

## THE DAVANZALI NECROPOLIS OF NUMANA (AN): FROM THE ARCHAEOLOGICAL CONTEXT TO THE VIRTUAL ENVIRONMENT

### 1. INTRODUCTION: THE ARCHAEOLOGICAL CONTEXT OF THE DAVANZALI NECROPOLIS

The Quagliotti-Davanzali necropolis is the largest funerary area of ancient Numana and includes more than 500 graves datable between the 9<sup>th</sup> and 2<sup>nd</sup> centuries BC (FINOCCHI, BALDONI 2017; FINOCCHI, BILÒ 2020, 163-167). It is actually only one sector of a large funerary complex extending on the slope located North of the ancient settlement (FINOCCHI 2018, 262). The necropolis was extensively excavated between 1965 and 1975 (LOLLINI 1985); the southernmost sector was brought to light by G. Spadea in 1976 (SPADEA 1977) and is the only one still accessible in the entire area: this allowed the Soprintendenza ABAP of Marche to carry out a recent maintenance operation, during which our research group carried out a new survey of the sector, of great importance also for the research included in the project whose results are presented here (BALDONI, PACI, FINOCCHI 2019, 3-6; see SILANI in this volume).

As already mentioned by V. Baldoni in this volume, the Davanzali area, in particular a sector occupied by over 240 burials, has been the focus of a study project of the University of Bologna since 2016. The progress in the study of the grave goods has already allowed us to acquire a large amount of new data on the funerary rituals and the dynamics of occupation of the necropolis (BALDONI, FINOCCHI 2019; NATALUCCI, ZAMPIERI 2019). However, the study also highlighted the critical aspects of the available documentation and the difficulties in the interpretation of the burial ground and in the topographical analysis: the tombs, as already pointed out, cover a vast chronological span and, during the different phases, often insist on the same areas, leading to overlaps that complicate the philological reading of the context.

These difficulties have led us to experiment, within the framework of the project presented here, with some of the methods of virtual archaeology, in the conviction that the three-dimensional reconstruction of the necropolis can be a concrete tool to support the interpretation of the archaeological context, as well as obviously a means for its dissemination.

The ultimate aim of this experimentation, which will continue beyond the time limits of the project presented here, in anticipation of the overall edition of the necropolis, is the creation of a virtual environment in which, through the interpolation of all possible documentary sources, it is possible to analyze the various constituent elements of the context at different viewing

scales: the ancient funerary landscape, the single burial context or a group of burials, and the object inserted within the grave.

The first of these sources is undoubtedly the archival documentation produced during the excavation phase: the processing of this data, which is quite substantial for the Quagliotti-Davanzali necropolis, led to the creation of two-dimensional cartographic products in a GIS environment, from which the subsequent three-dimensional processing was based. At the same time, the autoptic analysis of the finds preserved in the deposits of the National Archaeological Museum of the Marche in Ancona provided further insight into the Picenian material culture and its peculiarities in the various chronological phases attested in Numana. The wide range of objects present (mainly pottery and, to a lesser extent, metals and other types of objects) led to the consideration of different acquisition methods for obtaining three-dimensional models. The desire to focus primarily on the study of ceramic vascular forms led the research group to adopt photogrammetry (see BALDONI and GARAGNANI in this volume).

At the same time, the topographical study of the necropolis and of the ancient landscape of Numana was initiated, with the aim, once the chronotypological study of the grave goods had been completed, of placing the burial area in the broader context of the relative settlement, a fundamental aspect for better understanding the appearance of the site and the relationship between the necropolis and the neighbouring areas. To this end, a number of field activities have been carried out and a geomorphological study has been initiated, which lays the foundations for future developments of the project, as will be highlighted in the following paragraphs.

The aim of this contribution is therefore to describe the key points of the archaeological analysis that guided the various phases of the project, from the processing of the archaeological record to the creation of the three-dimensional models of the necropolis and the grave goods obtained following protocols that are as expeditious and replicable as possible, in the conviction that our experience can find analogous applications in different contexts.

## 2. THE ARCHAEOLOGICAL RECORD: ELABORATION AND INTERPRETATIVE ISSUES

During the excavation campaigns carried out in the Quagliotti-Davanzali necropolis, a large amount of graphic and photographic documentation was produced: in addition to some general plans of the funerary area, a detailed plan was realized for each grave and, for the more complex clusters of tombs, some sections, unfortunately small in number compared to the total amount of evidence excavated. Furthermore, at least two pictures were taken for each tomb and a good series of panoramic photos, useful for a more accurate overall reconstruction of the necropolis.

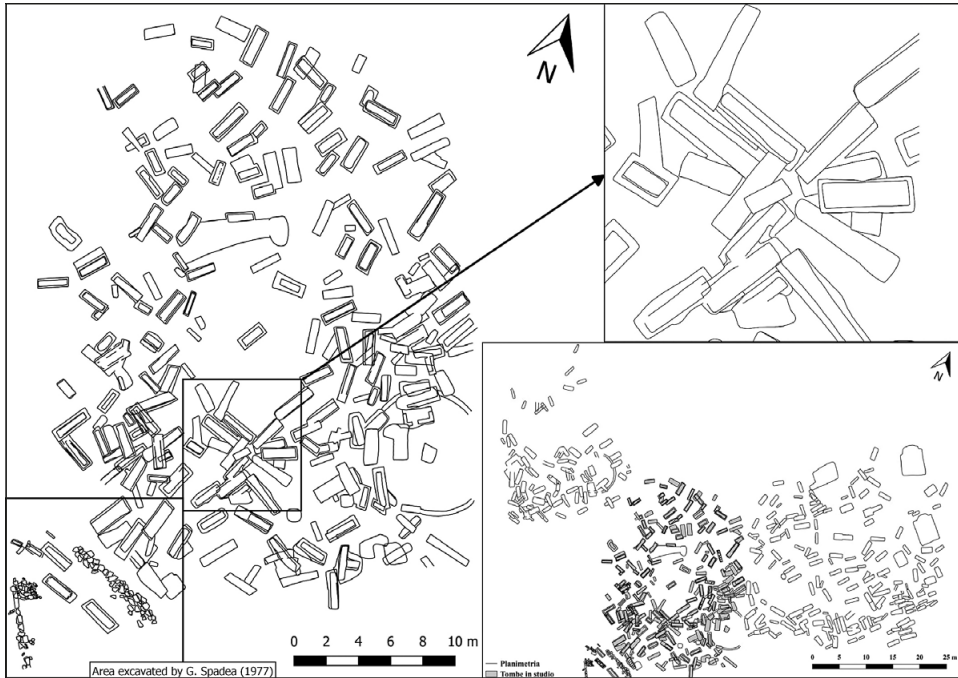


Fig. 1 – In the box on the lower right, planimetry of the Quagliotti-Davanzali necropolis; on the left, detailed plan of the Davanzali plot under study; in the box on the upper right, the tombs in which the three-dimensional modelling was initially experimented are highlighted (elaboration by E. Zampieri).

As detailed as it generally may be, the documentation of the excavations has some remarkable limits: for instance, the general plans lack the reference points necessary for their correct positioning. In addition, all the elevations reported in the excavation diaries and sections refer to a ‘zero point’ no longer recognizable in the area, which is also characterised by a not negligible N-S slope.

The complexity and quantity of the available documentation made it necessary, right from the start of the necropolis research project, for the implementation of a GIS platform associated to a PostgreSQL/PostGIS geodatabase, containing all the data on the grave goods, in order to correlate the information on the tombs (position, structure, etc.) with the individual objects they contain: the structure thus set up proves to be a useful tool not only for organizing the data, but also for a wide range of spatial analyses (NATALUCCI, SECCAMONTE, ZAMPIERI in press).

The general planimetry of the necropolis has been properly georeferenced also thanks to the new measurements conducted in the field. For the sector of the Davanzali necropolis currently being studied it has been possible to

achieve a high level of detail by georeferencing the plans of each single burial and subsequently vectorizing all the structural elements that made up the tombs, such as ditches, perimetral steps and, when present, covering elements.

The result was the creation of a new planimetry (Fig. 1), containing information on each individual tomb structure, which is the basic starting point for a more accurate philological reconstruction of the context in a three-dimensional environment.

### 3. FROM THE ANALYSIS OF THE CONTEXT TO THE VIRTUAL ENVIRONMENT

Excluding two cremation tombs, referable to the most ancient phase, all the burials in the Quagliotti-Davanzali necropolis consist of inhumations in simple ground pits, sometimes marked with a perimetral step; the sole exceptions are the so-called ‘monumental’ tombs 64, 178 and 185 Quagliotti, which are not included in the lot we consider, comprising 241 graves of the Davanzali area. In the contexts already studied within the research project on the Davanzali area, almost all the phases of occupation are represented: it could thus be argued that the area has been employed as a burial place from the 9<sup>th</sup> to the 2<sup>nd</sup> century BC, with a significant hiatus during the Orientalizing phase.

Through the study of the grave goods, still ongoing, it has been noticed (BALDONI, FINOCCHI 2019, 636-637) how the necropolis was originally occupied, between the 9<sup>th</sup> and 8<sup>th</sup> centuries BC, by separate burial plots. There is

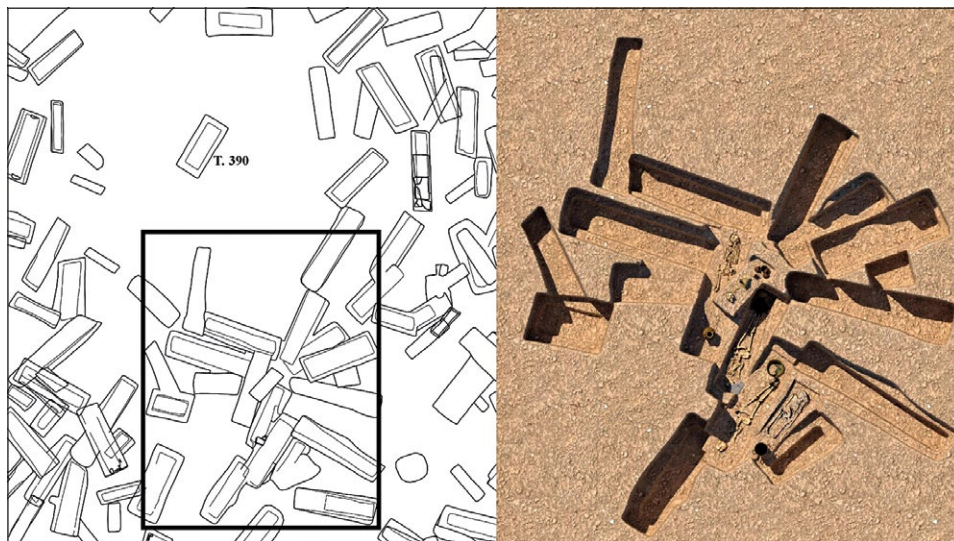


Fig. 2 – Zenith view of the 3D model realized for a sector of the Davanzali necropolis and its positioning with respect to tomb 390 (elaboration by S. Garagnani and E. Zampieri).

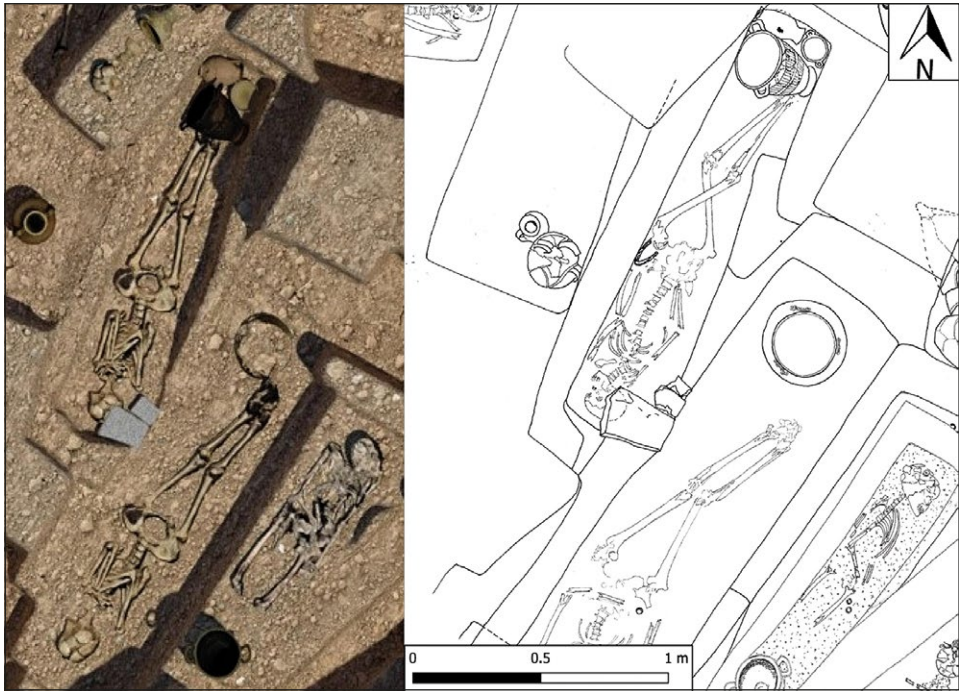


Fig. 3 – Comparison between 3D model and planimetry elaborated in GIS environment (model elaboration: S. Garagnani and E. Zampieri; planimetry elaboration by E. Zampieri on the basis of the drawing SA 16210 - Courtesy of Ministero della Cultura - Sabap Marche).

no record of the Orientalizing phase (yet, well represented in the surrounding areas), while an extensive occupation can be seen from the 6<sup>th</sup> century BC, when the burials maintain a certain regularity in their orientation and topographical arrangement. Especially from the 4<sup>th</sup> century BC there had been an increase in graves: in this final phase, which lasts until at least the first half of the third century BC (with sporadic attestations until the 2<sup>nd</sup> century BC), the graves are concentrated above all in the southern sector of the Davanzali area, very frequently intercepting previous burials while significantly respecting some of the most ancient graves of the whole necropolis.

The selected area for our first trial of 3D reconstruction is located in this specific sector (Fig. 2). The group of burials analyzed is located immediately to the South of a major area of respect related to one of the most ancient graves of Numana; it is also characterized by a remarkable continuity in occupation from the 6<sup>th</sup> to the 3<sup>rd</sup> century BC, a condition which has led to frequent cases of overlapping or partial obliteration of the burials. The tombs dating to the beginning of the 3<sup>rd</sup> century BC were excavated in the same ground already

occupied in the 6<sup>th</sup> and 5<sup>th</sup> centuries BC, but they still keep respecting the northern area pertaining to the tomb 390, dated to the 9<sup>th</sup> century BC. If on the one hand the insistence of the tombs in this sector may be explained by assuming the will to emphasize the belonging to the same social group, on the other hand it seems clear, given the disposition of burials in the surrounding areas, that in some way the tomb 390 influenced the topography of the necropolis even at very later stages (NATALUCCI, ZAMPIERI 2019, 645-646).

This sector effectively shows the potential of a ‘virtual’ approach: the 3D model allows us to read the stratigraphical relationships between the tombs in a more immediate and intuitive way, as well as facilitating their analysis. From the model, in fact, new sections can be extracted: this operation allows us to easily correlate tombs excavated in different archaeological campaigns. Moreover, once the digital reproductions of the grave goods are inserted, it is possible to actually recreate the context at the time of the excavation and analyze, with the aid of the third dimension and following an accurate study of post-depositional dynamics, the funerary ritual.

In extreme synthesis the virtual environment described here (obtained through the interpolation of archival documentation, traditional study of the grave goods, new field surveys and digital products, whose implementation process will be illustrated in the following sections of this paper) makes it possible to create a new archaeological documentation, more accurate than the one originally produced, yet at the same time clearly inseparable from the excavation, therefore constituting the first context to be reproduced in the process of constructing the virtual environment (Fig. 3).

#### 4. FURTHER DEVELOPMENTS

As already pointed out, the first detailed model (Fig. 4) opens up new perspectives for the analysis of the funerary context. It is a faithful 3D reconstruction of the sector at the time of the excavation, which does not, however, provide a hypothetical graphic representation of the burial at the time of its closure. This choice is dictated by a lack of data that probably not even the completion of the study on the grave goods will be able to fill.

However it is clear that, even considering the information derived from the use of the third dimension, the sector maintains some of its criticisms, mainly due to the overlap between the graves. It is therefore necessary to attempt, for a better understanding of the context, a virtual reconstruction that separately displays the different phases of the necropolis, starting from the objective but necessarily incomplete data of the excavation.

For this reason, the same ‘quick’ approach implemented for the reconstruction of the first detailed sector was applied to the entire area of the necropolis, starting from phase maps on the same model of the one in Fig. 4. In

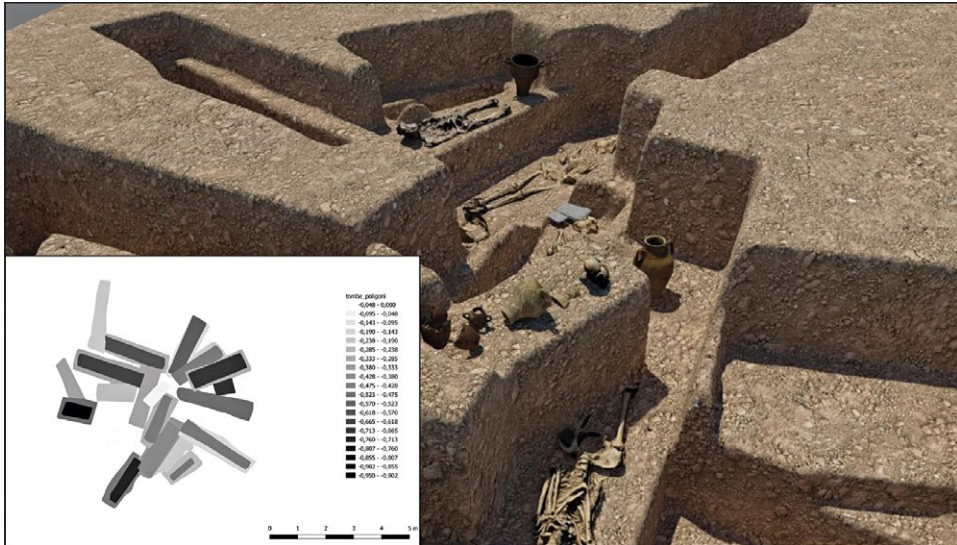


Fig. 4 – Perspective view of the detailed 3D model. In the lower left box, the planimetry with indication of the heights in relation to the marly soil (elaboration by S. Garagnani and E. Zampieri).

these plans, the gaps present in the tombs cut by successive burials have been integrated through drawing in GIS environment: the limits of the pits have been reconstructed when they were only partially incomplete; in the absence of sufficient data, instead, only the preserved portion has been represented. This method, which implies an interpretation process of the lacunar tomb structure, allows us to obtain reliable models of the necropolis on the basis of a bidimensional cartographic product, without having to hand-model the walls of the burials affected by the overlapping.

Considering the current state of progress of the research, it is possible to define four ‘macro-phases’ to be rendered graphically in three dimensions; these phases are based on the periodization of the Picenian material culture carried out by D.G. LOLLINI (1976). The first phase of attendance, which is defined by a few small burial plots dated between the end of the 9<sup>th</sup> century BC and the first half of the 8<sup>th</sup> century BC, falls within the periods known as Piceno I and Piceno II. A substantial number of burials show the traditional Piceno IVA and IVB phases, covering the entire 6<sup>th</sup> century up to the first decades of the 5<sup>th</sup> century; then comes the Piceno V phase, which lasts until the first decades of the 4<sup>th</sup> century BC. Finally, it is possible to include in a single graphic representation the later stages of attendance of the necropolis, corresponding to the Piceno VI phase until the romanization of ancient Numana.

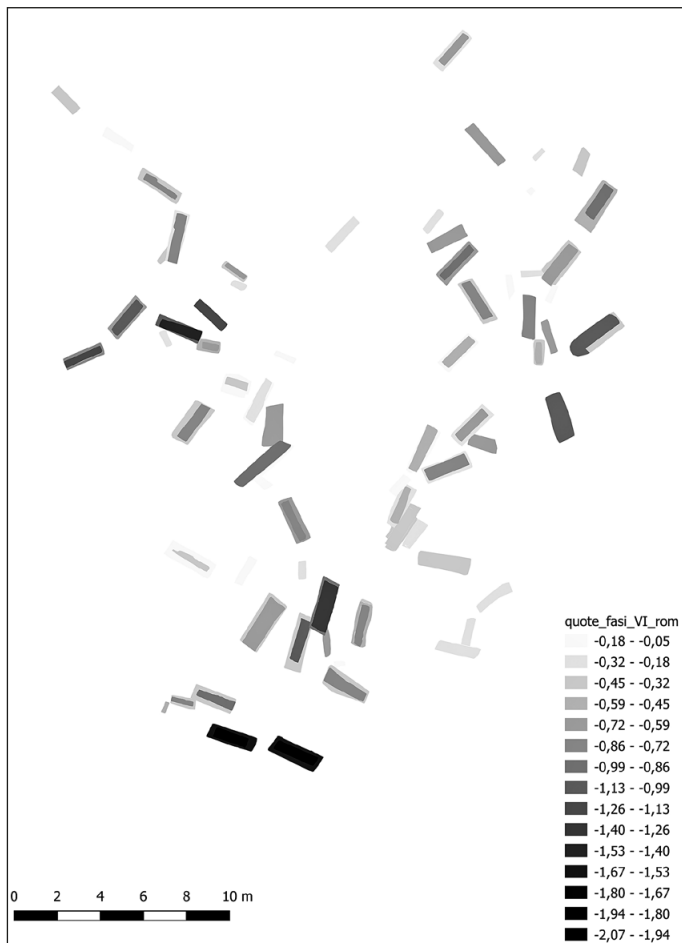


Fig. 5 – Plan of the necropolis including the tombs attributable to Piceno VI and those of the ‘Hellenistic-Roman’ phase, with indication of the heights in relation to the marly soil (elaboration by E. Zampieri).

A first attempt of quick 3D modeling on a wider scale was conducted precisely in the latter phase, in which the burials cover most of the area considered (Fig. 5). In fact, about 25% of the graves located in the Davanzali area are attributable to Piceno VI phase (385-268 BC); to these we can add a small number of burials representative of the romanization phase of the Picenian center (BALDONI, CIUCCARELLI, FINOCCHI 2020, 101-103).

The model obtained (for the realization of which see GARAGNANI in this volume, Fig. 4), despite being characterized by a lower level of detail



compared to the model of the sector proposed in Fig. 4, can be a useful tool for a diachronic analysis of the context and its ancient topography. However, only once the study of the grave goods has been completed will it be possible to fully explore the potential of this method. For example, it could be possible to understand, taking into consideration the volumes of all the burials attributable to each phase, the criteria behind the spatial arrangement of the burials themselves, or identify the presence of internal paths or other elements which influenced the organization of the necropolis in the different periods.

Once the study of the grave goods has been completed and the ‘phase models’ refined accordingly, these will be related to the DTM (see SILANI in this volume, Figs. 1-2), in an effort to recreate a proper ancient digital terrain model, which will allow us to analyze the diachronic development of the necropolis with a novel 3D approach.

The realization of such a model introduces some critical issues dictated by the lack of preserved paleosols, with the exception of a portion of a gravel embankment, datable within the first decades of the 4<sup>th</sup> century BC, identified during the excavation led by G. Spadea in 1976; it is therefore impossible to reliably rebuild a paleosol in the rest of the necropolis. It can reasonably be assumed that this lay at an elevation very similar, if not equal in certain sectors, to the current ground level, placed at an elevation varying between 1 m (as attested in the adjacent ‘Ex-Frontalini’ necropolis) and 2.5 m (in the area excavated by G. Spadea, in the southern part of Davanzali necropolis: see SILANI in this volume, Fig. 5) above the marly soil in which the graves have been identified. This information can be deduced by analyzing the depth of child burials, often discovered poorly preserved: especially in the tombs attributable to Piceno VI phase located nearby the central sector of Davanzali area (Fig. 5), the elevation in relation to the marly soil is often about -10 and -60 cm, which is certainly too small a depth even for the tomb of an individual of subadult age.

This is a preliminary hypothesis that certainly deserves to be further explored as the studies progress. However, it is certainly an effective example of how the results achieved within the framework of our project open up new research perspectives, in some cases filling or at least integrating the gaps in the excavation documentation. Once again we can see the potential of the virtual environment created for the Davanzali necropolis in Numana, which still needs to be enriched and therefore ‘explored’ in its entirety, but which is undoubtedly a useful tool for the topographical and essentially archaeological analysis of the context.

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ABSTRACT

The paper focuses on the issues of archaeological interpretation of the Quagliotti-Davanzali necropolis of Numana (AN) in relation to the virtual reconstruction of the context. The first step of this process is the reconstruction of the necropolis at the time of the excavation. This reconstruction is realized through the analysis and elaboration of the wide archival documentation produced during the archaeological campaigns. The study then focuses on the archaeological analysis of some specific sectors of the necropolis and on how digital models can effectively support this investigation. The limits and the potentialities of the experimented methods for the creation of the models are subsequently highlighted. Finally, a reflection is proposed on the future perspectives of the project in relation to the overall study of the necropolis, with a preliminary application of 3D modelling on the entire funerary area, in particular in its last phase of attendance. Indeed, for this last stage an optimal interpolation between the excavation data and the new research carried out in the field can be achieved, with a view to an integrated reading and a consequent virtual representation of the ancient funerary landscape.