ENVIRONMENTAL HEALTH COUNCIL

Soil Assessment of Educational Institution Grounds in the Districts of Cátac and Ticapampa, Province of Recuay, Áncash Region, Peru

Sampling Date: July 12, 2025

Results and Recommendations Report

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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 the framework of the Council's objectives, the soil of educational institution grounds in the districts of Cátac and Ticapampa, Province of Recuay, Áncash Region, Peru, was identified, analyzed, and evaluated.

Based on historical research, during the 18th, 19th, and 20th centuries in the Cordillera Negra, specifically in the Ticapampa area, mining operations were carried out for lead, silver, gold, limestone, and marble. Over time, these activities contaminated the soil, water, and air with heavy metals. In 1860, Portuguese, Polish, English, and French miners conducted early explorations in the Cordillera Negra, at the Tucu, Cotaparaco, and Santa Rosa (now Collaracra) mines, west of the current Ticapampa district. At the same time, the first metallurgical office was established in Parco (Cátac).

Additionally, due to the mineral wealth of this area, Italian naturalist Antonio Raimondi conducted a mining study of the Ticapampa and Cátac areas in the 1860s. In his book *Áncash* (Lima, Peru: P. Lira, 1873, p. 57), he reported several estates where silver minerals were refined in mines located in the Cordillera Negra, such as Santa Rosa, San Ildefonso, La Natividad, El Pilar, La Merced, San José, Santa Gertrudis, and El Cármen. Today, some of these sites are destroyed or renamed, while others have developed into communities.

Purpose of the Assessment

The objective of this evaluation was to determine the presence of contamination from historical silver mining and refining operations during the 18th, 19th, and 20th centuries. These activities often left behind heavy metal contamination, also known as "legacy contamination." The assessment aimed to determine the extent and levels of exposure to lead (Pb), mercury (Hg), and arsenic (As) for students and staff at the schools

(educational institutions) of preschool, primary, and secondary levels in the districts of Cátac and Ticapampa, located in the Cordillera Negra.

Soil Sampling
A total of 70 soil samples were collected from the communities of Recuay, Ticapampa, Cayac, and Parco. Of those samples, 15 were collected from the following school grounds (several schools had more than one sample collected):

Educational Institutions (I.E.) in Cátac

- I.E. Primary No. 86613 Fray Martín de Porres – Parco
- I.E. Preschool No. 033 – Parco
- PRONOEI - Los Girasoles (Non-Schooling Preschool) - Hatun Huishca

Educational Institutions (I.E.) in Ticapampa

- I.E. (primary and secondary) No. 86569 Santiago Antunez de Mayolo – Cayac
- I.E. Preschool No. 285 – Cayac
- I.E. Preschool No. 038 – Los Angelitos del Pilar
- I.E. Preschool No. 412 – Chuyan
- I.E. Preschool No. 417 – Santa Gertrudis
- I.E. Preschool No. 419
- I.E. (primary and secondary) No. 86568 Nuestra Señora del Pilar
- I.E. Primary No. 86601 / PRONOEI - Pequeños Exploradores (Non-Schooling Preschool) - Ichic Huishca (both schools at the same location)

The locations of historical gold and silver milling and refining operations were identified through searches of historical rural property archives at the Regional Agriculture Directorate of Áncash and mining settlement and concession records from the Regional Energy and Mining Directorate of Áncash, as well as reports by naturalist Antonio Raimondi. Exploratory fieldwork was also conducted to locate the historical mining sites and schools in the Cordillera Negra within the districts of Cátac and Ticapampa.

Permissions and authorization for soil sampling at the schools were obtained through Lic. Angela Cristilda Sarmiento Pereda, Director of the Local Educational Management Unit Recuay (UGEL RECUAY), who notified all school directors to allow access and consent for sampling during fieldwork.

Fieldwork and Sample Collection
EHC team members conducted fieldwork on July 11, 2025, identifying the geographic location of each school by district. Soil samples were collected within the grounds of each educational institution, with photographic documentation of the sampling areas. Many school grounds were covered with concrete, so samples were taken from exposed soil areas such as playgrounds, gardens, and patios. Old adobe and rammed-earth walls were also sampled to obtain more representative soil samples.

On July 12, 2025, analyses were conducted on the soil samples from the communities, including the schools. The evaluation involved analyzing the soil samples with a portable X-ray fluorescence (XRF) field device (SciAps model X550), reporting results in ppm (mg/kg) for heavy metal assessment. Lead (Pb), mercury (Hg), and arsenic (As) were detected in soil, especially where amalgamation was suspected. Heavy metal levels varied by school and in some cases exceeded the Environmental Quality Standards (ECA) for soil, according to Supreme Decree N 011-2017-MINAM of the Peruvian Government. Criteria for “Residential Use Soil” were applied, appropriate for schools and communities.

Priority Elements Analyzed
The main heavy metals and metalloids of toxicological concern commonly associated with mining activities were prioritized: arsenic (As), lead (Pb), and mercury (Hg). The Environmental Quality Standards (ECA) for these metals in soil are:

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

Summary of Sample Results on School Grounds

- **Arsenic (As):** The most critical contaminant. Multiple samples significantly exceeded the 50 ppm ECA. Sample TIC25-R-4 (I.E. Preschool No. 038 – Los Angelitos del Pilar) averaged 1447 ppm, TIC25-R-6 (125 ppm), and PAR-R-2 (151 ppm) also showed high-risk levels.
- **Lead (Pb):** Second most critical contaminant. Sample TIC25-R-6 (I.E. Preschool 419 Primavera) averaged 239 ppm, TIC25-R-4 (198 ppm) (I.E. Preschool No. 038 – Los Angelitos del Pilar) also showed elevated levels.
- **Mercury (Hg):** No samples had exceedances.

Recommendations

- **Remove Contaminated Soil:** Excavate and dispose of contaminated soil off site following local and federal regulations. In addition, if excavation depth is impractical, the contaminated soil can be capped with clean soil or clean material like concrete.
- **Fence and Restrict Access:** Around highly contaminated areas, especially TIC25-R-4 (Los Angelitos del Pilar) and TIC25-R-6 (Primavera). Post hazard warning signs.
- **Notify Authorities:** Inform the Regional Health Directorate (DIRESA), Ministry of Education, and local governments about the findings.
- **Prevent Direct Contact:** Ensure children do not play on or come into direct contact with soil in these areas.
- **Water Testing:** Sample nearby drinking and irrigation water sources to assess contaminant migration.

- **Further Sampling:** Conduct denser sampling to precisely delineate contaminated areas.

Attachments

Table – Soil Sample Results
Figure – Sample Locations

Soil Sample Results
School Grounds in Districts of Ticapampa, Recuay, and Catac
Ancash, Peru

Sample ID	Sample Location	School Pref	School No.	As (ppm)	Hg (ppm)	Pb (ppm)
CAT25-R-1	Los Girasoles primary school			30	ND	49
CAY-R-1	IEI 285 CAYAC	IEI	285	80	ND	61
PAR-R-1	86613 Fray Martin de Porras - Parco Catac	IEN	86613	58	ND	55
PAR-R-2	IEIN 033 PARCO	IEN	33	151	ND	239
TIC25-R-1	IE 86569 SANTIAGO ATUNEZ DE MAYOLO CAYAC	IE	86569	57	ND	45
TIC25-R-2	IE 86569 SANTIAGO ATUNEZ DE MAYOLO CAYAC	IEI	417	93	ND	74
TIC25-R-10	IEI 412 CHUYAN	IEI	412	49	ND	35
TIC25-R-11	IEI 412 CHUYAN	IEI	412	11	ND	22
TIC25-R-3	IEI 417 SANTA GERTRUDIS TICAPAMPA	IEI	417	83	ND	63
TIC25-R-4	IEI INICIAL 038 LOS ANGELITOS DEL PILAR	IEI	38	1447	2.3	198
TIC25-R-5	IEI INICIAL 038 LOS ANGELITOS DEL PILAR	IEI	38	347	ND	86
TIC25-R-6	IEI 419 PRIMAVERA	IEI	419	125	ND	68
TIC25-R-7	IE 86568 NUESTRA SENORA DEL PILAR	IE	86568	57	ND	38
TIC25-R-8	IE 86568 NUESTRA SENORA DEL PILAR	IE	86568	66	ND	47
TIC25-R-9	IEN 86601 ICHIC HUISCHCA- PRONOI DE PEQUENOS EXPLORADORES DE TOMAPATA	IEN	86601	142	ND	104
ECA				50	6.6	140

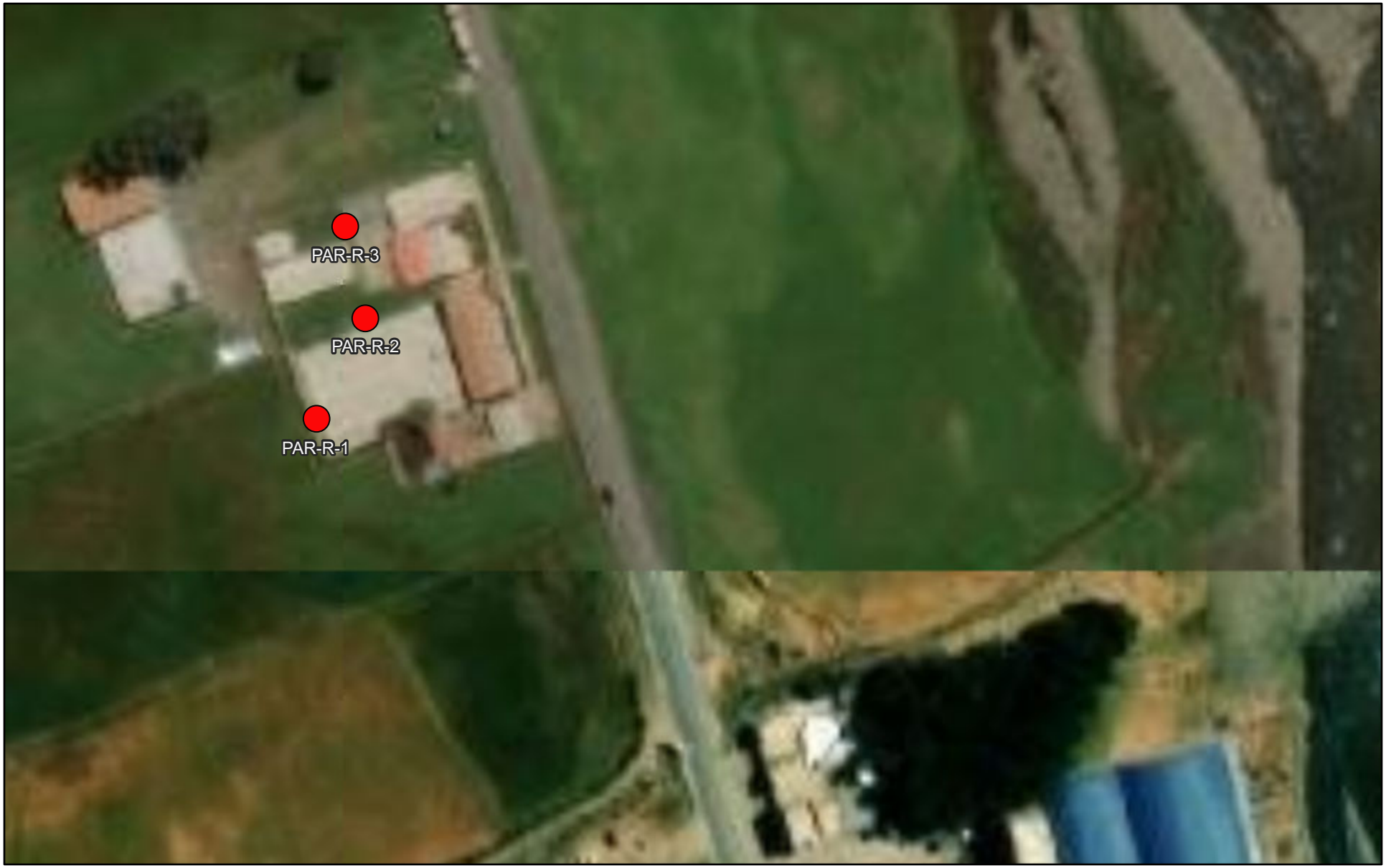
Note:
ppm - parts per million or milligrams per kilogram (mg/kg)
ECA - Environmental Quality Standard per MINAM, Supreme Decree No. 011-2017
ND - Not detected above detection limit of approximately 1 ppm
Red shaded cells indicate that the sample result is above the respective ECA

Ticapampa School Soil Sample Contaminant Risk Ranking
The Environmental Health Council

Site Location	Sample ID	Sample Type	Unit type	As	AsxSL	Hg	HgxSL	Pb	PbxSL	Sum of risk	Rank
IEI INICIAL 038 LOS ANGELITOS DEL PILAR	TIC25-R-4 and TIC25-R-5 AVE	Average		897	17.9	2.3	0.3	142	1.8	20.1	1
IEN 86601 ICHIC HUISCHCA- PRONOI DE PEQUENOS EXPLORADORES DE TOMAPATA (dentro del mismo sitio de ICHIC HUISCHCA)	TIC25-R-9	Discrete	PPM	142	2.8			104	1.8	4.7	2
IEIN 033 PARCO	PAR-R-2	Discrete	PPM	151	3.0			239	0.3	3.3	3
CUSY COYLLUR - CAYAC	CAY-R-3	Discrete	PPM	103	2.1	4.3	0.7	41	0.5	3.2	4
IEI 419 PRIMAVERA	TIC25-R-6	Discrete	PPM	125	2.5			68	0.5	3.0	5
IEI 285 CAYAC	CAY-R-2	Discrete	PPM	96	1.9			65	0.6	2.5	6
IEI 417 SANTA GERTRUDIS TICAPAMPA	TIC25-R-2 and TIC25-R-3 AVE	Average		88	1.8			68.5	0.2	1.9	7
IEI 285 CAYAC	CAY-R-1	Discrete	PPM	80	1.6			61	0.2	1.8	8
CUSY COYLLUR - CAYAC	CAY-R-4	Discrete	PPM	33	0.7	4	0.6	23	0.4	1.6	9
IE 86568 NUESTRA SENORA DEL PILAR	TIC25-R-8 and TIC25-R-7 AVE	Average		61.5	1.2			42.5	0.3	1.6	10
I.E.N°86613 FrayMartínde Porres – Parco.	PAR-R-1	Discrete	PPM	58	1.2			55	0.3	1.5	11
IE 86569 SANTIAGO ATUNEZ DE MAYOLO CAYAC	TIC25-R-1	Discrete	PPM	57	1.1	< 1	0.0	45	0.3	1.4	12
IEI 412 CHUYAN	TIC25-R-10 and TIC25-R-11 AVE	Average		30	0.6			28.5	0.0	0.6	14
LOS GIRASOLES	CAT25-R-1	Discrete	PPM	30	0.6			49	0.2	0.8	13
MINAM ECA				50		6.6		140			

Pink shading indicates contaminant concentration is above the MINAM ECA (screening level)
SL = screening level (MINAM ECA)
AsxSl = Arsenic concentration mutiplied by the screening level. This is used to determine the relative risk from each contaminant.
HgxSL = Mercury concentration multiplied by the screening level. This is used to determine the relative risk from each contaminant.
PbxSL = Lead concentration multiplied by the screening level. This is used to determine the relative risk from each contaminant.
Sum of risk = the sum of each contminant above the screening level. This is used to define the cumulative risk from the three contamaints.
This is used to provide a basis for the ranking. Sum of risk below 1 is low risk. Sum of risk above 2 is hgh risk.

IEN 86613 Fray Martin de Porras and IEIN 033 Parco



11/9/2025

Peru Colonial Site Assessment

World Imagery

Low Resolution 15m Imagery

Citations

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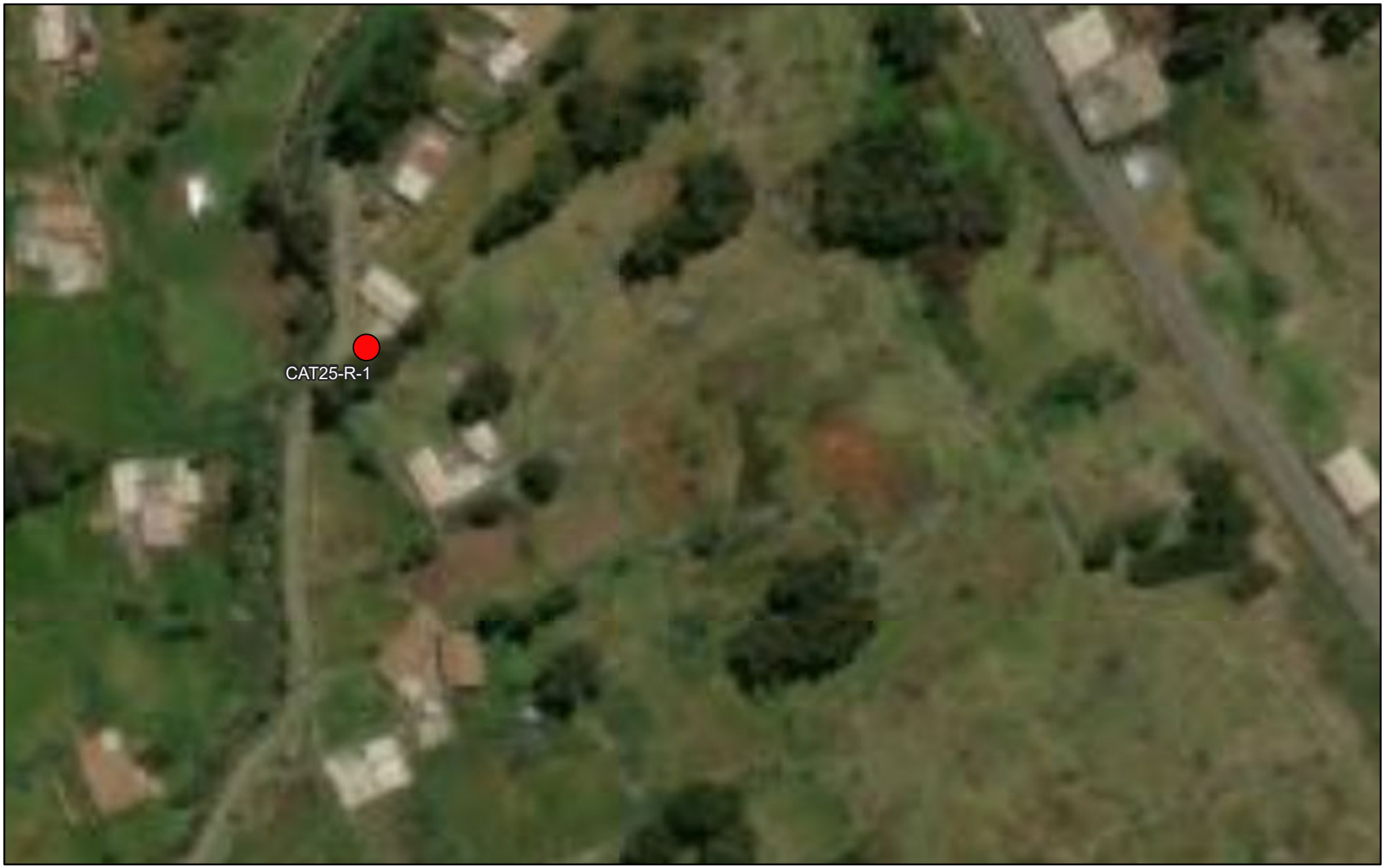
0 0.01 0.03 0.06 km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

The EHC

Los Girasoles Primary School



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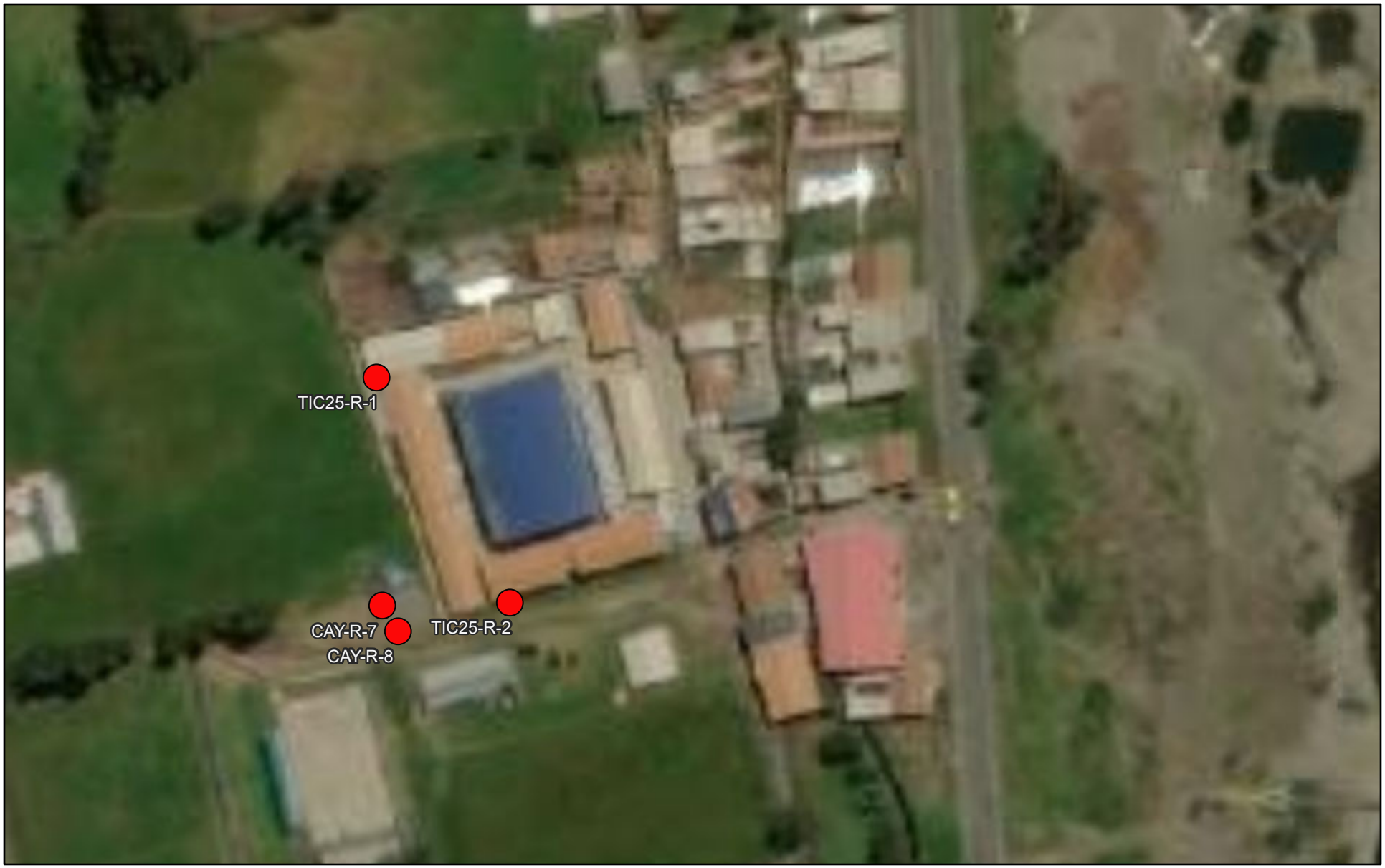
The EHC

IE 86569 Santiago Atunez



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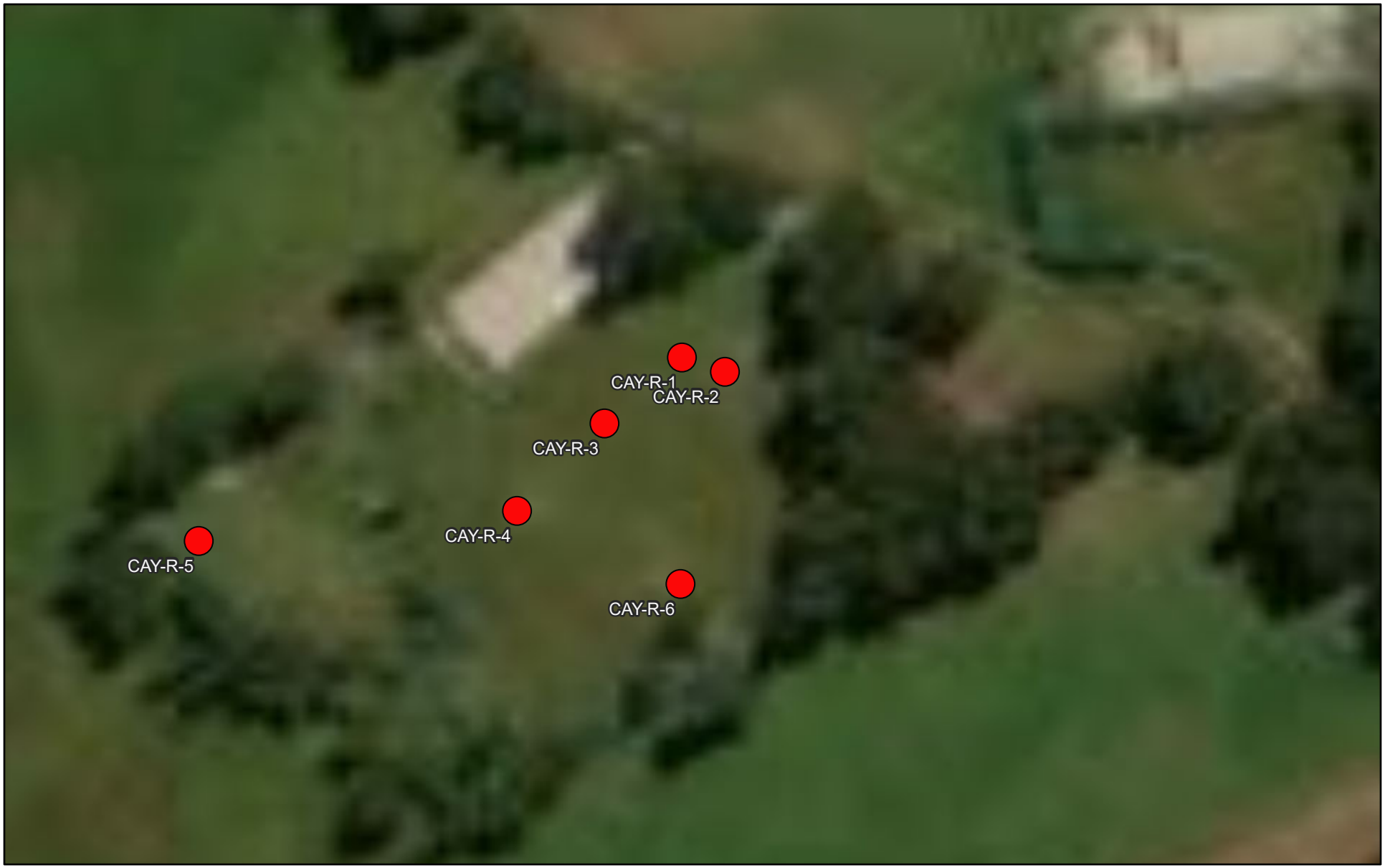
The EHC

IEI 285 Cayac



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World Imagery

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Citations

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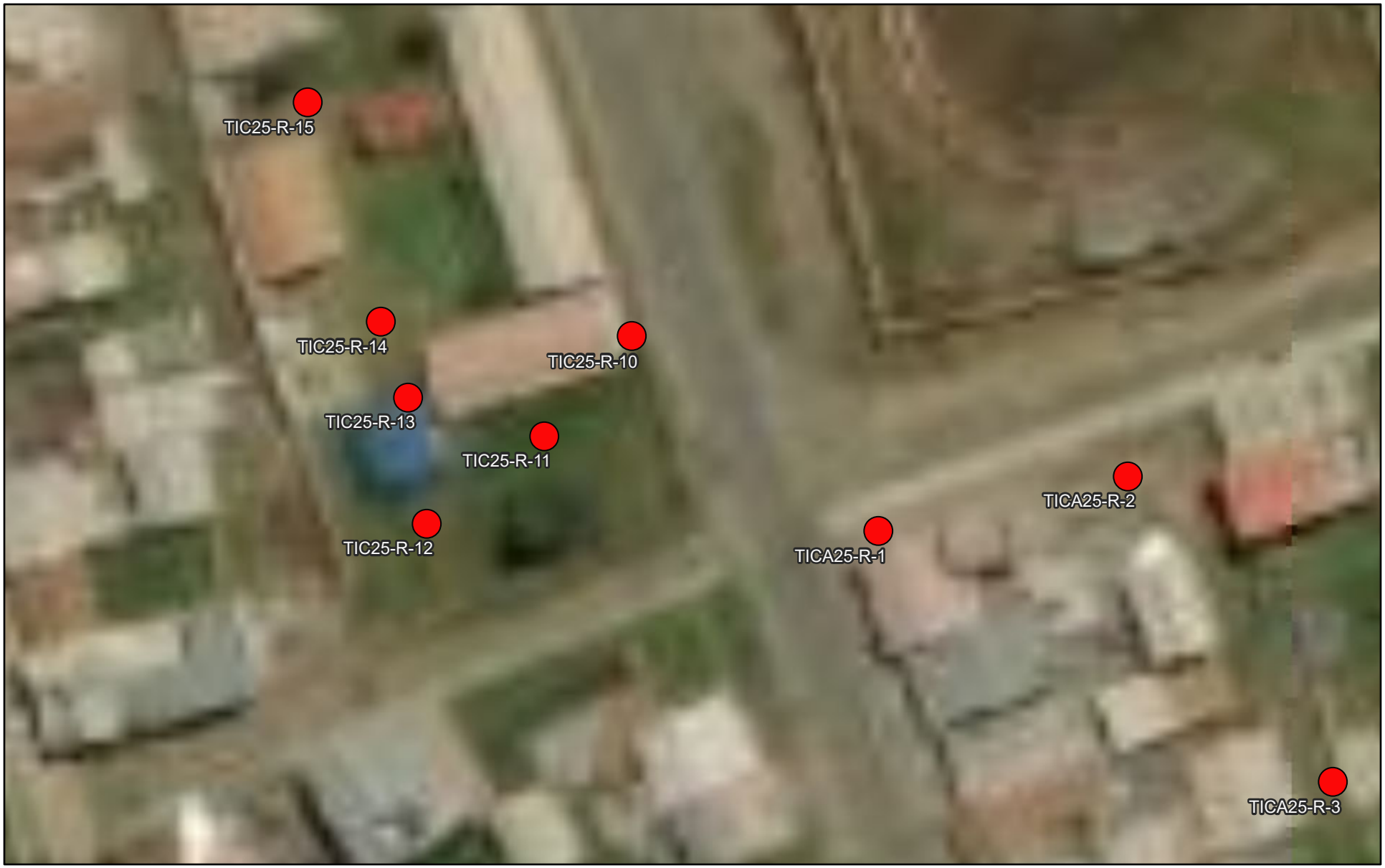
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

The EHC

IEI 412 Chuyan



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0 0.01 0.01 0.02 mi

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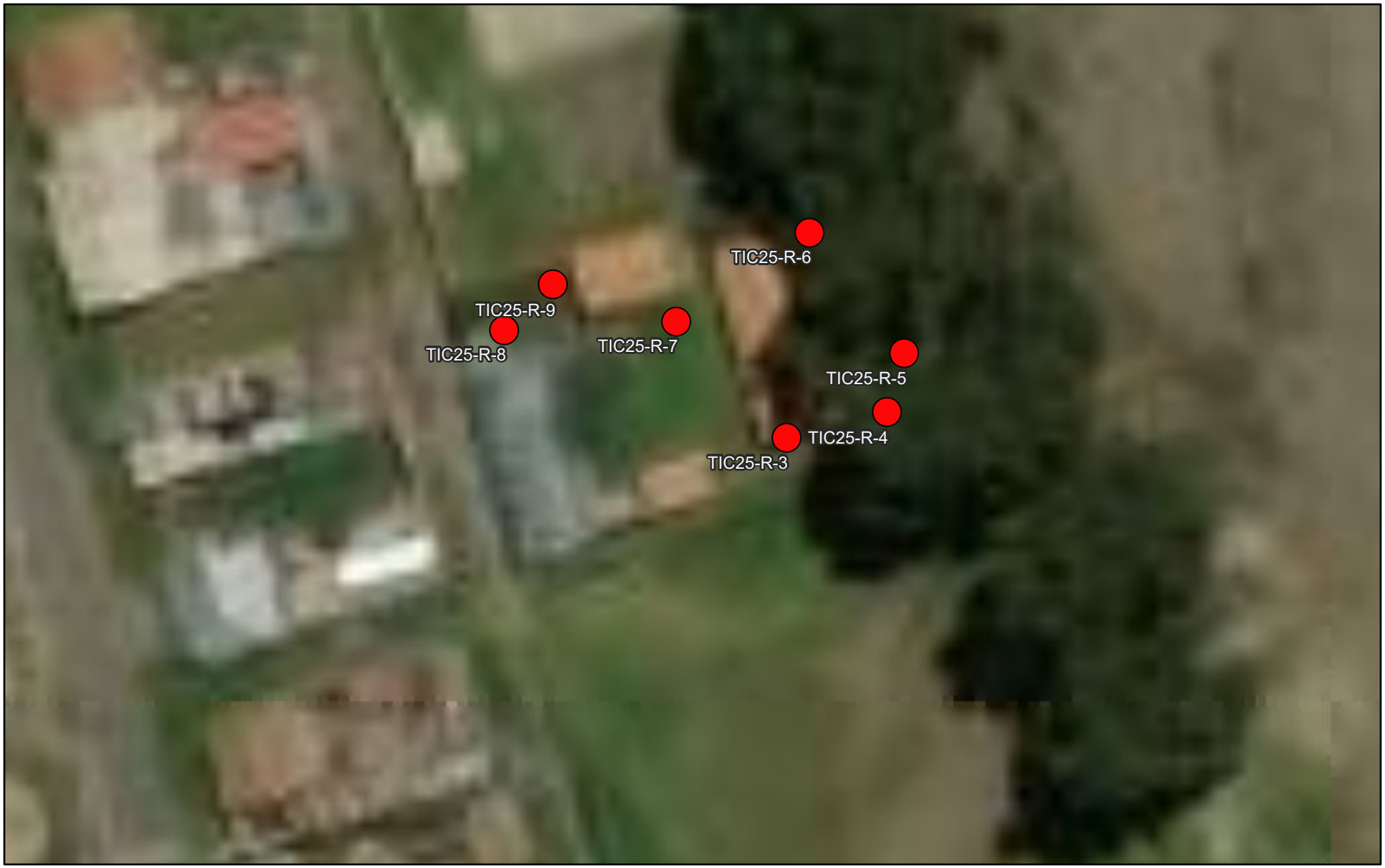
TIC25-R-3 through TIC25-R-9



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