Glossary

AHQ: Average Hazard Quotient

AMD: Acid Mine Drainage

ASM: Artisanal and Small-scale Mining

ASGM: Artisanal and Small-scale Gold Mining

ASTM: American Society for Testing and Materials

D: Distance from tailing deposit to water bodies

F_{SD}: Unprotected surfaces

F_{SUP-NA}: Environmental exposure factor

F_{SUP-PO}: Exposure factor for the population

F_{TOX}: Toxicity of mining wastes

ICP-MS: Inductively Coupled Plasma Mass Spectrometry

ICP-OES: Inductively Coupled Plasma Optical Emission Spectrometry

I_P: Probability Index

I_s: Severity Index

$I_s(NA)$: Severity Index for the natural environment

$I_s(PO)$: Severity Index for the population

LoD: Limit of Detection

MEL: Mining Environmental Liabilities

MPL: Maximum Permissible Limits

PCA: Principal Component Analysis

PC: Principal Components

P_E: Ecological vulnerability factor

P_{EX}: Factor of the population exposed to toxic elements

PO: Population

P_R: Proximity to water bodies

PTE: Potentially Toxic Elements

R_I: Risk of affectation

$R_I(NA)$: Risk of affectation on the natural environment

$R_I(PO)$: Risk of affectation on the population

S_{EX}: Exposed area of the tailing deposit

USGS FLT: U. S. Geological Survey Field Leaching Test Method

V_E: Vulnerability factor of the exposed population

V_P: Vulnerability factor of the exposed population

Supplementary materials

Figure S1. Particle size distribution curves of tailings samples.

Figure S2. Percentage of semi-quantitative minerals in the tailing's samples.

Figure S3. Spearman correlation for the PTE measured in tailings samples.

Figure S4. Contamination Index calculated for tailing samples.

Figure S5. Risk map of tailing samples for population and environment.

Table S1. Assessment criteria of parameters for the severity index (Is) determination on the population and the environment.

Table S2. Statistical summary of the PTE concentration (mg/kg) and pH values in tailings samples.

Table S3. Index of contamination (IC) calculated for the tailings samples.

Table S4. Individual contribution of PTEs to the Index of contamination.
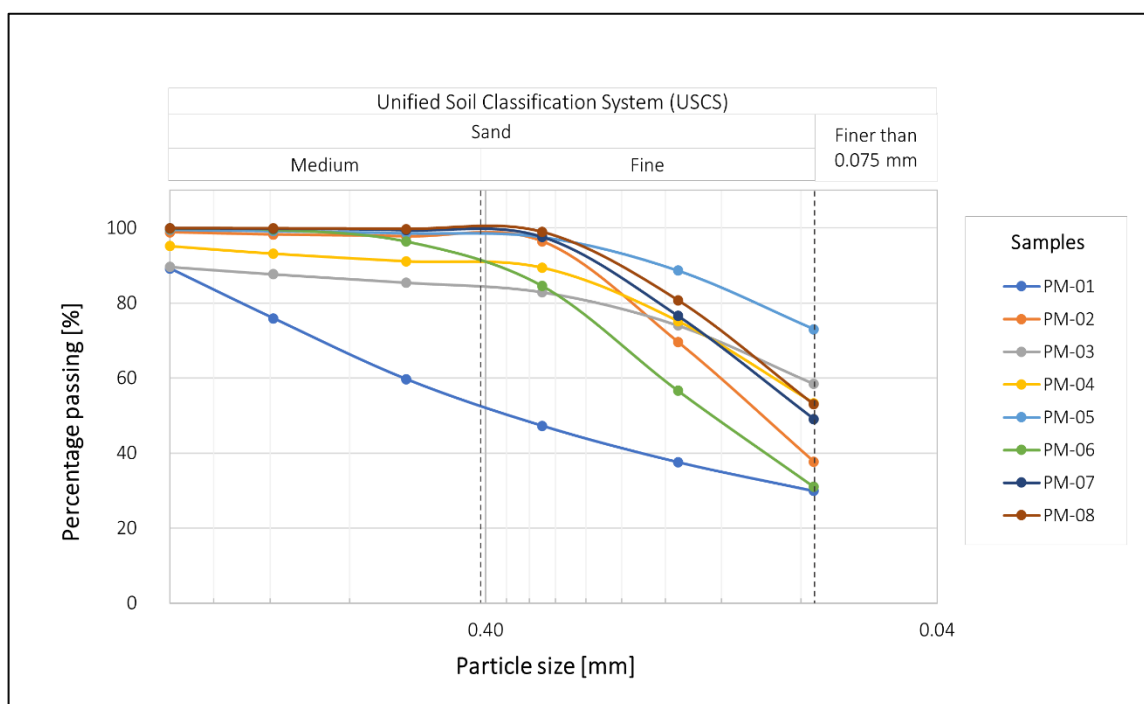
Figure S1. Particle size distribution curves of tailings samples
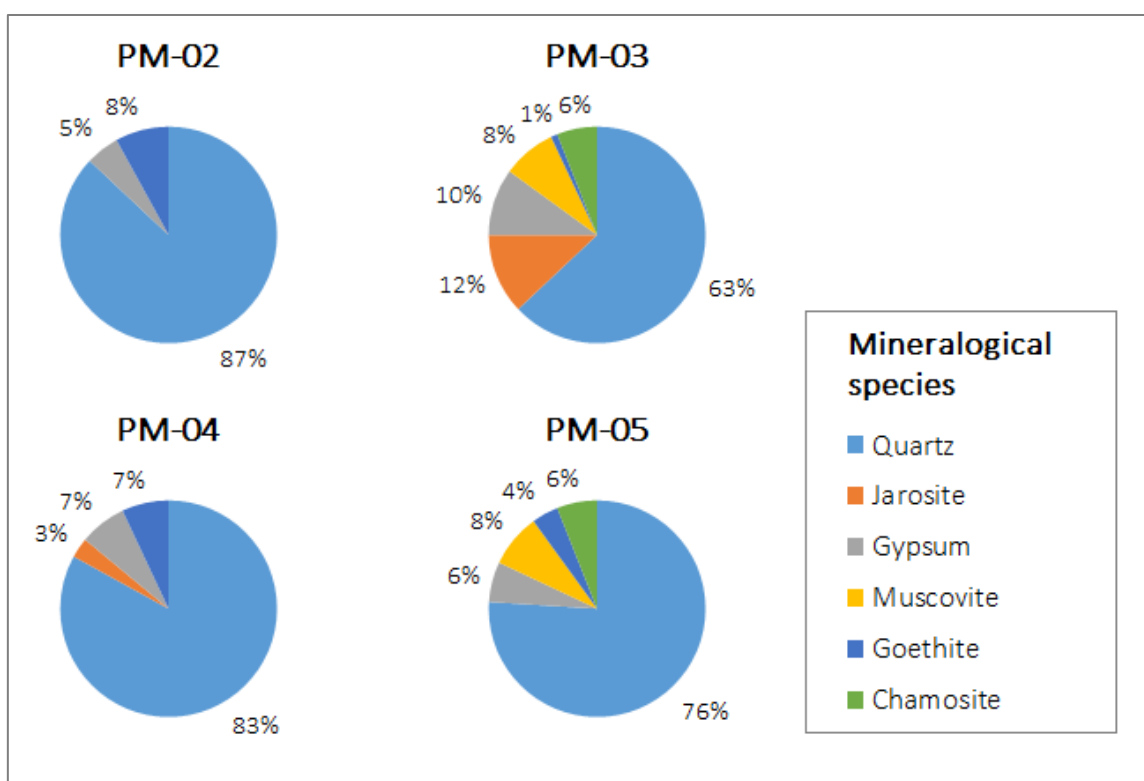

Figure S2. Percentage of semi-quantitative minerals in the tailing's samples.
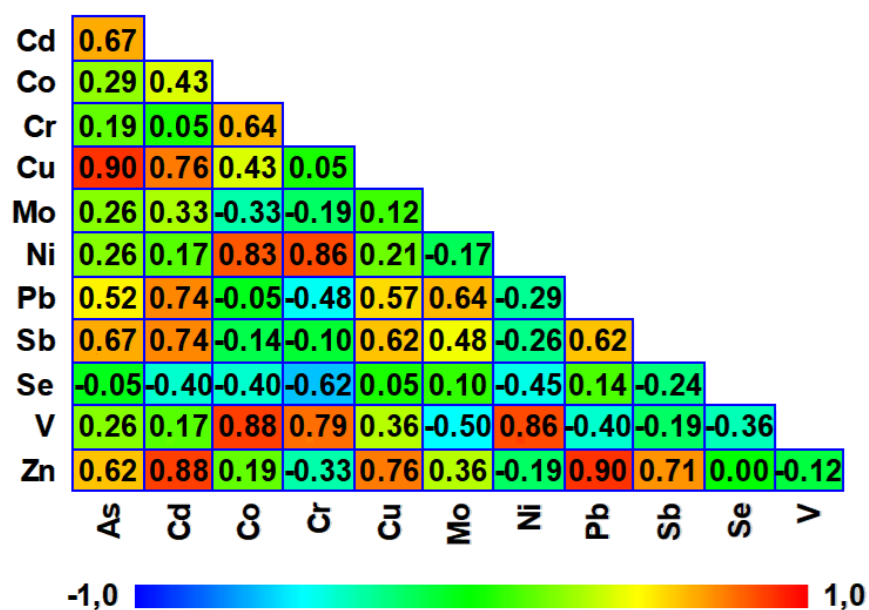
Figure S3. Spearman correlation for the PTE measured in tailings samples.
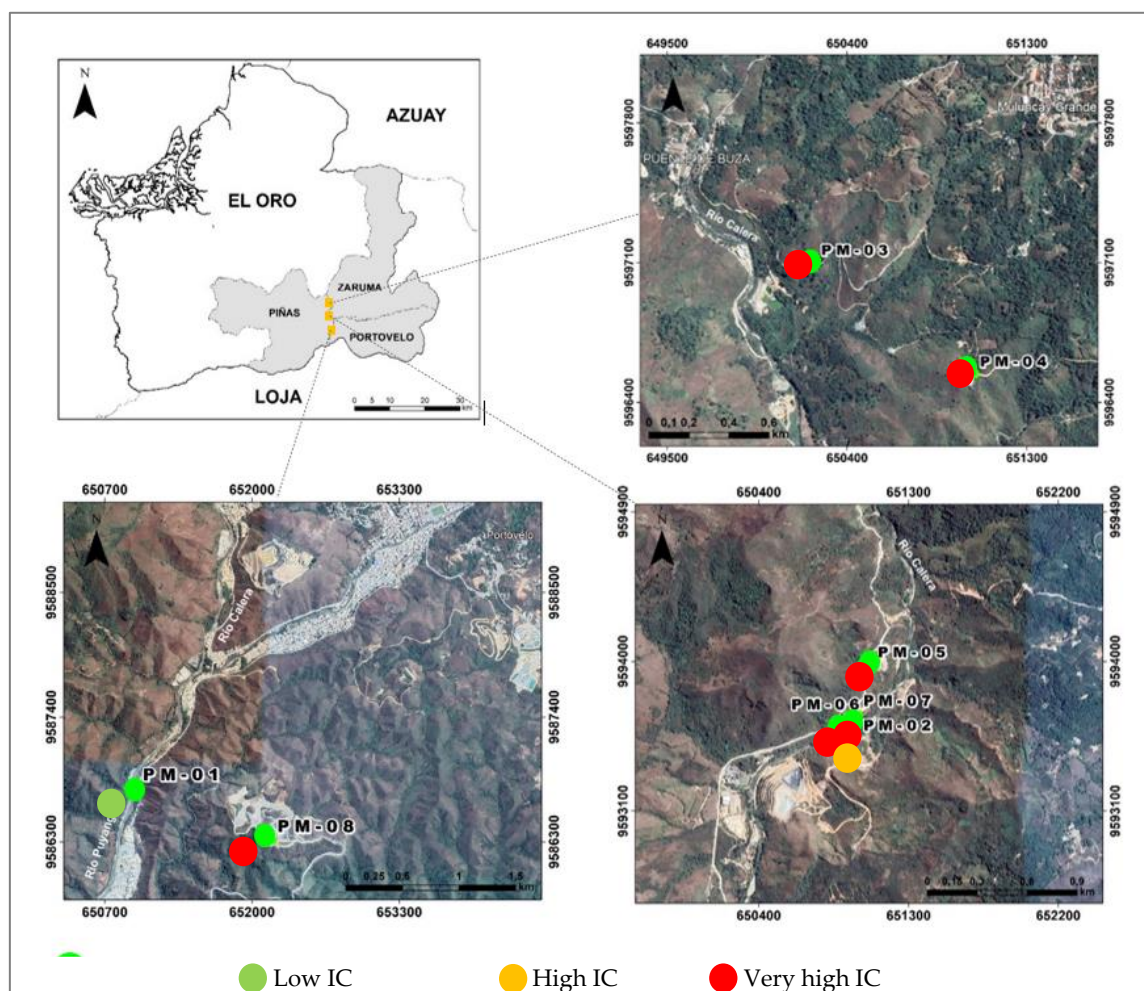

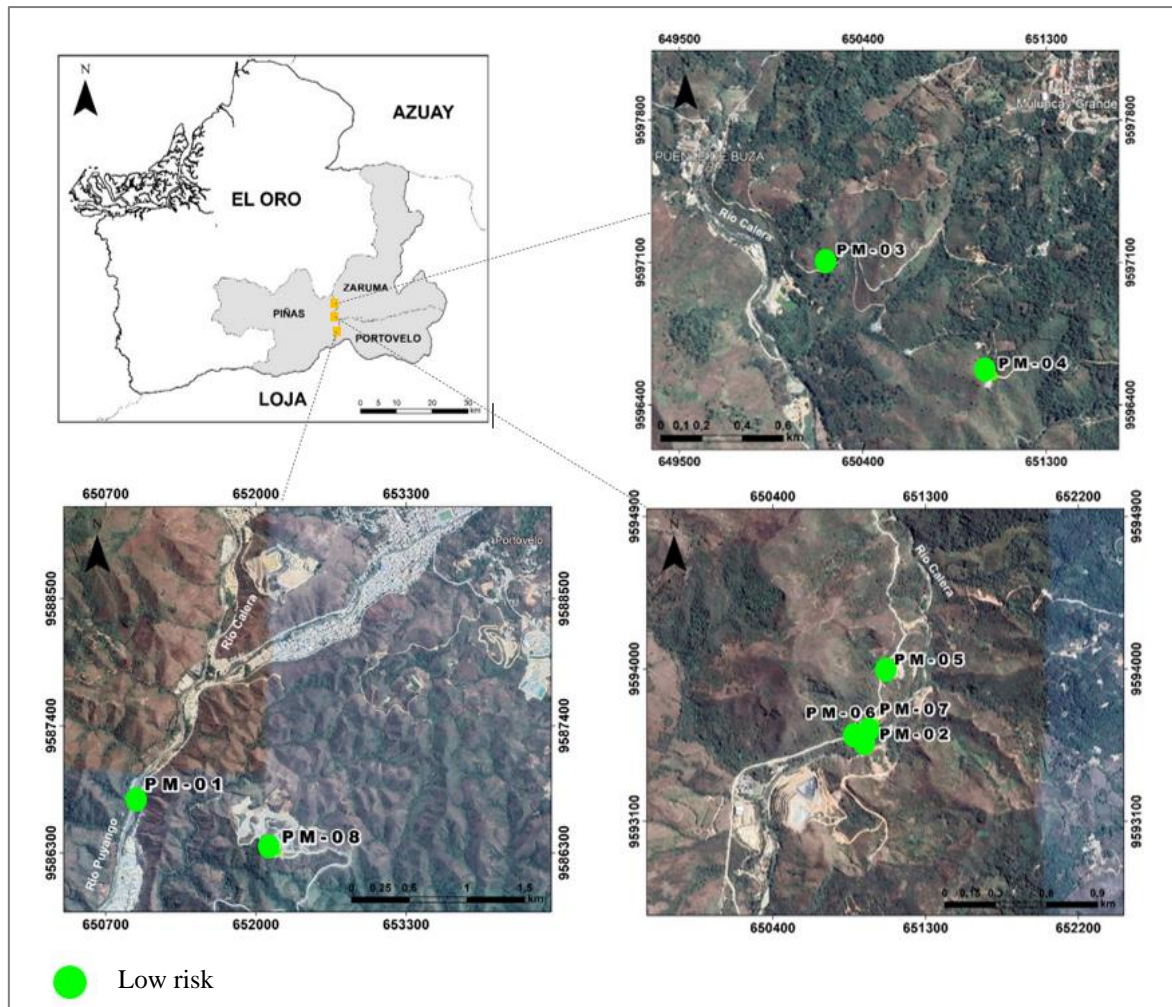**Figure S4.** Contamination Index (IC) calculated for tailing samples.

Figure S5. Risk map of tailing samples for population and environment

Table S1. Assessment criteria of parameters for the severity index (Is) determination on the population and the environment.

Parameter	Criteria	Value
Exposed population to toxic elements factor (P_{EX})*	$SP \leq 50$	$P_{EX} = 0.1 \times SP$
	$SP > 50$	$P_{EX} = 5$
Exposure factor (F_{SUP}): F_{SUP-PO} for population and F_{SUP-NA} for environment	$D \leq 100$ m	$F_{SUP} = 1$
	$100 < D \leq 5000$ m	$F_{SUP} = (-0.0002 \times D) + 1$
	$D > 5000$ m	$F_{SUP} = 0$

Vulnerability factor of the exposed population (VP)		Ecological vulnerability factor (VE)	
Criteria	**Value**	**Criteria**	**Value**
Use of Very Highly Vulnerable Water: Supply water to the population (wells for private use and catchments of water intended for human consumption, which supply more than 50 people or population centers).	5	Very Highly Vulnerable Resources and Ecosystems: Sensitive areas (environmental protection of resources and ecosystems). Surface water bodies with very ecological status.	5
Highly Vulnerable Water Use: Irrigation (orchards, other crops, and pastures) and other agro-livestock uses (water troughs). Aquaculture, fishing grounds and recreational use (bathing area).	4	Highly Vulnerable Resources and Ecosystems: Well conserved wetlands not included in the Ramsar Convention or the INHZ. Surface water bodies with a good ecological status.	4
Use of Vulnerable Water: Recreational use (sport fishing). Water for park irrigation.	3	Vulnerable Resources and Ecosystems: Surface water bodies with moderate ecological status.	3
Use of Low Vulnerable Water: Industrial use, generation of energy (for cooling) and other industrial uses, water for irrigation of golf courses, navigation and water transport. Water: Recreational use (sport fishing). Water for park irrigation.	2	Low Vulnerable Resources and Ecosystems: Surface water bodies with poor water status.	2
Use of Water Very Little Vulnerable: Other uses with low exposure.	1	Very Low Vulnerable Resources and Ecosystems: Surface water bodies with a bad ecological status.	1

* Considering a maximum radius of 5 km from the tailing deposit.

SP = Supplied people with surface water; D = Distance from the pollutant load in surface water body to the population (for F_{SUP-PO}) or environmental interest areas (for F_{SUP-NA}).

Table S2. Statistical summary of the PTE concentration (mg/kg) and pH values in tailings samples.

Parameter	Min	p50	p95	Max	S.D.
pH	2.60	3.25	6.99	7.30	1.77
As	23.60	444.20	5366.00	5772.00	2384.19
Cd	0.20	0.90	63.89	96.20	33.51
Co	2.40	13.25	35.94	42.90	13.48
Cr	25.10	44.50	83.86	88.30	23.60
Cu	1.68	199.55	732.38	812.60	305.98
Mo	1.00	4.85	20.45	25.80	7.94
Ni	3.10	11.05	35.72	42.40	13.07
Pb	37.40	529.30	4500.95	6196.00	2062.45
Sb	14.60	75.75	162.88	166.10	56.96
Se	1.20	8.50	12.98	14.10	3.99
V	68.70	106.90	216.04	246.80	57.80
Zn	106.80	172.35	12161.02	18392.00	6422.35

Min = minimum, Max = maximum, p50 = percentile 50, p95 = percentile 95, S.D. = standard deviation.

Table S3. Index of contamination (IC) calculated for the tailings samples.

PTE	PM-01	PM-02	PM-03	PM-04	PM-05	PM-06	PM-07	PM-08
As	0.46	3.45	98.13	8.15	76.21	9.89	11.12	102.34
Cd	0.00	0.00	0.00	0.00	0.27	0.39	0.00	7.29
Co	0.30	0.00	0.32	0.19	0.20	0.00	0.00	0.52
Cr	0.19	0.00	0.18	0.00	0.14	0.00	0.12	0.09
Cu	0.42	1.07	11.99	4.63	5.28	4.09	2.22	10.92
Mo	0.15	0.21	0.00	0.28	1.30	0.47	0.65	0.23
Ni	0.21	0.00	0.11	0.00	0.00	0.00	0.00	0.11
Pb	0.14	0.89	0.34	2.60	2.54	6.01	2.11	20.65
Sb	2.14	5.09	15.13	6.58	23.01	29.75	13.04	10.58
Se	0.15	1.95	0.78	2.24	1.26	0.85	1.55	0.87
V	0.24	0.19	0.41	0.18	0.17	0.13	0.14	0.18
Zn	0.16	0.29	0.24	0.35	0.49	1.06	0.20	24.72
Sum (IC)	4.56	13.14	127.63	25.20	110.88	52.63	31.15	178.50

Table S4. Individual contribution (%) of PTE to the Index of contamination

PTE	Index of Contamination (IC)							
	PM-01	PM-02	PM-03	PM-04	PM-05	PM-06	PM-07	PM-08
As	9.88	25.69	76.79	32.11	68.69	18.74	35.55	57.33
Cd	1.25	0.14	0.08	0.29	0.25	0.75	0.15	4.08
Co	6.57	0.92	0.25	0.73	0.18	0.08	0.12	0.29
Cr	4.14	0.69	0.14	0.26	0.12	0.13	0.37	0.05
Cu	9.12	7.98	9.39	18.24	4.76	7.75	7.08	6.12
Mo	3.30	1.53	0.04	1.11	1.17	0.88	2.07	0.13
Ni	4.63	0.32	0.09	0.16	0.07	0.04	0.13	0.06
Pb	2.94	6.66	0.27	10.23	2.29	11.40	6.74	11.57
Sb	46.32	37.95	11.84	25.91	20.74	56.38	41.71	5.93
Se	3.23	14.54	0.61	8.84	1.14	1.61	4.97	0.49
V	5.21	1.44	0.32	0.72	0.16	0.24	0.45	0.10
Zn	3.39	2.13	0.19	1.39	0.44	2.00	0.65	13.85
	100%	100%	100%	100%	100%	100%	100%	100%