

Figure 1. Distribution of Bishop ash beds in the Western United States. Shaded area indicates inferred extent of original Bishop ash fall.

Table 1. Chemical analyses of the glass phases of some Bishop ash beds and Bishop Tuff tephra from the Western United State

	Lab.	Field	Locality and sampled material	Ce	Sh	Ra	Sr	Th	U	La	Ce	Gd	Sr	Ra	Gd	Th	Dy	Ta	Yb	La	Ta	Zr	Hf	Sr	Ni	Fe	Co
1	016900	76014	IAO, Calif.; MP; locality A; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
2	016901	76015	IAO, Calif.; MP; locality B; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
3	016902	76016	IAO, Calif.; MP; locality C; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
4	016903	76017	IAO, Calif.; MP; locality D; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
5	016904	76018	IAO, Calif.; MP; locality E; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
6	016905	76019	IAO, Calif.; MP; locality F; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
7	016906	76020	IAO, Calif.; MP; locality G; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
8	016907	76021	IAO, Calif.; MP; locality H; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
9	016908	76022	IAO, Calif.; MP; locality I; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
10	016909	76023	IAO, Calif.; MP; locality J; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
11	016910	76024	IAO, Calif.; MP; locality K; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
12	016911	76025	IAO, Calif.; MP; locality L; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
13	016912	76026	IAO, Calif.; MP; locality M; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
14	016913	76027	IAO, Calif.; MP; locality N; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
15	016914	76028	IAO, Calif.; MP; locality O; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
16	016915	76029	IAO, Calif.; MP; locality P; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
17	016916	76030	IAO, Calif.; MP; locality Q; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
18	016917	76031	IAO, Calif.; MP; locality R; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
19	016918	76032	IAO, Calif.; MP; locality S; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
20	016919	76033	IAO, Calif.; MP; locality T; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
21	016920	76034	IAO, Calif.; MP; locality U; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
22	016921	76035	IAO, Calif.; MP; locality V; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
23	016922	76036	IAO, Calif.; MP; locality W; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
24	016923	76037	IAO, Calif.; MP; locality X; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
25	016924	76038	IAO, Calif.; MP; locality Y; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
26	016925	76039	IAO, Calif.; MP; locality Z; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
27	016926	76040	IAO, Calif.; MP; locality AA; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
28	016927	76041	IAO, Calif.; MP; locality AB; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
29	016928	76042	IAO, Calif.; MP; locality AC; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
30	016929	76043	IAO, Calif.; MP; locality AD; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
31	016930	76044	IAO, Calif.; MP; locality AE; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
32	016931	76045	IAO, Calif.; MP; locality AF; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
33	016932	76046	IAO, Calif.; MP; locality AG; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
34	016933	76047	IAO, Calif.; MP; locality AH; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
35	016934	76048	IAO, Calif.; MP; locality AI; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
36	016935	76049	IAO, Calif.; MP; locality AJ; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
37	016936	76050	IAO, Calif.; MP; locality AK; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
38	016937	76051	IAO, Calif.; MP; locality AL; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
39	016938	76052	IAO, Calif.; MP; locality AM; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
40	016939	76053	IAO, Calif.; MP; locality AN; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
41	016940	76054	IAO, Calif.; MP; locality AO; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
42	016941	76055	IAO, Calif.; MP; locality AP; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
43	016942	76056	IAO, Calif.; MP; locality AQ; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
44	016943	76057	IAO, Calif.; MP; locality AR; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
45	016944	76058	IAO, Calif.; MP; locality AS; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
46	016945	76059	IAO, Calif.; MP; locality AT; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
47	016946	76060	IAO, Calif.; MP; locality AU; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
48	016947	76061	IAO, Calif.; MP; locality AV; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
49	016948	76062	IAO, Calif.; MP; locality AW; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—	2.2	0.16	2.4	122	3.0	0.9	2.6	21	0.46	0.28
50	016949	76063	IAO, Calif.; MP; locality AX; pumice lagolith	4.5	150	55	163	17.7	15.4	28.8	1.4	3.5	0.55	7	0.49	3.4	—										

1707 ¹WAG, Dissolving Aggregate pump quarry of Bishop, Calif., now abandoned
 1708 ²See how only those samples analyzed by P. T. Millard, D. W. McKown, and J. E. Knight at the U.S. Geological Survey laboratory in Denver, Colo.
 1709 ³See how only those samples analyzed by P. T. Millard, D. W. McKown, and J. E. Knight at the U.S. Geological Survey laboratory in Denver, Colo.
 1710 ⁴See quarry included with the Bishop Tuff; the iron and manganese contents are anomalously high compared to other Bishop Tuff samples
 1711 ⁵From 2-4a-link bed in the Borrego Formation in the Salton Trough; this sample referred to as the Dissolving Aggregate Quarry type of Bishop ash by Sarma-Jedlicki and others (1980)
 1712 ⁶From 2-4a-link bed in the Borrego Formation in the Salton Trough; this sample referred to as the Painted Pounce size type of Bishop ash by Sarma-Jedlicki and others (1980)
 1713 ⁷From 2-4a-link bed in the Borrego Formation in the Salton Trough; this sample referred to as the Painted Pounce size type of Bishop ash by Sarma-Jedlicki and others (1980)

Table 3.—Chemical analyses of the glass phases of some Pliocene and Pleistocene rhyolite tephra units compositionally and mineralogically similar to the Bishop Tuff and ash beds in the Long Valley caldera.

[illegible]

Table 7.-- Potassium-argon ages of the Bishop Tuff of eastern California

Box No.	W ₀ g/cm ³	Sample Weight (gm)	Hydrogen mL/g ¹ mole	Hydrogen Percent	Age x 10 ⁶ yr	Sample No. and dated material	Sample location and remarks
UPPER PART OF BASSIN TUFF (ORTHOPHOSPHATE- AND GLIOPHOSPHATE-BEARING PUMICE)							
KA2385	10.97 10.97	6.0378	1.1262	66.0	0.7140-0.013	R-88B, sandstone	Pumice cobbles and blocks from near the base of narrowed ashfall in the NW1/4 sec. 27, T. 1 S., R. 29 E. in the Glendale National 15-minute quadrangle, New County, Calif.; collector, G. A. Teet.
KA2393	10.96 10.96	5.1749	1.2049	59.5	0.7840-0.016	R-88B-1, sandstone	No.
KA2384	10.96 10.99 11.08	6.7869	1.1734	50.0	0.7240-0.015	R-88B-2, sandstone	No.
KA2478	11.24 11.22	7.4778	1.2162	52.9	0.7740-0.007	R-89C, sandstone	Pumice block about 1 m in diameter from near the base of narrowed ashfall in the NW1/4 sec. 27, T. 1 S., R. 29 E. in the Glendale National 15-minute quadrangle, New County, Calif.; near locality R-87C of Hildreth (1977, p. 3391); collector, G. A. Teet.
	10.94 10.97	7.533 6.535	1.160 80.9		0.6540-0.033	640003, sandstone	Pumice blocks from upper surface of Bishop Tuff in the NW1/4 sec. 28, T. 1 S., R. 29 E., Overlook National 15-minute quadrangle, New County, Calif.; collector, G. M. Doherty; see bibliography and others (1965) and bibliography (1980).
KA2389	9.09	3.8485	0.8863	77.1	0.7050-0.016	B-86, sandstone	Pumice from the Bishop Tuff at San Pae Valley, New County, Calif.; collector, T. C. 1 S., R. 29 E., Overlook National 15-minute quadrangle, New County, Calif. (Hildreth, 1977).
KA2376	1.309	3.6567	0.1394	10.4	0.7420-0.064	7928B, glass	Pumice cobbles and blocks from near the base of narrowed ashfall in the NW1/4 sec. 27, T. 1 S., R. 29 E. in the Glendale National 15-minute quadrangle, New County, Calif.; collector, G. A. Teet.
KA2367	9.59	4.2462	0.6796	2.3	0.9240-0.112	7708B, glass	No.
KA2361	6.28	0.2558	0.3113	0.7	0.340-0.212	7708B, glass	No.
KA2430	1.16 1.19	5.3866	1.4084	4.4	0.8340-0.10	7909A, pHag	Pumice block about 1 m in diameter from near the base of narrowed ashfall in the NW1/4 sec. 27, T. 1 S., R. 29 E. in the Glendale National 15-minute quadrangle, New County, Calif.; near locality R-87C of Hildreth (1977, p. 3391); collector, G. A. Teet.
LOWER PART OF BASSIN TUFF (ORTHOPHOSPHATE-BEARING PUMICE)							
KA2387	10.02 10.13	6.6850	1.0739	72.5	0.7420-0.011	7901A, sandstone	Hand picked pumice lapilli from basal ashfall unit of the Bishop Tuff at the California Insulating Aggregate Quarry in the NW1/4 sec. 24, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, G. A. Teet, G. T. Coble, and J. G. Husey.
KA2395	10.01 10.08	4.0910	1.0817	54.2	0.7580-0.017	7901A-1, sandstone	No.
KA2416	10.48 10.83	5.7623	1.1541	45.4	0.7140-0.008	8002A, sandstone	Pumice lapilli from prominence, with ashfall over the Bishop Tuff in the NW1/4 sec. 4, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, G. A. Teet.
KA2417	10.93 10.49	5.1063	1.1230	38.2	0.7140-0.009	8002A-1, sandstone	No.
KA2425	11.02 10.56	6.0020	1.1648	60.4	0.7360-0.009	8002C, sandstone	Pumice lapilli from this basal interstitial ashfall of the Bishop Tuff in the NW1/4 sec. 4, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, G. A. Teet.
	10.46 10.63	7.6737	1.180	61.6	0.7640-0.007	640001, sandstone	Pumice blocks from near base of narrowed ashfall unit in the NW1/4 sec. 4, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, A. Doh and G. T. Coble; see bibliography and others (1965) and bibliography (1980).
	10.62 10.69	8.971 6.971	1.154	56.0	0.7280-0.003	640002, sandstone	Pumice fragments from the basal ashfall unit of the Bishop Tuff in the NW1/4 sec. 4, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, R. J. Janda; see bibliography and others (1965) and bibliography (1980).
KA2396	9.47	7.0561	1.0331	61.0	0.7350-0.007	B-101, sandstone	Pumice fragments from basal ashfall unit of the Bishop Tuff in the NW1/4 sec. 18, T. 2 S., R. 32 E., White Mountain Park 15-minute quadrangle, New County, Calif.; collector, R. W. Hildreth; see Hildreth (1977).
KA2393	10.40	2.1252	1.0780	42.8	0.7460-0.005	B-109, sandstone	Pumice fragments from ledge of properly narrowed ashfall in the NW1/4 sec. 6, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, G. A. Teet; see Hildreth (1977).
KA2397	6.92 6.94	0.4244	1.1355	2.1	1.1465-0.40	7901A, bitrite	Hand picked pumice lapilli from basal ashfall unit of the Bishop Tuff at the California Insulating Aggregate Quarry in the NW1/4 sec. 4, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, G. A. Teet, G. T. Coble, and J. G. Husey.
KA2388	0.90 0.99	3.3959	1.7537	11.4	1.1860-0.13	7901A, pHag	No.
KA2422	0.83 0.83	11.7166	0.8005	6.8	0.8660-0.03	8002A, pHag	Pumice from this, lowermost interstitial ashfall (fig. 2) of the Bishop Tuff at the California Insulating Aggregate Quarry in the NW1/4 sec. 4, T. 6 S., R. 33 E., Bishop 15-minute quadrangle, New County, Calif.; collector, G. A. Teet.

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.