

Archaeological field evaluations in Vieux-Aregenua: the benefits of combining geophysical surveys and trial trenches

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Abstract

The Roman city Vieux-Aregenua was already the subject of a pilot test. Magnetometer and electromagnetic induction (EMI) surveys were carried out. The trial trenches of the archaeological field evaluation were strategically placed as to take into account the results of the survey. The surveys allowed definition of the general layout, to characterise the areas and surfaces, and the identification of the buildings. The combined analysis of geophysics and trial trenches permitted the re-examination of the interpretation of geophysical anomalies.

Keywords

archaeological investigation; EMI; magnetometer survey; Roman city; trial trenches

Introduction

The unique setting of the village of Vieux (Normandy – France) proved to be favourable for the implementation of a geophysical survey in addition to trial trenches that were excavated in the context of an archaeological field evaluation (the first stage of developer-led archaeology in the French legislation) (Jardel et al. 2021). Indeed, the analysis benefitted from the results of a pilot project conducted between 2015 and 2018, where different methods had been tested, providing a reference for the study.

Materials and methods

The surveys extended over 4 areas investigating a total of 1.45 ha of land. Some of these areas were very small in size due to their locations in gardens attached to private houses with many obstacles present.

Two geophysical techniques were used, magnetometer and electromagnetic induction (EMI) surveys, with data recorded at 75 Hz and 10 Hz along lines spaced 0.27 m and 0.5 m, respectively. The magnetometer survey, us-

ing a multi-sensor cart, was completed in Zone 1 towing the instrumentation behind a quad bike and in Zones 2-4 pushed by hand to fully investigate areas with restricted access (Nicholls 2021).

The DUALEM EMI surveys were confined to Zones 1 and 3 and the apparatus was towed behind the quad bike due to its size and weight.

A survey grade GPS was used with both sets of geophysical instrumentation permitting precise navigation during data collection and accurate positioning (< 0.05 m) of the final geophysical measurements.

After the fieldwork, the raw geophysical data were merged with the GPS measurements also recorded in the field. All measurements were subsequently transformed from WGS84 geodetic coordinates to RGF93. The magnetometer and EMI measurements were then processed separately using in-house software developed according to the requirements of each set of instrumentation.

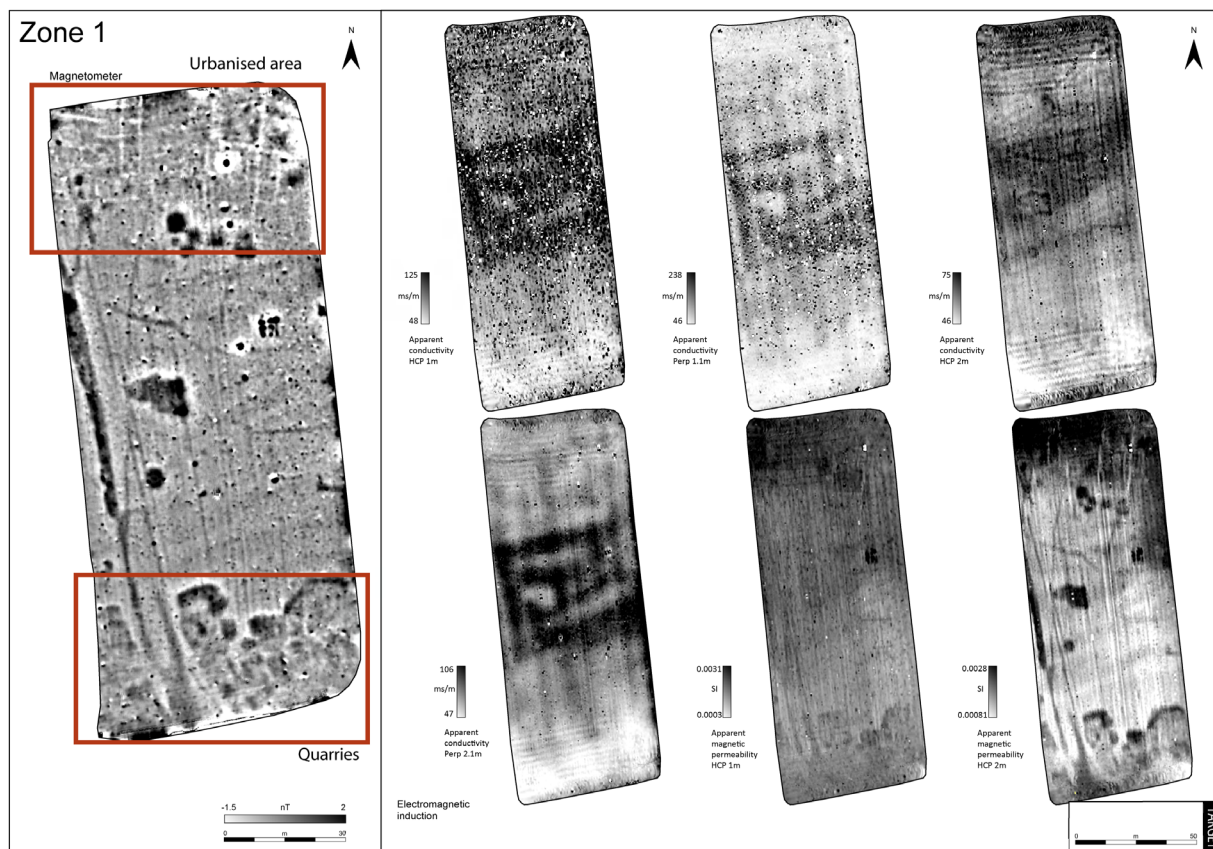


Fig. 1: Magnetometer (left) and EMI (right) results from Zone 1.

Results

The condition of the terrain in Zones 2, 3 and 4 was exceptionally poor for a geophysical survey severely affecting the results. By contrast, the results for Zone 1 are very clear (Fig. 1). They reveal the continuation of the roman city over parts of the area with the probable presence of staging posts or warehouses. The south-western limit of the ancient capital gives way to a suburban area where ditches, a road, limekilns and a vast quarry area were uncovered.

Discussion

The geophysical survey in Zone 1 showed the general layout of the structures, revealing different types of sectors. We propose to review two of these. Firstly, we will present the results of the geophysical prospection; secondly, those of the trial trenches and the revision of the geophysical interpretation, and thirdly we will conclude on the input

of the cross-analysis of the geophysical survey and trial trenches. This is still rarely implemented in developer-led surveys in France.

An urbanised sector in the north

The complex network of weak negatively contrasting linear and rectilinear responses marks out buildings (Fig. 2 a and b). Two orientations are apparent: northwest/southeast (2) and west/east (1). However, no clear layout is discernible, but it is possible to eliminate some hypotheses: no domus-type plan, no characteristic public building plan.

After excavation, the geophysical anomalies can be reinterpreted (Fig. 2 c). A greater quantity of built features was found than expected. Knowing this, the images collected outside the trenches benefit from a second level of reading.

The excavation helps to clarify the role and function of certain remains and buildings. There is a distinction between two adjoining buildings and the presence of a hypocaust nearby (indicated by collapsed *pilae* stacks) and provides further details concerning construction

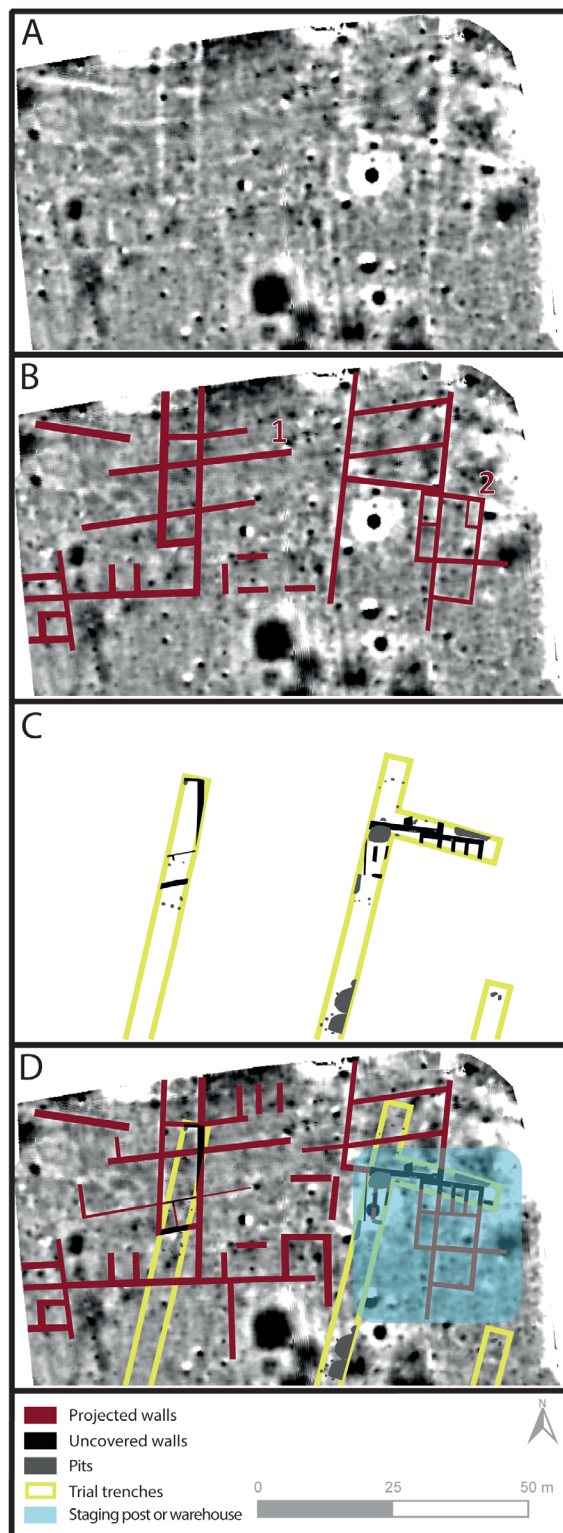


Fig. 2: Detail of the urbanised area A: Magnetogram B: interpretation of the magnetic anomalies, C: archaeological features revealed in the trenches, D: cumulative geophysical interpretation/trial trenches.

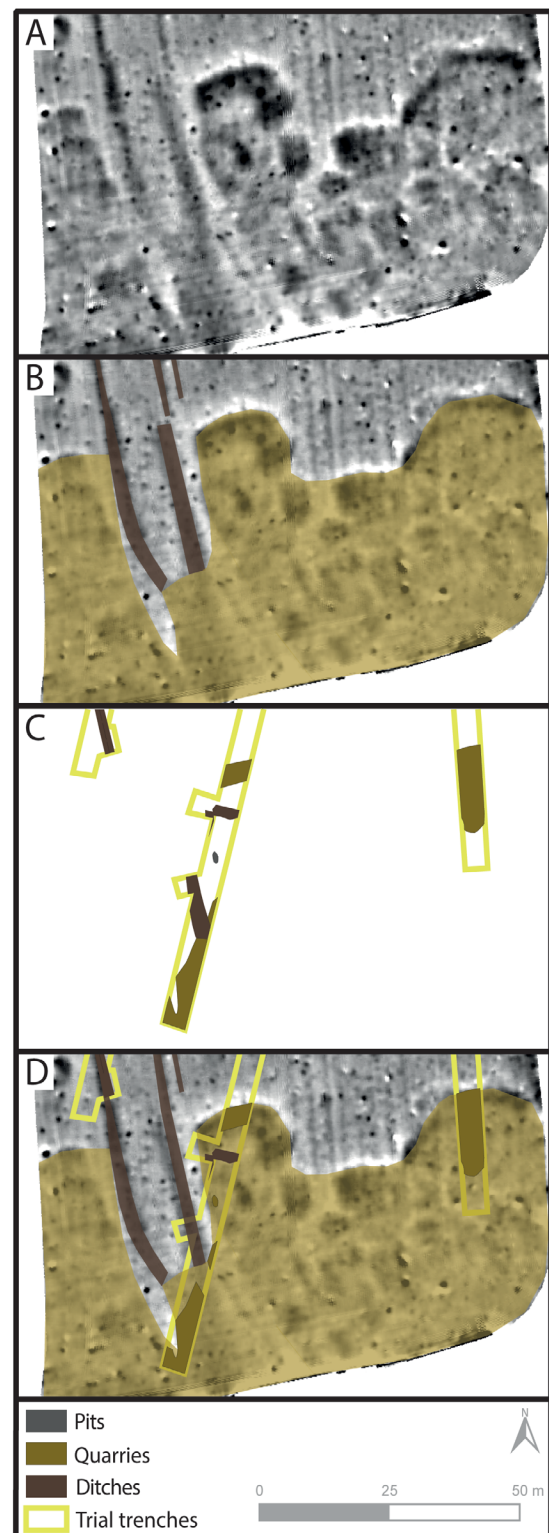


Fig. 3: Detail of the quarry area, A: Magnetogram, B: interpretation of the magnetic anomalies, C: structures revealed in the trenches, D: cumulative geophysical interpretation / trial trenches.

methods (*opus vittatum*, built with limestone known as Caen stone). The discovery of artefacts, in particular small finds, contributes to the hypothesis of a staging post or a roadside inn.

The chronological data (relative and absolute from standing building studies and archaeological artefacts) dates the construction of the building to between the end of the first and the beginning of the 2nd century AD.

The cross-analysis approach of geophysical surveys on the one hand and trial trenching on the other generates interesting methodological implications. Indeed, the results of the survey guided the placement of the trial trenches targeting the questions raised by the survey notably the presence or absence of features, conservation, stratigraphy, identification and, dating. It also provided the general layout of the remains, showing the precise delineation of spaces: urbanised sectors (roads, buildings, facilities), suburban areas and the south-western limit of the Roman city. Finally, the method allows an extended interpretation of the architecture. The identification of the general characteristics of the buildings and their layout either promotes their interpretation or allows us to exclude certain hypotheses, namely to rule out the possible presence of a domus and public building, suggesting instead the existence of a staging post or warehouse.

Quarries

In the southern part of Zone 1, positive/negative responses reveal a large anomaly with irregular boundaries, interpreted as a large quarry area over 5000 m². In the centre of Zone 1 a similar response marks out a smaller second anomaly also with an irregular shape and was hence interpreted as a hypothetical quarry of 350 m² (Fig. 3).

The excavation confirmed the presence of quarries and allowed to identify the nature of the rock mined, in this case limestone (rubble and lime). The artefacts collected date the extraction from between the first and the middle of the 2nd century (by dating of pottery sherds). The depth of the operation was also noted at 1.65 m (43.35 NGF). The quarries were probably not reused as a dump but this observation is restricted to the trial trenches' limits.

As mentioned above, the results of the survey guided the placement of the trial trenches in order to answer the questions raised by the survey regarding the presence or absence of features, conservation, stratigraphy, identification and dating. It also provided the extent, surface and depth of the remains.

Conclusion

Within the framework of this archaeological field evaluation, the combined use of the geophysical survey and trial trenches made it possible to improve the methodological approach. The excavation trenches were indeed able to be strategically placed as a result of the archaeological questions raised by the geophysical prospecting. Moreover, as an initial interpretation of the geophysical anomalies reveals multiple data, a second analysis after trial trenching makes it possible to complete and improve on the interpretation of the architecture and town planning of this district of the ancient capital. It also helps to address the chronological questions, taking into account the stratigraphic pattern identified in the trenches (relative and absolute dating). ■■■

References

- Jardel K, Chesnais P, Gaborit T. Vieux, Route d'Amayé, chemin de la Morinière. Rapport final d'opération de diagnostic archéologique. Calvados, Normandie, France; 2021 Dec. French.
- Nicholls J MSc. Vieux-la-Romaine – Phase 8. Rapport de Prospection Géophysique. Calvados, Basse-Normandie, France; 2021 Oct. Report No.: 2021FR17. French.

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