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Los Alamos Environmental Restoration Records Processing Facility

ER Record I.D.# 40222

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ER Record Index Form

DATE RECEIVED: 07/18/94 PROCESSOR: YCG

PAGE COUNT: 48

Complete all fields; indicate if not applicable or appropriate; please write legibly.

DOCUMENT TO: Ted Taylor ORGANIZATION: DOE

ORIGINATOR NAME: David G. McInroy ORGANIZATION: EM/ER

SYMBOL: EM/ER:94-J270 DOCUMENT DATE: 07/08/94

SUBJECT/TITLE: Requested Document Reports Supporting the Closure Plan on TA-35, TSL 85 Surface Impoundments

RECORD TYPE (Circle relevant type for primary record):

Analytical Data	Excerpt	Map	Procedure	Summary
Article	FAX	Memo	Purchase Request	Table
Chain-of-Custody	Figure	Microform	Receipt Acknowledgment	Telephone Record
Chart	Form	Notebook	Report	TOC
Computer Output	Interview	Outline	Review	Transcription
Contract	Letter	Personal Notes	Sow	Video
Controlled Distribution	List	Photo	Study	Work Plan
Drawing	Logbook	Plan		Other

RECORD CATEGORY: P
(P for Programmatic or R for Reference)

RECORD PACKAGE: —

FILE FOLDER: —

RECORD FILMED (Y/N): Y

RECORD LOCATION: —
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ATTACHMENTS FILMED (Y/N): Y
(Were attachments to this record filmed?)

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MISCELLANEOUS (List other indexing criteria as necessary; please write legibly): TSL-85

2798

TECH AREA(S)	ADS NO(S)
LIST RELEVANT TECH AREA(S). 35	LIST RELEVANT ADS NO(S).

SENSITIVE (Y/N): — AR (Y/N): Yes ADMINISTRATIVE RECORD: —

CORRECTION (Y/N): — CORRECTION #: —

CORRECTION DESCRIPTION.: —

ATTACHMENT LIST

A) Memo TO: Distribution FROM: Patrick Longmire SYMBOL: —

SUBJECT: Background Soil Chemical Data Using EPA SW846 Procedures

DATED: 03/21/94

B) Table TO: — FROM: — SYMBOL: —

SUBJECT: Table I: Background Elemental Concentrations in Soil at Los Alamos, New Mexico

DATED: —

C) Table TO: — FROM: — SYMBOL: —

SUBJECT: Table II: Background Elemental Concentrations in A horizons of Soil at Los Alamos, New Mexico

DATED: —

D) Report TO: — FROM: Patrick Longmire SYMBOL: —

SUBJECT: Preliminary Background Elemental Concentrations in Bandelier Tuff and Selected Soil Series, 1993

DATED: 01/01/93 abstract

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

(48)

DATE July 8, 1994
IN REPLY REFER TO EM/ER:94-J270
MAIL STOP M992
TELEPHONE 667-0819

Mr. Ted Taylor, Program Manager
Department of Energy
Los Alamos Area Office, MS A316
Los Alamos, NM 87544

Dear Mr. Taylor:

SUBJECT: REQUESTED DOCUMENT REPORTS SUPPORTING THE CLOSURE PLAN ON TA-35, TSL 85 SURFACE IMPOUNDMENT

Enclosed please find the two reports requested in NMED's June 24, 1994 letter, "Approval for Extension to Items in the May 5, 1994 Notice of Deficiency (NOD)". This information is being supplied to NMED as part of the Los Alamos National Laboratory's (LANL's) response to a notice of deficiency (NOD) received on the Closure Plan for TA-35, TSL 85 surface impoundment. Additional supporting documentation will be presented to NMED by Mr. Patrick Longmire of LANL's Environmental Restoration Program. It is my understanding that Mr. Longmire is coordinating this effort with NMED.

If you have any questions, please feel free to call me at 667-0819 or David Hickens at 665-4230.

Sincerely,

David J. McInroy
Acting Project Manager
Environmental Restoration Program

DM/ja

Cy:
RPF, MS M707
CRM, MS A150

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Los Alamos

Date: March 21, 1994
Mail Stop: J534
Telephone: 665-6493, 665-1264
Fax: 665-9118
memorandum

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

To: Distribution

From: Patrick Longmire, CST-10, Earth Sciences Technical Team

Subject: **BACKGROUND SOIL CHEMICAL DATA USING EPA SW846 PROCEDURES**

Attached are more recent background chemical data for soils collected at Los Alamos (Tables I and II). These data are collected from "true soils", which may have application for fill or reworked unconsolidated material found at the townsites and other disturbed areas of the Laboratory. Table I contains chemical data for all soils and fracture fill material sampled at the Laboratory. Table II contain chemical data from A horizons, which typically are the uppermost soil horizons found on the Pajarito Plateau. These A horizons are probably comparable to surface soil samples, excluding fill material, collected at operable units (OUs). Clearly, more Laboratory-wide background soil samples need to be collected from A horizons.

Nitric acid (HNO_3) was used to partly dissolve the soil samples. Atomic absorption (AA) and inductively coupled plasma spectroscopy (ICP) were the analytical methods used. Analytes of most concern include arsenic (As) and beryllium (Be) because background soil concentrations exceed screening action levels (SALs) for these two elements (Be, 0.16 ppm; As, 0.40 ppm). A seminar will be given in early May discussing details of these background data. Thank you for your interest in these background soil data.

TABLE I. Background Elemental Concentrations in Soils at Los Alamos, New Mexico

	Nitric Acid Dissolution (SW846)			INAA or DNAA (Uranium Only)		
Element[a]	Number of Samples	Mean	Range	Number of Samples	Mean	Range
As	72	4.9	0.5 - 13.6	67	5.04	1.20 - 10.81
Ba	72	176	24 - 730	75	459	125 - 829
Be	72	1.23	0.18 - 4.00		-	-
	75	[b]2.37	1.00 - 4.40			
Co	72	15.2	5.5 - 34	75	7.14	0.44 - 23.35
Cr	72	12.2	1.9 - 37.0	74	34.74	2.03 - 71.07
Cu	67	6.6	0.6 - 16.0		-	-
Fe (wt.%)	72	1.51	0.33 - 3.60	75	2.37	1.09 - 4.86
Ni	70	10.3	2.0 - 28.0		-	-
Pb	69	16.7	4.0 - 37.0		-	-
		[b]28.36	18.00 - 56.00			
Se	41	0.75	0.30 - 2.40		-	-
Th	72	7.1	0.6 - 15.0	75	16.06	10.09 - 27.30
Tl	40	0.42	0.20 - 0.90		-	-
U	72	0.94	0.20 - 2.40	75	3.41	1.54 - 6.73
V	72	26.6	4.0 - 56.0	72	48.95	11.54 - 113.10

[a]Data are reported in parts per million (ppm) unless otherwise noted.
[b]Hydrofluoric acid used in sample dissolution.

TABLE II. Background Elemental Concentrations in A Horizons of Soils at Los Alamos, New Mexico

	Nitric Acid Dissolution (SW846)		
Element[a]	Number of Samples	Mean	Range
As	9	3.1	0.8 - 5.4
Ba	9	123	27 - 220
Be	9	0.71	0.31 - 1.00
Co	9	16.7	10.0 - 29.0
Cr	9	8.1	1.9 - 16.0
Cu	7	6.5	3.3 - 9.5
Fe (wt.%)	9	1.21	0.33 - 2.30
Ni	9	6.7	2.0 - 12.0
Pb	9	15.8	4.0 - 38.0
Se	2	0.58	0.50 - 0.65
Th	9	5.8	2.0 - 8.0
Tl	2	0.2	0.2 - 0.2
U	9	0.9	0.5 - 2.4
V	9	19.8	4.6 - 37.0

[a]Data are reported in parts per million (ppm) unless otherwise noted.
Note: A horizon is uppermost soil horizon characterized during background investigation.

PRELIMINARY BACKGROUND ELEMENTAL CONCENTRATIONS IN BANDELIER TUFF AND SELECTED SOIL SERIES, 1993

by

Patrick Longmire, Clarence Duffy, and Steven Reneau

ABSTRACT

During spring and summer of 1992, the Bandelier Tuff and several soil series were sampled to determine background elemental concentrations. Thirty-eight samples of the Bandelier Tuff and seventy-five soil samples were submitted for chemical analyses. Rock and soil samples were analyzed for antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), silver (Ag), thorium (Th), uranium (U), and other elements. The soil samples contain higher concentrations of aluminum (Al), As, Ba, calcium (Ca), cesium (Cs), cobalt (Co), Cr, and iron (Fe) relative to the Bandelier Tuff samples. The Bandelier Tuff samples, however, contain higher concentrations of Be, Pb, sodium (Na), potassium (K), Th, and U relative to soils. Variations in soil elemental concentrations are related to chemical characteristics of a particular soil horizon and to the parent material, which consists of alluvial fans, sheet wash material, colluvium, air-fall pumice (El Cajete), loess, and the Bandelier Tuff. Because of the limited number of Bandelier Tuff and soil samples collected, this data set should not be considered statistically representative of the full suite of soils and tuff present at the Laboratory, and may not include the full range of natural concentrations for all elements. Generally, these data agree well with soil data reported by Ferenbaugh et al. (1990) and Schacklette and Boerngen (1984).

INTRODUCTION

During spring and summer of 1992, the Bandelier Tuff and several soil series were characterized (Watt and McFadden, 1992) and sampled to determine background elemental concentrations. Figures 1 and 2 show sampling locations for the Bandelier Tuff and different soil series, respectively. This investigation is relevant to the Environmental Restoration (ER) Program, because background elemental concentrations are used in determining screening action levels for different contaminants. Background elemental data are also required to distinguish between contaminated and non-contaminated media. Thirty-eight samples of the Bandelier Tuff and seventy-five soil samples were submitted for chemical analyses.

The samples of Bandelier Tuff include all stratigraphic units present within the Tshirege Member in the central and eastern portions of the Laboratory, and the background concentrations are probably representative of tuff elsewhere in these units at the Laboratory. Additional higher stratigraphic units of the Tshirege Member, however, are present in the western portion of the Laboratory that have not yet been analyzed.

The soil samples were collected from seven very different soils found geographically around the Laboratory. These sites were selected to sample soils influenced by a range of parent materials, topographic setting, local climate, and time. The limited number of sample sites precluded coverage of all types of soil present at the Laboratory. In addition, because only one soil profile was sampled from each setting, the natural background variability in soils occurring at similar settings has not yet been evaluated. Because of these concerns, this data set should not be considered statistically representative of

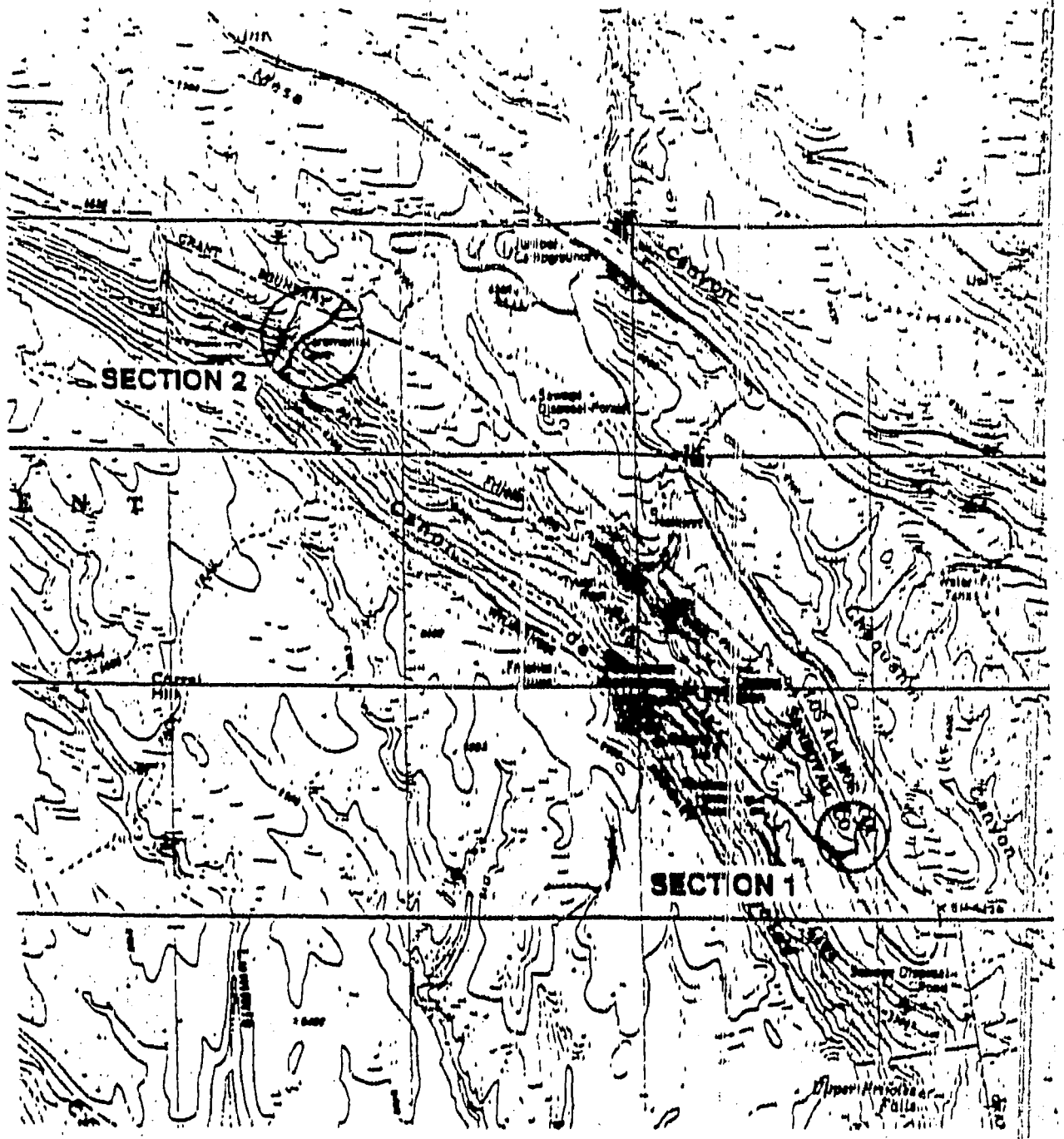

FIGURE 1. LOCATION MAP OF BANDELIER TUFF SECTIONS

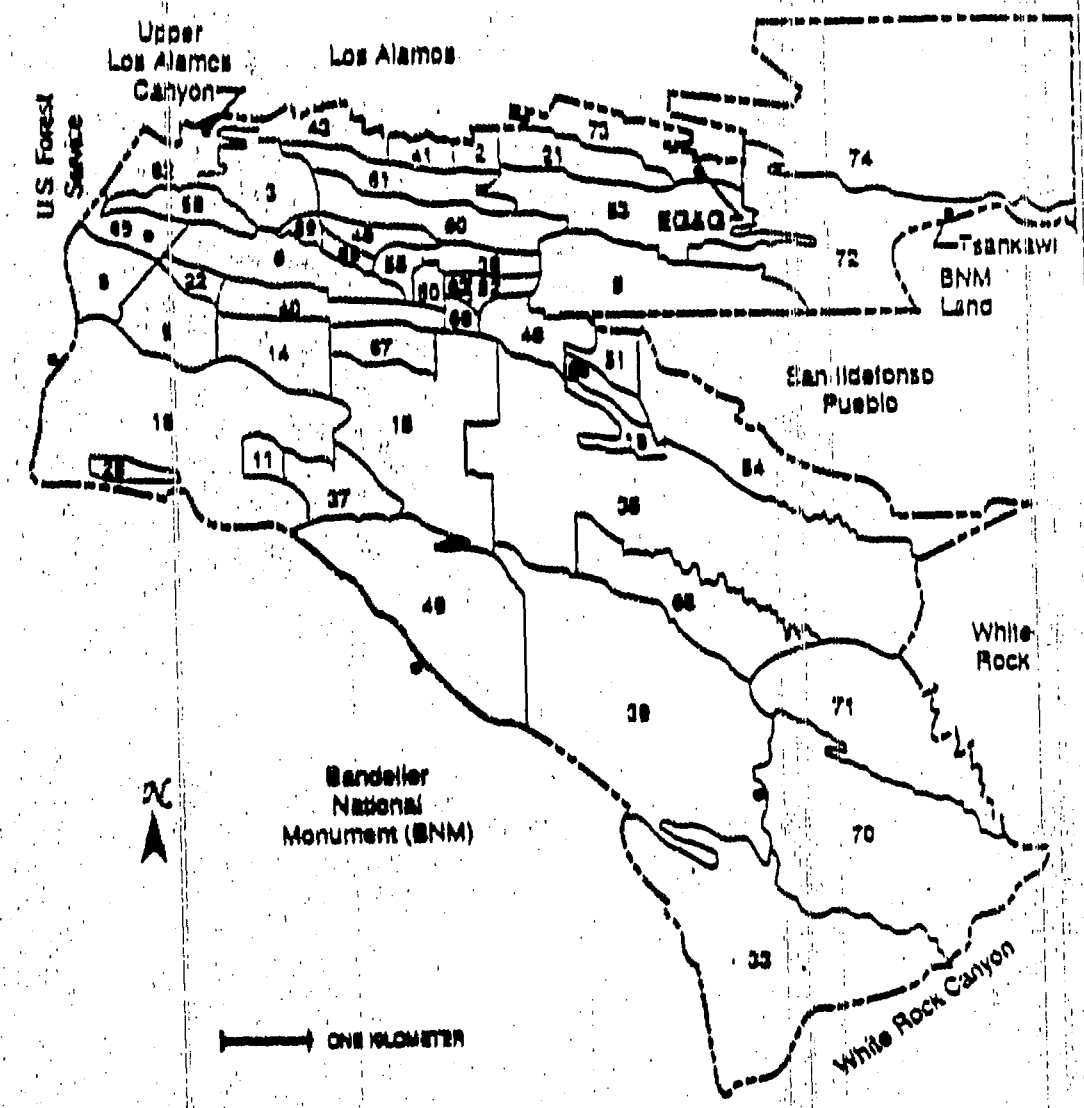

Figure 2 Locations of soil samples collected for background soil stucy in relation to other TAs and landholdings surrounding the Laborato

the full suite of soils present at the Laboratory, and may not include the full range of natural concentrations for all elements.

Rock and soil samples were analyzed for antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), silver (Ag), thorium (Th), and uranium (U). These elements are of primary concern to the ER program, because numerous solid waste management units (SWMUs) at Los Alamos National Laboratory (Laboratory) potentially contain elevated concentrations of these elements. Other elements of secondary importance to the ER Program include aluminum (Al), bromine (Br), calcium (Ca), cesium (Cs), chlorine (Cl), cobalt (Co), copper (Cu), gallium (Ga), gold (Au), hafnium (Hf), indium (In), iodine (I), iron (Fe), magnesium (Mg), manganese (Mn), potassium (K), rare earth elements (REE), rubidium (Rb), scandium (Sc), selenium (Se), sodium (Na), strontium (Sr), tantalum (Ta), titanium (Ti), tungsten (W), vanadium (V), zinc (Zn), and zirconium (Zr).

This report summarizes elemental background concentrations compiled on the Bandelier Tuff and soils collected within and adjacent to the Laboratory boundaries. An additional report will be made available in late spring of 1993, which will consist of statistical evaluation and interpretation of chemical, physical, and mineralogical data collected during this investigation.

METHODS

Non-contaminated samples of the Bandelier Tuff were collected at two localities within Bandelier National Monument (BNM). Locations of the sections where the samples were taken are shown in Figure 1. Locations of the samples within the sections are shown in Figures 3 and 4. Samples were taken from surface exposure, but material from obvious weathering rinds was excluded.

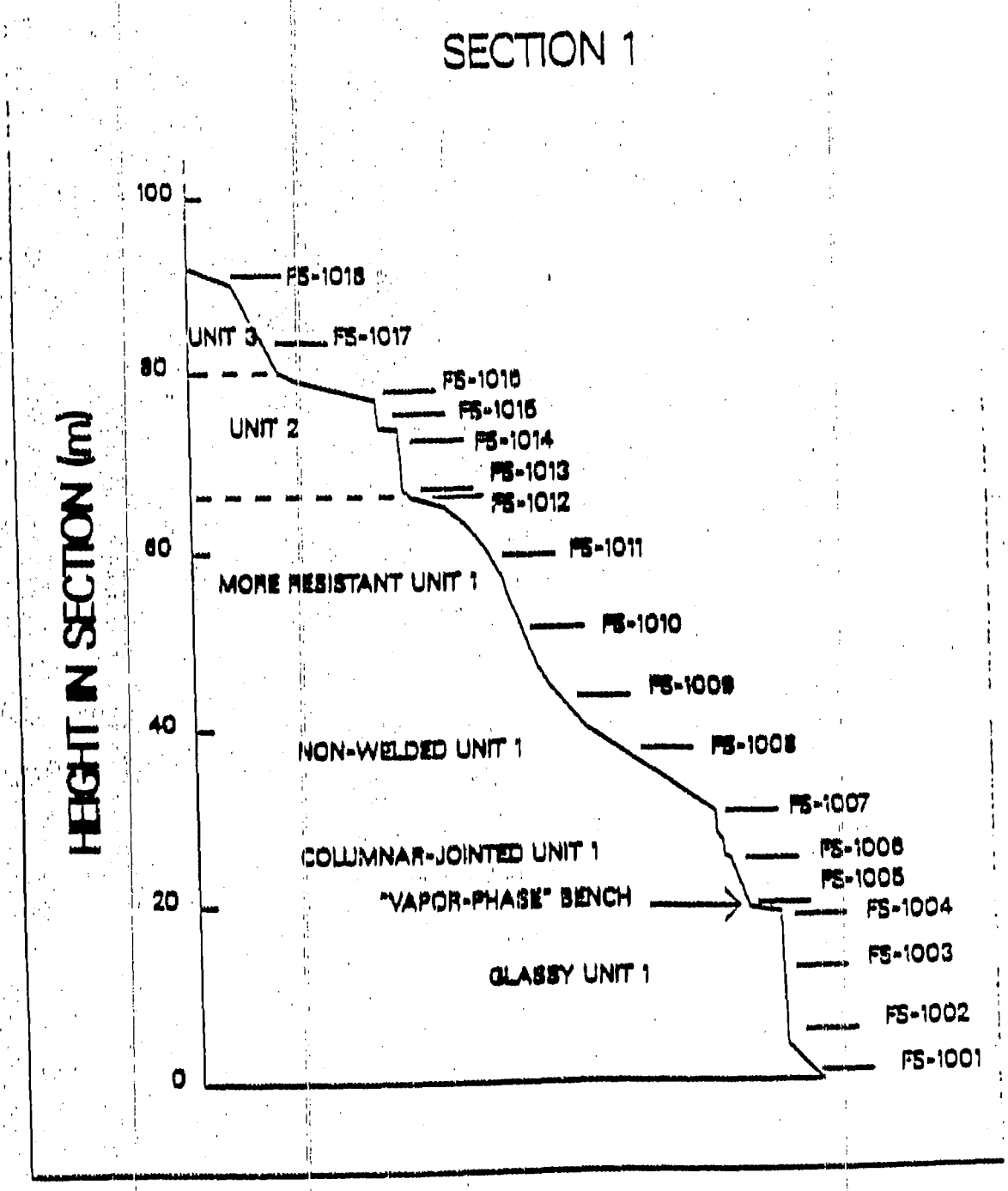

Figure 3 Locations of Bandelier Tuff samples within section 1.

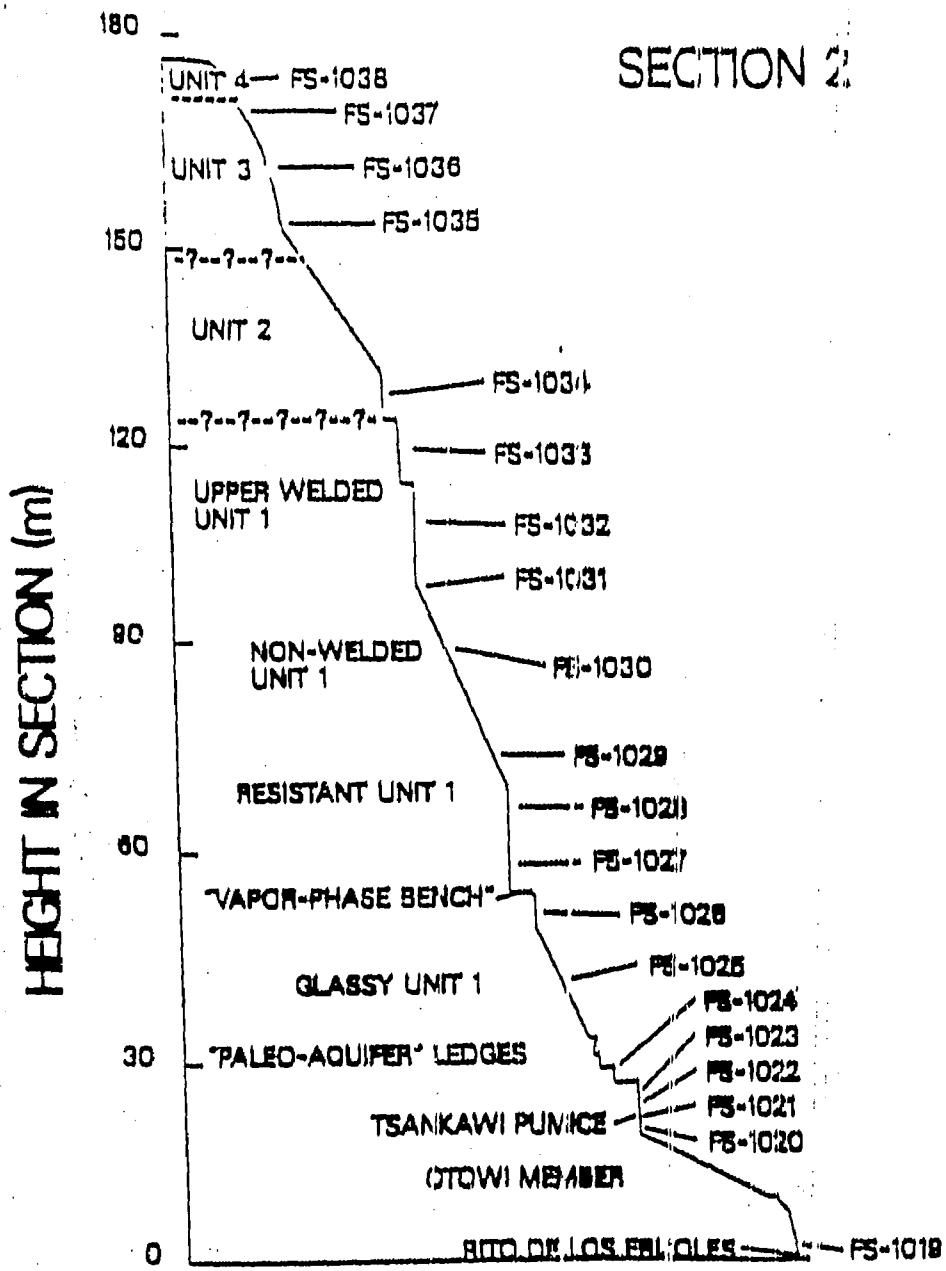

Figure 4 Locations of Bandelier Tuff samples within section 2.

Sampling, to this stage, has been largely limited to the upper (Tshirege) member of the Bandelier Tuff, with only two samples from the lower (Otowi) member.

Soil samples were collected from seven localities where either trenches were excavated or sides of drainage channels provided excellent soil exposure. These localities include Upper Los Alamos Canyon (south the dirt reservoir road on the north-facing canyon slope), TA-69 (west of any developments and/or disturbances), TA-16 (west of State Route 4), TA-49 (south of State Route 4), TA-39 (west of State Route 4), Tsankawi (north of Los Alamos Creek, west of State Route 4), and south of EG&G (south of State Route 551). These localities provided a wide geographical distribution of soil series, and allow partial sampling of the varying degree of soil development occurring on the Pajarito Plateau. At each location, soil samples were collected at different depths (0 to 300 cm) corresponding to the different soil horizons.

The different soil horizons were classified and characterized according to their texture, consistence (wet/dry), particle size distribution, color, clay mineral content, calcium carbonate content, organic carbon content, soil pH, cation exchange capacity (CEC), and bulk density (Watt et al., 1992).

Soil samples were passed through a 20 mesh sieve to remove pebbles and twigs. Bandelier Tuff and soil samples were either air-dried or dried in a forced-air circulation oven at 60 C for 48 hours and then ground with a corundum mortar and pestle. Grinding of the Bandelier Tuff samples was more extensive than the soil samples, because of the indurated nature of the rock samples.

After the samples were prepared, they were submitted to INC-15 for instrumental and delayed neutron activation analysis (INAA and DNAA) and to EM-9 for inductively coupled argon plasma (ICAP) spectroscopy. The

procedures used for these analyses are described in detail in Gautier and Gladney (1986), Gladney et al. (1981), and Garcia (1990). Quality assurance was provided by concurrent analysis of different National Institute of Standards and Technology (NIST), United States Environmental Protection Agency (USEPA), and United States Geological Survey (USGS) reference materials described by Gladney et al. (1981) and Garcia (1991).

RESULTS

Table I summarizes the means and ranges of elements in the Bandelier Tuff and soil series. The soil samples are enriched in Al, As, Ba, Ca, Cs, Co, Cr, and Fe relative to the Bandelier Tuff samples. The Bandelier Tuff samples, however, are enriched in Be, Pb, Na, K, Th, and U relative to soils. Variations in soil elemental concentrations are related to chemical characteristics of a particular soil horizon and to the parent material, which consists of alluvial fans, sheet wash material, colluvium, and the Bandelier Tuff. Generally, these data agree well with soil data reported from other sources summarized in Table II, including Ferenbaugh et al. (1990) and Schacklette and Boerngen (1984).

The results of individual analyses are tabulated in Appendix A, Tables A-I and A-II.

TABLE 2

SUMMARY OF TUFF AND SOIL ANALYSES (VALUES IN PPM)

ELEMENT		SAMPLES ABOVE DETECTION LIMIT				SAMPLES BELOW DETECTION		
		NUMBER OF SAMPLES	MINIMUM	MAXIMUM	AVERAGE	NUMBER OF SAMPLES	MINIMUM DETECTION LIMIT	MAXIMUM DETECTION LIMIT
Be								
	TUFF	38	0.42	7.50	4.72	0		
	SOIL	75	1.00	4.40	2.37	0		
Na								
	TUFF	38	13960.00	36230.00	31050.88	0		
	SOIL	75	2700.00	32560.00	17948.52	0		
Mg								
	TUFF	3	3035.00	6571.00	4301.00	35	2060.00	4173.00
	SOIL	53	1331.00	16790.00	6182.64	22	1597.00	4325.00
Al								
	TUFF	38	50600.00	76531.66	66370.31	0		
	SOIL	74	49680.00	113600.00	76767.63	1	1524.00	1524.00
Cl								
	TUFF	30	102.60	1883.00	593.43	8	104.40	173.40
	SOIL	36	69.12	966.90	326.63	39	51.79	198.20
K								
	TUFF	38	28760.00	47920.00	37944.74	0		
	SOIL	75	10390.00	42000.00	25418.80	0		
Ca								
	TUFF	15	1745.00	16960.00	5667.44	23	1777.00	2530.00
	SOIL	71	1911.00	80380.00	8639.29	4	1114.00	3002.00
Sc								
	TUFF	38	0.88	5.39	1.82	0		
	SOIL	75	1.29	18.80	6.56	0		
Ti								
	TUFF	6	432.50	1943.00	1199.64	32	3368.00	7024.00
	SOIL	72	1188.00	5438.00	2913.13	3	3607.00	5780.00
V								
	TUFF	3	9.63	42.25	24.46	35	5.79	10.49
	SOIL	72	11.54	113.10	48.95	3	6.40	8.84
Cr								
	TUFF	31	1.17	49.85	5.60	7	0.91	2.66
	SOIL	74	2.03	71.07	34.74	1	1.60	1.60
Mn								
	TUFF	38	360.40	834.50	551.71	0		
	SOIL	75	188.70	1552.00	507.77	0		

TABLE I (continued)

SUMMARY OF TUFF AND SOIL ANALYSIS (VALUES IN PPM)

ELEMENT		SAMPLES ABOVE DETECTION LIMIT				SAMPLES BELOW DETECTION		
		NUMBER OF SAMPLES	MINIMUM	MAXIMUM	AVERAGE	NUMBER OF SAMPLES	MINIMUM DETECTION LIMIT	MAXIMUM DETECTION LIMIT
Fe								
	TUFF	38	8818.00	22850.00	11529.60	0		
	SOIL	75	10860.00	48640.00	23704.27	0		
Co								
	TUFF	35	0.49	8.88	1.30	3	0.29	0.35
	SOIL	75	0.44	23.35	7.14	0		
Cu								
	TUFF	0				38	260.80	444.40
	SOIL	0				75	158.90	456.60
Zn								
	TUFF	35	39.85	131.30	81.85	3	6.42	46.20
	SOIL	36	19.97	146.30	64.58	39	5.32	71.93
Ga								
	TUFF	10	14.53	34.21	20.62	28	23.63	62.06
	SOIL	10	7.81	37.39	21.10	65	16.54	99.75
As								
	TUFF	16	0.94	3.15	1.89	22	2.29	4.55
	SOIL	67	1.20	10.81	5.04	8	2.58	5.21
Se								
	TUFF	0				38	1.14	4.92
	SOIL	0				75	1.71	7.72
Br								
	TUFF	9	1.70	6.73	2.79	29	2.55	5.42
	SOIL	64	1.38	46.88	6.48	11	1.77	4.67
Rb								
	TUFF	38	79.13	488.40	187.15	0		
	SOIL	75	43.95	159.00	108.69	0		
Sr								
	TUFF	1	653.90	653.90	653.90	37	236.90	483.80
	SOIL	2	170.40	242.20	206.30	73	164.90	746.10
Zr								
	TUFF	38	144.10	368.82	228.82	0		
	SOIL	70	148.00	704.30	350.64	5	128.40	316.30
Ag								
	TUFF	0				38	1.71	2.95
	SOIL	1	1.61	1.61	1.61	74	1.59	7.52

TABLE I (continued)

SUMMARY OF TUFF AND SOIL ANALYSES (VALUES IN PPM)

ELEMENT		SAMPLES ABOVE DETECTION LIMIT				SAMPLES BELOW DETECTION		
		NUMBER OF SAMPLES	MINIMUM	MAXIMUM	AVERAGE	NUMBER OF SAMPLES	MINIMUM DETECTION LIMIT	MAXIMUM DETECTION LIMIT
Cd								
	TUFF	0				38	1.00	1.00
	SOIL	3	1.20	1.70	1.50	72	1.00	1.00
In								
	TUFF	0				38	0.21	0.40
	SOIL	3	0.07	0.17	0.12	72	0.15	0.69
Sb								
	TUFF	2	0.24	0.70	0.47	36	0.24	0.67
	SOIL	57	0.27	1.59	0.69	18	0.25	0.51
I								
	TUFF	0				38	14.23	32.05
	SOIL	9	4.05	29.42	9.99	66	9.93	40.59
Cs								
	TUFF	38	1.79	8.10	4.38	0		
	SOIL	75	2.19	10.71	4.87	0		
Ba								
	TUFF	24	79.85	413.70	151.18	14	48.02	339.60
	SOIL	75	124.80	828.90	459.05	0		
La								
	TUFF	38	42.71	75.94	57.18	0		
	SOIL	75	31.70	93.50	47.31	0		
Ce								
	TUFF	38	81.71	157.10	112.28	0		
	SOIL	75	58.19	161.80	88.80	0		
Nd								
	TUFF	38	30.36	71.58	48.38	0		
	SOIL	75	6.58	71.68	34.33	0		
Sm								
	TUFF	38	0.81	13.21	10.08	0		
	SOIL	75	3.84	12.55	6.25	0		
Eu								
	TUFF	32	0.08	0.84	0.25	6	0.13	0.18
	SOIL	75	0.24	2.15	0.83	0		
Tb								
	TUFF	38	1.11	2.65	1.96	0		
	SOIL	73	0.40	1.96	0.87	2	0.10	0.16

TABLE 2 (continued)

SUMMARY OF TUFF AND SOIL ANALYSES (VALUES IN PPM)

ELEMENT		SAMPLES ABOVE DETECTION LIMIT				SAMPLES BELOW DETECTION		
		NUMBER OF SAMPLES	MINIMUM	MAXIMUM	AVERAGE	NUMBER OF SAMPLES	MINIMUM DETECTION LIMIT	MAXIMUM DETECTION LIMIT
Dy								
	TUFF	38	4.61	15.57	11.09	0		
	SOIL	75	2.68	10.38	4.88	0		
Yb								
	TUFF	38	2.96	10.63	6.87	0		
	SOIL	75	1.33	5.87	3.50	0		
Lu								
	TUFF	38	0.51	1.40	0.95	0		
	SOIL	75	0.22	0.75	0.48	0		
Hf								
	TUFF	38	6.34	12.13	8.96	0		
	SOIL	75	4.16	18.56	9.76	0		
Ta								
	TUFF	38	2.66	9.70	6.03	0		
	SOIL	75	1.27	5.67	2.44	0		
W								
	TUFF	23	2.04	20.03	6.01	15	3.10	9.62
	SOIL	22	1.62	17.07	5.96	53	1.47	13.21
Au								
	TUFF	0				38	0.01	0.02
	SOIL	4	0.02	0.04	0.03	71	0.01	0.02
Hg								
	TUFF	0				38	0.35	0.69
	SOIL	0				75	0.34	1.37
Pb								
	TUFF	34	18.00	57.00	35.79	4	14.00	14.00
	SOIL	73	18.00	56.00	28.36	2	14.00	14.00
Th								
	TUFF	38	12.90	37.06	23.71	0		
	SOIL	75	10.09	27.30	16.06	0		
U								
	TUFF	38	2.88	10.13	6.27	0		
	SOIL	75	1.54	6.73	3.41	0		

TABLE II. Elemental Concentrations in Soil

	Farenbaugh et al. (1990)		Schacklette and Boerngen (1984)	
Element[a]	Mean	Range	Mean	Range
Al (%)	5.8	5.3 - 6.7	5.8	0.5 - >10
As	3.9	1.3 - 6.7	5.5	<0.1 - 97
Ba	410	120 - 810	580	70 - 5,000
Be	1.9	1.1 - 3.3	0.68	<1 - 15
Br	1.9	0.40 - 5.7	0.52	<0.5 - 11
Cd (ppb)	170	30 - 520	-	-
Cl	<100	-	-	-
Cr	27	4.2 - 136	41	3 - 2,000
Cu	10	2.0 - 18	21	2 - 300
F	240	50 - 390	280	<10 - 1,900
Fe (%)	1.7	1.0 - 2.6	2.1	0.1 - >10
Hg (ppb)	18	7.0 - 29	46	<10 - 4,600
Mn	510	330 - 840	380	30 - 5,000
Ni	8.9	1.6 - 19	15	<5 - 700
Pb	24	8.0 - 98	17	<10 - 700
Rb	120	90 - 160	69	<20 - 210
Th	-	-	9.1	2.4 - 31
Ti (%)	0.26	0.079 - 0.49	0.22	0.05 - 2.0
U	-	-	2.5	0.68 - 7.9
Zn	54	38 - 71	55	10 - 2,100

[a]Data are reported in parts per million (ppm) unless otherwise noted.

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Appendix A
Results of Tuff and Soil Analyses

Table A-1
Bandelier Tuff Analyses

	Na	Standard Deviation	Mg	Standard Deviation	Al	Standard Deviation	Cl	Standard Deviation	K	Standard Deviation	Ca	Standard Deviation
FS-1001	33930.00	1764.36	<2300.00		66730.00	1868.64	1777.00	140.38	40640.00	2642.90	2104.00	329.47
FS-1002	30200.00	1332.32	<2729.00		64300.00	1881.32	1369.00	104.04	36350.00	2399.10	<2970.00	
FS-1003	25000.00	1175.00	<3122.00		59600.00	1867.06	809.00	82.62	28760.00	2415.84	<2056.00	
FS-1004	33090.00	1753.77	<2360.00		60090.00	1906.52	531.90	46.81	40150.00	2609.75	2255.00	311.40
FS-1005	29620.00	1273.66	<2742.00		66600.00	1811.64	168.93	62.49	36600.00	2818.28	10070.00	735.11
FS-1006	31445.00	1406.67	<3067.00		65590.00	1860.67	770.30	70.53	36400.00	2876.78	5450.00	541.58
FS-1007	33840.00	1768.88	<2252.00		66930.00	1875.72	869.60	77.31	39010.00	2769.71	<2070.00	
FS-1008	31640.00	1351.02	<2716.00		66600.00	1865.92	172.30	31.53	37300.00	2867.08	<1972.00	
FS-1009	32960.00	1509.32	<6173.00		66720.00	1934.00	711.90	61.22	36140.00	2621.38	<2055.00	
FS-1010	36230.00	1820.19	<2395.00		69930.00	1958.04	673.00	43.04	39470.00	2565.55	5277.00	2052.75
FS-1011	31970.00	1374.71	<2660.00		65950.00	1846.68	634.90	39.58	30000.00	2534.40	<1986.00	
FS-1012	34755.00	1723.19	<3141.50		65900.00	1870.04	273.15	32.38	38515.00	3807.23	3473.00	610.65
FS-1013	36220.00	1803.44	<2237.00		68590.00	1920.52	360.30	63.41	39900.00	3351.60	2824.00	353.02
FS-1014	31150.00	1330.45	<2526.00		65200.00	1827.04	134.30	19.74	38130.00	2516.58	3289.00	381.66
FS-1015	32130.00	1510.11	<3595.00		65400.00	1832.32	<173.40		35400.00	2336.40	<2043.00	
FS-1016	34330.00	1819.49	<2143.00		66900.00	1873.20	<119.50		41360.00	2729.76	<1807.00	
FS-1017	30790.00	1323.97	<2500.00		65000.00	1820.00	204.00	36.25	36050.00	2513.34	<1842.00	
FS-1018	31590.00	1404.73	<3811.00		66370.00	1858.36	378.00	41.25	38200.00	2521.20	2872.00	318.77
FS-1019	27300.00	1406.90	6571.00	722.81	73210.00	2049.08	671.10	55.59	37170.00	2453.22	11770.00	2307.19
FS-1020	27500.00	1105.94	3297.00	771.50	73020.00	2066.96	338.30	49.73	35850.00	2366.10	9119.00	619.71
FS-1021	24310.00	1142.57	<3734.00		55930.00	1621.97	1632.00	124.02	33830.00	2266.61	<2530.00	
FS-1022	31610.00	1675.33	<2800.00		60090.00	1906.52	1003.00	139.34	42500.00	2932.50	<1929.00	
FS-1023	26890.00	1156.27	<2549.00		63720.00	1764.16	1239.00	102.84	41740.00	3673.12	<1871.00	
FS-1024	13960.00	670.00	<3054.00		63600.00	1701.92	209.00	30.43	25210.00	2132.33	16960.00	1000.44
FS-1025	30030.00	1561.56	<2359.00		60830.00	1904.04	565.50	49.20	47520.00	3162.72	<1956.00	
FS-1026	28100.00	1225.77	<2604.00		69195.00	1937.46	842.10	44.73	41900.00	3757.45	<1899.00	
FS-1027	31660.00	1529.28	<4116.00		60200.00	1977.00	500.10	48.51	37870.00	4089.56	<2142.00	
FS-1028	31230.00	1592.73	<2257.00		65700.00	1840.72	259.20	28.77	39560.00	2610.96	<1849.00	
FS-1029	30430.00	1359.16	<2511.00		63870.00	1788.36	288.60	37.38	36830.00	2659.39	<1915.00	
FS-1030	32570.00	1530.79	<3770.00		66260.00	1855.28	342.00	36.64	36220.00	4962.16	<1777.00	
FS-1031	34420.00	1789.84	<2150.00		67630.00	1893.64	102.60	26.06	37810.00	2805.75	<1843.00	
FS-1032	32110.00	1300.73	<2370.00		64830.00	1815.24	<107.50		40470.00	3642.30	<1793.00	
FS-1033	31690.00	1521.12	<3395.00		66700.00	2668.00	<162.20		36280.00	2684.72	<1957.00	
FS-1034	33820.00	1826.28	<2060.00		64990.00	1819.72	<115.00		36050.00	2703.75	<1978.00	
FS-1035	31960.00	1339.00	<2456.00		66630.00	1865.64	<104.40		36230.00	2970.86	1745.00	305.10
FS-1036	31320.00	1640.72	<3512.50		66745.00	1868.86	<170.55		36125.00	2726.60	<2301.50	
FS-1037	33090.00	1753.77	<2160.00		68530.00	1918.84	120.50	30.00	40310.00	2982.94	2193.00	329.[illegible]
FS-1038	34303.33	1621.29	3035.00	664.66	76531.66	2142.89	<133.65		39430.00	3031.54	5800.67	585.[illegible]

	Sc	Standard Deviation	Ti	Standard Deviation	V	Standard Deviation	Cr	Standard Deviation	Mn	Standard Deviation	Fe	Standard Deviation
ES-1001	[illegible]	[illegible]	[illegible]		<6.74		2.39	0.59	552.60	24.31	11100.00	599.40
ES-1002	1.15	0.07	<4673.00		<7.27		<3.82		598.00	23.92	11550.00	716.10
ES-1003	0.98	0.05	<5160.00		<7.84		4.52	0.62	446.50	[illegible]	[illegible]	[illegible]
ES-1004	1.21	0.07	<4166.00		<7.00		<1.54		667.60	33.38	11170.00	659.03
ES-1005	1.19	0.08	<4533.00		<7.27		4.99	0.65	542.00	21.64	10600.00	530.60
ES-1006	1.05	0.06	<6364.00		<9.60		3.85	0.56	554.80	22.19	10136.50	511.47
ES-1007	1.16	0.06	832.50	155.70	<6.34		3.13	0.60	531.50	25.51	11040.00	640.32
ES-1008	1.11	0.06	<4385.00		<7.25		4.35	0.53	553.30	24.35	10690.00	641.40
ES-1009	1.07	0.06	<6867.00		<10.37		4.27	0.68	581.70	22.69	10680.00	544.68
ES-1010	1.56	0.08	<4011.00		<6.96		5.90	0.75	683.70	36.92	12440.00	684.20
ES-1011	1.17	0.07	<4355.00		<7.21		4.76	0.57	539.80	22.67	10250.00	533.00
ES-1012	1.17	0.06	<5291.00		<8.24		4.54	0.60	637.95	25.98	11645.00	624.48
ES-1013	1.10	0.06	<3661.00		<6.23		1.97	0.51	525.80	30.50	10710.00	610.47
ES-1014	1.36	0.08	<4131.00		<6.66		4.80	0.55	518.10	21.76	10650.00	660.30
ES-1015	1.34	0.07	<6055.00		<9.05		2.38	0.48	574.90	24.72	11080.00	565.08
ES-1016	1.63	0.09	<3466.00		<5.90		<1.31		459.70	20.69	11080.00	709.12
ES-1017	1.45	0.08	<4103.00		<6.53		3.61	0.51	428.50	16.73	10490.00	597.93
ES-1018	1.57	0.08	<6076.00		<9.19		2.84	0.52	465.70	18.63	10310.00	525.81
ES-1019	5.59	0.30	1943.00	318.65	42.25	2.75	49.85	3.14	834.50	37.55	22850.00	1462.40
ES-1020	4.08	0.22	1505.00	290.46	21.50	2.17	12.00	0.89	465.80	15.56	17080.00	888.16
ES-1021	1.01	0.05	<6524.00		<9.58		2.86	1.33	558.70	21.79	9177.00	518.18
ES-1022	0.91	0.05	<4051.00		<7.10		<0.91		626.90	29.46	11410.00	699.67
ES-1023	0.88	0.06	<4304.00		<7.01		2.70	0.52	574.40	22.40	10020.00	591.18
ES-1024	0.93	0.05	<6017.00		<8.62		<2.66		639.70	24.95	10560.00	536.56
ES-1025	1.19	0.06	<4020.00		<6.93		<1.68		589.80	28.90	11480.00	619.92
ES-1026	1.18	0.08	<4507.50		<7.42		3.94	0.63	581.30	23.87	11475.00	618.80
ES-1027	1.17	0.06	<7024.00		<10.49		3.72	0.61	663.10	25.86	11490.00	620.46
ES-1028	1.17	0.06	721.00	186.02	<6.60		1.79	0.48	663.40	33.17	11260.00	641.82
ES-1029	1.35	0.07	<4138.00		<6.92		3.12	0.59	514.60	22.13	10750.00	612.75
ES-1030	1.14	0.06	<6129.00		<9.28		3.84	0.51	558.20	22.33	10750.00	606.25
ES-1031	1.36	0.07	<3610.00		<6.24		5.94	0.65	590.00	26.55	11300.00	580.69
ES-1032	1.69	0.09	<3831.00		<6.43		5.08	0.63	510.10	20.91	11300.00	745.80
ES-1033	1.25	0.07	<5561.00		<8.45		1.63	0.37	502.10	19.58	10770.00	710.82
ES-1034	1.31	0.07	<3365.00		<5.79		<2.08		482.00	25.06	10220.00	541.66
ES-1035	1.59	0.09	<3873.00		<6.26		1.17	0.46	360.40	14.42	10740.00	519.96
ES-1036	1.92	0.11	1068.00	263.53	<8.40		2.07	0.41	382.75	15.49	10690.00	736.05
ES-1037	1.86	0.10	<3622.00		<6.17		5.80	0.67	[illegible]	21.56	11570.00	590.07
ES-1038	3.81	0.21	1528.33	265.13	9.63	1.83	9.90	0.93	558.48	24.02	17843.33	1015.54

	Co	Standard Deviation	Cu	Standard Deviation	Zn	Standard Deviation	Ga	Standard Deviation	As	Standard Deviation	Se	Standard Deviation
ES-1001	0.83	0.11	<322.90		115.80	15.75	29.86	5.08	1.68	0.40	<2.27	
ES-1002	<0.31		<307.60		95.66	31.95	24.22	4.77	<2.63		<3.85	
ES-1003	0.71	0.06	<333.30		63.28	8.60	<28.45		<3.46		<3.62	
ES-1004	1.27	0.11	<322.08		110.58	15.03	25.40	5.82	3.04	0.51	<2.28	
ES-1005	0.55	0.21	<301.60		83.57	32.08	<23.85		1.80	0.46	<4.11	
ES-1006	0.66	0.14	<413.90		96.83	21.66	32.61	5.84	1.39	0.43	<4.04	
ES-1007	1.22	0.08	<305.40		88.45	12.30	<28.58		1.00	0.31	<2.13	
ES-1008	0.45	0.19	<300.40		78.40	29.56	<24.46		<2.57		<3.61	
ES-1009	0.83	0.08	<437.10		79.85	10.94	<40.36		2.03	0.50	<4.92	
ES-1010	1.13	0.08	<322.90		106.50	13.67	16.53	4.40	1.38	0.38	<2.13	
ES-1011	<0.35		<298.80		78.09	28.58	<24.65		1.68	0.40	<3.81	
ES-1012	0.81	0.10	<378.35		84.23	11.32	26.22	5.30	<3.47		<3.83	
ES-1013	0.72	0.08	<369.50		89.34	12.24	<25.61		<2.37		<1.93	
ES-1014	0.83	0.16	<283.90		56.08	24.86	<23.83		<2.43		<3.27	
ES-1015	0.77	0.06	<385.80		62.76	8.54	<36.56		<4.03		<3.68	
ES-1016	1.11	0.09	<288.60		71.19	9.90	15.10	4.70	<2.29		<1.85	
ES-1017	0.51	0.18	<285.70		<63.50		<25.37		<2.55		<3.43	
ES-1018	1.04	0.08	<403.00		41.34	6.12	<39.67		<4.24		<3.86	
ES-1019	0.88	0.48	<298.40		112.60	15.17	33.70	5.59	1.47	0.34	<2.59	
ES-1020	3.98	0.27	<267.10		<46.20		<23.63		<2.30		<3.97	
ES-1021	0.78	0.06	<399.60		86.31	11.74	<38.01		2.31	0.37	<4.15	
ES-1022	0.70	0.09	<326.10		138.90	17.67	34.21	6.53	3.15	0.52	<1.14	
ES-1023	<0.29		<284.00		83.24	29.55	<25.60		0.94	0.28	<3.58	
ES-1024	0.75	0.07	<313.40		181.60	13.53	30.35	4.83	<3.02		<4.58	
ES-1025	1.18	0.11	<323.40		131.30	17.86	<29.12		1.99	0.44	<2.98	
ES-1026	0.92	0.15	<299.25		58.65	23.48	<35.28		2.13	0.47	<3.14	
ES-1027	0.86	0.08	<444.60		96.79	11.72	<45.53		<4.55		<4.13	
ES-1028	1.78	0.18	<306.30		87.37	12.06	<27.72		<2.34		<2.10	
ES-1029	0.59	0.07	<289.60		76.66	10.66	<38.26		<2.43		<3.97	
ES-1030	0.54	0.17	<401.10		59.45	25.50	<58.83		<4.35		<3.66	
ES-1031	1.34	0.08	<382.50		73.65	9.86	<39.68		1.70	0.41	<4.35	
ES-1032	1.38	0.10	<260.80		80.09	10.89	<37.87		<2.52		<3.86	
ES-1033	0.76	0.15	<363.20		50.21	22.90	<55.89		<4.00		<3.11	
ES-1034	1.34	0.08	<284.80		54.13	7.58	<40.44		<2.40		<3.93	
ES-1035	1.07	0.65	<274.40		53.52	7.81	<41.37		<2.66		<1.85	
ES-1036	0.64	0.17	<374.10		<6.42		<62.06		<4.31		<3.24	
ES-1037	1.39	0.10	<297.80		39.85	5.94	<43.18		<2.52		<3.69	
ES-1038	3.14	0.20	<335.42		62.79	9.09	<53.58		2.62	0.55	<3.50	

	Br	Standard Deviation	Rb	Standard Deviation	Sr	Standard Deviation	Zr	Standard Deviation	Ag	Standard Deviation	In	Standard Deviation
ES-1001	1.30	0.55	238.60	11.26	<276.80		227.70	33.02	<1.95		<0.25	
ES-1002	2.39	0.59	234.00	11.23	<325.20		273.20	35.38	<2.47		<0.31	
ES-1003	2.57	0.80	168.80	8.10	<351.60		204.00	28.15	<2.24		<0.25	
ES-1004	<3.07		217.40	10.44	<285.30		220.30	33.27	<2.00		<0.25	
ES-1005	2.56	0.51	200.30	9.61	<312.40		235.40	35.78	<2.40		<0.31	
ES-1006	<4.80		206.40	9.80	<438.55		254.80	47.33	<2.38		<0.37	
ES-1007	6.73	0.81	210.70	10.11	<262.60		206.30	31.98	<1.90		<0.24	
ES-1008	<3.64		205.40	9.86	<309.70		265.00	38.16	<2.31		<0.30	
ES-1009	<5.42		217.00	10.42	<474.60		219.90	33.20	<2.72		<0.40	
ES-1010	<3.01		195.00	9.36	<283.50		225.30	33.79	<1.94		<0.25	
ES-1011	<3.64		193.10	9.27	<308.70		234.60	35.66	<2.25		<0.30	
ES-1012	<3.90		207.75	9.87	<370.25		235.25	32.33	<2.51		<0.32	
ES-1013	<2.93		190.90	9.35	<255.50		184.10	27.61	<1.71		<0.23	
ES-1014	<3.36		147.80	7.24	<286.30		227.80	31.21	<2.09		<0.28	
ES-1015	<4.67		144.30	7.07	<409.60		205.60	28.37	<2.28		<0.35	
ES-1016	<2.81		124.20	6.33	<236.90		144.10	34.30	<1.77		<0.22	
ES-1017	<3.50		124.20	6.21	<281.40		223.90	32.24	<2.16		<0.28	
ES-1018	<4.09		110.30	5.63	<418.30		231.10	37.67	<2.50		<0.36	
ES-1019	<2.56		162.00	8.42	<290.80		165.80	53.39	<2.90		<0.23	
ES-1020	<3.17		157.40	7.71	<275.50		229.90	35.63	<2.95		<0.27	
ES-1021	1.89	0.48	242.90	11.66	<441.40		247.30	35.86	<2.66		<0.36	
ES-1022	2.82	0.70	272.90	13.10	<288.30		217.30	34.77	<2.07		<0.25	
ES-1023	2.34	0.78	259.50	12.20	<305.70		249.10	36.37	<2.21		<0.29	
ES-1024	<3.43		488.40	22.47	653.90	120.32	243.70	33.87	<2.63		<0.30	
ES-1025	2.07	0.52	211.80	10.38	<286.60		196.80	33.85	<2.12		<0.25	
ES-1026	<3.38		194.90	9.55	<312.65		264.05	42.57	<2.21		<0.30	
ES-1027	<5.14		178.60	8.75	<483.80		259.40	43.84	<2.74		<0.40	
ES-1028	<2.75		198.10	9.71	<276.00		173.20	27.89	<1.86		<0.24	
ES-1029	<3.17		188.70	9.06	<287.90		227.10	32.48	<1.77		<0.28	
ES-1030	<4.44		198.30	9.52	<421.00		270.10	37.54	<2.17		<0.36	
ES-1031	<2.59		202.30	9.51	<254.60		216.30	30.93	<2.47		<0.23	
ES-1032	<3.10		145.90	7.15	<270.60		183.60	25.70	<1.71		<0.26	
ES-1033	<4.08		145.50	7.00	<381.60		246.70	32.81	<1.95		<0.33	
ES-1034	<2.55		145.80	7.00	<238.40		195.40	27.36	<2.30		<0.21	
ES-1035	<3.21		100.60	5.23	<266.40		200.20	28.43	<1.76		<0.27	
ES-1036	<4.30		100.85	5.14	<375.55		258.80	34.14	<2.21		<0.33	
ES-1037	<2.66		105.60	5.39	<242.30		226.30	30.55	<2.22		<0.22	
ES-1038	<3.55		79.33	4.57	<327.17		368.82	50.10	<2.95		<0.30	

	Sb	Standard Deviation	I	Standard Deviation	Cs	Standard Deviation	Ba	Standard Deviation	La	Standard Deviation	Ce	Standard Deviation
FS-1001	<0.45		<16.20		7.06	0.42	131.40	28.65	56.05	2.92	111.70	5.[illegible]
FS-1002	<0.40		<19.20		7.01	0.42	<67.45		56.71	2.85	111.00	5.[illegible]
FS-1003	<0.52		<23.52		5.02	0.36	128.30	17.83	42.11	2.52	87.94	5.[illegible]
FS-1004	<0.24		<17.07		6.63	0.41	<73.70	—	56.03	3.13	113.60	5.[illegible]
FS-1005	<0.39		<18.57		8.10	0.46	97.65	33.79	51.72	2.90	106.80	4.[illegible]
FS-1006	<0.55		<29.05		7.11	0.41	116.10	22.56	52.05	2.84	105.06	4.[illegible]
FS-1007	<0.43		<15.75		4.65	0.44	116.60	25.30	54.19	3.14	117.20	5.16
FS-1008	<0.38		<18.28		2.47	0.15	122.00	24.40	51.10	3.07	102.40	4.[illegible]
FS-1009	<0.67		<30.98		5.20	0.30	133.90	48.61	59.32	3.68	121.20	5.[illegible]
FS-1010	<0.43		<17.00		3.96	0.37	<120.80	—	57.05	3.14	116.70	5.[illegible]
FS-1011	<0.37		<18.39		4.85	0.28	122.70	20.25	59.08	3.19	111.20	5.[illegible]
FS-1012	<0.47		<23.70		4.75	0.28	129.50	29.28	57.96	3.31	117.65	5.18
FS-1013	<0.41		<15.22		4.53	0.32	<48.02	—	59.05	3.42	107.80	4.74
FS-1014	<0.34		<17.17		3.12	0.18	146.50	32.22	56.87	3.30	111.00	4.[illegible]
FS-1015	<0.57		<27.65		2.81	0.18	124.90	35.22	66.14	3.97	122.20	5.18
FS-1016	<0.39		<18.23		2.31	0.21	113.10	54.63	69.60	3.73	120.50	5.[illegible]
FS-1017	<0.35		<16.09		2.90	0.17	<100.50	—	68.29	4.03	110.20	4.[illegible]
FS-1018	<0.59		<27.80		2.85	0.12	180.60	21.31	57.99	3.42	107.90	4.75
FS-1019	<0.36		<17.12		3.95	0.30	<300.40	—	45.47	2.36	84.40	3.71
FS-1020	<0.32		<16.19		3.34	0.20	348.30	27.52	45.85	2.75	81.71	3.[illegible]
FS-1021	<0.55		<28.96		6.58	0.36	79.85	38.73	45.09	2.57	91.00	4.[illegible]
FS-1022	0.70	0.13	<17.27		7.87	0.46	<91.32	—	62.81	3.52	124.80	5.30
FS-1023	<0.33		<18.12		7.28	0.41	<73.65	—	53.43	2.94	99.75	4.59
FS-1024	<0.42		<26.42		5.09	0.31	<339.60	—	48.49	2.86	102.20	4.50
FS-1025	<0.40		<16.70		6.52	0.44	<79.56	—	59.04	3.07	112.10	4.51
FS-1026	0.24	0.07	<18.51		6.18	0.38	<144.75	—	57.24	3.06	114.70	5.1[illegible]
FS-1027	<0.61		<32.05		2.61	0.17	158.30	25.49	57.16	3.20	121.50	5.3[illegible]
FS-1028	<0.37		<16.54		3.70	0.24	<85.87	—	55.29	2.93	122.50	5.[illegible]
FS-1029	<0.28		<17.17		3.46	0.22	118.40	26.05	52.80	3.01	103.80	4.27
FS-1030	<0.47		<27.92		4.47	0.25	<103.00	—	55.53	3.33	109.60	4.9[illegible]
FS-1031	<0.31		<15.23		3.40	0.29	149.80	24.87	57.29	3.77	131.80	5.6[illegible]
FS-1032	<0.27		<15.68		3.55	0.26	<97.08	—	75.35	4.29	157.10	6.9[illegible]
FS-1033	<0.42		<25.23		2.84	0.20	99.62	17.04	47.36	2.70	102.00	4.[illegible]
FS-1034	<0.30		<14.27		2.66	0.16	150.10	19.21	59.45	3.15	133.30	5.07
FS-1035	<0.28		<15.81		2.66	0.15	113.10	49.88	54.95	3.08	105.40	4.[illegible]
FS-1036	<0.44		<24.75		2.20	0.17	145.60	16.69	62.40	3.49	103.60	4.[illegible]
FS-1037	<0.31		<14.53		1.79	0.11	192.30	19.04	61.81	3.34	120.50	5.[illegible]
FS-1038	<0.34		<19.82		1.82	0.13	413.70	45.33	75.54	4.06	134.38	5.7[illegible]

	Nd	Standard Deviation	Sm	Standard Deviation	Eu	Standard Deviation	Tb	Standard Deviation	Dy	Standard Deviation	Ho	Standard Deviation
ES-1001	36.38	3.56	11.42	0.53	<0.16		2.34	0.21	14.96	1.32	8.46	0.48
ES-1002	63.07	5.30	[illegible]	[illegible]	[illegible]	[illegible]	7.44	0.21	15.57	1.23	7.75	0.85
ES-1003	40.03	3.40	10.30	0.48	0.11	0.01	1.94	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ES-1004	43.87	4.56	10.05	0.47	0.18	0.09	2.12	0.20	12.21	0.96	7.30	0.43
ES-1005	56.27	4.78	9.64	0.44	<0.18		2.35	0.23	14.13	1.13	7.90	0.99
ES-1006	51.96	4.39	12.26	0.58	0.12	0.01	2.11	0.19	12.52	1.00	9.21	0.53
ES-1007	44.56	4.50	10.02	0.47	<0.17		2.10	0.19	11.76	0.99	6.99	0.41
ES-1008	51.87	4.46	9.83	0.45	<0.17		2.39	0.23	13.34	1.31	7.19	0.95
ES-1009	56.78	4.77	13.20	0.61	0.13	0.01	2.47	0.22	13.65	1.08	10.63	0.62
ES-1010	30.36	3.07	10.59	0.50	0.21	0.08	2.11	0.19	12.06	0.99	6.93	0.39
ES-1011	62.94	5.16	10.73	0.49	0.11	0.01	2.29	0.20	14.06	1.12	6.85	0.75
ES-1012	55.30	4.56	12.62	0.59	0.11	0.01	2.26	0.20	12.31	1.03	8.19	0.52
ES-1013	37.04	4.04	11.46	0.54	0.16	0.08	2.12	0.19	12.64	1.07	6.71	0.39
ES-1014	53.74	4.51	8.65	0.40	0.20	0.07	1.85	0.18	9.05	0.79	5.03	0.45
ES-1015	55.78	4.52	12.47	0.57	0.27	0.06	1.94	0.17	10.15	1.48	7.31	0.45
ES-1016	49.80	4.53	10.37	0.49	0.26	0.06	1.60	0.14	8.71	0.78	4.20	0.27
ES-1017	60.14	4.99	10.47	0.48	0.24	0.04	1.79	0.16	9.26	0.79	4.48	0.55
ES-1018	51.08	4.29	9.61	0.43	0.38	0.02	1.37	0.12	8.11	0.64	4.47	0.34
ES-1019	32.67	3.99	7.56	0.36	0.53	0.06	1.22	0.16	6.18	0.54	3.89	0.26
ES-1020	43.76	3.94	6.46	0.30	0.52	0.03	1.14	0.11	4.61	0.51	2.96	0.30
ES-1021	47.84	4.31	10.60	0.50	<0.13		1.99	0.18	12.17	1.06	6.66	0.49
ES-1022	34.27	3.84	13.01	0.60	0.08	0.01	2.61	0.24	15.47	1.25	9.86	0.53
ES-1023	59.71	5.14	9.93	0.46	<0.13		2.27	0.21	14.13	1.26	9.00	0.49
ES-1024	46.42	4.18	0.81	0.06	0.41	0.19	1.98	0.18	11.14	1.18	10.14	0.55
ES-1025	33.14	3.71	11.66	0.55	0.17	0.08	2.27	0.22	13.62	1.05	8.44	0.47
ES-1026	44.96	4.15	10.68	0.50	0.19	0.08	2.40	0.22	14.19	1.18	8.32	0.60
ES-1027	58.36	5.02	13.21	0.61	0.10	0.01	2.34	0.21	13.34	1.11	9.95	0.56
ES-1028	31.01	3.41	10.82	0.50	0.21	0.06	2.04	0.19	12.08	1.06	6.73	0.38
ES-1029	40.23	3.90	9.41	0.43	0.19	0.05	2.02	0.18	11.72	1.77	7.13	0.71
ES-1030	58.42	4.79	12.08	0.56	0.17	0.08	2.50	0.23	12.89	1.28	9.07	0.50
ES-1031	71.58	5.65	13.05	0.60	0.18	0.02	2.65	0.24	14.03	1.19	7.73	0.38
ES-1032	47.91	4.26	11.27	0.51	0.28	0.05	1.95	0.18	11.65	1.36	6.10	0.57
ES-1033	38.79	3.34	7.84	0.37	0.21	0.05	1.18	0.11	6.56	0.60	5.62	0.50
ES-1034	52.68	4.27	8.06	0.37	0.28	0.11	1.61	0.14	7.73	0.66	4.60	0.27
ES-1035	36.65	3.52	6.90	0.31	0.31	0.05	1.11	0.11	6.66	0.63	3.34	0.40
ES-1036	52.14	[illegible]	[illegible]	0.44	0.31	0.04	1.26	0.12	6.22	0.54	4.58	0.24
ES-1037	49.76	4.08	7.56	0.36	0.40	0.04	1.24	0.12	6.38	0.54	3.64	0.29
ES-1038	57.22	5.02	8.77	0.41	0.84	0.05	1.19	0.12	5.80	0.65	3.63	0.37

	Lu	Standard Deviation	Hf	Standard Deviation	Ta	Standard Deviation	W	Standard Deviation	Au	Standard Deviation	Hg	Standard Deviation
FS-1001	1.22	0.06	10.53	0.88	8.16	0.55	4.53	0.87	<0.02		<0.43	
FS-1002	1.22	0.06	10.75	0.55	8.17	0.51	7.18	3.03	<0.02		<0.63	
FS-1003	0.93	0.04	7.83	0.42	5.66	0.36	3.37	0.71	<0.02		<0.53	
FS-1004	1.10	0.05	10.38	0.50	7.70	0.48	3.30	1.42	<0.02		<0.43	
FS-1005	1.08	0.05	9.68	0.46	7.23	0.54	2.27	0.61	<0.02		<0.61	
FS-1006	1.05	0.05	9.07	0.51	6.89	0.42	4.31	1.12	<0.02		<0.90	
FS-1007	1.06	0.05	10.66	0.41	7.12	0.51	4.37	0.87	<0.02		<0.42	
FS-1008	1.02	0.05	9.78	0.48	7.02	0.41	3.12	1.13	<0.02		<0.56	
FS-1009	1.18	0.06	9.65	0.50	7.33	0.44	3.87	0.83	<0.02		<0.69	
FS-1010	1.02	0.05	9.21	0.69	6.33	0.40	3.85	0.88	<0.02		<0.41	
FS-1011	1.07	0.05	9.08	0.56	6.68	0.41	<5.60		<0.02		<0.55	
FS-1012	1.12	0.05	9.12	0.48	6.70	0.42	19.73	4.85	<0.02		<0.63	
FS-1013	1.01	0.05	8.65	0.44	6.12	0.39	<6.23		<0.02		<0.38	
FS-1014	0.77	0.04	7.69	0.48	4.76	0.29	<5.24		<0.02		<0.49	
FS-1015	0.84	0.04	7.77	0.58	4.55	0.36	<9.04		<0.02		<0.54	
FS-1016	0.71	0.04	7.99	0.46	3.98	0.31	<3.59		<0.02		<0.37	
FS-1017	0.72	0.04	7.04	0.52	3.92	0.24	<5.51		<0.02		<0.51	
FS-1018	0.66	0.03	6.09	0.39	3.33	0.21	<9.53		<0.02		<0.56	
FS-1019	0.65	0.04	6.34	0.35	4.92	0.42	2.04	0.77	<0.01		<0.53	
FS-1020	0.58	0.03	6.34	0.48	4.10	0.29	<5.05		<0.01		<0.62	
FS-1021	1.15	0.06	9.29	0.45	7.57	0.52	5.89	1.09	<0.02		<0.89	
FS-1022	1.40	0.07	12.13	0.75	9.74	0.56	5.41	0.97	<0.02		<0.48	
FS-1023	1.22	0.06	10.25	0.63	8.03	0.55	3.47	1.66	<0.01		<0.58	
FS-1024	1.16	0.06	10.33	0.48	8.44	0.55	<3.10		<0.02		<0.67	
FS-1025	1.21	0.06	9.74	0.65	7.10	0.45	4.78	1.34	<0.02		<0.47	
FS-1026	1.15	0.06	9.78	0.58	7.38	0.51	2.53	0.33	<0.01		<0.52	
FS-1027	1.18	0.06	10.52	0.56	7.75	0.48	5.40	1.91	<0.02		<0.89	
FS-1028	1.07	0.05	9.25	0.48	6.88	0.43	3.86	1.17	<0.02		<0.41	
FS-1029	0.93	0.05	9.63	0.71	6.15	0.40	3.43	1.19	<0.01		<0.39	
FS-1030	1.02	0.05	9.58	0.56	6.96	0.63	2.68	0.82	<0.02		<0.53	
FS-1031	1.12	0.05	9.45	0.45	7.03	0.45	<6.62		<0.01		<0.61	
FS-1032	0.83	0.04	8.67	0.41	4.55	0.31	<5.85		<0.01		<0.36	
FS-1033	0.56	0.03	8.16	0.51	4.67	0.31	<9.62		<0.02		<0.46	
FS-1034	0.72	0.04	7.06	0.41	4.58	0.29	<6.66		<0.01		<0.55	
FS-1035	0.53	0.03	7.45	0.41	2.95	0.28	<6.16		<0.01		<0.35	
FS-1036	0.51	0.03	7.31	0.41	3.10	0.22	18.87	2.60	<0.02		<0.48	
FS-1037	0.58	0.03	7.33	0.37	3.16	0.25	<6.98		<0.01		<0.57	
FS-1038	0.55	0.03	9.79	0.59	2.66	0.20	20.03	3.67	<0.01		<0.58	

	Th	Standard Deviation	U	Standard Deviation	Be	Standard Deviation	Cd	Standard Deviation	Pb	Standard Deviation
ES-1001	31.95	1.46	8.63	0.30	7.20	1.40	<1.00		51.00	6.00
ES-1002	[illegible]	1.34	9.74	0.31	0.62	0.16	<1.00		<14.00	
ES-1003	21.32	0.85	5.58	0.21	[illegible]	1.30	<1.00		44.00	4.00
ES-1004	31.20	1.31	7.85	0.27	6.00	1.20	<1.00		48.00	5.00
ES-1005	22.56	2.46	7.26	0.25	4.90	1.00	<1.00		41.00	4.00
ES-1006	25.20	1.01	7.02	0.25	5.10	1.00	<1.00		43.30	4.20
ES-1007	30.08	1.23	7.31	0.26	6.30	1.30	<1.00		26.00	3.00
ES-1008	22.27	2.85	7.27	0.25	7.00	1.40	<1.00		54.00	5.00
ES-1009	27.67	1.11	7.59	0.27	5.60	1.10	<1.00		52.00	5.00
ES-1010	27.30	1.09	7.30	0.26	6.10	1.20	<1.00		39.00	4.00
ES-1011	24.54	0.98	7.41	0.26	5.95	1.20	<1.00		32.50	4.00
ES-1012	26.09	1.04	6.91	0.24	6.00	1.20	<1.00		30.90	3.00
ES-1013	25.93	1.06	7.12	0.25	6.10	1.20	<1.00		27.00	3.00
ES-1014	16.25	2.68	5.05	0.18	4.00	0.80	<1.00		19.00	4.00
ES-1015	19.67	0.78	4.73	0.17	4.60	0.90	<1.00		25.00	2.00
ES-1016	19.55	0.80	4.32	0.16	3.50	0.70	<1.00		<14.00	
ES-1017	16.32	0.67	4.37	0.16	2.90	0.60	<1.00		22.00	2.00
ES-1018	15.43	0.63	3.28	0.12	2.70	0.50	<1.00		27.00	3.00
ES-1019	19.94	0.96	5.61	0.20	5.00	1.00	<1.00		31.00	3.00
ES-1020	15.62	0.61	5.08	0.18	4.90	1.00	<1.00		32.00	3.00
ES-1021	27.13	1.09	7.80	0.27	6.40	1.30	<1.00		49.00	5.00
ES-1022	37.06	1.52	10.13	0.35	0.72	0.10	<1.00		<14.00	
ES-1023	27.17	1.09	8.33	0.29	7.50	1.50	<1.00		51.30	5.10
ES-1024	29.39	1.26	6.65	0.24	5.70	1.10	<1.00		45.60	4.60
ES-1025	29.76	1.22	7.75	0.28	6.12	1.20	<1.00		39.30	4.00
ES-1026	28.42	1.33	6.93	0.24	6.30	1.00	<1.00		45.90	4.40
ES-1027	29.53	1.18	7.41	0.26	5.40	1.00	<1.00		36.00	3.60
ES-1028	29.87	1.28	7.14	0.25	5.20	1.00	<1.00		40.40	4.00
ES-1029	26.37	1.05	6.58	0.23	5.70	1.00	<1.00		31.00	3.10
ES-1030	22.10	2.83	7.27	0.25	5.60	1.10	<1.00		51.00	5.10
ES-1031	27.64	1.11	6.98	0.24	6.00	1.00	<1.00		24.00	2.60
ES-1032	21.50	0.90	4.71	0.16	3.90	0.80	<1.00		26.00	3.00
ES-1033	19.14	0.77	4.62	0.17	3.90	0.80	<1.00		29.70	3.00
ES-1034	20.53	0.82	4.45	0.16	3.50	0.70	<1.00		22.00	2.00
ES-1035	15.05	0.71	3.18	0.12	0.42	0.10	<1.00		<14.00	
ES-1036	12.96	0.80	3.40	0.12	1.40	0.80	<1.00		18.00	4.00
ES-1037	15.05	0.62	3.17	[illegible]	2.50	0.50	<1.00		21.60	2.00
ES-1038	14.50	0.64	2.88	0.11	2.05	0.40	<1.00		[illegible]	[illegible]

Table A-II
Soil Analyses

FRAMEWORK SOIL SAMPLES ORDERED BY FS NUMBER

SAMPLE NUMBER	DATE COLLECTED	NEUTRON ACTIVATION ANALYSIS SAMPLE WEIGHT (g) TARE	GROSS	NET	COMMENTS
FS-2000	92 08 07 09 54	2.259	6.977	4.718	ULAC-08
FS-2000F	92 08 07 09 54	2.264	5.633	3.369	ULAC-08 Fine fraction
FS-2001	92 06 24 10 12	2.235	6.927	4.692	TA-16 base colluvium-14
FS-2002	92 06 24 14 10	2.257	4.533	2.276	TA-49 CB-06
FS-2003	92 06 24 14 02	2.257	6.890	4.633	TA-49 altered B-05 (Bandelier Tuff)
FS-2004	92 06 24 13 25	2.257	5.778	3.521	TA-49 BW-02
FS-2005	92 06 24 12 59	2.236	4.871	2.635	TA-49 Buk-04
FS-2006	92 06 24 09 50	2.256	6.039	3.783	TA-16 WTT1 CO3 Zone
FS-2007	92 06 24 09 16	2.260	5.558	3.298	TA-16 CO3 Zone
FS-2008	92 06 15 16 00	2.257	6.334	4.077	TA-16 WTT1 oxd. CVZP-10
FS-2009	92 06 15 15 45	2.262	6.498	4.236	TA-16 WTT1 reduced CVZP-01
FS-2010	92 08 07 14 22	2.259	5.727	3.468	EGG Btb-06
FS-2011	92 08 07 14 16	2.255	6.605	4.350	EGG Bw-03
FS-2012	92 08 07 14 22	2.262	6.347	4.085	EGG CB-04
FS-2013	92 08 07 14 12	2.257	6.646	4.389	EGG Bt-02
FS-2014F	92 08 01 15 49	2.236	4.530	2.294	ULAC BAb-05 Fine Fraction
FS-2015F	92 08 01 15 53	2.261	6.658	4.397	ULAC Bwb-06 Fine Fraction
FS-2016F	92 08 01 15 55	2.260	6.411	4.151	ULAC C-07 Fine Fraction
FS-2017F	92 08 01 15 41	2.200	5.073	2.873	ULAC A2-02 Fine Fraction
FS-2018F	92 08 01 15 38	2.261	5.010	2.749	ULAC A1-01 Fine Fraction
FS-2019F	92 08 01 15 46	2.263	5.942	3.679	ULAC BW-04 Fine Fraction
FS-2020F	92 08 01 15 44	2.262	6.603	4.341	ULAC BA-03 Fine Fraction
FS-2021	92 08 07 14 06	2.258	6.638	4.380	EGG A-01
FS-2022	92 08 07 15 27	2.257	5.767	3.510	EGG CBb-07
FS-2023	92 08 07 14 26	2.258	5.977	3.719	EGG C-05
FS-2024	92 08 01 15 44	2.268	[illegible]	[illegible]	ULAC BA-03 Fine Fraction, FS-2020F Duplicate
FS-2025	92 06 24 09 50	2.264	6.115	3.851	TA-16 WTT1 CO3 Zone, FS-2006 Duplicate
FS-2026	92 06 10 12 50	2.256	5.988	3.732	TA-69-25S weathered B
FS-2027	92 06 08 14 39	2.252	6.699	4.447	TA-16-10 BW
FS-2028	92 06 08 14 10	2.261	6.893	4.632	TA-69 Bc2
FS-2029	92 06 10 13 29	2.257	5.687	3.430	TA-69-25S fracture fill
FS-2030	92 06 18 14 00	2.263	5.206	2.943	TA-16-10 CO3 rich
FS-2031	92 06 10 12 10	2.257	7.330	5.073	TA-69 South 24 CI Bt
FS-2032	92 06 12 12 17	2.258	6.775	4.517	TA-39-36-A1
FS-2033	92 06 05 16 20	2.260	6.484	4.224	TA-69-2W
FS-2034	92 06 12 13 14	2.257	7.068	4.811	TA-39-40 Bukb
FS-2035	92 06 08 14 51	2.262	7.212	4.950	TA-69WA-11
FS-2036	92 06 08 14 51	[illegible]	[illegible]	4.857	TA-69WA-11, FS-2035 Duplicate
FS-2037		2.257	6.742	4.485	TA-69E
FS-2038		2.262	6.058	3.796	TA-69 South Bc
FS-2039		2.256	5.823	3.567	TA-69 Crb
FS-2040		2.258	5.954	3.696	TA-69 BC
FS-2041	92 06 18 11 30	2.259	5.865	3.606	TA-16-06
FS-2042		2.257	6.985	4.728	TA-69-A (11)
FS-2043	92 06 08 13 48	2.259	6.006	3.747	TA-69-07W 2Bt3b
FS-2044	92 06 10 11 50	2.256	6.867	4.611	TA-69S-23 2Bt2b
FS-2045	92 06 10 11 05	2.259	6.701	4.442	TA-69S-19 A
FS-2046	92 06 12 13 30	2.255	6.167	3.912	TA-39-S-41 Btkb
FS-2047	92 06 12 13 30	2.262	6.264	4.002	TA-39-S-41 Btkb, FS-2046 Duplicate
FS-2048	92 06 18 11 15	2.260	5.922	3.662	TA-16 WTT1-05
FS-2049	92 06 18 11 45	2.238	6.505	4.267	TA-16 WTT1-07
FS-2050	92 06 10 11 35	2.259	6.242	3.983	TA-16 Org. Mat.
FS-2051		2.260	6.486	4.226	TA-16-07
FS-2052		2.261	7.321	5.060	TA-69 AE
FS-2053	92 06 12 12 34	2.257	7.037	4.780	TA-39-37-A2
FS-2054	92 06 18 13 45	2.263	5.953	3.690	TA-16-A-09
FS-2055	92 06 10 11 00	2.259	5.766	3.507	TA-69S Humic Layer (no. 1d)

FS-2056	92 06 08 14 21	2.266	6.803	4.537	TR-69-N-09-20KIb
FS-2057	92 06 12 12 55	2.242	[illegible]	[illegible]	TR-39-39-Bubb
FS-2058	92 06 12 12 55	2.242	6.723	4.481	TR-39-39-Bubb, FS-2057 Duplicate
FS-2059		2.253	5.385	3.732	TR-69Cr
FS-2060	92 06 12 13 50	2.259	5.913	3.654	TR-39-62-2Cr
FS-2061	92 06 12 12 46	2.263	6.911	4.648	TR-39-38-BC
FS-2062	92 06 06 13 35	2.253	6.052	3.799	TR-65 BR
FS-2063	92 06 18 11 00	2.268	6.052	3.792	TR-16 WRT1-04
FS-2064	92 06 18 12 28	2.264	6.288	4.016	TR-16 WRTT1-8
FS-2065	92 06 08 15 15	2.263	6.341	4.078	TR-69 BK3
FS-2066	92 06 18 11 25	2.235	6.906	4.665	TR-69-S-26 Bw
FS-2067		2.267	6.677	4.410	TR-69 BK1
FS-2068	92 06 18 11 00	2.256	6.553	4.697	TR-69-S-22 20KIb
FS-2069	92 06 18 11 00	2.258	6.908	4.730	TR-69-S-22 20KIb, FS-2068 Duplicate
FS-2070	92 09 16 12 17	2.618	6.723	4.113	TR-46-81-81 Bandelier Tuff
FS-2071	92 09 16 12 35	2.611	5.662	2.871	TR-46-81-82 Fracture Fill A
FS-2072	92 09 16 12 38	2.609	5.567	2.958	TR-46-81-83 Fracture Fill B
FS-2073	92 09 16 12 08	2.608	6.906	4.297	TR-46-81-84 soil
FS-2074	92 09 16 12 45	2.606	6.507	3.898	TR-46-82-85 Bandelier Tuff
FS-2075	92 09 16 12 58	2.613	7.146	4.533	TR-46-82-86 Coarse Fracture Fill (outer)
FS-2076	92 09 16 13 08	2.618	6.825	4.215	TR-46-82-87 Fine Fracture Fill (inner)
FS-2077	92 06 25 10 57	2.263	6.840	4.577	BSS-TS-06-81 AC Tsankawi
FS-2078	92 06 25 11 15	2.262	6.230	3.968	BSS-TS-06-82 C1 Tsankawi
FS-2079	92 06 25 11 40	2.262	5.750	3.488	BSS-TS-06-83 C2 Tsankawi

	Na	Standard Deviation	Mg	Standard Deviation	Al	Standard Deviation	Cl	Standard Deviation	K	Standard Deviation	Ca	Standard Deviation
[illegible]	31180.00	1259.48	<3815.00		69530.00	1946.84	<177.30		32050.00	2531.95	5988.00	562.67
ES-2000F	25130.00	1331.28	<2227.00		66160.00	1918.64	<134.70		33890.00	2677.31	6375.00	582.75
ES-2001	14770.00	620.34	4949.00	606.73	64430.00	1806.04	<[illegible]		25720.00	1991.84	4691.00	194.03
ES-2002	23530.00	1105.91	8239.00	1128.74	87080.00	2525.32	854.10	78.58	31760.00	2764.86	15190.00	1802.59
ES-2003	14600.00	744.60	5543.00	595.66	66990.00	1875.72	<79.98		23240.00	1905.68	3338.00	326.21
ES-2004	15990.00	671.58	6648.00	784.46	88760.00	2485.28	111.20	15.46	19860.00	1627.12	12310.00	770.66
ES-2005	19270.00	905.69	5870.00	858.75	85100.00	2382.80	325.20	63.74	26770.00	2543.15	18440.00	1174.28
ES-2006	16665.00	875.03	6719.00	645.95	89265.00	2499.42	129.00	22.06	24210.00	2529.73	9609.50	643.91
ES-2007	19020.00	817.86	5634.00	777.49	88020.00	2464.56	208.90	23.40	23140.00	2013.18	14370.00	2818.89
ES-2008	19310.00	868.95	<3767.00		69380.00	1942.64	<162.80		26430.00	2220.12	3218.00	406.47
ES-2009	18160.00	927.18	4434.00	576.42	67790.00	1898.12	<78.61		24040.00	1971.28	2918.00	294.31
ES-2010	20280.00	872.04	3237.00	702.43	75150.00	2104.20	152.60	21.97	32330.00	2974.36	5410.00	1920.55
ES-2011	22750.00	978.25	4271.00	751.70	68240.00	1910.72	104.10	48.82	29660.00	2402.46	3675.00	389.55
ES-2012	22460.00	1033.16	5753.00	811.17	71800.00	2010.40	193.90	24.24	31860.00	2516.94	4832.00	468.67
ES-2013	23840.00	1263.52	3032.00	551.62	73520.00	2058.56	158.30	21.05	31980.00	2462.46	5598.00	453.41
ES-2014F	21320.00	916.76	<3027.00		60360.00	1750.44	<131.20		29610.00	2694.51	13870.00	957.03
ES-2015F	27580.00	1323.84	<3279.00		66310.00	1856.68	<152.60		35760.00	2860.80	3388.00	394.18
ES-2016F	28530.00	1540.62	<1971.00		67540.00	1891.12	<104.90		36210.00	2860.59	1411.00	328.67
ES-2017F	20140.00	866.02	3400.00	710.60	59970.00	1739.13	<124.70		21790.00	2070.05	18670.00	1138.81
ES-2018F	20490.00	963.03	<4325.00		59710.00	1731.59	<198.20		27610.00	2434.96	13850.00	947.20
ES-2019F	26180.00	1256.64	1807.00	495.12	70850.00	1983.80	<111.30		34900.00	3036.30	5836.00	501.90
ES-2020F	27050.00	1204.07	<2906.00		67255.00	1883.14	<128.35		29150.00	2539.21	6687.00	550.54
ES-2021	24540.00	1153.38	<3287.00		67700.00	1895.60	203.90	34.05	31960.00	2620.72	4238.00	436.51
ES-2022	19420.00	1009.84	3607.00	595.16	71290.00	1996.12	202.50	23.08	28340.00	2380.56	6782.00	522.21
ES-2023	22950.00	963.90	4099.00	705.03	73350.00	2054.92	198.20	35.48	29480.00	2505.80	7088.00	545.70
ES-2026	18860.00	810.98	6084.00	748.33	104900.00	2937.20	239.60	24.24	21460.00	2103.08	5921.00	471.68
ES-2027	13530.00	676.50	<2693.00		58090.00	1626.52	<119.10		22260.00	1958.88	4454.00	400.86
ES-2028	12270.00	625.77	6481.00	573.25	91170.00	2461.59	69.12	15.76	21030.00	1976.82	5156.00	341.86
ES-2029	3392.00	149.25	13810.00	871.65	113600.00	3067.20	127.60	20.93	13040.00	1447.44	9127.00	2416.66
ES-2030	17090.00	769.05	8150.00	886.15	77803.00	2178.40	241.60	34.79	23010.00	2324.01	37070.00	1840.57
ES-2031	15150.00	818.10	3490.00	471.15	68400.00	1915.20	<80.92		26180.00	2853.62	2010.00	245.22
ES-2032	15026.00	630.84	5029.00	663.83	60890.00	1704.92	<83.99		21740.00	2174.00	6357.00	430.42
ES-2033	10120.00	495.88	10610.00	870.02	109200.00	2948.40	<110.00		17160.00	1767.48	8748.00	566.12
ES-2034	16040.00	802.00	5829.00	582.90	72260.00	1995.28	<79.81		20410.00	1896.08	10230.00	611.00
ES-2035	14745.00	662.82	1785.00	442.68	51680.00	1472.84	<114.57		23130.00	2090.34	3956.50	345.64
ES-2037	15580.00	772.22	2323.00	424.81	55360.00	1550.08	<79.86		20780.00	2057.22	1932.00	245.46
ES-2038	10300.00	463.50	6404.00	627.59	79110.00	2215.08	<[illegible]		15090.00	1690.08	12000.00	712.00
ES-2039	26860.00	1262.42	<3670.00		81180.00	2273.04	855.60	68.45	42000.00	4116.00	<[illegible]	
ES-2040	22090.00	1148.68	5070.00	633.75	92220.00	2582.16	939.50	72.34	26880.00	3119.08	5165.00	456.02
ES-2041	14780.00	650.32	7443.00	826.17	94120.00	2635.36	123.40	18.51	20640.00	2621.28	7821.00	576.94
ES-2042	13330.00	594.35	<2631.00		49680.00	1391.04	<114.80		22420.00	2354.10	3543.00	353.30
ES-2043	16880.00	725.84	5652.00	678.24	85700.00	2391.60	573.70	50.49	24880.00	1666.96	5742.00	451.02
ES-2044	10850.00	509.95	6106.00	622.81	79360.00	2222.08	<100.80		19350.00	1296.45	5520.00	437.15
ES-2045	14740.00	781.22	<1597.00		54510.00	1526.28	<79.37		23090.00	1547.03	5468.00	421.03
ES-2046	8286.00	368.41	12770.00	913.74	100470.00	2762.26	85.70	16.63	18630.00	1369.10	13425.00	772.22
ES-2048	16960.00	898.88	6956.00	681.69	88720.00	2484.16	159.50	19.94	25760.00	1751.68	8316.00	590.44
ES-2049	14720.00	632.96	5172.00	636.16	87870.00	2460.36	110.60	49.00	23960.00	1605.32	6299.00	466.11
ES-2050	10710.00	521.46	5870.00	672.81	69440.00	1944.32	<107.00		16800.00	1391.20	8071.00	564.97
ES-2051	13280.00	707.88	6732.00	605.08	53530.00	1522.85	114.30	16.46	21480.00	1460.64	7357.00	529.76
ES-2052	15070.00	648.01	1767.00	427.09	52940.00	1482.32	<76.91		23010.00	1522.57	3485.00	342.48
ES-2053	16190.00	652.74	4123.00	560.73	59180.00	1657.04	<115.80		21950.00	1492.60	6453.00	430.61
ES-2054	17740.00	940.22	3995.00	547.32	76830.00	2151.24	162.30	20.45	24370.00	1709.13	9582.00	612.41
ES-2055	13420.00	577.06	4405.00	572.65	50280.00	1458.12	<85.43		18860.00	1339.06	6587.00	520.17
ES-2056	11990.00	563.53	6625.00	689.00	85930.00	2406.04	<102.90		21460.00	1459.28	6278.00	470.55
ES-2057	13580.00	645.86	5508.00	614.71	69245.00	1938.86	<81.01		22935.00	1559.58	14150.00	[illegible]

	Na	Standard Deviation	Mg	Standard Deviation	Al	Standard Deviation	Cl	Standard Deviation	K	Standard Deviation	Fe	Standard Deviation
FS-2059	25180.00	1181.58	<3450.00		80410.00	2251.88	966.50	76.39	36040.00	2450.72	4277.00	436.25
FS-2060	10600.00	508.00	10670.00	746.90	74310.00	1932.06	187.30	20.60	16270.00	1236.52	80380.00	1295.58
FS-2061	20090.00	843.78	<1909.00		69310.00	1882.06	624.90	88.74	26840.00	1851.96	6917.00	2165.02
FS-2062	12560.00	615.44	9708.00	857.82	96630.00	2512.38	<131.80		24950.00	1749.30	9449.00	670.88
FS-2063	17600.00	904.80	5181.00	632.52	73700.00	1917.24	256.80	24.91	22210.00	1576.91	7837.00	2437.31
FS-2064	21300.00	937.20	<2348.00		76610.00	1976.26	<102.40		26680.00	1867.60	6384.00	437.95
FS-2065	12060.00	604.42	7725.00	710.70	111100.00	2808.60	358.40	32.24	20620.00	1484.64	8155.00	570.85
FS-2066	14520.00	775.84	3624.00	507.36	57900.00	1506.44	<77.94		23150.00	2037.20	4063.00	381.92
FS-2067	9185.00	394.95	6641.00	657.46	94400.00	3398.84	<66.63		20920.00	1483.48	5911.00	455.15
FS-2068	10085.00	535.68	6233.00	604.76	84700.00	2623.05	<88.05		19165.00	1351.04	5155.50	424.18
FS-2070	32560.00	1608.08	<2098.00		67450.00	1821.15	124.90	29.35	41100.00	2794.80	<1978.00	
FS-2071	2700.00	121.50	16790.00	1040.94	101000.00	2636.40	<76.92		10390.00	841.59	14160.00	893.11
FS-2072	3271.00	168.28	15190.00	911.40	108300.00	2815.80	<51.75		11540.00	877.04	10770.00	700.05
FS-2073	21690.00	805.70	1331.00	412.61	76120.00	1979.12	<91.98		30720.00	2119.68	4116.00	374.56
FS-2074	31300.00	1474.86	<3672.00		67110.00	1811.97	212.70	27.65	37350.00	2988.00	<1848.00	
FS-2075	30630.00	1658.82	<3470.00		81460.00	2632.72	696.90	78.75	32120.00	2248.40	3472.00	614.54
FS-2076	14540.00	638.76	8983.00	1277.01	185800.00	2750.00	549.70	86.85	19120.00	1472.24	5094.00	662.22
FS-2077	25950.00	1193.70	<2200.00		63930.00	1790.84	372.20	33.50	31070.00	2827.37	4497.00	445.20
FS-2078	28160.00	1492.48	<3493.00		67570.00	1891.96	771.60	62.50	35570.00	2667.75	4988.00	468.87
FS-2079	27170.00	1168.31	<2167.00		<1524.00		<318.60		32930.00	2469.75	<1114.00	

	Sc	Standard Deviation	Ti	Standard Deviation	V	Standard Deviation	Cr	Standard Deviation	Mn	Standard Deviation	Fe	Standard Deviation
ES-[illegible]	2.58	0.16	1284.00	296.60	18.94	2.48	10.90	0.82	1161.00	45.28	15120.00	1026.43
ES-2000F	3.88	0.22	1551.00	322.33	20.41	2.82	22.54	1.60	1552.00	74.50	16030.00	817.54
ES-2001	6.74	0.36	3688.00	505.26	59.40	2.97	45.25	2.85	[illegible]	20.40	22260.00	1441.42
ES-2002	5.88	0.31	2718.00	453.91	36.54	2.92	19.42	1.48	480.10	19.66	21750.00	[illegible]
ES-2003	8.09	0.44	4102.00	537.36	60.50	2.90	57.41	3.56	647.70	28.50	27230.00	1370.42
ES-2004	7.76	0.41	2975.00	428.40	66.69	3.47	45.51	3.00	503.50	24.17	29820.00	1997.94
ES-2005	6.70	0.37	3226.00	474.22	49.35	3.31	32.29	2.10	513.10	20.52	25320.00	1291.32
ES-2006	7.60	0.43	3471.00	468.58	59.56	3.04	46.53	2.95	545.80	24.84	28545.00	1496.56
ES-2007	6.81	0.36	3157.00	467.24	56.57	3.17	34.55	2.31	486.90	19.96	26470.00	1508.19
ES-2008	6.36	0.35	3585.00	526.99	51.85	3.37	29.24	1.90	1329.00	51.83	23830.00	1641.41
ES-2009	6.78	0.37	3374.00	441.99	31.55	2.24	47.73	2.96	185.70	8.17	15900.00	810.90
ES-2010	5.94	0.31	2507.00	363.52	34.94	2.38	30.36	2.06	473.00	23.65	21730.00	1260.34
ES-2011	4.29	0.23	1703.00	285.28	24.61	1.94	20.00	1.42	400.60	17.64	18300.00	1152.90
ES-2012	4.82	0.26	1970.00	311.26	31.73	2.44	20.71	1.37	478.00	19.12	19730.00	1302.18
ES-2013	4.91	0.26	2298.00	324.02	34.25	2.16	31.34	2.04	483.40	23.69	21830.00	1266.14
ES-2014F	3.42	0.18	2066.00	302.21	25.17	2.77	14.72	1.31	772.80	36.32	14070.00	759.73
ES-2015F	2.28	0.12	1205.00	219.31	16.25	1.84	9.08	0.72	396.00	15.84	11920.00	703.28
ES-2016F	2.80	0.15	1802.00	282.91	14.62	1.78	18.51	1.28	451.70	21.68	14340.00	741.34
ES-2017F	3.97	0.21	1571.00	391.18	26.25	2.91	20.12	1.51	1449.00	56.51	16020.00	865.08
ES-2018F	3.75	0.21	2323.00	448.34	23.77	2.90	19.71	1.40	1323.00	51.60	14940.00	761.94
ES-2019F	3.83	0.21	1922.00	313.29	22.62	2.06	22.61	1.54	574.70	24.71	16150.00	823.65
ES-2020F	3.02	0.16	1524.00	273.50	15.24	1.96	13.83	1.03	499.90	21.90	14665.00	817.49
ES-2021	3.70	0.20	2472.00	385.63	21.09	2.13	15.75	1.17	501.40	15.55	17870.00	1104.51
ES-2022	5.86	0.33	2812.00	402.12	40.95	2.50	39.25	2.51	494.40	26.70	20820.00	1349.03
ES-2023	5.00	0.27	1606.00	287.47	24.42	2.20	24.60	1.72	429.20	18.03	19520.00	1112.04
ES-2026	7.12	0.38	2372.00	379.52	47.93	2.92	32.40	2.24	404.10	17.78	29270.00	1931.82
ES-2027	5.46	0.29	4648.00	613.54	57.66	3.11	39.03	2.46	530.10	20.67	17430.00	1161.81
ES-2028	9.53	0.54	3885.00	501.17	76.79	3.38	60.04	3.72	251.60	10.83	34390.00	3124.49
ES-2029	13.80	0.73	2310.00	328.02	84.23	3.79	58.35	3.19	194.30	9.72	43170.00	2558.61
ES-2030	5.78	0.32	2634.00	355.10	46.73	3.04	24.04	1.68	472.60	19.65	22390.00	1567.80
ES-2031	6.15	0.35	4070.00	533.17	60.41	2.90	43.86	3.09	703.30	31.65	25580.00	2149.00
ES-2032	5.44	0.29	3707.00	511.57	54.22	2.82	43.13	2.36	557.40	21.74	19590.00	1616.27
ES-2033	11.32	0.61	3647.00	488.70	72.70	3.42	43.94	2.77	205.80	8.23	40310.00	2015.50
ES-2034	7.09	0.39	3672.00	481.03	55.46	2.77	50.29	3.12	468.00	20.59	21660.00	1566.54
ES-2035	4.57	0.24	3743.00	528.16	61.42	3.22	33.83	2.51	1053.55	42.14	21365.00	1173.13
ES-2037	5.12	0.28	[illegible]	547.34	50.32	2.52	46.10	2.90	454.60	21.37	15680.00	1199.62
ES-2038	8.01	0.42	1617.00	245.78	48.36	2.58	[illegible]	3.10	189.30	6.33	25110.00	1856.38
ES-2039	4.25	0.23	1434.00	285.37	18.67	2.25	10.86	0.91	326.20	13.31	[illegible]	[illegible]
ES-2040	7.10	0.42	1645.00	254.58	34.64	2.32	26.74	1.85	232.20	9.98	27010.00	1566.58
ES-2041	7.64	0.41	3025.00	432.58	57.67	3.11	35.65	2.42	633.30	20.16	28090.00	1685.84
ES-2042	4.74	0.24	4413.00	600.17	45.34	2.68	37.61	2.33	658.80	26.35	15580.00	810.16
ES-2043	8.38	0.44	1815.00	284.95	67.35	2.45	39.85	2.14	227.20	11.81	30920.00	2195.32
ES-2044	8.41	0.45	5029.00	658.80	79.45	3.50	46.85	2.90	412.60	[illegible]	[illegible]	1676.25
ES-2045	5.34	0.29	4454.00	579.02	44.54	2.45	52.12	3.18	586.60	25.81	18000.00	918.00
ES-2046	12.41	0.67	2969.00	408.90	83.44	3.75	57.29	3.58	375.70	16.16	40255.00	2310.71
ES-2048	7.59	0.42	2854.00	385.29	52.88	2.75	41.83	2.68	393.00	17.68	28090.00	1460.68
ES-2049	7.44	0.41	2902.00	420.46	62.17	3.11	41.57	2.70	446.20	19.63	26890.00	1532.71
ES-2050	[illegible]	[illegible]	4492.00	587.44	68.78	3.30	42.57	2.64	460.60	17.62	25620.00	1639.68
ES-2051	8.77	0.49	3295.00	433.62	[illegible]	[illegible]	49.68	3.13	483.50	20.31	32120.00	1670.24
ES-2052	4.42	0.23	4557.00	606.08	55.74	2.79	36.78	2.32	[illegible]	[illegible]	[illegible]	822.91
ES-2053	5.94	0.32	4386.00	578.95	56.66	2.89	43.97	2.68	615.50	25.24	20850.00	1063.33
ES-2054	6.19	0.34	2904.00	400.75	45.16	2.62	35.99	2.30	493.00	23.17	21710.00	1849.38
ES-2055	4.46	0.24	4193.00	574.44	43.46	2.56	37.38	2.43	531.80	21.80	15110.00	831.05
ES-2056	8.95	0.48	4008.00	525.05	76.78	3.38	45.50	2.82	246.40	10.35	32650.00	1697.80
ES-2057	7.33	0.40	3797.50	509.52	62.10	3.04	49.33	3.10	543.85	22.58	21935.00	1411.03

	Sc	Standard Deviation	Ti	Standard Deviation	V	Standard Deviation	Cr	Standard Deviation	Mn	Standard Deviation	Fe	Standard Deviation
FS-2059	6.75	0.26	1981.00	309.04	18.04	1.96	11.43	0.96	345.00	16.15	19940.00	1036.68
FS-2060	8.75	0.49	2016.00	208.22	58.23	2.74	46.77	2.99	258.80	11.95	29220.00	1986.96
FS-2061	4.31	0.23	1531.00	251.00	22.94	1.81	13.16	1.08	223.60	8.50	17360.00	1215.20
FS-2062	12.04	0.65	5430.00	717.82	96.98	4.36	61.51	3.81	733.50	28.61	38890.00	2022.28
FS-2063	5.33	0.30	2835.00	293.04	36.64	2.16	22.35	1.59	301.70	15.39	20960.00	1278.56
FS-2064	5.68	0.27	2537.00	428.00	35.04	2.02	28.31	1.33	539.60	23.04	21050.00	1159.65
FS-2065	10.38	0.56	3216.00	437.10	58.91	3.06	40.08	2.53	231.00	11.09	37490.00	1911.59
FS-2066	5.60	0.31	4712.00	612.56	52.65	2.58	49.62	3.04	536.90	23.62	19060.00	1123.53
FS-2067	10.07	0.53	3016.00	511.34	87.81	3.70	57.51	3.62	395.70	17.81	35940.00	2192.13
FS-2068	8.95	0.48	4630.50	605.44	82.60	3.60	56.87	3.45	491.55	20.40	32865.00	1758.07
FS-2070	1.29	0.07	<3644.00		<6.40		2.63	0.47	361.90	16.29	10860.00	608.16
FS-2071	17.90	0.97	2200.00	323.76	113.10	4.06	60.18	3.79	203.00	8.53	46230.00	2496.42
FS-2072	18.00	1.03	2300.00	321.30	101.30	4.15	71.07	4.48	208.60	8.76	48640.00	2626.56
FS-2073	5.23	0.28	2070.00	313.93	42.37	2.42	28.22	1.52	322.90	12.92	21690.00	1409.85
FS-2074	1.45	0.08	<5700.00		<8.04		<1.60		376.90	14.32	11240.00	573.23
FS-2075	6.16	0.35	2163.00	326.45	23.56	2.00	15.96	1.48	319.60	14.30	26190.00	1455.78
FS-2076	15.73	0.83	1650.00	313.55	75.41	3.85	42.93	2.84	626.90	25.00	35310.00	2555.15
FS-2077	2.42	0.13	1105.00	237.06	13.47	1.95	9.93	0.78	403.50	16.16	13060.00	679.12
FS-2078	2.32	0.13	1106.00	256.61	11.54	2.00	5.28	0.82	433.40	17.34	12670.00	635.57
FS-2079	2.13	0.11	<3607.00		<6.41		5.26	0.90	476.50	18.96	11370.00	716.11

	Cu	Standard Deviation	Cu	Standard Deviation	Zn	Standard Deviation	Ga	Standard Deviation	As	Standard Deviation	Se	Standard Deviation
ES-2000	2.80	0.21	<402.90		54.57	22.81	<60.79		<3.98		<1.11	
[illegible]	[illegible]	0.22	<349.00		64.74	9.06	<45.31		1.63	0.41	<1.63	
ES-2001	8.58	[illegible]	[illegible]		[illegible]	8.12	<33.64		4.38	0.56	<2.58	
ES-2002	5.93	0.44	<456.60		<13.48		<81.90		[illegible]	[illegible]	[illegible]	
ES-2003	9.82	0.53	<215.30		<19.20		<35.48		7.01	0.82	<3.38	
ES-2004	9.10	0.48	<238.30		58.92	9.13	<41.37		2.24	0.43	<1.05	
ES-2005	7.55	0.48	<400.10		<10.92		<75.61		4.86	0.80	<5.72	
ES-2006	9.12	0.49	<238.25		<21.22		<43.65		5.33	0.68	<5.54	
ES-2007	8.59	0.54	<262.50		53.35	8.59	<46.46		3.73	0.60	<2.94	
ES-2008	10.26	0.56	<387.20		<28.15		<63.24		7.36	0.91	<4.67	
ES-2009	4.00	0.32	<210.30		<20.36		<40.80		1.42	0.32	<4.98	
ES-2010	6.67	0.37	<258.30		70.29	10.19	<48.42		2.06	0.39	<2.74	
ES-2011	4.27	0.24	<228.70		57.12	8.34	<41.28		1.53	0.33	<2.24	
ES-2012	4.87	0.31	<335.10		<35.21		<63.77		2.51	0.54	<4.22	
ES-2013	5.94	0.31	<245.20		45.16	6.64	<42.02		2.51	0.45	<4.76	
ES-2014F	4.12	0.28	<321.90		64.31	10.03	<55.96		<3.23		<2.93	
ES-2015F	1.95	0.19	<348.50		<23.40		<66.71		2.13	0.51	<3.24	
ES-2016F	3.04	0.17	<266.80		41.60	6.07	<46.54		2.03	0.46	<3.86	
ES-2017F	4.83	0.28	<330.20		146.20	19.59	<50.69		<7.94		<2.71	
ES-2018F	3.87	0.33	<453.70		94.92	39.01	<78.60		3.78	0.70	<4.62	
ES-2019F	4.01	0.23	<284.30		45.38	6.76	<50.46		<2.58		<4.52	
ES-2020F	3.03	0.20	<306.85		60.89	8.71	<61.28		<3.43		<2.78	
ES-2021	3.87	0.26	<344.50		<32.04		<70.13		2.80	0.58	<3.85	
ES-2022	6.78	0.37	<252.00		<20.27		<47.78		4.99	0.67	<5.17	
ES-2023	5.29	0.30	<258.10		61.44	9.09	<51.55		3.64	0.62	<2.56	
ES-2026	9.31	0.53	<245.10		65.90	9.75	<51.54		4.91	0.69	<2.88	
ES-2027	10.91	0.59	<276.50		<8.09		<60.63		7.56	0.92	<4.13	
ES-2028	7.39	0.39	<186.40		<21.10		<42.53		8.51	0.96	<5.57	
ES-2029	6.82	0.48	<158.90		106.70	14.83	<44.23		10.30	1.54	<3.51	
ES-2030	6.92	0.44	<367.50		<15.23		<83.28		4.95	0.75	<5.00	
ES-2031	12.32	0.64	<216.50		<16.52		<41.49		7.64	0.88	<4.67	
ES-2032	8.29	0.65	<209.10		49.72	7.51	<44.48		2.99	0.87	<2.48	
ES-2033	7.12	0.41	<250.50		60.40	25.97	<69.66		8.23	0.96	<5.45	
ES-2034	5.75	0.52	<207.40		65.70	9.20	<48.25		4.21	0.58	<4.24	
ES-2035	13.73	0.73	<273.30		<7.78		<54.17		7.58	0.93	<1.14	
[illegible]	22.53	1.19	<207.80		<16.24		<45.99		5.25	0.65	<4.61	
ES-2038	4.19	0.39	[illegible]		66.97	9.71	<49.31		3.26	0.52	<2.71	
ES-2039	1.72	0.22	<384.20		<34.34		<99.75		<5.21		<4.17	
ES-2040	4.28	0.24	<256.20		<20.43		<61.53		4.90	0.69	<5.11	
ES-2041	7.54	0.41	<231.40		<10.28		<71.07		3.90	0.63	<3.06	
ES-2042	7.29	0.41	<271.40		<10.22		<80.74		5.68	0.75	<1.96	
ES-2043	5.24	[illegible]	[illegible]		76.30	10.91	<20.15		3.71	0.51	<2.82	
ES-2044	8.18	0.45	<249.70		<23.06		[illegible]	3.34	7.33	0.83	<4.62	
ES-2045	8.22	0.48	<208.50		<16.77		<16.54		5.35	0.60	<4.65	
ES-2046	10.95	0.60	<216.35		62.60	25.75	20.13	3.51	8.27	0.91	<4.32	
ES-2048	7.24	0.39	<229.30		<21.55		<20.33		4.45	0.56	<5.39	
ES-2049	7.75	0.42	<212.00		<8.95		<16.67		4.58	0.58	<2.64	
ES-2050	7.91	0.45	<261.30		<13.52		<25.08		7.26	0.82	<4.65	
ES-2051	9.62	[illegible]	[illegible]		<21.83		13.59	3.72	5.36	0.63	<5.43	
ES-2052	14.65	0.79	<199.20		19.97	[illegible]	[illegible]		5.11	0.61	<2.20	
ES-2053	9.41	0.52	<271.10		<21.93		<26.60		5.06	0.63	[illegible]	
ES-2054	6.56	0.35	<242.20		<20.14		<21.64		3.36	0.67	<5.18	
ES-2055	7.06	0.39	<212.30		43.67	7.03	<20.12		3.91	0.51	<2.56	
ES-2056	7.00	0.40	<244.20		<37.68		17.06	3.75	9.80	1.06	<4.86	
ES-2057	9.16	0.49	<207.50		<14.39		7.81	2.15	5.12	0.61	<1.89	

	Co	Standard Deviation	Cu	Standard Deviation	Zn	Standard Deviation	Ga	Standard Deviation	As	Standard Deviation	Se	Standard Deviation
FS-2059	1.72	0.21	<363.30		<42.04		<41.82		2.93	0.53	<3.17	
FS-2060	7.33	0.46	<202.00		<23.76		<20.74		4.92	0.58	<5.89	
FS-2061	2.51	0.15	<200.00		60.87	8.58	<22.86		3.12	0.47	<2.03	
FS-2062	12.63	0.68	<320.50		63.70	28.09	37.39	6.02	5.33	1.06	<5.88	
FS-2063	5.09	0.20	<229.00		<18.09		<23.00		2.00	0.33	<4.46	
FS-2064	7.30	0.30	<206.70		52.70	7.87	<25.09		3.86	0.54	<2.49	
FS-2065	6.50	0.30	<277.60		52.16	25.92	26.05	4.30	6.78	0.81	<5.13	
FS-2066	9.73	0.52	<203.80		<16.57		<20.10		5.14	0.60	<4.68	
FS-2067	16.56	0.84	<187.60		68.53	10.07	<19.42		8.93	0.97	<3.01	
FS-2068	9.09	0.51	<226.75		<24.55		15.63	3.41	8.76	0.97	<4.90	
FS-2070	1.85	0.08	<274.00		30.92	6.19	<32.25		<2.58		<1.71	
FS-2071	6.73	0.42	<232.30		<71.93		32.14	11.00	10.81	1.15	<6.56	
FS-2072	7.30	0.39	<171.00		<35.10		23.30	4.51	9.73	1.05	<7.72	
FS-2073	6.95	0.30	<227.20		43.97	6.90	<27.34		3.05	0.44	<2.37	
FS-2074	6.44	0.17	<392.00		<5.32		<50.00		3.43	0.67	<3.08	
FS-2075	3.42	0.19	<206.30		132.30	17.20	<31.13		2.86	0.46	<4.48	
FS-2076	23.35	1.32	<200.60		92.57	13.20	<20.20		10.12	1.34	<3.45	
FS-2077	2.26	0.19	<247.20		<42.39		<50.54		<3.36		<3.23	
FS-2078	2.04	0.13	<365.00		47.08	6.87	<37.44		1.20	0.33	<4.20	
FS-2079	2.17	0.14	<291.00		79.40	11.27	<40.48		1.59	0.39	<2.14	

	Br	Standard Deviation	Rb	Standard Deviation	Sr	Standard Deviation	Zr	Standard Deviation	Rj	Standard Deviation	In	Standard Deviation
[illegible]	6.52	0.78	113.90	5.81	<498.80		293.00	49.61	<2.46		-0.17	
ES-2000F	11.69	1.28	103.35	5.32	<200.80		314.50	42.77	<3.62		-0.21	
ES-2001	<2.36		108.10	5.95	<236.00		355.20	55.35	<2.75		-0.24	
ES-2002	4.90	0.71	151.00	8.15	<501.70		174.00	39.50	<4.73		-0.41	
ES-2003	<2.02		134.40	6.85	<221.20		485.20	98.98	<4.25		-0.17	
ES-2004	7.35	0.85	126.90	5.98	<278.30		225.00	42.53	<3.44		-0.25	
ES-2005	11.62	1.30	131.70	7.51	<455.60		319.30	60.99	<4.62		-0.17	
ES-2006	2.43	0.45	143.15	7.44	<231.65		279.70	59.59	<4.66		-0.14	
ES-2007	1.45	0.42	132.40	7.26	<291.10		246.50	56.20	<3.36		-0.26	
ES-2008	<3.79		119.10	6.19	<526.20		439.80	77.40	<3.67		-0.16	
ES-2009	1.97	0.41	121.50	6.20	<170.50		441.00	53.80	<3.88		-0.15	
ES-2010	3.10	0.55	331.10	7.08	<279.30		290.70	47.97	<3.07		-0.20	
ES-2011	1.67	0.41	122.40	6.36	<241.20		265.10	37.64	<2.34		-0.23	
ES-2012	6.74	0.98	124.80	6.49	<365.20		392.70	50.27	<3.17		-0.30	
ES-2013	2.12	0.34	120.50	6.27	<219.40		377.50	47.19	<3.54		-0.19	
ES-2014F	9.79	1.31	101.50	5.99	<383.90		203.70	66.41	<2.92		-0.31	
ES-2015F	2.54	0.42	106.00	5.41	<356.00		273.20	63.38	<2.27		-0.31	
ES-2016F	2.39	0.46	104.00	5.30	<229.50		327.80	45.89	<2.89		-0.20	
ES-2017F	12.13	1.37	93.13	5.77	<444.70		238.10	37.14	<2.83		-0.14	
ES-2018F	6.26	0.81	104.60	5.75	<609.90		332.40	47.53	<3.52		-0.42	
ES-2019F	3.05	0.42	111.40	5.90	<255.50		323.10	41.68	<3.42		-0.23	
ES-2020F	3.08	0.49	84.79	4.79	<328.95		296.15	48.10	<2.34		-0.29	
ES-2021	<3.93		109.80	5.71	<373.10		456.00	54.72	<2.85		-0.31	
ES-2022	2.10	0.61	136.10	7.08	<236.00		432.00	78.19	<4.24		-0.20	
ES-2023	7.74	1.26	130.70	6.93	<271.50		226.60	70.29	<2.75		-0.26	
ES-2026	2.19	0.43	93.07	5.96	<255.90		281.00	44.96	<3.23		-0.25	
ES-2027	2.74	0.70	90.69	5.17	<339.80		585.90	69.72	<3.20		-0.25	
ES-2028	9.28	1.18	110.70	6.20	<164.90		488.90	58.67	<4.60		0.07	[illegible]
ES-2029	9.34	1.17	104.80	6.52	<185.90		<175.70		<4.41		-0.14	
ES-2030	8.90	1.01	122.90	5.36	<417.30		282.90	67.61	<4.05		-0.11	
ES-2031	4.14	0.56	105.90	5.82	<221.20		522.20	60.05	<3.32		-0.11	
ES-2032	2.73	0.60	90.73	5.17	<250.70		449.70	70.60	<2.57		-0.21	
ES-2033	10.29	1.15	112.30	6.63	<270.00		344.30	54.06	<4.70		-0.21	
ES-2034	7.24	0.81	114.30	6.17	<198.80		344.20	77.45	<3.95		-0.16	
ES-2035	1.58	0.39	89.81	5.21	<370.15		620.55	74.15	<2.70		-0.26	
ES-2037	2.05	0.28	87.75	5.09	<196.60		636.70	78.31	<3.66		-0.16	
ES-2038	4.61	0.65	64.97	4.68	<191.90		<128.10		<3.22		-0.15	
ES-2039	<4.67		98.15	5.50	<383.20		336.40	45.75	<3.25		-0.25	
ES-2040	4.86	0.57	107.80	6.14	<199.90		277.70	41.10	<4.46		-0.19	
ES-2041	2.66	0.58	122.60	7.11	<261.20		169.50	29.66	<3.36		-0.24	
ES-2042	<3.22		83.60	4.60	<351.30		666.80	76.02	<2.89		-0.25	
ES-2043	5.06	0.78	87.40	5.42	<216.60		278.60	49.24	<2.59		-0.22	
ES-2044	3.97	0.48	114.70	5.96	<295.10		440.20	88.48	<3.82		-0.23	
ES-2045	<1.77		87.68	4.82	170.40	55.55	704.30	78.18	<3.47		-0.16	
ES-2046	12.26	1.40	111.00	6.49	<259.05		247.00	47.42	1.61	0.51	-0.21	
ES-2048	2.89	0.52	139.80	7.27	<213.40		260.20	66.09	<4.53		-0.18	
ES-2049	1.71	0.66	121.20	6.54	<235.60		192.90	61.92	<2.97		-0.21	
ES-2050	3.22	0.38	104.30	5.63	<317.80		400.40	52.45	<3.74		-0.24	
ES-2051	3.71	0.44	139.80	7.27	<204.50		375.70	50.36	<4.63		-0.16	
ES-2052	<2.23		87.68	5.00	<247.50		445.90	77.59	<2.24		-0.22	
ES-2053	4.59	0.61	102.00	5.41	<339.00		670.00	76.38	<3.21		-0.25	
ES-2054	2.53	0.35	118.30	6.39	<223.10		288.70	49.37	<4.17		-0.18	
ES-2055	2.53	0.41	73.69	4.50	<257.00		438.30	53.91	<2.62		-0.22	
ES-2056	9.80	1.68	104.50	5.75	<267.60		435.50	59.23	<3.99		-0.22	
ES-2057	18.91	2.05	99.21	5.55	<224.10		417.75	52.54	<3.53		-0.16	

	Br	Standard Deviation	Rb	Standard Deviation	Sr	Standard Deviation	Zr	Standard Deviation	Ag	Standard Deviation	In	Standard Deviation
FS-2059	2.08	0.47	95.18	5.43	<372.50		431.70	53.96	<3.18		<0.12	
FS-2060	16.26	1.77	98.26	5.59	<189.70		270.30	44.60	<5.01		<0.15	
FS-2061	2.60	0.90	70.87	4.18	<282.50		163.00	33.58	<2.23		<0.21	
FS-2062	25.55	2.71	134.00	7.37	<411.70		492.10	66.53	<5.07		<0.14	
FS-2063	2.42	0.36	109.50	5.91	<194.90		100.00	68.08	<3.85		<0.17	
FS-2064	1.61	0.40	110.00	6.18	<276.50		351.70	72.10	<2.44		<0.25	
FS-2065	10.81	1.21	113.90	6.61	<292.00		390.60	55.47	<4.53		<0.25	
FS-2066	1.99	0.32	89.97	5.04	<285.30		522.60	76.30	<3.61		<0.16	
FS-2067	8.50	0.97	118.20	6.74	<215.10		239.30	48.34	<3.46		<0.19	
FS-2068	4.39	0.55	120.10	6.42	<257.65		485.70	66.60	<4.17		<0.19	
FS-2070	<3.31		100.10	5.31	<267.30		189.30	26.12	<1.55		<0.27	
FS-2071	7.96	0.87	92.22	6.73	<204.30		<311.80		<6.66		0.17	0.04
FS-2072	6.52	0.71	97.08	6.41	242.20	63.46	<316.30		<7.52		0.13	0.04
FS-2073	3.83	0.59	100.00	5.94	<227.90		282.70	68.94	<2.56		<0.23	
FS-2074	<4.46		100.00	5.53	<394.00		257.50	33.99	<2.11		<0.35	
FS-2075	9.23	1.01	43.95	3.21	<567.70		138.70	32.39	<3.74		<0.49	
FS-2076	46.80	5.25	65.30	4.90	<766.10		<144.60		<4.15		<0.69	
FS-2077	<3.30		113.70	5.68	<252.20		215.90	31.52	<2.29		<0.25	
FS-2078	1.50	0.60	159.00	7.79	<309.00		239.00	36.57	<2.84		<0.33	
FS-2079	1.38	0.42	148.20	7.56	<249.00		198.40	33.85	<2.09		<0.22	

	Sb	Standard Deviation	I	Standard Deviation	Cs	Standard Deviation	Ba	Standard Deviation	La	Standard Deviation	Ce	Standard Deviation
ES-2000	[illegible]	[illegible]	<22.98		3.15	0.18	314.20	68.50	49.52	2.62	91.11	[illegible]
ES-2000F	0.46	0.08	<22.70		[illegible]	[illegible]	[illegible]	34.10	49.25	2.66	93.69	[illegible]
ES-2001	0.46	0.07	<13.83		4.01	0.35	478.60	146.45	[illegible]	[illegible]	[illegible]	[illegible]
ES-2002	0.47	0.13	<32.97		5.09	0.32	629.00	42.77	62.11	2.32	85.66	[illegible]
ES-2003	1.05	0.10	<12.91		6.29	0.38	745.10	43.96	75.92	3.01	88.88	[illegible]
ES-2004	0.28	0.07	<16.62		6.04	0.35	553.20	138.85	43.29	2.42	81.92	[illegible]
ES-2005	0.43	0.09	<30.49		5.67	0.36	697.50	43.94	41.40	2.40	76.10	[illegible]
ES-2006	0.62	0.09	<13.65		6.73	0.39	768.15	53.54	48.12	2.45	88.25	[illegible]
ES-2007	<0.25		7.06	2.18	5.32	0.45	477.10	39.12	44.05	2.51	88.07	[illegible]
ES-2008	0.53	0.09	<34.89		5.35	0.34	587.00	36.98	48.76	2.81	101.30	[illegible]
ES-2009	0.52	0.08	<9.93		4.86	0.29	635.00	45.08	56.42	2.82	[illegible]	[illegible]
ES-2010	0.27	0.08	<16.37		5.31	0.35	258.60	72.41	47.14	2.64	[illegible]	[illegible]
ES-2011	0.31	0.07	<14.17		3.73	0.23	230.50	88.97	54.42	2.88	105.80	[illegible]
ES-2012	0.54	0.11	<24.48		4.29	0.27	319.10	26.60	51.47	3.04	95.81	[illegible]
ES-2013	0.45	0.08	<12.98		4.12	0.26	367.10	36.00	55.78	2.68	105.10	[illegible]
ES-2014F	<0.30		<22.55		3.27	0.20	296.90	48.39	43.98	2.55	84.55	[illegible]
ES-2015F	<0.38		<23.60		2.87	0.18	206.30	20.63	41.81	2.34	82.01	[illegible]
ES-2016F	<0.27		<13.56		2.76	0.17	288.30	23.93	48.68	2.48	97.42	[illegible]
ES-2017F	<0.27		<26.59		2.91	0.20	343.20	97.13	45.65	2.42	85.68	[illegible]
ES-2018F	0.41	0.10	<40.59		3.23	0.22	493.00	56.69	43.06	2.37	81.71	[illegible]
ES-2019F	0.34	0.09	<15.01		3.61	0.21	416.90	29.60	55.04	2.70	103.30	[illegible]
ES-2020F	<0.31		<20.74		2.68	0.22	319.85	25.76	45.33	2.38	84.33	[illegible]
ES-2021	0.37	0.08	<24.77		3.51	0.20	279.90	51.50	55.88	3.07	100.90	[illegible]
ES-2022	0.71	0.09	<13.80		5.12	0.30	542.50	37.43	48.58	2.51	99.60	[illegible]
ES-2023	0.27	0.07	<15.87		4.38	0.32	366.20	45.19	52.65	2.79	101.70	[illegible]
ES-2026	0.52	0.08	<15.59		5.19	0.49	434.60	102.57	53.74	2.90	112.90	[illegible]
ES-2027	0.97	0.10	<22.15		3.70	0.21	587.80	122.85	36.69	2.05	76.51	[illegible]
ES-2028	1.01	0.09	6.52	1.56	7.23	0.41	634.50	45.05	66.27	3.38	117.30	[illegible]
ES-2029	1.23	0.11	6.89	1.56	8.65	0.61	183.80	39.33	41.48	2.32	66.65	[illegible]
ES-2030	0.40	0.09	29.42	4.06	4.93	0.30	828.90	51.39	37.61	2.26	72.07	[illegible]
ES-2031	1.11	0.10	<13.13		4.65	0.26	764.00	45.08	42.94	2.10	99.55	[illegible]
ES-2032	0.47	0.07	<14.83		3.14	0.24	463.70	112.68	39.56	2.22	70.72	[illegible]
ES-2033	0.73	0.10	<18.58		7.66	0.45	524.70	86.58	49.04	3.14	93.92	[illegible]
ES-2034	0.60	0.08	<11.85		5.31	0.30	610.80	39.70	40.17	1.93	76.08	[illegible]
ES-2035	0.91	0.08	<23.57		2.73	0.22	528.00	74.75	37.73	2.08	73.51	[illegible]
ES-2037	0.75	0.08	<11.86		3.43	0.20	690.00	43.47	39.89	1.99	100.30	[illegible]
ES-2038	1.15	0.10	6.36	1.81	6.97	0.34	288.00	[illegible]	35.49	1.82	82.35	[illegible]
ES-2039	<0.43		<25.62		3.24	0.20	374.50	83.51	70.87	4.11	116.80	[illegible]
ES-2040	0.64	0.10	<12.14		5.10	0.29	558.70	43.02	53.99	2.81	107.50	[illegible]
ES-2041	0.29	0.07	<25.48		5.87	0.44	560.00	45.36	47.98	2.49	80.56	[illegible]
ES-2042	1.08	0.09	<23.28		2.86	0.18	609.90	45.13	35.32	2.05	68.96	[illegible]
ES-2043	0.53	0.10	<13.26		5.58	0.31	356.20	[illegible]	51.35	2.77	102.90	[illegible]
ES-2044	0.72	0.09	<19.95		6.35	0.36	543.60	48.92	37.70	2.11	67.78	[illegible]
ES-2045	0.68	0.10	<12.42		3.33	0.20	614.90	36.83	36.52	1.90	71.59	[illegible]
ES-2046	0.72	0.09	<16.77		8.26	0.61	371.50	45.32	42.03	2.39	99.81	[illegible]
ES-2048	0.47	0.10	<12.49		6.03	0.36	723.70	44.15	44.67	2.28	84.82	[illegible]
ES-2049	0.46	0.08	<13.70		5.97	0.39	508.60	138.39	47.55	2.47	79.84	[illegible]
ES-2050	1.00	[illegible]	[illegible]		5.45	0.32	493.90	46.43	39.86	2.15	61.55	[illegible]
ES-2051	0.59	0.08	<12.16		7.11	[illegible]	[illegible]	[illegible]	[illegible]	2.27	81.82	[illegible]
ES-2052	0.61	0.09	<16.73		2.49	0.18	548.80	35.12	37.10	1.97	[illegible]	[illegible]
ES-2053	<0.34		<22.38		3.56	0.25	502.10	33.64	39.31	2.20	81.09	[illegible]
ES-2054	0.52	0.11	<13.41		4.79	0.28	579.70	38.26	39.32	2.12	87.41	[illegible]
ES-2055	0.89	0.10	<15.22		2.66	0.22	415.30	33.22	32.95	1.58	58.19	[illegible]
ES-2056	1.03	0.10	<17.94		6.36	0.36	511.20	71.06	54.60	3.06	103.40	[illegible]
ES-2057	0.60	0.09	5.64	2.07	5.09	0.39	631.40	80.83	40.70	2.14	14.56	[illegible]

	Sb	Standard Deviation	I	Standard Deviation	Cs	Standard Deviation	Ba	Standard Deviation	La	Standard Deviation	Ce	Standard Deviation
FS-2059	<0.51		<24.51		2.90	0.22	282.20	28.22	74.77	4.11	121.10	5.45
FS-2060	0.66	0.10	11.74	2.20	6.82	0.42	624.10	273.36	93.50	4.58	81.49	3.81
FS-2061	<0.25		<11.99		2.85	0.23	291.70	43.76	50.51	2.83	76.52	3.45
FS-2062	1.10	0.12	<20.15		8.14	0.54	602.60	49.57	52.40	3.04	99.30	4.51
FS-2063	<0.27		<11.37		4.03	0.30	618.50	40.20	31.70	1.87	72.68	3.42
FS-2064	0.65	0.11	<16.16		4.08	0.27	309.30	66.37	46.21	2.40	78.98	3.55
FS-2065	0.84	0.10	12.18	2.13	7.22	0.41	335.70	33.91	54.85	3.13	102.60	4.72
FS-2066	0.75	0.08	<12.25		3.57	0.21	651.10	39.07	38.08	1.98	69.78	3.21
FS-2067	0.94	0.08	<13.08		6.70	0.47	292.30	76.29	46.34	2.36	128.80	5.67
FS-2068	0.97	0.08	<16.56		6.84	0.41	596.30	42.15	37.01	1.92	72.10	3.32
FS-2070	<0.30		<15.37		2.19	0.16	124.80	24.84	56.91	3.07	95.36	4.37
FS-2071	1.59	0.12	<18.59		10.08	0.65	396.30	52.71	32.58	1.86	63.16	3.16
FS-2072	1.44	0.11	4.85	1.39	10.71	0.61	377.20	50.32	33.50	1.94	79.26	3.84
FS-2073	0.32	0.08	<13.98		4.14	0.80	254.30	112.65	50.96	2.85	92.79	4.08
FS-2074	<0.48		<25.92		2.67	0.16	126.80	15.66	51.18	3.02	99.17	4.36
FS-2075	<0.31		<27.51		3.26	0.20	414.10	54.25	43.21	2.29	73.80	3.39
FS-2076	0.65	0.09	<36.97		8.72	0.66	139.80	32.01	78.22	4.22	161.80	7.12
FS-2077	<0.34		<14.91		2.98	0.18	163.90	61.46	36.53	2.30	69.09	3.18
FS-2078	<0.25		<25.68		4.27	0.29	234.60	29.05	44.92	2.34	50.41	4.16
FS-2079	<0.25		<14.73		4.08	0.32	235.10	35.03	45.96	2.67	82.45	3.63

	Nd	Standard Deviation	Sm	Standard Deviation	Eu	Standard Deviation	Tb	Standard Deviation	Dy	Standard Deviation	Yb	Standard Deviation
ES-2000	28.69	3.40	7.33	0.34	0.46	0.05	1.05	0.11	5.49	0.50	4.43	0.28
ES-2000F	33.68	3.33	5.92	0.23	0.38	0.06	1.00	0.10	4.21	0.45	3.02	0.20
ES-2001	26.35	3.29	5.89	0.28	1.04	0.08	0.82	0.18	5.37	0.32	3.33	0.45
ES-2002	31.65	3.67	5.48	0.28	0.82	0.06	<0.16		4.07	0.43	3.13	0.27
ES-2003	53.21	4.52	9.04	0.42	1.65	0.09	1.29	0.12	5.93	0.48	4.20	0.24
ES-2004	27.34	3.85	5.41	0.27	0.91	0.08	0.59	0.08	5.41	0.56	3.04	0.38
ES-2005	26.79	2.60	5.48	0.25	0.79	0.05	0.68	0.07	3.74	0.43	3.61	0.26
ES-2006	37.76	3.66	5.68	0.27	1.14	0.06	0.90	0.09	4.96	0.45	3.43	0.20
ES-2007	24.19	3.82	5.32	0.27	0.85	0.08	0.63	0.07	3.69	0.47	3.50	0.26
ES-2008	38.22	3.63	7.50	0.35	0.93	0.05	0.90	0.08	4.91	0.51	3.96	0.25
ES-2009	43.48	3.83	6.47	0.31	1.24	0.09	0.93	0.09	5.37	0.43	3.34	0.21
ES-2010	35.84	4.16	6.11	0.28	0.74	0.04	1.14	0.11	6.12	0.61	4.39	0.26
ES-2011	38.33	3.91	7.24	0.34	0.59	0.05	1.18	0.12	7.21	0.63	4.28	0.54
ES-2012	41.69	3.79	8.14	0.38	0.63	0.05	1.06	0.10	6.02	0.55	4.98	0.30
ES-2013	41.82	3.72	6.91	0.32	0.72	0.05	1.15	0.10	6.05	0.49	3.75	0.14
ES-2014F	18.17	2.11	4.79	0.23	0.51	0.03	0.74	0.09	3.43	0.53	2.26	0.41
ES-2015F	34.73	3.20	6.01	0.29	0.40	0.04	0.88	0.09	5.23	0.48	3.69	0.26
ES-2016F	35.11	3.23	5.39	0.26	0.57	0.05	0.91	0.09	4.71	0.42	2.57	0.18
ES-2017F	29.97	4.05	5.11	0.25	0.62	0.06	0.88	0.11	3.35	0.52	3.04	0.24
ES-2018F	26.02	2.39	6.82	0.33	0.58	0.04	0.88	0.08	4.91	0.56	3.97	0.26
ES-2019F	39.52	3.64	6.28	0.30	0.64	0.03	0.86	0.08	4.50	0.42	3.06	0.20
ES-2020F	31.31	3.25	5.08	0.24	0.56	0.04	0.64	0.06	3.61	0.41	2.63	0.28
ES-2021	43.08	3.83	8.42	0.40	0.57	0.07	1.21	0.12	6.13	0.59	4.75	0.28
ES-2022	47.14	4.29	6.89	0.33	0.91	0.07	1.27	0.14	6.53	0.63	4.48	0.40
ES-2023	32.73	4.09	6.55	0.31	0.57	0.06	1.12	0.11	6.67	0.63	3.85	0.46
ES-2026	20.28	3.93	5.67	0.26	0.79	0.08	0.76	0.09	3.77	0.46	3.34	0.22
ES-2027	21.96	2.24	5.74	0.28	0.92	0.09	<0.10		4.14	0.40	3.62	0.22
ES-2028	45.76	4.21	7.05	0.33	1.31	0.07	0.94	0.10	5.55	0.46	3.25	0.12
ES-2029	44.13	4.05	4.70	0.22	0.66	0.05	0.40	0.09	4.71	0.44	2.66	0.23
ES-2030	28.83	3.57	5.35	0.27	0.35	0.05	0.68	0.07	3.93	0.42	3.83	0.26
ES-2031	29.53	3.02	5.24	0.25	1.06	0.07	0.69	0.08	3.85	0.34	2.81	0.17
ES-2032	32.01	3.94	5.65	0.27	0.87	0.06	0.75	0.08	5.82	0.56	3.97	0.36
ES-2033	36.27	3.92	6.34	0.30	0.92	0.06	0.71	0.10	4.53	0.54	3.36	0.23
ES-2034	31.55	3.22	5.20	0.25	1.03	0.07	0.82	0.09	4.72	0.40	3.28	0.23
ES-2035	31.65	3.52	5.05	0.24	0.86	0.03	0.70	0.09	3.94	0.44	3.54	0.13
ES-2037	31.70	3.30	5.10	0.24	1.06	0.08	0.76	0.07	4.38	0.43	3.43	0.14
ES-2038	12.44	1.68	4.22	0.21	0.50	0.05	0.43	0.07	3.23	0.36	2.08	0.26
ES-2039	54.83	4.93	11.41	0.54	0.87	0.05	1.26	0.12	6.58	0.63	4.82	0.30
ES-2040	37.03	3.81	5.30	0.27	0.65	0.06	0.74	0.07	4.53	0.39	3.01	0.20
ES-2041	25.26	4.22	5.42	0.25	0.85	0.06	0.68	0.07	4.07	0.46	3.42	0.21
ES-2042	25.05	2.86	5.47	0.26	0.82	0.04	0.71	0.08	4.34	0.40	4.01	0.23
ES-2043	22.07	3.46	5.97	0.27	0.68	0.06	0.55	0.08	4.47	0.77	3.78	0.35
ES-2044	31.09	3.11	6.15	0.29	1.03	0.06	0.78	0.07	4.42	0.56	3.60	0.22
ES-2045	35.71	3.29	4.93	0.23	0.94	0.04	0.90	0.09	4.02	0.36	3.52	0.25
ES-2046	32.96	3.85	6.88	0.32	1.05	0.05	0.84	0.09	5.64	0.65	3.52	0.31
ES-2048	36.55	3.55	5.22	0.25	0.99	0.06	0.81	0.08	4.91	0.50	2.85	0.23
ES-2049	13.69	1.59	5.57	0.26	0.97	0.07	0.58	0.09	3.37	0.56	3.05	0.19
ES-2050	27.25	2.83	5.17	0.29	1.06	0.05	0.75	0.08	5.22	0.46	3.95	0.26
ES-2051	33.94	3.36	5.41	0.26	0.98	0.07	0.72	0.08	4.34	0.38	2.76	0.17
ES-2052	27.12	3.17	4.68	0.22	0.90	0.07	0.57	0.06	4.06	0.45	2.33	0.29
ES-2053	34.13	3.28	6.94	0.33	1.03	0.06	0.83	0.08	5.48	0.48	4.63	0.38
ES-2054	32.90	3.32	4.76	0.22	0.96	0.06	0.77	0.07	4.04	0.38	2.70	0.19
ES-2055	23.03	3.34	4.08	0.19	0.80	0.08	0.58	0.08	3.86	0.45	2.33	0.21
ES-2056	47.09	4.24	8.80	0.40	1.30	0.08	1.18	0.11	6.81	0.58	4.56	0.27
ES-2057	32.58	3.55	5.89	0.27	1.07	0.06	0.85	0.09	4.45	0.44	3.37	0.20

	Nd	Standard Deviation	Sm	Standard Deviation	Eu	Standard Deviation	Tb	Standard Deviation	Dy	Standard Deviation	Yb	Standard Deviation
FS-2059	61.31	5.27	11.28	0.52	0.79	0.05	1.35	0.14	6.88	0.70	4.88	0.35
FS-2060	71.68	6.02	12.55	0.58	2.15	0.09	1.96	0.18	10.38	0.79	5.14	0.29
FS-2061	31.27	3.35	5.47	0.25	0.51	0.04	0.72	0.07	4.24	0.39	2.13	0.45
FS-2062	42.69	4.35	9.79	0.45	1.45	0.08	1.25	0.12	7.26	0.89	5.67	0.35
FS-2063	23.71	2.77	3.64	0.17	0.68	0.04	0.54	0.05	3.21	0.30	2.22	0.17
FS-2064	6.68	1.56	5.24	0.24	0.77	0.06	0.65	0.08	2.68	0.38	3.52	0.28
FS-2065	38.12	3.98	6.30	0.30	0.94	0.05	0.68	0.08	4.20	0.38	2.84	0.22
FS-2066	28.14	2.93	5.13	0.25	1.08	0.07	0.76	0.07	4.64	0.74	3.08	0.25
FS-2067	35.50	4.33	6.02	0.28	1.06	0.06	0.82	0.10	4.77	0.46	3.19	0.27
FS-2068	26.47	2.71	5.56	0.26	1.04	0.06	0.70	0.07	4.25	0.42	3.31	0.20
FS-2070	45.43	4.37	6.18	0.28	0.25	0.05	0.99	0.09	4.96	0.51	3.65	0.35
FS-2071	21.85	2.73	4.57	0.22	0.70	0.06	0.59	0.08	3.78	0.37	3.02	0.20
FS-2072	23.54	3.60	3.93	0.19	0.61	0.05	0.67	0.08	3.59	0.31	2.59	0.28
FS-2073	55.81	5.13	5.70	0.26	0.62	0.04	0.77	0.08	5.33	0.50	3.29	0.57
FS-2074	43.43	3.91	8.09	0.38	0.24	0.02	1.07	0.10	5.89	0.51	4.38	0.31
FS-2075	35.22	3.31	4.92	0.22	0.55	0.06	0.57	0.07	3.38	0.55	3.33	0.21
FS-2076	54.48	5.72	10.66	0.50	1.00	0.07	1.16	0.11	4.29	0.85	3.15	0.56
FS-2077	33.59	3.22	6.38	0.30	0.30	0.04	0.96	0.09	3.40	0.38	3.76	0.23
FS-2078	44.49	4.00	6.61	0.32	0.37	0.05	1.37	0.16	7.30	1.12	4.36	0.25
FS-2079	34.85	4.32	6.85	0.32	0.28	0.05	1.45	0.15	8.72	1.79	5.08	0.62

	Lu	Standard Deviation	Hf	Standard Deviation	Ta	Standard Deviation	W	Standard Deviation	As	Standard Deviation	Hg	Standard Deviation
FS-2000	0.47	0.03	8.42	0.45	3.13	0.21	13.74	2.84	<0.01		<0.54	
FS-2000	0.45	0.03	8.19	0.43	2.34	0.15	<6.95		<0.01		<0.74	
FS-2001	0.59	0.04	13.73	[illegible]	[illegible]	[illegible]	[illegible]		<0.01		<0.51	
FS-2002	0.45	0.03	5.43	0.55	3.18	0.20	<13.21		<0.02		[illegible]	
FS-2003	0.67	0.04	13.28	0.81	1.59	0.13	<5.57		<0.01		<0.84	
FS-2004	0.48	0.03	9.40	0.63	2.73	0.20	<5.76		<0.01		<0.63	
FS-2005	0.47	0.03	6.70	0.43	2.98	0.19	<11.86		<0.02		<0.92	
FS-2006	0.54	0.03	8.88	0.53	3.01	0.23	6.25	1.94	<0.01		<0.90	
FS-2007	0.42	0.03	7.68	0.40	2.87	0.24	<1.47		<0.01		<0.61	
FS-2008	0.51	0.03	10.60	0.78	2.24	0.15	<9.56		<0.01		<0.75	
FS-2009	0.55	0.03	11.80	0.68	1.86	0.16	<5.92		<0.01		<0.78	
FS-2010	0.56	0.04	8.93	0.43	3.17	0.21	<6.23		<0.01		<0.57	
FS-2011	0.57	0.03	9.74	0.67	3.37	0.24	13.26	5.69	<0.01		<0.45	
FS-2012	0.56	0.03	9.60	0.62	3.13	0.19	<9.70		<0.01		<0.67	
FS-2013	0.64	0.03	11.09	0.98	3.12	0.19	<6.20		<0.01		<0.72	
FS-2014F	0.30	0.03	7.45	0.31	2.26	0.15	<7.41		<0.01		<0.57	
FS-2015F	0.42	0.02	7.60	0.51	2.84	0.17	<9.97		<0.01		<0.50	
FS-2016F	0.42	0.02	8.68	0.52	2.49	0.15	<6.62		<0.01		<0.60	
FS-2017F	0.33	0.03	7.72	0.35	2.00	0.17	<6.62		<0.01		<0.54	
FS-2018F	0.49	0.03	8.26	0.63	2.47	0.18	12.99	3.68	<0.02		<0.74	
FS-2019F	0.48	0.03	9.23	0.36	2.46	0.16	8.72	2.18	<0.01		<0.71	
FS-2020F	0.42	0.03	8.82	0.57	2.27	0.16	<8.17		<0.01		<0.48	
FS-2021	0.57	0.03	10.85	0.74	3.02	0.20	<10.26		<0.01		<0.60	
FS-2022	0.66	0.04	11.62	0.73	3.15	0.21	5.47	2.08	<0.01		<0.85	
FS-2023	0.64	0.04	9.13	0.68	3.06	0.24	<6.54		<0.01		<0.52	
FS-2026	0.30	0.03	10.22	0.76	2.46	0.22	<6.39		<0.01		<0.60	
FS-2027	0.47	0.03	14.60	1.05	1.69	0.12	<8.43		<0.01		<0.70	
FS-2028	0.58	0.04	11.94	0.69	2.06	0.17	<6.02		<0.01		<0.91	
FS-2029	0.22	0.04	5.76	0.33	1.91	0.13	<5.80		<0.01		<0.78	
FS-2030	0.45	0.03	6.98	0.38	2.78	0.17	6.28	2.29	<0.01		<0.85	
FS-2031	0.48	0.03	13.02	0.82	1.87	0.16	2.82	0.83	<0.01		<0.75	
FS-2032	0.43	0.03	13.72	1.26	1.50	0.14	<5.36		<0.01		<0.50	
FS-2033	0.44	0.03	9.55	0.62	2.66	0.17	<5.68		<0.01		<0.93	
FS-2034	0.58	0.03	11.69	0.78	2.02	0.12	<5.89		0.02		<0.79	
FS-2035	0.50	0.03	15.90	1.19	1.53	0.13	<7.21		<0.01		<0.56	
FS-2037	0.57	0.04	15.71	1.04	1.71	0.12	<5.92		0.04		<0.76	
FS-2038	0.27	0.03	5.04	[illegible]	[illegible]	[illegible]	<5.67		<0.01		<0.58	
FS-2039	0.57	0.04	8.60	0.71	2.53	0.17	<13.06		[illegible]		[illegible]	
FS-2040	0.44	0.03	8.60	0.46	2.84	0.20	<7.75		<0.01		<0.67	
FS-2041	0.45	0.04	7.38	0.39	2.74	0.19	<5.72		<0.01		<0.63	
FS-2042	0.51	0.03	15.93	1.55	1.53	0.10	<10.34		<0.01		<0.65	
FS-2043	0.30	0.03	[illegible]	[illegible]	[illegible]	0.20	7.23	1.21	<0.01		<0.59	
FS-2044	0.44	0.03	11.03	0.84	2.06	0.13	2.13	[illegible]	[illegible]		<0.75	
FS-2045	0.58	0.03	18.56	1.02	1.62	0.11	8.53	2.58	<0.01		<0.73	
FS-2046	0.39	0.03	7.93	0.39	2.26	0.17	2.96	0.73	<0.01		<0.81	
FS-2048	0.46	0.03	7.48	0.65	2.94	0.19	2.02	0.66	<0.01		<0.87	
FS-2049	0.41	0.03	8.50	0.37	2.56	0.22	<3.91		<0.01		<0.54	
FS-2050	0.46	0.03	11.18	0.79	1.86	0.12	<5.83		<0.01		<0.76	
FS-2051	0.50	0.03	[illegible]	[illegible]	[illegible]	0.21	3.19	0.69	<0.01		<0.87	
FS-2052	0.46	0.03	14.97	1.30	1.58	0.13	<3.61		[illegible]		<0.64	
FS-2053	0.57	0.03	16.79	1.23	1.76	0.11	<6.08		<0.01		<0.68	
FS-2054	0.49	0.03	8.48	0.47	2.59	0.18	2.22	0.64	<0.01		<0.83	
FS-2055	0.29	0.02	13.68	0.79	1.27	0.09	<3.98		<0.01		<0.50	
FS-2056	0.54	0.03	11.32	0.80	1.83	0.13	<6.41		<0.01		<0.60	
FS-2057	0.51	0.03	11.03	0.63	1.96	0.16	<6.01		<0.01		<0.67	

	Lu	Standard Deviation	Mt	Standard Deviation	Ta	Standard Deviation	W	Standard Deviation	Au	Standard Deviation	Hg	Standard Deviation
FS-2059	0.52	0.03	10.35	0.72	2.83	0.19	17.07	2.34	<0.02		<0.10	
FS-2060	0.75	0.04	6.08	0.39	1.98	0.15	<4.61		<0.01		<0.36	
FS-2061	0.38	0.03	6.32	0.38	1.04	0.16	<4.32		0.04		<0.41	
FS-2062	0.68	0.04	13.73	0.88	2.08	0.16	<7.38		<0.01		<1.01	
FS-2063	0.36	0.02	4.16	0.21	2.51	0.16	<4.75		<0.01		<0.78	
FS-2064	0.31	0.03	10.06	0.64	2.23	0.15	<4.08		<0.01		<0.51	
FS-2065	0.42	0.03	9.64	0.54	2.93	0.21	3.99	1.86	<0.01		<0.89	
FS-2066	0.55	0.03	15.45	1.08	1.75	0.12	<4.13		<0.01		<0.73	
FS-2067	0.32	0.03	10.04	0.54	1.94	0.15	1.62	0.50	<0.01		<0.63	
FS-2068	0.46	0.03	10.29	0.62	2.25	0.15	<4.91		<0.01		<0.82	
FS-2070	0.49	0.03	7.64	0.47	3.23	0.23	<5.71		<0.01		<0.34	
FS-2071	0.36	0.04	5.77	0.64	1.92	0.16	2.51	0.48	<0.01		<1.26	
FS-2072	0.43	0.04	5.93	0.46	1.95	0.14	2.09	1.01	<0.01		<1.37	
FS-2073	0.47	0.03	9.08	0.59	2.50	0.24	<4.87		<0.01		<0.49	
FS-2074	0.51	0.03	7.29	0.39	3.41	0.20	<4.91		<0.02		<0.50	
FS-2075	0.23	0.02	6.74	0.42	1.55	0.12	<5.81		<0.01		<0.72	
FS-2076	0.31	0.03	7.33	0.31	1.77	0.16	2.42	0.69	0.02		<0.15	
FS-2077	0.47	0.03	6.21	0.39	3.55	0.22	<7.99		<0.01		<0.50	
FS-2078	0.68	0.04	7.49	0.41	5.42	0.35	<5.75		<0.01		<0.62	
FS-2079	0.64	0.04	7.65	0.39	5.67	0.39	2.81	0.67	<0.01		<0.44	

	Th	Standard Deviation	U	Standard Deviation	Ba	Standard Deviation	Cd	Standard Deviation	Pb	Standard Deviation
FS-2059	13.56	1.30	3.14	0.12	2.30	0.50	<1.00		29.00	3.00
FS-2060	14.79	0.64	2.99	0.11	2.60	0.50	<1.00		23.00	2.00
FS-2061	11.79	0.66	2.18	0.08	2.20	0.40	<1.00		24.00	2.00
FS-2062	18.81	0.74	3.72	0.14	2.70	0.50	<1.00		32.00	3.00
FS-2063	17.56	0.60	3.07	0.11	3.30	0.60	<1.00		29.00	3.00
FS-2064	15.76	0.80	3.70	0.14	2.20	0.40	<1.00		21.50	2.00
FS-2065	17.91	0.70	2.20	0.09	1.95	0.40	<1.00		28.50	3.00
FS-2066	13.31	0.52	3.50	0.13	1.60	0.30	<1.00		25.00	2.00
FS-2067	18.29	0.80	3.41	0.13	3.00	0.60	<1.85		38.00	6.00
FS-2068	15.52	0.61	3.29	0.12	2.20	0.40	<1.00		35.00	6.00
FS-2070	15.22	0.67	3.47	0.13	2.00	0.50	<1.00		18.00	2.00
FS-2071	17.63	0.66	2.50	0.10	2.00	0.40	<1.00		20.00	2.00
FS-2072	15.26	0.79	2.62	0.10	4.30	0.90	<1.00		41.00	6.00
FS-2073	17.99	0.77	3.85	0.14	2.30	0.50	<1.00		26.00	3.00
FS-2074	14.50	0.71	3.51	0.13	2.20	0.40	<1.00		19.00	2.00
FS-2075	10.09	0.39	1.54	0.06	1.60	0.30	<1.00		27.00	3.00
FS-2076	27.38	1.06	3.21	0.12	3.90	0.80	<1.60		42.00	6.00
FS-2077	14.17	0.55	4.34	0.15	3.20	0.60	<1.00		34.00	3.00
FS-2078	26.86	0.88	5.77	0.20	4.30	0.90	<1.00		30.00	3.00
FS-2079	23.81	1.00	6.73	0.24	4.40	0.90	<1.00		56.00	6.00

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Sigma Mesa: Background Elemental Concentrations in Soil and Vegetation, 1979

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SIGMA MESA:
BACKGROUND ELEMENTAL CONCENTRATIONS IN SOIL AND VEGETATION, 1979

by

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and George H. Brooks, Jr.

ABSTRACT

In 1979, soil and vegetation samples were collected on Sigma Mesa to provide background data before construction on the mesa. Elemental data are presented for soil, grass, juniper, piñon pine, and oak. None of the data looks out of the ordinary.

I. INTRODUCTION

In 1979, Sigma Mesa was a relatively undisturbed area east of the buildings located immediately adjacent to Diamond Drive. At that time, the only activity that had occurred on the mesa at any distance from Diamond Drive was the erection of an antenna farm about 1 mile from the road. In 1979, the decision was made to drill a geothermal well on Sigma Mesa. This activity was scheduled to begin in the summer of 1979. Sigma Mesa also was projected to be a growth area for contractor facilities. For these reasons, a project was initiated in the Environmental Surveillance Group (H-8, renamed the Environmental Protection Group [HSE-8] in 1989) to undertake a comprehensive soil and vegetation sampling program on Sigma Mesa. The purpose of the sampling program was to acquire, before any disturbance, a set of data to be used as background for future impact analysis.

II. METHODS

A sampling grid was established using the proposed location of the geothermal well as the center of the grid. Transects were run at eight compass points: N, NE, E, SE, S, SW, W, and NW. Samples were collected along these transects at 250 ft, 500 ft, and thereafter at intervals of 500 ft out to 2500 ft, or as far as possible before the transect was terminated because of obstacles (such as mesa walls and roads). Table I gives a tabulation of sampling sites and samples collected at each site. Figure 1 shows the location of the sampling area within Laboratory boundaries, and Fig. 2 shows individual sampling locations.

At each location, surface soil samples (0 to 2 in. deep) and grass samples were collected. Foliage samples were collected if tree species were present. The three tree species that were encountered were oak (*Quercus undulata*), piñon pine (*Pinus edulis*), and juniper (*Juniperus monosperma*). Grasses were not identified as to species.

Soil samples were passed through a coarse sieve (10 mesh) to remove matter such as pebbles and twigs, and then the samples were air-dried and ground in a Spex Industries shatterbox. Vegetation samples were dried in a

TABLE I. Sampling Locations and Samples Collected

Sample Designation	Location	Type of Sample Collected				
		Soil	Grass	Juniper	Piñon	Oak
1N	250 ft	X	X	X		
2N	500 ft	X	X		X	X
3N	1000 ft	X	X		X	
4N	Gravel pit	X	X		X	
5N	Above pit	X	X	X		
1NE	250 ft	X	X	X		
2NE	500 ft	X	X	X		X
3NE	1000 ft	X	X	X		
4NE	1500 ft	X	X		X	
5NE	2000 ft	X	X		X	
6NE	2640 ft	X	X		X	
1E	250 ft	X	X	X		
2E	500 ft	X	X	X		X
3E	1000 ft	X	X	X		
4E	1500 ft	X	X	X		
5E	2000 ft	X	X	X		
6E	2640 ft	X	X		X	
7E	Knoll	X	X	X		
1SE	250 ft	X	X	X		X
2SE	500 ft	X	X		X	X
3SE	TA-35, above ponds	X	X		X	
1S	250 ft	X	X	X		X
2S	500 ft	X	X		X	X
3S	TA-35	X	X		X	
1SW	250 ft	X	X	X		X
2SW	500 ft	X	X			X
3SW	Trailers at TA-35	X	X		X	
1W	Wellhead	X	X	X		
2W	250 ft	X	X	X		
3W	500 ft	X	X	X		
4W	1000 ft	X	X	X		
5W	1500 ft	X	X		X	
6W	2000 ft	X	X	X		
7W	2640 ft	X	X	X		
1NW	250 ft	X	X	X		
2NW	500 ft	X	X		X	
3NW	1000 ft	X	X		X	
4NW	1500 ft	X	X		X	
5NW	2000 ft	X	X		X	
6NW	2640 ft	X	X		X	

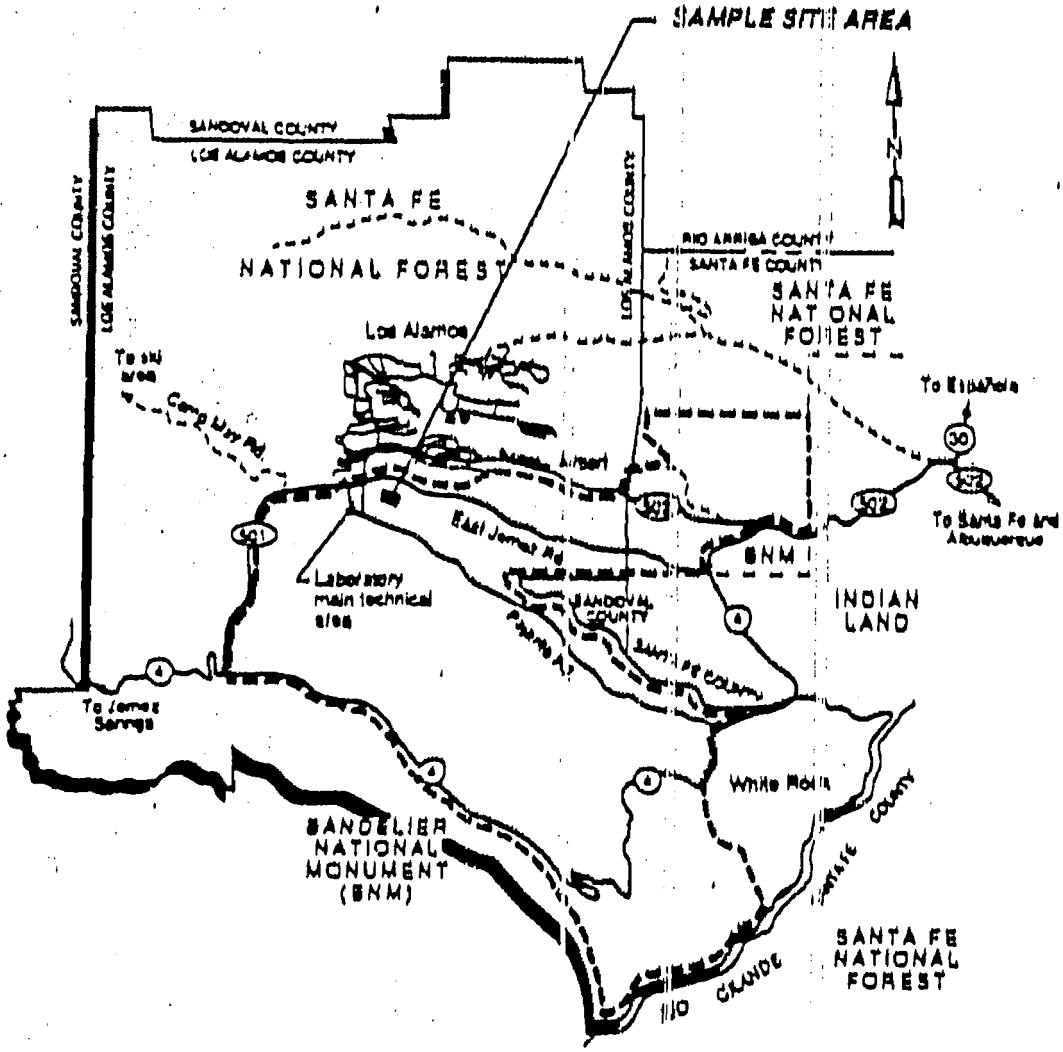

Fig. 1. Location of sampling site.

forced-air circulation oven at 60°C for 2 days and then were ground in the shatterbox.

After the samples were prepared, as described above, they were submitted for a variety of elemental analyses. Several analytical techniques were used, including neutron activation analysis, atomic absorption, ion chromatography, ion selective electrode analysis, and some special analytical techniques. The procedures used for these analyses have been described in detail in Gautier and Gladney (1986) and Gladney et al. (1980). Quality assurance was provided by concurrent analysis of a variety of National Bureau of Standards (NBS), United States Environmental Protection Agency (EPA), and United States Geological Survey (USGS) reference materials using the approach documented in Gladney et al. (1981).

III. RESULTS

Table II summarizes the means and standard deviations of the soil data. Tables III through VI summarize

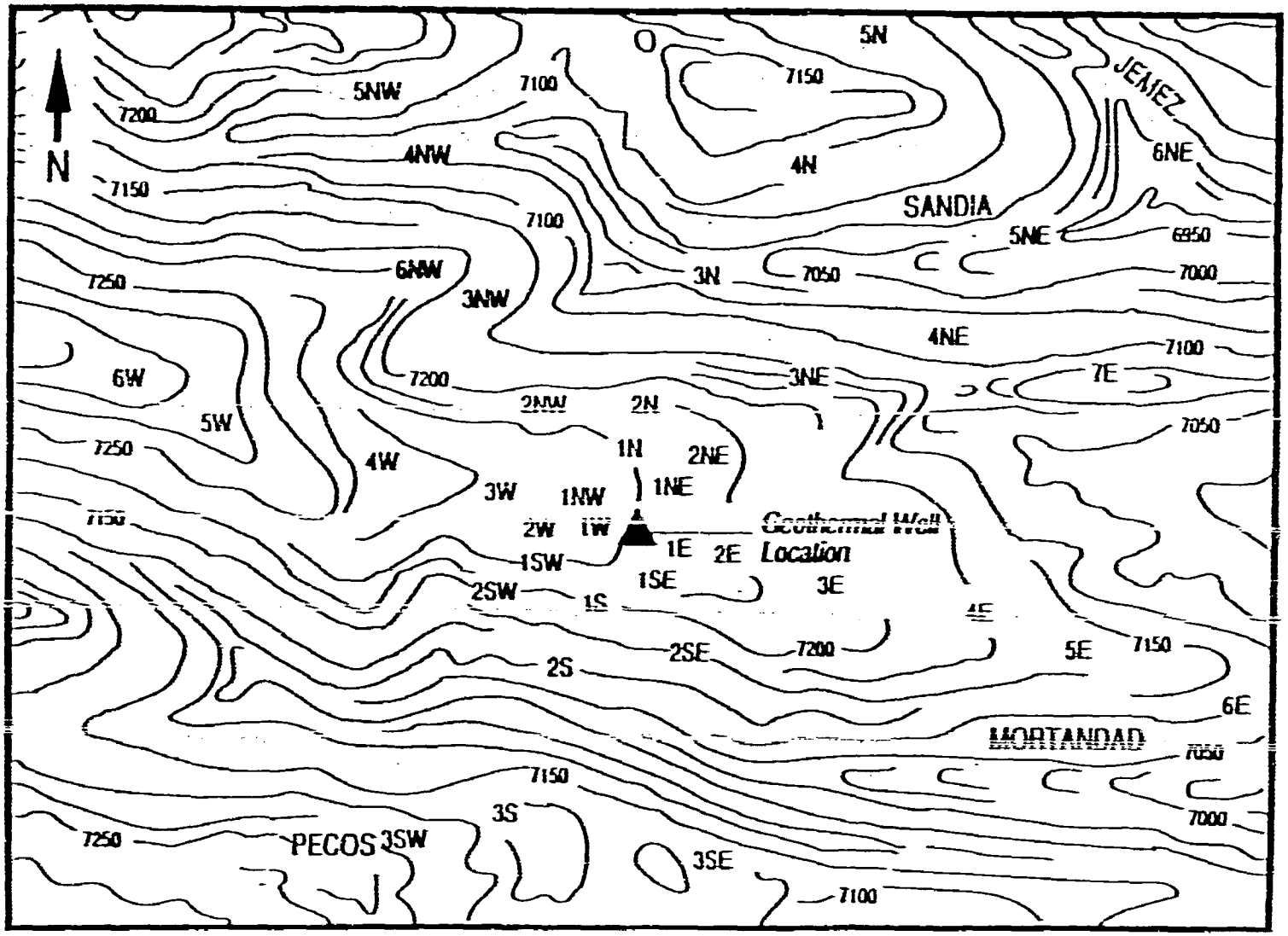

Fig. 2. Locations of sampling sites.

TABLE II. Elemental Concentrations in Soil

Element[a]	Mean	Standard Deviation	No. of Samples	Maximum	Minimum
Al (%)	5.8	0.35	40	6.7	5.3
As	3.9	1.6	40	5.7	1.3
B	16	7.2	38	27	7.0
Ba	410	220	40	810	120
Be	1.9	0.49	37	3.3	1.1
Br	1.9	1.2	38	5.7	0.40
Cd (ppb)	170	100	36	520	30
Cl	<100		40		
Cr	27	24	40	136	4.2
Cu	10	4.5	40	18	2.0
F	240	74	40	390	50
Fe (%)	1.7	0.48	40	2.6	1.0
Hg (ppb)	18	6.0	39	29	7.0
Li	24	4.6	40	39	19
Mg (%)	0.23	0.12	40	0.40	0.051
Mn	510	130	40	840	330
Ni	8.9	4.8	40	19	1.6
NO_3	8.1	6.5	30	26	0.50
Pb	24	15	40	98	8.0
PO_4	11	20	21	94	0.10
Rb	120	15	40	160	90
SO_4	10	13	39	59	2.0
Ti (%)	0.26	0.15	40	0.49	0.079
Zn	54	12	40	71	38

[a]Data are reported in parts per million (ppm) unless otherwise noted.

vegetation data, and Table VII shows soil data from other sources for comparison with the data in Table II. In general, the Sigma Mesa data agree well with the data from other sources. Those instances where there is some discrepancy can be attributed to the chemical characteristics of the volcanic tuff from which the Sigma Mesa soil is derived.

The results of the individual analyses are tabulated in the Appendix, Tables A-I through A-V.

TABLE III. Elemental Concentrations in Grass

Element[a]	Mean	Standard Deviation	No. of Samples	Maximum	Minimum
Al	650	770	39	4400	150
As (ppb)	360	210	38	960	60
B	14	7.0	29	34	7.0
Ba	73	50	15	200	13
Be (ppb)	12	10	14	42	4.0
Br	40	41	40	160	2.7
Cd	<200		15		
Cl (%)	0.19	0.12	40	0.60	0.034
Cr	5.5	3.2	40	13	1.6
Cu	6.8	3.0	16	14	3.3
F	1.1	0.60	40	3.4	0.60
Fe	260	190	40	810	60
Li (ppb)	40	190	11	750	200
Mg (%)	0.12	0.028	16	0.17	0.061
Mn	48	35	40	180	13
Ni	26	11	15	55	7.0
NO_3	420	380	37	1300	60
Pb	1.7	1.1	11	4.0	1.0
PO_4 (%)	0.19	0.083	40	0.47	0.070
Rb	5.6	3.2	37	18	2.1
SO_4	690	360	40	1500	120
Tl	46	60	15	250	12
Zn	21	11	15	52	9.4

[a]Data are reported in parts per million (ppm) unless otherwise noted.

TABLE IV. Elemental Concentrations in Juniper

Element[a]	Mean	Standard Deviation	No. of Samples	Maximum	Minimum
Al	350	180	21	960	140
As (ppb)	90	40	18	170	40
B	23	8.0	21	50	15
Ba	110	100	9	290	22
Be (ppb)	18	7.0	9	29	11
Br	21	18	21	65	3.2
Cd (ppb)	140	60	10	250	100
Cl	910	390	21	2000	350
Cr	3.5	1.4	21	5.9	1.5
Cu	5.9	2.5	9	10	3.5
F (ppb)	250	140	21	600	100
Fe	160	91	21	500	60
Li (ppb)	320	90	6	440	200
Mg (%)	0.24	0.061	9	0.35	0.17
Mn	48	10	21	62	26
Ni	5.2	3.7	9	11	1.9
NO_3	110	41	19	240	43
Pb	2.5	1.3	4	4.0	1.0
PO_4 (%)	0.23	0.096	21	0.43	0.11
Rb	3.1	1.4	19	6.9	1.1
SO_4	470	210	21	830	170
Tl	67	51	9	150	16
Zn	21	5.0	9	27	9.2

[a]Data are reported in parts per million (ppm) unless otherwise noted.

TABLE V. Elemental Concentrations in Piñon Pine

Element[a]	Mean	Standard Deviation	No. of Samples	Maximum	Minimum
Al	200	65	18	310	100
As (ppb)	150	60	17	300	80
B	22	7.0	18	46	11
Ba	24	6.0	3	28	17
Be (ppb)	16	7.0	4	24	8.0
Br	13	14	18	55	1.7
Cd (ppb)	110	60	4	200	50
Cl	570	860	18	4000	230
Cr	3.2	1.5	18	6.8	1.0
Cu	3.9	2.2	4	7.0	2.2
F (ppb)	190	160	18	700	100
Fe	87	33	18	150	40
Li	3.4	2.7	5	7.0	0.70
Mg (%)	0.19	0.064	6	0.31	0.12
Mn	200	160	18	540	58
Ni	5.5	4.4	4	12	2.2
NO_3 [b]					
Pb [b]					
PO_4 (%)	0.18	0.077	17	0.32	0.080
Rb	4.4	2.2	16	9.8	1.5
SO_4	750	380	17	1700	19
Tl	94	160	4	340	11
Zn	34	26	6	69	4.0

[a]Data are reported in parts per million (ppm) unless otherwise noted.
[b]No average was calculated (see data in the Appendix).

TABLE VI. Elemental Concentrations in Oil[a]

Element[a]	Mean	Standard Deviation	No. of Samples	Maximum	Minimum
Al	510	220	9	860	210
As (ppb)	170	110	9	440	70
B	63	13	9	81	48
Ba	39	30	3	73	18
Be (ppb)	46	39	3	90	18
Br	6.4	4.6	9	16	2.2
Cd (ppb)	<200		3		
Cl	260	92	9	380	65
Cr	4.0	2.0	9	6.9	1.9
Cu	7.0	1.3	3	8.1	5.5
F (ppb)	260	150	9	600	100
Fe	210	68	9	350	140
Li	4.3	3.5	3	7.1	0.31
Mg (%)	0.25	0.026	3	0.28	0.23
Mn	500	180	9	870	220
Ni	4.4	0.40	3	4.8	4.0
NO_3	120	34	7	190	80
Pb	<3.0		3		
PO_4 (%)	0.17	0.076	9	0.28	0.019
Rb	17	10	3	26	5.9
SO_4	470	320	8	990	200
Tl	29	5.0	3	34	24
Zn	25	6.0	3	30	18

[a]Data are reported in parts per million (ppm) unless otherwise noted.

TABLE VII. Elemental Abundance in the Earth's Crust

Element	Concentrations (ppm)			
	Mason[a]	Vinogradov[b]	Vinogradov[c]	Wedepohl[d]
Al	81 300	104 500	71 300	78 [illegible]00
As	1.8	6.6	5	1.7
Ba	425	800	500	[illegible]90
Be	2.8	7	6	2
Br	2.5	6	5	2.9
Cd	0.2	0.3	0.5	0.1
Cl	130	160	100	[illegible]20
Cr	100	160	200	70
Cu	55	57	20	30
F	625	500	200	[illegible]20
Fe	50 000	33 300	38 000	35 [illegible]00
Hg	0.08	0.4	0.01	0.03
Li	20	60	30	30
Mg	20 900	13 400	6 300	13 [illegible]00
Mn	950	670	850	[illegible]90
Ni	75	95	40	44
Pb	13	20	10	15
Rb	90	400	100	120
Ti	4 400	4 500	4 600	4 [illegible]00
Zn	70	80	50	60
Ag	0.07	0.9	0.1	0.06
Au	0.004	—	—	0.004
Ca	36 300	25 300	13 700	28 [illegible]00
Ce	60	30	50	75
Co	25	23	8	12
Cs	3	12	5	2.7
Dy	3	4	—	6.1
Eu	1.2	1	—	1.4
Ga	15	40	30	17
Gd	5.4	5	—	8
Ge	1.5	7	1	1.3
Hf	3	4	6	3
I	0.5	1	5	0.5
In	0.1	—	—	0.07
K	25 900	22 800	13 600	28 [illegible]00
La	30	40	40	44
Lu	0.5	0.2	—	0.6
Mo	1.5	2	2	1
Na	28 300	6 600	6 300	24 [illegible]00
Nb	20	20	—	20
Nd	28	18	—	[illegible]30
S	260	3 000	850	310
Sb	0.2	1	—	0.2
Sc	22	10	7	14
Se	0.05	0.6	—	0.09
Si	277 000	248 000	330 000	305 000

TABLE VII (Continued)

Element	Concentrations (ppm)			
	Mason[a]	Vinogradov[b]	Vinogradov[c]	Wedepohl[d]
Sm	6	5	—	>7
Sn	2	30	10	3
Sr	375	450	300	190
Ta	2	3.5	—	3.4
Tb	0.9	0.9	—	<1.4
Te	0.01	—	—	0.002
Th	7.2	11	6	11
U	1.8	3.2	1	3.5
V	135	130	100	95
W	1.5	—	—	1.3
Y	33	33	50	34
Yb	3.4	2.2	—	3.4
Zr	165	200	300	160

[a]Crustal concentrations (Mason 1966).
[b]Sedimentary rocks, shales, and clays (Vinogradov 1959).
[c]Soil concentrations (Vinogradov 1959).
[d]Crustal concentrations (Wedepohl 1968).

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TABLE A-1. Soil: Elemental Concentrations[a]

Location	Al (%)	As (ppm)	B (ppm)	Ba (ppm)	Be (ppm)	Br (ppm)	Cd (ppb)	Cl (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)	Fe (%)
1N	5.5 ± 0.5	5.8 ± 0.7	24 ± 5	680 ± 100	2.7 ± 0.2	4.0 ± 0.5	170 ± 20	<100	41 ± 4	16 ± 2	280 ± 30	2.4 ± 0.1
2N	5.8 ± 0.5	6.0 ± 0.7	27 ± 5	620 ± 90	<0.2	<0.3	150 ± 20	<100	43 ± 4	13 ± 1	260 ± 30	2.2 ± 0.1
3N	5.8 ± 0.5	3.8 ± 0.5	10 ± 5	210 ± 30	<0.2	0.87 ± 0.5	80 ± 20	<100	9.2 ± 1.1	6 ± 1	180 ± 20	1.3 ± 0.1
4N	5.9 ± 0.5	1.8 ± 0.4	10 ± 5	180 ± 30	2.6 ± 0.2	0.61 ± 0.5	290 ± 30	<100	9.0 ± 1.4	6 ± 1	50 ± 10	1.2 ± 0.1
5N	5.7 ± 0.5	3.1 ± 0.4	8 ± 5	400 ± 60	2.1 ± 0.2	1.3 ± 0.4	210 ± 20	<100	6.7 ± 1.0	15 ± 2	150 ± 10	1.2 ± 0.1
1NE	6.2 ± 0.5	4.8 ± 0.5	20 ± 5	570 ± 90	1.5 ± 0.2	5.7 ± 0.7	140 ± 20	<100	27 ± 2	13 ± 1	310 ± 30	2.0 ± 0.1
2NE	6.0 ± 0.5	6.2 ± 0.7	25 ± 5	620 ± 90	1.4 ± 0.2	3.3 ± 0.5	260 ± 20	<100	41 ± 4	18 ± 2	340 ± 30	2.1 ± 0.1
3NE	5.8 ± 0.5	1.3 ± 0.3	<5	150 ± 20	3.3 ± 0.3	0.72 ± 0.5	210 ± 20	<100	140 ± 11	6 ± 1	150 ± 10	1.1 ± 0.1
4NE	6.2 ± 0.5	1.8 ± 0.4	7 ± 5	120 ± 20	1.8 ± 0.2	1.5 ± 0.6	200 ± 20	<100	5.1 ± 1.1	5 ± 1	160 ± 20	1.1 ± 0.1
5NE	5.8 ± 0.5	2.7 ± 0.4	10 ± 5	180 ± 30	1.6 ± 0.2	0.99 ± 0.3	200 ± 20	<100	8.9 ± 1.1	6 ± 1	170 ± 20	1.2 ± 0.1
6NE	5.3 ± 0.5	3.7 ± 0.5	11 ± 5	240 ± 40	2.2 ± 0.2	1.6 ± 0.3		<100	13 ± 2	8 ± 1	190 ± 20	1.3 ± 0.1
1E	5.5 ± 0.5	5.7 ± 0.6	27 ± 5	720 ± 110	1.6 ± 0.2	2.2 ± 0.5	170 ± 20	<100	39 ± 4	15 ± 2	360 ± 40	2.1 ± 0.1
2E	6.2 ± 0.5	5.0 ± 0.6	23 ± 5	590 ± 90	<0.2	2.3 ± 0.4	80 ± 20	<100	40 ± 4	14 ± 1	210 ± 20	2.4 ± 0.1
3E	6.2 ± 0.5	4.1 ± 0.5	15 ± 5	390 ± 60	1.7 ± 0.2	1.4 ± 0.4	110 ± 20	<100	23 ± 2	9 ± 3	220 ± 20	2.1 ± 0.1
4E	5.7 ± 0.5	4.2 ± 0.6	13 ± 5	300 ± 50	2.1 ± 0.2	2.8 ± 0.6	60 ± 20	<100	15 ± 2	11 ± 1	210 ± 20	1.5 ± 0.1
5E	6.3 ± 0.5	2.8 ± 0.5	10 ± 5	260 ± 40	2.3 ± 0.2	0.57 ± 0.4	160 ± 20	<100	14 ± 2	6 ± 2	210 ± 20	1.7 ± 0.1
6E	5.9 ± 0.5	2.6 ± 0.5	9 ± 5	190 ± 30	2.0 ± 0.2	1.2 ± 0.4		<100	8.9 ± 1.2	3 ± 1	230 ± 20	1.0 ± 0.1
7E	6.2 ± 0.5	1.8 ± 0.5	10 ± 5	120 ± 30	2.6 ± 0.2	1.7 ± 0.6	100 ± 20	<100	6.8 ± 1.0	4 ± 1	300 ± 30	1.2 ± 0.1
1SE	6.0 ± 0.5	3.5 ± 0.4	15 ± 5	400 ± 70	1.5 ± 0.2	2.8 ± 0.4	100 ± 20	<100	18 ± 2	10 ± 1	260 ± 20	1.5 ± 0.1
2SE	5.4 ± 0.5	1.7 ± 0.3	9 ± 5	130 ± 20	2.1 ± 0.2	3.5 ± 0.5	140 ± 20	<100	4.4 ± 1.2	5 ± 1	190 ± 20	1.0 ± 0.1
3SE	6.0 ± 0.5	1.6 ± 0.3	7 ± 5	140 ± 20	2.2 ± 0.2	1.6 ± 0.3	260 ± 20	<100	4.3 ± 0.9	2 ± 2	270 ± 30	1.1 ± 0.1
1S	5.3 ± 0.5	4.3 ± 0.5	16 ± 5	390 ± 60	1.7 ± 0.2	3.6 ± 0.7	390 ± 30	<100	21 ± 2	14 ± 1	220 ± 20	1.7 ± 0.1
2S	5.4 ± 0.5	2.1 ± 0.4	9 ± 5	150 ± 20	1.9 ± 0.2	1.9 ± 0.6	180 ± 20	<100	4.2 ± 0.8	5 ± 1	140 ± 10	1.0 ± 0.1
3S	5.7 ± 0.5	1.7 ± 0.3	<5	350 ± 50	2.3 ± 0.2	0.70 ± 0.5	110 ± 20	<100	54 ± 4	7 ± 1	150 ± 10	2.6 ± 0.1
1SW	6.0 ± 0.5	4.5 ± 0.5	19 ± 5	590 ± 90	1.8 ± 0.2	2.5 ± 0.4	140 ± 20	<100	39 ± 4	11 ± 1	270 ± 30	2.2 ± 0.1
2SW	6.4 ± 0.5	4.9 ± 0.6	18 ± 5	380 ± 60	2.0 ± 0.2	2.7 ± 0.5		<100	26 ± 3	15 ± 2	300 ± 30	1.9 ± 0.1
3SW	6.7 ± 0.5	3.5 ± 0.4	13 ± 5	280 ± 30	2.4 ± 0.2	1.7 ± 0.5	100 ± 20	<100	16 ± 2	13 ± 1	320 ± 30	1.7 ± 0.1
1W	5.3 ± 0.5	4.7 ± 0.7	27 ± 5	810 ± 120	1.4 ± 0.2	2.8 ± 0.4	260 ± 20	<100	40 ± 4	17 ± 2	220 ± 30	2.2 ± 0.1
2W	5.9 ± 0.5	5.5 ± 0.6	24 ± 5	610 ± 90	0.9 ± 0.2	1.8 ± 0.4	190 ± 20	<100	48 ± 4	14 ± 1	320 ± 30	2.2 ± 0.1
3W	5.5 ± 0.5	4.8 ± 0.6	25 ± 5	570 ± 90	1.4 ± 0.2	0.44 ± 0.4	90 ± 20	<100	38 ± 3	11 ± 1	340 ± 30	1.9 ± 0.1
4W	6.0 ± 0.5	5.7 ± 0.6	28 ± 5	680 ± 100	1.7 ± 0.2	4.1 ± 0.6	30 ± 20	<100	42 ± 4	15 ± 2	390 ± 40	2.2 ± 0.1
5W	5.7 ± 0.5	5.7 ± 0.6	19 ± 5	700 ± 110	1.6 ± 0.2	1.0 ± 0.4	520 ± 50	<100	46 ± 4	14 ± 1	320 ± 30	2.0 ± 0.1
6W	5.5 ± 0.5	5.4 ± 0.6	25 ± 5	650 ± 100	1.8 ± 0.2	1.4 ± 0.4	130 ± 20	<100	41 ± 4	13 ± 1	160 ± 20	1.9 ± 0.1
7W	5.3 ± 0.5	5.3 ± 0.6	24 ± 5	620 ± 90	1.3 ± 0.2	3.0 ± 0.5	30 ± 20	<100	40 ± 4	12 ± 1	280 ± 30	2.0 ± 0.1
1NW	5.5 ± 0.5	5.6 ± 0.6	27 ± 5	660 ± 100	1.1 ± 0.2	2.4 ± 0.5		<100	32 ± 4	16 ± 2	310 ± 30	2.0 ± 0.1
2NW	5.4 ± 0.5	5.1 ± 0.6	26 ± 5	700 ± 110	1.4 ± 0.2	0.42 ± 0.3	150 ± 20	<100	45 ± 4	14 ± 1	250 ± 20	2.1 ± 0.1
3NW	5.7 ± 0.5	3.2 ± 0.4	9 ± 5	200 ± 30	1.5 ± 0.2	<0.3	250 ± 20	<100	7.6 ± 1.1	6 ± 1	180 ± 20	1.1 ± 0.1
4NW	5.8 ± 0.5	2.5 ± 0.4	10 ± 5	160 ± 20	2.1 ± 0.2	0.73 ± 0.5	100 ± 20	<100	8.8 ± 1.3	6 ± 1	160 ± 20	1.2 ± 0.1
5NW	6.3 ± 0.5	3.0 ± 0.4	11 ± 5	260 ± 40	2.4 ± 0.2	0.40 ± 0.4	150 ± 20	<100	11 ± 1	7 ± 1	220 ± 20	1.6 ± 0.1
6NW	6.2 ± 0.5	2.4 ± 0.4	8 ± 5	220 ± 30	2.1 ± 0.2	0.65 ± 0.5	140 ± 20	<100	8.5 ± 1.3	5 ± 1	190 ± 20	1.3 ± 0.1

TABLE A-1 (Continued)

Location	Hg (ppb)	Li (ppm)	Mg (ppm)	Mn (ppm)	Ni (ppm)	NO_3 (ppm)	Pb (ppm)	PO_4 (ppm)	Rb (ppm)	SO_4 (ppm)	Ti (ppm)	Zn (ppm)
1N	22 ± 4	24 ± 2	3800 ± 380	770 ± 80	15 ± 2	6.0 ± 0.6	18 ± 2	15 ± 1	120 ± 15	10 ± 1	4200 ± 400	51 ± 3
2N	14 ± 4	23 ± 2	3400 ± 340	530 ± 50	13 ± 2	6.0 ± 0.6	33 ± 3	<0.6	120 ± 14	9.0 ± 0.9	4300 ± 450	41 ± 2
3N	18 ± 4	29 ± 3	1500 ± 150	400 ± 40	6.5 ± 1	2.0 ± 0.2	18 ± 2	<0.6	130 ± 15	4.0 ± 0.4	1200 ± 170	58 ± 3
4N		28 ± 3	850 ± 50	400 ± 40	4.7 ± 1	6.0 ± 0.6	28 ± 2	<0.6	150 ± 18	4.0 ± 0.4	1100 ± 170	52 ± 3
5N	12 ± 4	25 ± 3	2400 ± 240	350 ± 40	6.8 ± 1	10 ± 1	65 ± 6	<0.6	120 ± 13	4.0 ± 0.4	1300 ± 220	64 ± 3
1NE	22 ± 4	25 ± 3	3700 ± 370	740 ± 70	14 ± 2	23 ± 2	18 ± 2	<0.6	120 ± 14	59 ± 6	3700 ± 390	52 ± 3
2NE	27 ± 4	25 ± 3	4000 ± 400	570 ± 60	14 ± 2	<0.9	20 ± 2	2.0 ± 0.2	150 ± 18	10 ± 1	3800 ± 390	52 ± 3
3NE	14 ± 4	24 ± 2	670 ± 70	390 ± 40	3.1 ± 1	<0.9	12 ± 2	7.0 ± 0.7	120 ± 14	6.0 ± 0.6	810 ± 140	64 ± 3
4NE	10 ± 4	26 ± 3	510 ± 50	460 ± 50	2.7 ± 1	<0.9	15 ± 2	4.0 ± 0.4	130 ± 15	2.0 ± 0.2	1000 ± 180	71 ± 4
5NE	17 ± 4	26 ± 3	1200 ± 120	470 ± 50	6.8 ± 1	<0.9	32 ± 3	<0.6	120 ± 13	3.0 ± 0.3	1300 ± 140	63 ± 3
6NE	22 ± 4	26 ± 3	1600 ± 160	640 ± 60	5.2 ± 1	<0.9	30 ± 3	3.0 ± 0.3	130 ± 15	6.0 ± 0.6	1200 ± 120	71 ± 4
1E	21 ± 4	25 ± 3	3800 ± 380	630 ± 60	15 ± 2	7.0 ± 0.7	25 ± 2	8.0 ± 0.8	120 ± 17	9.0 ± 0.9	4300 ± 450	45 ± 2
2E	13 ± 4	25 ± 3	4000 ± 400	840 ± 80	19 ± 2	6.0 ± 0.6	12 ± 2	<0.6	120 ± 14	8.0 ± 0.8	4900 ± 280	50 ± 3
3E	17 ± 4	24 ± 2	2700 ± 270	430 ± 40	6.9 ± 1	11 ± 1	20 ± 2	<0.6	110 ± 12	7.0 ± 0.7	2900 ± 330	48 ± 2
4E	27 ± 4	24 ± 2	1800 ± 180	430 ± 40	6.3 ± 1	14 ± 1	25 ± 2	<0.6	90 ± 11	14 ± 1	2000 ± 240	62 ± 3
5E	11 ± 4	23 ± 3	1400 ± 140	390 ± 40	5.6 ± 1	16 ± 1	16 ± 2	<0.6	120 ± 14	5.0 ± 0.5	1700 ± 210	53 ± 3
6E	13 ± 4	26 ± 3	930 ± 90	360 ± 40	3.2 ± 1	4.0 ± 0.4	8 ± 2	<0.6	110 ± 12	3.0 ± 0.3	1100 ± 180	47 ± 2
7E	17 ± 4	29 ± 3	1100 ± 110	400 ± 40	3.8 ± 1	12 ± 1	19 ± 2	5.0 ± 0.5	130 ± 14	3.0 ± 0.3	790 ± 150	55 ± 6
1SE	15 ± 4	25 ± 3	2700 ± 270	390 ± 40	8.1 ± 1	6.0 ± 0.6	19 ± 2	3.0 ± 0.3	90 ± 10	6.0 ± 0.6	2500 ± 260	45 ± 2
2SE	13 ± 4	19 ± 2	810 ± 80	440 ± 40	3.8 ± 1	<0.9	14 ± 2	25 ± 2	120 ± 14	34 ± 3	850 ± 90	59 ± 3
3SE	7 ± 4	25 ± 3	560 ± 90	420 ± 40	12 ± 2	<0.9	8 ± 2	<0.6	110 ± 12	2.0 ± 0.2	950 ± 100	58 ± 3
1S	29 ± 4	25 ± 2	2200 ± 220	540 ± 50	8.7 ± 1	0.5 ± 0.1	28 ± 2	94 ± 9	120 ± 15	22 ± 2	2100 ± 240	62 ± 3
2S	16 ± 4	22 ± 2	760 ± 80	400 ± 40	34 ± 1	4.0 ± 0.4	19 ± 2	23 ± 2	110 ± 12	<0.6	810 ± 140	56 ± 2
3S	22 ± 4	22 ± 2	1700 ± 170	460 ± 50	13 ± 2	12 ± 1	11 ± 2	5.0 ± 0.5	100 ± 15	56 ± 6	4090 ± 920	60 ± 3
1SW	18 ± 4	24 ± 2	3400 ± 340	460 ± 50	1.6 ± 1	<0.9	19 ± 2	0.3 ± 0.1	120 ± 15	8.0 ± 0.8	4200 ± 430	49 ± 3
2SW	20 ± 4	27 ± 3	3000 ± 300	520 ± 50	7.5 ± 1	6.0 ± 0.6	20 ± 2	<0.6	120 ± 14	9.0 ± 0.9	3100 ± 340	51 ± 3
3SW	29 ± 4	28 ± 3	2800 ± 280	330 ± 30	10 ± 2	<0.9	24 ± 2	2.0 ± 0.2	110 ± 14	13 ± 1	1400 ± 190	56 ± 3
1W	17 ± 4	22 ± 2	3300 ± 330	690 ± 70	16 ± 2	8.0 ± 0.8	25 ± 2	4.0 ± 0.4	120 ± 15	10 ± 1	4200 ± 250	48 ± 2
2W	22 ± 4	25 ± 3	3600 ± 360	670 ± 70	11 ± 2	6.0 ± 0.6	24 ± 2	10 ± 1	150 ± 20	10 ± 1	3800 ± 400	46 ± 2
3W	16 ± 4	20 ± 2	3000 ± 300	540 ± 50	9.5 ± 1	22 ± 2	25 ± 2	4.0 ± 0.4	120 ± 15	10 ± 1	3600 ± 220	39 ± 2
4W	23 ± 4	26 ± 3	3900 ± 390	650 ± 60	16 ± 2	5.0 ± 0.5	25 ± 2	2.0 ± 0.2	110 ± 14	2.0 ± 0.2	3900 ± 410	43 ± 2
5W	21 ± 4	24 ± 2	3900 ± 370	600 ± 60	14 ± 2	26 ± 2	23 ± 2	<0.6	120 ± 14	12 ± 1	4200 ± 240	41 ± 2
6W	10 ± 4	21 ± 2	3300 ± 330	530 ± 50	12 ± 2	8.0 ± 0.8	25 ± 2	<0.6	100 ± 14	7.0 ± 0.7	4300 ± 460	42 ± 2
7W	18 ± 4	23 ± 2	2700 ± 270	570 ± 60	12 ± 2	6.0 ± 0.6	23 ± 2	<0.6	120 ± 14	7.0 ± 0.7	4500 ± 260	38 ± 2
1NW	31 ± 4	23 ± 2	3400 ± 340	660 ± 70	16 ± 2	2.0 ± 0.2	98 ± 9	8.0 ± 0.8	110 ± 13	12 ± 1	4300 ± 440	47 ± 2
2NW	20 ± 4	22 ± 2	3300 ± 330	640 ± 60	14 ± 2	4.0 ± 0.4	24 ± 2	<0.6	130 ± 16	9.0 ± 0.9	4400 ± 460	39 ± 2
3NW	18 ± 4	24 ± 2	1100 ± 110	330 ± 30	4.5 ± 1	2.0 ± 0.2	22 ± 2	<0.6	100 ± 12	3.0 ± 0.3	940 ± 160	48 ± 2
4NW	20 ± 4	28 ± 3	950 ± 100	360 ± 40	3.6 ± 1	2.0 ± 0.2	16 ± 2	2.0 ± 0.2	130 ± 15	4.0 ± 0.4	940 ± 150	56 ± 3
5NW	7 ± 4	39 ± 4	1200 ± 120	600 ± 60	4.8 ± 1	<0.9	22 ± 2	<0.6	160 ± 17	2.0 ± 0.2	1200 ± 160	110 ± 5
6NW	15 ± 4	23 ± 2	1100 ± 110	370 ± 40	3.7 ± 1	1.0 ± 0.1	23 ± 2	0.1 ± 0.1	110 ± 13	3.0 ± 0.3	1100 ± 170	52 ± 3

[a]Insufficient sample for analysis where no data are reported. Uncertainties represent analytical uncertainties.

TABLE A-H. Grass: Elemental Concentrations[a]

Location	Al (ppm)	As (ppm)	B (ppm)	Ba (ppm)	Be (ppb)	Br (ppm)	Cd (ppm)	Cl (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)
1N	1300 ± 380	<0.08	<10			160 ± 20		2700 ± 400	5.0 ± 0.5		1.6 ± 0.2
2N	1500 ± 460	0.17 ± 0.05	22 ± 5			130 ± 10		1700 ± 260	4.3 ± 0.4		2.6 ± 0.3
3N	230 ± 70	0.06 ± 0.02	7 ± 5			16 ± 2	<0.2	1500 ± 220	3.1 ± 0.3		2.4 ± 0.2
4N	4400 ± 1300	<0.03	6 ± 5	44 ± 10	21 ± 2	31 ± 3	<0.2	2400 ± 360	4.0 ± 0.4	3.3 ± 0.3	2.2 ± 0.2
5N	320 ± 100	0.32 ± 0.06	14 ± 5	90 ± 20	11 ± 2	20 ± 2		2000 ± 300	3.7 ± 0.4	4.4 ± 0.4	1.3 ± 0.1
1NE	720 ± 220	0.57 ± 0.10	<5			110 ± 10		2400 ± 360	7.5 ± 0.8		0.8 ± 0.1
2NE	460 ± 140	0.25 ± 0.06	8 ± 5			32 ± 3		1500 ± 220	13 ± 1.3		0.9 ± 0.1
3NE	260 ± 80	0.55 ± 0.08	23 ± 5			10 ± 1		900 ± 140	9.7 ± 1.0		0.7 ± 0.1
4NE	280 ± 90	0.23 ± 0.05	<5			11 ± 1	0.07 ± 0.01	1500 ± 230	6.1 ± 0.6		0.6 ± 0.1
5NE	220 ± 70	0.51 ± 0.07	9 ± 5			10 ± 1		2600 ± 380	6.5 ± 0.7		0.6 ± 0.1
6NE	300 ± 90	0.53 ± 0.08	8 ± 5			13 ± 1		1500 ± 230	4.3 ± 0.4		0.7 ± 0.1
1E	1300 ± 380	0.17 ± 0.06	<5			51 ± 5		1400 ± 210	3.9 ± 0.4		0.9 ± 0.1
2E	310 ± 90	0.08 ± 0.05	<5			34 ± 3		960 ± 140	2.1 ± 0.2		1.5 ± 0.1
3E	2000 ± 610	0.15 ± 0.07	13 ± 5			29 ± 3	<0.2	2100 ± 310	9.6 ± 1.0		1.6 ± 0.2
4E	240 ± 70	0.50 ± 0.07	11 ± 5	50 ± 10	4 ± 2	12 ± 1		980 ± 150	2.1 ± 0.2	5.0 ± 0.5	1.1 ± 0.1
5E	290 ± 90	0.19 ± 0.07	<5			50 ± 5		2700 ± 400	2.5 ± 0.3		0.8 ± 0.1
6E	150 ± 50	0.31 ± 0.05	19 ± 5			6.2 ± 0.6	<0.2	1300 ± 190	1.6 ± 0.2		0.8 ± 0.1
7E	250 ± 80	0.61 ± 0.08	10 ± 5	42 ± 10	6 ± 2	13 ± 1	<0.2	1400 ± 220	3.5 ± 0.4	5.0 ± 0.5	1.0 ± 0.1
1SE	330 ± 100	0.32 ± 0.06	8 ± 5	13 ± 10	17 ± 2	12 ± 1	<0.2	1500 ± 220	3.3 ± 0.3	6.6 ± 0.7	0.9 ± 0.1
2SE	260 ± 80	0.24 ± 0.04	9 ± 5	86 ± 20	8 ± 2	2.7 ± 0.3	<0.2	400 ± 60	3.1 ± 0.3	4.8 ± 0.5	1.0 ± 0.1
3SE	240 ± 70	0.32 ± 0.06	14 ± 5	98 ± 20	8 ± 2	33 ± 3	<0.2	2100 ± 320	7.6 ± 0.8	14 ± 1.4	0.9 ± 0.1
1S	290 ± 90	0.15 ± 0.04	12 ± 5			13 ± 1		1100 ± 160	3.9 ± 0.4		0.6 ± 0.1
2S	250 ± 70	0.27 ± 0.04	10 ± 5			25 ± 2		1600 ± 240	3.5 ± 0.4		0.7 ± 0.1
3S	240 ± 70	0.39 ± 0.06	<5	90 ± 20	<3	15 ± 2	<0.3	6000 ± 850	13 ± 1.3	6.9 ± 0.7	0.7 ± 0.1
1SW	460 ± 140	0.31 ± 0.05	21 ± 5	22 ± 10	6 ± 2	3.9 ± 0.4	<0.2	340 ± 50	3.9 ± 0.4	9.2 ± 0.9	1.2 ± 0.1
2SW	250 ± 70	0.29 ± 0.05	9 ± 5	45 ± 10	6 ± 2	19 ± 2	<0.2	1300 ± 200	3.5 ± 0.4	7.6 ± 0.8	0.7 ± 0.1
3SW	240 ± 70	0.31 ± 0.07	<5	150 ± 30	5 ± 2	23 ± 2	<0.2	5600 ± 850	13 ± 1.3	3.9 ± 0.4	0.6 ± 0.1
1W	1500 ± 460	0.81 ± 0.12	34 ± 5			77 ± 8		1600 ± 250	6.9 ± 0.7		3.4 ± 0.3
2W	600 ± 180	0.37 ± 0.11	<5	100 ± 20	10 ± 2	98 ± 10	<0.3	1900 ± 280	4.8 ± 0.4	3.4 ± 0.3	1.3 ± 0.1
3W	1100 ± 340	0.72 ± 0.13	12 ± 5	44 ± 10	10 ± 2	150 ± 15	<0.2	4200 ± 630	5.9 ± 0.6	6.8 ± 0.7	1.2 ± 0.1
4W	810 ± 240	0.48 ± 0.10	26 ± 5			69 ± 7		940 ± 140	3.2 ± 0.3	9.7 ± 1.0	1.6 ± 0.2
5W		0.96 ± 0.14	12 ± 5			91 ± 9		2300 ± 340	13 ± 1.3	11 ± 1.1	1.5 ± 0.1
6W	1200 ± 350	0.39 ± 0.10	29 ± 5	200 ± 40	42 ± 4	72 ± 7	<0.2	2400 ± 370	2.1 ± 0.2	7.6 ± 0.8	1.0 ± 0.1
7W	710 ± 210	0.28 ± 0.06	11 ± 5	32 ± 10	16 ± 2	37 ± 4	<0.2	2000 ± 300	5.1 ± 0.5		0.8 ± 0.1
1NW	880 ± 260	0.29 ± 0.08	7 ± 5			47 ± 5		1900 ± 280	5.2 ± 0.5		1.1 ± 0.1
2NW	540 ± 160	0.62 ± 0.11	17 ± 5			24 ± 2		410 ± 60	6.3 ± 0.6		1.1 ± 0.1
3NW	190 ± 60	0.13 ± 0.04	11 ± 5			5.9 ± 0.6		1800 ± 270	8.1 ± 0.8		0.6 ± 0.1
4NW	390 ± 120	0.22 ± 0.04	<5			15 ± 2		970 ± 150	4.3 ± 0.4		0.9 ± 0.1
5NW	220 ± 70	0.25 ± 0.05	<5			17 ± 2		2300 ± 350	6.3 ± 0.6		0.7 ± 0.1
6NW	150 ± 50	0.32 ± 0.05	9 ± 5			19 ± 2		1900 ± 290	2.8 ± 0.3		0.7 ± 0.1

TABLE A-II (Continued)

Location	Fe (ppm)	Li (ppm)	Mg (ppm)	Mn (ppm)	Ni (ppm)	NO_3 (ppm)	Pb (ppm)	PO_4 (ppm)	Rb (ppm)	SO_4 (ppm)	Ti (ppm)	Zn (ppm)
1N	490 ± 100			52 ± 11		110 ± 10		2500 ± 250	4.4 ± 1.2	360 ± 40		
2N	540 ± 100			45 ± 10		810 ± 80		1400 ± 140	4.9 ± 1.2	450 ± 50		
3N	90 ± 20			28 ± 6		4.0 ± 0.4		2000 ± 200	5.3 ± 1.2	990 ± 100		
4N	810 ± 160	0.20 ± 0.10	1300 ± 130	52 ± 11	18 ± 2	1300 ± 130	3.0 ± 1.0	2000 ± 200	18 ± 1.2	270 ± 30	21 ± 3	9.4 ± 0.9
5N	130 ± 30	<0.20	1200 ± 120	17 ± 5	7.0 ± 1.0	450 ± 50	2.0 ± 1.0	1100 ± 110	7.1 ± 1.2	570 ± 60	16 ± 3	21 ± 2
1NE	300 ± 60			39 ± 8		200 ± 20		2600 ± 260	11 ± 1.2	920 ± 90		
2NE	270 ± 50			33 ± 7		93 ± 9		2100 ± 210	2.2 ± 1.2	1300 ± 130		
3NE	240 ± 50			73 ± 15		<0.9		2000 ± 200	4.3 ± 1.2	520 ± 50		
4NE	140 ± 30			32 ± 7		190 ± 20		2000 ± 200	6.4 ± 1.2	540 ± 50		
5NE	100 ± 20			35 ± 7		300 ± 30		2000 ± 200	9.5 ± 1.2	470 ± 50		
6NE	100 ± 20			57 ± 12		200 ± 20		1300 ± 130	2.6 ± 1.2	740 ± 70		
1E	460 ± 90			36 ± 8		200 ± 20		1600 ± 160	5.4 ± 1.2	320 ± 30		
2E	110 ± 20			24 ± 5		100 ± 10		1900 ± 190	<1.2	610 ± 60		
3E	230 ± 40			17 ± 4		600 ± 60		1500 ± 150	5.5 ± 1.2	1100 ± 110		
4E	110 ± 20	<0.20	1100 ± 110	23 ± 5	35 ± 4	150 ± 20	<3.0	1100 ± 110	3.6 ± 1.2	820 ± 80	16 ± 3	14 ± 1
5E	110 ± 20			24 ± 5		410 ± 40		700 ± 70	11 ± 1.2	730 ± 70		
6E	60 ± 10			31 ± 6		250 ± 30		2000 ± 200	4.2 ± 1.2	990 ± 100		
7E	90 ± 20	<0.20	1200 ± 120	31 ± 6	15 ± 2	60 ± 6	1.0 ± 1.0	820 ± 80	2.7 ± 1.2	1200 ± 120	12 ± 3	16 ± 2
1SE	150 ± 30	0.50 ± 0.05	820 ± 80	26 ± 5	28 ± 3	270 ± 30	1.0 ± 1.0	1900 ± 190	2.2 ± 1.2	1500 ± 150	29 ± 3	12 ± 1
2SE	170 ± 30	0.37 ± 0.04	1100 ± 110	79 ± 16	20 ± 3	260 ± 30	1.0 ± 1.0	1100 ± 110	2.6 ± 1.2	270 ± 30	25 ± 3	22 ± 2
3SE	150 ± 30	0.20 ± 0.10	1500 ± 150	32 ± 7	20 ± 3	<0.9	1.0 ± 1.0	1100 ± 110	8.8 ± 1.2	320 ± 30	17 ± 3	24 ± 2
1S	130 ± 20			25 ± 5		100 ± 10		1700 ± 170	4.4 ± 1.2	840 ± 80		
2S	70 ± 20			30 ± 6		100 ± 10		2300 ± 230	3.8 ± 1.2	950 ± 90		
3S	200 ± 40	<0.20	1500 ± 150	64 ± 13	32 ± 4	660 ± 70	<3.0	2000 ± 200	2.3 ± 1.2	130 ± 10	16 ± 3	39 ± 4
1SW	160 ± 30	0.77 ± 0.07	1100 ± 110	120 ± 25	22 ± 3	550 ± 60	1.0 ± 1.0	760 ± 80	<1.2	290 ± 30	22 ± 3	16 ± 2
2SW	150 ± 30	0.35 ± 0.04	900 ± 100	61 ± 12	28 ± 3	<0.9	<3.0	1400 ± 140	2.1 ± 1.2	1100 ± 110	24 ± 3	19 ± 2
3SW	150 ± 30	<0.20	1300 ± 130	60 ± 12	28 ± 3	180 ± 20	<1.0	4700 ± 470	7.0 ± 1.2	590 ± 60	36 ± 3	52 ± 5
1W	720 ± 140			87 ± 18		1200 ± 120		4100 ± 410	8.0 ± 1.2	1200 ± 120		
2W	270 ± 50	0.27 ± 0.10	610 ± 60	38 ± 8	24 ± 3	110 ± 10	<3.0	1900 ± 190	5.0 ± 1.2	880 ± 90	88 ± 8	14 ± 1
3W	610 ± 120	0.75 ± 0.08	1100 ± 110	54 ± 11	25 ± 3	690 ± 70	3.0 ± 1.0	3100 ± 310	7.0 ± 1.2	970 ± 100	56 ± 5	23 ± 2
4W	350 ± 70	0.45 ± 0.05	1000 ± 100	39 ± 12		1100 ± 110	4.0 ± 1.0	3300 ± 330	2.6 ± 1.2	550 ± 50		
5W	500 ± 120			41 ± 9		200 ± 20		1800 ± 180	4.8 ± 1.2	750 ± 80		
6W	470 ± 90	0.34 ± 0.03	1500 ± 150	52 ± 11	34 ± 4	1100 ± 110	1.0 ± 1.0	2400 ± 240	6.9 ± 1.2	740 ± 70	250 ± 25	22 ± 2
7W	430 ± 80	0.28 ± 0.03	1700 ± 170	74 ± 15	55 ± 6	310 ± 30	1.0 ± 1.0	1600 ± 160	5.0 ± 1.2	1100 ± 110	64 ± 6	15 ± 2
1NW	380 ± 70			38 ± 8		240 ± 20		2100 ± 210	3.5 ± 1.2	810 ± 80		
2NW	270 ± 50			170 ± 33		140 ± 10		910 ± 90	<1.2	880 ± 90		
3NW	130 ± 30			26 ± 6		1200 ± 120		1900 ± 190	8.1 ± 1.2	280 ± 30		
4NW	170 ± 30			26 ± 6		290 ± 30		1300 ± 130	4.3 ± 1.2	120 ± 10		
5NW	160 ± 30			31 ± 7		960 ± 100		2000 ± 200	6.3 ± 1.2	170 ± 20		
6NW	80 ± 20			13 ± 3		380 ± 40		960 ± 100	2.8 ± 1.2	850 ± 90		

[a]*Insufficient sample for analysis where no data are reported. Uncertainties represent analytical uncertainties.*

TABLE A-III. Juniper: Elemental Concentrations[a]

Location	Al (ppm)	As (ppm)	B (ppm)	Ba (ppm)	Be (ppb)	Br (ppm)	Cd (ppm)	Cl (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)
1N	300 ± 90	0.17 ± 0.05	28 ± 5			26 ± 3		790 ± 120	3.7 ± 0.4		0.40 ± 0.04
5N	560 ± 160	0.08 ± 0.02	17 ± 5			9.5 ± 1.0	0.13 ± 0.01	780 ± 120	4.7 ± 0.5		0.30 ± 0.03
1NE	400 ± 120	0.10 ± 0.03	16 ± 5			33 ± 3		1200 ± 180	4.0 ± 0.4		0.40 ± 0.04
2NE	270 ± 80	0.05 ± 0.02	22 ± 5			5.5 ± 0.5		1100 ± 170	5.9 ± 0.6		0.30 ± 0.03
3NE	250 ± 70	0.06 ± 0.02	27 ± 5			6.3 ± 0.6	0.11 ± 0.02	1200 ± 180	3.0 ± 0.3		0.10 ± 0.01
1E	260 ± 80	0.10 ± 0.04	23 ± 5			38 ± 4	0.10 ± 0.02	1300 ± 200	2.0 ± 0.2		0.10 ± 0.01
2E	240 ± 70	0.06 ± 0.03	24 ± 5	22 ± 10	12 ± 2	42 ± 5	<0.20	920 ± 140	2.9 ± 0.3	4.7 ± 0.5	0.30 ± 0.03
3E	200 ± 60	0.06 ± 0.02	18 ± 5			7.6 ± 0.8	0.20 ± 0.02	460 ± 70	2.9 ± 0.3		0.10 ± 0.01
4E	140 ± 40	<0.02	16 ± 5			3.7 ± 0.4		350 ± 50	5.0 ± 0.5		0.10 ± 0.01
5E	150 ± 50	0.04 ± 0.02	15 ± 5			4.3 ± 0.4	0.22 ± 0.02	540 ± 80	3.5 ± 0.4		0.10 ± 0.01
7E	280 ± 80	0.15 ± 0.02	16 ± 5	52 ± 20	27 ± 2	3.8 ± 0.4	<0.20	480 ± 70	1.6 ± 0.2	3.6 ± 0.4	0.10 ± 0.01
1SE	480 ± 150	0.15 ± 0.04	17 ± 5	290 ± 50	29 ± 3	5.7 ± 0.6	<1.0	460 ± 70	1.5 ± 0.2	4.0 ± 2.0	0.20 ± 0.02
1S	250 ± 70	0.08 ± 0.02	21 ± 5			3.2 ± 0.3	0.10 ± 0.01	800 ± 120	5.9 ± 0.6		0.30 ± 0.02
1SW	330 ± 100	0.06 ± 0.02	23 ± 5	31 ± 10	14 ± 4	3.6 ± 0.4	0.10 ± 0.10	710 ± 110	1.7 ± 0.2	3.5 ± 0.4	0.10 ± 0.01
1W	310 ± 90	0.14 ± 0.04	22 ± 5			34 ± 3	0.33 ± 0.01	990 ± 150	2.9 ± 0.3		0.60 ± 0.06
2W	250 ± 70	<0.03	34 ± 5	28 ± 10	11 ± 2	30 ± 3	0.25 ± 0.10	1100 ± 170	2.5 ± 0.3	5.9 ± 0.6	0.40 ± 0.04
3W	520 ± 220	0.08 ± 0.03	27 ± 5	180 ± 40	12 ± 2	27 ± 3	<0.30	830 ± 120	4.0 ± 0.4	9.4 ± 0.9	0.30 ± 0.03
4W	460 ± 140	<0.03	50 ± 5	83 ± 20	24 ± 2	51 ± 5	0.10 ± 0.10	1400 ± 210	4.6 ± 0.5	7.7 ± 0.8	0.30 ± 0.03
6W	960 ± 290	0.06 ± 0.04	29 ± 5	220 ± 40	22 ± 2	65 ± 7	<0.70	2000 ± 290	4.7 ± 0.5	10 ± 1.0	0.40 ± 0.04
7W	430 ± 130	0.06 ± 0.02	22 ± 5	44 ± 10	14 ± 2	18 ± 2	<0.20	780 ± 120	1.9 ± 0.2	4.7 ± 0.5	0.30 ± 0.03
1NW	300 ± 90	0.08 ± 0.04	21 ± 5			32 ± 3		970 ± 150	4.1 ± 0.4		0.10 ± 0.01

TABLE A-III (Continued)

Location	Fe (ppm)	Li (ppm)	Mg (ppm)	Mn (ppm)	Ni (ppm)	NO_3 (ppm)	Pb (ppm)	PO_4 (ppm)	Rb (ppm)	SO_4 (ppm)	Ti (ppm)	Zn (ppm)
1N	140 ± 30			55 ± 11		<0.9		2400 ± 240	1.9 ± 1.2	610 ± 60		
5N	200 ± 40			37 ± 8		43 ± 4		1100 ± 110	3.0 ± 1.2	180 ± 20		
1NE	180 ± 40			38 ± 8		98 ± 10		4300 ± 430	6.9 ± 1.2	830 ± 80		
2NE	140 ± 30			57 ± 11		110 ± 10		3800 ± 380	2.4 ± 1.2	790 ± 80		
3NE	170 ± 30			58 ± 12		<0.9		1400 ± 140	2.9 ± 1.2	440 ± 40		
1E	90 ± 20			44 ± 9		88 ± 9		3400 ± 340	3.4 ± 1.2	520 ± 50		
2E	60 ± 10	<0.20	2500 ± 250	56 ± 11	9.0 ± 1.0	130 ± 10	<3.0	3200 ± 320	1.9 ± 1.2	350 ± 40	30 ± 3	20 ± 2
3E	80 ± 20			38 ± 8		90 ± 9		1500 ± 150	2.1 ± 1.2	280 ± 30		
4E	70 ± 20			26 ± 5		68 ± 9		1600 ± 160	5.0 ± 1.2	220 ± 20		
5E	80 ± 20			37 ± 8		97 ± 10		1200 ± 120	2.0 ± 1.2	280 ± 30		
7E	110 ± 20	0.24 ± 0.10	1700 ± 170	43 ± 9	3.0 ± 1.0	150 ± 20	3.0 ± 1.0	1600 ± 160	1.8 ± 1.2	530 ± 50	41 ± 5	19 ± 2
1SE	180 ± 40	<1.0	1700 ± 170	30 ± 6	2.0 ± 1.0	130 ± 10	4.0 ± 2.0	1200 ± 120	<1.2	170 ± 20	150 ± 20	9.2 ± 0.9
1S	140 ± 30			53 ± 11		55 ± 5		1900 ± 190	2.6 ± 1.2	340 ± 30		
1SW	110 ± 20	<0.20	2500 ± 250	44 ± 9	2.0 ± 1.0	71 ± 7	<3.0	1600 ± 160	1.9 ± 1.2	240 ± 20	23 ± 6	24 ± 2
1W	160 ± 30			54 ± 11		240 ± 20		2200 ± 220	<1.2	370 ± 40		
2W	140 ± 30	0.20 ± 0.10	2500 ± 250	62 ± 13	11.0 ± 2.0	120 ± 10	<3.0	2100 ± 210	2.5 ± 1.2	820 ± 80	16 ± 3	21 ± 5
3W	190 ± 40	0.30 ± 0.10	3000 ± 300	51 ± 10	4.3 ± 0.5	110 ± 10	1.0 ± 1.0	3100 ± 310	3.5 ± 1.2	560 ± 60	65 ± 6	20 ± 2
4W	240 ± 40	0.35 ± 0.04	2600 ± 260	58 ± 12	1.9 ± 0.5	110 ± 10	2.0 ± 1.0	3400 ± 340	4.7 ± 1.2	520 ± 50	48 ± 3	27 ± 3
6W	500 ± 100	0.44 ± 0.04	3600 ± 360	55 ± 11	9.8 ± 1.0	110 ± 10	<3.0	3400 ± 340	4.1 ± 1.2	600 ± 60	150 ± 15	27 ± 3
7W	170 ± 40	0.41 ± 0.04	2000 ± 200	44 ± 9	4.1 ± 0.5	110 ± 10	<3.0	2400 ± 240	1.1 ± 1.2	720 ± 70	78 ± 8	19 ± 2
1NW	160 ± 30			56 ± 11		90 ± 9		2400 ± 240	4.3 ± 1.2	590 ± 60		

[a]Insufficient sample for analysis where no data are reported. Uncertainties represent analytical uncertainties.

TABLE A-IV. Piñon: Elemental Concentrations[a]

Location	Al (ppm)	As (ppm)	B (ppm)	Ba (ppm)	Be (ppb)	Br (ppm)	Cd (ppm)	Cl (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)
2N	140 ± 40	<0.03	18 ± 5			19 ± 2		320 ± 50	2.9 ± 0.3		0.40 ± 0.04
3N	190 ± 60	0.09 ± 0.03	14 ± 5			7.9 ± 0.8		230 ± 30	3.6 ± 0.4		0.30 ± 0.03
4N	130 ± 40	0.18 ± 0.04	22 ± 5			5.0 ± 0.5	0.10 ± 0.01	420 ± 60	3.1 ± 0.3		0.30 ± 0.03
4NE	220 ± 70	0.15 ± 0.03	22 ± 5			15 ± 2		280 ± 40	4.2 ± 0.4		0.10 ± 0.01
5NE	140 ± 40	0.10 ± 0.02	21 ± 5			5.1 ± 0.5		470 ± 70	2.8 ± 0.3		0.10 ± 0.01
6NE	180 ± 60	0.11 ± 0.03	11 ± 5			9.9 ± 1		330 ± 50	2.3 ± 0.2		0.10 ± 0.01
6E	140 ± 40	0.15 ± 0.02	25 ± 5	27 ± 10	18 ± 2	6.0 ± 0.6	<0.30	400 ± 60	1.4 ± 0.1	2.2 ± 0.2	0.10 ± 0.01
2SE	250 ± 70	0.20 ± 0.03	17 ± 5			5.1 ± 0.5	0.10 ± 0.02	260 ± 40	1.9 ± 0.2	7.0 ± 3.0	0.20 ± 0.02
3SE	310 ± 90	0.17 ± 0.03	28 ± 5	28 ± 10	13 ± 2	8.3 ± 0.8	0.20 ± 0.01	370 ± 60	3.6 ± 0.4	2.5 ± 0.3	0.10 ± 0.01
2S	230 ± 70	0.08 ± 0.02	19 ± 5	17 ± 10	8 ± 2	1.7 ± 0.2	<0.20	440 ± 70	1.0 ± 0.1		0.10 ± 0.01
3S	250 ± 80	0.30 ± 0.04	18 ± 5			7.3 ± 0.7	<0.50	230 ± 40	1.8 ± 0.2	4.0 ± 1.0	0.20 ± 0.02
3SW	220 ± 70	0.21 ± 0.03	46 ± 5			9.4 ± 0.9		4000 ± 600	4.1 ± 0.4		0.20 ± 0.02
5W	280 ± 80	0.19 ± 0.04	23 ± 5			55 ± 6	0.05 ± 0.01	710 ± 110	2.1 ± 0.2		0.70 ± 0.07
2NW	100 ± 30	0.18 ± 0.05	17 ± 5			41 ± 4		460 ± 70	6.8 ± 0.7		0.10 ± 0.01
3NW	290 ± 90	0.15 ± 0.03	17 ± 5			9.7 ± 1		390 ± 60	5.2 ± 0.5		0.10 ± 0.01
4NW	200 ± 60	0.14 ± 0.04	23 ± 5	<100	24 ± 4	29 ± 3	<8.0	450 ± 70	3.3 ± 0.3	<15	0.10 ± 0.01
5NW	230 ± 70	0.08 ± 0.02	25 ± 5			3.0 ± 0.3		250 ± 40	4.8 ± 0.5		0.20 ± 0.02
6NW	120 ± 40	0.09 ± 0.02	23 ± 5			3.6 ± 0.4		330 ± 50	2.7 ± 0.3		0.10 ± 0.01

TABLE A-IV (Continued)

Location	Fe (ppm)	Li (ppm)	Mg (ppm)	Mn (ppm)	Ni (ppm)	NO_3 (ppm)	Pb (ppm)	PO_4 (ppm)	Rb (ppm)	SO_4 (ppm)	Ti (ppm)	Zn (ppm)
2N	72 ± 20			74 ± 15		<0.9		<0.6	4.8 ± 1.2	19 ± 2		
3N	110 ± 20			190 ± 39		8 ± 1		1600 ± 160	4.9 ± 1.2	1000 ± 100		
4N	53 ± 10			100 ± 18		<0.9		2400 ± 240	9.8 ± 1.2	730 ± 70		
4NE	95 ± 20			500 ± 100		<0.9		820 ± 80	2.7 ± 1.2	1300 ± 130		
5NE	40 ± 10			220 ± 44		<0.9		2000 ± 20	3.8 ± 1.2	770 ± 80		
6NE	47 ± 10			150 ± 31		100 ± 10		800 ± 80	1.6 ± 1.2	470 ± 50		
6E	40 ± 10	5.3 ± 0.5	2000 ± 200	86 ± 17	2.2 ± 0.5	<0.9	1.0 ± 1.0	2200 ± 220	5.3 ± 1.2	840 ± 80	13 ± 3	39 ± 4
2SE	99 ± 20	7.0 ± 2.0	1200 ± 120	130 ± 25		<0.9	<20	1400 ± 140	4.0 ± 1.2	610 ± 60		
3SE	110 ± 30	1.1 ± 0.1	1800 ± 180	190 ± 38	3.5 ± 0.5	50 ± 5	1.0 ± 1.0	890 ± 90	1.8 ± 1.2	960 ± 100	11 ± 3	23 ± 2
2S	70 ± 20	2.7 ± 0.3	1700 ± 170	150 ± 31	4.1 ± 0.5	<0.9		3100 ± 310	6.7 ± 1.2	650 ± 70	13 ± 3	39 ± 4
3S	150 ± 30	0.7 ± 0.5	1600 ± 160	120 ± 24		62 ± 6	<3.0	1100 ± 110	<1.2	550 ± 60		28 ± 3
3SW	120 ± 20			76 ± 15		130 ± 10		1300 ± 130	<1.2	420 ± 40		4.0 ± 0.4
5W	130 ± 30			58 ± 12		110 ± 10		2500 ± 250	3.3 ± 1.2	360 ± 40		
2NW	94 ± 20			77 ± 15		92 ± 9		[illegible]	3.3 ± 1.2	[illegible]		
3NW	89 ± 20			340 ± 70		120 ± 10		1100 ± 110	1.5 ± 1.2	1100 ± 110		
4NW	60 ± 10	<8.0	3100 ± 310	540 ± 110	12 ± 10	100 ± 10	<99	1600 ± 160	4.6 ± 1.2	630 ± 60	340 ± 100	69 ± 7
5NW	86 ± 20			460 ± 98		<0.9		2400 ± 240	6.8 ± 1.2	1700 ± 170		
6NW	79 ± 20			61 ± 12		<0.9		1400 ± 140	5.8 ± 1.2	460 ± 50		

*Insufficient sample for analysis where no data are reported. Uncertainties represent analytical uncertainties.

TABLE A-V. Oak: Elemental Concentrations[a]

Location	Al (ppm)	As (ppm)	B (ppm)	Ba (ppm)	Be (ppb)	Br (ppm)	Cd (ppm)	Cl (ppm)	Cr (ppm)	Cu (ppm)	F (ppm)
2N	860 ±260	0.44 ± 0.07	81 ± 8			12 ± 1		65 ± 10	3.5 ± 0.4		0.60 ± 0.06
2NE	300 ± 90	0.07 ± 0.03	62 ± 6			3.1 ± 0.3		200 ± 30	2.9 ± 0.3		0.20 ± 0.02
2E	760 ±230	0.16 ± 0.04	69 ± 7			16 ± 2	0.34 ± 0.03	230 ± 30	2.4 ± 0.2		0.20 ± 0.02
1SE	370 ±110	0.20 ± 0.03	48 ± 5	25 ±10	18 ± 2	5.3 ± 0.5	<0.20	260 ± 40	2.2 ± 0.2	5.5 ± 0.6	0.10 ± 0.01
2SE	650 ±200	0.13 ± 0.03	63 ± 6	18 ±10	29 ± 3	3.4 ± 0.4	<0.20	360 ± 50	1.9 ± 0.2	7.3 ± 0.7	0.20 ± 0.02
1S	350 ±110	0.10 ± 0.04	66 ± 7			5.3 ± 0.5		280 ± 40	6.5 ± 0.7		0.20 ± 0.02
2S	580 ±180	0.14 ± 0.04	79 ± 8	73 ±20	90 ± 9	5.3 ± 0.5	<0.20	280 ± 40	3.3 ± 0.3	8.1 ± 0.8	0.40 ± 0.04
1SW	470 ±140	0.12 ± 0.04	48 ± 5			5.4 ± 0.5		380 ± 60	6.9 ± 0.7		0.20 ± 0.02
2SW	210 ± 60	0.14 ± 0.03	49 ± 5			2.2 ± 0.2		240 ± 40	6.4 ± 0.6		0.20 ± 0.02

Location	Fe (ppm)	Li (ppm)	Mg (ppm)	Mn (ppm)	Ni (ppm)	NO_3 (ppm)	Pb (ppm)	PO_4 (ppm)	Rb (ppm)	SO_4 (ppm)	Ti (ppm)	Zn (ppm)
2N	350 ± 70			430 ± 86		<0.9		190 ± 20		<0.6		
2NE	190 ± 40			220 ± 43		<0.9		1900 ± 190		230 ± 20		
2E	280 ± 60			390 ± 78		120 ± 10		2800 ± 280		930 ± 90	24 ± 3	18 ± 2
1SE	180 ± 40	0.31 ± 0.03	2300 ± 230	500 ± 100	4.8 ± 0.5	80 ± 10	<3.0	1100 ± 110	18 ± 2	200 ± 20	34 ± 10	26 ± 3
2SE	150 ± 30	7.1 ± 0.7	2400 ± 240	550 ± 110	4.0 ± 1.0	110 ± 10	<3.0	1400 ± 140	26 ± 3	290 ± 30		
1S	140 ± 30			450 ± 90		100 ± 10		1800 ± 180		490 ± 50		
2S	210 ± 40	5.4 ± 0.5	2800 ± 280	590 ± 120	4.4 ± 0.5	130 ± 10	3.0 ± 1	2500 ± 250	5.9 ± 1.2	990 ± 100	30 ± 3	30 ± 3
1SW	240 ± 50			500 ± 100		190 ± 20		1600 ± 160		250 ± 30		
2SW	170 ± 40			870 ± 170		120 ± 10		1600 ± 160		380 ± 40		

[a]Insufficient sample for analysis where no data are reported. Uncertainties represent analytical uncertainties.