



**Soil evaluation of the Soil of the Sports Field and Public Playground in
Araqueda in the District of Cachachi, Province of Cajabamba,
Department of Cajamarca, Peru.**

Report of Results and Recommendations

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The Environmental Health Council (EHC) is a U.S.-based nonprofit organization dedicated to identifying, evaluating, and remediating the effects of environmental toxins on affected communities. We work through a combination of scientific assessment, advocacy, and collaboration with communities and authorities to promote environmental and public health.

Within this framework, the Environmental Health Council analyzed and evaluated the soil of the sports field and public playground in Araqueda in the District of Cachachi, province of Cajabamba, department of Cajamarca, Peru.

The technical evaluation aimed to:

1. Determine whether contamination from historic mining operations—including mineral processing and refining activities dating from the 18th century has left heavy metal pollution (*legacy contamination*).
2. Quantify concentrations of heavy metals—specifically lead (Pb), mercury (Hg), and arsenic (As) that may affect children and others who access the park and sports field.
3. Compare these concentrations with the Environmental Quality Standards (ECAs) established by the Peruvian government (*Supreme Decree N° 011-2017-MINAM*) for residential/park soils.
4. Identify any critical areas requiring attention, assess potential health risks to the community, and propose technical recommendations based on the findings.

Sampling and Methodology

Twelve soil samples were collected in specific spaces of the Araqueda sports area and park were evaluated. Samples were collected from the following spaces: 1) Public Sports Field and 2) Public Playground (in front of I.S Araqueda).

The analysis was conducted using a portable X-ray fluorescence (XRF) spectrometer (SciAps model X550), with results expressed in parts per million (ppm or mg/kg) to evaluate the presence of lead (Pb), mercury (Hg), and arsenic (As). Additional metals were analyzed by the XRF but only the metals of interest, due to their association with legacy mining impacts and because of their toxicological relevance, are presented in this report.

The ECAs for residential/park soils are:

- Arsenic (As): 50 mg/kg (ppm)
- Mercury (Hg): 6.6 mg/kg (ppm)
- Lead (Pb): 140 mg/kg (ppm)

The results of the analysis of the samples are presented in the tables presented below:

Sample	Sample Location	As (ppm)	Hg (ppm)	Pb (ppm)	Exceeds ECA
ARAQ26-R-1	Public Sports Field	101	5.1	84	As
ARAQ26-R-2	Public Sports Field	87	8.1	109	As, Hg
ARAQ26-R-3	Public Sports Field	121	9.9	130	As, Hg
ARAQ26-R-4	Public Sports Field	75	4.7	100	As
ARAQ26-R-5	Average	96	6.9	106	As, Hg

* ppm = parts per million.

* ECA = Environmental Quality Standard.

* ND = Not detected at approximately 1 ppm

Sample	Sample Location	As (ppm)	Hg (ppm)	Pb (ppm)	Exceeds ECA
ARAQ26-R-6	Public Sports Field	51	3.3	81	As
ARAQ26-R-7	Public Sports Field	135	9.9	172	As, Hg, Pb
ARAQ26-R-8	Public Sports Field	64	4.4	76	As
ARAQ26-R-9	Public Sports Field	112	6.9	222	As, Hg, Pb
ARAQ26-R-10	Average	90	6.1	138	As

* ppm = parts per million.

* ECA = Environmental Quality Standard.

* ND = Not detected at approximately 1 ppm

Sample	Sample Location	As (ppm)	Hg (ppm)	Pb (ppm)	Exceeds ECA
ARAQ26-R-11	Public Playground	53	5.2	94	As

ARAQ26-R-12	Public Playground	38	ND	70	None
ARAQ26-R-13	Public Playground	ND	ND	26	None
ARAQ26-R-14	Public Playground	53	ND	53	As
ARAQ26-R-15	Average	36	ND	61	None

* ppm = parts per million.

* ECA = Environmental Quality Standard.

* ND = Not detected at approximately 1 ppm

As results in soil range from 38 to 135 ppm and 10 of 12 sample results exceed the ECA of 50 ppm. The highest concentration was detected at sample location ARAQ26-R-7 at 135 ppm which exceeds the ECA by 2.7 times.

Hg results in soil range from 3.3 to 9.9 ppm and 4 out of 12 sample results exceed the ECA of 6.6 ppm. The highest concentration was detected at sample locations ARAQ26-R-3 and R-7, both at 9.9 ppm which exceeds the ECA by 1.5 times.

Pb results in soil range from 26 to 222 ppm and 2 out of 12 sample results exceed the ECA of 140 ppm. The highest concentration was detected at sample location ARAQ26-R-9 at 222 ppm which exceeds the ECA by 1.6 times.

Areas of concern:

The results indicate variable contamination within the Araqueda area, such as:

1. *Most critical points of contamination:* The samples ARAQ26-R-1, 2, 3, 4, 6, 7, 8, 9, 11 and 14 (Sports field and public playground) show levels that are in excess of the ECA for the 3 contaminants analyzed.
2. *Localized contamination in Araqueda:* Soil contamination in the area is not homogeneous. Samples ARAQ26-R-12 and 13 have levels of 2 metals below the ECAs. Samples ARAQ26-R-1, 2, 3, 4, 6, 7, 8, 9, 11 and 14 show significant contamination for all three contaminants.
3. *Risk to people accessing these areas:* The area of the public sports field (ARAQ26-R-1, 2, 3, 4, 6, 7, 8 and 9, not ruling out ARAQ26-R-11 and 14) presents concerning levels of mercury and lead (Hg 9.9 ppm and Pb 222 ppm) exceeding the ECA. Contact with and exposure to arsenic, mercury, or lead in children and adolescents can cause irreversible neurological damage, attention deficit and decreased IQ among other potential health effects.

Conclusions:

1. Critical areas were identified within the sports field and public playground in Araqueda that exceed the ECAs established in Supreme Decree No. 011-2017-MINAM – for residential land/parks of the Government of Peru.
2. The area of the public sports field (ARAQ26-R-1, 2, 3, 4, 6, 7, 8 and 9), presents greater concern, with high levels of 3 of the metals analyzed and immediate action

is required from the competent authorities to manage this risk, prioritizing the protection of the health of children, adolescents and the community in general.

3. There are significant health risks for the residents who use the area and spaces of Araqueda.

Recommendations:

1. Delimit and restrict access to the public sports field area (ARAQ26-R-1, 2, 3, 4, 6, 7, 8 and 9, not ruling out ARAQ26-R-11 and 14) contaminated with mercury and lead.
2. Conduct additional testing using fixed laboratory methods such as ICPMs, or AAS to support the accuracy of the XRF results. Additional testing of the extent of the contamination using XRF analysis may also help define how much area is contaminated and may help provide more detail on where mitigation needs to take place.
3. Cover the contaminated area with clean materials (with soil not contaminated by metals), putting layers of clean soil and geotextile, followed by grass on top to avoid direct contact and the generation of dust. Also to reduce future exposure, damaged grass or exposed soil, should be replaced with grass or other healthy vegetation.
4. Notify the authorities and parents about the findings and preventive measures and the actions to be taken.
5. Inform the relevant local, regional and national authorities of the findings.

Attachment: Figure – Sample Locations



0 10 20 40 Meters

Soil Sample Locations
July 2026
Araqueda Soccer Field
Araqueda, Cajamarca





0 5 10 20 Meters

Soil Sample Locations
July 2026
Ninos Felices Playground
Araqueda, Cajamarca

