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Sequential Extraction Results and Mineralogy of Mine Waste and Stream Sediments Associated with Metal Mines in Vermont, Maine, and New Zealand

By N. M. Piatak, R. R. Seal II, R.F. Sanzolone, P. J. Lamothe, Z. A. Brown, and M. Adams

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Conversion Factors

SI to Inch/Pound

Multiply	By	To obtain
Length		
centimeter (cm)	0.3937	inch (in.)
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
meter (m)	1.094	yard (yd)
liter (L)	33.82	ounce, fluid (fl. oz)
liter (L)	2.113	pint (pt)
liter (L)	1.057	quart (qt)
liter (L)	0.2642	gallon (gal)
Mass		
gram (g)	0.03527	ounce, avoirdupois (oz)
kilogram (kg)	2.205	pound avoirdupois (lb)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:
°F=(1.8×°C)+32

Sequential Extraction Results and Mineralogy of Mine Waste and Stream Sediments Associated with Metal Mines in Vermont, Maine, and New Zealand

By N. M. Piatak[1], R. R. Seal II[1], R.F. Sanzolone[2], P. J. Lamothe[2], Z. A. Brown[2], and M. Adams[2]

Abstract

We report results from sequential extraction experiments and the quantitative mineralogy for samples of stream sediments and mine wastes collected from metal mines. Samples were from the Elizabeth, Ely Copper, and Pike Hill Copper mines in Vermont, the Callahan Mine in Maine, and the Martha Mine in New Zealand. The extraction technique targeted the following operationally defined fractions and solid-phase forms: (1) soluble, adsorbed, and exchangeable fractions; (2) carbonates; (3) organic material; (4) amorphous iron- and aluminum-hydroxides and crystalline manganese-oxides; (5) crystalline iron-oxides; (6) sulfides and selenides; and (7) residual material. For most elements, the sum of an element from all extractions steps correlated well with the original unleached concentration. Also, the quantitative mineralogy of the original material compared to that of the residues from two extraction steps gave insight into the effectiveness of reagents at dissolving targeted phases. The data are presented here with minimal interpretation or discussion and further analyses and interpretation will be presented elsewhere.

Introduction

Sequential partial dissolutions were used to characterize the distribution of elements in stream sediments, mine wastes, and flotation-mill tailings from several metal mines. The procedure was developed to extract metals associated with operationally defined solid phases to provide insight into speciation and possible bioavailability. This study was prompted by concerns about the potential environmental impact of elevated selenium concentrations in stream sediments raised by the preliminary Baseline Ecological Risk Assessment (BERA) at the Elizabeth Mine in Vermont. Additional samples from elsewhere in the Vermont copper belt and beyond were selected for comparison purposes. The distribution of selenium in extraction fractions and implications with respect to potential bioavailability were discussed by Piatak and others (2006a; 2006b). This report presents the results of the major and trace elements in unleached samples and in extracts and residues from the dissolutions. Also, quantitative mineralogy of the original samples and several residues was included.

Samples were collected from the Elizabeth (fig. 1), Ely Copper (fig. 2), and Pike Hill Copper (fig. 3) mines, all Superfund sites in the Vermont copper belt, and include stream sediments, oxidized mine waste, and flotation-mill tailings (table 1). These deposits, mined primarily for copper and zinc, are Besshi-type massive sulfide deposits composed of pyrrhotite,

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chalcopyrite, and minor sphalerite and pyrite (Slack and others, 2001). Fine-grained flotation-mill tailings from the Callahan Mine, a Superfund site in Brooksville, Me., were also collected (table 1 and fig. 4). This mine exploited a Kuroko-type massive sulfide deposit that contained bodies of pyrite, sphalerite, and chalcopyrite that were mined for zinc, copper, lead, and gold (Bouley and Hodder, 1984). Flotation-mill tailings were also examined from the Martha Mine in Waihi, New Zealand, which is an epithermal gold-silver deposit (Castendyk and others, 2005) (table 1).

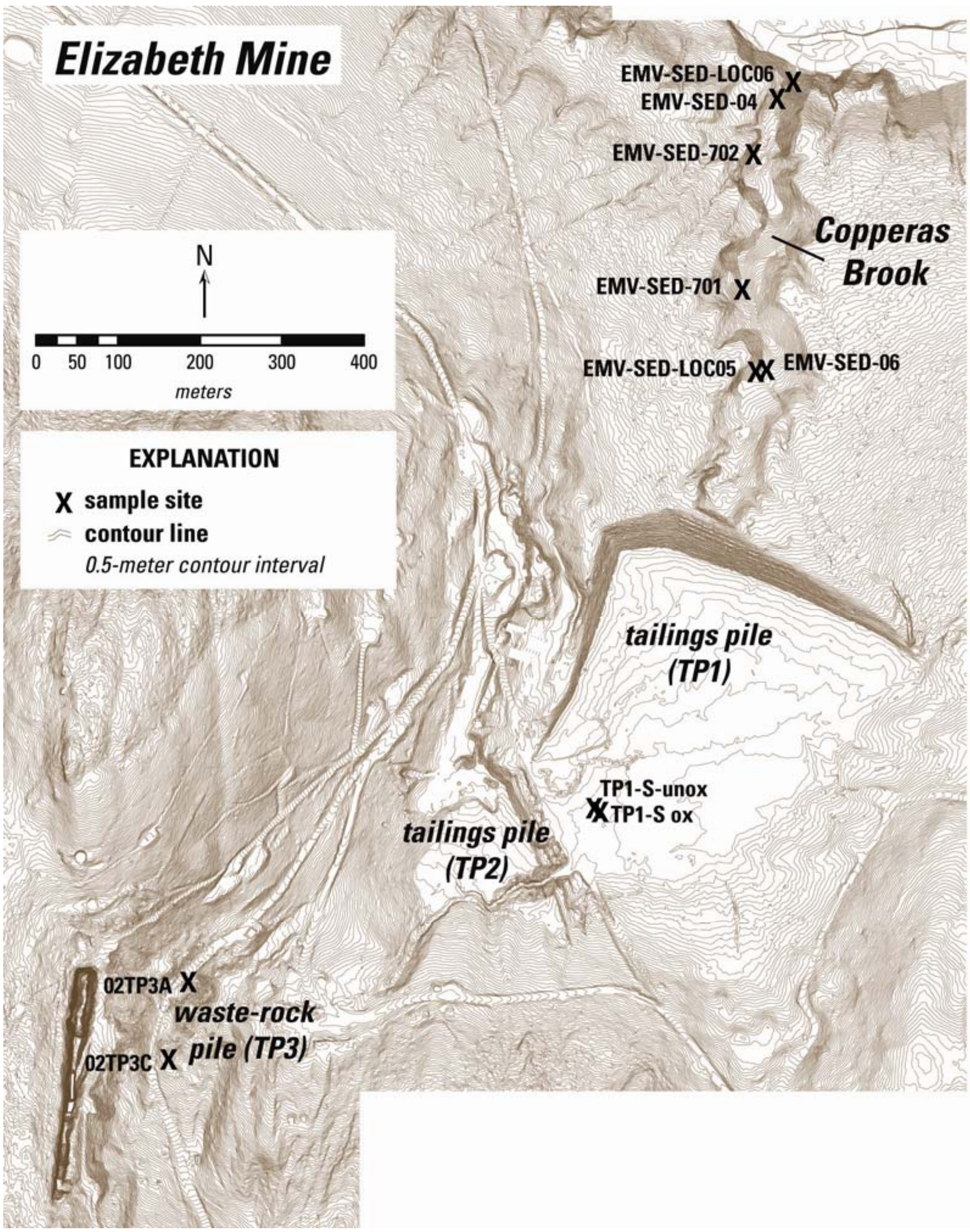

Figure 1. Locations of samples from the Elizabeth Mine. The north toe of TP1 has been regraded to a less steep slope, and stream-sediment samples were collected after regrading.

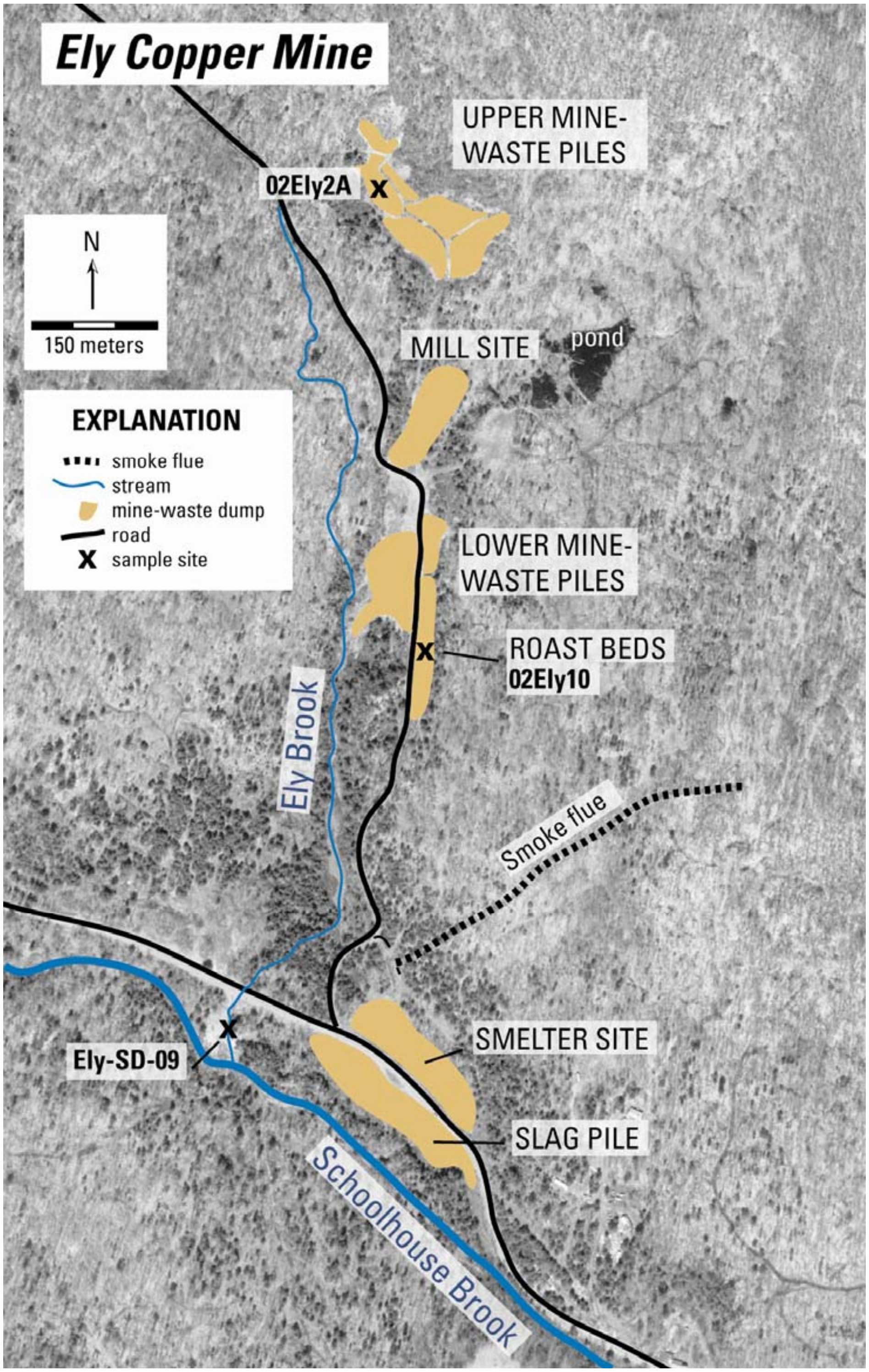

Figure 2. Locations of samples from the Ely Copper Mine. Modified from Piatak and others (2004).

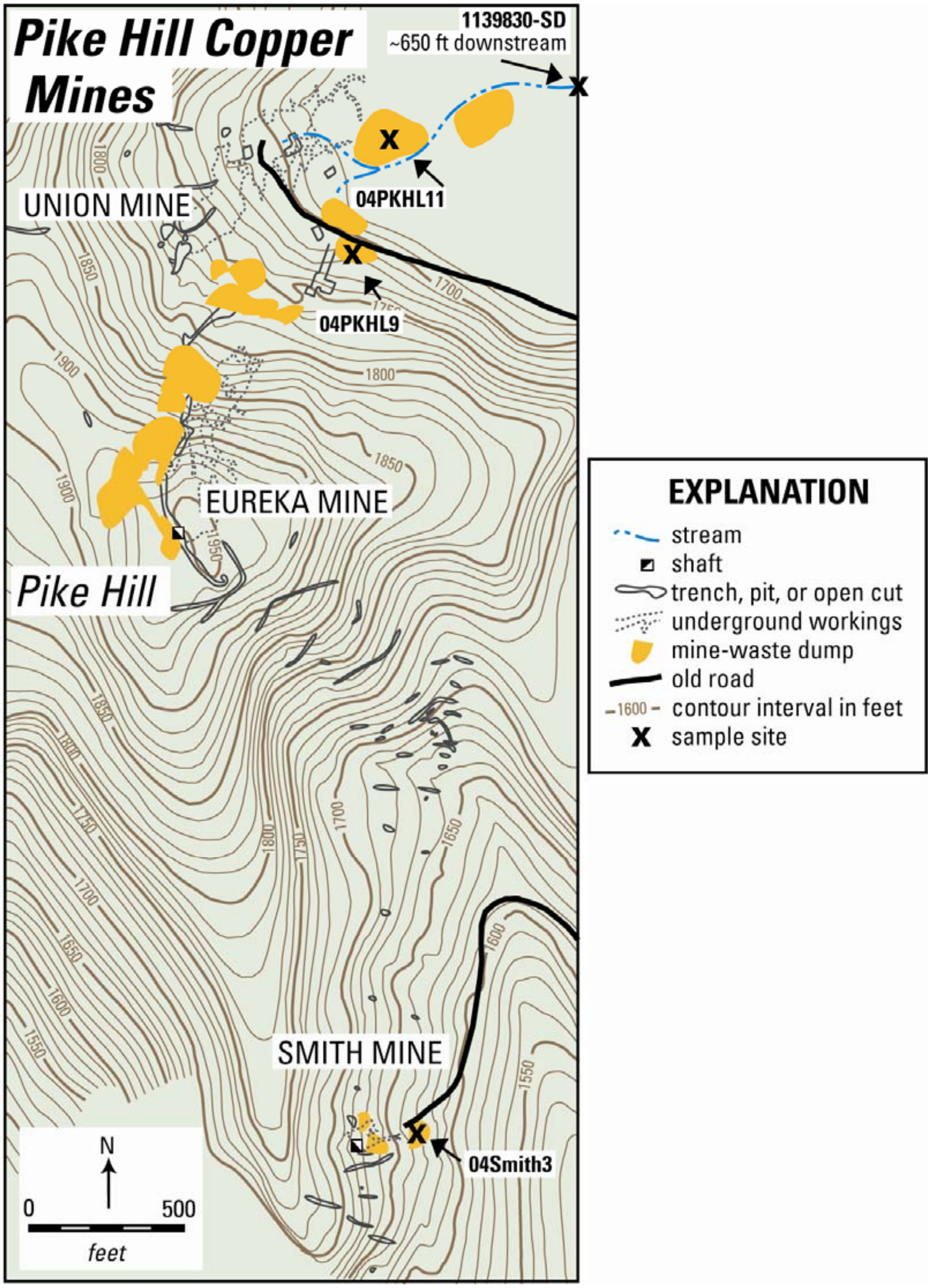

Figure 3. Locations of samples from the Pike Hill Copper Mines. Modified from Piatak and others (2006c); original base map from White and Eric (1944).

Table 1. Sample descriptions

Sample ID	Extract ID	Mine	Type	Locations	Soil Color	Latitude	Longitude	Date	Method	Preparation
Blank	A	-	Blank	Blank	-	-	-	-	-	None
EMV-SED-LOC05	B	Elizabeth	Stream sediment	Copperas Brook below weir at sediment basin outlet.	Brownish yellow	43.82814	-72.32739	June-05	Grab	Dry sieved <2 mm
EMV-SED-LOC05-Dup1	C	Elizabeth	Stream sediment	Copperas Brook below weir at sediment basin outlet. Duplicate.	Brownish yellow	43.82814	-72.32739	June-05	Grab	Dry sieved <2 mm
EMV-SED-LOC06	D	Elizabeth	Stream sediment	Copperas Brook below flume at mouth.	Strong brown	43.83129	-72.32686	June-05	Grab	Dry sieved <2 mm
EMV-SED-04	E	Elizabeth	Stream sediment	Copperas Brook upstream of flume at mouth.	Strong brown	43.83112	-72.32710	June-05	Grab	Dry sieved <2 mm
EMV-SED-06	F	Elizabeth	Stream sediment	Copperas Brook down-gradient of decant and sediment basin drainage confluence.	Strong brown	43.82814	-72.32730	June-05	Grab	Dry sieved <2 mm
EMV-SED-701	G	Elizabeth	Stream sediment	Copperas Brook at confluence with decant diversion.	Dark yellowish brown	43.82903	-72.32760	June-05	Grab	Dry sieved <2 mm
EMV-SED-702	H	Elizabeth	Stream sediment	Copperas Brook downstream of confluence with decant diversion.	Strong brown	43.83050	-72.32746	June-05	Grab	Dry sieved <2 mm
Ely-SD-09	I	Ely Copper	Stream sediment	Ely Brook downstream of culvert, upstream of confluence with Schoolhouse Brook	Strong brown	43.91873	-72.28652	Dec-1-05	Composite	Dry sieved <2 mm
1139830-SD	J	Pike Hill Copper	Stream sediment	Pike Hill Brook above Richardson Road at weir.	Strong brown	44.06389	-72.30194	Aug-2-05	Composite	Dry sieved <180 µm
04Smith3	K	Pike Hill Copper	Mine waste	Lowermost mine-waste dump below main adit at the Smith mine.	Olive yellow	44.05464	-72.30517	Oct-19-04	Composite	Dry sieved <2 mm
CLHN-TP-2	L	Callahan	Tailings	Fine-grained tailings from tailings pile near edge of wetlands.	Light gray	44.34306	-68.80556	Jul-19-04	Grab	Dry sieved <2 mm
Blank	M	-	Blank	Blank	-	-	-	-	-	None
EMV-SED-LOC05-Dup2	N	Elizabeth	Stream sediment	Copperas Brook below weir at sediment basin outlet. Duplicate.	Brownish yellow	43.82814	-72.32739	June-05	Grab	Dry sieved <2 mm
TP1-S-unox	O	Elizabeth	Tailings	Unoxidized sulfidic tailings from pile 1 (TP1) near base of TP2. Collected at depth.	Very dark gray	43.82332	-72.32990	Jul-20-04	Grab	Air-dried
TP1-S-unox-Dup	P	Elizabeth	Tailings	Unoxidized sulfidic tailings from TP1 near base of TP2 collected at depth. Duplicate.	Very dark gray	43.82332	-72.32990	Jul-20-04	Grab	Air-dried
TP1-S-ox	Q	Elizabeth	Tailings	Oxidized tailings from surface of TP1 near base of TP2.	Yellowish brown	43.82332	-72.32990	Jul-20-04	Grab	Air-dried
02TP3A	R	Elizabeth	Mine waste	TP3 yellow waste pile below road.	Yellow	43.82139	-72.33611	Oct-10-02	Composite	Dry sieved <2 mm
02TP3C	S	Elizabeth	Mine waste	TP3 roasted waste pile below road.	Yellowish red	43.82056	-72.33639	Oct-10-02	Composite	Dry sieved <2 mm
02Ely2A	T	Ely Copper	Mine waste	Upper mine waste pile.	Reddish yellow	43.92756	-72.28572	Oct-8-02	Composite	Dry sieved <2 mm
02Ely10A	U	Ely Copper	Mine waste	Roast beds.	Red	43.92389	-72.28556	Oct-8-02	Composite	Dry sieved <2 mm
04PKHL9	V	Pike Hill Copper	Mine waste	Partly burnt mine waste from above the mine road.	Yellowish brown	44.06258	-72.30519	Oct-20-04	Composite	Dry sieved <2 mm
04PKHL11	W	Pike Hill Copper	Mine waste	Large mine-waste dump below the mine access road.	Yellow	44.06353	-72.30511	Oct-20-04	Composite	Dry sieved <2 mm
NZ-Newmont-A	X	Martha	Tailings	Fine-grained tailing from tailings pile.	Light gray	-37.38592	175.84292	Dec-16-05	Grab	Air-dried

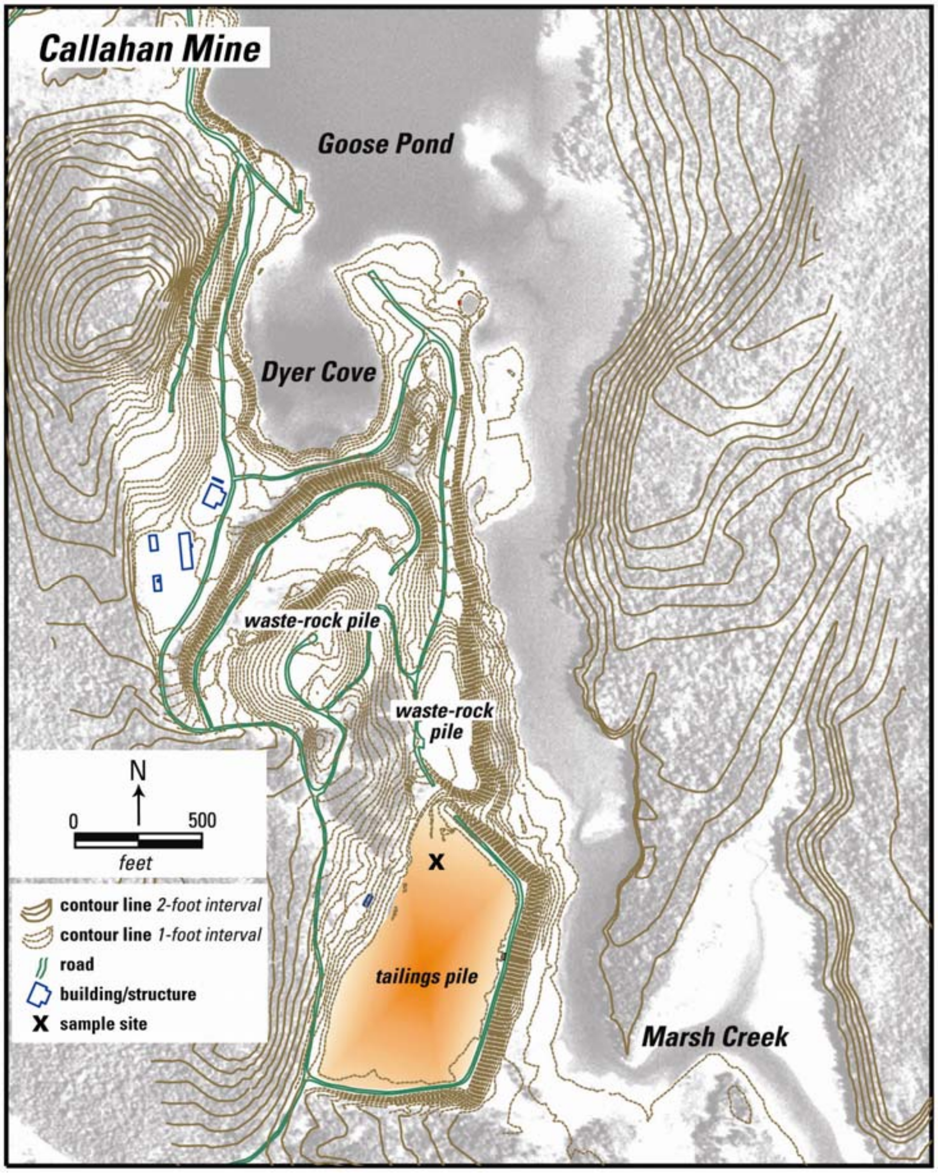

Figure 4. Location of sample from the Callahan Mine. Modified from MACTEC (2006).

Methods

Mineralogy

Minerals were identified by powder X-ray diffraction analysis (XRD). Diffraction patterns were collected using a Scintag X1 automated powder diffractometer equipped with a Peltier detector with CuKα radiation. The XRD patterns were analyzed using Material Data Inc.'s JADE software and standard reference patterns. Relative amounts of phases were estimated using the Siroquant computer program, which utilizes the full XRD profile in a Rietveld refinement (Taylor and Clapp, 1992). The analytical uncertainty of the Siroquant results is approximately ± 5 wt. %. The colors of the samples, given in table 1, were determined using soil color charts (Munsell Soil Color Charts, 1994).

Sequential Extractions

Seven-step sequential extractions were done on nineteen mine-waste and stream-sediment samples, on three duplicates, and on two blanks (table 1). One blank was used for analytical calibration purposes (Extract ID ‘A’ in table 1). Samples were either grab or composites. Most composites consisted of a minimum of 30 sample increments sampled over a measured area divided into a stratified grid. One stream-sediment composite (Ely-SD-09) consisted of three increments from different depositional areas in the stream. Samples were air-dried, sieved to <2 mm (or <180 µm for sample 1139830-SD, stream sediment from Pike Hill), and homogenized (table 1). After digestion by a mixture of HCl-HNO_3-$HClO_4$-HF, a split of the original untreated sample was analyzed by inductively coupled plasma-mass spectrometry (ICP-MS) to determine the major- and trace-element composition (Briggs and Meier, 2002). A split of the original untreated sample was also analyzed by hydride-generation atomic absorption spectrometry (HG-AAS) to determine the concentration of Se after the sample was digested with a mixture of HNO_3-HF-$HClO_4$ (Hageman and others, 2002). Residues remaining after extraction steps 5 and 6 were analyzed after digestion by ICP-MS and HG-AAS. Extraction solutes were analyzed by ICP-MS (Lamothe and others, 2002). The analyses were done in U.S. Geological Survey (USGS) laboratories in Denver, Colo. The accuracy of both methods was approximately ±10%.

The distribution of elements determined by sequential extractions were operationally defined by the reagents used, the reaction times, temperatures, and solid-to-extraction solution ratio for each step. No single reagent, time, and temperature combination could be applied to all sample types to recover a given phase; extractions were matrix-dependent. This extraction procedure also attempted to differentiate the amorphous (step 4) versus crystalline (step 5) iron-oxide and iron-hydroxide phases. There is a gradation from amorphous to cryptocrystalline to crystalline iron-oxides and hydroxides; Hall and others (1996a) discussed the subtleties in differentiating among the phases depending on reagent strength. Additional complicating factors included the possibility that occluded grains might persist past their designated dissolution step or factors such as grain size, mineralogy, or solid solution may affect the reactivity of phases. The sequential extraction procedure used in this study is outlined below and illustrated in figure 5. The procedure was a combination of methods developed by Chao (1972), Chao and Sanzolone (1977; 1989), Chao and Zhou (1983), Chester and Hughes (1967), Hall and others (1996a, b), and Kulp and Pratt (2004). The hypothetically targeted species in each step are given in *italics*.

- <u>Step 1:</u> *(soluble, adsorbed, and exchangeable fraction)* Combine 1.0 g of sample with 25 mL 0.1 M KH_2PO_4, agitate for 2 hours at 25ºC. Centrifuge for 10 minutes (15,000 rpm, Sorvall RC2-B refrigerated supercentrifuge), decant extract and dilute with deionized water (DIW) to 50 mL. Add 500 µL concentrated ultrapure HNO_3. Analyze extract by ICP-MS (**Extract 1**).
- <u>Step 2:</u> *(carbonates)* Combine residue with 25 mL 15% acetic acid, agitate for 2 hours, centrifuge, decant, fill to 50 mL volume with DIW. Analyze extract by ICP-MS (**Extract 2**).
- <u>Step 3:</u> *(organic material)* Combine residue with 25 mL 0.1 M sodium pyrophosphate and agitate for 1 hour. Centrifuge and decant. Add another 25 mL 0.1 M sodium pyrophosphate to residue, agitate for 1 hour, centrifuge, decant, add to first split and bring to 50 mL volume with DIW. Analyze extract by ICP-MS (**Extract 3**).

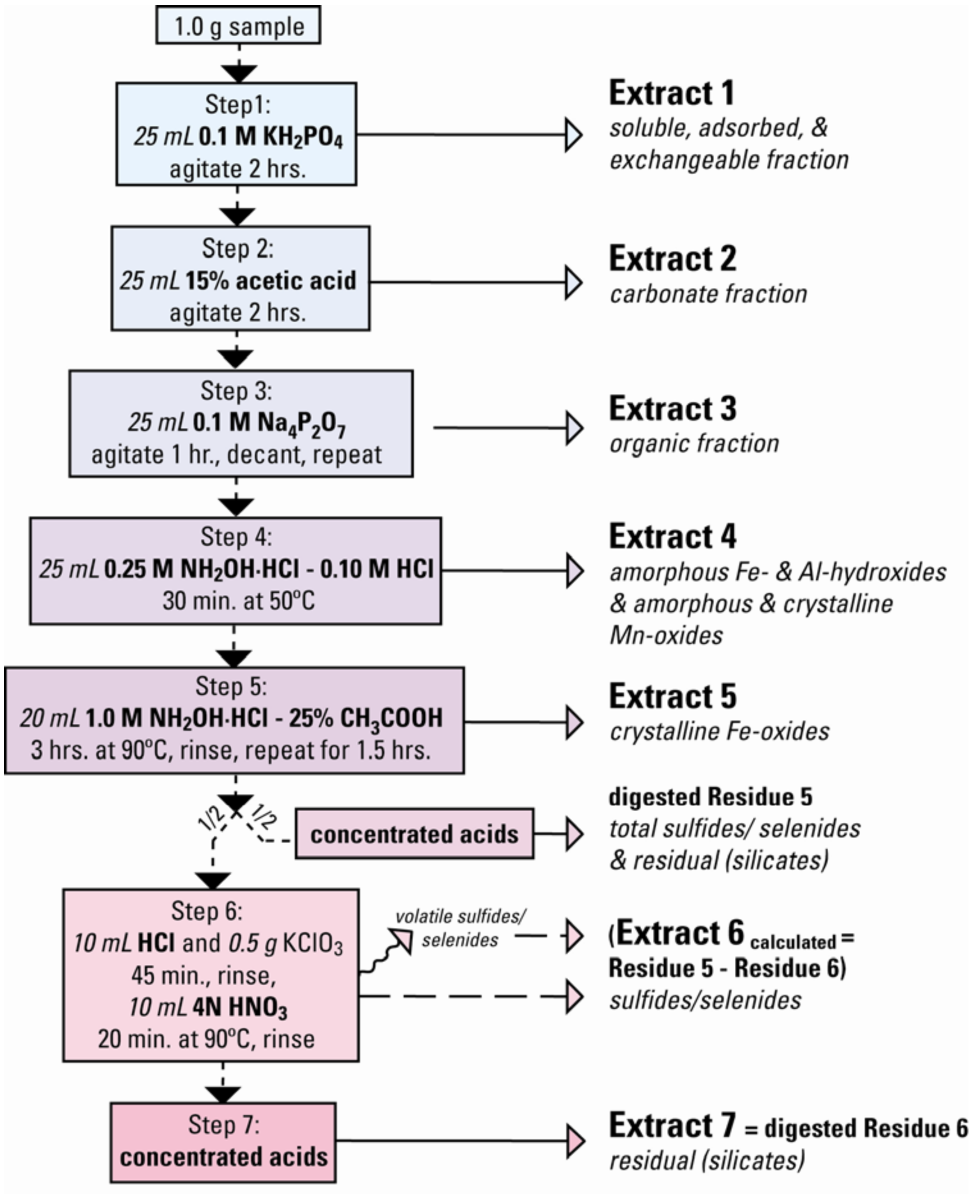

Figure 5. Schematic of sequential extraction procedure. After extract step 5, half of sample was digested and analyzed by ICP-MS and HG-AAS and the other half was treated in step 6. Because of the potential volatilization of sulfide and selenides in step 6, element concentrations in extract 6 were calculated from the difference between the concentration in the residue from step 5 and that in residue from step 6.

- <u>Step 4:</u> *(amorphous iron- and aluminum-hydroxides and amorphous and crystalline manganese-oxides)* Mix residue with 25 mL 0.25 M $NH_2OH{\cdot}HCl$ (hydroxylamine hydrochloride)- 0.10 M HCl for 30 minutes in a water bath at 50-54ºC. Stir occasionally. Centrifuge, decant and fill to 50 mL with DIW. Add 500 µL concentrated ultrapure HNO_3 and analyze by ICP-MS (**Extract 4**).

- Step 5: *(crystalline iron-oxides)* Combine residue with 20 mL 1.0 M $NH_2OH{\cdot}HCl$ in 25% acetic acid. Cap and shake. Place in boiling water (~90º C) bath for 3 hours uncapped, mix occasionally. Centrifuge and decant. Rinse residue with 10 mL 25% acetic acid, by hand-shaking and then centrifuge and decant into first split. Carry out a second leach with 20 mL 1.0 M $NH_2OH{\cdot}HCl$ in 25% acetic acid but heat in boiling water bath for 1.5 hours. Mix occasionally. Centrifuge and decant into first split. Fill to 50 mL with DIW. Analyze extract by ICP-MS (**Extract 5**).
- Residue 5: (*sulfides and selenides and residual material*) Dry residue at approximately 100°F (~38°C) and then disaggregate to homogenize. Split residue in half. Digest half of sample with mixture of concentrated acids and analyze by ICP-MS and HG-AAS (**Residue 5**). Treat other half of residue in next step.
- Step 6: (*sulfides and selenides- acid volatile phases volatilized; step may potentially attack surfaces, corners, or edges of silicate minerals*) Add 0.5 g of $KClO_3$ to residue and mix. Slowly add 10 mL concentrated HCl and mix. Let sit for 45 minutes with occasional gentle shaking. Add 10 mL of DIW, mix, centrifuge, and discard. To the residue, add 10 mL 4 N HNO_3 and heat in boiling water bath for 20 minutes, centrifuge, and discard. Add 10 mL DIW, shake and centrifuge for 10 minutes, also discard. Because some sulfide and selenides may be volatilized, calculate step 6 fraction by subtracting element concentration in residue from step 5 from concentrations in residue from step 6 (**Residue 5 – Residue 6**).
- Step 7: (*residual material*) Dry residue at approximately 100°F (~38°C). Digest sample with mixture of concentrated acids and analyze by ICP-MS and HG-AAS (**Residue 6**).

Results

Mineralogy

The quantitative mineralogy of the original unleached samples and residues after extraction steps 5 (residue 5) and 6 (residue 6) are given in Appendix 1. The relative amounts of phases in each sample in weight percent (wt. %) were for the crystalline part of the sample only. The percentages of phases in the residues were normalized with respect to weight loss due to the dissolution of the various phases during the previous extraction steps. This measured weight loss in weight percent is given in Appendix 1. The detection limit for XRD was on the order of a few weight percent and therefore phases present in trace amounts were likely below reliable detection.

Most samples primarily were composed of silicates including quartz, feldspar (albite, anorthite, labradorite, microcline, orthoclase), hornblende, mica (muscovite), chlorite, and clay (kaolin, vermiculite, and vermiculite-type mixed layer clay). The mineralogy of the residues suggested that most of these silicates were resistant to the extraction reagents. The exceptions were several clay minerals such as vermiculite and the vermiculite-type mixed layer clay and, in some cases, hornblende. The vermiculite-type mixed layer clay had an intense broad peak at a spacing of approximately 11.5 to 12.0 Å, which was assigned to sepiolite by the XRD phase matching software. Sepiolite commonly forms in shallow seas and lakes and is not likely to be found in mine waste so this peak was likely from a hydrous altered biotite (Poppe and others, 2001). According to Rebertus and others (1986), biotite weathers to interstratified biotite-vermiculite (hydrobiotite); thus this low angle peak may have been the result of varying degrees of biotite alteration.

The only sample that contained significant carbonate was the tailings from the Callahan Mine (CLHN-TP-2) having nearly 20 wt. % calcite. The second step using acetic acid aimed at dissolving carbonate minerals such as calcite [$CaCO_3$] and dolomite [$CaMg(CO_3)_2$] (Kulp and Pratt, 2004). The residue remaining after step 5 did not contain detectable calcite; dissolution of calcite had taken place between steps 1 and 5.

Step 4 of the extraction procedure targeted amorphous iron- and aluminum-hydroxides and amorphous and crystalline manganese-oxides (Chao, 1972; Chao and Zhou, 1983; Hall and others, 1996a). No crystalline manganese-oxide phases were detected by XRD. The crystalline Fe-oxide and Fe-hydroxysulfate minerals found in these samples included goethite [FeOOH], hematite [Fe_2O_3], and jarosite [$K_2Fe_6(SO_4)_4(OH)_{12}$]. Chester and Hughes (1967) reported the dissolution of crystalline iron-oxide minerals (goethite and hematite) using the reagents in step 5. Only partial dissolution of jarosite was expected based on a study by Filipek and Theobald (1981). Based on the mineralogy of residue 5, the reagents in steps 1 through 5 did not generally digest hematite and only partially digested goethite and jarosite (Appendix 1).

Several samples contained minor to trace amounts of sulfides. The reagents used in step 6 of the extraction procedure should have oxidized, possibly volatilized, and decomposed sulfides and selenides (Chao and Sanzolone, 1977). Nearly all of the estimated 15 wt. % pyrrhotite in the unoxidized tailings from Elizabeth (TP1-S-unox) was digested after step 6. Pyrite was present in few weight percent for several samples and was broken down by reagents in step 6.

Sequential Extractions

The concentrations of elements in unleached samples are given in Appendix 2. The concentrations of elements in extracts from steps 1 through 5 and in residues after steps 5 and 6 are given in Appendix 3. The amounts of an element extracted from the solid were calculated from the extract concentration and solid-to-extraction solution ratio. The difference between the step 5 residue and the step 6 residue concentrations was the amount of an element extracted by step 6 solvents (selenide/sulfide fraction; see figure 5). Direct measurement of element concentrations in extract solution 6 was not used because some sulfides and selenides may have been volatilized by the acids utilized in step 6.

The sum of the concentrations of an element leached from the solids in steps 1 through 5 plus the residue after step 5 (calculated total) should be equal to the original total element concentration of the solid (bulk total). The calculated total from the extractions generally correlated with the original unleached concentration for most of the major elements. Figure 6 shows these correlations for iron and calcium with the bulk total shown on the x-axis and the calculated total shown on the y-axis. As shown, many values plot within the ± 10% analytical uncertainty associated with the ICP-MS. The stream sediment from the Pike Hill Copper Mine is anomalous in figure 6. For calcium, the sum of extractions 1 through 5 plus residue 5 falls within an acceptable range; but for nearly all samples, the concentration in residue 6 was higher than in the original sample (not shown). Therefore, the data for residue 6 for calcium were considered invalid and extract steps 6 and 7 were grouped together (sulfide/selenide and residual fractions). This was also applied to magnesium and manganese because a significant amount of samples contained higher concentrations of these elements in the final residue (residue 6) compared to the unleached sample. A reagent that contained sodium was used in step 3 so concentrations in extracts after this step were not examined. The concentrations of sodium in extracts 1 and 2 were at or below the detection limit for all samples except the tailings from the Martha Mine. Most aluminum was higher in the summed concentrations compared to the bulk concentration and for nearly all the samples the concentration in residue 6 was higher than in the original. This suggests one of the reagents may have been contaminated with aluminum.

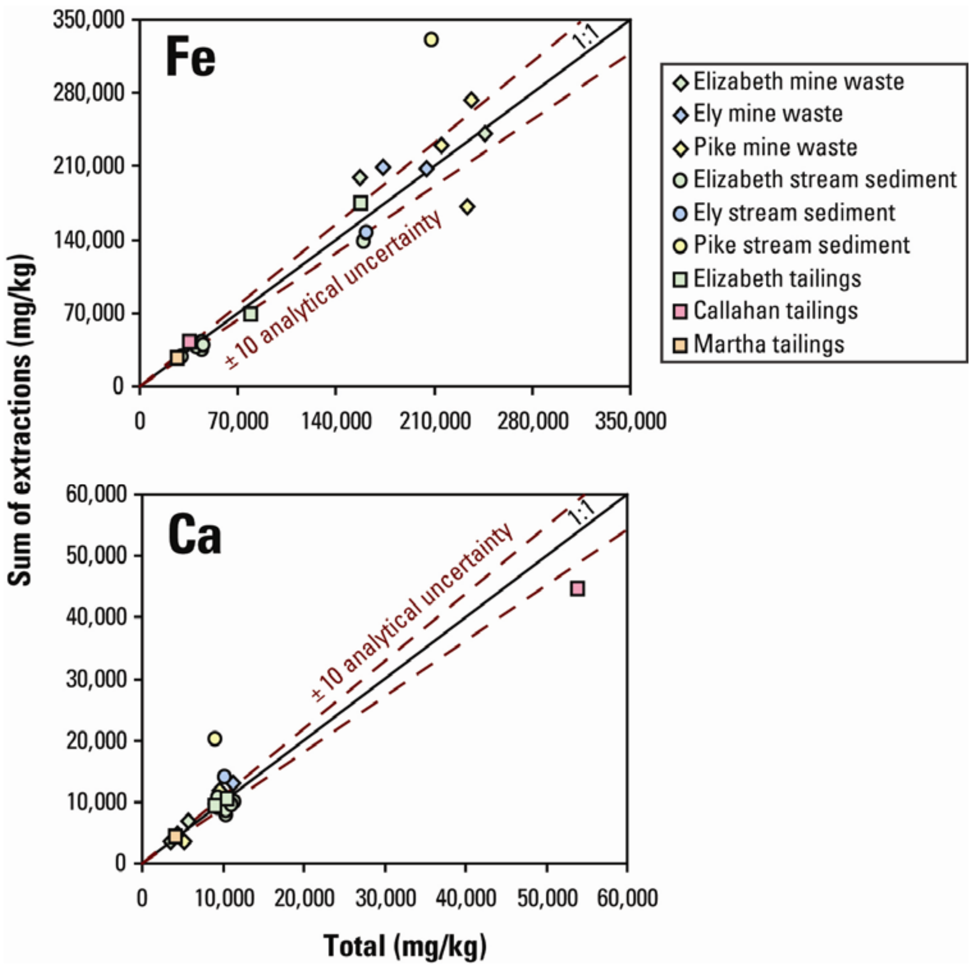

Figure 6. Calculated iron (Fe) and calcium (Ca) totals from extractions versus total from untreated samples. Calculated totals are the sum of an element in extracts 1, 2, 3, 4, and 5 and in the residue after step 5. Zero was used for concentrations less than the detection limit. The black line represents a 1:1 correlation and the red dashed lines represent the analytical uncertainty of ± 10%.

The calculated totals for trace elements generally correlated with concentrations in the unleached sample. In figure 7, the concentrations of arsenic, copper, selenium, and zinc for most samples fall within the ± 10% ICP-MS and HG-AAS analytical uncertainties. As with iron and calcium, the Pike Hill stream sediment is anomalous for copper and zinc. The results of the sequential extraction on other trace elements such as cadmium, cobalt, lead, and nickel also were reasonable because calculated totals generally correlated with the original bulk concentrations. Based on these comparisons, the validity of the data from the extractions was assessed. For most elements, the extraction results were within the acceptable range of error. Future reports will interpret the results of the sequential extractions in more detail.

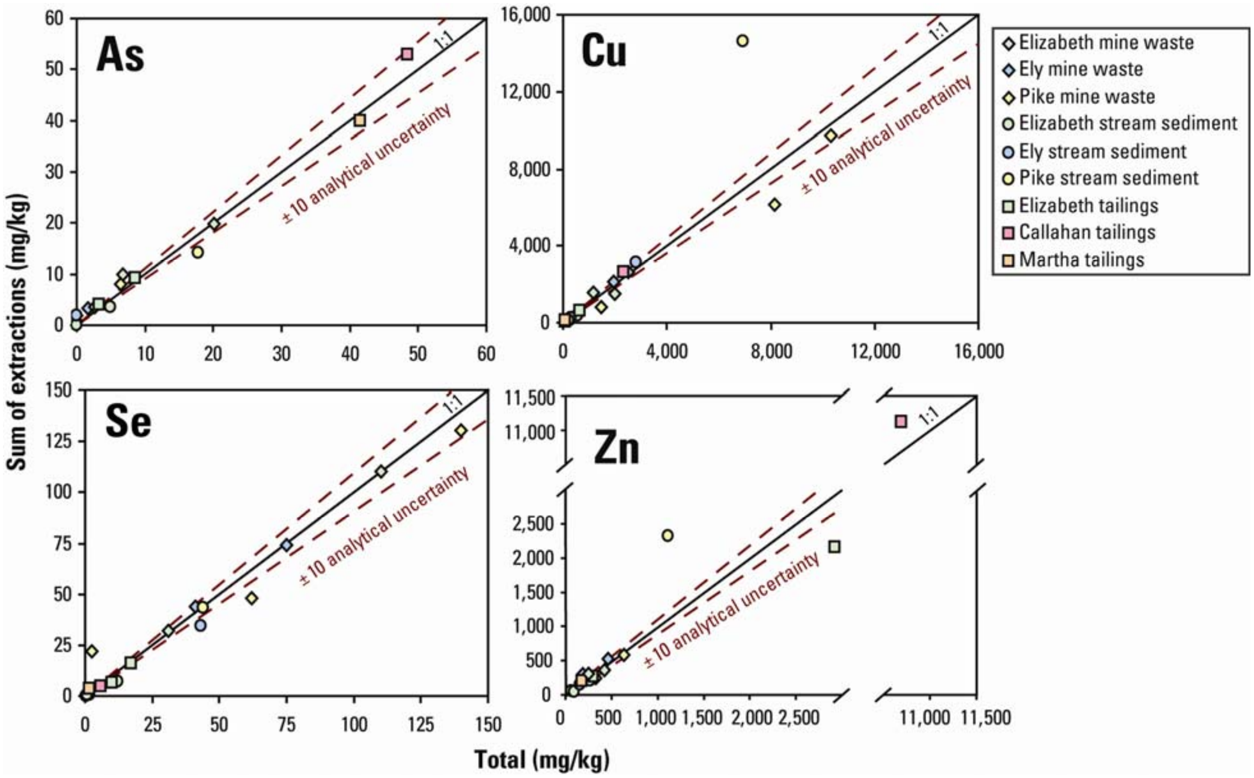

Figure 7. Calculated arsenic (As), copper (Cu), selenium (Se), and zinc (Zn) totals from extractions versus total from untreated samples. Calculated totals are the sum of an element in extracts 1, 2, 3, 4, and 5 and in the residue after step 5. Zero was used for concentrations less than the detection limit. The black line represents a 1:1 correlation and the red dashed lines represent the analytical uncertainty of ± 10%.

Acknowledgments

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Appendix 1. Estimates of mineral abundances in original unleached samples and in residues after extraction steps 5 and 6 normalized with respect to measured weight loss. Values given in weight percent.

['-', not determined or not applicable]

Sample ID	EMV-SED-LOC05	EMV-SED-LOC05	EMV-SED-LOC05	EMV-SED-LOC05	EMV-SED-LOC05	EMV-SED-LOC05	EMV-SED-LOC06	EMV-SED-LOC06	EMV-SED-LOC06	EMV-SED-04	EMV-SED-04	EMV-SED-04	EMV-SED-06
Extract ID	B, C, N	B	B	B, C, N	C	C	D	D	D	E	E	E	F
Sample split	original	residue 5	residue 6	original	residue 5	residue 6	original	residue 5	residue 6	original	residue 5	residue 6	original
Weight loss	-	19.0	37.6	-	19.6	37.9	-	7.2	16.3	-	7.8	16.9	-
Albite	13.4	12.6	12.2	13.4	-	10.5	7.7	9.5	10.5	9.4	9.3	7.9	8.1
Anorthite	1.6	0.5	5.2	1.6	-	9.3	5.8	0.0	0.0	5.1	4.0	3.5	4.0
Augite	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcite	-	-	-	-	-	-	-	-	-	-	-	-	-
Chalcopyrite	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorite	4.1	5.5	2.4	4.1	-	3.1	2.4	3.7	1.8	2.9	0.2	2.1	4.3
Copiapite	-	-	-	-	-	-	-	-	-	-	-	-	-
Goethite	5.8	1.9	1.2	5.8	-	0.6	-	-	-	-	-	-	-
Gypsum	-	-	-	-	-	-	-	-	-	-	-	-	-
Hematite	-	-	-	-	-	-	-	-	-	-	-	-	-
Hornblende	9.4	0.0	2.7	9.4	-	2.4	0.9	1.9	0.4	3.1	0.8	1.5	3.8
Jarosite	8.6	2.7	1.2	8.6	-	1.0	-	-	-	-	-	-	-
Kaolin	0.0	-	-	0.0	-	-	0.3	0.0	0.1	0.0	0.6	0.1	0.0
Labradorite	-	-	-	-	-	-	-	-	-	-	-	-	-
Lepidocrocite	0.0	-	-	0.0	-	-	-	-	-	-	-	-	-
Melanterite	-	-	-	-	-	-	-	-	-	-	-	-	-
Microcline	-	-	-	-	-	-	-	-	-	-	-	-	-
Muscovite	3.9	1.6	7.7	3.9	-	7.7	3.6	3.8	2.9	3.2	4.5	3.5	4.6
Orthoclase	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrite	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrrhotite	-	-	-	-	-	-	-	-	-	-	-	-	-
Quartz	50.3	54.7	29.6	50.3	-	25.7	76.4	73.8	68.0	69.2	72.7	64.5	73.2
Rozenite	-	-	-	-	-	-	-	-	-	-	-	-	-
Rutile	-	-	-	-	-	-	-	-	-	-	-	-	-
Sepiolite[1]	0.0	-	-	0.0	-	-	0.4	0.0	0.0	0.4	0.0	0.1	0.3
Sphalerite	-	-	-	-	-	-	-	-	-	-	-	-	-
Talc	1.9	1.5	0.0	1.9	-	1.7	-	-	-	-	-	-	-
Vermiculite	1.1	0.0	0.0	1.1	-	0.0	2.6	0.0	0.0	6.7	0.1	0.0	1.7
Chi-square[2]	4.2	3.6	3.5	4.2	-	4.1	4.3	3.7	4.2	6.0	3.8	3.8	5.1

Appendix 1. Estimates of mineral abundances in original unleached samples and in residues after extraction steps 5 and 6 normalized with respect to measured weight loss. Values given in weight percent.-Continued

['-', not determined or not applicable]

Sample ID	**EMV-SED-06**	**EMV-SED-06**	**EMV-SED-701**	**EMV-SED-701**	**EMV-SED-701**	**EMV-SED-702**	**EMV-SED-702**	**EMV-SED-702**	**Ely-SD-09**	**Ely-SD-09**	**Ely-SD-09**	**1139830-SD**
Extract ID	**F**	**F**	**G**	**G**	**G**	**H**	**H**	**H**	**I**	**I**	**I**	**J**
Sample split	**residue 5**	**residue 6**	**original**	**residue 5**	**residue 6**	**original**	**residue 5**	**residue 6**	**original**	**residue 5**	**residue 6**	**original**
Weight loss	7.9	16.1	-	7.5	12.7	-	6.6	13.8	-	17.3	32.1	-
Albite	6.9	7.0	7.3	14.2	10.9	9.7	10.3	6.3	16.7	16.7	13.0	4.4
Anorthite	2.3	3.3	4.1	1.7	0.0	4.4	0.8	2.5	6.5	0.4	5.6	7.7
Augite	-	-	-	-	-	-	-	-	-	-	-	-
Calcite	-	-	-	-	-	-	-	-	-	-	-	0.0
Chalcopyrite	-	-	-	-	-	-	-	-	-	-	-	1.6
Chlorite	6.6	4.5	2.5	3.6	3.6	5.0	9.0	2.6	4.8	3.7	3.4	0.0
Copiapite	-	-	-	-	-	-	-	-	-	-	-	-
Goethite	-	-	-	-	-	-	-	-	4.7	5.6	0.6	19.7
Gypsum	-	-	-	-	-	-	-	-	-	-	-	-
Hematite	-	-	-	-	-	-	-	-	-	-	-	-
Hornblende	0.9	0.0	2.4	0.0	0.0	2.2	2.1	1.6	5.5	0.0	0.0	1.1
Jarosite	-	-	-	-	-	-	-	-	4.4	0.6	0.8	2.6
Kaolin	-	-	0.3	0.0	0.0	0.2	-	-	-	-	-	1.8
Labradorite	-	-	-	-	-	-	-	-	-	-	-	-
Lepidocrocite	-	-	-	-	-	-	-	-	-	-	-	-
Melanterite	-	-	-	-	-	-	-	-	-	-	-	-
Microcline	-	-	-	-	-	-	-	-	-	-	-	-
Muscovite	6.4	5.5	5.3	3.1	1.9	6.3	3.0	3.8	10.9	13.1	10.7	7.9
Orthoclase	-	-	-	-	-	-	-	-	-	-	-	-
Pyrite	-	-	-	-	-	-	-	-	-	-	-	-
Pyrrhotite	-	-	-	-	-	-	-	-	-	-	-	-
Quartz	68.9	63.6	76.2	69.9	70.7	68.1	68.2	69.3	43.4	42.4	33.8	49.7
Rozenite	-	-	-	-	-	-	-	-	-	-	-	-
Rutile	-	-	-	-	-	-	-	-	-	-	-	0.0
Sepiolite	0.0	0.0	1.3	0.0	0.0	0.8	0.1	0.0	3.0	0.1	0.1	-
Sphalerite	-	-	-	-	-	-	-	-	-	-	-	-
Talc	-	-	-	-	-	-	-	-	-	-	-	-
Vermiculite	0.0	0.0	0.7	0.0	0.0	3.4	0.0	0.0	-	0.0	0.0	3.5
Chi-square[2]	4.2	4.2	4.6	4.3	3.8	5.1	4.3	3.6	4.3	3.9	4.8	4.2

Appendix 1. Estimates of mineral abundances in original unleached samples and in residues after extraction steps 5 and 6 normalized with respect to measured weight loss. Values given in weight percent.-Continued

['-', not determined or not applicable]

Sample ID	1139830-SD	1139830-SD	04Smith3	04Smith3	04Smith3	CLHN-TP-2	CLHN-TP-2	CLHN-TP-2	EMV-SED-LOC05	EMV-SED-LOC05	EMV-SED-LOC05	TP1-S-unox	TP1-S-unox
Extract ID	J	J	K	K	K	L	L	L	B, C, N	N	N	O, P	O
Sample split	residue 5	residue 6	original	residue 5	residue 6	original	residue 5	residue 6	original	residue 5	residue 6	original	residue 5
Weight loss	19.6	41.4	-	28.5	55.6	-	17.0	27.7	-	16.0	35.3	-	8.1
Albite	5.9	5.8	8.6	2.9	2.8	-	-	-	13.4	12.6	13.7	8.3	15.3
Anorthite	2.8	6.7	0.0	-	-	-	-	-	1.6	0.8	1.6	11.8	7.7
Augite	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcite	0.0	-	0.0	-	-	19.4	0.0	0.0	-	-	-	-	-
Chalcopyrite	1.0	0.0	0.1	-	-	-	-	-	-	-	-	-	-
Chlorite	0.0	-	4.9	8.7	7.3	27.2	24.4	22.3	4.1	3.4	4.4	4.3	2.1
Copiapite	-	-	0.4	-	-	-	-	-	-	-	-	-	-
Goethite	6.9	4.2	12.6	8.9	0.8	-	-	-	5.8	2.8	1.2	-	-
Gypsum	-	-	0.3	-	-	-	-	-	-	-	-	-	-
Hematite	-	-	-	-	-	-	-	-	-	-	-	-	-
Hornblende	0.0	3.2	0.0	-	-	-	-	-	9.4	0.0	0.5	-	-
Jarosite	0.0	-	12.5	1.4	0.7	-	-	-	8.6	2.9	1.6	-	-
Kaolin	1.1	0.6	1.6	0.8	0.5	-	-	-	0.0	-	-	-	-
Labradorite	-	-	9.9	12.2	13.7	-	-	-	-	-	-	-	-
Lepidocrocite	-	-	1.0	1.2	0.3	-	-	-	0.0	-	-	-	-
Melanterite	-	-	0.8	-	-	-	-	-	-	-	-	-	-
Microcline	-	-	-	-	-	-	-	-	-	-	-	-	-
Muscovite	10.6	5.9	7.4	11.6	5.6	7.0	12.1	9.3	3.9	3.2	5.8	22.3	17.4
Orthoclase	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrite	-	-	1.4	1.5	0.0	3.0	2.9	0.1	-	-	-	5.5	7.5
Pyrrhotite	-	-	0.0	-	-	-	-	-	-	-	-	14.6	12.2
Quartz	52.1	32.0	29.5	21.3	11.5	18.3	19.0	15.3	50.3	56.9	33.8	32.9	29.4
Rozenite	-	-	0.0	-	-	-	-	-	-	-	-	-	-
Rutile	-	-	1.0	0.8	1.1	-	-	-	-	-	-	-	-
Sepiolite	-	-	7.6	0.1	0.0	-	-	-	0.0	-	-	-	-
Sphalerite	-	-	0.1	-	-	2.3	2.6	2.2	-	-	-	0.3	0.2
Talc	-	-	-	-	-	22.8	22.0	23.0	1.9	1.4	2.2	0.0	-
Vermiculite	0.0	0.0	-	-	-	-	-	-	1.1	0.0	0.0	-	-
Chi-square[2]	3.1	3.7	4.2	3.3	3.0	5.2	5.4	6.7	4.2	3.4	3.6	5.0	3.1

Appendix 1. Estimates of mineral abundances in original unleached samples and in residues after extraction steps 5 and 6 normalized with respect to measured weight loss. Values given in weight percent.-Continued

['-', not determined or not applicable]

Sample ID	**TP1-S-unox**	**TP1-S-unox**	**TP1-S-unox**	**TP1-S-unox**	**TP1-S-ox**	**TP1-S-ox**	**TP1-S-ox**	**02TP3A**	**02TP3A**	**02TP3A**	**02TP3C**	**02TP3C**	**02TP3C**	**02Ely2A**
Extract ID	**O**	**O, P**	**P**	**P**	**Q**	**Q**	**Q**	**R**	**R**	**R**	**S**	**S**	**S**	**T**
Sample split	**residue 6**	**original**	**residue 5**	**residue 6**	**original**	**residue 5**	**residue 6**	**original**	**residue 5**	**residue 6**	**original**	**residue 5**	**residue 6**	**original**
Weight loss	33.3	-	8.5	34.6	-	7.1	18.5	-	22.0	44.1	-	8.4	21.8	-
Albite	11.7	8.3	9.7	15.0	14.7	14.1	11.5	23.0	31.3	24.4	16.9	9.6	6.3	12.9
Anorthite	4.8	11.8	10.2	3.7	7.0	0.8	4.2	13.7	0.1	4.6	3.4	0.0	1.3	4.3
Augite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chalcopyrite	-	-	-	-	-	-	-	0.8	0.5	0.1	0.2	0.5	0.1	0.2
Chlorite	3.5	4.3	2.3	2.4	3.8	1.9	2.6	0.3	1.0	0.9	1.2	1.0	1.9	4.2
Copiapite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goethite	-	-	-	-	5.2	3.0	0.0	10.7	10.4	1.3	10.8	2.8	2.0	9.4
Gypsum	-	-	-	-	-	-	-	2.0	0.5	0.0	0.5	0.0	0.0	0.2
Hematite	-	-	-	-	-	-	-	0.0	-	-	23.3	21.4	22.1	0.0
Hornblende	-	-	-	-	0.0	-	-	0.0	4.1	0.6	0.0	0.0	0.0	8.7
Jarosite	-	-	-	-	3.4	0.0	0.7	19.4	6.1	3.6	3.3	0.0	0.5	12.2
Kaolin	-	-	-	-	-	-	-	0.0	-	-	0.0	-	-	0.0
Labradorite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lepidocrocite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Melanterite	-	-	-	-	-	-	-	0.0	-	-	0.3	-	-	1.3
Microcline	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Muscovite	12.9	22.3	19.2	14.0	17.6	12.3	12.4	2.2	2.7	2.7	10.6	10.5	11.7	10.9
Orthoclase	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrite	0.1	5.5	6.1	0.3	-	-	-	0.0	-	-	0.3	1.2	0.0	0.0
Pyrrhotite	2.6	14.6	10.4	1.7	-	-	-	0.0	-	-	0.0	-	-	0.0
Quartz	30.8	32.9	33.3	28.1	46.3	59.4	50.1	19.5	15.9	12.5	23.1	43.9	30.6	29.0
Rozenite	-	-	-	-	-	-	-	0.0	-	-	0.0	-	-	0.0
Rutile	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sepiolite	-	-	-	-	1.4	0.1	0.0	-	-	-	-	-	-	6.7
Sphalerite	0.2	0.3	0.2	0.1	-	-	-	3.1	1.4	0.6	0.3	0.3	0.6	0.0
Talc	0.0	0.0	-	0.0	0.7	1.5	0.0	5.1	4.1	4.4	5.6	0.2	1.1	0.0
Vermiculite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chi-square[2]	4.4	5.0	3.7	3.8	4.3	3.8	3.8	5.6	4.1	4.0	4.3	3.2	3.4	4.9

Appendix 1. Estimates of mineral abundances in original unleached samples and in residues after extraction steps 5 and 6 normalized with respect to measured weight loss. Values given in weight percent.-Continued

['-', not determined or not applicable]

Sample ID	02Ely2A	02Ely2A	02Ely10A	02Ely10A	02Ely10A	04PKHL9	04PKHL9	04PKHL9	04PKHL11	04PKHL11	04PKHL11	NZ-Newmont-A	NZ-Newmont-A	NZ-Newmont-A
Extract ID	T	T	U	U	U	V	V	V	W	W	W	X	X	X
Sample split	residue 5	residue 6	original	residue 5	residue 6	original	residue 5	residue 6	original	residue 5	residue 6	original	residue 5	residue 6
Weight loss	19.8	39.9	-	15.6	33.7	-	18.9	39.4	-	22.6	48.9	-	4.6	13.1
Albite	17.2	14.4	6.2	10.6	8.7	2.2	3.0	1.9	4.5	4.3	3.9	-	-	-
Anorthite	6.7	5.6	5.5	8.0	3.0	0.9	0.7	0.1	0.0	0.1	0.0	7.2	7.7	7.5
Augite	-	-	-	-	-	-	-	-	-	-	-	2.3	4.8	4.5
Calcite	-	-	-	-	-	0.8	1.0	0.4	0.2	0.2	0.4	-	-	-
Chalcopyrite	0.3	0.1	0.2	0.6	0.0	1.8	0.7	0.2	1.8	0.7	0.0	-	-	-
Chlorite	3.0	1.2	4.1	3.4	1.9	0.6	4.3	2.2	0.0	-	-	3.8	2.6	3.1
Copiapite	-	-	-	-	-	0.2	-	-	0.6	-	-	-	-	-
Goethite	4.7	0.1	5.5	4.3	2.1	27.3	16.3	11.3	8.7	6.0	1.7	-	-	-
Gypsum	0.0	0.0	0.4	0.0	0.0	2.4	1.5	0.0	3.0	2.2	0.0	-	-	-
Hematite	-	-	10.6	14.3	12.8	6.8	7.5	5.1	-	-	-	-	-	-
Hornblende	2.5	0.0	12.3	0.3	4.5	4.6	1.6	0.0	0.4	0.1	0.0	-	-	-
Jarosite	2.9	0.6	9.2	1.7	1.2	7.5	2.8	0.7	13.6	3.4	1.2	-	-	-
Kaolin	-	-	0.0	-	-	2.3	2.9	1.3	2.1	1.5	0.3	-	-	-
Labradorite	-	-	-	-	-	0.0	2.3	2.0	7.8	11.0	7.6	-	-	-
Lepidocrocite	-	-	-	-	-	0.0	-	-	0.0	-	-	-	-	-
Melanterite	-	-	1.1	-	-	0.0	-	-	0.2	-	-	-	-	-
Microcline	-	-	-	-	-	-	-	-	-	-	-	4.4	1.7	7.4
Muscovite	14.7	12.3	9.1	13.7	8.2	3.6	8.4	6.1	8.8	6.7	6.2	-	-	-
Orthoclase	-	-	-	-	-	-	-	-	-	-	-	13.2	13.4	7.2
Pyrite	-	-	0.0	-	-	0.0	-	-	0.1	-	-	2.7	2.1	0.0
Pyrrhotite	-	-	0.0	-	-	0.0	-	-	0.0	-	-	-	-	-
Quartz	28.2	25.7	33.3	27.4	23.9	33.0	27.8	29.2	38.2	41.1	29.7	66.4	63.0	57.2
Rozenite	-	-	0.0	-	-	0.0	-	-	0.0	-	-	-	-	-
Rutile	-	-	-	-	-	0.0	-	-	0.1	-	-	-	-	-
Sepiolite	0.1	0.2	2.4	0.1	0.1	5.0	0.1	0.1	9.4	0.1	0.1	-	-	-
Sphalerite	-	-	0.0	-	-	0.8	0.1	0.0	0.2	0.0	0.0	-	-	-
Talc	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-
Vermiculite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chi-square[2]	3.5	4.2	3.9	3.4	3.6	4.8	3.2	2.9	4.1	3.0	4.4	3.7	3.2	3.8

[1] Phase identified by JADE software but likely a vermiculite-type mixed layer clay.

[2] Chi-square is a computed statistical residual to measure the fit of refinement. Chi-square = 1 for perfect correspondence between least-squares model and observed data. Values below 6 are considered reasonable fits for these complex mine wastes due to systematic errors and imperfect physical corrections.

Appendix 2. Concentration of elements in mg/kg for samples used in sequential extractions.

Sample ID	Extract ID	Ag[1]	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	K	La	Li	Mg
EMV-SED-LOC05	B, C, N	<2	41,700	4.9	153	0.87	0.8	10,400	0.53	12.6	21.3	52.5	1.6	568	160,000	9.6	12,200	6.5	9.6	7,180
EMV-SED-LOC05-D	B, C, N (duplicate)	<2	38,800	4.9	139	1.4	0.82	9,750	0.42	11.6	19.3	53.4	1.6	519	165,000	9.3	12,300	5.9	8.7	7,100
EMV-SED-LOC06	D	<2	36,700	<1	178	1.5	0.14	9,330	0.08	19.3	7.6	49.5	2.3	277	45,000	8.4	6,760	9.6	20.4	7,830
EMV-SED-04	E	<2	38,500	<1	170	1.6	0.15	10,400	0.32	20.7	12.6	48.3	2.4	297	44,900	8.6	6,170	10.4	21.9	8,660
EMV-SED-06	F	<2	37,200	<1	158	1.6	0.11	11,400	0.05	20.3	8.3	45	2	188	41,200	8	6,110	10	19.4	7,680
EMV-SED-701	G	<2	33,000	<1	144	1.5	0.08	9,430	0.08	16.4	7.7	41	1.9	97	30,500	7.2	5,010	8	19.6	7,560
EMV-SED-702	H	<2	39,900	<1	188	1.5	0.13	11,100	0.27	20.6	9	47.2	2.4	214	46,000	9	7,530	10.2	20.8	8,550
Ely-SD-09	I	3.6	42,600	<1	208	1.2	2.24	10,300	0.38	15.9	15.2	68.1	1.8	2,840	162,000	12.4	10,400	8.1	5.7	6,870
1139830-SD	J	5.8	27,700	17.8	152	1	2.92	9,100	5.5	10.4	50.3	30.3	1	6,940	208,000	9.1	7,880	4.9	4.1	6,120
04Smith3	K	6.4	28,400	<1	175	1.1	2.71	5,250	0.16	9.8	30.1	28.2	0.84	1,480	234,000	12.2	11,800	6.5	2.3	4,600
CLHN-TP-2	L	5.5	51,700	48.5	163	0.89	19	53,900	36.6	19.3	4.7	31.4	2.7	2,350	36,100	28.5	7,460	8	44.8	124,000
TP1-S-unox	O, P	<2	62,400	8.5	158	0.78	1.16	10,600	21.4	23.8	344	132	4.9	635	158,000	14.4	16,700	12.1	22	14,100
TP1-S ox	Q	<2	50,100	3.3	158	0.94	0.7	9,070	0.18	6.6	27.3	69.8	1.4	86	79,300	13.3	13,700	3.5	7	6,350
02TP3A	R	5	34,200	6.7	27.2	0.2	2.51	5,700	0.32	1.2	4.8	71.4	2.1	2,000	157,000	9.5	9,570	0.55	< 0.3	5,830
02TP3C	S	11.5	37,000	20.1	37.2	0.26	6.86	3,580	1.1	1.5	40.2	70.9	1	1,160	246,000	11.2	10,100	0.79	3.3	2,740
02Ely2A	T	4.4	47,000	<1	237	1.2	2.61	11,200	0.48	16.2	18.9	68.3	2.3	2,500	174,000	14.1	14,200	8.9	3	5,820
02Ely10A	U	15.4	39,200	1.6	192	0.86	9.46	9,080	1.1	15.1	35.6	77.9	2.2	1,970	205,000	11	11,700	7.9	4.1	5,580
04PKHL9	V	25.4	16,600	6.5	177	0.53	7.76	4,410	2.2	8.6	91.7	20.7	1	10,300	237,000	6.3	9,400	4.3	< 0.3	2,610
04PKHL11	W	9.1	28,300	2.6	197	1	6.26	9,640	0.72	9	42.6	28.2	1.1	8,140	215,000	11.9	14,500	5	2.4	4,440
NZ-Newmont-A	X	17.8	51,400	41.5	465	1.3	0.06	4,260	0.28	16.4	10.8	108	9.2	102	26,800	9.6	31,200	8.4	95.5	7,780

Appendix 2. Concentration of elements in mg/kg for samples used in sequential extractions.-Continued

Sample ID	Mn	Mo	Na	Nb	Ni	P	Pb	Rb	Sb	Sc	Se	Sr	Th	Ti	Tl	U	V	Y	Zn	Job No.	Lab No.
EMV-SED-LOC05	521	9.3	13,300	2.4	12.3	286	29.2	36.6	0.1	8.1	12	94.8	2.19	1,640	0.41	0.58	76.7	8	265	MRP-06905	C-275581
EMV-SED-LOC05-D	433	9.2	12,300	2.4	12.3	292	27.8	37.5	0.1	7.6	14	91.6	2.21	1,630	0.43	0.58	75.8	7.3	260	MRP-06905	C-275582
EMV-SED-LOC06	542	0.9	8,000	3.2	16.4	303	10.2	40.2	<0.04	6.7	0.82	159	3.38	1,820	0.22	0.62	50.3	10.4	63	MRP-06905	C-275583
EMV-SED-04	424	1.1	8,900	4.2	18.7	425	12	38	<0.04	6.3	1.6	175	3.52	2,120	0.22	0.73	53.1	10	105	MRP-06905	C-275584
EMV-SED-06	1,020	0.45	7,590	5	16.7	351	9.28	35.4	<0.04	9.6	0.66	156	3.32	2,520	0.19	0.68	50.8	15.6	57	MRP-06905	C-275585
EMV-SED-701	506	0.41	7,520	4.1	15.6	323	8.91	30.9	<0.04	5.9	0.43	161	2.83	2,000	0.17	0.55	43.9	9.6	61	MRP-06905	C-275586
EMV-SED-702	737	0.5	8,210	5.4	18.6	352	9.93	43.1	<0.04	8.6	0.77	163	3.66	2,660	0.22	0.7	59.5	13	91	MRP-06905	C-275587
Ely-SD-09	1,050	20.3	12,100	5.6	10.5	413	51.4	43	0.32	9.8	43	87.5	3.08	2,720	0.47	0.8	116	8.9	153	MRP-06905	C-275590
1139830-SD	706	16.5	5,650	7	8.4	379	55.8	31.6	1.2	3.8	44	92	3.03	1,910	0.49	0.82	54.6	10.7	1,110	MRP-06905	C-275600
04Smith3	743	21.7	7,850	2.8	6	818	79	49.2	0.2	3.8	2.5	63.1	2.48	1,130	1.11	0.72	125	6.7	331	MRP-06905	C-275597
CLHN-TP-2	1,960	54.2	1,870	4.7	18.4	196	956	32.1	14.8	3.6	5.8	47.8	2.93	934	2.28	5.13	35.5	37.4	10,700	MRP-06905	C-275592
TP1-S-unox	393	8.5	10,500	2.6	90.6	764	32.6	69.8	0.08	16.4	17	59.2	5.15	1,710	0.94	1.64	120	14.8	2,920	MRP-06905	C-275588
TP1-S ox	302	12.4	13,900	1.9	9.1	147	32.7	48.3	0.08	8.6	10	75.4	0.91	1,440	0.61	0.59	80.8	5.5	298	MRP-06905	C-275589
02TP3A	288	29.2	20,700	< 0.1	0.8	82.2	47.1	43.6	0.06	6	31	27.6	< 0.1	1,210	1.03	0.19	71	1.6	248	MRP-06905	C-275593
02TP3C	268	82.8	12,600	< 0.1	9.4	76.5	78.2	29.3	0.1	7.8	110	25.4	0.13	1,100	1.02	0.38	87.3	1.7	425	MRP-06905	C-275594
02Ely2A	1,730	15.8	14,200	3.6	7.7	452	50.6	58.4	0.2	12.2	41	91	2.57	4,150	0.49	0.73	147	11.7	186	MRP-06905	C-275595
02Ely10A	1,170	24.8	9,960	2.8	14.3	402	60.5	47.6	0.24	11.1	75	74.7	2.44	3,660	0.48	0.73	158	8.6	466	MRP-06905	C-275596
04PKHL9	212	33.2	2,180	4.9	9.5	163	153	42.2	3.9	2.4	140	63.4	1.48	1,230	0.71	0.55	47	3.7	637	MRP-06905	C-275598
04PKHL11	205	25.8	6,350	6.7	4	343	91.5	64.4	0.1	4.3	62	84.5	2.25	1,820	1.21	0.63	77.4	4.9	276	MRP-06905	C-275599
NZ-Newmont-A	2,930	1.3	4,510	3.9	30.3	211	89.1	166	14.3	8.7	1.7	84	3.56	1,670	2.33	0.71	66.2	9.7	220	MRP-06905	C-275591

[1] Results from ICP-MS analysis for all elements except Se, which was determined by HG-AAS.

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1].

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sample ID	Extract Step	Lab No	Job No.	Ag [2]	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr
B-1	EMV-SED-LOC05	Extract 1	02-1	-	< 0.6	10.6	< 0.2	< 0.04	< 0.01	< 0.04	181	0.01	-	1.62	< 0.2
B-2	EMV-SED-LOC05	Extract 2	02-2	-	< 0.6	58.0	< 0.2	0.2	< 0.01	< 0.04	*<136*[3]	0.02	-	0.27	**< 0.2**[4]
B-3	EMV-SED-LOC05	Extract 3	02-3	-	< 0.6	*94.5*	0.4	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.17	< 0.2
B-4	EMV-SED-LOC05	Extract 4	02-4	-	< 0.6	*141*	< 0.2	1.19	< 0.01	< 0.04	43.8	*0.01*	-	0.24	0.5
B-5	EMV-SED-LOC05	Extract 5	02-5	-	< 0.6	*670*	0.6	19.2	0.04	0.53	< 40	< 0.004	-	1.27	**6.7**
B-5R	EMV-SED-LOC05	Residue 5	C-275601	MRP-06906	<2	36,700	2.9	98.2	0.83	0.23	7,710	0.28	10	9.5	55.6
B-6R	EMV-SED-LOC05	Residue 6	C-275623	MRP-06906	<2	61,500	<1	152	1.4	< 0.06	16,000	0.05	11.1	5.2	83.3
C-1	EMV-SED-LOC05	Extract 1	03-1	-	< 0.6	10.3	< 0.2	< 0.04	0.01	< 0.04	225	0.01	-	1.63	< 0.2
C-2	EMV-SED-LOC05	Extract 2	03-2	-	< 0.6	57.2	< 0.2	0.20	< 0.01	< 0.04	*<136*	0.02	-	0.31	**0.4**
C-3	EMV-SED-LOC05	Extract 3	03-3	-	< 0.6	*102*	0.4	< 0.04	0.02	< 0.04	38.6	< 0.004	-	0.19	< 0.2
C-4	EMV-SED-LOC05	Extract 4	03-4	-	< 0.6	*139*	< 0.2	1.09	< 0.01	< 0.04	38.8	*0.02*	-	0.26	0.4
C-5	EMV-SED-LOC05	Extract 5	03-5	-	< 0.6	*688*	0.5	20.6	0.03	0.50	< 40	< 0.004	-	1.29	**11.7**
C-5R	EMV-SED-LOC05	Residue 5	C-275602	MRP-06906	<2	39,300	3.6	105	0.83	0.35	8,080	0.26	8.4	11.2	56.2
C-6R	EMV-SED-LOC05	Residue 6	C-275624	MRP-06906	<2	61,500	<1	172	1.4	0.06	15,900	0.06	13.6	5.3	143
D-1	EMV-SED-LOC06	Extract 1	04-1	-	< 0.6	7.80	< 0.2	0.05	< 0.01	< 0.04	< 40	< 0.004	-	0.33	< 0.2
D-2	EMV-SED-LOC06	Extract 2	04-2	-	< 0.6	61.6	< 0.2	0.36	< 0.01	< 0.04	*<136*	0.008	-	0.07	**0.4**
D-3	EMV-SED-LOC06	Extract 3	04-3	-	< 0.6	*110*	0.3	< 0.04	0.01	< 0.04	< 40	< 0.004	-	0.08	< 0.2
D-4	EMV-SED-LOC06	Extract 4	04-4	-	< 0.6	*311*	< 0.2	2.63	< 0.01	< 0.04	237	*0.01*	-	0.21	0.7
D-5	EMV-SED-LOC06	Extract 5	04-5	-	< 0.6	*1,382*	< 0.2	5.38	0.04	0.04	256	< 0.004	-	0.96	**9.4**
D-5R	EMV-SED-LOC06	Residue 5	C-275603	MRP-06906	<2	35,900	<1	159	1.7	< 0.06	8,580	0.01	10.9	6.1	45
D-6R	EMV-SED-LOC06	Residue 6	C-275625	MRP-06906	<2	37,300	<1	157	1.6	< 0.06	10,800	0.02	9	3.8	61.3
E-1	EMV-SED-04	Extract 1	05-1	-	< 0.6	10.4	< 0.2	0.1	0.02	< 0.04	98.0	0.02	-	0.74	< 0.2
E-2	EMV-SED-04	Extract 2	05-2	-	< 0.6	109	< 0.2	0.83	< 0.01	< 0.04	*<136*	0.03	-	0.29	**1.4**
E-3	EMV-SED-04	Extract 3	05-3	-	< 0.6	*185*	0.4	0.08	0.02	< 0.04	< 40	0.006	-	0.29	0.3
E-4	EMV-SED-04	Extract 4	05-4	-	< 0.6	*455*	< 0.2	3.94	0.02	< 0.04	325	*0.02*	-	0.45	0.9
E-5	EMV-SED-04	Extract 5	05-5	-	< 0.6	*2,032*	< 0.2	7.76	0.06	0.08	283	< 0.004	-	2.05	**12.3**
E-5R	EMV-SED-04	Residue 5	C-275604	MRP-06906	<2	32,400	<1	121	1.4	< 0.06	7,880	0.03	10.1	6.5	40.6
E-6R	EMV-SED-04	Residue 6	C-275626	MRP-06906	<2	36,500	<1	139	1.8	< 0.06	11,000	<0.007	11.2	2.6	40.4
F-1	EMV-SED-06	Extract 1	06-1	-	< 0.6	5.14	< 0.2	0.2	< 0.01	< 0.04	116	< 0.004	-	0.19	< 0.2
F-2	EMV-SED-06	Extract 2	06-2	-	< 0.6	63.2	< 0.2	0.71	< 0.01	< 0.04	*<136*	0.01	-	0.07	**0.9**
F-3	EMV-SED-06	Extract 3	06-3	-	< 0.6	*126*	0.4	0.08	0.01	< 0.04	< 40	< 0.004	-	0.10	0.2
F-4	EMV-SED-06	Extract 4	06-4	-	< 0.6	*376*	< 0.2	3.03	0.02	< 0.04	285	*0.01*	-	0.41	0.8
F-5	EMV-SED-06	Extract 5	06-5	-	< 0.6	*1,852*	< 0.2	5.11	0.06	0.07	404	< 0.004	-	1.64	**17.6**
F-5R	EMV-SED-06	Residue 5	C-275605	MRP-06906	<2	34,500	<1	163	1.2	< 0.06	9,120	0.03	16.3	4.1	46.3
F-6R	EMV-SED-06	Residue 6	C-275627	MRP-06906	<2	41,500	<1	197	1.7	< 0.06	12,200	0.01	21.8	3.6	64.5
G-1	EMV-SED-701	Extract 1	07-1	-	< 0.6	11.3	< 0.2	0.04	0.01	< 0.04	95.9	0.004	-	0.39	< 0.2
G-2	EMV-SED-701	Extract 2	07-2	-	< 0.6	79.6	< 0.2	0.72	< 0.01	< 0.04	*<136*	0.009	-	0.11	**0.8**
G-3	EMV-SED-701	Extract 3	07-3	-	< 0.6	*139*	0.3	0.09	0.01	< 0.04	< 40	< 0.004	-	0.12	0.3
G-4	EMV-SED-701	Extract 4	07-4	-	< 0.6	*432*	< 0.2	5.13	0.01	< 0.04	387	*0.01*	-	0.24	0.9
G-5	EMV-SED-701	Extract 5	07-5	-	< 0.6	*1,842*	< 0.2	7.50	0.04	0.05	365	< 0.004	-	1.74	**17.3**
G-5R	EMV-SED-701	Residue 5	C-275606	MRP-06906	<2	33,800	<1	128	1.7	< 0.06	9,800	0.14	8.9	5.8	41.1
G-6R	EMV-SED-701	Residue 6	C-275628	MRP-06906	<2	30,400	<1	111	1.6	< 0.06	10,100	<0.007	7.3	2.5	33.2

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1].-Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Cs	Cu	Fe	Ga	Ge	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb
B-1	0.03	1.7	54	< 0.01	0.02	-	-	< 0.2	95.3	6.7	< 0.4	< 20	-	0.7	-	< 0.01	0.02
B-2	0.01	9.4	97	0.02	0.01	-	-	0.3	8.43	*<0.7*	< 0.4	< 20	-	0.1	-	*<0.5*	0.13
B-3	0.04	4.7	993	< 0.01	0.02	-	-	0.8	15.5	0.6	< 0.4	< 20	-	< 0.08	-	*<0.2*	*0.19*
B-4	0.02	6.5	2,130	0.31	< 0.01	-	-	< 0.2	49.0	1.6	< 0.4	-	-	0.3	-	0.1	0.14
B-5	0.49	84.6	*42,570*	0.58	0.27	-	-	1.6	332	*11.9*	1.50	1,270	-	1.9	-	*9.4*	7.53
B-5R	0.99	245	80,700	7.8	-	7,380	5.1	12.9	5,460	334	9	12,200	1.9	9.5	2,350	23.3	24.9
B-6R	0.87	14.8	23,900	11.5	-	9,700	5.3	16.3	8,870	607	3.5	19,600	5.4	8.7	38.2	20.5	28.2
C-1	0.03	2.3	22	< 0.01	0.01	-	-	< 0.2	81.6	5.9	< 0.4	< 20	-	0.7	-	< 0.01	0.03
C-2	0.004	9.4	79	0.02	< 0.01	-	-	< 0.2	8.78	*<0.7*	< 0.4	< 20	-	0.2	-	*<0.5*	0.14
C-3	0.03	5.1	951	< 0.01	< 0.01	-	-	0.6	18.8	0.6	< 0.4	< 20	-	0.1	-	*<0.2*	*0.18*
C-4	0.01	6.3	2,490	0.36	< 0.01	-	-	< 0.2	44.9	1.7	< 0.4	-	-	0.3	-	0.08	0.12
C-5	0.41	86.6	*42,270*	0.58	0.26	-	-	2.0	355	*13.6*	1.50	1,830	-	6.0	-	*9.3*	7.60
C-5R	1	289	92,000	8.7	-	8,010	4.1	11.8	5,410	584	7.1	12,800	4.1	9	3,160	19.9	27.5
C-6R	0.88	32.1	26,200	11.4	-	10,100	6.6	16.7	9,200	808	14	19,000	4	22.5	53.3	21.2	28.7
D-1	0.03	2.9	< 10	< 0.01	< 0.01	-	-	< 0.2	23.6	2.2	< 0.4	< 20	-	0.2	-	< 0.01	< 0.002
D-2	0.009	7.8	46	0.02	< 0.01	-	-	< 0.2	4.84	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.11
D-3	0.04	4.2	641	< 0.01	< 0.01	-	-	0.9	16.6	1.0	< 0.4	< 20	-	< 0.08	-	*<0.2*	*0.15*
D-4	0.04	19.8	1,250	0.2	< 0.01	-	-	< 0.2	93.5	8.7	< 0.4	-	-	0.4	-	0.95	0.09
D-5	0.36	41.0	*10,370*	0.57	0.09	-	-	3.8	676	*27.6*	< 0.4	269	-	3.0	-	*1.2*	2.39
D-5R	2.1	74.3	29,200	7.6	-	6,410	5.5	20.6	6,820	464	0.78	8,590	4.6	12.1	824	8.24	35.6
D-6R	0.67	28.9	16,500	6.4	-	5,310	4.5	14.5	4,160	481	1.8	10,500	6.7	11.1	19.7	8	17.2
E-1	0.03	4.4	< 10	< 0.01	< 0.01	-	-	< 0.2	34.6	9.7	< 0.4	< 20	-	0.3	-	< 0.01	< 0.002
E-2	0.02	18.0	64	0.02	0.01	-	-	< 0.2	9.95	*2.7*	< 0.4	< 20	-	0.2	-	*<0.5*	0.13
E-3	0.04	9.2	889	< 0.01	< 0.01	-	-	0.7	22.3	3.5	< 0.4	< 20	-	0.2	-	*<0.2*	*0.21*
E-4	0.05	17.4	1,220	0.2	0.01	-	-	0.3	139	12.0	< 0.4	-	-	0.6	-	0.76	0.17
E-5	0.39	92.6	*11,570*	0.79	0.09	-	-	5.4	1,100	*32.2*	< 0.4	379	-	4.9	-	*2.0*	2.99
E-5R	1.6	100	21,800	6.6	-	5,250	5	18.6	6,320	282	0.41	8,520	2.5	13.7	802	7.67	30.5
E-6R	0.51	4.3	8,980	6	-	4,700	5.4	13.2	4,050	325	0.49	11,000	5.8	7	19	9.58	14.9
F-1	0.02	2.2	< 10	< 0.01	< 0.01	-	-	< 0.2	24.1	2.2	< 0.4	< 20	-	0.1	-	< 0.01	< 0.002
F-2	0.01	8.6	41	0.02	< 0.01	-	-	< 0.2	6.27	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.11
F-3	0.04	5.1	617	< 0.01	0.01	-	-	0.7	18.1	2.4	< 0.4	< 20	-	0.09	-	*<0.2*	*0.19*
F-4	0.02	10.5	978	0.2	< 0.01	-	-	< 0.2	112	20.3	< 0.4	-	-	0.6	-	0.73	0.06
F-5	0.31	56.0	*11,370*	0.80	0.07	-	-	4.0	807	*31.1*	< 0.4	244	-	4.2	-	*1.4*	2.32
F-5R	1.2	19.2	24,500	6.8	-	5,840	8.3	19.4	5,990	1,580	0.07	6,270	3.4	9.1	313	5.29	25.9
F-6R	0.67	7	17,500	7.3	-	6,980	10	16.6	4,950	873	0.72	9,470	6.8	12	19	8.38	20.5
G-1	0.02	2.5	< 10	< 0.01	< 0.01	-	-	< 0.2	40.8	5.5	< 0.4	< 20	-	0.2	-	< 0.01	< 0.002
G-2	0.007	6.8	53	0.02	< 0.01	-	-	< 0.2	7.37	*<0.7*	< 0.4	< 20	-	0.1	-	*<0.5*	0.11
G-3	0.04	4.0	761	< 0.01	< 0.01	-	-	0.5	18.7	1.7	< 0.4	< 20	-	< 0.08	-	*<0.2*	*0.20*
G-4	0.03	6.5	939	0.2	< 0.01	-	-	0.2	152	6.6	< 0.4	-	-	0.5	-	0.58	0.08
G-5	0.32	39.8	*8,220*	0.74	0.06	-	-	4.8	1,060	*27.8*	< 0.4	190	-	4.1	-	*0.9*	2.19
G-5R	1.5	38.8	17,500	6.6	-	5,110	4.4	18	6,330	412	0.28	8,550	2.6	12.3	434	7.82	26.9
G-6R	0.38	4.2	9,750	5	-	3,770	3.6	12	3,350	506	0.27	8,940	5.7	5.4	15.9	6.95	11.6

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sb	Sc	Se	SiO_2	Sr	Th	Ti	Tl	U	V	W	Y	Zn
B-1	< 0.06	-	< 0.2	< 40	0.58	-	-	< 0.02	< 0.02	0.1	< 0.1	-	1
B-2	0.1	-	< 0.2	**< 40**	0.20	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
B-3	1.23	-	< 0.2	1,380	< 0.1	-	-	< 0.02	0.03	0.2	< 0.1	-	*<0.7*
B-4	0.42	-	< 0.2	805	0.49	-	-	< 0.02	< 0.02	0.9	< 0.1	-	2
B-5	0.2	-	*0.7*	**1,740**	6.48	-	-	0.05	0.04	*7.6*	< 0.1	-	*18.4*
B-5R	0.22	6.4	7.4	-	69.8	1.87	1,270	0.28	0.56	56.4	-	4.6	193
B-6R	0.2	13.1	2.3	-	111	1.03	2,640	0.32	0.53	95	-	9.1	108
C-1	< 0.06	-	< 0.2	< 40	0.67	-	-	< 0.02	< 0.02	0.1	< 0.1	-	1
C-2	0.1	-	< 0.2	**< 40**	0.23	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
C-3	1.27	-	< 0.2	1,390	< 0.1	-	-	< 0.02	0.03	0.3	< 0.1	-	*<0.7*
C-4	0.51	-	< 0.2	888	0.51	-	-	< 0.02	< 0.02	0.8	< 0.1	-	2
C-5	0.2	-	*1.0*	**2,950**	6.57	-	-	0.02	0.03	*8.9*	< 0.1	-	*18.4*
C-5R	0.38	6.7	7.4	-	62.1	1.57	2,170	0.3	0.46	64.3	-	5.3	186
C-6R	0.2	13.2	2.3	-	108	1.32	2,560	0.3	0.58	90.1	-	8.9	123
D-1	< 0.06	-	< 0.2	< 40	0.73	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	0.7
D-2	0.1	-	< 0.2	**< 40**	0.16	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
D-3	0.74	-	< 0.2	230	< 0.1	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	*<0.7*
D-4	0.2	-	< 0.2	480	0.76	-	-	< 0.02	< 0.02	0.9	< 0.1	-	7.9
D-5	0.1	-	*<0.7*	**2,470**	2.94	-	-	< 0.02	0.05	*5.3*	< 0.1	-	*6.7*
D-5R	0.1	6.5	0.31	-	153	2.34	2,160	0.17	0.5	43.3	-	7.2	54.2
D-6R	0.07	6.6	<0.1	-	154	1.06	1,920	0.08	0.4	40.7	-	6.9	45.6
E-1	< 0.06	-	< 0.2	< 40	0.97	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	2.0
E-2	0.2	-	< 0.2	**327**	0.32	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*0.5*
E-3	0.94	-	< 0.2	371	0.17	-	-	< 0.02	0.04	0.2	< 0.1	-	*1*
E-4	0.2	-	< 0.2	691	1.06	-	-	< 0.02	< 0.02	0.8	< 0.1	-	3.6
E-5	0.1	-	*<0.7*	**2,880**	3.06	-	-	< 0.02	0.06	*7.2*	< 0.1	-	*15.9*
E-5R	0.2	5.1	0.52	-	137	1.99	1,900	0.16	0.47	37.4	-	5	47.5
E-6R	0.1	5.1	<0.1	-	170	1.24	1,940	0.08	0.48	34.6	-	5.7	19.6
F-1	< 0.06	-	< 0.2	< 40	1.00	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	0.6
F-2	0.1	-	< 0.2	**97.7**	0.26	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
F-3	0.69	-	< 0.2	243	0.20	-	-	< 0.02	0.02	0.2	< 0.1	-	*0.1*
F-4	0.1	-	< 0.2	527	0.94	-	-	< 0.02	< 0.02	1.0	< 0.1	-	2.6
F-5	0.1	-	*<0.7*	**3,560**	3.76	-	-	< 0.02	0.07	*7.3*	< 0.1	-	*13.2*
F-5R	0.06	7.9	0.75	-	110	3.21	1,710	0.13	0.58	40.2	-	9.9	29.7
F-6R	0.08	9.5	0.22	-	161	1.93	2,390	0.1	0.65	44.3	-	11	29.4
G-1	< 0.06	-	< 0.2	< 40	0.97	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	1
G-2	0.1	-	< 0.2	**< 40**	0.22	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
G-3	0.70	-	< 0.2	283	0.16	-	-	< 0.02	0.02	0.2	< 0.1	-	*0.1*
G-4	0.1	-	< 0.2	550	1.28	-	-	< 0.02	< 0.02	1.0	< 0.1	-	2.4
G-5	0.09	-	*<0.7*	**2,950**	3.20	-	-	< 0.02	0.05	*6.8*	< 0.1	-	*10.8*
G-5R	0.1	6.1	0.15	-	173	1.9	2,090	0.14	0.44	38.8	-	7.3	45.8
G-6R	0.05	5.7	<0.1	-	149	0.89	2,100	<0.08	0.36	29.9	-	6.5	14.6

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sample ID	Extract Step	Lab No	Job No.	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr
H-1	EMV-SED-702	Extract 1	08-1	-	< 0.6	9.19	< 0.2	< 0.04	0.01	< 0.04	< 40	0.006	-	0.62	< 0.2
H-2	EMV-SED-702	Extract 2	08-2	-	< 0.6	59.4	< 0.2	0.35	< 0.01	< 0.04	*<136*	0.009	-	0.12	**1.4**
H-3	EMV-SED-702	Extract 3	08-3	-	< 0.6	*124*	0.4	0.08	0.02	< 0.04	< 40	< 0.004	-	0.14	0.3
H-4	EMV-SED-702	Extract 4	08-4	-	< 0.6	*272*	< 0.2	2.14	0.01	< 0.04	219	*0.01*	-	0.21	0.7
H-5	EMV-SED-702	Extract 5	08-5	-	< 0.6	*1,442*	< 0.2	6.32	0.06	0.07	383	< 0.004	-	1.18	**20.8**
H-5R	EMV-SED-702	Residue 5	C-275607	MRP-06906	<2	31,800	<1	144	1.3	< 0.06	8,880	0.01	11.5	5.3	50.3
H-6R	EMV-SED-702	Residue 6	C-275629	MRP-06906	<2	33,400	<1	141	1.4	< 0.06	10,900	0.01	9.7	3.6	48.4
I-1	Ely-SD-09	Extract 1	09-1	-	< 0.6	6.08	< 0.2	0.2	0.01	< 0.04	< 40	< 0.004	-	0.35	< 0.2
I-2	Ely-SD-09	Extract 2	09-2	-	< 0.6	69.0	< 0.2	0.49	< 0.01	< 0.04	*<136*	0.02	-	0.12	**1.6**
I-3	Ely-SD-09	Extract 3	09-3	-	< 0.6	*128*	0.6	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.12	0.7
I-4	Ely-SD-09	Extract 4	09-4	-	< 0.6	*162*	< 0.2	2.20	< 0.01	0.06	50.6	*0.02*	-	0.24	1.3
I-5	Ely-SD-09	Extract 5	09-5	-	1.99	*792*	< 0.2	29.4	0.03	1.63	< 40	< 0.004	-	1.32	**16.0**
I-5R	Ely-SD-09	Residue 5	C-275608	MRP-06906	<2	57,600	1.2	214	1.9	0.48	13,900	0.27	13.2	13.3	72.6
I-6R	Ely-SD-09	Residue 6	C-275630	MRP-06906	<2	61,600	<1	202	2.1	0.13	16,800	0.09	12.8	5.7	93.1
J-1	1139830-SD	Extract 1	10-1	-	< 0.6	12.5	< 0.2	< 0.04	< 0.01	< 0.04	< 40	0.09	-	2.35	< 0.2
J-2	1139830-SD	Extract 2	10-2	-	< 0.6	45.9	< 0.2	0.1	< 0.01	< 0.04	*<136*	0.07	-	0.39	**1.0**
J-3	1139830-SD	Extract 3	10-3	-	< 0.6	*106*	0.6	< 0.04	< 0.01	< 0.04	< 40	0.02	-	0.31	0.6
J-4	1139830-SD	Extract 4	10-4	-	1.06	*112*	< 0.2	1.93	< 0.01	0.08	119	*0.05*	-	0.47	0.4
J-5	1139830-SD	Extract 5	10-5	-	2.91	*915*	0.8	20.9	0.02	2.23	< 40	< 0.004	-	3.73	**13.5**
J-5R	1139830-SD	Residue 5	C-275609	MRP-06906	3.3	61,100	12.8	294	2.5	1.46	20,100	11.7	14.7	77.2	64.6
J-6R	1139830-SD	Residue 6	C-275631	MRP-06906	<2	42,400	1.2	207	1.9	0.18	15,100	0.05	11.3	9.7	70.4
K-1	04Smith3	Extract 1	11-1	-	< 0.6	2.19	< 0.2	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.17	< 0.2
K-2	04Smith3	Extract 2	11-2	-	< 0.6	9.48	< 0.2	0.1	< 0.01	< 0.04	*<136*	0.02	-	0.04	**1.5**
K-3	04Smith3	Extract 3	11-3	-	< 0.6	*26.2*	0.6	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.03	0.4
K-4	04Smith3	Extract 4	11-4	-	0.84	*31.3*	< 0.2	1.42	< 0.01	< 0.04	< 40	*0.01*	-	0.07	< 0.2
K-5	04Smith3	Extract 5	11-5	-	5.23	*270*	< 0.2	48.0	< 0.01	2.46	< 40	< 0.004	-	4.38	**10.1**
K-5R	04Smith3	Residue 5	C-275610	MRP-06906	<2	20,200	<1	94	0.82	0.27	3,570	0.05	4.1	19.4	23.8
K-6R	04Smith3	Residue 6	C-275632	MRP-06906	ins	ins	ins	ins	ins	ins	ins	ins	ins	ins	ins
L-1	CLHN-TP-2	Extract 1	12-1	-	< 0.6	2.89	1	< 0.04	< 0.01	< 0.04	1,230	2.49	-	0.47	< 0.2
L-2	CLHN-TP-2	Extract 2	12-2	-	< 0.6	209	0.7	1.60	0.06	10.9	*38,664*	9.20	-	1.00	**4.9**
L-3	CLHN-TP-2	Extract 3	12-3	-	< 0.6	*82.5*	4.3	0.47	0.03	1.96	2,000	0.56	-	0.13	1.0
L-4	CLHN-TP-2	Extract 4	12-4	-	0.63	*301*	3.0	2.12	0.06	1.91	296	*1.05*	-	0.10	0.8
L-5	CLHN-TP-2	Extract 5	12-5	-	2.59	*2552*	0.6	2.08	0.07	1.40	66.6	4.23	-	0.20	**20.0**
L-5R	CLHN-TP-2	Residue 5	C-275611	MRP-06906	2	56,400	43.3	180	1.1	2.04	2,400	23.2	17.6	3.5	38.5
L-6R	CLHN-TP-2	Residue 6	C-275633	MRP-06906	<2	52,200	<1	177	1.1	< 0.06	2,490	<0.007	17.8	0.96	42.5
M-1	blank	Extract 1	13-1	-	< 0.6	< 0.4	< 0.2	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	< 0.004	< 0.2
M-2	blank	Extract 2	13-2	-	< 0.6	0.41	< 0.2	< 0.04	< 0.01	0.05	*<136*	0.007	-	< 0.004	**2.2**
M-3	blank	Extract 3	13-3	-	< 0.6	*<1.37*	0.3	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	< 0.004	< 0.2
M-4	blank	Extract 4	13-4	-	< 0.6	*<0.69*	< 0.2	< 0.04	< 0.01	< 0.04	< 40	*<0.008*	-	< 0.004	< 0.2
M-5	blank	Extract 5	13-5	-	< 0.6	*<7.6*	< 0.2	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	< 0.004	**13.8**
N-1	EMV-SED-LOC05	Extract 1	14-1	-	< 0.6	10.4	< 0.2	< 0.04	< 0.01	< 0.04	213	0.01	-	1.77	< 0.2
N-2	EMV-SED-LOC05	Extract 2	14-2	-	< 0.6	50.7	< 0.2	0.2	< 0.01	< 0.04	*<136*	0.02	-	0.28	**0.6**

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Cs	Cu	Fe	Ga	Ge	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb
H-1	0.02	2.9	< 10	< 0.01	< 0.01	-	-	< 0.2	37.2	3.0	< 0.4	< 20	-	0.3	-	< 0.01	< 0.002
H-2	0.007	7.2	38	0.02	< 0.01	-	-	< 0.2	5.72	*<0.7*	< 0.4	< 20	-	0.08	-	*<0.5*	0.10
H-3	0.05	5.0	686	< 0.01	< 0.01	-	-	0.8	24.2	1.1	< 0.4	< 20	-	0.2	-	*<0.2*	*0.24*
H-4	0.04	10.4	1,160	0.2	< 0.01	-	-	< 0.2	80.2	6.2	< 0.4	-	-	0.4	-	0.52	0.10
H-5	0.33	59.1	*12,270*	0.67	0.08	-	-	3.4	714	*25.0*	< 0.4	346	-	3.5	-	*1.5*	2.84
H-5R	1.5	39.4	25,400	6.5	-	5,660	5.8	18.6	6,350	1,080	0.2	6,590	2.6	11	663	6.4	29
H-6R	0.58	3.6	17,100	5.6	-	4,860	4.7	15.8	4,590	1,280	0.67	7,790	6.7	9.5	19.2	9.13	16.8
I-1	0.04	6.3	< 10	< 0.01	0.01	-	-	< 0.2	8.73	1.2	< 0.4	< 20	-	0.2	-	< 0.01	< 0.002
I-2	0.009	35.0	48	0.02	< 0.01	-	-	< 0.2	2.45	*<0.7*	< 0.4	19.5	-	0.1	-	*<0.5*	0.16
I-3	0.04	22.4	2,150	< 0.01	< 0.01	-	-	< 0.2	7.57	0.8	< 0.4	< 20	-	< 0.08	-	*<0.2*	*0.12*
I-4	0.03	45.4	1,690	0.2	< 0.01	-	-	< 0.2	34.4	2.7	< 0.4	-	-	0.2	-	1.1	0.03
I-5	0.40	371	*43,170*	0.94	0.24	-	-	1.8	296	*12.1*	6.43	401	-	1.8	-	*18.0*	11.3
I-5R	1.5	2,640	99,900	14.2	-	10,300	6.4	11.7	8,400	1,190	25.2	16,800	7.7	11.3	3,100	40.8	34.1
I-6R	0.98	86.3	24,100	13.1	-	9,500	6.1	11.3	7,500	1,290	24.3	19,400	7.8	10.2	28.8	33.2	28.6
J-1	0.06	27.5	< 10	< 0.01	< 0.01	-	-	< 0.2	15.3	3.3	< 0.4	< 20	-	0.3	-	< 0.01	< 0.002
J-2	0.01	60.2	44	0.02	< 0.01	-	-	0.3	2.20	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.16
J-3	0.04	40.6	1,730	< 0.01	< 0.01	-	-	< 0.2	7.09	0.8	< 0.4	< 20	-	< 0.08	-	*<0.2*	*0.23*
J-4	< 0.004	78.4	1,510	0.2	< 0.01	-	-	< 0.2	24.6	2.3	< 0.4	-	-	0.1	-	2.0	0.004
J-5	0.12	513	*55,570*	1.1	0.36	-	-	1.2	414	*18.5*	3.42	318	-	1.2	-	*36.9*	8.10
J-5R	1.7	13,900	272,000	17.7	-	14,600	6.7	17.7	12,900	1,510	35.9	12,700	16	16.7	6,720	31.8	49.6
J-6R	0.98	110	37,600	9.9	-	10,100	5	13.4	7,180	1,090	8.8	9,150	16	13.6	51.2	16	33.2
K-1	0.02	5.5	< 10	< 0.01	< 0.01	-	-	< 0.2	32.2	3.5	< 0.4	< 20	-	< 0.08	-	< 0.01	0.07
K-2	0.009	27.2	36	0.02	< 0.01	-	-	< 0.2	2.32	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.17
K-3	0.01	21.5	1,940	< 0.01	< 0.01	-	-	< 0.2	3.40	0.6	0.62	< 20	-	< 0.08	-	*<0.2*	*0.15*
K-4	< 0.004	16.9	999	0.2	< 0.01	-	-	< 0.2	6.85	1.8	< 0.4	-	-	< 0.08	-	1.6	0.07
K-5	0.24	278	*79,570*	0.95	0.42	-	-	< 0.2	73.0	*27.6*	10.3	409	-	1.1	-	*65.2*	26.6
K-5R	0.45	466	89,400	7.9	-	4,760	2.2	6	3,020	482	7.7	5,060	1.8	4.3	2,360	13.2	16.4
K-6R	ins	ins	ins	ins	-	ins	ins	ins	ins	ins	ins	ins	ins	ins	ins	ins	ins
L-1	0.10	66.6	< 10	< 0.01	< 0.01	-	-	< 0.2	45.6	30.8	< 0.4	< 20	-	1.4	-	0.84	< 0.002
L-2	0.04	399	1,250	0.1	0.01	-	-	< 0.2	346	*642*	< 0.4	< 20	-	4.1	-	*511*	0.28
L-3	0.19	54.3	952	< 0.01	< 0.01	-	-	< 0.2	123	34.8	3.10	< 20	-	0.5	-	*185*	*0.88*
L-4	0.08	111	768	0.37	0.02	-	-	< 0.2	374	10.2	0.46	-	-	0.5	-	56.2	0.11
L-5	0.30	95.0	*2,180*	1.5	0.05	-	-	3.9	4,180	*79.8*	< 0.4	136	-	1.8	-	*72.8*	0.74
L-5R	2.4	1,940	36,000	29.6	-	8,270	7.5	52.8	143,000	1,200	60.5	2,120	4	15.8	32.8	18.5	31.3
L-6R	2	7	17,600	28.2	-	8,580	7.4	52.4	140,000	1,100	2.9	2,270	3.4	11.1	11.4	1.43	32.6
M-1	< 0.004	0.2	< 10	< 0.01	< 0.01	-	-	< 0.2	< 2	< 0.04	< 0.4	< 20	-	< 0.08	-	< 0.01	< 0.002
M-2	< 0.004	0.4	< 10	< 0.01	< 0.01	-	-	< 0.2	< 2	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	< 0.002
M-3	< 0.004	0.3	< 10	< 0.01	< 0.01	-	-	< 0.2	< 2	< 0.04	< 0.4	< 20	-	< 0.08	-	*<0.2*	*<0.02*
M-4	< 0.004	< 0.1	< 10	< 0.01	< 0.01	-	-	< 0.2	< 2	< 0.04	< 0.4	---	-	< 0.08	-	0.01	< 0.002
M-5	< 0.004	< 0.1	*<30*	0.03	< 0.01	-	-	< 0.2	< 2	*<0.3*	< 0.4	< 20	-	0.09	-	*<0.2*	< 0.002
N-1	0.02	2.3	35	< 0.01	< 0.01	-	-	< 0.2	93.6	7.0	< 0.4	< 20	-	0.7	-	< 0.01	0.06
N-2	0.007	8.8	65	0.02	< 0.01	-	-	< 0.2	7.64	*<0.7*	< 0.4	< 20	-	0.2	-	*<0.5*	0.11

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sb	Sc	Se	SiO_2	Sr	Th	Ti	Tl	U	V	W	Y	Zn
H-1	< 0.06	-	< 0.2	< 40	0.82	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	1
H-2	0.1	-	< 0.2	**75.3**	0.19	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
H-3	0.66	-	< 0.2	318	0.16	-	-	< 0.02	< 0.02	0.2	< 0.1	-	*0.2*
H-4	0.2	-	< 0.2	456	0.75	-	-	< 0.02	< 0.02	0.5	< 0.1	-	2.0
H-5	0.09	-	*<0.7*	**3,450**	3.28	-	-	< 0.02	0.05	*8.4*	< 0.1	-	*7.7*
H-5R	0.09	9	0.47	-	114	2.31	2,180	0.15	0.43	44.1	-	12.6	35.5
H-6R	0.05	7.6	0.29	-	125	1.16	2,610	0.09	0.44	37.8	-	10.7	19.9
I-1	< 0.06	-	< 0.2	< 40	0.34	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	0.2
I-2	0.1	-	< 0.2	**253**	0.11	-	-	< 0.02	< 0.02	*0.1*	< 0.1	-	*<2.3*
I-3	1.25	-	< 0.2	1,670	< 0.1	-	-	< 0.02	0.06	0.4	< 0.1	-	*0.2*
I-4	0.2	-	0.2	699	0.24	-	-	< 0.02	< 0.02	1.5	< 0.1	-	1
I-5	0.20	-	*4.9*	**3,150**	2.35	-	-	0.07	0.06	*25.1*	< 0.1	-	*11.7*
I-5R	0.67	12.7	29	-	105	2.88	3,890	0.29	0.7	113	-	9.3	139
I-6R	0.2	13.1	2.5	-	126	1.36	3,500	0.24	0.75	96.1	-	9.8	70
J-1	< 0.06	-	< 0.2	< 40	0.22	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	15.1
J-2	0.1	-	< 0.2	**149**	< 0.1	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*7.6*
J-3	1.33	-	< 0.2	1,380	< 0.1	-	-	< 0.02	0.04	0.3	< 0.1	-	*4.5*
J-4	0.20	-	< 0.2	642	0.38	-	-	< 0.02	< 0.02	0.3	< 0.1	-	8.0
J-5	0.32	-	*6.5*	**3,110**	5.52	-	-	0.08	0.06	*13.3*	< 0.1	-	*62.8*
J-5R	2.9	10.3	37	-	171	5.02	4,130	0.66	1.46	99.3	-	19.9	2,230
J-6R	0.51	6.4	9.3	-	121	1.2	3,040	0.42	0.89	51.5	-	17.2	86.2
K-1	< 0.06	-	< 0.2	< 40	< 0.1	-	-	< 0.02	< 0.02	0.3	< 0.1	-	1
K-2	0.09	-	< 0.2	**71.3**	< 0.1	-	-	< 0.02	< 0.02	*1.2*	< 0.1	-	*<2.3*
K-3	1.19	-	< 0.2	3,530	< 0.1	-	-	< 0.02	< 0.02	1.7	< 0.1	-	*<0.7*
K-4	0.22	-	< 0.2	753	0.19	-	-	< 0.02	< 0.02	5.4	< 0.1	-	1
K-5	0.36	-	*6.1*	**2,260**	6.83	-	-	0.63	0.06	*41.4*	< 0.1	-	*73.6*
K-5R	0.43	2.7	16	-	32.5	1.53	784	0.26	0.38	58.6	-	3.7	169
K-6R	ins	ins	6.2	-	ins	ins	ins	ins	ins	ins	-	ins	ins
L-1	< 0.06	-	0.3	< 40	0.87	-	-	0.1	< 0.02	< 0.1	< 0.1	-	666
L-2	1.61	-	0.3	**1,750**	33.6	-	-	0.06	0.60	*<0.6*	< 0.1	-	*2,338*
L-3	1.31	-	< 0.2	693	1.39	-	-	0.1	0.14	0.1	< 0.1	-	*312*
L-4	1.61	-	0.4	845	0.40	-	-	< 0.02	0.07	0.2	< 0.1	-	298
L-5	0.50	-	*0.8*	**5,790**	< 0.1	-	-	< 0.02	0.15	*5.0*	< 0.1	-	*1,005*
L-5R	10.7	4	2.9	-	9.2	2.75	1,050	2.28	4.3	39.4	-	30.5	6,480
L-6R	2.1	3.7	<0.1	-	10	2.02	928	1.22	3.03	34.8	-	32.1	121
M-1	< 0.06	-	< 0.2	< 40	< 0.1	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	0.3
M-2	< 0.06	-	< 0.2	**1,640**	< 0.1	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
M-3	< 0.06	-	< 0.2	< 40	< 0.1	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	*<0.7*
M-4	< 0.06	-	< 0.2	< 40	< 0.1	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	0.1
M-5	< 0.06	-	*<0.7*	**3,880**	< 0.1	-	-	< 0.02	< 0.02	*<1.9*	< 0.1	-	*<4.6*
N-1	< 0.06	-	< 0.2	< 40	0.65	-	-	< 0.02	< 0.02	0.1	< 0.1	-	2.3
N-2	0.1	-	< 0.2	**540**	0.20	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sample ID	Extract Step	Lab No	Job No.	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr
N-3	EMV-SED-LOC05	Extract 3	14-3	-	< 0.6	*97.6*	0.3	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.24	0.3
N-4	EMV-SED-LOC05	Extract 4	14-4	-	< 0.6	*121*	< 0.2	1.24	< 0.01	< 0.04	< 40	*0.00*	-	0.24	0.4
N-5	EMV-SED-LOC05	Extract 5	14-5	-	< 0.6	*716*	0.4	19.1	0.04	0.48	94.6	< 0.004	-	1.19	**14.4**
N-5R	EMV-SED-LOC05	Residue 5	C-275612	MRP-06906	<2	45,100	4.1	122	0.93	0.32	10,400	0.38	8.4	16	61.5
N-6R	EMV-SED-LOC05	Residue 6	C-275634	MRP-06906	<2	56,100	<1	143	1.3	0.06	13,300	0.05	8.6	3.9	76.6
O-1	TP1-S-unox	Extract 1	15-1	-	< 0.6	53.7	< 0.2	< 0.04	< 0.01	< 0.04	133	0.75	-	19.5	2.1
O-2	TP1-S-unox	Extract 2	15-2	-	< 0.6	847	< 0.2	0.20	< 0.01	0.09	*<136*	1.24	-	3.84	**5.8**
O-3	TP1-S-unox	Extract 3	15-3	-	< 0.6	*1,849*	1	< 0.04	< 0.01	0.21	< 40	0.33	-	19.5	13.8
O-4	TP1-S-unox	Extract 4	15-4	-	< 0.6	*2709*	< 0.2	2.28	< 0.01	0.11	529	*0.94*	-	5.88	16.5
O-5	TP1-S-unox	Extract 5	15-5	-	< 0.6	*4,412*	< 0.2	1.15	0.03	0.40	611	0.87	-	7.10	**36.2**
O-5R	TP1-S-unox	Residue 5	C-275613	MRP-06906	<2	53,400	8.1	146	0.76	0.43	9,210	13.4	22.1	325	112
O-6R	TP1-S-unox	Residue 6	C-275635	MRP-06906	<2	73,900	<1	200	1.3	0.1	13,100	0.4	26.5	42.6	144
P-1	TP1-S-unox	Extract 1	16-1	-	< 0.6	62.0	< 0.2	< 0.04	0.01	< 0.04	229	0.66	-	19.7	2.1
P-2	TP1-S-unox	Extract 2	16-2	-	< 0.6	866	< 0.2	0.24	< 0.01	0.09	*<136*	1.26	-	3.83	**5.7**
P-3	TP1-S-unox	Extract 3	16-3	-	< 0.6	*1,569*	1	< 0.04	< 0.01	0.18	< 40	0.31	-	17.6	10.4
P-4	TP1-S-unox	Extract 4	16-4	-	< 0.6	*2149*	< 0.2	1.90	0.02	0.09	312	*0.77*	-	5.08	13.5
P-5	TP1-S-unox	Extract 5	16-5	-	< 0.6	*4,292*	< 0.2	0.96	0.06	0.44	819	0.86	-	7.64	**41.4**
P-5R	TP1-S-unox	Residue 5	C-275614	MRP-06906	<2	59,800	6.7	165	0.83	0.51	9,720	17.3	25.4	328	127
P-6R	TP1-S-unox	Residue 6	C-275636	MRP-06906	<2	75,000	<1	206	1.3	0.1	12,900	0.27	22.1	28.8	142
Q-1	TP1-S ox	Extract 1	17-1	-	< 0.6	2.99	< 0.2	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.18	< 0.2
Q-2	TP1-S ox	Extract 2	17-2	-	< 0.6	12.4	< 0.2	0.24	< 0.01	< 0.04	*<136*	0.01	-	0.02	**1.0**
Q-3	TP1-S ox	Extract 3	17-3	-	< 0.6	*25.4*	0.5	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.03	0.2
Q-4	TP1-S ox	Extract 4	17-4	-	< 0.6	*35.8*	< 0.2	0.92	< 0.01	< 0.04	< 40	*-0.003*	-	0.006	0.3
Q-5	TP1-S ox	Extract 5	17-5	-	< 0.6	*274*	0.8	13.0	< 0.01	0.59	< 40	< 0.004	-	3.83	**15.6**
Q-5R	TP1-S ox	Residue 5	C-275615	MRP-06906	<2	50,600	2.6	147	0.98	0.11	9,140	0.17	5.3	22.1	78.8
Q-6R	TP1-S ox	Residue 6	C-275637	MRP-06906	<2	60,800	<1	158	1.2	0.1	11,000	0.02	9.7	1.5	80.6
R-1	02TP3A	Extract 1	18-1	-	< 0.6	15.5	< 0.2	< 0.04	< 0.01	< 0.04	868	0.04	-	0.27	< 0.2
R-2	02TP3A	Extract 2	18-2	-	< 0.6	57.6	< 0.2	< 0.04	< 0.01	< 0.04	*<136*	0.03	-	0.02	**1.9**
R-3	02TP3A	Extract 3	18-3	-	< 0.6	*55.4*	0.6	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.007	0.3
R-4	02TP3A	Extract 4	18-4	-	< 0.6	*14.9*	0.2	0.1	< 0.01	< 0.04	< 40	*0.00*	-	< 0.004	0.4
R-5	02TP3A	Extract 5	18-5	-	5.43	*426*	0.9	7.27	< 0.01	2.27	< 40	< 0.004	-	0.27	**40.5**
R-5R	02TP3A	Residue 5	C-275616	MRP-06906	<2	42,600	8.2	21.5	0.31	0.98	6,100	0.19	1.5	6.7	82
R-6R	02TP3A	Residue 6	C-275638	MRP-06906	<2	60,700	<1	24.3	0.43	0.59	8,030	0.08	1.1	2.7	91.3
S-1	02TP3C	Extract 1	19-1	-	< 0.6	1.16	0.3	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.03	< 0.2
S-2	02TP3C	Extract 2	19-2	-	< 0.6	12.7	< 0.2	0.2	< 0.01	< 0.04	*<136*	0.01	-	0.005	**1.4**
S-3	02TP3C	Extract 3	19-3	-	< 0.6	*18.1*	0.7	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.007	0.4
S-4	02TP3C	Extract 4	19-4	-	2.14	*19.3*	1	0.67	< 0.01	0.13	< 40	*0.01*	-	0.004	0.3
S-5	02TP3C	Extract 5	19-5	-	8.73	*313*	3.0	7.16	< 0.01	5.93	< 40	0.02	-	0.51	**18.9**
S-5R	02TP3C	Residue 5	C-275617	MRP-06906	<2	35,700	14.9	23.6	0.26	1.36	3,650	0.96	1	43.8	71.7
S-6R	02TP3C	Residue 6	C-275639	MRP-06906	<2	46,000	6.3	29.6	0.35	0.96	4,780	1.3	1.3	47.6	93.6
T-1	02Ely2A	Extract 1	20-1	-	< 0.6	25.4	< 0.2	< 0.04	< 0.01	< 0.04	< 40	0.04	-	1.96	< 0.2
T-2	02Ely2A	Extract 2	20-2	-	< 0.6	55.3	< 0.2	< 0.04	< 0.01	< 0.04	*<136*	0.04	-	0.16	**0.5**

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Cs	Cu	Fe	Ga	Ge	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb
N-3	0.03	6.2	1,310	< 0.01	< 0.01	-	-	< 0.2	17.5	0.9	< 0.4	< 20	-	0.1	-	*<0.2*	*0.23*
N-4	0.007	7.3	1,220	0.2	< 0.01	-	-	< 0.2	51.1	1.7	< 0.4	-	-	0.3	-	0.2	0.06
N-5	0.34	80.2	*39,570*	0.57	0.24	-	-	1.7	358	*11.9*	1.23	1,500	-	2.0	-	*8.1*	6.92
N-5R	1.2	873	103,000	9.2	-	8,600	4.2	9.6	6,260	442	8.8	15,100	2.5	11.6	3,020	25.4	29.1
N-6R	0.86	264	21,200	10.9	-	9,640	4.2	13.6	7,440	530	5.8	18,600	5.1	7.9	26.3	19.8	31.2
O-1	0.54	< 0.1	774	< 0.01	< 0.01	-	-	0.5	34.8	2.4	< 0.4	< 20	-	6.2	-	< 0.01	0.10
O-2	0.11	8.2	492	0.06	< 0.01	-	-	0.5	3.80	*<0.7*	< 0.4	< 20	-	1.4	-	*<0.5*	0.19
O-3	0.32	21.8	10,800	< 0.01	0.01	-	-	< 0.2	12.6	0.8	0.58	< 20	-	7.0	-	*2.6*	*1.79*
O-4	0.14	4.9	2,220	0.24	< 0.01	-	-	0.2	55.4	4.1	< 0.4	-	-	2.1	-	1.9	0.28
O-5	0.26	19.6	*6,010*	0.69	0.06	-	-	4.1	820	*27.6*	< 0.4	576	-	3.6	-	*4.8*	0.74
O-5R	3.3	570	154,000	13	-	16,200	11	20.3	12,300	348	6	10,800	2.4	81.2	1,260	31.3	58.9
O-6R	1.9	69.1	40,700	16.8	-	19,800	13.1	26.8	13,100	376	4.6	16,200	5.8	19.6	14.1	22.5	65.1
P-1	0.52	< 0.1	774	< 0.01	< 0.01	-	-	0.9	38.8	2.7	< 0.4	< 20	-	6.4	-	< 0.01	0.04
P-2	0.11	8.8	506	0.07	< 0.01	-	-	0.3	4.07	*<0.7*	< 0.4	< 20	-	1.3	-	*<0.5*	0.19
P-3	0.31	20.1	8,700	< 0.01	< 0.01	-	-	< 0.2	9.64	0.7	0.49	< 20	-	6.2	-	*2.4*	*1.78*
P-4	0.12	3.8	2,210	0.26	< 0.01	-	-	< 0.2	50.7	3.5	< 0.4	-	-	1.8	-	1.6	0.26
P-5	0.28	22.3	*6,580*	0.71	0.07	-	-	3.3	872	*28.3*	< 0.4	612	-	4.1	-	*5.1*	0.79
P-5R	3.6	640	159,000	14.6	-	17,500	12.6	22	14,300	378	8.4	11,600	2.8	82.2	1,810	25.2	67.2
P-6R	1.9	50.8	29,700	17.1	-	20,300	11.1	25.2	12,900	360	5	16,600	5.6	12.8	17.1	22.6	66.2
Q-1	0.09	0.4	< 10	< 0.01	< 0.01	-	-	< 0.2	44.6	2.1	< 0.4	< 20	-	< 0.08	-	< 0.01	< 0.002
Q-2	0.02	1.7	36	0.02	< 0.01	-	-	< 0.2	2.57	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.10
Q-3	0.09	1.1	581	< 0.01	< 0.01	-	-	< 0.2	3.84	0.2	< 0.4	< 20	-	< 0.08	-	*<0.2*	*0.18*
Q-4	< 0.004	1.0	710	0.46	< 0.01	-	-	< 0.2	11.3	0.3	< 0.4	-	-	< 0.08	-	0.1	< 0.002
Q-5	0.15	35.7	*22,470*	0.64	0.2	-	-	0.3	128	*13.6*	4.84	1,280	-	1.7	-	*13.7*	7.38
Q-5R	1	49.7	44,700	11.5	-	12,400	2.7	10.2	5,740	274	6.9	13,200	2.1	8.6	750	17.3	37.8
Q-6R	0.98	7.8	6,990	12.5	-	13,900	4.7	13.6	5,940	217	3.2	17,500	2.3	1.9	16	21.7	44.4
R-1	0.14	19.6	< 10	< 0.01	< 0.01	-	-	< 0.2	31.8	0.9	< 0.4	< 20	-	0.08	-	< 0.01	< 0.002
R-2	0.02	26.1	12	0.03	< 0.01	-	-	< 0.2	< 2	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.11
R-3	0.06	7.0	1,040	< 0.01	< 0.01	-	-	< 0.2	< 2	< 0.04	1.66	< 20	-	< 0.08	-	*<0.2*	*0.06*
R-4	< 0.004	7.2	803	0.1	0.02	-	-	< 0.2	< 2	0.04	1.03	-	-	< 0.08	-	0.1	0.08
R-5	0.98	117	*60,070*	2.5	0.40	-	-	0.4	< 2	*1.5*	16.8	4,290	-	0.4	-	*21.0*	31.6
R-5R	1.7	1,360	138,000	10.1	-	8,000	0.62	3.5	8,450	455	19.6	22,600	< 0.1	1.9	3,060	36.3	25.7
R-6R	2.4	52.9	30,600	11	-	8,360	0.47	7.6	9,350	410	8.5	32,600	0.54	7.7	42.2	56.2	22.6
S-1	0.01	3.0	< 10	< 0.01	< 0.01	-	-	< 0.2	2.07	0.2	< 0.4	< 20	-	< 0.08	-	< 0.01	< 0.002
S-2	0.008	10.3	13	0.02	< 0.01	-	-	< 0.2	< 2	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.09
S-3	0.04	5.6	501	< 0.01	< 0.01	-	-	< 0.2	< 2	< 0.04	1.23	< 20	-	< 0.08	-	*0.8*	*0.10*
S-4	< 0.004	8.8	959	0.2	< 0.01	-	-	< 0.2	< 2	0.06	2.43	-	-	< 0.08	-	2.4	< 0.002
S-5	0.14	106	*29,070*	0.90	0.20	-	-	0.2	< 2	*0.8*	48.8	681	-	0.4	-	*44.4*	9.67
S-5R	0.86	1,410	210,000	9.5	-	7,530	0.54	7.1	2,170	168	44.5	12,100	0.2	11	637	31.2	18.1
S-6R	1	465	214,000	12.7	-	11,500	0.68	12	3,340	260	20.1	15,600	0.52	12.9	45.1	36	24.1
T-1	0.32	47.5	11	< 0.01	< 0.01	-	-	0.2	132	5.9	< 0.4	< 20	-	0.5	-	< 0.01	< 0.002
T-2	0.04	47.1	22	0.03	< 0.01	-	-	< 0.2	6.59	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.15

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sb	Sc	Se	SiO_2	Sr	Th	Ti	Tl	U	V	W	Y	Zn
N-3	1.10	-	< 0.2	1,360	< 0.1	-	-	< 0.02	0.03	0.4	< 0.1	-	*0.1*
N-4	0.29	-	< 0.2	637	0.55	-	-	< 0.02	< 0.02	0.5	< 0.1	-	1
N-5	0.20	-	*1.2*	**3,720**	6.92	-	-	< 0.02	0.03	*9.2*	< 0.1	-	*16.6*
N-5R	0.49	8.7	9.6	-	80.2	1.9	1,630	0.3	0.5	71.3	-	5.9	275
N-6R	0.2	10.1	1.6	-	104	0.85	1,990	0.34	0.54	76.2	-	6.9	83
O-1	< 0.06	-	< 0.2	210	0.26	-	-	< 0.02	< 0.02	0.2	< 0.1	-	71.0
O-2	0.20	-	< 0.2	**1,090**	< 0.1	-	-	< 0.02	0.03	*1.1*	< 0.1	-	*59.7*
O-3	1.38	-	< 0.2	2,120	< 0.1	-	-	< 0.02	0.08	6.2	< 0.1	-	*47.2*
O-4	0.30	-	< 0.2	4,970	0.36	-	-	< 0.02	0.04	2.2	< 0.1	-	60.9
O-5	0.1	-	*<0.7*	**6,120**	0.60	-	-	< 0.02	0.12	*8.1*	< 0.1	-	*147*
O-5R	0.2	15.3	16	-	50.8	4.19	1,760	0.86	1.48	105	-	11	1,770
O-6R	0.2	15.7	4.4	-	73.3	2.43	2,570	0.86	1.18	121	-	15.3	143
P-1	< 0.06	-	< 0.2	196	0.31	-	-	< 0.02	< 0.02	0.3	< 0.1	-	75.4
P-2	0.20	-	< 0.2	**980**	< 0.1	-	-	< 0.02	0.04	*1.1*	< 0.1	-	*69.7*
P-3	1.26	-	< 0.2	1,870	< 0.1	-	-	< 0.02	0.07	4.3	< 0.1	-	*64.7*
P-4	0.31	-	< 0.2	4,060	0.26	-	-	< 0.02	0.04	2.4	< 0.1	-	61.2
P-5	0.1	-	*<0.7*	**5,600**	0.74	-	-	< 0.02	0.11	*9.9*	< 0.1	-	*170*
P-5R	0.2	16.8	16	-	56.7	4.5	1,990	0.96	1.59	116	-	12.5	2,670
P-6R	0.2	15.4	3.1	-	70.6	2.03	2,480	0.89	1.09	122	-	14.5	114
Q-1	< 0.06	-	< 0.2	< 40	0.19	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	0.7
Q-2	0.1	-	< 0.2	**44.1**	< 0.1	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*<2.3*
Q-3	0.88	-	< 0.2	2,620	< 0.1	-	-	< 0.02	< 0.02	0.3	< 0.1	-	*<0.7*
Q-4	0.34	-	0.3	380	0.10	-	-	< 0.02	< 0.02	1.5	< 0.1	-	0.4
Q-5	0.20	-	*2.3*	**4,200**	3.99	-	-	< 0.02	< 0.02	*11.6*	< 0.1	-	*42.0*
Q-5R	0.38	9.3	3.8	-	63	0.74	1,500	0.45	0.48	76.4	-	4.6	227
Q-6R	0.1	9.6	0.86	-	78.2	0.85	1,240	0.53	0.56	74.7	-	5.6	56.5
R-1	< 0.06	-	0.8	< 40	0.16	-	-	< 0.02	< 0.02	0.5	< 0.1	-	8.7
R-2	0.1	-	0.2	**331**	< 0.1	-	-	< 0.02	< 0.02	*2.3*	< 0.1	-	*2.3*
R-3	1.05	-	1.8	2,470	< 0.1	-	-	< 0.02	< 0.02	2.0	< 0.1	-	*0.2*
R-4	0.37	-	0.9	304	0.26	-	-	< 0.02	< 0.02	7.7	< 0.1	-	0.7
R-5	0.30	-	*6.4*	**3,140**	5.85	-	-	0.66	< 0.02	*21.8*	< 0.1	-	*13.9*
R-5R	0.61	9.6	22	-	24.4	< 0.1	1,770	0.42	0.25	68.4	-	2.2	280
R-6R	0.1	10.3	2.6	-	34.7	< 0.1	1,450	0.3	0.22	44.7	-	4.5	143
S-1	< 0.06	-	2.6	< 40	< 0.1	-	-	< 0.02	< 0.02	< 0.1	< 0.1	-	< 0.1
S-2	0.1	-	0.3	**372**	< 0.1	-	-	< 0.02	< 0.02	*0.1*	< 0.1	-	*<2.3*
S-3	0.68	-	4.5	2,170	< 0.1	-	-	< 0.02	< 0.02	0.5	< 0.1	-	*<0.7*
S-4	0.39	-	2.6	259	0.13	-	-	< 0.02	< 0.02	1.9	< 0.1	-	0.3
S-5	0.22	-	*16.0*	**3,270**	1.24	-	-	0.4	< 0.02	*14.3*	< 0.1	-	*13.6*
S-5R	0.33	7.6	84	-	19.1	0.13	1,040	0.5	0.35	73.2	-	1.2	352
S-6R	0.1	9.8	39	-	25.6	< 0.1	1,130	0.66	0.43	84.3	-	2.1	425
T-1	< 0.06	-	0.3	< 40	< 0.1	-	-	< 0.02	< 0.02	0.7	< 0.1	-	8.8
T-2	0.08	-	< 0.2	**174**	< 0.1	-	-	< 0.02	< 0.02	*1.9*	< 0.1	-	*1.7*

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sample ID	Extract Step	Lab No	Job No.	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr
T-3	02Ely2A	Extract 3	20-3	-	< 0.6	*79.1*	0.4	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.08	0.5
T-4	02Ely2A	Extract 4	20-4	-	< 0.6	*73.8*	< 0.2	0.51	< 0.01	< 0.04	< 40	*0.01*	-	0.12	0.5
T-5	02Ely2A	Extract 5	20-5	-	4.02	*348*	0.4	54.3	< 0.01	2.36	< 40	< 0.004	-	1.42	**15.4**
T-5R	02Ely2A	Residue 5	C-275618	MRP-06906	<2	56,600	1.6	218	1.6	0.59	13,000	0.92	15.7	17.9	89.9
T-6R	02Ely2A	Residue 6	C-275640	MRP-06906	<2	75,500	<1	252	2.2	0.16	18,600	0.1	17.2	6.5	101
U-1	02Ely10A	Extract 1	21-1	-	< 0.6	6.10	< 0.2	0.42	< 0.01	< 0.04	< 40	< 0.004	-	0.04	< 0.2
U-2	02Ely10A	Extract 2	21-2	-	< 0.6	43.6	< 0.2	0.68	< 0.01	< 0.04	*<136*	0.01	-	0.009	**1.4**
U-3	02Ely10A	Extract 3	21-3	-	< 0.6	*105*	0.6	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.01	0.6
U-4	02Ely10A	Extract 4	21-4	-	2.56	*92.7*	< 0.2	2.95	< 0.01	0.07	< 40	*0.01*	-	0.06	0.7
U-5	02Ely10A	Extract 5	21-5	-	13.0	*661*	0.5	43.3	0.01	7.02	< 40	0.07	-	4.14	**15.7**
U-5R	02Ely10A	Residue 5	C-275619	MRP-06906	<2	43,000	2.3	166	0.99	3.09	9,730	1.1	14.6	36.2	92.2
U-6R	02Ely10A	Residue 6	C-275641	MRP-06906	<2	60,100	<1	229	1.4	2.52	14,800	1.3	18	41.9	117
V-1	04PKHL9	Extract 1	22-1	-	< 0.6	22.5	< 0.2	< 0.04	0.01	< 0.04	1,240	0.12	-	19.3	< 0.2
V-2	04PKHL9	Extract 2	22-2	-	< 0.6	76.6	< 0.2	0.54	< 0.01	< 0.04	*<136*	0.07	-	1.89	**0.9**
V-3	04PKHL9	Extract 3	22-3	-	< 0.6	*156*	1	< 0.04	< 0.01	< 0.04	< 40	< 0.004	-	0.26	0.5
V-4	04PKHL9	Extract 4	22-4	-	3.46	*53.7*	0.2	4.86	< 0.01	< 0.04	< 40	*0.01*	-	0.31	0.3
V-5	04PKHL9	Extract 5	22-5	-	16.1	*427*	1	26.7	< 0.01	6.03	< 40	< 0.004	-	5.74	**10.2**
V-5R	04PKHL9	Residue 5	C-275620	MRP-06906	3.2	21,000	5.8	171	0.65	1.17	3,440	1.1	6.8	68.2	25.9
V-6R	04PKHL9	Residue 6	C-275642	MRP-06906	<2	28,400	<1	236	1	0.37	4,830	0.36	8.4	31.8	45.6
W-1	04PKHL11	Extract 1	23-1	-	< 0.6	6.36	< 0.2	< 0.04	< 0.01	< 0.04	3,390	0.04	-	1.06	< 0.2
W-2	04PKHL11	Extract 2	23-2	-	< 0.6	16.4	< 0.2	0.09	< 0.01	< 0.04	*113*	0.02	-	0.11	**1.8**
W-3	04PKHL11	Extract 3	23-3	-	< 0.6	*39.6*	0.4	< 0.04	< 0.01	< 0.04	94.1	< 0.004	-	0.06	0.4
W-4	04PKHL11	Extract 4	23-4	-	0.70	*37.5*	< 0.2	0.64	< 0.01	< 0.04	< 40	*0.01*	-	0.08	< 0.2
W-5	04PKHL11	Extract 5	23-5	-	6.43	*244*	0.5	33.0	< 0.01	4.68	< 40	< 0.004	-	4.34	**13.8**
W-5R	04PKHL11	Residue 5	C-275621	MRP-06906	<2	40,700	3.1	204	1.5	1.37	8,300	0.21	7.6	43.6	45.8
W-6R	04PKHL11	Residue 6	C-275643	MRP-06906	<2	48,400	<1	235	2.1	0.14	10,500	0.03	3.8	4.2	50.1
X-1	NZ-Newmont-A	Extract 1	24-1	-	< 0.6	3.61	2	< 0.04	0.03	< 0.04	2,390	0.007	-	0.69	< 0.2
X-2	NZ-Newmont-A	Extract 2	24-2	-	< 0.6	166	0.7	16.6	0.1	< 0.04	*810*	0.07	-	0.99	**4.7**
X-3	NZ-Newmont-A	Extract 3	24-3	-	< 0.6	*422*	1	8.50	0.03	< 0.04	196	0.02	-	0.86	7.6
X-4	NZ-Newmont-A	Extract 4	24-4	-	5.76	*503*	2	50.4	0.1	< 0.04	78.0	*0.05*	-	1.88	8.2
X-5	NZ-Newmont-A	Extract 5	24-5	-	5.18	*1,982*	6.1	10.1	0.2	0.04	< 40	< 0.004	-	1.70	**26.8**
X-5R	NZ-Newmont-A	Residue 5	C-275622	MRP-06906	6.9	51,300	28.2	414	0.88	< 0.06	799	0.08	9.6	4.8	111
X-6R	NZ-Newmont-A	Residue 6	C-275644	MRP-06906	4	48,800	4.7	434	0.76	< 0.06	873	<0.007	5.6	0.39	70.4

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Cs	Cu	Fe	Ga	Ge	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb
T-3	0.07	22.0	1,120	< 0.01	< 0.01	-	-	< 0.2	7.26	0.3	0.54	< 20	-	< 0.08	-	*<0.2*	*0.17*
T-4	0.03	20.5	1,180	0.46	< 0.01	-	-	< 0.2	13.1	0.7	0.49	-	-	< 0.08	-	0.07	0.15
T-5	0.68	264	*53,670*	1.0	0.32	-	-	0.4	85.9	*7.8*	10.4	866	-	0.7	-	*19.2*	30.1
T-5R	1.4	2,250	153,000	14.4	-	11,500	8	7.1	5,620	1,360	23	16,700	8.3	9.7	4,050	35.1	34
T-6R	1.3	65.9	29,300	16.2	-	13,100	8	12.4	7,060	2,720	8.6	22,400	8.8	9.6	41.1	40.1	36
U-1	0.05	7.2	< 10	< 0.01	< 0.01	-	-	0.2	7.67	0.6	< 0.4	< 20	-	< 0.08	-	< 0.01	0.11
U-2	0.02	27.3	13	0.02	< 0.01	-	-	< 0.2	< 2	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.16
U-3	0.07	18.2	1,240	< 0.01	< 0.01	-	-	< 0.2	3.73	0.2	1.38	< 20	-	< 0.08	-	*0.1*	*0.34*
U-4	0.06	21.1	1,350	0.30	< 0.01	-	-	< 0.2	13.7	0.6	1.23	-	-	0.1	-	1.3	0.16
U-5	0.45	428	*50,670*	1.1	0.31	-	-	0.8	142	*11.1*	22.3	1,260	-	1.8	-	*37.2*	23.6
U-5R	2	1,630	155,000	10.4	-	8,940	7.3	9.2	6,320	1,050	23.3	10,400	5	15.6	2,420	22.2	26.7
U-6R	2.1	704	117,000	13.5	-	11,300	8.7	13.3	8,700	1,610	11.8	15,200	8.5	16.3	144	37.2	32.5
V-1	0.05	156	14	< 0.01	< 0.01	-	-	0.2	143	6.5	< 0.4	< 20	-	1.0	-	< 0.01	< 0.002
V-2	0.01	170	35	0.03	< 0.01	-	-	< 0.2	7.38	*<0.7*	< 0.4	< 20	-	0.1	-	*<0.5*	0.13
V-3	0.05	61.0	2,240	< 0.01	< 0.01	-	-	< 0.2	6.92	0.4	1.30	< 20	-	< 0.08	-	*<0.2*	*0.09*
V-4	< 0.004	29.6	1,290	0.23	< 0.01	-	-	< 0.2	20.9	1.0	0.82	-	-	0.08	-	1.9	0.10
V-5	0.09	232	*44,170*	0.98	0.25	-	-	0.2	198	*12.0*	14.8	967	-	0.9	-	*94.8*	19.1
V-5R	0.95	9,070	225,000	6.2	-	7,750	3.2	5.7	3,320	215	29.5	2,370	5.1	10.7	3,970	23.5	23.9
V-6R	1.2	2,480	161,000	7.5	-	10,200	3.8	10.2	4,010	200	18.3	3,420	7.5	9.4	146	15.8	31.4
W-1	0.07	20.0	< 10	< 0.01	< 0.01	-	-	0.2	35.0	2.3	< 0.4	< 20	-	0.2	-	< 0.01	< 0.002
W-2	0.02	32.3	23	0.03	< 0.01	-	-	< 0.2	2.64	*<0.7*	< 0.4	< 20	-	< 0.08	-	*<0.5*	0.16
W-3	0.03	16.0	1,160	< 0.01	< 0.01	-	-	< 0.2	4.43	0.4	0.53	< 20	-	< 0.08	-	*<0.2*	*0.14*
W-4	< 0.004	16.9	1,290	0.36	< 0.01	-	-	< 0.2	8.61	1.1	0.57	-	-	< 0.08	-	0.90	0.09
W-5	0.31	282	*59,470*	0.97	0.38	-	-	< 0.2	56.6	*12.5*	11.8	1,100	-	0.9	-	*55.5*	32.2
W-5R	0.98	5,780	168,000	14.3	-	13,000	3.7	11	6,940	211	18	7,940	8.6	5.1	4,470	30.5	40.8
W-6R	0.94	666	14,900	13.6	-	14,500	1.7	16.1	8,400	191	4.3	9,470	9	3.3	36.4	16.4	42.7
X-1	0.05	3.3	< 10	0.02	0.01	-	-	0.8	227	61.6	< 0.4	984	-	1.2	-	< 0.01	< 0.002
X-2	0.01	27.0	80	0.1	0.01	-	-	< 0.2	102	*493*	< 0.4	35.1	-	2.1	-	*6.7*	0.27
X-3	0.43	22.0	1,220	< 0.01	< 0.01	-	-	< 0.2	70.9	383	0.42	< 20	-	1.7	-	*23.1*	*1.52*
X-4	0.70	10.3	935	0.52	0.03	-	-	1.9	298	937	< 0.4	-	-	4.0	-	35.2	0.66
X-5	1.93	12.8	*4,880*	1.0	0.1	-	-	9.7	2,150	*284*	0.46	161	-	10.2	-	*14.2*	1.42
X-5R	6.8	35.5	19,800	8.1	-	33,100	6.2	97.3	4,380	272	0.53	3,680	4.4	14.2	245	8.5	142
X-6R	5.6	8	3,780	6.7	-	35,600	3.2	111	1,960	110	0.2	4,020	4.3	3	29.5	2.72	162

Appendix 3. Amounts of elements leached in sequential extraction experiments given in mg/kg[1]. -Continued

['-', not determined or not applicable; 'ins', insufficient material]

Extract ID	Sb	Sc	Se	SiO_2	Sr	Th	Ti	Tl	U	V	W	Y	Zn
T-3	1.03	-	0.5	2,700	< 0.1	-	-	< 0.02	< 0.02	2.2	< 0.1	-	*1*
T-4	0.38	-	0.4	506	0.20	-	-	< 0.02	< 0.02	8.0	< 0.1	-	1
T-5	0.23	-	*10.7*	**2,990**	6.88	-	-	0.3	< 0.02	*37.4*	< 0.1	-	*12.8*
T-5R	0.73	14.2	32	-	89.1	3.19	5,330	0.33	0.8	139	-	10.5	283
T-6R	0.28	18.6	2.8	-	124	1.89	4,660	0.31	0.78	115	-	14.2	91.1
U-1	< 0.06	-	1.1	< 40	0.14	-	-	< 0.02	< 0.02	0.2	< 0.1	-	< 0.1
U-2	0.08	-	< 0.2	**173**	< 0.1	-	-	< 0.02	< 0.02	*1.8*	< 0.1	-	*<2.3*
U-3	1.04	-	3.4	2,290	< 0.1	-	-	< 0.02	< 0.02	2.5	< 0.1	-	*<0.7*
U-4	0.43	-	1.3	580	0.27	-	-	< 0.02	< 0.02	7.9	< 0.1	-	0.8
U-5	0.29	-	*21.2*	**3,270**	6.00	-	-	0.2	0.02	*36.9*	< 0.1	-	*34.1*
U-5R	0.84	13	47	-	63.5	2.6	4,060	0.24	0.77	146	-	7.2	493
U-6R	0.36	17.7	27	-	97.3	2.38	4,930	0.27	0.86	168	-	11.9	557
V-1	< 0.06	-	1.8	< 40	0.67	-	-	< 0.02	< 0.02	0.4	< 0.1	-	13.4
V-2	0.07	-	0.3	**239**	0.16	-	-	< 0.02	< 0.02	*1.5*	< 0.1	-	*4.5*
V-3	1.32	-	10.4	3,410	< 0.1	-	-	< 0.02	< 0.02	1.9	< 0.1	-	*1*
V-4	0.39	-	2.7	659	0.54	-	-	< 0.02	< 0.02	2.9	< 0.1	-	1
V-5	0.69	-	*15.3*	**3,140**	11.6	-	-	0.3	< 0.02	*12.4*	< 0.1	-	*35.7*
V-5R	5	3.4	100	-	48.6	1.55	1,660	0.26	0.77	41.9	-	3.2	528
V-6R	3.2	4.4	55	-	74.2	1.07	1,140	0.32	0.78	44.3	-	4.4	337
W-1	< 0.06	-	0.4	< 40	0.75	-	-	< 0.02	< 0.02	0.2	< 0.1	-	3.9
W-2	0.09	-	0.3	**441**	0.19	-	-	< 0.02	< 0.02	*0.8*	< 0.1	-	*0.2*
W-3	0.93	-	0.7	2,660	< 0.1	-	-	< 0.02	< 0.02	0.8	< 0.1	-	*0*
W-4	0.43	-	0.8	556	0.41	-	-	< 0.02	< 0.02	3.6	< 0.1	-	0.9
W-5	0.28	-	*12.7*	**3,070**	20.6	-	-	0.56	< 0.02	*24.5*	< 0.1	-	*27.6*
W-5R	0.93	7.5	33	-	70.4	2.84	2,680	0.62	0.71	81.9	-	5.5	239
W-6R	0.32	8.1	5.0	-	83.5	0.33	1,850	0.6	0.55	71.9	-	5.7	53.9
X-1	< 0.06	-	< 0.2	254	4.20	-	-	< 0.02	< 0.02	0.6	< 0.1	-	2
X-2	0.1	-	< 0.2	**728**	4.92	-	-	< 0.02	< 0.02	*<0.6*	< 0.1	-	*15.3*
X-3	1.00	-	< 0.2	1,770	2.03	-	-	0.1	< 0.02	0.8	0.81	-	*10.1*
X-4	0.82	-	< 0.2	1,060	5.25	-	-	< 0.02	< 0.02	2.0	0.82	-	22.2
X-5	0.37	-	*2.7*	**4,240**	< 0.1	-	-	< 0.02	< 0.02	*12.7*	0.72	-	*48.2*
X-5R	14.1	9.1	0.60	-	61.3	3.55	1,870	1.88	0.78	53.5	-	5.6	109
X-6R	13.1	6.7	0.22	-	71.1	2.5	1,740	2.03	0.78	34.6	-	4.4	28.6

[1] Explanation of results: The concentrations in extracts 1 through 5 are presented as solid concentrations and were calculated from the extraction solution concentration and solid -to-extraction solution ratio. The concentrations in residues remaining after steps 5 (5R) and 6 (6R) are for solids. The sum of the solid phase results for extracts 1 through 5 plus extract 5R should sum to the total mass of the sample. The subtraction of 6R from 5R represents the mass released to aqueous and gaseous phases by step 6 reagents (fig. 5).

[2] Results from ICP-MS analysis for all elements except Se concentrations in residues, which were determined by HG-AAS.

[3] If the concentration of an element was near the detection limit in the blank, concentrations were not corrected. For samples with blank concentrations greater than the detection limit, the concentration in the blank was subtracted from the concentration in the samples for a given extraction step and the detection limit became the concentration in the blank (shown in italics).

[4] Concentrations of Cr and SiO_2 in blanks for steps 2 and 5 were equal to or greater than many extract concentrations. Data are invalid and shown in bold red.