	30
036 Tmb	30	<10	N	N	30	200	30
037 Tmb	50	<10	N	N	30	200	30
038 Tmm	70	<10	N	N	50	300	30
039 Tmv	70	N	<100	N	50	300.	30
040 Tmb	50	<10	N	N	20	500	30
041 Tmb	50	<10	N	N	30	200	30
042 Tmv	70	<10	N	N	50	500	30
043 Tbi	30	N	1,000	200	30	300	30
044 Tmbl	70	<10	N	N	30	200	30
045 Tmbl	50	N	N	N	50	200	30
046 Tmm	50	<10	500	N	50	300	20
047 glas	30	N	<100	<20	50	200	30
048 Tmbl	50	<10	N	N	50	200	20
049 Tmv	30	N	N	<20	50	300	30

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
050 Tmv	38 26 23	112 30 51	2.00	.10	.10	.100	700	<.5	<20
051 Tb	38 28 36	112 33 12	10.00	2.00	5.00	1.000	700	N	1,000
052 Tb	38 27 16	112 33 17	2.00	2.00	5.00	.500	1,000	N	2,000
053 Tb	38 27 19	112 33 10	10.00	5.00	5.00	1.000	1,000	N	2,000
054 Tb	38 26 41	112 32 49	10.00	2.00	2.00	.500	1,000	N	1,000
055 Tb	38 27 9	112 32 43	10.00	2.00	1.00	1.000	1,000	<.5	1,000
056 Tb	38 27 21	112 32 39	7.00	3.00	7.00	1.000	500	1.0	1,000
057 Tb	38 27 23	112 32 52	7.00	2.00	3.00	1.000	1,500	N	1,000
058 Tmb	38 24 3	112 28 23	.50	.05	.10	.100	300	<.5	50
059 Tmb	38 23 57	112 27 58	.50	.05	.05	.100	150	N	50
060 Tmb	38 23 59	112 28 0	.50	.10	.05	.100	200	N	50
061 Tmb	38 23 53	112 28 1	1.00	.05	.05	.100	100	<.5	30
062 Tmi	38 23 53	112 27 36	1.00	.10	.10	.500	30	<.5	100
063 Tmi	38 23 48	112 27 30	1.00	.05	.10	.500	150	N	300
065	38 22 7	112 30 25	1.00	.20	.05	1.000	70	.5	500
066 Tmb	38 22 6	112 30 56	.20	.02	<.05	.500	70	N	50
067 Tb	38 22 0	112 32 24	1.00	.30	.10	.300	1,500	N	100
068 Tb	38 22 5	112 32 23	.50	.10	.50	.100	700	<.5	<20
069 Tb	38 21 46	112 33 48	10.00	3.00	5.00	1.000	700	N	1,500
070 Tb	38 21 48	112 33 53	10.00	7.00	3.00	1.000	1,000	<.5	2,000
071 Tmb	38 22 47	112 34 2	<.05	<.02	<.05	.100	70	N	70
072 Tb	38 22 55	112 33 54	2.00	.30	.20	1.000	500	10.0	2,000
073 Tb	38 22 59	112 33 47	2.00	1.00	1.00	1.000	300	1.0	2,000
074 JPs	38 24 6	112 33 49	.50	.05	.05	.100	100	15.0	100
075 JPs	38 24 7	112 33 54	.20	.10	.05	.050	150	<.5	100
076 Tb	38 24 29	112 33 25	5.00	3.00	2.00	1.000	700	2.0	2,000
077 Tbi	38 26 3	112 34 57	10.00	3.00	2.00	1.000	1,000	.7	1,000
078 Tbi	38 26 32	112 33 32	5.00	2.00	2.00	1.000	700	N	1,500
079 Tbi	38 26 25	112 33 34	7.00	2.00	5.00	1.000	1,000	N	2,000
080 Tb	38 27 23	112 33 24	7.00	5.00	3.00	1.000	1,000	N	2,000
081 Tb	38 27 6	112 33 45	5.00	2.00	2.00	1.000	300	N	5,000
082 Tbi	38 26 3	112 34 13	10.00	5.00	5.00	1.000	1,500	N	1,500
083 Tbi	38 25 36	112 34 27	7.00	5.00	5.00	1.000	1,500	N	1,000
084 Tbi	38 25 31	112 34 29	7.00	5.00	5.00	1.000	1,500	N	1,000
085 Tb	38 25 36	112 33 57	10.00	5.00	1.00	1.000	1,000	1.0	1,000
086 JPs	38 25 32	112 33 54	.50	.10	.05	.050	200	N	100
087 Tb	38 25 16	112 33 44	1.00	<.02	<.05	1.000	30	<.5	100
088 JPs	38 25 41	112 33 48	.10	.10	.20	.100	100	N	100
089 Tb	38 30 6	112 33 40	5.00	1.00	2.00	.500	500	N	1,000
090 Tb	38 30 14	112 33 18	5.00	2.00	2.00	1.000	700	<.5	2,000
091 Tmb	38 26 25	112 29 31	1.00	.10	.10	.200	700	N	50
092 Tmb	38 26 29	112 29 44	1.00	.10	.10	.300	700	<.5	70
093 Tmb	38 27 13	112 29 28	1.00	.20	.10	.200	700	N	70
094 Tmb	38 27 26	112 29 45	1.00	.05	.10	.200	1,000	<.5	50
095 Tmv	38 27 43	112 29 59	1.00	.50	1.50	.200	1,000	<.5	20

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
050 Tmv	15.0	5.00	N	N	70	N	70	<5
051 Tb	1.5	N	100	50	50	N	<20	50
052 Tb	3.0	N	50	10	20	N	N	15
053 Tb	1.0	5.00	500	30	50	N	<20	50
054 Tb	1.0	N	100	30	20	N	<20	30
055 Tb	1.0	30.00	150	50	70	N	<20	30
056 Tb	3.0	N	70	30	30	5	N	20
057 Tb	1.5	15.00	70	15	30	N	N	30
058 Tmb	15.0	N	N	N	<20	7	70	<5
059 Tmb	10.0	7.00	N	N	N	7	50	<5
060 Tmb	15.0	N	N	N	<20	<5	50	N
061 Tmb	10.0	30.00	N	N	30	N	50	N
062 Tmi	10.0	30.00	N	N	100	N	70	<5
063 Tmi	10.0	N	N	7	70	5	50	N
065	5.0	N	N	<5	70	N	30	<5
066 Tmb	1.0	20.00	20	<5	N	5	20	<5
067 Tb	15.0	5.00	<20	N	70	15	70	N
068 Tb	10.0	30.00	30	N	50	10	20	<5
069 Tb	1.0	50.00	200	50	50	5	<20	70
070 Tb	2.0	N	200	70	70	<5	<20	70
071 Tmb	1.0	N	20	<5	20	5	50	N
072 Tb	1.0	N	20	30	100	5	20	<5
073 Tb	5.0	N	20	15	70	<5	20	<5
074 JPs	3.0	N	30	<5	N	N	N	<5
075 JPs	10.0	N	20	7	N	N	N	N
076 Tb	1.5	N	70	50	70	5	<20	30
077 Tbi	5.0	7.00	50	70	70	7	20	30
078 Tbi	5.0	N	50	30	70	N	20	30
079 Tbi	1.0	N	50	30	<20	5	N	30
080 Tb	2.0	5.00	100	70	50	N	N	50
081 Tb	1.5	N	70	30	70	N	<20	20
082 Tbi	5.0	20.00	100	70	100	5	20	50
083 Tbi	1.0	5.00	50	30	50	N	N	30
084 Tbi	1.5	20.00	50	30	30	N	N	30
085 Tb	<1.0	N	200	70	70	N	<20	70
086 JPs	1.0	N	<20	<5	N	N	N	7
087 Tb	<1.0	30.00	20	20	N	5	<20	N
088 JPs	N	30.00	20	7	N	N	N	7
089 Tb	2.0	30.00	50	30	50	N	N	20
090 Tb	2.0	N	100	30	70	N	<20	30
091 Tmb	7.0	N	N	N	70	N	50	N
092 Tmb	15.0	70.00	<20	5	50	7	70	N
093 Tmb	15.0	N	N	N	70	7	70	N
094 Tmb	10.0	20.00	N	N	70	N	50	N
095 Tmv	20.0	N	N	N	30	N	70	<5

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
050 Tmv	50	<10	N	<20	50	300	30
051 Tb	30	N	700	<20	30	200	30
052 Tb	<10	N	150	<20	30	100	10
053 Tb	30	N	700	200	30	100	30
054 Tb	15	N	500	200	20	200	20
055 Tb	30	N	500	200	20	200	30
056 Tb	20	N	1,000	N	30	200	20
057 Tb	15	N	300	100	30	200	10
058 Tmb	30	<10	N	N	30	200	30
059 Tmb	15	N	N	<20	10	200	20
060 Tmb	30	N	N	<20	10	200	15
061 Tmb	20	N	N	<20	20	200	30
062 Tmi	15	N	<100	<20	50	200	20
063 Tmi	30	N	<100	N	30	300	20
065	10	N	150	50	20	200	20
066 Tmb	N	N	N	<20	N	200	N
067 Tb	70	10	<100	<20	50	200	50
068 Tb	100	N	100	<20	20	100	50
069 Tb	30	N	700	N	30	200	50
070 Tb	30	N	1,000	N	30	200	30
071 Tmb	30	N	150	N	15	200	30
072 Tb	30	N	500	N	20	200	30
073 Tb	50	N	500	100	30	300	50
074 JPs	N	N	N	N	N	200	N
075 JPs	<10	N	N	<20	N	150	N
076 Tb	30	N	1,000	N	30	200	50
077 Tbi	50	N	700	100	30	200	30
078 Tbi	30	N	500	N	50	300	20
079 Tbi	30	N	700	N	20	100	20
080 Tb	20	N	500	100	30	200	30
081 Tb	20	N	700	N	20	200	30
082 Tbi	30	N	700	200	30	200	30
083 Tbi	10	N	500	200	30	200	30
084 Tbi	15	N	700	200	30	200	20
085 Tb	30	N	300	N	30	200	30
086 JPs	N	N	<100	N	<10	100	N
087 Tb	N	N	<100	20	<10	200	N
088 JPs	10	N	N	<20	<10	200	N
089 Tb	20	N	700	200	30	100	20
090 Tb	30	N	2,000	200	30	100	30
091 Tmb	30	<10	N	N	50	200	20
092 Tmb	70	10	N	<20	30	200	50
093 Tmb	70	<10	N	<20	30	200	30
094 Tmb	30	<10	N	200	30	200	30
095 Tmv	50	<10	500	N	30	100	20

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
096 Tmb	38 27 53	112 30 4	1.00	.05	.10	.200	1,000	<.5	50
097 Tmb	38 27 22	112 29 9	1.00	.20	.10	.200	500	N	200
098 Tmb	38 27 27	112 28 47	1.00	.05	.05	.200	700	N	20
099 Tmb	38 27 14	112 28 47	1.00	.10	.10	.100	700	N	30
100 Tmb	38 27 6	112 28 57	1.00	.20	.20	.200	500	.5	50
101 Tmb	38 26 47	112 28 50	1.00	.20	.10	.200	700	<.5	50
102 Tmb	38 26 47	112 29 0	1.00	.20	.10	.200	1,000	N	50
103 Tmb	38 26 15	112 29 12	1.00	.20	.10	.200	500	N	50
104 Tmb	38 25 57	112 28 51	1.00	.20	.20	.200	700	N	70
105 Tmj	38 30 3	112 26 44	1.00	.20	.20	.100	500	5.0	100
106 Tb	38 29 52	112 26 55	10.00	3.00	7.00	1.000	1,000	N	5,000
107 Tb	38 29 38	112 27 14	10.00	5.00	5.00	1.000	2,000	N	300
108 Tb	38 29 32	112 27 12	2.00	1.00	3.00	1.000	500	N	2,000
109 Tmm	38 29 19	112 26 53	.50	.50	.50	.200	200	.5	100
110 Tmm	38 28 34	112 27 21	1.00	.20	.20	.200	700	N	70
111 Tmm	38 28 11	112 27 5	1.00	.10	.10	.100	500	N	70
112 Tmj	38 31 9	112 23 21	N	<.02	<.05	.050	20	N	<20
113 Tmj	38 30 23	112 23 18	2.00	.20	.10	.200	500	<.5	100
114 Tmj	38 30 13	112 23 35	.20	.05	.10	.100	100	<.5	100
115 Tmj	38 29 45	112 23 11	1.00	.20	.50	.200	500	3.0	100
116 Tmj	38 29 33	112 23 25	1.00	.20	.50	.200	300	.5	100
117 Tmj	38 29 27	112 23 31	2.00	2.00	.50	.700	700	2.0	1,000
118 Tbi	38 29 3	112 23 59	2.00	1.00	2.00	.500	500	N	1,000
119 Tbi	38 29 0	112 24 20	2.00	2.00	1.00	1.000	1,000	.5	2,000
120 Tbi	38 29 7	112 24 31	10.00	5.00	2.00	>1.000	1,000	<.5	2,000
121 Tmj	38 29 33	112 24 19	.70	.20	.20	.100	500	<.5	200
122 Tmj	38 29 32	112 24 19	1.00	.30	.10	.100	300	.5	200
123 Tmj	38 29 59	112 24 21	1.00	.50	.20	.200	500	N	200
124 Tmj	38 29 30	112 24 41	10.00	7.00	5.00	1.000	1,500	<.5	3,000
125 Tb	38 28 54	112 23 28	2.00	2.00	.50	.500	500	.5	2,000
126 Tmj	38 29 59	112 24 45	.70	.10	.20	.200	150	<.5	150
127 Tmj	38 30 8	112 25 10	1.00	.50	1.00	.200	2,000	N	300
128 Tbi	38 29 28	112 25 12	5.00	1.00	2.00	.700	700	<.5	2,000
129 Tbi	38 28 55	112 24 42	3.00	2.00	2.00	.700	500	<.5	3,000
130 Tbi	38 29 11	112 25 1	3.00	3.00	2.00	1.000	1,000	N	2,000
131 Tbi	38 29 27	112 22 58	.50	.10	.20	.100	200	N	100
132 Tmj	38 29 22	112 22 42	.50	.05	.70	.200	200	5.0	200
133 Tmj	38 29 23	112 22 42	1.00	.05	.05	.100	300	10.0	100
134 Tmj	38 28 37	112 22 43	1.00	.10	.10	.100	300	<.5	70
135 Tmj	38 29 34	112 22 48	1.00	.70	.50	.200	500	N	200
136 Tmb	38 30 13	112 28 56	1.00	.20	1.00	.200	500	.7	20
137 Tmb	38 29 50	112 28 45	2.00	.10	.50	.500	1,000	N	100
138 Tmb	38 29 29	112 28 55	1.00	.10	.10	.200	1,000	<.5	100
139 Tmb	38 29 24	112 29 12	1.00	.10	.20	.200	1,000	N	100
140 Tmb	38 28 44	112 29 36	1.00	.05	1.00	.200	1,000	<.5	50

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
096 Tmb	20.0	7.00	<20	<5	70	15	70	<5
097 Tmb	15.0	N	N	<5	70	5	70	N
098 Tmb	15.0	N	N	N	70	<5	70	<5
099 Tmb	7.0	7.00	N	N	30	N	50	N
100 Tmb	15.0	N	N	<5	70	<5	70	N
101 Tmb	15.0	7.00	N	N	30	N	50	<5
102 Tmb	15.0	N	N	<5	30	<5	70	N
103 Tmb	15.0	5.00	N	N	50	N	50	N
104 Tmb	30.0	20.00	N	N	30	N	70	N
105 Tmj	15.0	15.00	<20	50	70	N	50	<5
106 Tb	3.0	N	200	100	100	7	20	70
107 Tb	1.5	N	100	50	50	5	<20	50
108 Tb	5.0	10.00	<20	15	100	N	20	<5
109 Tmm	10.0	N	<20	<5	70	5	30	<5
110 Tmm	15.0	N	N	N	50	N	30	N
111 Tmm	10.0	30.00	N	N	50	N	50	<5
112 Tmj	10.0	N	N	<5	20	N	20	<5
113 Tmj	10.0	N	<20	<5	50	7	50	<5
114 Tmj	7.0	30.00	N	<5	50	5	30	N
115 Tmj	20.0	N	<20	<5	100	N	30	N
116 Tmj	15.0	N	N	<5	50	N	50	<5
117 Tmj	5.0	7.00	<20	10	150	N	30	<5
118 Tbi	7.0	7.00	<20	10	70	N	20	N
119 Tbi	5.0	15.00	<20	20	50	N	20	<5
120 Tbi	3.0	N	100	70	100	N	20	50
121 Tmj	10.0	7.00	<20	7	70	N	50	<5
122 Tmj	10.0	20.00	20	<5	100	N	50	<5
123 Tmj	15.0	15.00	30	5	70	N	50	5
124 Tmj	2.0	N	200	70	70	N	<20	100
125 Tb	5.0	N	<20	15	100	<5	20	N
126 Tmj	15.0	20.00	<20	<5	70	N	30	<5
127 Tmj	20.0	N	20	10	70	N	50	5
128 Tbi	2.0	N	30	30	100	N	20	7
129 Tbi	7.0	N	20	30	100	5	30	7
130 Tbi	2.0	N	<20	20	100	5	20	<5
131 Tbi	7.0	N	20	5	70	<5	30	<5
132 Tmj	15.0	N	30	<5	100	N	30	5
133 Tmj	15.0	30.00	150	7	50	N	30	<5
134 Tmj	15.0	N	<20	<5	50	N	30	N
135 Tmj	10.0	N	<20	<5	70	5	50	<5
136 Tmb	20.0	20.00	N	10	50	5	70	N
137 Tmb	20.0	N	<20	<5	100	10	70	N
138 Tmb	15.0	20.00	N	N	70	10	50	<5
139 Tmb	15.0	N	N	<5	70	7	70	<5
140 Tmb	15.0	20.00	N	<5	50	10	50	<5

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
096 Tmb	50	<10	N	100	50	200	30
097 Tmb	50	<10	N	N	50	200	30
098 Tmb	50	<10	N	N	20	200	30
099 Tmb	30	<10	N	100	30	200	20
100 Tmb	100	<10	N	N	30	200	30
101 Tmb	50	<10	N	100	30	200	30
102 Tmb	70	<10	N	N	30	200	30
103 Tmb	50	<10	N	50	30	200	30
104 Tmb	30	N	<100	100	50	200	30
105 Tmj	100	<10	<100	70	30	100	30
106 Tb	50	N	700	N	50	200	30
107 Tb	20	N	500	N	30	100	20
108 Tb	30	N	500	100	30	500	30
109 Tmm	70	<10	<100	N	20	200	50
110 Tmm	70	N	N	N	20	200	30
111 Tmm	70	N	N	200	20	200	30
112 Tmj	50	N	N	N	10	200	20
113 Tmj	100	10	N	N	30	200	50
114 Tmj	30	N	N	100	20	200	20
115 Tmj	100	<10	100	N	20	200	70
116 Tmj	50	N	N	N	30	200	30
117 Tmj	70	N	200	70	30	200	50
118 Tbi	50	N	500	100	20	200	30
119 Tbi	30	N	500	200	15	500	30
120 Tbi	70	N	700	N	30	200	50
121 Tmj	70	N	<100	70	30	200	50
122 Tmj	70	N	<100	200	30	200	50
123 Tmj	50	N	<100	200	20	200	30
124 Tmj	70	N	500	N	30	200	30
125 Tb	50	N	700	N	30	500	30
126 Tmj	70	N	<100	200	20	200	30
127 Tmj	70	10	500	N	50	200	50
128 Tbi	50	N	700	N	50	200	50
129 Tbi	70	N	700	N	30	200	50
130 Tbi	50	N	500	N	30	300	30
131 Tbi	50	N	N	N	15	200	30
132 Tmj	50	N	<100	N	20	200	30
133 Tmj	70	N	N	200	50	200	30
134 Tmj	15	<10	N	N	20	200	50
135 Tmj	100	N	150	N	20	200	50
136 Tmb	100	<10	N	200	30	200	30
137 Tmb	50	<10	N	N	70	200	50
138 Tmb	50	<10	N	200	50	200	30
139 Tmb	50	<10	N	N	50	100	30
140 Tmb	50	<10	N	100	30	200	20

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
141 Tmb	38 28 31	112 29 47	1.00	.10	.50	.500	1,500	N	50
142 Tmb	38 28 13	112 30 32	1.00	.10	.05	.200	1,000	N	100
143 Tmb	38 28 33	112 30 45	1.00	.10	.05	.200	700	N	50
144 Tmb	38 28 59	112 30 56	1.00	.10	.10	.100	1,000	<.5	100
145 Tmb	38 29 7	112 30 42	1.00	.10	<.05	.300	1,500	N	100
146 Tmb	38 29 22	112 30 34	2.00	.10	.05	.200	1,000	<.5	50
147 Tmb	38 29 30	112 30 36	1.00	.05	.05	.200	1,000	<.5	70
148 Tmm	38 29 52	112 31 1	1.00	.05	<.05	.200	1,000	N	50
149 Tmm	38 25 56	112 23 52	10.00	2.00	5.00	1.000	700	N	2,000
150 Tmm	38 25 41	112 23 45	5.00	1.00	2.00	1.000	1,500	N	1,500
151 Tml	38 25 30	112 23 54	1.00	.20	.05	.050	700	<.5	20
152 Tml	38 25 40	112 23 14	.70	.10	.10	.200	150	.7	200
153 Tb	38 26 10	112 22 36	5.00	2.00	3.00	1.000	1,000	N	2,000
154 Tb	38 26 11	112 22 36	3.00	3.00	3.00	1.000	700	<.5	2,000
155 Tb	38 26 33	112 22 32	.50	.05	.10	.100	100	<.5	100
156 Tmj	38 26 40	112 22 27	.50	.05	.10	.100	70	<.5	70
157 Tb	38 26 53	112 22 17	10.00	5.00	2.00	1.000	1,000	N	1,500
158 Tmj	38 27 30	112 21 44	3.00	2.00	2.00	.500	500	<.5	1,000
159 Tmj	38 27 41	112 21 39	1.50	.50	2.00	.500	700	N	300
160 Tb	38 27 11	112 21 57	10.00	5.00	2.00	1.000	1,000	N	1,000
161 Tmj	38 27 55	112 21 13	2.00	.50	2.00	.700	1,500	N	500
162 Tmj	38 29 1	112 23 16	.50	.10	.10	.200	150	<.5	20
163 Tb	38 29 21	112 25 39	10.00	5.00	5.00	1.000	1,000	N	1,500
164 Tmm	38 29 5	112 26 9	1.00	.50	.20	.200	700	<.5	100
165 Tmm	38 28 58	112 26 17	1.00	.20	.10	.100	150	<.5	70
166 Tb	38 28 41	112 26 5	10.00	5.00	5.00	1.000	1,000	N	2,000
167 Tb	38 28 32	112 26 0	5.00	1.00	2.00	1.000	1,000	N	2,000
168 Tb	38 28 19	112 26 10	5.00	2.00	2.00	1.000	700	N	1,500
169 Tb	38 27 48	112 26 15	5.00	2.00	2.00	1.000	700	N	2,000
170 Tb	38 27 42	112 25 47	10.00	2.00	5.00	1.000	1,000	N	2,000
171 Tb	38 27 47	112 25 42	10.00	5.00	5.00	1.000	1,000	N	2,000
172 Tb	38 24 9	112 23 18	5.00	1.00	.05	.500	300	N	1,000
173 Tb	38 24 12	112 22 59	5.00	1.00	5.00	.500	700	N	700
174 Tbd	38 24 13	112 22 49	5.00	2.00	2.00	.500	700	N	1,000
175 Tbd	38 24 30	112 22 37	7.00	2.00	3.00	.500	700	N	1,000
176 Tbt	38 24 31	112 22 2	5.00	1.00	2.00	1.000	700	N	1,000
177 Tbm	38 24 59	112 22 21	10.00	1.00	3.00	1.000	700	N	500
178 Tbd	38 25 5	112 21 59	10.00	2.00	3.00	.500	1,000	<.5	1,500
179 Tbu	38 25 36	112 21 29	7.00	5.00	5.00	.500	700	<.5	2,000
180 Tbu	38 25 25	112 21 29	5.00	.20	1.00	.500	300	N	500
181 Tbu	38 25 22	112 21 54	2.00	.50	3.00	.500	700	N	1,000
182 Tbm	38 25 8	112 22 21	7.00	5.00	1.00	1.000	1,000	.5	1,000
183 Tmm	38 25 13	112 22 50	.50	.10	.10	.100	200	<.5	70
184 Tmm	38 25 5	112 22 52	.20	.10	.05	.100	150	N	70
185 Tb	38 23 0	112 25 23	10.00	5.00	5.00	1.000	>5,000	N	2,000

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
141 Tmb	20.0	N	<20	N	70	15	70	N
142 Tmb	15.0	N	<20	N	70	10	70	N
143 Tmb	20.0	N	N	<5	20	10	70	N
144 Tmb	20.0	30.00	<20	N	50	7	70	<5
145 Tmb	15.0	20.00	N	<5	70	7	70	N
146 Tmb	20.0	N	<20	N	70	10	70	<5
147 Tmb	15.0	N	N	N	50	15	70	N
148 Tmm	20.0	20.00	<20	N	70	10	70	<5
149 Tmm	5.0	N	<20	30	100	<5	<20	5
150 Tmm	2.0	N	N	<5	150	N	30	N
151 Tml	15.0	N	N	N	50	N	50	<5
152 Tml	7.0	15.00	20	<5	70	N	50	<5
153 Tb	3.0	N	20	30	50	5	<20	7
154 Tb	3.0	30.00	30	30	70	5	20	7
155 Tb	10.0	N	20	N	30	N	30	<5
156 Tmj	7.0	30.00	<20	<5	50	N	50	<5
157 Tb	3.0	N	200	70	70	N	<20	70
158 Tmj	7.0	N	50	20	50	N	30	15
159 Tmj	10.0	N	70	15	70	<5	30	7
160 Tb	2.0	N	200	70	50	N	20	50
161 Tmj	15.0	N	50	15	70	N	50	15
162 Tmj	7.0	N	70	<5	70	10	50	<5
163 Tb	2.0	N	500	100	70	5	20	70
164 Tmm	15.0	N	<20	N	70	N	50	N
165 Tmm	10.0	N	N	<5	70	N	50	<5
166 Tb	3.0	30.00	500	70	100	7	<20	70
167 Tb	3.0	N	70	30	100	N	20	20
168 Tb	3.0	N	70	50	150	7	<20	30
169 Tb	3.0	20.00	30	50	100	5	20	10
170 Tb	2.0	N	500	100	100	N	<20	70
171 Tb	3.0	20.00	500	70	100	5	20	70
172 Tb	3.0	20.00	30	30	30	N	<20	10
173 Tb	5.0	N	50	20	30	N	<20	30
174 Tbd	2.0	N	50	15	20	N	<20	30
175 Tbd	2.0	20.00	50	20	50	N	<20	20
176 Tbt	2.0	N	100	20	50	N	<20	50
177 Tbm	3.0	N	30	30	70	N	<20	15
178 Tbd	1.5	N	20	30	100	N	<20	30
179 Tbu	1.5	N	100	50	70	N	N	30
180 Tbu	1.0	N	50	15	30	N	N	20
181 Tbu	2.0	N	30	7	30	N	N	15
182 Tbm	3.0	20.00	30	70	30	N	<20	20
183 Tmm	7.0	N	N	<5	30	N	50	<5
184 Tmm	10.0	15.00	N	<5	20	N	30	5
185 Tb	5.0	N	50	70	70	N	<20	20

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
141 Tmb	100	10	N	N	70	500	50
142 Tmb	70	<10	N	N	30	200	50
143 Tmb	50	N	N	N	20	500	30
144 Tmb	50	<10	<100	100	30	100	30
145 Tmb	50	N	N	100	50	200	30
146 Tmb	70	<10	N	N	50	200	30
147 Tmb	50	<10	N	N	50	200	30
148 Tmm	70	<10	N	100	30	200	30
149 Tmm	30	N	1,000	N	50	200	30
150 Tmm	50	N	500	N	50	300	30
151 Tml	15	N	N	N	30	200	20
152 Tml	10	N	<100	100	20	200	30
153 Tb	30	N	1,000	N	30	200	30
154 Tb	30	N	1,000	200	30	200	30
155 Tb	70	N	N	N	10	100	15
156 Tmj	50	N	N	500	20	200	30
157 Tb	30	N	1,000	N	30	200	30
158 Tmj	50	N	500	N	30	200	30
159 Tmj	70	N	100	N	30	200	20
160 Tb	15	N	700	N	30	200	20
161 Tmj	70	N	150	N	30	200	30
162 Tmj	N	N	N	N	20	200	30
163 Tb	20	N	700	N	30	200	20
164 Tmm	50	N	N	N	20	200	30
165 Tmm	70	N	N	N	15	200	30
166 Tb	50	N	1,000	200	30	200	30
167 Tb	30	N	300	N	50	200	30
168 Tb	50	N	700	N	30	200	30
169 Tb	70	N	500	200	30	300	30
170 Tb	30	N	700	N	30	200	30
171 Tb	50	N	1,000	200	30	200	30
172 Tb	15	N	700	200	15	200	20
173 Tb	<10	N	200	N	20	200	10
174 Tbd	10	N	700	N	20	200	10
175 Tbd	20	N	700	100	20	100	30
176 Tbt	10	N	700	N	20	200	30
177 Tbm	30	N	700	N	30	200	20
178 Tbd	30	N	1,500	N	20	200	30
179 Tbu	30	N	1,000	N	30	200	30
180 Tbu	30	N	700	N	15	200	10
181 Tbu	10	N	700	N	20	100	20
182 Tbm	20	N	500	100	30	200	20
183 Tmm	15	N	N	N	15	200	20
184 Tmm	70	N	N	100	10	200	15
185 Tb	50	N	700	N	30	200	30

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
186 Tmbl	38 23 47	112 24 59	1.00	.10	.10	.500	150	<.5	50
187 Tmbl	38 23 45	112 25 15	1.00	.50	.30	.200	>5,000	N	200
188 Tb	38 23 28	112 25 36	10.00	5.00	5.00	1.000	2,000	N	2,000
189 Tb	38 23 13	112 26 4	2.00	.50	2.00	.500	500	N	700
190 Tb	38 23 8	112 26 11	7.00	2.00	5.00	1.000	1,000	N	1,000
191 Tb	38 22 58	112 26 28	2.00	1.00	1.00	1.000	500	<.5	500
192 Tbi	38 22 23	112 26 57	5.00	2.00	2.00	1.000	700	N	1,000
193 Tb	38 22 4	112 27 12	2.00	.50	2.00	1.000	700	N	1,000
194 Tb	38 21 53	112 27 32	1.00	.20	.10	.200	300	N	500
195 Tb	38 22 9	112 27 38	2.00	1.00	.10	.500	100	N	1,000
196 Tb	38 22 22	112 27 52	2.00	.02	.05	.500	30	N	1,500
197 Tbi	38 22 17	112 28 26	7.00	3.00	3.00	1.000	1,000	N	1,500
198 Tb	38 22 21	112 29 3	10.00	2.00	3.00	1.000	700	N	1,000
199 Tb	38 22 21	112 29 41	1.00	.50	.10	.500	30	.5	500
200 Tmm	38 28 12	112 27 51	1.00	.20	.20	1.000	700	<.5	150
201 Tmm	38 28 2	112 28 8	1.00	.50	.50	.200	500	<.5	100
202 Tmm	38 27 53	112 28 21	.50	.05	.05	.200	300	N	N
203 Tmb	38 26 57	112 28 7	1.00	.20	.10	.200	1,500	<.5	100
204 Tmb	38 26 46	112 28 11	1.00	.20	.10	.200	500	<.5	70
205 Tmb	38 26 26	112 28 12	1.00	.05	.10	.200	150	<.5	70
206 Tmb	38 26 23	112 28 2	1.00	.10	.10	.200	200	<.5	50
207 Tmb	38 26 12	112 27 44	1.00	.20	.10	.200	500	.5	70
208 Tmb	38 26 34	112 27 46	.50	.10	.10	.200	200	.5	100
209 Tmb	38 27 18	112 27 54	2.00	.10	.10	.200	1,000	<.5	100
210 Tmm	38 27 32	112 27 36	1.00	.20	.20	.100	500	N	70
211 Tmm	38 28 5	112 27 26	1.00	.20	.20	.200	700	N	70
212 Tmbl	38 25 49	112 24 18	1.00	.20	.10	.100	300	N	50
213 Tmm	38 25 49	112 24 30	.50	.10	.05	.100	500	<.5	20
214 Tmbl	38 26 0	112 24 31	.50	.10	.20	.200	700	<.5	100
215 Tml	38 26 32	112 24 18	.50	.10	.05	.100	300	<.5	50
216 Tml	38 26 29	112 24 27	1.00	.10	.10	.200	150	<.5	100
501 Tmb	38 26 18	112 31 55	.70	.20	.10	.100	700	N	30
502 Tb	38 26 53	112 31 45	10.00	2.00	2.00	1.000	1,500	N	2,000
503 Tb	38 26 21	112 32 22	2.00	1.00	1.00	.500	700	<.5	700
504 Tmv	38 26 1	112 30 25	1.00	.10	.10	.200	1,000	N	70
505 Tmv	38 25 51	112 30 21	1.00	.05	<.05	.200	1,000	N	20
506 Tmv	38 25 1	112 31 17	1.00	.50	.20	.200	1,000	<.5	100
507 Tmv	38 24 44	112 30 55	1.00	.07	.10	.200	1,000	<.5	50
508 Tmv	38 24 22	112 30 55	1.00	.20	1.00	.200	1,000	<.5	100
509 Tmb	38 24 19	112 31 10	2.00	.20	.10	.200	1,000	.5	200
510 Tmb	38 24 11	112 31 16	1.00	.20	.10	.200	1,500	N	70
511 Tmb	38 24 5	112 31 25	1.00	.20	.10	.200	700	N	100
512 Tmb	38 24 6	112 31 43	1.00	.10	.10	>1.000	700	N	100
513 Tmb	38 24 24	112 31 51	1.00	.10	.10	.200	700	N	100
514 Tmb	38 24 57	112 32 2	.50	.20	.50	.100	500	<.5	100

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
186 Tmbl	5.0	20.00	N	N	30	N	70	<5
187 Tmbl	20.0	N	<20	7	150	N	50	<5
188 Tb	5.0	30.00	50	70	50	<5	<20	20
189 Tb	3.0	20.00	30	10	70	N	20	15
190 Tb	5.0	N	50	30	100	7	20	30
191 Tb	5.0	15.00	<20	30	100	<5	30	N
192 Tbi	5.0	N	50	50	70	<5	<20	30
193 Tb	7.0	N	<20	7	50	7	20	<5
194 Tb	7.0	N	<20	7	50	N	20	<5
195 Tb	5.0	7.00	<20	10	150	N	30	N
196 Tb	<1.0	N	<20	30	N	N	<20	<5
197 Tbi	5.0	N	100	70	50	N	20	30
198 Tb	3.0	20.00	70	70	70	N	20	50
199 Tb	3.0	N	N	15	50	5	30	<5
200 Tmm	15.0	20.00	N	<5	70	5	30	<5
201 Tmm	7.0	N	N	<5	70	5	50	<5
202 Tmm	15.0	N	<20	N	30	5	70	<5
203 Tmb	10.0	20.00	N	N	30	N	70	<5
204 Tmb	15.0	N	N	<5	70	N	70	N
205 Tmb	15.0	N	N	N	30	N	70	<5
206 Tmb	15.0	N	<20	N	30	5	70	<5
207 Tmb	15.0	N	N	<5	50	7	70	N
208 Tmb	20.0	10.00	N	N	20	N	50	<5
209 Tmb	10.0	N	N	<5	70	N	70	<5
210 Tmm	20.0	N	N	<5	30	N	70	<5
211 Tmm	15.0	N	<20	<5	70	<5	70	<5
212 Tmbl	30.0	N	N	N	30	N	50	5
213 Tmm	7.0	N	N	N	20	N	50	5
214 Tmbl	10.0	N	N	<5	30	5	50	<5
215 Tml	3.0	N	N	N	20	N	50	<5
216 Tml	10.0	N	N	N	70	N	30	<5
501 Tmb	20.0	5.00	N	N	50	N	50	<5
502 Tb	3.0	N	200	70	100	<5	20	50
503 Tb	15.0	N	30	15	70	N	50	10
504 Tmv	15.0	N	30	N	50	7	70	<5
505 Tmv	10.0	N	<20	N	30	N	70	<5
506 Tmv	20.0	15.00	<20	<5	70	5	50	N
507 Tmv	10.0	N	N	N	70	N	50	<5
508 Tmv	15.0	N	N	N	50	N	50	N
509 Tmb	15.0	N	N	<5	70	10	70	<5
510 Tmb	15.0	N	N	N	70	10	70	N
511 Tmb	10.0	N	<20	<5	70	5	70	N
512 Tmb	10.0	50.00	N	N	70	20	70	<5
513 Tmb	10.0	N	N	N	70	15	70	<5
514 Tmb	10.0	N	N	N	20	N	<20	<5

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
186 Tmbl	30	<10	N	200	30	300	50
187 Tmbl	100	N	<100	N	70	200	30
188 Tb	30	N	700	200	50	200	30
189 Tb	20	N	300	100	30	200	20
190 Tb	30	N	500	N	30	200	30
191 Tb	70	<10	200	100	30	1,000	30
192 Tbi	30	N	500	N	20	200	30
193 Tb	30	N	500	N	30	500	15
194 Tb	30	10	100	N	50	200	20
195 Tb	20	N	100	100	30	300	30
196 Tb	N	N	200	N	<10	100	N
197 Tbi	20	N	700	N	30	500	15
198 Tb	20	N	700	200	30	200	30
199 Tb	30	<10	200	N	20	200	20
200 Tmm	50	N	<100	200	30	100	20
201 Tmm	70	N	<100	N	20	200	30
202 Tmm	50	<10	N	N	30	100	20
203 Tmb	70	<10	N	100	30	200	30
204 Tmb	30	<10	N	N	50	200	50
205 Tmb	50	<10	N	N	20	200	30
206 Tmb	70	<10	N	N	30	200	30
207 Tmb	70	<10	N	N	30	300	50
208 Tmb	70	<10	N	50	30	200	50
209 Tmb	50	10	N	N	50	200	30
210 Tmm	50	N	N	N	50	300	20
211 Tmm	30	<10	N	N	30	200	20
212 Tmbl	15	N	N	N	30	200	15
213 Tmm	<10	N	N	N	30	200	15
214 Tmbl	20	N	N	N	30	200	15
215 Tml	10	N	N	N	20	200	15
216 Tml	10	N	N	<20	20	200	15
501 Tmb	20	N	N	50	30	200	30
502 Tb	70	N	700	N	30	200	50
503 Tb	70	N	500	N	50	300	30
504 Tmv	70	<10	N	N	50	200	30
505 Tmv	30	N	N	N	30	200	15
506 Tmv	100	10	N	70	30	200	50
507 Tmv	100	10	N	N	70	200	50
508 Tmv	50	10	500	N	30	200	30
509 Tmb	70	15	N	N	50	200	50
510 Tmb	70	10	N	N	50	200	50
511 Tmb	70	10	N	<20	50	200	50
512 Tmb	70	10	N	200	50	200	50
513 Tmb	70	10	N	N	50	200	50
514 Tmb	70	N	N	N	10	100	30

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
515 Tmb	38 25 9	112 31 50	1.00	.05	.05	.100	500	<.5	100
516 Tb	38 24 42	112 32 40	7.00	3.00	3.00	1.000	1,000	<.5	1,000
517 Tmbl	38 24 16	112 33 4	.50	.10	.10	.500	150	N	100
518 Tb	38 23 51	112 32 43	1.00	.02	.20	1.000	15	<.5	1,000
519 Tb	38 23 15	112 32 34	7.00	2.00	5.00	1.000	700	N	2,000
520 Tb	38 23 9	112 32 10	5.00	2.00	5.00	1.000	500	<.5	1,500
521 Tmb	38 23 9	112 32 10	1.00	.10	.10	.200	1,000	N	50
522 Tmb	38 22 38	112 32 6	5.00	3.00	3.00	.500	1,000	N	1,000
523 Tmb	38 22 57	112 31 14	.50	.05	.05	.200	50	N	50
524 Tmb	38 22 57	112 31 14	1.00	.05	.05	.200	150	<.5	50
525 Tmb	38 23 3	112 31 11	.70	.20	.10	.200	70	<.5	100
526 Tmb	38 23 4	112 30 47	1.00	.20	1.00	.200	200	<.5	70
527 Tmb	38 23 16	112 31 3	1.00	.10	.10	.200	1,000	N	50
528 Tmb	38 23 26	112 31 21	1.00	.20	.20	.200	700	N	50
529 Tmb	38 23 28	112 30 52	1.00	.20	.10	.200	700	<.5	50
530 Tmb	38 23 46	112 29 23	1.00	.10	.20	.200	500	<.5	70
531 Tmb	38 23 51	112 29 24	1.00	.20	.20	.200	500	<.5	50
532 Tmb	38 23 51	112 29 23	1.00	.10	.20	.200	500	N	50
533 Tmb	38 24 12	112 29 33	1.00	.10	.20	.200	300	<.5	50
534 Tmb	38 24 26	112 29 7	1.00	.10	1.00	.200	500	N	70
535 Tmb	38 24 42	112 28 42	1.00	.10	.20	.200	500	<.5	70
536 Tmb	38 24 34	112 28 41	1.00	.10	.20	.200	300	<.5	70
537 Tmb	38 24 27	112 28 5	.50	.05	.05	.200	100	<.5	100
538 Tmb	38 24 34	112 27 27	.50	.20	.10	.100	100	<.5	70
539 Tmb	38 24 44	112 27 33	1.00	.10	.10	.200	150	<.5	70
540 Tmb	38 25 4	112 27 55	1.00	.10	.10	.100	200	<.5	50
541 Tmb	38 25 5	112 28 13	1.00	.05	.20	.200	500	N	30
542 Tmm	38 25 9	112 30 26	.05	.10	2.00	.200	300	<.5	70
543 Tmm	38 25 27	112 30 43	1.00	.10	.20	.050	700	N	100
544 Tmm	38 25 28	112 30 36	1.50	.20	.50	.500	700	<.5	100
545 Tb	38 25 15	112 30 6	1.00	.20	.50	.500	500	N	50
546 Tmb	38 24 33	112 29 26	.50	.10	.10	.100	300	<.5	70
547 Tmb	38 24 47	112 29 29	1.00	.20	.10	.100	300	<.5	70
548 Tmb	38 24 56	112 29 23	1.00	.20	.20	.200	300	.5	50
549 Tmb	38 25 4	112 29 7	1.00	.20	.10	.050	150	<.5	50
550 Tbi	38 26 1	112 32 49	10.00	5.00	5.00	1.000	1,000	N	1,500
551 Tbi	38 26 0	112 32 49	10.00	5.00	5.00	1.000	1,000	N	2,000
552 Tmbl	38 27 20	112 30 10	1.00	.20	.10	.500	700	<.5	70
553 Tmm	38 27 20	112 30 51	1.00	.20	.10	.100	500	<.5	30
554 Tmv	38 27 43	112 30 50	1.00	.10	.10	.100	1,000	N	70
555 Tmb	38 27 45	112 30 54	1.00	.10	.05	.200	1,000	N	50
556 Tmv	38 27 28	112 31 12	1.00	.50	1.00	.100	1,500	<.5	150
557 Tmbl	38 27 12	112 31 10	1.00	.10	.10	.050	1,000	<.5	70
558 Tb	38 27 23	112 31 51	10.00	3.00	5.00	1.000	500	<.5	1,000
559 Tb	38 28 16	112 32 40	2.00	1.00	2.00	1.000	700	<.5	2,000

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
515 Tmb	15.0	N	50	50	50	N	50	5
516 Tb	2.0	15.00	200	70	70	<5	<20	50
517 Tmbl	1.0	N	<20	<5	20	N	50	N
518 Tb	1.0	N	100	20	70	<5	20	<5
519 Tb	2.0	10.00	200	70	100	5	N	50
520 Tb	15.0	7.00	100	N	50	7	50	N
521 Tmb	3.0	10.00	<20	50	50	15	<20	50
522 Tmb	5.0	20.00	100	30	30	N	<20	50
523 Tmb	15.0	N	<20	N	30	N	70	<5
524 Tmb	10.0	N	N	N	N	<5	50	N
525 Tmb	15.0	N	<20	N	50	N	50	<5
526 Tmb	7.0	N	N	N	30	N	70	N
527 Tmb	10.0	N	<20	<5	50	N	50	<5
528 Tmb	10.0	5.00	<20	N	50	<5	70	N
529 Tmb	15.0	10.00	N	N	50	N	50	N
530 Tmb	15.0	N	N	N	50	N	70	<5
531 Tmb	15.0	10.00	N	N	70	5	70	<5
532 Tmb	20.0	N	<20	N	30	5	70	N
533 Tmb	15.0	7.00	N	N	50	N	70	<5
534 Tmb	15.0	N	N	N	50	N	70	<5
535 Tmb	15.0	N	N	N	70	<5	70	<5
536 Tmb	15.0	N	N	<5	70	<5	50	<5
537 Tmb	15.0	N	N	N	30	15	70	<5
538 Tmb	7.0	N	N	N	150	7	70	<5
539 Tmb	20.0	N	N	<5	30	5	70	<5
540 Tmb	15.0	N	N	N	<20	N	50	<5
541 Tmb	20.0	N	<20	N	50	N	70	<5
542 Tmm	15.0	N	N	N	30	7	50	N
543 Tmm	70.0	N	<20	<5	70	N	50	<5
544 Tmm	30.0	N	<20	<5	70	<5	70	N
545 Tb	20.0	N	N	<5	50	N	70	<5
546 Tmb	15.0	N	<20	N	30	10	50	<5
547 Tmb	15.0	N	N	N	100	N	50	N
548 Tmb	20.0	N	N	<5	30	N	70	N
549 Tmb	15.0	N	N	N	30	N	50	<5
550 Tbi	3.0	10.00	100	70	70	5	20	50
551 Tbi	3.0	N	150	70	100	5	20	50
552 Tmbl	15.0	10.00	N	N	50	7	70	N
553 Tmm	15.0	N	20	N	70	N	70	<5
554 Tmv	10.0	N	N	N	50	N	70	<5
555 Tmb	15.0	N	N	N	50	N	70	<5
556 Tmv	20.0	30.00	<20	<5	100	N	70	<5
557 Tmbl	10.0	N	N	N	70	15	50	<5
558 Tb	1.5	30.00	100	50	50	N	<20	70
559 Tb	3.0	N	<20	20	70	5	30	<5

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
515 Tmb	30	N	N	N	30	200	50
516 Tb	20	N	700	150	30	200	30
517 Tmbl	N	N	N	N	20	500	N
518 Tb	30	N	2,000	N	30	500	30
519 Tb	30	N	1,000	100	30	200	30
520 Tb	50	<10	N	100	30	200	30
521 Tmb	30	N	700	150	30	200	20
522 Tmb	15	N	700	N	20	100	15
523 Tmb	70	<10	N	N	30	100	30
524 Tmb	70	<10	N	N	30	200	30
525 Tmb	30	N	N	N	30	200	15
526 Tmb	50	<10	N	N	30	200	30
527 Tmb	30	N	N	N	30	300	30
528 Tmb	50	N	N	50	30	100	30
529 Tmb	50	<10	N	100	30	200	30
530 Tmb	50	<10	N	N	30	200	30
531 Tmb	70	<10	N	100	50	200	30
532 Tmb	70	<10	N	N	30	100	30
533 Tmb	70	<10	N	70	30	200	30
534 Tmb	50	<10	N	N	50	100	30
535 Tmb	50	<10	N	N	30	200	30
536 Tmb	70	<10	N	N	50	200	30
537 Tmb	50	<10	N	N	30	200	30
538 Tmb	70	<10	N	N	50	200	30
539 Tmb	30	<10	N	N	30	300	30
540 Tmb	50	<10	N	N	20	100	30
541 Tmb	30	<10	N	N	30	200	30
542 Tmm	50	N	150	N	30	200	30
543 Tmm	70	<10	N	N	30	200	30
544 Tmm	50	<10	<100	N	50	300	30
545 Tb	30	<10	N	N	30	200	20
546 Tmb	30	<10	N	N	30	300	30
547 Tmb	50	<10	N	N	30	200	30
548 Tmb	50	<10	N	N	30	300	30
549 Tmb	50	<10	N	100	50	300	30
550 Tbi	50	N	700	100	30	300	30
551 Tbi	50	N	1,000	N	50	500	30
552 Tmbl	50	<10	N	200	30	300	30
553 Tmm	30	<10	N	N	50	500	30
554 Tmv	70	N	N	N	30	300	30
555 Tmb	50	<10	N	50	30	300	30
556 Tmv	70	<10	500	200	50	300	30
557 Tmbl	50	<10	N	N	50	300	30
558 Tb	30	N	700	200	30	200	20
559 Tb	70	N	500	N	30	300	50

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
560 Tb	38 28 30	112 31 34	10.00	2.00	3.00	.500	700	N	1,500
561 Tb	38 28 39	112 31 29	2.00	1.00	3.00	.500	1,000	N	700
562 Tb	38 28 37	112 31 52	7.00	1.00	5.00	1.000	1,000	<.5	1,000
563 Tmb	38 28 30	112 32 3	1.00	.10	.05	.100	700	N	30
564 Tmb	38 28 38	112 32 20	2.00	1.00	2.00	.500	1,000	<.5	50
565 Tb	38 28 24	112 32 44	7.00	1.00	5.00	1.000	700	N	1,000
566 Tb	38 28 24	112 32 44	10.00	5.00	5.00	1.000	700	N	2,000
567 Tb	38 28 2	112 32 51	10.00	2.00	5.00	1.000	500	<.5	2,000
568 Tb	38 28 1	112 32 37	10.00	5.00	10.00	.500	1,500	N	1,000
569 Tb	38 27 38	112 32 30	10.00	5.00	5.00	.500	1,500	N	500
570 Tmb	38 24 27	112 27 6	1.00	.05	<.05	.200	200	<.5	50
571 Tmb	38 24 18	112 26 32	.50	.05	<.05	.100	100	<.5	50
572 Tmb	38 24 7	112 26 4	1.00	.20	.20	.200	200	.5	50
573 Tmb	38 23 52	112 26 19	1.00	.10	.05	.100	300	<.5	50
574 Tmb	38 23 37	112 26 37	.50	.05	<.05	.100	100	<.5	30
575 Tmb	38 23 27	112 26 54	1.00	.10	.05	.200	200	<.5	50
576 Tmb	38 23 15	112 27 19	1.00	.10	.10	.100	300	<.5	70
577 Tmb	38 23 4	112 27 52	1.00	.10	.10	.100	500	<.5	50
578 Tmb	38 23 8	112 28 12	.50	.05	<.05	.100	150	<.5	50
579 Tmb	38 23 11	112 28 30	.50	.05	<.05	.050	300	.5	20
580 Tmb	38 23 36	112 28 39	1.00	.10	.20	.100	300	N	50
581 Tb	38 21 43	112 31 31	10.00	3.00	5.00	1.000	700	.5	1,000
582 Tb	38 22 2	112 30 24	1.00	1.00	.10	1.000	150	5.0	1,000
583 Tb	38 21 54	112 30 46	1.00	.50	.20	.500	200	<.5	500
584 Tb	38 21 53	112 32 34	5.00	5.00	3.00	1.000	700	<.5	2,000
585 Tmm	38 22 6	112 32 46	.50	.02	.05	.100	50	.5	200
586 Tb	38 22 6	112 32 46	.50	.10	.20	.100	500	<.5	300
587 Tb	38 21 43	112 32 46	1.00	.50	.10	.200	300	<.5	100
588 Tmb	38 22 46	112 32 47	10.00	3.00	5.00	1.000	700	N	1,500
589 Tb	38 22 23	112 31 58	.50	.05	.05	.100	200	<.5	30
590 Tb	38 21 53	112 31 52	10.00	3.00	7.00	1.000	1,000	N	1,500
591 Tmv	38 22 29	112 31 31	2.00	1.00	.30	.500	700	<.5	500
592 Tmb	38 22 22	112 33 46	1.00	.10	.10	.200	2,000	<.5	70
593 Tb	38 22 38	112 33 33	10.00	5.00	5.00	1.000	700	<.5	2,000
594 Tb	38 22 23	112 33 59	5.00	5.00	5.00	1.000	700	<.5	2,000
595 Tb	38 23 51	112 34 0	2.00	1.00	2.00	1.000	500	<.5	2,000
596 Tb	38 23 45	112 33 46	2.00	1.00	2.00	1.000	700	N	2,000
597 Tb	38 23 43	112 33 54	2.00	1.00	.10	.500	200	.7	1,000
598 Tb	38 24 9	112 34 7	2.00	1.00	.20	.500	200	N	2,000
599 Tb	38 24 29	112 33 54	.50	<.02	.20	.500	<10	N	1,000
600 JPs	38 24 43	112 34 3	1.00	.70	.20	.100	200	<.5	100
601 Tb	38 24 46	112 33 41	1.00	.02	.20	.500	20	<.5	2,000
602 Tb	38 25 51	112 35 21	.20	<.02	.05	.500	10	N	200
603 Tb	38 26 45	112 34 2	10.00	5.00	5.00	1.000	1,000	N	1,500
604 Qtz	38 26 44	112 34 33	.50	.10	.10	.010	200	1.0	200

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
560 Tb	1.0	15.00	100	20	50	N	<20	20
561 Tb	1.5	N	50	30	30	N	N	15
562 Tb	1.5	N	50	30	50	N	N	15
563 Tmb	15.0	30.00	N	N	30	5	70	<5
564 Tmb	10.0	N	N	N	200	N	50	N
565 Tb	2.0	30.00	70	50	50	N	<20	50
566 Tb	1.0	N	200	70	70	N	<20	70
567 Tb	1.0	15.00	<20	50	50	N	<20	20
568 Tb	1.0	20.00	500	70	20	<5	N	50
569 Tb	1.5	N	100	70	30	N	N	30
570 Tmb	15.0	N	<20	N	20	7	70	<5
571 Tmb	15.0	N	N	N	20	7	70	5
572 Tmb	15.0	N	N	N	70	5	70	N
573 Tmb	20.0	30.00	N	N	50	5	70	<5
574 Tmb	10.0	N	N	N	20	7	50	<5
575 Tmb	15.0	15.00	N	N	200	7	50	<5
576 Tmb	15.0	N	20	N	70	7	70	<5
577 Tmb	20.0	N	<20	N	70	N	70	N
578 Tmb	15.0	N	N	N	20	<5	50	<5
579 Tmb	20.0	30.00	N	N	20	5	70	<5
580 Tmb	15.0	N	N	N	70	N	50	5
581 Tb	1.5	N	100	70	70	5	<20	50
582 Tb	3.0	20.00	<20	15	100	20	30	<5
583 Tb	5.0	<5.00	N	10	20	N	30	5
584 Tb	2.0	5.00	200	50	70	5	<20	70
585 Tmm	5.0	20.00	30	<5	100	7	20	<5
586 Tb	15.0	N	50	<5	30	N	20	<5
587 Tb	10.0	N	<20	<5	100	N	N	5
588 Tmb	3.0	20.00	150	50	70	5	<20	50
589 Tb	7.0	N	20	N	30	N	30	<5
590 Tb	3.0	N	150	100	100	5	<20	50
591 Tmv	7.0	N	30	20	70	N	30	10
592 Tmb	20.0	N	<20	N	70	5	70	N
593 Tb	2.0	N	100	70	70	5	N	50
594 Tb	2.0	50.00	200	70	70	N	<20	50
595 Tb	5.0	N	<20	20	70	5	20	<5
596 Tb	5.0	N	20	20	100	7	30	<5
597 Tb	5.0	N	20	15	100	5	30	<5
598 Tb	2.0	30.00	20	15	100	5	20	5
599 Tb	N	N	20	7	50	15	<20	N
600 JPs	1.0	N	20	5	N	N	N	5
601 Tb	<1.0	30.00	30	50	100	5	<20	N
602 Tb	1.0	N	30	<5	70	N	<20	N
603 Tb	1.0	30.00	100	30	50	N	<20	50
604 Qtz	7.0	N	20	7	N	7	N	N

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
560 Tb	30	N	700	150	30	200	50
561 Tb	15	N	500	N	20	100	20
562 Tb	30	N	700	N	30	200	30
563 Tmb	30	N	N	150	15	100	20
564 Tmb	70	<10	<100	N	70	500	50
565 Tb	20	N	500	200	30	100	20
566 Tb	30	N	1,000	N	70	200	50
567 Tb	30	N	1,000	50	30	200	50
568 Tb	15	N	700	200	30	200	30
569 Tb	20	N	700	N	30	100	30
570 Tmb	20	<10	N	N	20	200	30
571 Tmb	30	N	N	N	20	300	20
572 Tmb	50	<10	N	N	50	300	30
573 Tmb	70	<10	N	300	15	200	30
574 Tmb	30	N	N	N	20	200	20
575 Tmb	70	<10	N	200	70	200	30
576 Tmb	50	<10	N	30	50	200	30
577 Tmb	50	<10	N	N	50	300	30
578 Tmb	20	N	N	N	30	200	30
579 Tmb	30	N	N	500	20	200	20
580 Tmb	30	N	N	N	30	200	20
581 Tb	50	N	1,000	N	30	200	30
582 Tb	50	N	150	200	50	500	30
583 Tb	10	N	100	70	20	500	15
584 Tb	30	N	700	100	30	200	50
585 Tmm	20	N	<100	200	15	200	15
586 Tb	30	N	N	N	15	100	20
587 Tb	20	N	N	N	50	200	10
588 Tmb	50	N	700	200	30	200	50
589 Tb	30	N	N	N	10	150	30
590 Tb	30	N	500	N	30	200	50
591 Tmv	70	N	<100	N	30	200	50
592 Tmb	70	10	N	N	50	200	50
593 Tb	30	N	1,000	N	30	200	30
594 Tb	50	N	700	200	30	200	50
595 Tb	50	N	500	N	20	100	30
596 Tb	50	N	1,000	N	30	500	50
597 Tb	50	<10	300	N	30	200	30
598 Tb	15	N	100	200	30	200	30
599 Tb	100	N	700	N	<10	200	50
600 JPs	N	N	N	N	N	200	N
601 Tb	70	N	1,000	200	30	200	50
602 Tb	15	N	200	N	20	200	15
603 Tb	50	N	1,000	200	30	200	30
604 Qtz	N	N	<100	N	<10	100	N

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
605 Tb	38 26 55	112 34 35	1.00	<.02	<.05	>1.000	15	N	<20
606 Tb	38 26 56	112 34 25	10.00	3.00	3.00	1.000	700	N	1,000
607 Tb	38 26 57	112 34 26	10.00	2.00	3.00	1.000	1,000	N	1,500
608 Tb	38 29 8	112 33 8	5.00	5.00	2.00	.500	700	<.5	1,000
609 Tb	38 29 14	112 32 36	1.00	.10	<.05	.200	1,500	N	50
610 Tmi	38 29 42	112 32 40	5.00	2.00	2.00	.500	1,000	N	1,000
611 Tb	38 29 36	112 32 11	10.00	3.00	2.00	1.000	500	N	1,000
612 Tb	38 29 42	112 33 13	2.00	1.00	2.00	.700	700	N	1,000
613 Tb	38 29 49	112 33 18	5.00	2.00	5.00	1.000	700	N	1,000
614 Tb	38 30 2	112 33 27	7.00	2.00	3.00	1.000	500	<.5	2,000
615 Tb	38 29 37	112 33 56	10.00	3.00	3.00	1.000	700	N	1,000
616 Tb	38 29 24	112 33 55	10.00	2.00	5.00	1.000	1,000	N	1,000
617 Tb	38 29 2	112 33 40	5.00	1.00	2.00	1.000	700	.5	1,000
618 Tb	38 28 43	112 33 32	5.00	1.00	2.00	.500	500	N	1,000
619 Tb	38 28 34	112 33 35	10.00	1.00	5.00	1.000	1,000	<.5	1,000
620 Tb	38 28 30	112 33 59	10.00	1.00	5.00	1.000	700	<.5	1,000
621 Tb	38 28 31	112 34 0	5.00	2.00	5.00	.500	700	<.5	1,000
622 Tb	38 28 38	112 34 15	10.00	2.00	2.00	1.000	700	<.5	2,000
623 Tb	38 27 50	112 34 22	5.00	2.00	2.00	1.000	1,000	N	1,000
624 Tb	38 27 39	112 34 12	5.00	1.00	2.00	1.000	700	<.5	2,000
625 Tb	38 27 55	112 33 50	5.00	2.00	3.00	1.000	700	<.5	2,000
626 Tmb	38 25 23	112 28 13	1.00	.20	.50	.200	1,000	<.5	50
627 Tmb	38 25 9	112 27 40	.70	.05	.10	.200	50	.5	50
628 Tmb	38 24 48	112 27 2	1.00	.10	.20	.200	300	<.5	100
629 Tmb	38 24 42	112 26 37	.70	.05	.05	.200	300	<.5	50
630 Tmb	38 24 36	112 26 2	1.00	.10	.10	.500	50	<.5	500
631 Tmb	38 24 49	112 25 51	.50	.10	.05	.200	70	<.5	50
632 Tmb	38 25 12	112 26 4	.50	.10	.10	.200	150	<.5	100
633 Tmb	38 25 10	112 26 37	1.00	.50	.30	.200	500	<.5	70
634 Tmb	38 25 18	112 26 48	1.00	.10	.10	.200	200	<.5	50
635 Tmb	38 25 41	112 27 46	1.00	.10	.10	.200	500	<.5	50
636 Tmb	38 25 38	112 27 52	1.00	.10	.20	.200	300	<.5	50
637 Tmm	38 29 32	112 27 18	.50	.10	.20	.100	500	<.5	70
638 Tmm	38 28 25	112 27 20	2.00	.20	.20	.500	1,000	<.5	100
639 Tb	38 22 13	112 23 24	5.00	5.00	2.00	1.000	700	<.5	1,500
640 Tbd	38 23 25	112 23 52	5.00	3.00	5.00	.500	1,000	<.5	2,000
641 Tb	38 23 4	112 24 1	10.00	3.00	5.00	1.000	1,000	N	2,000
642 Tb	38 23 6	112 23 41	2.00	1.00	2.00	1.000	700	<.5	2,000
643 Tb	38 22 36	112 23 45	5.00	2.00	3.00	.500	700	N	1,500
644 Tb	38 22 50	112 24 10	5.00	3.00	2.00	1.000	1,000	N	2,000
645 Tmj	38 22 33	112 24 53	1.00	1.00	2.00	.200	500	.5	100
646 Tmj	38 22 36	112 25 2	1.00	.20	.10	.200	500	<.5	100
647 Tb	38 22 55	112 24 43	7.00	2.00	5.00	1.000	500	N	2,000
648 Tmb	38 23 41	112 24 13	1.00	.20	.10	.200	1,500	N	50
649 Tmb	38 23 54	112 24 13	1.00	.20	.50	.200	200	<.5	100

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
605 Tb	<1.0	30.00	50	<5	N	N	<20	N
606 Tb	1.5	N	100	20	70	N	N	50
607 Tb	1.5	N	100	50	70	N	<20	50
608 Tb	2.0	15.00	50	30	50	N	<20	20
609 Tb	15.0	20.00	N	N	50	<5	50	<5
610 Tmi	1.5	N	50	30	50	N	N	20
611 Tb	1.0	N	70	50	50	N	<20	30
612 Tb	1.5	N	50	30	50	N	N	15
613 Tb	1.5	N	50	20	50	N	N	20
614 Tb	2.0	30.00	100	30	70	N	<20	20
615 Tb	1.5	N	50	30	50	N	<20	30
616 Tb	2.0	N	100	50	70	N	<20	50
617 Tb	2.0	N	70	50	30	N	N	20
618 Tb	1.0	N	50	20	30	N	N	15
619 Tb	2.0	N	100	30	50	N	<20	30
620 Tb	1.5	30.00	50	30	20	N	N	20
621 Tb	<1.0	N	100	100	30	N	<20	20
622 Tb	1.5	N	70	30	50	N	<20	20
623 Tb	1.5	20.00	100	50	50	N	<20	50
624 Tb	5.0	N	<20	30	100	10	30	5
625 Tb	2.0	20.00	50	50	70	N	<20	50
626 Tmb	15.0	N	20	N	50	5	70	N
627 Tmb	15.0	N	<20	N	70	N	50	N
628 Tmb	15.0	N	<20	N	N	5	50	N
629 Tmb	15.0	N	20	N	N	5	50	N
630 Tmb	5.0	15.00	<20	N	70	5	70	<5
631 Tmb	7.0	20.00	<20	N	20	<5	70	N
632 Tmb	50.0	30.00	<20	<5	50	N	50	<5
633 Tmb	15.0	20.00	<20	<5	50	N	70	<5
634 Tmb	15.0	50.00	N	N	300	7	50	<5
635 Tmb	15.0	15.00	N	N	30	7	30	<5
636 Tmb	20.0	30.00	<20	N	70	<5	70	N
637 Tmm	10.0	N	N	N	50	10	50	<5
638 Tmm	20.0	30.00	20	<5	100	<5	70	<5
639 Tb	1.0	N	100	50	50	N	<20	50
640 Tbd	1.0	20.00	100	50	70	N	<20	30
641 Tb	2.0	5.00	200	70	100	N	<20	50
642 Tb	2.0	N	N	15	70	N	<20	<5
643 Tb	1.0	50.00	200	50	50	N	<20	50
644 Tb	1.5	N	150	50	70	<5	<20	50
645 Tmj	20.0	N	N	<5	30	N	50	N
646 Tmj	2.0	N	N	<5	70	7	30	<5
647 Tb	2.0	30.00	70	70	50	5	<20	20
648 Tmb	10.0	30.00	N	N	70	N	70	N
649 Tmb	7.0	N	N	<5	50	N	50	N

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
605 Tb	N	N	N	200	70	200	20
606 Tb	30	N	700	N	30	200	30
607 Tb	30	N	1,000	N	30	300	30
608 Tb	30	N	500	200	30	200	30
609 Tb	50	<10	N	200	30	200	30
610 Tmi	15	N	500	N	30	100	15
611 Tb	30	N	1,000	N	20	200	30
612 Tb	15	N	700	N	30	200	15
613 Tb	20	N	700	N	30	100	20
614 Tb	30	N	700	200	30	150	30
615 Tb	20	N	1,500	N	20	100	30
616 Tb	30	N	700	N	30	200	30
617 Tb	30	N	700	N	20	200	30
618 Tb	10	N	500	100	20	200	15
619 Tb	20	N	1,000	N	30	100	30
620 Tb	20	N	500	300	20	200	20
621 Tb	20	N	700	N	30	200	20
622 Tb	50	N	1,000	N	20	200	20
623 Tb	20	N	700	N	30	500	30
624 Tb	30	N	1,000	N	30	500	30
625 Tb	30	N	1,000	200	30	200	30
626 Tmb	70	<10	N	N	50	500	30
627 Tmb	30	N	N	N	50	500	30
628 Tmb	50	<10	N	N	20	300	30
629 Tmb	30	N	N	70	30	200	30
630 Tmb	30	N	100	100	30	500	30
631 Tmb	20	<10	N	200	20	500	30
632 Tmb	30	N	N	300	20	200	30
633 Tmb	30	<10	<100	200	50	200	30
634 Tmb	50	<10	N	200	70	500	30
635 Tmb	30	N	N	200	20	200	30
636 Tmb	50	<10	N	200	50	300	50
637 Tmm	10	N	N	N	20	200	30
638 Tmm	100	N	N	200	30	200	50
639 Tb	30	N	1,500	N	30	200	30
640 Tbd	30	N	700	200	20	200	50
641 Tb	50	N	1,000	50	30	200	50
642 Tb	50	N	500	N	30	200	30
643 Tb	30	N	1,000	200	30	200	30
644 Tb	50	N	700	N	30	200	30
645 Tmj	50	N	500	N	50	200	30
646 Tmj	100	10	N	20	50	200	70
647 Tb	30	N	1,000	N	30	200	50
648 Tmb	100	<10	N	200	50	200	50
649 Tmb	30	<10	N	N	30	200	30

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
650 Tmm	38 24 8	112 23 54	1.00	.20	.10	.200	700	N	100
651 Tmbl	38 24 19	112 23 56	1.00	.20	.10	.200	500	N	100
652 Tmm	38 24 23	112 23 50	1.00	.05	.10	.200	100	<.5	100
653 Tmm	38 24 47	112 24 6	1.00	.20	.20	.200	500	<.5	70
654 Tmbl	38 24 48	112 23 49	1.00	.10	.10	.200	200	<.5	70
655 Tmbl	38 25 11	112 23 57	.50	.05	.05	.100	50	<.5	20
656 JPs	38 24 43	112 20 6	.50	.10	.10	.050	70	1.5	500
657 Jps	38 24 30	112 20 15	.50	.05	<.05	.010	30	1.0	200
658 Tmbl	38 26 1	112 23 54	.50	.10	.10	.050	200	.5	100
659 Tb	38 29 6	112 22 0	.05	<.02	.05	.500	70	<.5	30
660 Tmb	38 29 18	112 29 40	1.00	.10	<.05	.100	1,000	N	100
661 Tb	38 29 52	112 29 44	5.00	1.00	5.00	1.000	700	N	2,000
662 Tmb	38 30 3	112 29 22	1.00	.05	.05	.100	1,000	N	70
663 Tb	38 30 2	112 31 56	7.00	3.00	5.00	1.000	1,000	N	1,500
664 To	38 29 55	112 31 38	10.00	3.00	2.00	.500	1,000	<.5	1,500
665 To	38 29 37	112 31 35	10.00	5.00	5.00	1.000	700	<.5	1,500
666 To	38 29 35	112 31 42	10.00	2.00	5.00	1.000	1,000	N	1,500
667 Tb	38 29 25	112 31 34	5.00	3.00	3.00	.500	700	N	1,000
668 To	38 29 23	112 31 43	10.00	2.00	2.00	1.000	500	<.5	1,000
669 Tmj	38 29 56	112 21 50	.70	.10	.20	.200	150	<.5	70
670 Tmj	38 29 46	112 21 31	1.00	.50	.10	.200	500	<.5	300
671 Tmj	38 29 28	112 21 59	1.00	.20	.10	.200	300	N	70
672 Tmj	38 29 5	112 21 37	1.00	.50	.20	.050	700	<.5	200
673 Tb	38 28 44	112 22 4	10.00	5.00	5.00	1.000	100	N	1,500
674 Tb	38 28 26	112 21 50	.50	.10	.10	.100	150	N	100
675 Tb	38 28 3	112 21 59	3.00	1.00	.50	.500	500	N	2,000
676 Tmm	38 26 16	112 23 31	.70	.05	.10	.100	150	<.5	100
677 Tmm	38 26 18	112 23 19	.70	.05	.05	.100	150	<.5	20
678 Tmm	38 26 26	112 23 13	2.00	.50	.20	.500	500	N	2,000
679 Tmb	38 26 37	112 23 35	.50	.05	<.05	.100	200	.5	100
680 Tb	38 26 35	112 22 48	10.00	5.00	2.00	1.000	1,500	N	1,000
681 Tb	38 27 31	112 23 13	5.00	.50	.50	1.000	300	<.5	1,500
682 Tb	38 27 43	112 23 8	5.00	1.00	1.00	1.000	300	N	2,000
683 Tmm	38 27 11	112 23 41	1.00	.20	.10	.500	70	<.5	500
684 Tmm	38 27 14	112 23 58	1.00	.20	.20	.200	300	N	100
685 Tmm	38 27 34	112 23 53	1.00	.05	.10	.050	150	<.5	100
686 Tmm	38 27 40	112 23 56	1.00	.20	.10	.100	500	N	100
687 Tmm	38 27 48	112 23 50	.20	.05	.05	.200	50	.5	100
688 Tmm	38 27 52	112 24 22	5.00	1.00	.70	1.000	300	<.5	2,000
689 Tbi	38 28 0	112 24 37	2.00	1.00	5.00	1.000	700	<.5	2,000
690 Tb	38 28 15	112 24 27	2.00	2.00	2.00	1.000	500	N	2,000
691 Tbi	38 28 33	112 24 39	1.00	.70	.10	.500	300	<.5	200
692 Tb	38 28 34	112 25 2	5.00	1.00	2.00	.500	700	N	1,500
693 Tb	38 28 43	112 25 5	5.00	2.00	5.00	.500	1,500	N	1,500
694 Tb	38 28 44	112 25 5	3.00	1.00	2.00	.500	700	<.5	2,000

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
650 Tmm	10.0	20.00	N	<5	30	N	50	<5
651 Tmbl	7.0	N	<20	<5	70	10	70	<5
652 Tmm	20.0	15.00	20	5	70	N	50	<5
653 Tmm	10.0	N	N	<5	30	N	50	<5
654 Tmbl	3.0	30.00	<20	N	50	<5	70	N
655 Tmbl	1.0	N	N	N	50	N	70	N
656 JPs	1.0	N	20	10	N	10	N	N
657 Jps	1.0	N	20	5	N	15	N	N
658 Tmbl	5.0	7.00	N	N	20	N	50	<5
659 Tb	5.0	N	<20	<5	100	<5	70	N
660 Tmb	20.0	N	<20	<5	70	15	70	<5
661 Tb	5.0	N	20	20	100	5	20	<5
662 Tmb	15.0	30.00	<20	N	70	15	70	<5
663 Tb	1.0	N	70	50	50	N	N	20
664 To	1.5	5.00	100	50	50	N	<20	30
665 To	1.0	N	70	50	50	N	<20	20
666 To	1.5	N	150	30	70	N	N	20
667 Tb	2.0	30.00	50	30	30	<5	N	20
668 To	1.0	N	50	30	50	N	<20	20
669 Tmj	20.0	N	30	5	70	5	50	<5
670 Tmj	20.0	30.00	20	7	70	N	50	5
671 Tmj	15.0	30.00	<20	N	50	N	70	N
672 Tmj	20.0	N	N	5	70	N	50	<5
673 Tb	1.5	30.00	300	70	50	N	<20	70
674 Tb	15.0	30.00	<20	<5	30	N	30	5
675 Tb	7.0	N	30	50	100	5	30	7
676 Tmm	10.0	N	N	N	70	N	50	<5
677 Tmm	7.0	N	N	N	30	N	70	<5
678 Tmm	5.0	N	<20	<5	150	N	30	N
679 Tmb	7.0	N	<20	N	<20	N	50	<5
680 Tb	2.0	30.00	300	70	70	N	<20	70
681 Tb	7.0	10.00	70	70	70	7	30	15
682 Tb	5.0	30.00	30	20	70	7	30	10
683 Tmm	10.0	50.00	50	7	150	N	50	<5
684 Tmm	7.0	30.00	<20	5	70	N	30	<5
685 Tmm	7.0	N	N	<5	70	N	30	<5
686 Tmm	15.0	20.00	<20	5	70	N	30	<5
687 Tmm	5.0	N	<20	<5	100	N	50	<5
688 Tmm	5.0	N	20	20	100	N	30	<5
689 Tbi	3.0	10.00	50	30	100	7	30	5
690 Tb	5.0	15.00	20	20	70	N	20	5
691 Tbi	10.0	10.00	<20	7	70	N	20	<5
692 Tb	2.0	N	<20	20	50	N	<20	<5
693 Tb	3.0	20.00	30	20	70	N	<20	7
694 Tb	1.5	20.00	30	20	50	N	<20	<5

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
650 Tmm	70	<10	N	200	30	150	30
651 Tmbl	20	10	N	N	50	200	50
652 Tmm	30	<10	N	200	30	200	30
653 Tmm	<10	10	N	N	30	200	50
654 Tmbl	15	10	N	200	30	200	50
655 Tmbl	30	10	N	N	10	300	50
656 JPs	10	N	N	N	<10	200	N
657 Jps	50	N	N	200	N	200	N
658 Tmbl	10	N	<100	100	20	200	20
659 Tb	30	<10	<100	N	30	200	20
660 Tmb	70	<10	N	N	30	300	50
661 Tb	70	N	500	70	30	200	50
662 Tmb	70	<10	N	200	30	200	30
663 Tb	20	N	700	N	30	100	30
664 To	30	N	500	70	30	200	30
665 To	30	N	700	N	20	150	30
666 To	30	N	700	N	30	150	30
667 Tb	20	N	500	500	20	100	20
668 To	30	N	700	N	30	100	30
669 Tmj	70	N	N	N	20	200	30
670 Tmj	70	<10	100	200	70	200	20
671 Tmj	30	<10	N	300	30	100	20
672 Tmj	50	<10	100	N	50	200	20
673 Tb	30	N	1,000	200	30	300	30
674 Tb	30	N	<100	200	15	200	15
675 Tb	70	<10	500	N	30	500	30
676 Tmm	30	N	<100	N	20	200	30
677 Tmm	10	<10	N	N	30	200	15
678 Tmm	20	N	200	N	50	300	20
679 Tmb	20	N	N	N	20	200	30
680 Tb	20	N	1,000	200	30	200	30
681 Tb	70	N	500	N	30	700	30
682 Tb	50	N	500	200	30	200	30
683 Tmm	70	N	100	300	100	300	30
684 Tmm	50	N	<100	100	20	200	30
685 Tmm	50	N	<100	N	20	200	30
686 Tmm	50	N	<100	200	30	100	20
687 Tmm	50	N	<100	70	20	200	30
688 Tmm	30	N	200	50	50	200	30
689 Tbi	70	N	700	100	30	500	30
690 Tb	50	N	700	100	30	200	20
691 Tbi	20	N	150	100	30	200	15
692 Tb	20	N	300	N	30	200	15
693 Tb	30	N	500	200	30	200	20
694 Tb	20	N	500	200	30	200	20

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
695 Tbi	38 28 45	112 24 57	5.00	2.00	1.50	.500	1,000	.5	2,000
696 Tb	38 22 46	112 23 2	2.00	1.00	5.00	.500	1,000	N	1,000
697 Tbd	38 22 57	112 22 40	10.00	3.00	5.00	.500	1,500	N	2,000
698 Tbd	38 22 38	112 22 27	5.00	2.00	5.00	1.000	1,500	N	2,000
699 Tbd	38 22 37	112 21 58	5.00	2.00	2.00	1.000	700	N	1,500
700 Tbt	38 22 48	112 21 30	5.00	1.00	3.00	1.000	700	<.5	1,000
701 Tbd	38 23 2	112 21 43	10.00	5.00	5.00	.500	1,000	N	1,500
702 Tbt	38 23 14	112 21 21	10.00	5.00	5.00	.500	1,000	<.5	500
703 Tbt	38 23 27	112 21 22	10.00	5.00	5.00	1.000	1,500	N	1,000
704 Tbt	38 23 49	112 21 25	5.00	2.00	2.00	1.000	500	N	1,500
705 Tbt	38 23 56	112 21 45	7.00	3.00	5.00	.500	1,500	N	1,000
706 Tbt	38 23 45	112 22 9	10.00	5.00	5.00	1.000	1,000	N	2,000
707 Tb	38 23 40	112 22 40	5.00	2.00	2.00	1.000	700	N	1,000
708 Tmm	38 27 53	112 26 54	1.00	.50	.50	.100	500	<.5	100
709 Tmm	38 27 33	112 26 53	.50	.20	.20	.020	300	<.5	100
710 Tmm	38 27 28	112 26 38	1.00	.20	.20	.200	300	<.5	200
711 Tmb	38 27 9	112 26 35	1.00	.20	.20	.050	3,000	<.5	200
712 Tmb	38 26 53	112 26 44	1.00	.10	.10	.200	1,500	N	100
713 Tmb	38 26 33	112 27 0	1.00	.10	.05	.050	300	<.5	70
714 Tmb	38 26 22	112 27 4	1.00	.20	.20	.200	700	<.5	50
715 Tmb	38 25 56	112 27 3	1.00	.20	.10	.500	1,000	N	30
716 Tmm	38 26 28	112 26 38	1.00	.50	.20	.100	700	<.5	70
717 Tmm	38 26 52	112 25 40	1.00	.10	.20	.100	200	<.5	<20
718 Tmm	38 26 47	112 25 33	1.00	.20	.50	.200	1,000	N	100
719 Tmbl	38 27 15	112 25 17	.50	.10	.10	.100	150	.7	200
720 Tmbl	38 27 24	112 25 10	.50	.05	.10	.100	100	<.5	100
721 Tml	38 27 30	112 24 59	.70	.05	.10	.100	200	<.5	70
722 Tbi	38 27 42	112 24 57	3.00	2.00	1.00	1.000	700	N	2,000
723 Tmm	38 29 19	112 27 10	1.00	.20	.10	.100	100	<.5	100
724 Tmb	38 29 15	112 27 41	1.00	.05	.10	.200	1,000	<.5	50
725 Tmm	38 29 30	112 27 49	1.00	.20	.50	.100	1,000	<.5	100
726 Tmm	38 29 12	112 28 0	1.00	.10	.10	.100	500	<.5	100
727 Tmm	38 29 6	112 28 31	2.00	.50	.30	.500	1,000	<.5	100
728 Tmm	38 28 55	112 28 17	1.00	.50	2.00	.100	700	<.5	20
729 Tmb	38 28 49	112 28 23	1.00	.10	.20	.200	700	<.5	30
730 Tmm	38 28 40	112 29 3	1.00	.50	.20	.100	1,000	<.5	70
731 Tmm	38 28 29	112 28 59	2.00	.10	.10	.200	2,000	N	50
732 Tmb	38 28 31	112 28 40	2.00	.20	.10	.500	1,500	N	20
733 Tmb	38 28 16	112 28 48	2.00	.20	.05	.500	1,000	.5	20
734 Tmm	38 28 7	112 28 57	.50	.50	2.00	.100	500	.5	<20
735 Tmbl	38 25 29	112 24 28	1.00	.20	.10	.200	500	<.5	70
736 Tmb	38 25 20	112 25 13	1.50	.20	.20	.500	500	<.5	70
737 Tmb	38 25 20	112 25 12	2.00	.20	.20	.500	500	<.5	100
738 Tmb	38 25 27	112 25 18	1.00	.10	.05	.200	200	<.5	70
739 Tmb	38 25 35	112 25 20	1.00	.05	.10	.200	200	N	50

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
695 Tbi	5.0	N	<20	30	30	N	<20	<5
696 Tb	2.0	N	200	30	50	N	<20	70
697 Tbd	2.0	N	100	50	50	N	<20	30
698 Tbd	3.0	30.00	20	20	100	5	<20	<5
699 Tbd	2.0	7.00	50	15	50	N	N	20
700 Tbt	1.0	10.00	100	30	20	N	<20	30
701 Tbd	1.5	N	150	30	70	N	<20	30
702 Tbt	1.0	N	200	50	50	N	<20	50
703 Tbt	<1.0	N	200	70	50	N	<20	50
704 Tbt	2.0	20.00	150	20	30	N	<20	50
705 Tbt	1.0	15.00	150	20	50	N	<20	50
706 Tbt	2.0	50.00	200	50	50	N	<20	50
707 Tb	2.0	N	150	50	30	N	<20	30
708 Tmm	10.0	N	20	10	70	N	50	<5
709 Tmm	10.0	20.00	<20	<5	100	N	50	<5
710 Tmm	20.0	N	N	<5	50	N	70	<5
711 Tmb	15.0	15.00	N	<5	50	N	50	<5
712 Tmb	15.0	15.00	N	N	30	N	70	N
713 Tmb	15.0	10.00	N	N	50	7	70	<5
714 Tmb	15.0	N	<20	N	50	7	70	<5
715 Tmb	15.0	N	N	N	70	N	70	N
716 Tmm	10.0	N	N	<5	30	N	70	<5
717 Tmm	10.0	N	N	N	50	N	50	<5
718 Tmm	15.0	15.00	70	<5	70	N	50	<5
719 Tmbl	3.0	20.00	<20	<5	50	5	30	<5
720 Tmbl	7.0	5.00	N	<5	20	N	50	<5
721 Tml	3.0	20.00	<20	N	N	5	50	<5
722 Tbi	3.0	20.00	<20	20	70	N	30	<5
723 Tmm	15.0	N	N	<5	70	<5	50	<5
724 Tmb	20.0	20.00	N	N	70	<5	70	<5
725 Tmm	15.0	20.00	<20	<5	70	N	50	<5
726 Tmm	15.0	N	<20	<5	30	5	50	<5
727 Tmm	15.0	N	<20	5	50	5	70	<5
728 Tmm	15.0	20.00	N	N	70	N	70	<5
729 Tmb	15.0	N	N	N	70	N	50	N
730 Tmm	20.0	20.00	N	<5	70	N	70	N
731 Tmm	10.0	20.00	N	N	70	<5	70	N
732 Tmb	10.0	N	<20	<5	70	7	70	<5
733 Tmb	20.0	10.00	N	N	70	7	70	N
734 Tmm	20.0	15.00	N	N	30	N	30	N
735 Tmbl	15.0	N	N	N	20	N	70	<5
736 Tmb	15.0	N	<20	N	70	10	50	N
737 Tmb	15.0	N	<20	N	100	10	70	N
738 Tmb	15.0	N	N	N	30	5	70	<5
739 Tmb	10.0	N	N	N	30	N	70	N

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
695 Tbi	30	N	500	N	30	200	20
696 Tb	20	N	700	50	30	200	20
697 Tbd	30	N	700	N	20	100	30
698 Tbd	70	N	700	200	50	500	50
699 Tbd	15	N	700	100	15	100	30
700 Tbt	20	N	500	200	30	100	15
701 Tbd	30	N	1,000	N	20	200	30
702 Tbt	20	N	300	N	30	200	30
703 Tbt	20	N	700	N	50	200	30
704 Tbt	30	N	500	100	20	100	20
705 Tbt	20	N	700	100	30	200	30
706 Tbt	30	N	1,000	300	50	200	30
707 Tb	30	N	700	N	30	200	20
708 Tmm	50	N	N	N	20	200	30
709 Tmm	70	N	<100	200	20	200	30
710 Tmm	15	<10	N	N	50	200	30
711 Tmb	30	N	<100	200	50	200	30
712 Tmb	50	<10	N	100	30	200	30
713 Tmb	70	<10	N	100	30	300	30
714 Tmb	50	<10	<100	N	50	200	30
715 Tmb	70	<10	N	N	30	300	30
716 Tmm	70	<10	<100	N	30	200	30
717 Tmm	<10	N	N	50	10	200	15
718 Tmm	30	N	<100	70	50	200	20
719 Tmbl	10	N	N	100	20	150	15
720 Tmbl	30	N	<100	50	20	200	20
721 Tml	20	N	N	100	10	200	20
722 Tbi	50	N	500	100	30	200	30
723 Tmm	50	N	N	N	30	200	30
724 Tmb	50	<10	N	200	30	200	30
725 Tmm	70	N	N	200	30	200	30
726 Tmm	30	N	N	N	20	200	20
727 Tmm	100	10	<100	N	30	200	50
728 Tmm	70	<10	200	200	30	200	30
729 Tmb	30	<10	N	N	50	200	30
730 Tmm	30	<10	N	200	50	200	30
731 Tmm	100	<10	N	200	70	200	30
732 Tmb	100	10	N	N	50	200	50
733 Tmb	70	<10	N	70	50	200	30
734 Tmm	50	N	500	100	50	200	30
735 Tmbl	15	<10	N	N	50	200	20
736 Tmb	70	<10	N	N	50	200	30
737 Tmb	70	10	N	N	50	300	70
738 Tmb	50	<10	N	N	20	200	30
739 Tmb	30	N	N	N	30	200	30

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
740 Tmm	38 25 24	112 24 36	2.00	.30	.50	.500	2,000	.5	100
301	38 23 55	112 27 55	15.00	.05	<.05	.100	100	<.5	200
302	38 28 2	112 22 5	2.00	.50	.20	.500	500	.5	1,000
303	38 22 45	112 32 45	2.00	1.00	1.00	.500	500	<.5	500
304	38 22 44	112 32 45	1.00	.10	<.05	.200	150	<.5	100
305	38 21 42	112 33 47	7.00	1.00	1.00	1.000	200	.7	2,000
306	38 22 49	112 34 2	15.00	1.00	.20	1.000	700	.5	1,000
307	38 22 49	112 33 59	1.00	.50	.05	.500	300	2.0	500
308	38 24 8	112 33 53	.50	.02	<.05	.050	20	.5	70
309	38 25 56	112 35 16	3.00	1.00	.50	.500	700	.5	2,000
310	38 26 29	112 33 45	5.00	.20	.20	.500	200	3.0	1,500
311	38 27 6	112 33 38	.05	.20	<.05	.200	30	1.0	150
312	38 27 28	112 29 46	1.00	.05	<.05	.200	700	<.5	50
313	38 31 14	112 23 43	1.00	.02	<.05	.200	50	N	50
314	38 29 10	112 24 40	.50	.20	.05	.500	150	2.0	500
315	38 29 30	112 24 42	10.00	1.00	1.00	>1.000	500	3.0	2,000
316	38 29 31	112 24 57	.50	.05	<.05	.010	300	3.0	200
317	38 25 5	112 22 30	1.00	.50	.50	.200	700	1.0	2,000
318	38 23 33	112 25 31	.20	.05	N	.100	200	N	70
319	38 25 49	112 24 20	.05	.10	.05	.100	300	<.5	50
801	38 25 49	112 32 17	5.00	1.00	.20	1.000	150	.5	2,000
802	38 26 53	112 31 46	.50	.50	3.00	.200	200	<.5	500
803	38 26 53	112 31 45	2.00	.50	1.00	.500	500	5.0	500
804	38 25 49	112 32 22	.10	<.02	<.05	>1.000	50	5.0	150
805	38 25 49	112 32 22	2.00	.10	.10	.200	200	<.5	100
806	38 24 52	112 32 0	1.00	.10	1.00	.100	700	<.5	100
807	38 25 32	112 32 42	7.00	5.00	2.00	1.000	1,000	<.5	2,000
808	38 25 32	112 32 41	10.00	1.00	1.00	1.000	1,500	3.0	1,000
809	38 24 29	112 33 5	.50	.50	.10	.200	150	<.5	200
810	38 24 12	112 32 54	1.50	1.00	.10	.500	150	.5	1,000
811	38 23 46	112 32 47	10.00	3.00	5.00	>1.000	1,000	<.5	2,000
812	38 22 40	112 32 5	.50	.05	.05	.100	300	<.5	30
813	38 24 10	112 32 54	1.00	.20	.10	.200	500	<.5	70
814	38 24 0	112 32 52	10.00	.50	.05	1.000	100	<.5	1,000
815	38 22 54	112 31 57	1.00	.20	.10	.100	700	<.5	50
816	38 22 41	112 31 6	7.00	1.00	.20	1.000	200	N	1,000
817	38 25 24	112 30 46	1.00	.07	.10	.100	500	<.5	20
818	38 25 7	112 29 58	1.00	.20	.10	.100	70	.7	70
819	38 25 58	112 33 19	1.50	.50	.05	.200	150	2.0	300
821	38 27 29	112 31 10	1.00	.20	.50	.200	1,000	<.5	70
822	38 27 13	112 31 18	.05	.20	2.00	.100	500	N	<20
823	38 21 47	112 31 22	10.00	1.00	.50	>1.000	700	<.5	1,000
824	38 22 10	112 30 29	5.00	.50	.05	.500	200	.7	1,000
825	38 21 54	112 32 16	10.00	2.00	2.00	>1.000	200	<.5	2,000
826	38 22 59	112 33 57	5.00	1.00	1.00	>1.000	700	70.0	1,000

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
740 Tmm	20.0	N	<20	5	50	<5	70	<5
301	7.0	N	N	<5	150	N	30	N
302	5.0	5.00	30	30	50	N	30	5
303	20.0	5.00	20	10	30	N	70	15
304	15.0	<5.00	30	15	50	5	20	10
305	5.0	10.00	200	70	100	N	20	50
306	5.0	20.00	150	70	50	N	20	50
307	5.0	<5.00	N	50	20	20	20	<5
308	1.5	N	<20	30	N	N	N	N
309	2.0	50.00	50	30	30	<5	N	50
310	5.0	15.00	50	50	20	15	N	10
311	3.0	N	30	<5	N	50	N	<5
312	20.0	N	<20	N	70	7	70	<5
313	7.0	N	N	5	70	N	50	N
314	15.0	5.00	20	10	20	5	<20	7
315	5.0	30.00	200	70	100	20	20	50
316	10.0	<5.00	N	7	N	N	N	<5
317	15.0	N	<20	50	30	N	50	N
318	3.0	N	<20	N	30	10	70	<5
319	10.0	N	N	N	20	N	50	<5
801	3.0	7.00	100	70	50	20	20	30
802	7.0	N	<20	5	20	N	20	<5
803	10.0	5.00	20	300	70	N	30	5
804	N	N	30	<5	70	70	30	<5
805	5.0	<5.00	N	<5	70	N	50	<5
806	15.0	N	N	7	20	5	20	N
807	3.0	20.00	100	70	70	7	<20	50
808	10.0	20.00	50	100	50	7	<20	50
809	15.0	<5.00	N	<5	20	7	70	N
810	10.0	<5.00	N	7	100	5	30	N
811	3.0	50.00	300	100	100	5	20	100
812	15.0	N	<20	5	30	N	30	<5
813	15.0	N	N	N	50	N	70	<5
814	5.0	<5.00	50	50	30	N	<20	N
815	10.0	N	<20	N	50	N	70	N
816	2.0	10.00	500	150	50	30	20	30
817	10.0	N	N	<5	30	N	50	<5
818	15.0	<5.00	N	5	30	15	50	<5
819	10.0	5.00	20	15	20	30	<20	5
821	20.0	<5.00	<20	<5	70	15	70	<5
822	15.0	N	N	N	20	5	30	<5
823	3.0	30.00	100	70	50	<5	20	50
824	5.0	5.00	<20	30	70	7	30	<5
825	7.0	10.00	200	70	100	N	<20	30
826	7.0	7.00	20	50	100	5	20	5

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
740 Tmm	70	<10	N	N	50	200	30
301	30	N	N	N	100	100	15
302	50	N	500	70	30	200	20
303	30	<10	150	100	50	200	30
304	30	N	N	100	30	200	30
305	30	N	200	200	30	300	30
306	30	N	150	200	30	200	30
307	10	N	N	50	<10	200	10
308	N	N	N	N	<10	100	N
309	10	N	<100	100	30	200	10
310	20	N	200	100	15	200	15
311	N	N	N	70	<10	70	<10
312	30	10	N	N	50	200	30
313	30	N	N	N	20	200	10
314	<10	N	100	N	<10	200	N
315	50	N	700	500	50	500	50
316	15	N	N	N	N	<50	<10
317	100	N	150	N	20	200	30
318	N	N	<100	N	30	200	15
319	30	N	N	N	30	200	15
801	50	N	100	200	30	200	20
802	30	N	3,000	N	20	200	15
803	100	N	200	100	30	200	30
804	50	30	<100	<20	<10	50	N
805	50	N	N	N	50	200	20
806	150	N	<100	N	10	100	50
807	15	N	700	200	30	200	30
808	30	N	100	200	30	200	15
809	50	N	N	N	30	300	15
810	70	N	300	50	30	300	30
811	30	N	1,000	500	50	300	30
812	20	N	N	N	15	100	10
813	50	<10	N	N	30	200	30
814	20	N	N	200	20	200	20
815	20	10	<100	N	30	200	20
816	30	N	100	500	20	500	30
817	30	N	N	N	50	200	15
818	70	N	N	N	30	200	15
819	<10	N	<100	<20	10	200	<10
821	70	10	100	N	50	200	50
822	30	N	150	N	30	100	30
823	20	N	100	200	30	200	20
824	20	N	<100	100	30	500	30
825	30	N	150	200	30	200	50
826	150	N	200	100	30	500	20

Appendix 1.-- Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Latitude	Longitude	Fe .05%	Mg .02%	Ca .05%	Ti .002%	Mn 10ppm	Ag .5ppm	Ba 20ppm
827	38 23 47	112 33 50	1.00	.50	.05	1.000	70	.7	1,500
828	38 23 42	112 33 52	N	.02	.10	<.002	20	.7	50
829	38 24 36	112 33 55	10.00	.50	2.00	.500	150	.7	2,000
830	38 26 31	112 33 49	.05	.10	.05	.100	20	<.5	500
831	38 24 27	112 25 31	1.00	.10	.05	.200	200	.7	50
832	38 23 7	112 23 43	7.00	2.00	5.00	1.000	500	<.5	1,500
833	38 22 51	112 24 5	5.00	2.00	3.00	.500	1,000	N	2,000
834	38 22 37	112 24 57	2.00	.10	.20	.500	1,000	3.0	100
835	38 24 55	112 23 56	1.00	.10	<.05	.200	300	<.5	30
839	38 24 31	112 20 15	2.00	.10	.10	.010	150	500.0	2,000
840	38 24 44	112 19 40	10.00	2.00	.50	.500	1,500	100.0	2,000
841	38 28 56	112 22 16	7.00	1.00	1.00	>1.000	300	1.0	1,500
842	38 28 3	112 21 59	1.00	.50	.20	.500	300	N	1,000
843	38 27 41	112 23 10	.50	.20	.10	1.000	30	<.5	1,500
844	38 27 58	112 24 36	1.00	.20	.50	1.000	100	3.0	2,000
845	38 28 40	112 24 41	.70	.50	.10	.500	200	3.0	1,000
846	38 22 54	112 23 33	2.00	.30	1.00	1.000	150	<.5	2,000
847	38 22 28	112 22 23	1.00	.20	.10	1.000	50	<.5	2,000
848	38 23 9	112 21 23	5.00	.50	.05	.500	500	1.0	300
849	38 25 17	112 24 52	1.00	.10	.10	.100	200	<.5	30

Appendix 1.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Be 1ppm	Co 5ppm	Cr 20ppm	Cu 5ppm	La 20ppm	Mo 5ppm	Nb 20ppm	Ni 5ppm
827	5.0	N	<20	7	50	7	20	N
828	7.0	N	N	10	N	N	N	N
829	7.0	10.00	30	70	100	7	30	20
830	3.0	N	N	N	N	15	50	<5
831	15.0	N	N	15	30	50	70	<5
832	2.0	20.00	50	50	50	N	<20	30
833	3.0	15.00	50	30	50	N	<20	20
834	15.0	N	N	5	100	15	70	N
835	5.0	N	N	N	30	N	70	N
839	5.0	<5.00	<20	>20,000	N	150	N	<5
840	3.0	30.00	50	5,000	150	500	20	70
841	3.0	30.00	100	70	50	5	20	50
842	5.0	5.00	20	30	70	7	30	<5
843	2.0	N	30	20	150	N	30	<5
844	7.0	N	20	70	50	N	30	N
845	7.0	<5.00	30	10	20	N	20	<5
846	5.0	N	<20	5	70	N	<20	N
847	1.5	N	<20	7	50	N	20	<5
848	5.0	15.00	1,500	30	20	30	N	70
849	20.0	N	N	<5	70	10	50	<5

Appendix I.--Rock analysis from the Mount Belknap caldera vicinity--continued

sample	Pb 10ppm	Sn 10ppm	Sr100ppm	V 20ppm	Y 10ppm	Zr 50ppm	Ga 10ppm
827	50	N	300	70	20	200	20
828	N	N	N	N	N	N	N
829	50	N	700	200	30	500	20
830	30	<10	300	N	30	200	15
831	70	<10	N	N	30	300	30
832	20	N	700	100	20	100	20
833	30	N	500	200	20	200	20
834	150	10	<100	N	50	300	50
835	N	N	N	N	15	300	20
839	20,000	N	N	N	<10	N	30
840	20,000	10	<100	500	50	200	50
841	30	N	500	200	30	200	20
842	30	N	300	100	30	300	20
843	30	N	500	100	30	500	30
844	70	N	500	100	30	300	30
845	20	N	150	<20	10	200	<10
846	50	N	500	100	20	200	20
847	30	N	150	50	30	200	20
848	10	N	<100	200	10	200	20
849	70	10	N	N	30	200	20

Appendix 2.--Elements with fewer than 15 reported values

Zinc 200ppm

sample	concentration in ppm
055	<200
185	500
187	500
207	<200
547	200
566	<200
568	200
678	200
683	200
309	<200
818	200
839	>10000
840	>10000

Bismuth 10ppm

sample	concentration in ppm
140	<10
199	<10
599	10
313	15
805	15
821	<10
839	30

Cadmium 20ppm

sample	concentration in ppm
818	<20
840	500

Thorium 100ppm

sample	concentration in ppm
078	<100
092	<100
148	<100
549	<100
675	<100
682	200
843	100

Arsenic 200ppm

sample	concentration in ppm
819	<200
823	700
839	10000
840	500
847	200

Tungsten 50ppm

sample	concentration in ppm
801	<50
823	50
839	<50

Antimony 100ppm

sample	concentration in ppm
839	>10000
840	3000

Gold 10ppm

sample	concentration in ppm
826	10