The Dark Side of Vesuvius:
Landscape Change and the Roman Economy

Girolamo Ferdinando De Simone



A thesis submitted for the degree of
Doctor of Philosophy
at the University of Oxford

St. John's College
Michaelmas Term 2014

The Dark Side of Vesuvius:
Landscape Change and the Roman Economy

Girolamo Ferdinando De Simone
St. John's College

Abstract

This study investigates the territories of Neapolis and Nola in order to understand what role they played in the economy of their cities and in Campania. It further explores the difficult relationship between mankind and the fragile landscape of Vesuvius, how eruptions changed settlement patterns, exploitation strategies, and how people dealt with other smaller natural disasters that frequently occurred in that area.

The thesis is organised in nine chapters, each describing a separate layer of the landscape. The introduction analyses the reasons for the apparent lack of data for the northern slopes of the volcano and further discusses the theoretical issues pertaining to the economy of the countryside. The history chapter lists the major facts of the *histoire événementielle* and their connection with the landscape's long-term history. The third chapter studies the features of the static landscape and the exploitation of bedrock resources. Vesuvius is the subject of the fourth chapter, in which are discussed its shape and the eruptions' effects on the static landscape. Chapter five discusses the river Sebethus and how the intermingled action humans and nature created the marshes. Agriculture and animal breeding are analysed in chapter six, settlement patterns in chapter seven, trade in chapter eight.

Through archival research and field survey it has been possible to plot 820 sites from ancient southern Campania, 263 of which from the territories of Neapolis and Nola. This evidence has been matched with environmental and archaeological datasets to provide estimates on agricultural produce and population, thus defining surplus and dependance for certain products.

The results reveal a high compartmentalisation and degree of dependence of each micro-regional area on the others, for which one can deduce a high specialisation of each economic agent but not necessarily a high productivity for each of its units.

Table of Contents

Preface 4

1. Introduction 6
1.1. Previous studies 11
1.2. Methods and limits of the research 12
1.2.1. Landscape Archaeology 13
1.2.2. Theoretical schemes and spatial models 16
1.2.3. Application of the model: limits and opportunities 24

2. The historical framework 26
2.1. The Romans 27
2.2. Late Antiquity 35
2.3. Conclusion on historical sources 37

3. Eternal constant: the Apennines and the plain 39
3.1. The Campanian geographic system 39
3.2. Human geography 44
3.3. Resources of the static landscape 45
3.4. The role of the territories of Neapolis and Nola 52

4. The shifting landscape of Vesuvius 53
4.1. Vesuvius' present and past shape 53
4.2. Vesuvius' eruptive history and its distinctive features 56
4.3. The erupting volcano: a field survey perspective 59
4.4. Lahars, landslides, floods, and hydrogeology 66
4.5. Bradyseism and subsidence 76

5. The river Sebethus and the marshland question 79
5.1. The classical sources 79
5.2. Middle Age to Renaissance 82

5.3. The cartographic evidence and the recent period 85
5.4. Conclusions on the documentary evidence 87
5.5. Palaeoclimate 88
5.5.1. Methodological remarks 89
5.5.2. Global vs. regional climate models 89
5.5.3. Getting local 90
5.5.4. Global proxies for global climate 91
5.5.5. Discussion 92
5.6. The place of volcanic debris 93
5.7. The marshes between 'eterogenesi dei fini', complex systems, and historical narratives 94

6. Soil classification and land use 98
6.1. Present agricultural land classification 99
6.2. Land use before the Pompeian eruption 101
6.2.1. Wine 105
6.2.2. Olive oil 114
6.2.3. Cereals, legumes, and vegetables 115
6.2.4. Woodland 119
6.3. Animal husbandry, the 600 Senecan sheep, and the Paulinian piglets 122
6.4. Short- and long-term consequences of the AD 79 eruption 135
6.5. Land use after the Pompeian eruption 156

7. Site distribution and settlement pattern 166
7.1. Site classification 166
7.1.1. The creation of the archaeological map 166
7.1.2. Definitions 172
7.2. Modes of settlement 174
7.2.1. Pre-Roman sites 175
7.2.2. Roman pre-79 sites 179
7.2.3. Roman post-79 sites 181
7.3. Land divisions 182
7.3.1. Neapolis 184
7.3.2. Nola 185

7.3.3. Dating problems 187
7.4. Infrastructure 188
7.5. Populating the countryside 192
7.5.1. The population of the cities 194
7.5.2. The rural population in the environs of Vesuvius 197

8. Trade 207
8.1. Brickstamps in AD 79 207
8.2. Pottery trade patterns in AD 472 210
8.3. Longue durée trade 215

9. Conclusions 219

Bibliography 226

Figures 281

Preface

This study investigates the difficult relationship between mankind and environment in a volcanic area. The object of enquiry is the north slope of Vesuvius, an area overshadowed by the fame of Pompeii and Herculaneum and never investigated systematically. The choice of the subject grows out of my involvement in the excavation of the so-called "Villa of Augustus" at Somma Vesuviana. Indeed the great discoveries made at the site immediately revealed how insufficient and misleading the traditional perspective for the north slope of Vesuvius was; for example the volcanic fill – uncritically dated to AD 79 – in reality belonged to the late antique eruption of 472, and thus revealed an entire new chapter in the history of ancient southern Campania. The site lay in *terra incognita*, because information about other sites on Vesuvius' northern flank was scant and scattered among footnotes and minor publications, or collected by local amateur historians in a non-academic fashion. Therefore the first task was to contextualise the new evidence. As I pursued this project, I started the excavation of a post-79 AD villa with baths. As research director I had the opportunity to test theories against new evidence and keep the regional perspective in the study of discrete data. The work on the dissertation started at this point.

This study is organised in nine chapters. The introduction summarises previous studies on the environs of Vesuvius and analyses the reasons for the apparent lack of data for the northern slopes of the volcano. It further discusses the theoretical issues pertaining to the economy of the countryside and the methodology adopted to process the data. The history chapter lists the major facts of the *histoire événementielle* and explains their connection with the landscape's long-term history. The third chapter studies the features of the static landscape, the importance of natural borders in the definition of ethnic groups and territories, and the exploitation of bedrock resources. Vesuvius is the subject of the fourth chapter, in which are discussed its shape and size, and the eruptions' main- and side-effects on the static landscape. Chapter five discusses

the river Sebethus and its marshland. By analysing the written and pictorial sources of the last two millennia, I describe the intermingled action of humans and nature in the creation and transformation of the marshes. Agriculture and animal breeding are analysed in chapter six, settlement patterns in chapter seven, trade in chapter eight. Each chapter describes a separate layer of the landscape, but due to the complex relationships between them, I have included several cross-references and discussions, especially in the first chapters, which are useful for the analysis of land use and settlement in the last two.

1. Introduction

"On ne découvre pas de terre nouvelle sans consentir à perdre de vue, d'abord et longtemps, tout rivage" (André Gide, *Les faux-monnayeurs*, 1925).

This study investigates the territories of Neapolis and Nola, and in particular their sections on the northern flank of Mt. Vesuvius, in order to understand how that fertile soil was exploited and what role this area played in the economy of their cities. It further explores the difficult relationship between mankind and the fragile landscape of Vesuvius, how eruptions changed settlement patterns, exploitation strategies, and how people dealt with other smaller natural disasters that frequently occurred in this area.

It is the general opinion that the bay of Naples is one of the best-known archaeological areas in the Mediterranean basin. To the classicist's eyes, the picturesque description provided by Strabo (5.4.8) evokes many concepts: the Greek *otia* of Naples, the luxurious villas of Roman senators and emperors on the coast, Pompeii and Herculaneum. These ideas are closely bound together and create a coherent perception of the area, supported by ancient sources, almost three centuries of discoveries, and remarkable scholarship.

This study argues that our perception of the area is in reality rather incomplete since it has been misled by a complex series of cultural and historical factors, which have produced incorrect historical conclusions. The study of the Vesuvian area usually focuses on a specific timeframe (i.e. the late republic and the early empire until the Pompeian eruption) and a pretty narrow area: the coastline. Yet very little is known for the period after the eruption and the region that lies "beyond" the coast, i.e. the territories of Neapolis and Nola, and especially the north slope of Vesuvius. The study of ancient

southern Campania usually concentrates on the maritime villas and the cities on the coast, while the area north of Vesuvius is largely neglected. This emphasis is caused mainly by two factors: the description provided by the ancient sources and the historical and cultural relevance of excavations at Herculaneum and Pompeii.

The Latin authors – the Roman senatorial class which spent much of its leisure time in the area – connected Neapolis and the surrounding areas with the Greek way of life, the concept of *otium* and, consequently, life in the maritime villas. The Roman perception of the coast is effectively summarised in the famous passage of Pliny: "In what terms to describe the coast of Campania taken by itself, with its blissful and heavenly loveliness, so as to show that there is one region where nature has been at work in her joyous mood! [...] I do not speak of the character and customs of its people, its men, the nations that its language and its might have conquered. The Greeks themselves, a people most prone to gushing self-praise, have pronounced sentence on the land by conferring on but a very small part of it the name of Great Greece!".[1] His cultural perspective explains the prominence of the coast over the interior in the written sources, but it does not necessarily reflect the settlement distribution or the economy of the two areas.

The distorted perception of the land was reinforced after the discovery of Pompeii and Herculaneum. Since the Renaissance, the territories of Napoli and Nola were regularly exploited in search of classical antiquities, which were used to sustain the political agendas of the ruling elite.[2] The discoveries made in the Nolan fields (usually Italic tombs with Greek vases), stimulated the antiquities market and inspired the quest for the past in Europe.[3] Still, this new interest was detached from its physical context since objects were not connected with their find-spots (Fig. 1).

---

[1] Plin. *N.H.* 3.5.40-42. Other relevant sources: Sen. *Dial.* 9.2.13; Strabo 5.4.7; Varro *R.Rust.* 6.15; Sil. It. 12.18; Tac. *Ann.* 15.13. For the perception of Neapolis and its Bay under the Romans, see Fedeli 2005: 21-35.

[2] The most prominent display of classical antiquities was in the palace of Diomede Carafa, Count of Maddaloni (Lyons 1997).

[3] Of particular interest for the development of local antiquarian studies is the Mastrilli collection (Napolitano 2005; Lyons 2007).

The discoveries of Herculaneum (1709) and Pompeii (1748) provided a transition to a new way of looking at the past and to the creation of a historical perception of the Vesuvian territory.[4] Apart from their well-known effects on the history of archaeological thought and their contribution to the creation of modern archaeology, it is useful here to stress the political use of these discoveries and the consequences of such use for our way of looking at the area.

From the very beginning, the Bourbon kings used Herculaneum and Pompeii as symbols of their grandeur and as fundamental elements of their cultural policy.[5] The impact on European culture was enormous,[6] but soon the interest of the *haut monde* shifted from the objects to the sites. Indeed the possibility of walking along ancient streets and entering Roman houses thrilled the European nobility, which soon included the sites in the Grand Tour.[7] The Bourbon kings followed and encouraged this trend, they created a new architectonic/decorative style inspired by the new discoveries and provided funds for continued excavation in the cities.

Nevertheless, the funds, efforts, and attention devoted to excavation in the cities prevented the exploration of areas outside the known sites, especially those in the countryside. Bourbon diaries mention the incidental discovery of a few burials and hoards on the north slope of Vesuvius, but only in one instance did the king (or rather the military engineer Alcubierre) decide to proceed with an excavation. This happened in the town of Pollena in 1749, significantly while the excavations in Pompeii were interrupted by the recurring spread of the *mofete* (a poisonous gas) and few explorations were taking place in other areas. In the case of Pollena though, Alcubierre and the

[4] Moving progressively from the idea of these cities as repositories of artworks to places with intrinsic value and worth visiting in open air (Schnapp 2007).

[5] Allroggen-Bedel 1993, with particular attention to the use of the volumes *Le Antichità di Ercolano.*

[6] See for example the echoes of the discovery of the Pompeian temple of Isis in European culture: De Caro 1992: 12-18; Pappalardo 2006; Martorelli 2006; on the general impact of the discoveries: Zevi 1980, id. 1988.

[7] The reports of the tourists are useful for this purpose, see for example the enthusiastic opinion of Auguste von Kotzebue (1805: 233-248) and, in striking contrast, the one of Goethe (1815, 11. März 1787).

Bourbon excavators proceeded in unconventional fashion.[8] Indeed, they not only collected the artefacts (bronze and glass vessels, lamps, and coins), but they also spoliated the walls, taking roughly 18,000 bricks for the construction of the Opera House in Naples. This decision is even more striking if one considers that it has no parallel with the activities carried on at the same time in Pompeii and Herculaneum.

In modern times, similar factors have led to the same results. The prestige and appeal attached to excavations in Pompeii and Herculaneum encourage funding and offer the promise of immediate 'academic marketability'.

One striking example is the 'two-faced correspondence' which Maiuri carried on simultaneously with Della Corte[9] and the Fascists[10] in secret from each other, regarding Della Corte's request for more funds for the excavation of the so-called "Villa di Augusto" in Somma Vesuviana (cat. SVE014). Close reading of Maiuri's letters reveals that even though he recognised the growing importance of the villa, Maiuri refused to support the town's request for funds, in order to divert the money to his own excavations in Herculaneum, whose fame was enhancing his own prestige.[11]

The emphasis given to the coast generated a further problem. In the 1980s the territory between Naples and Nola was split between the Soprintendenza di Napoli and

[8] For the complete analysis of the discovery, see De Simone 2008: 332-3.

[9] "è indubbiamente opera di alto interesse scientifico, topografico e storico" (letter dated 12 june 1934 to the major of the town, folder S 10/1 at the Soprintendenza Archaeologica di Napoli, same folder as the following notes). Della Corte was supported by the local authorities, who perceived the site as part of the lost collective memory.

[10] "mi parve che la supposta identificazione non avesse alcun fondamento né nelle testimonianze degli antichi né nel carattere della costruzione. [...] senza uno scavo oneroso e dispendioso, non mi par possibile determinare esattamente la natura di quella costruzione. [...] Saluti fascisti" (letter n.prot.3480 dated 11 june 1934 to the Federal Fascist Secretary and marked as "Riservato").

[11] "i ruderi messi in luce durante il saggio dimostrano tuttavia che si tratta di un edificio sicuramente importante per grandiosità e per architettura e che ben varrebbe la pena di scoprire e restaurare, se problemi più urgenti non si imponessero. Opera dunque di alto interesse quella che l'egregio podestà segnala e raccomanda, ma non tale, tuttavia, come ben osserva l'E.V., che convenga distrarre per essa fondi e mezzi dall'impresa di Ercolano che il Regime ha preso impegno dinanzi al mondo scientifico di portare a compimento e il cui interesse quasi supera ormai, per la parte più eletta del turismo mondiale, quello degli stessi scavi di Pompei" (n.prot.1821 dated 21 march 1935 to the Alto Commissario per la Provincia di Napoli).

the newly founded Soprintendenza di Pompei.[12] In this scheme, the north slope of Vesuvius appeared marginal; it was not considered a geographical or historical unit, thus it was split into four parts (Fig. 2). Consequentially, it became the far limit of territory administered by four city offices (Naples, Nola, Herculaneum, Pompeian peripheral areas) and received no real attention from the officials. The bureaucratic fragmentation of the land also led to paradoxical situations, like the partial excavation of a villa which lay on the boundary between two offices.[13]

The apparent lack of evidence and non-systematic research in the archives and in the field has brought scholars to the *opinio communis* that the territory of Neapolis was "severely limited in size",[14] ringed by volcanic hills to the north and west and bordered by marshland to the southeast.[15] The Nolan territory is commonly considered vast and divided into *pagi* and *vici*.[16] However, its landscape appears equally deserted, since the intensive activity of tomb raiders from the 15th to the 18th century left no trace or record of the spoliated sites.

The factors described above caused the artificial and distorted assumption that the area between the cities of Neapolis and Nola was almost an 'ἔρημος χώρα'.[17]

---

[12] The Soprintendenza di Pompei administers the sites of Pompeii, Herculaneum, Oplontis and Stabiae and part of the modern neighbouring towns; the other towns in the province of Naples, even Sorrento, are administered by the Soprintendenza di Napoli.

[13] Cicirelli 1995.

[14] Arthur 2002: 83; similarly Lepore 1968: 35: "Io mi chiedo quanto abbia contato la chora a Neapolis, nell'impianto, nello svolgimento e nello sviluppo della colonia, o da che momento abbia veramente cominciato a contare"; Frederiksen 1984: 4-21; Giampaola 1985: 273; De Simone 1999: XXXIII.

[15] The assumption that marshes existed during Greek and Roman times derives largely from descriptions of that area in the 16th century.

[16] Camodeca 2001.

[17] About ancient sources mentioning 'deserted lands', see Asheri 1966: 5. For Neapolis, one should work within the historical framework theorised by Lepore 1968: 42: "in Magna Grecia il caso della éremos chora cioè della 'terra vergine', non è quasi mai un caso reale, [...] un territorio niente affatto vuoto, che i coloni greci soltanto han ritenuto tale, ignorando precedenti insediamenti e occupazioni. È chiaro che in questi casi il problema della delimitazione ordinaria va posto in maniera del tutto diversa e si trasforma in un problema, per così dire, di frontier history".

Nevertheless, some elements (like the fresco from the House of the Centenary in Pompeii[18] and a passage by Cicero[19]) suggest that we must re-examine the generally accepted hypothesis that the north slope of Vesuvius was economically irrelevant and that the city had no real interest in its hinterland.

1.1. Previous studies

The city of Neapolis is the subject of numerous studies, which increase constantly thanks to the new evidence from the works on the new underground line,[20] but its countryside has never been studied systematically. The short contributions available on the topic are marginal sections in books about Campania or the city of Neapolis. Significantly, still today the borders of the Neapolitan territory are traced following Beloch's arguments, which are dated to 1890 and are based solely on the late medieval Papal bull by Innocent III.[21] New evidence has been adduced in 1984-5,[22] but it did not change the general idea that Neapolis' economy consisted primarily of maritime trade and that its plain was mostly marshy and barely inhabited. The scarce evidence of rural settlement has been studied within this framework, and consequentially questions regarding connections between rural settlement and the city have never been stressed and the non-archaeological evidence (e.g.: the absence of roads connecting Neapolis to Nola in the Tabula Peutingeriana) is usually deemed sufficient for describing the situation. This study aims to integrate the countryside into the economic system of the

[18] IX, 8, 6, originally in the SE corner of the room n. 49; discovered the 29th september 1880, now in the Museo Archeologico Nazionale di Napoli, inv. 112286. For the complete analysis of the fresco, see § 4.1.

[19] *De off.* 1.33.

[20] Giampaola 2005a.

[21] Beloch 1890: 60-87, 402-411 (see also the Italian translation with updates: Beloch 1989).

[22] Frederiksen 1984: 34-37; Giampaola 1985. Johannowsky (1985) offers a quick overview of the finds around Neapolis, focusing more on the north side of the city and excluding the relevance of the territory between the city and Nola and assuming that the land was mainly swampy. The later studies by Sommella (1991) and Arthur (2002: 92-5) are mostly based on data from earlier articles.

city by analysing settlement pattern, land division, and distribution of goods.

For Nola the situation is rather the opposite. Very little is known about the ancient city. Most of the archaeological remains have either been destroyed in the past three centuries or are still buried under the modern settlement. A few rescue archaeology works unearthed portions of houses and the project to fully excavate one of the two amphitheatres is far from being completed, but the recent creation of the Antiquarium at Nola is encouraging the publication of the artefacts on display.[23] The city necropolis was robbed between the 15th and the 18th century, thus no record remains of the location of the tombs.[24]

The Nolan countryside is better studied. Castagnoli[25] identified multiple centuriation grids around the city, and Camodeca[26] collected the inscriptions of its *pagi*, even though their location is still unknown. Some Roman residential villas and farmhouses are discovered occasionally, but they are poorly published and never provide the exact location of the site nor a detailed account of the artefacts discovered.[27]

1.2. Methods and limits of the research

This work studies the landscape and the economy of the north slope of Vesuvius. They are closely interconnected to each other and both are the product of the interdependent relationship between mankind and environment. The apparently natural landscape of ancient Campania was indeed already highly anthropised before its cities were settled,

[23] Capaldi 2004.

[24] Only exception: Bonghi Jovino 1969.

[25] Castagnoli 1956.

[26] Camodeca 2001.

[27] A few lines of reports in Notizie Scavi di Antichità, in local amateur history books (Quindici 1984), in articles on various topics, as for example the few pages by Johannowsky (1986: 87-96) about the villa in the town of Lauro, in a touristic book on the Campanian villas.

and it would therefore not be profitable to distinguish between natural and human landscape. Yet the idea of a passive environment is equally incorrect.[28] The natural boundaries and the eruptions shaped and modified the settlement pattern and the economy. Therefore the relationship between mankind and environment cannot be resolved into a dichotomous perspective, according to which one agent dominated the other. The idea of dominance is fascinating and useful; it explains intuitively phenomena like the (over-) exploitation of the land or the effects of natural catastrophes and this study takes advantage of these models. Still the risk is to reduce the whole relationship between mankind and environment to a sequence of dominations and their reactions which leads to the creation of artificial periodisations. The relationship between mankind and environment is more complex and interdependent, it generates at the same time multiple cycles, each proceeding at a different pace. For example the environment includes both static elements like the mountains and recurring events like the floods. But again the boundary between natural and human process is often difficult to draw. Floods are for instance natural phenomena, but they can be trigged by deforestation, overexploitation, or most likely by the combination of natural and human factors. The landscape is therefore a complex system in which several interactions between mankind and environment take place at the same time. These interactions are mostly economic, because either they are generated by the land exploitation or they modify it, thus the landscape study becomes necessarily also an economic study.

To describe the landscape and its economy, this work analyses the interactions, rather than its agents. The landscape is dismantled in several layers each of which is analysed separately: static landscape, eruptions, hydrography, vegetation, settlement, trade. The layers' superimposition creates a comprehensive picture of the landscape.

The following sections describe the theoretical models which will be used to read the evidence pertaining to the landscape and the ancient economy.

---

[28] On the idea of landscape as static 'given' or canvas, see: Potter 1979; Cherry 1991; Arthur 1991: 3-13; I follow the approach outlined in Barker 1995: 62-83.

1.2.1. Landscape archaeology

Landscape archaeology is an umbrella term which includes different strands and practices of archaeology, but generally it defines the study of "past human impacts on the resources, topography and environment of the whole landscape".[29] From this perspective, landscape is the place of human action but this work is arguing that the landscape is rather the result of the interaction between mankind and the environment. The slight difference in definition shifts the subject of the enquiry from the remains of human action to those of human-nature interaction, thus it includes for instance eruptions and landslides, because of their effects on land use. Natural phenomena are thoroughly discussed also beyond the timeframe of the archaeological analysis, because ancient environment and land use can be reconstructed only by removing the modifications which occurred in the last two millennia. This conclusion explains the substantial space given in this work to disciplines other than archaeology, but it also requires a brief explanation about how interdisciplinarity was achieved in this study. Different disciplines have different terminology, methodology, and aims, but sometimes the information is taken out of context and used uncritically. Vesuvius is a good case in point, since archaeologists use distribution maps of volcanic deposits as self-explanatory evidence and volcanologists rely on classicists' works on written sources to label eruptions. This work tries to contextualise the information and offers archaeological alternative readings of the evidence.

Landscape studies are further complicated by the quantification and analysis of what is invisible. Ancient sources describe a fully anthropised countryside, in which human presence goes beyond the brick-or-posthole option. Many alterations of the environment leave few traces or become archaeologically invisible, for example natural architectures like a wooden wall used for terracing or tunnels and quarries, which are trickier to date or destroyed by later use. When it is absent, this evidence can neither be assumed nor be discarded *ex silentio*, but by comparing with other cases it can be hypothesised to create

[29] Definition of the MSt in Applied Landscape Archaeology at the University of Oxford.

multiple scenarios to test the archaeological evidence. For example, the territory of Acerrae was naturally subject to floods and it was assumed that it had always been swampy. Recently there have been found ditches 1.4-2.0 m deep, dated to the 6th-4th c. BC and used to drain surface waters, improve cultivation, and reduce the marshes.[30] Interestingly, during the Roman phase the ditches were backfilled and the Acerran territory returned to swamp land, as many written sources also testify. One can argue that in the 6th-4th centuries BC other cities in southern Campania (Neapolis, Nola, Pompeii, and Nuceria) mastered the same skill and could potentially reduce the marshland in their territories. The extensive presence/absence of marshes in these territories can potentially clarify whether drainage ditches were used and indirectly tell about the cities' efficiency in managing the environmental risk.

For the analysis of the settlement pattern, this study uses the model of interacting factors as outlined by Trigger.[31] Among the factors, the most noticeable are: the relation between settlements and landscape (availability of natural resources, relative ease of communication, etc.); the distribution of specialised activity settlements and markets; the degree of seasonal mobility; centralisation of some activities and, related to this, the political, religious, and military domination and hierarchy. It is clear that the process goes from the micro- to a macro-scale, from the single element to the building, to the site, to the settlement, to the relation between settlements.

The application of this model is limited by the static nature of archaeological remains[32] and by the evidence available for the north slope of Vesuvius. In reality there has never been systematic field survey in this area, nor has any systematic excavation or project ever been carried out. Additionally, the excavation records are scant, incomplete, and go back to the 18th century. Theoretically Vesuvian eruptions provide high-resolution data, because they preserve ancient vegetation and cultivated plough soil

[30] Giampaola 1997.

[31] In: Tringham 1972: xxii-xxiv.

[32] Millet 1991: 170.

surfaces, but they also reduce considerably the utility of field surveys. Volcanic fills cover the soil non-homogeneously, filling gullies or taking away part of the previous eruption down to the valley, thus some archaeological sites remain visible, while others are covered by a thick fill (sometimes up to 9-10 metres), leaving no trace on the surface. Furthermore, eruptions vastly distort the archaeological data, because they create the artificial impression of a denser settlement pattern in periods close to the eruptions. Indeed the sites buried by the volcanic fill paradoxically are better preserved than the others, which are subject to spoliation, decay, and collapse, leaving fewer traces in the ground. In the Vesuvian region, the majority of the archaeological data are related and dated to the eruptions (Avellino pumices, Pompeii, Pollena), but there is almost no trace of the settlements in between, as for example the Greek and Etruscan settlements in the countryside, for which only the burials remain. Is this lack of data historically relevant or just caused by the nature of the volcanic region?

1.2.2. Theoretical schemes and spatial models

Once the data are collected, the problem hinges on the choice of the theoretical model to interpret them and whether it is possible to deduce from the settlement pattern the political and economic spheres of influence.[33]

One obvious model of choice is Central Place Theory, developed by Christaller in 1933 and today still used as model to link the settlement pattern to the economy, therefore it might be a useful tool for understanding the economic spheres of influence between towns. According to Christaller, cities function as central places by providing services for their countryside. Each city is the centre of a cell, which forms with other cells a lattice. This model was once defined by Renfrew as "the great awakening" in archaeology but was later criticised by the Post-processual Archaeologists.[34]

---

[33] On the difficulties in data interpretation, see Cherry 1987: 153-156. "The hope that there might exist easily recognizable sharp distributional fall-offs at the boundary between the areas of dominance of two autonomous centres is rarely fulfilled" (156). This shows how the archaeological remains *per se* are not enough for understanding this relation. The support of other kinds of data could help.

[34] Hodges 1987: 118.

One of the limits of Central Place Theory is represented by the fact that it creates a dichotomy between centre and periphery, city and countryside.[35] I argue that Central Place Theory parallels the economic theories of Weber and Finley about the relationship between city and countryside. The lattice-model is actually a visual representation of this relationship, because it assumes a direct dependence between city and countryside. Therefore, in order to use Christaller's central-place model one must first discuss Finley's theory, and if it proves false, theorise a new distributional model.[36]

Finley's economic theory for antiquity[37] stems from Weber, who theorised that ancient cities obtained their major incomes from rural rents and that commercial enterprises played a minor economic role. Finley used these conclusions to create his model of the ancient city as a consumer city, whose counterpart is the productive countryside.

Since its formulation in 1977, Finley's theory of the ancient consumer city had been challenged and opposed several times,[38] mainly by stressing the city's productive activities and services, like the 'organiser city' by Leveau[39] or the 'service city' by Engels.[40] Despite the criticism they received, these alternative models revealed the gaps in Finley's theory and stressed the presence of other economic factors, which were previously ignored and that now contribute to create a more elaborate idea of the ancient city. Cities had both producer and consumer aspects in different degrees, thus "the ideal type approach is more of a hindrance than a help in conceptualising the

---

[35] Champion 1989: 2.

[36] From this point of view, I do not agree with the use that Morley (1997: 51ff.) makes of central place schemes for representing, for example, non-Finley type networks of power and influence.

37 Finley 1977. See also: Weber 1922; Finley 1973.

[38] A review of all of them can be found in Whittaker 1990, id. 1995, Wilson 2002. One relevant problem is related to how practically apply and test this theory in the field, see Fulford 1982: 413-417.

[39] Leveau 1983.

[40] Engels 1990 and, against it, Whittaker 1995: 12-14.

economy of ancient urban centres".[41]

I would complicate this picture even further. To study the degree of dependence of the city on its countryside, the theories described above are based on the assumption that the ancient economic system is enclosed within the territory of a city (similar to Christaller's cells), in which the economic flows move mostly between two entities, the city and its countryside. Yet the Roman city was not a city-state (or von Thünen's "Isolieerte Staat") and within the territory of a city there are more than two entities, like hamlets and *vici*.[42] Several Italic *gentes* and tribes lived in settlements with a high degree of dispersion in the countryside. Some degree of nucleation could be found and eventually some farmsteads and hamlets started to share resources (e.g.: mills) and agglomerate to form a small village or pseudo-urban settlement (i.e.: the *vicus*)[43] (Figure 3).

Still in the 1st century AD, according to Strabo,[44] the Vestini, Marsi, Paeligni, Marrucini and Frentani were living κατὰ κῶμας (a term that could refer probably to the latin *pagatim*), but the *res publica* generally encouraged and promoted urbanism[45] through the creation of *municipia* and *civitates.*[46] The process was probably easier and faster in the fertile plains, where the richness of the land encouraged the settlement of colonies, but generally *pagi* and *vici* coexisted with the other systems until late antiquity. The *pagus/ vicus* retained full autonomy in matters of religion, administration and finance. As

[41] Wilson 2002: 234.

[42] Whittaker 1990, with important remarks on dispersed urbanism of the Central American type within the Roman Empire.

[43] Garnsey 1979: 6: "Pagus has the sense of a rural division containing within it both isolated farmsteads and small population centres or vici, one or more of which might have emerged as a central place of refuge, a cult-centre or an economic focus". There is no element suggesting the existence of agro-towns *tout court*, see Garnsey 1979: 19.

[44] Strabo 5.4.2.

[45] Gabba 1972: 80.

[46] Laffi 1974: 336.

Whittaker suggests, although *pagi* and *vici* had no real urban character, they shared several similarities with the rural villas and often operated between these two poles, for both production and distribution of goods.[47] Moreover, the administrative and religious roles played by the *pagi* create economic poles, which are independent and do not necessarily form a subcategory of the city.

Moreover, as Chang "has shown for a hypothetical situation, the hierarchical structure may be of great complexity and related to different facets of life within the same society. In general it may be useful to distinguish network or non-centralised relationships between settlements from hierarchical or centralised relationships" (Fig. 4).[48] Although the scheme provided by Chang has been developed within the theoretical discussion about spatial models, it shows how the economic movements and the services provided can be multifocal and not bounded in the rigid city-countryside relationship.

In my opinion the alternative models to Weber/Finley failed because they kept the dichotomous relation between city and countryside and only stressed particular aspects of production, which were used only to "strait-jacket" the model either towards the city or the countryside, but they remained variables and variants of the original model.[49] Conversely, the idea of a multi-focal economic model (as Chang proposed) and the possibility to open-up the dichotomous relationship by including other centres of production with possibly independent economic flows (e.g. the *pagi*) would produce an entirely new economic model of the ancient city.

The model proposed by Davies goes in that direction.[50] He stresses that the economic movements are not only two-way (directly reciprocal), but also three-way or diffused through a complex and indirect system, therefore the term 'flow' is more appropriate

[47] Another variable is represented by the villas selling the goods in their estates, without using the *pagi* or the cities as intermediary, see Plin. *Ep.* 8.2.

[48] Chang in: Hodder 1976: 64. For the new trends in spatial models, their use and limits, see Hodges 1987.

[49] From this point of view, I agree with Parkins (1997: 107): "The point is, however, that by going beneath the surface of the model more interesting possibilities for understanding the function of the Roman city reveal themselves and other dimensions are opened up".

[50] Davies 1998: 243-256.

than ‘exchange’. Flows are not always commensurable with money flows and, consequently, the model for the ancient economy needs to be qualitative and descriptive, not quantitative. The result is the creation of a scheme (Fig. 5), divided into three levels of complexity. In it, the factors interacting in the economic space are units and flows. The economic space is the city, represented as a cell; the regional and inter-regional relations are represented as multiple interacting cells. Davies’ scheme moves beyond the city theories and breaks the dualism between city and countryside, yet it encompasses some difficulties.

Indeed on one hand it is not complex enough. Some entities are not included, like the temporary markets (*nundinae*) and the *pagi*.[51] Moreover, the scheme does not distinguish different kinds of land use, even though they produce different economic flows and types of dominance (i.e.: *fundus* vs. *saltus*).[52] On the other hand, the scheme is too complex and cannot be used to compare different systems. Davies does not quantify the ‘weight’ of each unit and flow, thus his scheme is only a flow diagram of economic components. Ultimately it fails to characterise each system, and thus to understand how one system differs from another.

Before developing a new model, we must first return to the distributional models, and in particular to Christaller’s central place theory, which operates as a useful tool for macroscopic analyses, like ranking cities within a region, while in a microscopic analysis its assumptions are in contrast with the actual evidence. For example, the assumption of a homogeneous distribution of purchasing power implies a homogeneous distribution of natural resources, which is rare in the real world (Fig. 6). Each resource provides a different level of income, so theoretically two neighbouring areas, one used for gold

[51] Cfr. Morley (1997: 52 ff.) on the market system in Campania: “Clearly, however, the demands of the city were not the only force operating on the Campanian market system. Rather, we seem to have a combination of a regional central place system and a dendritic network; the former distributing goods across the region in response to local demand, the latter siphoning them off towards an external consumer”.

[52] Giardina (1981) uses literary sources to stress the economic relevance of wood economy for Roman senators, especially considering that it provided probably less income than agriculture, but it was a much safer investment.

extraction, the other as a wood-cutting area, might have the same population but a clearly different *per capita* income, thus a non-homogeneous distribution of purchasing power.

Furthermore, the assumption that central goods are purchased by the nearest central place is sometimes false. Variations in farmers' entrepreneurial aims, abilities, and in the amount of knowledge, are boundary-blurring forces; in other words people's choices are not necessarily economically optimal or correspond to a positivistic/efficient model. The same criticism can be applied to von Thünen's model, whose theory actually encompasses distortions like the influence of a fertile area or of a subsidiary town, but it does not include non-optimal behaviours – like the use of a more distant or expensive service (Fig. 7, IV quadrant). Moreover, considering that goods are unevenly distributed across the land and that each of them requires a different threshold population, it is unlikely that central places of the same rank can provide the same goods. Therefore, small centres are served by more than one central place. This relationship cannot be represented with a regular hexagonal lattice, but with several maps, according to the good sold or the service provided. According to the scheme offered by Chang and discussed above (Fig. 4), we have to conclude that there are different sorts of hierarchies (administrative, legal, cultural, economic, population size) and "we must assume that these do not necessarily correlate".[53]

Within this scheme, one should also accommodate periodic central places like the *nundinae*; the economic reasons for the existence of periodic central places are clear: in certain locations, the threshold population for selling goods is not enough, because the good is not sufficiently 'attractive' or the 'friction of distance' is too high; in this case, the firm can survive only by moving from place to place. In Roman Campania,[54] as well as in the entire Italian peninsula, the local temporary markets, or *nundinae*, played a key role

[53] Collis 1986: 37.

[54] Morley 1997: 52-54; Lo Cascio 2000: *passim*.

in the economy.[55] One striking example is provided by Strabo,[56] describing how people kept going to Fregellae, also after its destruction, for the festival and the related fair. Finley's city theory and Christaller's central place theory have in common the dichotomous opposition of city and countryside and the role of the city as centre of an area. The criticism and the elements provided above show that our understanding of the Roman economy requires many other factors and variables. *Pagi*, *vici*, *villae*, *nundinae* play a significant role in the Roman economy and their relation to the city is not always clear, up to the point that we could also assume that, in some cases, the presence/absence of a city in a certain area was irrelevant. For example, in the case of large farmsteads, the basic functions and services are provided within the settlement and some owners (e.g.: a Roman senator) could decide to bypass the city and sell their goods in other centres. In these cases, the attraction played by hubs, routes, and social networks might have been higher than that of a city.

In summary, Christaller's and Finley's theories are based on similar assumptions, and therefore central place theory cannot be used 'as it is' for other city theories or, better said, for theories on Roman economy. Nevertheless, the concept of a threshold population for goods and services is valid and can be used to understand the economic flows.

As an alternative to the models described above, I suggest a different approach to the entire problem. The consumer city model and its opponents have a top-down approach; to solve the question of the city/countryside economic relations, these models stem from the assumption that city and countryside are homogeneous entities (i.e.: they belong to the same ontological grouping), and therefore are comparable, but clearly this is not the case.

---

[55] Gabba 1975: 148: "La continuità di taluni mercati cittadini deve essere stata grande e dimostra la loro importanza".

[56] Strabo 5.3.10.

Therefore I suggest as an alternative a bottom-up approach: to compare the economic flows of city and countryside (i.e. to understand to what extent the ancient economy was 'primitive' or 'modern'), we should start from the components of the ancient economy, analyse their flows, and then move to the broader picture and weigh the economic preponderance of city over the countryside or the opposite. I define all components of the ancient economy as "economic agents". The economic agents are the producers of goods or services and therefore they form a homogeneous group. From this perspective, my scheme differs considerably from Davies', in which entities of different sorts are mixed together (persons, farms, agora, state, employment entity, etc.) and economic analysis or even comparison between entities is impossible. The economic agents act in an open environment. Differently from the theories previously illustrated, I do not think that the territory of a city can be used as autonomous cell, or environment of analysis. Indeed the economic agents of the Roman city and its territory do not necessarily interact hierarchically, for example the goods in Pliny's estate are traded directly to another city, or the estate can be used as temporary market for several goods; but undoubtedly poles of attraction existed, for example areas providing a highly specialised service (e.g. harbours) or clusters of services, like the cities. The adoption of this model on the larger scale would explain the degree of dependence of countryside settlements on their town. It is generally assumed that the administrative boundaries played an important role in directing the flows (e.g.: the wine produced in the Neapolitan countryside would necessarily be distributed through the city of Neapolis), or that transportation costs were the main concern, but this is not always necessarily the case.

The analysis of the flows should then be complemented by estimating for each economic agent whether the good or service provided was more than sufficient to cover the needs of its threshold population. For example, grain is a basic good and therefore the threshold population is very small. If the quantity of grain produced was bigger than the need of the population in the countryside and in the city, then it clearly was produced in surplus for export. Theoretically, by overlaying the results of goods traded

and services produced in the town and the countryside, one can understand the level of surplus production and the economic relation between city and countryside. Ultimately, it would tell the peculiar character of each city and its dependence on or autonomy towards its territory. Through this bottom-up approach, it will not be possible to use a uniform label for all ancient cities, but it will probably provide a clearer picture of the character of each city and will define the quantity of economic flows between city, countryside, and neighbouring areas. Thus in my opinion the 'degree of dependence' of one region over others for a specific good is the key concept to characterise each city and to provide a meaningful understanding of micro-regional/regional/trans-regional trade.

The limits of this model are clearly in its applicability. Most of the goods or services produced do not leave any trace in the archaeological record or are difficult to quantify, therefore it is impossible to reconstruct the entire series. Nevertheless, for some goods it is theoretically possible to reckon the quantity produced and the threshold population needed, as is clearly shown in Jongman's tentative reconstruction of grain production figures in the Pompeian territory.[57] This partial view on the flows of the economic agents is insufficient to understand the relation between city and countryside, but it is potentially enough to prove higher per capita production for at least one good/service.

1.2.3. Application of the model: limits and opportunities

Theoretically the environs of Vesuvius are the optimal investigation area for the ancient economy. The sealed contexts have preserved much archaeological information, which in many other contexts is absent, as for example the ploughing furrows of agricultural cultivations or the carbonised trees. This high-resolution information is especially important for the cities, where the entire system of services can be reconstructed. Unfortunately though, most of the information is already lost because of the early discovery of the cities and the growing urbanisation of modern towns in the countryside.

[57] Jongman 1988.

The data offered in this work are not the result of complete archaeological field walking,[58] but rather the collection of information from the Bourbon archives, from excavations made in the last two centuries, and fresher data from new excavations and other sources. The limits of this kind of data are well known,[59] nevertheless the evidence is, I hope, sufficient to reconstruct part of the rural land produce, which will be compared to the theoretical threshold population and to the total population of the area to calculate the 'weight' of specific productions (e.g.: wine) within the system.

In conclusion, this study will address several questions which can be divided by degree of abstraction as follows:

1. How dense was the settlement pattern in the territories of Neapolis and Nola? How important was the north slope of Vesuvius for their economies? Are there differences between the northern and the southern slopes of the volcano?
2. What advantages/disadvantages did the presence of the volcano bring (fertility vs. landscape instability)?
3. How similar/different were the economies of Neapolis and Nola? Did they differ from the economy of Pompeii?
4. What effects had the AD 79 eruption on the settlement pattern and cultivation?
5. What role did Neapolis and Nola play in the regional economic system?
6. How dependent were these cities on their territories (autarky vs. dependency)?
7. How useful are the territories of Neapolis and Nola for our understanding of the Roman economy?

[58] Whose structural limits are in Hope Simpson 1983 and Fulford 1987.

[59] See the preface in Carrington's study: "we are unable, however, owing the nature of our evidence, to find an answer to all the enquiries we should like to make". Carrington 1931: 11.

2. The historical framework

Landscape studies inherited from the Annales School – and in particular from Braudel's *Mediterranée*[60] – the marginalisation of political events (*histoire événementielle*) in favour of the creation of long-term history. Indeed landscape studies necessitate regional and long-term levels of analysis, which are generally considered as opposed to particular historical events.[61] Furthermore, ancient sources are often regarded as elite-biased and unconcerned about life in the countryside.[62] The conflict between political and social history is generally resolved into a polarised view of the relationship between city and countryside, according to which urban political authorities used their power and influence to (re)organise the countryside (e.g. shifting political boundaries or setting centuriation grids). Consequently, landscape archaeology focuses on the degree of resistance of the countryside to these changes.[63]

This chapter follows this trend by providing a brief summary of the historical events between the Roman conquest of Neapolis and Nola,[64] and the eruption of AD 512, with particular attention to the facts which can potentially illuminate the relationship between city and countryside.

There is nevertheless a deeper way of reading historical events in the geographical context, especially in the case of Campania (Fig. 8). In the past scholars linked Strabo's

[60] Braudel 1972: 17-24.

[61] Alcock 1993: 3-6.

[62] Alcock 1993: 24: "Also to be remembered is the overwhelmingly elite and urban bias of these sources, written by men ignorant of, or not interested in, the latter-day concerns of the social or economic historian. These factors inevitably leave the textual evidence an inadequate foundation upon which to base a comprehensive study of provincial life".

[63] For example, according to Ward-Perkins, in South Etruria the political history played a limited immediate effect on the rural economy and settlement pattern (Ward-Perkins 1972: 872).

[64] The sections on the Greek-Etruscan, and Campanian/Samnite periods have been cut to fit the word limit.

opposition between the Campanian coast and the hinterland[65] to ethnic differences between Greek sea-traders and Italic/Etruscan/Samnite farmers. The ethnic contrast has been encouraged also in subsequent studies, and in particular by Lepore's Marxist interpretation of Neapolis' social tensions between the Greek urban aristocracy and the Samnite rural plebs,[66] which with only minor changes still predominates. Consequently, the problem of ethnicity – and in particular of the "Greekness" of Neapolis, a problematic umbrella term which I will define later – is central to the definition of land use and its shifts over time.

By using the written sources to write social history, I define the cultural framework or system of human actions, through which I hope to understand (not positivistically label) the archaeological evidence. From this perspective, political history becomes the framework of social history.

2.1. The Romans

Roman conquests in Campania did not start by accident, but in a particularly favourable period of Roman military history. By the second half of the 4th c. BC Rome solved the problem of the possible Gaulish invasions and won against the Volsci and the Aequi. The conflict against the Etruscans was at a pause, since Rome called a truce with Caere (353) and Tarquinia (351). The situation was particularly propitious with the Latini as well: in 381 Tusculum was conquered, transformed into a municipium, and this allowed the peace treaty with the Latini in 358.[67]

Even a very short list of the events would show a clear pattern in the choices made by Rome. The Roman conquest spreads with constant pace and rationality. Rome first takes over the key cities, then gains their territories, subsequently it consolidates the new areas with roads, outpost-colonies, and new land divisions, and then it repeats the cycle

[65] Strabo 5.4.8.

[66] Lepore 1967.

[67] Musti 1988: 527.

for new areas. Within this framework, the decision to keep Neapolis as an ally was probably a choice of political convenience. The idea that Rome might have spared the city because of its Greekness is quite fragile and the evidence supports the idea that the city was still quite vibrant, as I will show shortly. The apparently odd strategy of Rome is nevertheless quite similar to the decision the Campanians made nearly one century earlier. In that case, the Campanians were interested more in the land than the sea and needed the trading skills and connections of the Neapolitans. Indeed for trade with the whole Mediterranean basin Rome adopted the coin system and weights of Neapolis, where the first Roman silver series was minted.

The treaty between Rome and Carthage (306) allowed Neapolis to trade safely with the western Mediterranean and the alliance with Rome, together with the political unity of the entire region, brought Neapolis to unparalleled levels of richness.[68]

These are attested by many proxies, such as the spread of Neapolitan coins in Samnium and in Southern Italy;[69] the great quality of monumental Hellenistic tombs in the necropolis; the new city walls; the expansion of the city; the victory of the Neapolitan athlete Symilos at the Olympic games in 248;[70] the wide distribution of the amphorae of Neapolitan producers, like Trebius Lolius (162), in Sicily, Carthage, and Delos;[71] the asylum decree between Neapolis and Cos (242).[72]

This wealth was counterbalanced by the duties Neapolis had to perform as one of the *socii navales*. This entailed the use of ships and crews to help Rome, as in the attack of 310 to conquer Nuceria, or in the war against Pyrrhus, and also in the First Punic War[73] and

[68] The following points are a summary of De Caro 2005: 656.

[69] Rutter 1986.

[70] De Caro 2005: 656.

[71] Olcese 2004.

[72] De Caro 2005.

[73] Polyb. 1.20.14.

the First Syrian War,[74] for which we have more details.

The transformation of Puteoli into a Roman colony in 194 and the works undertaken by Rome in Misenum to transform it into the main navy base are generally considered the turning point for Neapolis, because they mark Rome's intention to become independent in the sea trade. This is the beginning of Puteoli's take-off, which in a few decades became one of the wealthiest cities in the empire. Nevertheless, this was not a detriment to Neapolis' business; actually the 2nd c. BC is the wealthiest period for the city, which benefitted from the propitious political situation. In this period Neapolitan merchants, bankers, and entrepreneurs are frequently attested around the Mediterranean basin.[75] At Delos, they are the most present among the Italians and after those of Elea/Velia. Neapolis became richer and more open to foreign elements, as mirrored in the Atticising funerary reliefs – 2nd to 1st c. BC, probably from Delos and with no parallel in Italy – in which Greek, Oscan, and Latin names are inscribed (though significantly always in Greek letters).[76] Neapolis' richness in the 2nd c. is generally associated with the production of 'Campana A' pottery,[77] whose ubiquitous presence in the western Mediterranean has been interpreted by Morel as a consequence of the Roman victory at Zama in 202 and the direct control of Puteoli from 194.[78] A closer look at the chronology and context of production might provide a different reading of the events. The production of Campana A pottery begins roughly one generation before the political events mentioned and stems from Greek tradition.[79] Furthermore, one should consider that though the Campana A is

---

[74] Liv. 35.16; 36.42.

[75] Taylor in press, ch. 1. The most prominent merchants are Trebius Loesius – active in the 160s BC – and Marcus Anterius.

[76] Ibid.

[77] 220-40 BC.

[78] Morel 1981: 87: "L'improvvisa ascesa della Campana A coincide col dominio romano sulla Campania, che culmina nell'istituzione del *portorium* di Pozzuoli nel 199 e nella fondazione di Puteoli nel 194. In questo senso la Campana A non è una ceramica della Magna Grecia, ma una ceramica romana".

[79] The shapes and the technology used are a development of the previous Greek tradition; the pottery is sometimes inscribed with Greek mottos – e.g. ΤΗΣ ΥΓΙΗΣ – until the end of the production; the Greek colonies of Massalia and Ampurias have been the first market of preference for its distribution. See Morel 1985.

the most easily recognisable Neapolitan product, it was just 1% of the total weight traded by Neapolitan merchants.[80] Therefore Campana A was the smallest part of a business, which must have been constituted mostly of richer goods, like grain or wine. It is useful to remember that the production of amphorae from workshops in Pithekoussai and Neapolis (and the trade of their contents) can be detected from at least the mid-4th c. BC until the end of the 3rd c. BC. Through the stamps[81] on the handles and thin sections on the fabrics, we have a quite reliable map (Fig. 10)[82] of the distribution of MGS II-VI amphorae across the Mediterranean (e.g.: Tour Fondue, Pech Maho, Ampurias, Soluntum, Cartagena, Carthage, and most of western and southern Sicily, where the amphorae are attested also in the interior). The spread of MGS II-VI from Pithekoussai and Neapolis has been linked with the end of the Second Punic War or the Neapolitan *foedus aequum* (326 BC), but these events occurred roughly one generation after the diffusion of the amphorae. Around 260 BC new amphora types are created; some Greco-Italic 1D (260-210 BC) and 1C (260-150 ca. BC)[83] are generally defined 'Pompeian' for the 'black-sand' inclusions in the fabrics; I would rather define them 'Vesuvian' and suggest that some of them might have been produced on the northern slope of the volcano, in the territories of Neapolis and Nola, and exported with the Campana A wares in Neapolis. Similar arguments can be advanced for the Dressel 1A-1B, which are produced from 140-125 ca. BC and are considered the evolutions of the Greco-Italic types.[84] The end of the Campana A production around 40 BC does not mark a decline in Neapolis' trade, because around 50 BC the same workshops started the so-called 'Production A of the Bay of Naples' (known also as Campanian Orange Ware, though other workshops have been found also in Cales

[80] E.g. in the ship at Grand Congloué the total weight of Campana A is 1.5 vs. 108 tons of amphorae (according to F. Benoit in Morel 1981: 88).

[81] Most of which have Greek names, though interestingly there are also Oscan and (two) Etruscan names, written in Greek letters. The stamps include also a TR. LOISIO (Olcese 2010: 164-6), who might be the mid-third c. BC ancestor of the famous Trebius Loesius who traded around 160.

[82] The figure illustrates only the spread of the stamp by Trebius Loesius; the volume by Olcese (2010) provides multiple maps for each Neapolitan stamp and for the amphorae with Campanian volcanic inclusions.

[83] Lund 2000; Vandermersch 1994.

[84] Tchernia 1986.

and Puteoli).[85] The production had a wide distribution in southern Italy, Sicily, North African coast, and Spain, and ceased around AD 75, somehow matching the decline of Dressel 2-4 amphorae before the Pompeian eruption.[86]

Through the lens of the *longue durée* the political events of the Roman period lose most of their importance. Wine trade from Pithekoussai across the Mediterranean is attested (through the amphorae) from the 7th c. BC and Neapolis took part in this production from the mid-4th c. (MGS II-VI). The names on the amphorae match the political situation in the city as attested from the written sources: a predominance of Greek families with the inclusion of Oscan and Etruscan groups. In the 2nd c. BC, the stamps on the Campana A vessels follow the same pattern, with the significant inclusion of Latin names. The sea routes remain the same, though the scale of the trade is now larger, especially in Gaul, where the goods penetrate far inland. Indubitably Neapolis benefitted from the expansion of the Roman Empire, but other factors could have contributed to its economic growth, for example the increasing demand for wine.[87] At least for the 2nd c. BC, there is no evidence to support the theory that Puteoli threatened Neapolis' trade. Furthermore, the assumption that Puteoli's growth hindered Neapolis' trade is based on the untested premises that the two harbours competed on the same routes and for the same goods, while theoretically they might have been complementary. If on the other hand one assumes that the two harbours competed with each other, theoretically one should include in the competition also the other harbours operating in the bay of Naples, especially Pompeii, which was a smaller-rank harbour but nevertheless is generally assumed – rather than Neapolis or Puteoli – to have traded Vesuvian wine to Britain and

[85] Soricelli 2004: 299-300. The Neapolitan pots can be easily identified by the black sand fabric (Soricelli 1987: 109).

[86] Potsherds of Prod. A have been found also in a Claudian context in Pompeii, though the scarce fragments attested in AD 79 might suggest that the production ceased around AD 50 (Soricelli 2004: 300).

[87] Which is not necessarily a result of "Romanisation", but could be also a natural development of tastes and habits after two centuries of wine trade, or a sign of the spreading wealth across the Mediterranean.

India (*sic!*).[88]

Between 82 and 80 BC, Sulla sacked Neapolis, forcibly colonised Nola[89] and Pompeii, seized villas in the Ager Campanus, and probably took part of Neapolitan territory.[90] In Pompeii, Romans started assuming key roles in the municipal administration and Latin became the official language of the city. In Neapolis, from this period and until the early Empire new Roman families are included in the political body – Antonii, Cornelii, Domitii, Iunii, Septimii, Valerii, etc.[91] According to Lepore, this led to the disappearance of the Greek mercantile class, to economic stagnation and cultural impoverishment.[92] In his Marxist perspective, the *otia* of Neapolis mentioned by Strabo (5.4.7) are interpreted as parasitism and profligacy. Beyond leisure and culture (e.g. here were composed works of Cicero and Vergil), these places were also production units and a spur to acquire more land (e.g. Cicero's villas) and start intensive cultivation (e.g. the chestnut varieties created by the knight Corellius and his freedman, Plin. *N.H.* 17.122). Furthermore, it is unclear how successful the Sullan colonisation had been. Among the villas of the Pompeian countryside, many had been built in the 2nd c. BC and still belonged to Oscan families in AD 79.[93]

The quantity and spread of Campanian "black-sand" Dressel 2-4 amphorae across the Mediterranean testify to the maximum expansion of vineyards on both slopes of

---

[88] Within the wider debate of *cabotage* vs. *le grand commerce maritime* I follow Nieto's (1997) and Wilson-Shörle-Rice's (2011) ideas of a combined system of the two, though I think that Christaller's hierarchical model might not be useful to explain to complex trade patterns in the bay of Naples.

[89] Liv. *Per.* 89: "Sulla Nolam in Samnio recepit"; Liv. 47: "legiones in agros captos deduxit et eos his divisit".

[90] Vell. 2.25.4; App. 1.89.

[91] Though the Campanian families were not swept away: Annii, Fuficii, Marii, Opsii, Paccii, and Poppae.

[92] Lepore 1985: 120: "I mezzi di produzione e di scambio che avevano fatto la prosperità di Neapolis e dei suoi abitanti sono così distrutti: economia e società cambiano faccia nel I secolo a.C., i *negotiatores* spariscono, il capitale commerciale e industriale emigra ad investire nei vicini centri affermatisi, Puteoli tra i primi, le sue possibilità e risorse; il territorio agricolo della città viene ridotto, la popolazione rurale intensifica la sua penetrazione in città e il suo parassitismo, la cerchia di vita economica si restringe, le attività ristagnano, prosperano le piccole e medie fortune, d'origine fondiaria, di scarsa iniziativa e capacità, o quelle dei grandi proprietari dell'Urbe; si inizia un clima di sperequazione e di squilibrio, di puri consumi e spese di lusso".

[93] E.g.: the villa of Olius Ampliatus in Ponticelli/Napoli.

Vesuvius. Though the role of Neapolis' harbour in their distribution is still unclear, the association of these amphorae with the 'Produzione A della baia di Napoli' orange ware suggests that the city was not excluded from the trade. In summary, after the Sullan colonisation, many Campanian cities experienced the inclusion of Romans in their civic orders. It is difficult to reckon how effective the colonisation of the countryside had been, because the modes of production show no remarkable change. Neapolis changed considerably, though there is no evidence of a cultural or economic decline.

The process of cultural blending and inclusion in Roman society started under Sulla reached its completion under Augustus. The Emperor undertook many public works to generate consensus and reorganise the entire region.

After centuries of quiescence, in AD 79 Vesuvius erupted. The narrative provided by Pliny the Younger (*Ep.* 6.16; 6.20), although very engaging, does not inform us about the damage caused by the event and its aftermath. Two short passages narrate that Titus appointed two ex-consuls for the relief of Campania and to oversee the rebuilding; the first of the two accounts, by Suetonius (*Tit.* 8.4),[94] also tells that they were chosen randomly and that they acquired lands and properties of the victims who had no heirs left alive and used them to restore the cities that suffered from the eruption. The other passage, in Cassius Dio (66.24.3-4), further adds that lands and resources of the deceased population were distributed among the survivors and that Titus did not accept help from private citizens, cities, or kings, but rather rebuilt everything (πάντα) with the funds available. In Suetonius the term used to define the ex-consuls is *Curatores restituendae Campaniae*, which somehow gives the impression of an overarching project to restore and rebuild all damaged areas in Campania, and I think the passage on the "afflicted cities" should be interpreted in this sense, whereas it is often translated as "buried cities", assuming a reference to Pompeii and Herculaneum only. In Cassius Dio the term used to define the two ex-consuls is *οἰκισταὶ*, which is not the Greek translation for *Curatores*;

[94] "Curatores restituendae Campaniae e consularium numero sorte duxit; bona oppressorum in Vesuvio, quorum heredes non exstabant, restitutioni afflictarum civitatum attribuit".

among Greek historians the term *οἰκισταὶ* is commonly used to define settlers of cities, in Cassius Dio this term occurs in another instance (47.14.4), in reference to the officials appointed by the *triumviri* to redistribute the confiscated lands (43 BC). In any case, by comparison with the management of other catastrophes in present times, it makes good sense to hypothesise that the highest priorities would have been the prevention of robberies and the assistance of the survivors, then the restoration of the regional infrastructure (roads and aqueducts), next the definition of land properties, their redistribution, and eventually the resettlement of the buried cities.

At least to a certain extent, the *modus operandi* adopted by Titus followed the long-standing tradition of imperial support after natural catastrophes; inscriptions in Neapolis, Nola, Nuceria, Surrentum, and Salerno,[95] dated between AD 80 and 82, testify to the reconstruction of public monuments[96] damaged *a terrae motibus*.[97] The road network was probably repaired at the same time, at least the inner route Capua-Nola-Nuceria, while the thicker and harder debris around Herculaneum made a fast recovery on the seaside rather unlikely; a more systematic work undertaken by Hadrian is hinted at by the milestones[98] dated to AD 120/121.

Differently from other catastrophes though, in this case the imperial intervention was not limited to the assessment of the damage and the reconstruction of ruined buildings, but it had to deal also with the redefinition of property boundaries, the acquisition and redistribution of goods (like the statues and treasures from Pompeii's forum and the temple of Venus) and estates and, once it had been decided not to rebuild Pompeii and Herculaneum, the reallocation of their territories to the neighbouring cities. Many

[95] CIL 10.1481; Simonelli 1972: 386-7; Johannowsky 1986; NotSc 1901: 363; Paci 1991.

[96] See Storchi Marino 2009 for a comprehensive picture on imperial interventions after natural catastrophes.

[97] A quick note on terminology is here necessary, since many scholars wrongly presume that the mention of an earthquake refers to the famous one occurred in AD 62/63, rather than the AD 79 eruption; nevertheless, lacking classical Latin a term for eruption, ancient authors defined the event through its effects, mostly earthquakes or burning, therefore also in consideration of the dating I do not see any hurdle in linking these activities to the eruption.

[98] CIL 10.6940,6939,6938.

landowners probably died during the event or their properties could not be easily identified and, even when this was possible, the recovery time for cultivation might have been too long for the small landowners to be bearable. In this perspective, the 'landscape of disaster' might have been perceived by the Roman entrepreneurial class also as one of 'opportunity', especially considering that almost all prominent families already owned several estates in the bay of Naples. These considerations are compatible with the presence of Titus in Campania, who probably wanted to follow the operations closely, as well as the decision to appoint the ex-consuls randomly. Furthermore, Titus' decision to use the *bona oppressorum quorum heredes non extabant* to finance the reconstruction implies the taking of all lands and goods to the imperial *fiscus*, following the Roman law on *bona vacantia*.[99] Along these lines Soricelli[100] suggests that imperial interest in the fruitful lands of Vesuvius played the most prominent role in the decision not to resettle Pompeii, while Savino favours a more pessimistic view according to which the rapid succession of tragic events[101] rapidly brought Titus to the acknowledgement that it would have been impossible to resettle the buried cities, thus he reduced the activity of the *Curatores* only to the restoration of the public monuments in the other cities around the volcano. Both hypotheses will be further explored in the next chapters.

2.2. Late Antiquity[102]

Diocletian's administrative reform of the Empire led to the division of the Italian

---

[99] Soricelli 2001: 455-7.

[100] Soricelli 2001: 458: "L'eventuale passaggio di questi territori tra le proprietà imperiali potrebbe, peraltro, ben giustificare perché non si sia proceduto alla ricostruzione delle città sepolte, una decisione che potrebbe manifestare, piuttosto che la volontà di abbandonare al proprio destino aree non più economicamente vitali, l'interesse dell'imperatore ad acquisire territori dalle note potenzialità economiche".

[101] Savino 2007, according to whom the eruption occurred in September/October, Titus reached Campania right afterwards and left for Rome in January/February, when a vast burning occurred, meanwhile he sent the *Curatores* to Campania; in March Titus inaugurated the Colosseum.

[102] This section is mostly based on the recent works by Savino (2005, 2006, 2009b) and complemented by the studies of Arthur (2002) and De Carolis (2005).

peninsula into provinces. The new organisation encouraged each region and province to locally produce the resources they needed[103] and encompassed also a reorganisation of the taxes, according to which Southern Italy had to provide part of the food for Rome. The province of Campania was ruled by senators, who were based in Capua. In 350 the new province of Samnium was created and the borders of Campania changed slightly, outside the geographical framework of this thesis. In Neapolis, Diocletian's reform led also to a gradual switch from Greek to Latin as an institutional language; the *demarchia* was replaced by the *ordo Neapolitanorum*.

Throughout the 3rd c. and in the first half of the 4th c., emperors and senators performed many acts of euergetism in Campania.[104] In particular, the emperor Gallienus restored/embellished the forum of Nola[105] and Constantine restored the Augustan aqueduct of Serino (323-4), for the benefit of all the principal towns of Campania,[106] and the forum of Neapolis, where he also built the church of the Saviour or Holy Apostles.[107] From Constantine and during most of the 4th c., Neapolis benefitted from the assignation of the *annona*, initially with 150,000 modii of grain, which according to Arthur would have been enough for some 2,500-3,600 people.[108]

Agricultural production in Campania is generally considered still relatively sizeable until the half of the 4th century.[109] Savino analysed the *Liber Pontificalis* and Symmachus' letters to create an estimate of production, in my opinion his arguments are fragile nevertheless they are the only economic model for late antique Campania.[110]

---

[103] Savino 2005: 17-26.

[104] Savino 2005: 266-291.

[105] Camodeca 2001.

[106] Sgobbo 1938.

[107] *Lib. Pont.* 1.186: vita Sylvestri. As sign of gratitude, the city erected a statue in honour of Helena (*AE* 1939: no. 151).

[108] Arthur 2002: 10.

[109] *Exp. tot. mun.* 53.

[110] Savino 2005: 32.

According to the ancient sources, at the end of the 4th century the agriculture of the entire region experienced a rapid decline. In a document of Honorius dated to 395, it is stated that 1/7 of the cultivable land of Campania was abandoned and unproductive. For this reason, the owners of the land were unable to pay taxes; Honorius ordered the burning of the registers of properties covering an area of 528,042 iugera (roughly 132,000 hectares), which according to Galasso correspond to 1/10 of the entire land available in Campania,[111] although my measurements provide a much darker scenario. Indeed, 132,000 ha correspond to all the plains from the *Mons Massicus* to the Surrentine peninsula.[112] In 410, Alaric king of the Visigoths sacked Rome and then moved towards Neapolis. He did not manage to enter the city walls, therefore he ruined the fields and killed the peasants, and then he sacked Nola.[113] After this event, Honorius granted five years of tax reduction for the whole of Campania twice, in 413 and in 418.[114] In 455 the Vandals again sacked Nola, Capua, ravaged the land, and ransomed or enslaved farmers by bringing them to Africa.[115] Similar raids occurred also in 458 and 463. In 472 Vesuvius exploded with an impressive subplinian eruption, followed in 505 and 512 by smaller eruptions, which are also the chronological limit of this work.

2.3. Conclusion on historical sources

Beneath the surface of the *histoire événementielle*, the political reading of ancient sources provides elements of continuity throughout the millennium considered. The Ager Campanus, first split between Capua and Cumae, and then the possession of

---

[111] *Cod. Theod.* 11.28.2. Galasso 1965; Arthur 2002: 10; De Carolis 2005: 516.

[112] My calculation excludes all the 'internal' plains, i.e. those north of Teanum Sidicinum, the plain between Allifae and Telesia, the plain of Caudium, but include the Ager Falernus and the Campus Stellas, the Ager Campanus in both the territories of Cumae and Capuae down to Acerrae, the Nolan plain, the Pompeian/ Nucerian plain. My calculation went beyond the centuriation grids of the Ager Campanus, covering also areas where in antiquity there were marshes, and amounted to 140,500 ha.

[113] Aug. *De civ. Dei* 1.10.

[114] *Cod. Theod.* 11.28.7, 11.28.12.

[115] Greg. Mag. *Dial.* 3.1; Paol. Diac. *Hist. Rom.* 14.18. Related to this event there is also the legend, attested from ancient sources, of the voyage of St. Paulinus of Nola to Africa to rescue the prisoners. On the risks of raids on the Campanian coast, see Sid. Apoll. *Carm.* 5.388-392.

Campanians, Samnites, and Romans, had a strategic importance for grain production and was the main trigger of change in the region. Neapolis' political prominence resided in its ability to trade the agricultural produce of the hinterland across the Mediterranean basin. The city was strictly linked with the interior from its settlement, when it provided grain for Athens, but it became stronger under the Campanians, who created political unity in the region. Nola is politically characterised as organiser of the countryside. There are many references to its countryside and the presence of *pagi* also in Late Antiquity testifies to the resilience of scattered settlement patterns. But on the other hand this city is closely related to Neapolis; indeed except for the famous passage of Strabo (5.4.7), in which Pompeii is described as the harbour for Nola, all the other sources and the archaeological evidence point towards Neapolis, because Nola was the most hellenised Italic city in Campania and because of the long-standing relationship with Neapolis it came in support of the Greek city. The last element of continuity is the difficult relationship between the Italic rural plebs and the civic aristocracies in Capua, Neapolis, and Nola. On several occasions the plebs started a revolt against the city and the general impression one gains from the evidence is that the native population, despite the continuous inclusions of other Italic tribes, kept the same culture and organisation until Sulla at least.

3. Eternal constant: the Apennines and the plain

3.1. The Campanian geographic system

The term Campania defines, for the Roman period, a geographical area which is much smaller than the modern Italian region. Here the term Campania refers to its historical geographical meaning in the 1st century AD, which differs from its original meaning (the Ager Campanus) and from the Augustan administrative regions. It consists basically of a vast plain framed on three sides by the Apennines (Fig. 8), from the Mons Massicus to the Surrentine peninsula, facing the sea on the west. In antiquity the plain was fragmented by rivers, marshes, and volcanic areas. The coast is straight, marshy, without good bays for mooring in its northern part, while towards the south, from the Phlegraean Fields to the Surrentine peninsula, it consists of a wide safe bay with several natural harbours.

The Apennine range is geologically quite recent and frames the region with steep barriers, making the connection with other regions more difficult. The mountains primarily consist of Mesozoic limestone, but their actual appearance is the result of tectonic movements that happened during the Pliocene, when clay and sand covered the bedrock. Thanks to these elements, which cover the limestone, vegetation sprouts easily. There is an abundance of sedimentary rocks, such as chalk, clay and travertine (sedimentary limestone). The Apennines are easily subject to erosion and due to their geological nature springs and streams are numerous and follow complex patterns, disappearing in the rock and emerging again at a much lower altitude in many places.

The region contains two volcanic areas. On the northern border is Roccamonfina, a caldera volcano dated to 600 kyBP, whose activity created a series of hills around it.[116] In more recent times, around 300 kyBP, volcanic activity began in southern Campania, with the formation (150 kyBP) of many volcanoes along the bay of Naples: Ischia, Procida, Monte di Procida, the Phlegraean Fields and the Somma-Vesuvius complex.[117] In this

[116] Dobran 1993: 7.

[117] Arthur 1990: 3.

chapter the volcanic areas are considered only in their static features; the analysis of the changes caused by the eruptions are detailed in the following chapter on the Somma-Vesuvius complex. The Roccamonfina complex lies between the Mons Massicus and Monte Maggiore, thus it has two strategic passes, which during the Roman period were guarded by the settlements of Suessa Aurunca and Teanum Sidicinum.

The Phlegraean Fields break the plain between Cumae and Neapolis with several hills and calderas. Communication between these two settlements is possible only along the coast through Puteoli and Bauli. The path through the hills and calderas was rough; nevertheless the strategic importance of Puteoli in the Roman period led to the creation of a route between Puteoli and Capua (Fig. 11). The volcanic nature of the area creates easily defended topographical summits for Puteoli, Cuma and Palaepolis (the former settlement of Neapolis). It further generates lakes and bays, which only in the Roman period were connected artificially to create an efficient system of harbours. According to Strabo the only substantial harbours of the Greek period were Dikaiarchaia/Puteoli (for Cumae) and Neapolis, because the bays at Misenum, Lucrinus, Avernus, and Baiae were very shallow, despite their great potential. Only in the Roman period, with jetties in *opus caementicium*, did it happen that "the greatest merchant ships can moor within with safety".[118]

The Somma-Vesuvius volcano divides the plain into two parts; on the northern half were the Ager Nolanus and the alluvial plain of the river Sebethus, while on the southern was the Ager Pompeianus/Nucerinus. Communication between these areas occurred through the coastline, in the narrow bend where Herculaneum lies, or through the hinterland passage between the volcano and the Apennine Mountains, where the modern town of Palma Campania lies (Fig. 11).

Unlike today, ancient Campania had several rivers and streams, which were

[118] Strabo 5.4.4-6.

characterised by strong flow at the springs and slow movement in the wide alluvial plains. The river Volturnus[119] is still today the longest in southern Italy (185 km). It was quite rapid until Capua, then slow and frequently overflowing.[120] It formed with the rivers Savo[121] and Clanius[122] a wide marshy area.[123] Before AD 95, when part of the swamps was reclaimed and the via Domitiana built, there were no easy fords for crossing it, the only known bridge was near Casilinum, very close to Capua.[124] The river Savo was quite short, just 50 km, and flowed from Roccamonfina through the Ager Falernus. Like the Volturnus and the Clanis, near the coast it flowed slowly and was swampy. The Clanis was a river of little discharge, from Suessula to Liternum following a quite tortuous path. The river was particularly slow and marshy[125] and was transformed into a channel (the Regi Lagni) in the modern era, under Bourbon rule. The via Campana crossed it south of Capua. As mentioned, the three rivers contributed to the formation of a wide swampy area,[126] which is indirectly confirmed by the absence of traces of centuriation or any other kind of settlement, as Frederiksen notes.[127] Possibly there were minor harbours for

---

[119] For the definition of some of the strategic passes and fords, I follow the description offered by Frederiksen (1984: 17ff.). As limit of the ager Falernus and Campanus: Strabo 5.238.243; for its features: Verg. *Aen.* 7.728-9; Ov. *Met.* 15.714-5; Lucan II 423; Sil. It. 8.529-530; Stat. *Silv.* 4.3.67ff.; as strategic pass: Liv. 10.20.6 and 31.2; Dion. Hal. *Ant.* 15.4.

[120] Virg. *Aen.* 7.728: amnisque vadosi accola Volturni.

[121] Stat. *Silv.* 4.3.66: pigerque Savo; Plin. *N.H.* 3.61.

[122] Dion. Hal. 7.3; Lycophr. *Alex.* 718; Liv. 32.29.3; Strabo 5.243; App. *b.c.* 1.39.

[123] For the management of surface waters and marshes, see Pagano 1995. Of particular interest, the channel created by Aristodemus after the Cumean conquest of part of the Capuan territory. The channel is described in the ancient sources (Dion. Hal. 7.11; Liv. 28.46.4-5) and it has been found recently 1.5 km north of Cuma (in the modern town of Licola, see Pagano 1995: 214). For the reclamation works in the 16th and 17th centuries, see Fiengo 1988.

[124] Stat. *Silv.* 4.3; Mart. 8.65.

[125] Frederiksen 1984: 18.

[126] Verg. *Georg.* 2.225: et vacuis Clanius non aequus Acerris; Plut. *C. Mar.* 37-8 (Caius Marius takes shelter in the swamps); Liv. 22.16.4: inter Formiana saxa ac Literni harenas stagnaque et per horridas silvas hibernaturus esset; Sil. It. 6.653: Hic dum stagnosi spectat templumque domosque Literni ductor; Stat. *Silv.* 4.4.28; Val. Max. 5.3.2; Sil. It. 7.537. Recent rescue excavations (Giampaola 1997: 226-7) prove that before the Roman period the marshes were smaller and limited to a narrow area near the river; in the period between the end of the 6th and second half of the 4th c. BC many drainage ditches were created around Acerrae.

[127] Frederiksen 1980: 18.

small trade along the coast or at some point along the Volturnus.[128] This area was exposed to pirate raids, as is implied by the establishment of the *praesidium* Volturnum nearby.[129]

The springs of the river Sarnus[130] are between the modern towns of Sarno and Nocera. The current discharge is much less than it was in antiquity, when it was navigable for a stretch[131] and was venerated.[132] Modern scholars do not agree on the path of the ancient river, which has been markedly changed by the volcanic eruption of AD 79. It is impossible to judge where exactly the bridges for crossing the river were and how the coastal route from Pompeii was connected to Stabiae and Nuceria.[133]

The river Sebethus ran between the city of Neapolis and the Somma-Vesuvius complex. The discharge of the river had changed over the centuries, creating marshes a more detailed analysis of which is offered in the following chapters. Here it is important to stress the strategic importance of the bridge at the mouth of the river, a key feature of the coastal route connecting Neapolis to Herculaneum and Pompeii.

There were probably other minor rivers and several streams (Fig. 12), but the scarcity of ancient sources mentioning them and the lack of specific field research make it impossible to plot them all. Nonetheless, these features were important economic resources and settlement triggers. I present one example for the Somma-Vesuvius complex in order to show their possible impact on the archaeological record.

Livy and other Latin authors[134] mention the Veseris, a stream/river with a city nearby

---

[128] Liv. 26.7.9; Stat. *Silv.* 4.3.76.

[129] Liv. 25.20.2: castellum communitum ... et praesidium impositum ut mare proximum et flumen in potestate essent.

[130] Verg. *Aen.* 7.738; Sil. It. 8.537-8.

[131] Strabo 5.4.8.

[132] See Suet. *De gram. et rhet.* 28 and the fresco found at Murecine (De Simone 2000).

[133] Conticello de' Spagnolis 1994.

[134] Liv. 8.8.19: haud procul radicibus Vesuvii montis, quae via ad Veserim ferebat. Cic. *Fin.* 1.23; id. *Off.* 3.112; Val. Max. 6.4.1; Aurel. Vict. *Vir. ill.* 26, 28: positis apud Veserim fluvium castris.

probably located on the north slope of Vesuvius, where a battle occurred during the Latin war. The existence of the centre is confirmed also by a few Campanian coins on the Neapolitan weight standard bearing the Oscan legend Fenseris.[135] This place is frequently shown on historical maps, but the evidence is too scarce and scattered to locate the stream and the settlement reliably.[136]

A similar approach can be applied to some minor harbours, mentioned by ancient sources or known from archaeological records, as in the cases of Herculaneum, Stabiae, and Oplontis. The presence of a harbour at Herculaneum was hinted at by a passage of Dionysius of Halicarnassus, who refers to inlets safe in any weather conditions.[137] This hypothesis is confirmed by the presence on the shore of several warehouses, traces of a river, and by recent volcanological studies.[138] Stabiae's harbour was known only through Pliny the Younger's account of his uncle's trip during the eruption, but its existence has been confirmed recently by archaeological discoveries. The area where the harbour lay shows traces of occupation from the Oscan period to very late antiquity. Some scholars[139] have interpreted it as the harbour of the Nucerian confederation and later as an auxiliary naval base and strategic harbour for the *classis praetoria Misensis*.[140] In the Hadrianic period, the harbour was restored, improved, and probably became the major harbour for Nuceria and the entire area. The existence of a harbour at Oplontis has recently been hypothesised by archaeologists from the University of Texas on the basis of some ground

---

[135] 400-335 BC, AR Didrachm, Obv: Head of Hera, wearing broad stephanos, Rev.: 𐌇ΕΝΣΕΡ (Fenser) or 𐌌𐌖𐌌𐌄𐌔𐌌𐌄𐌈 (Fensernum). Bellerophon on Pegasos rt., spearing Chimaera. See SG293a. See also: Imhoof-Blumer 1886: 206-221; Rutter 1979: 85-90, 181-183; Rutter 1986: 77, dates the coins of Veseris to 395-390 BC, proves that they were minted with several others (Hyria, Nola, Allifae, etc.) in Neapolis and are strictly related to the coins of Hyria. The stem of the toponym is Ves-, the same as Mt. Vesuvius.

[136] The name place Feneria might be related to Fensern/Veseris. It defines a neighbourhood in the town of Casalnuovo di Napoli, where Sebethus originates (see § 5.5.5).

[137] *Antiquitates Romanae* 1.44: λιμένας ἐν παντὶ καιρῷ βεβαίους ἔχουσα. There were two rivers on the sides of the city, Sisenna IV frg. 53 (p.182 Peter): inter duas fluvias infra Vessuvium conlocatum.

[138] De Simone 1998: 18-26; Aprile 1999: 61.

[139] Varone 1965: 83 with references.

[140] Senatore 2001; Parma 2002, based on epigraphic evidence.

penetrating radar surveys.[141] The presence of several small harbours might suggest an integrated trade system, according to which the goods were transported by shallow boats to the major harbours, where they were moved to cargoes for long-distance trade. Similarly the goods transported to Puteoli, like the Egyptian grain, could have been distributed easily across the bay and from there to the interior.

3.2. Human geography

The mountain range, the volcanic areas, the marshes and the rivers constitute obstacles to communication and fragment the region into several areas.

Mountain passes are the outer shell of this system. Some of them played a particular strategic importance, thus were often guarded by settlements at their feet. Sinuessa, Sessa Aurunca, and Teanum Sidicinum control the gates that connect Latium to all the regions of southern Italy. Access to Apulia is guarded by the mountain pass of the Furculae Caudinae, which leads to Caudium and Beneventum, and Abella, on the route to Abellinum. Today the latter pass is the principal gateway to the southern Adriatic Sea (the highway passes through Avellino instead of Benevento), but for antiquity its importance is proved also by two passages in Paulinus' *Carmina* (20.65; 20.312). Nuceria is the only gate to Bruttium.

Sea connections are easier and better in the bay of Naples than along the coast of northern Campania. Cumae's location is particularly advantageous, because it is provided with a natural fortress and benefits from both the difficulty of being attacked from the north and the easy connection to the fertile plain on one side and the harbours of Baiae, Puteoli and Misenum on the other. The sea routes connecting central and northern Italy with the southern part of the Mediterranean basin pass through the straits of the Surrentine Peninsula with Capri, and of Misenum with Procida and Pithekoussai (Ischia). Control of these areas entails control of all sea traffic; this was the incentive for the first Greek tradepoint in the West on Pithekoussai (Fig. 11).

[141] Pers. comm. with John Clarke.

In the interior, the presence of volcanic areas, marshes and only a few fords, created natural districts, which roughly correspond to the political territories: along the coast lay the Greek settlements of Cumae, Dikaiarcheia/Puteoli and Neapolis; in the area between Mt. Roccamonfina and the river Volturnus there was the territory of the Sidecini; the wide fertile plain between Capua and Cumae was at first divided between the two cities, then it became the major cause of struggle; the territory of Nola and the Ager Pompeianus/Nucerinus kept their cultural homogeneity throughout the centuries. The main natural route which connected the centres to the hinterland from Capua to Nuceria is also the spine for the Italic/Etruscan settlements. These differences were later cancelled by the arrival of the Samnite tribes, which conquered the entire region.

3.3. Resources of the static landscape

The Apennine range and the volcanic areas are not just obstacles to connections, but also a rich system of resources for construction (Fig. 13). The Apennines and the sedimentary deposits in the river valleys offer limestone quarries at a very short distance from the settlements. The modern limestone quarries are located mainly in the areas of Nola and Capua (roughly 60% and 30% respectively), with a few in the area of Sarno, which provides sedimentary limestone (travertine).

The volcanic areas and those affected by volcanic activity offer a wide range of different materials. Volcanic ejecta, according to their temperature and mix of basic elements, form different materials which can be used in architecture. The lithology can be divided into three categories: lavas, pyroclastic materials, and alluvium.[142] The volcanic products originating from the lava are the *cruma di lava* (lava foam or scoria), soft lava, and basalt. The first two are very soft and light and are used as construction material, in the *opus caementicum*, in the facing of *opus incertum*, and especially for vaults, due to their combination of good resistance and light specific gravity. Basalt was used mainly for paving roads or for mills and press counter-weights.

[142] De Fusco 1993: 59.

Lynne Lancaster discovered the presence of volcanic scoria (*cruma di lava*) of the proto-historical eruption of the "Avellino pumices" in the *opus caementicium* of many buildings in Rome.[143] The Vesuvian scoria are particularly important for their light specific gravity[144] and were used from the 1st century AD (Forum of Caesar in Rome), then in many Trajanic buildings, in the Pantheon, and later in the reconstructed Basilica Iulia (after the fire of AD 283).[145] Lancaster's analysis identifies the scoria with the volcanic ejecta of Vesuvius' prehistoric eruption (36-18 ka)[146] and originally suggested that the scoria were excavated in the Pompeian area "from under the 79 deposits" and that "the river port of Pompeii at the mouth of the Sarno was the major point of exportation".[147] This hypothesis seemed problematic to me, since it does not take into account the effects of the AD 79 eruption, i.e. thickness of these ejecta and impossibility of using the buried harbour of Pompeii.[148] Thus I have suggested that the scoria quarries were located on the north slope of the volcano and exported through Neapolis, and Lancaster agreed with my interpretation.[149]

Lavas are easily extracted in the Somma-Vesuvius complex;[150] Cato probably refers to this area when he states that the best olive mills come from the Nolan and Pompeian

---

[143] Samples were taken from the Forum of Caesar, Ostia from the Julio-Claudian period, in an *opus reticulatum* wall of the house of Augustus on the Palatine. One piece was sampled from a wall at Pompeii. The buildings after 79 include the Basilica Ulpia, Baths of Trajan, Pantheon, Temple of Divine Hadrian, Baths of Caracalla, and the Diocletianic rebuilding of the Basilica Julia.

[144] 750-850 kg/m^3. The tufo giallo della via Tiberina weights 1350 kg/m^3, the pumice 600-700 kg/m^3 (Lancaster 2005: 59).

[145] Lancaster 2005: 59-63, 223.

[146] Lancaster (2006) notices a switch in the late 3rd c. AD imperial buildings from the Vesuvian scoria to the pumices of Latium and explains it with the Diocletian's tax reform, which made the import from Latium more economical than the use of Campanian materials.

[147] Lancaster 2005: 64.

[148] Vogel and Marker 2010, with bibliography.

[149] Lancaster 2011.

[150] Nicotera 1950: 406-7 refers of some analyses made on the basaltic stones used in Pompeii for paving the roads and traces them back to the Somma-Vesuvius.

areas.[151] Scholars have focused their attention more on Pompeian millstones. Nicotera,[152] making a macroscopic analysis of the composition of the millstones in Pompeii, argues that their source is Roccamonfina rather than the Somma-Vesuvius. Peacock[153] divides the Pompeian mills into two categories, based on a macroscopic difference, not supported by analyses at the microscope: leucite-augite-tephrite mills for which he supposes a local production, and leucite mills, for which he hypothesises a production in the area of Orvieto, where he found production waste. Buffone[154] adopts a broad division between leucitic phonolites (from Orvieto) and leucite basaltic trachyandesites (from the Somma Vesuvius complex). This study is more accurate and supported by chemical analyses. His sample for the Somma-Vesuvius was taken in the modern town of Castello di Cisterna, where there are remains of pre-79 lavas. He analysed 45 hourglass millstones from Pompeii (10 *metae* and 35 *catilli*), of which 62% are supposedly from Orvieto, the remaining 38% from Somma-Vesuvius. He also analysed 25 rotary-hand millstones and 80% of them are from the Somma-Vesuvius, 16% from Mt. Etna and just 1 sample (4%) from Roccamonfina. Similar rotary-hand millstones are found also in Grumentum and Aquileia and probably come from the Vesuvian region.

Williams-Thorpe[155] proceeds with a more scientific analysis on a wider basis. Analysing 192 samples from 64 archaeological sites around the Mediterranean basin, she proceeds with chemical analyses and thin-sections. Nevertheless, the provenance of the comparative samples is not precisely described: she criticises the analysis of some of the

---

[151] Cato *Agr.* 22.2; 22.3.4; 135.2-3.

[152] Nicotera 1950: 421-3.

[153] Peacock 1980; id. 1989. In another article (1986), Peacock describes unfinished mills found in a quarry in Orvieto, suggesting that this area was the centre of production for Pompeii, but no comparative analysis was done on the volcanic materials from both Roccamonfina or the Vesuvius. A similar approach is adopted by Antonelli 2005. The statement in Antonelli 2001: 183: "it is now certain that the Orvieto area was one of the main production centres of leucite millstones under the Roman Empire" is supported by the analysis of samples taken only from central Italy and therefore is unreliable. The same arguments are repeated in Antonelli 2010.

[154] Buffone 1999; id. 2003.

[155] Williams-Thorpe 1988.

samples provided by Peacock, stressing the importance of microscopic analysis, but divides the possible productive sources into wide areas, therefore mainland Italy constitutes a vast productive area and includes central and southern Italy. For the samples from Mondragone, Herculaneum, Pompeii, and Paestum she suggests as provenance mainland Italy, with no difference between Orvieto and the Vesuvian area.

In summary, the study of volcanic mills in the Vesuvian area still lacks a systematic collection of comparative samples from the volcanic areas in Campania (islands, Somma-Vesuvius, Roccamonfina), therefore an overall interpretation of mill production is distorted by more samples from central Italy rather than from Campania. According to Williams-Thorpe, all the volcanic products in mainland Italy are very similar and differences can be noted more at the microscopic scale (i.e.: differences between quarries), than at the macroscopic one (i.e.: regional differences). The importance given by Peacock to Orvieto as the main productive centre of mills for the Italian peninsula and the main coastal centres in the western Mediterranean, if confirmed, shows an interesting proxy of mass-production, especially considering the availability of volcanic material for mills and presses also in the nearer Vesuvian area. The interpretation offered by Buffone emphasises the difference between hourglass millstones made in Orvieto and used for "industrial-scale" production, and rotary-hand millstones, made with local materials, and intended rather for small-scale (home) production. If confirmed, the prevalence of Orvieto – rather than local – mills in Campania suggests a very efficient system of mass-production (i.e.: low-priced products) and distribution (i.e.: good roads and harbours and low costs for transportation). Furthermore, it reduces the importance of local networks and resources in favour of broader connectivity.

The study on volcanic mills is limited to the artefacts of the 1st century AD. An analysis of post-79 mills could show how production trends changed, for example if the reduced agricultural relevance of Campania from the 2nd century AD is paralleled by a local (rather than global) supply of production tools. Moreover, it could be used to compare the efficiency of mass-production over time. The analysis shown above covers the mills

only, no specific study on the presses has been done.

The main product of the pyroclastic flow is the pyroclastite; in relation to its grade of cohesion it becomes pozzolana or tuff.

Tuff was quarried in the areas of Caserta, Benevento, Avellino, Sorrento, and Nuceria, which provided the grey tuff for Pompeii (it is typical of the 2nd c. BC construction phase of the city).[156]

The yellow Neapolitan tuff is a product of the Phlegraean Fields and constitutes the bedrock on which Neapolis lies. It outcrops at several points and was widely used in antiquity as well as in modern times. It is the most suitable volcanic material for construction because it is easy and very soft to work, very light,[157] particularly appropriate for binding with mortar, and resistant to huge loads.[158] No systematic study has been conducted to locate the ancient quarries of this tuff, there is only one reference[159] to an unpublished quarry under the church of Santa Maria del Pianto, in the modern area of Poggioreale, one of the districts on the east border of modern Napoli, outside the ancient city (cat. NAP007). Poggioreale (50 m a.s.l.) is the southern edge of Capodichino, a 3 km long hill at 100 m a.s.l. The entire southern flank of the hill could have been exploited and along this path ran the aqueduct, possibly a road to Nola, and a vast necropolis of the 3rd c. BC has been found (cat. NAP001). Other tuff outcrops might have been north of the ancient city, in the neighbourhood of Materdei at the feet of the Capodimonte hill.

Loose pyroclasts (tephra) include all the deposits of explosive volcanic eruptions, from the millimetric to the metric. According to size, the pyroclasts are categorised as: big blocks and bombs (bigger than 256mm), fine blocks (between 256 and 64 mm), lapilli

---

[156] Carrington 1933: 127, 130.

[157] From 1.1 to 1.4 tons/m^3 (De Fusco 1993: 64).

[158] Depending on the variety, it changes from 20 Kg/cm^2 to 175 Kg/cm^2, with a medium value of 50 Kg/cm^2 (De Fusco 1993: 64).

[159] Greco 1994: 43: “latomia sfruttata per cavare i blocchi delle mura di Neapolis, recentemente scoperta sotto la Chiesa di S. Maria di Poggioreale”. With plates at pages 117 (general) and 118 (detail of the marks).

(between 64 and 2 mm), and ashes (smaller than 2 mm). Pozzolana defines the granular ash.[160] All tephra were used in the Roman buildings, but ancient sources focus on the pozzolana of the Phlegraean Fields, because of its suitability for constructions under water.[161] Until recently there were several pozzolana quarries in both the Phlegraean Fields and Somma-Vesuvius complex. The Colles Leucogaei – the still-steaming volcanic crater (Solfatara) at the border of the Phlegraean Fields in the territory of Neapolis – was used as an Imperial quarry by Augustus for a special "chalk" (lime?).[162]

Clay is present in some parts of the Apennine Mountains, but there is no mapping of the ancient clay quarries, nor a systematic catalogue of the modern ones. The map of geographical units of Campania[163] shows clay hills in the area of Avellino and beyond Benevento. Within the plain, it is commonly accepted that clay quarries were abundant in Ischia/Pithekoussai and Arthur hypothesises some in the Phlegraean Fields, from modern quarries.[164] Cerulli Irelli mentions clay deposits of mediocre quality within the city of Pompeii;[165] Carrington hypothesises one along the Sarno River.[166] Probably most of the ancient clay quarries are exhausted today. The presence of the Apennine range and alluvial valleys at its foot make several areas of the Campanian plain particularly suitable for clay quarries. There are indirect clues to the existence of some of them: (1) the presence in the Tabula Peutingeriana of a mansio/statio/vicus named Ad Teglanum (probably in the territory of the modern town of Palma Campania or Sarno), interpreted

---

[160] De Fusco 1993: 70.

[161] Plin. *N.H.* 16.202; 35.167; Vitr. 5.12.2, 2.6; Sen. *Nat. Quaest.* 3.20.3.

[162] Plin. *N.H.* 35.174. Considering the lithology of the area, it hardly can be real chalk; more likely it is sulphur with a chalky consistency. Augustus paid an annual rent of 20,000 HS to Neapolis for the exploitation of this special chalk.

[163] Di Gennaro 2002.

[164] Sersale 1974: 178-181. Arthur 1990: 3, at the Solfatara and Licola, with no archaeological evidence. Arthur 1994: 95, clays in Puteoli, Pithekoussai, and around Mt. Massicus. About the clay quarries in Pithekoussai, see Olcese 1996.

[165] Cerulli Irelli 1977: 53. She refers to the discoveries made by Jashemski of clay deposits in the garden of the "casa della nave Europa" and by Laidlaw in the "casa di Sallustio", but no traces of quarries were found.

[166] Carrington 1933: 129.

as "place where *tegulae* are produced";[167] (2) the huge production of amphorae and pottery in the environs of Vesuvius (the identification of the production area is given by the presence of volcanic inclusions),[168] as well as the names on the brick stamps in Pompeii,[169] which occur only in Campania and therefore suggest local production. Still, no analysis of clay in modern quarries has been done and therefore there is no archaeological proof for identifying the ancient quarries.

According to Pliny the Elder and Strabo,[170] the coast between Cumae and Liternum provided different sands of good quality for the production of glass and colours. Recent analyses[171] on 20 glass fragments from Pompeii and Herculaneum though, show that the sands used for glass-making were from the river Belus[172] in Israel rather than from the Volturnus. Another study[173] on 27 glass fragments sampled in different locations around the Mediterranean basin does not exclude however that sands from the French, Spanish, and Italian coast, including the river Volturnus,[174] provided raw materials for glass production, especially between the 1st and the 3rd centuries AD. In most of the cases, the ample evidence for glass workshops in commercial hubs like Puteoli (and probably another centre was in the environs of Vesuvius),[175] suggests that the raw materials were

---

[167] Romanelli 1818: 515.

[168] Most of the Campanian Black-Glaze pottery is produced in Neapolis or around Vesuvius, similarly the Dressel 2-4 Amphorae and the so called "Campanian terra sigillata" (1st BC – Vespasian; see Soricelli 2004).

[169] CIL X, 8042; Carrington 1933: 137.

[170] Plin. *N.H.* 36.194; Strabo 16.2.25. For the sand for the *caeruleum* (azure colour), used for creating the *lomentum* and the *Vestorianum*: Plin. *N.H.* 33.161.

[171] Vallotto 2002.

[172] The present name of this river is Naman, in north-western Israel.

[173] Degryse 2008.

[174] Of three samples taken from the river, just one, black and quite rich in heavy volcanic minerals, is unsuitable for glass production.

[175] The glass flasks with cityscapes of Puteoli and Baiae were produced in the 4th c. AD and spread across the entire empire (Ostrow 1979). Glass producers probably concentrated in the *clivus vitrarius*, commonly identified with the vaulted rooms in via Ragnisco, n. 13 and 15 (Sommella 1978). The mark of a certain Publius Gessius Ampliatus suggests that probably another important production centre was in the environs of Vesuvius (De Franciscis 1963).

imported from Egypt and the Near East and blown locally.[176]

The overall picture indicates that southern Campania had a wide range of natural resources for both construction and production. A closer look at the volcanic products shows the variety of materials and therefore the difficulties in placing the resources on the map. Nevertheless, for some building materials – such as, for example, tuff – the main types are easy to distinguish and will help in interpreting the sites of our area. The resources are quite widely spread in the region; therefore they are not attraction poles for settlement or connection routes. Although quite rich, this system of resources is used mainly within the region – apart from the quite relevant exception of the pozzolana and the cruma di lava – and therefore overall it was not a source of regional surplus.

3.4. The role of the territories of Neapolis and Nola

Within the wider geographical framework described, the settlements of Neapolis and Nola had the possibility of controlling the routes to the Ager Pompeianus/Nucerinus and ultimately to Nuceria and the pass to Bruttium. Nola also controlled the hills and mountains around it, and the mountain passes that through Abella and Abellinum connected Campania to Apulia. The strategic importance of Nolan mountain passes is echoed in a passage of Polybius (3.91), in which Nola is defined as one of the access points (εἰσβολαί) from the "middle-earth" (μεσόγαια) to the inner lands and directly to the Daunii.[177]

Very likely Neapolis was connected with direct routes to Capua, Acerrae and Nola, but no ancient source reports it. For control of the sea traffic, Neapolis had to rely on the minor harbours on the bay and on the straits. The area of Herculaneum was particularly important for controlling the coastal route and as the most direct connection of the Nolan area to the coast.

---

[176] Foy 2001, ch. 1. For the distribution system, see Wilson, Schörle, Rice 2012.

[177] See Musti 1988: 173-181, with reference to 8th c. BC Daunian pottery, which underpins this theory. A similar strong link with Apulia is proved by the already mentioned passages in St. Paulinus' letters and in the distributional pattern of late antique coarse ware (see ch. 7).

4. The shifting landscape of Vesuvius

This chapter analyses the dynamics of landscape change in the Vesuvian region and in particular the effects of eruptions on the environment. Since the phenomenon is complex and articulated, the study proceeds through several sections, each focusing on a specific question: which shape Vesuvius had before and after the AD 79 eruption - thus how much land was available for cultivation; how eruptions changed rivers, hills, and the consequences of these phenomena on the site visibility.

4.1. Vesuvius' present and past shape

The problem of the volcano's past shape is a topos in Pompeian studies. This section re-evaluates the evidence to assert the available land for cultivation and the differences between past and present hydrography.

Mt. Vesuvius consists today of an almost symmetrical cone-shaped stratovolcano, rising 1281 meters above the bay.[178] The cone sits in a 4 km diameter caldera, the Somma caldera,[179] which is now preserved only on the northern flank, forming a wall-like ridge on the north side of Vesuvius, which becomes shallower on the western and south-eastern sides and disappears on the seaward side (Figs. 14-15). The trough between the Somma caldera and Vesuvius is known as the Atrio del Cavallo (Fig. 16) to the west and the Valle dell'Inferno to the north. Although belonging to the same volcanic complex, Mt. Somma and Vesuvius are perceived as distinct entities by both the local population and tourists. Vesuvius' soil is extremely permeable and has no surface circulation of water, while Mt. Somma on the other hand shows several stream-beds (Fig. 12). The present rainfall (around 550 mm per year) is not enough for consistent springs or streams, which appear only after particularly heavy rains, but until recently the annual rainfall was much heavier (the average value for the period 1926-1950 was around 1000

[178] De Boer 2002: 74.

[179] Guest 2003: 25.

mm per year).[180]

One of the most popular research topoi in Pompeian studies is the shape and appearance of the Somma-Vesuvius complex before the AD 79 eruption.[181] The question is more interesting than the old approaches may suggest, because the different shape and dimensions of the volcano affect the distribution of the waters and the surface available for exploitation, and therefore the settlement pattern.

Four ancient authors provide a description of the volcano:[182] Strabo (5.4.8) describes it as exploited all around except for its top, which is flat, deserted and ashy, with rocks and caves. Plutarch and Florus[183] refer to the episode of Spartacus, who took shelter on the top of Mt. Vesuvius and, besieged by Clodius Glaber, escaped by descending the steep walls of the crater. Dio Cassius witnessed from Capua a minor eruption of the volcano in AD 203 (77.2). He refers also to the eruption in AD 79 and describes the volcano with a flat top, with fire coming from its centre. The fire did not touch the surrounding peaks which formed the outer walls. Additionally, also during the AD 203 eruption, he witnessed the existence of these peaks, which resembled a gigantic amphitheatre (66.21-23). Traditional interpretations of these passages have led scholars to think that the Somma-Vesuvius complex appeared before AD 79 either as a one-peak conic volcano[184] or as it appears today. In support of each of these hypotheses are usually brought as visual proofs a published drawing of a landscape "quadretto" from Herculaneum,[185] a "vignetta" from Pompeii,[186] or the fresco[187] from the lararium of the House of the

[180] di Fusco 1998: 11.

[181] A complete list of the publications on this topic is in Renna 1992: 38-49.

[182] The complete list of ancient sources about Vesuvius is in Renna 1992: 128-133.

[183] Plut. *Crass.* 9; Florus 2.8.4-5.

[184] See for example Sigursson 2007: 47-49.

[185] Published in the Antichità di Ercolano esposte; in the publications I have checked the exact reference is wrong, therefore I refer to its reprint in Renna 1992: Figs.1-2.

[186] Gell 1832: 83, 173.

[187] Inv. n° 112286.

Centenary of Pompeii, with Bacchus dressed in grapes stands close to a mountain (Figs. 17-18), and the depiction of St. Ianuarius in the eponymous catacombs in Naples, with two mountains in the background.[188]

The analysis becomes less complex when each element is examined critically and in its context. As first step, one should divide the pre-79 from the post-79 sources. Volcanologists agree in thinking that after the eruption in AD 79 Vesuvius' cone existed,[189] although it rose and collapsed multiple times after that (Fig. 19).

The literary passages appear incompatible with each other because they have been misread. The main confusion arises from the implicit assumption that a one-headed volcano corresponds necessarily to a mountain with a peak, as for example Mt. Etna. However, Strabo's description fits better with a caldera volcano. This was probably similar in shape to the current Mt. Somma, but with the crater entirely preserved (the present one is broken on the south and west) and slightly higher on the northern side. This explains easily how it could appear flat and ashy on the top. Furthermore, imagining it as a caldera volcano, it could be possible that Spartacus was taking shelter on one of the higher peaks of the crater and escaped by moving down within the caldera, then exiting from one of the shallower peaks.

The use of ancient paintings to solve the problem is quite tricky for several reasons (e.g.: artistic distortion, uncertainty about the subject, etc.), and therefore it would be beneficial to discard them entirely. Nevertheless, the fresco of the house of the Centenary in Pompeii is different from the others because of one detail noticed by Scherillo which might be a characterising detail of Mt. Vesuvius.[190] Indeed at the bottom of the mountain depicted in that fresco, two ellipses (Fig. 18) – almost joined together and forming the number 8 – are drawn. This detail hints at a volcano of the double-

[188] Gigante 1998: 218.

[189] Contra: Rolandi 1998, id. 2004: analysing the ancient passages he thinks that the cone of Mt. Vesuvius appeared at an uncertain period during the medieval eruptions, after the 6th century AD.

[190] Scherillo 1982, unknown to many scholars, who discussed the topic.

caldera type, which is the kind of volcano Vesuvius was.

Volcanologists do not offer a complete and uniform reconstruction of how the volcano appeared before AD 79, but in some of the most recent ones, the idea of a double-caldera-type volcano seems to be the most likely (Fig. 20).[191] Thus literary sources, pictorial evidence, and volcanological models point to a caldera-type volcano.[192]

In summary, before the AD 79 eruption, the volcano was a single-headed caldera which appeared similar to the present Mt. Somma, but it was higher and with the crater complete. This conclusion implies a slightly larger area for woodland, especially on the north slope of the volcano; on the south and east sides of it, there was probably more land to exploit. Moreover, the existence of Mt. Somma also on the southern side implies that in antiquity there was more surface drainage in that area too. This should rebalance the present different rates of percolation for Vesuvius and Mt. Somma and ultimately it lets us hypothesise that on the southern slope there were as many streams as on the northern.

The presence of one cone instead of a caldera would change the scenario entirely, providing evenly the same natural resources on each side of the volcano and in higher quantities. Using Cioni's[193] reconstructive maps and sections of Vesuvius, I have calculated the area of Mt. Somma's available land, according to the two models proposed. The current area, excluding Vesuvius, is 70.5 km^2. According to the caldera-model, the area was 85 km^2, for the one-peaked cone it was 89 km^2. The ancient volcano provided therefore almost 15 km^2 more woodland than the present one.

---

[191] Cioni 1999.

[192] Unfortunately these considerations have not been taken into account in the 3D model used for the recent exhibition at the British Museum.

[193] Cioni 1999. The maps have been used to calculate the total width, height, and degree of the slopes at different altitudes. The surface area has been calculated through geometric equations for truncated cones. Each hypothetical shape of Vesuvius has been divided into superimposed truncated cones. Taking into account the fact that hills and gullies create geometries far more complex than truncated cones (and that the data available are insufficient to create digital elevation models), the results presented here should be considered very conservative figures.

4.2. Vesuvius' eruptive history and its distinctive features

This section describes the typical characters of Vesuvian eruptions to understand their effects on the archaeological record. The historical sequence of the eruptions as reconstructed by volcanologists is compared with the literary evidence and what is visible in the field.

The volcanic eruptions of the Somma-Vesuvius complex are generally divided into three main categories, according to the quantity of magma ejected:[194]

1. Plinian: billions of tons of magma; examples for historical times are the Pumices of Avellino eruption (Early Bronze, 18th-17th c. BC) and the AD 79 eruption;

2. sub-plinian: hundreds of millions of tons, the most important ones are the AD 472 and 1631 eruptions;

3. smaller eruptions: tens of millions of tons, are the most frequent ones, as in 1906 and 1944.

The magma in the volcanic chamber is viscous and contains large quantities of gases; when the pressure is high enough, the gases escape the magma and move up to the magma conduit, ripping it apart. The gases, together with volcanic fragments of different dimensions, move rapidly upwards and create a column of cloud. Heavier bigger fragments, like bombs and rocks, are ballistically ejected in the region near the vent and eventually transported with other materials onto the plain. Lighter materials (pumices and ashes) move up into the sky, according to the strength of the eruption.[195] These light materials are then moved for several kilometres by the winds. Particles of these materials continuously fall to the ground and during the Pompeian eruption they accumulated for a depth of more than 3 metres. When the eruptive column becomes too dense, it collapses (Figs. 21-23) and forms two different kinds of fragmental flows: pyroclastic surges and pyroclastic flows. Pyroclastic surges have low density and consist of a

[194] Civetta 1998: 11.

[195] During the plinian eruptions in AD 79, they reached the stratosphere (~ 11 km).

turbulent cloud of ash and gas; they are very hot (>200°C), move quickly (up to 350 km/h) and can easily rise over physical obstacles such as ridges or hills.[196] They can erode the surface and destroy any obstacle in their path. On the ground they leave quite thin deposits, usually difficult to identify. Pyroclastic flows are more high-density clouds and consist mainly of laminar flow deposits. Pyroclastic flows deposit massive beds of poorly sorted material at a high temperature.[197] They are usually accompanied by a hot surge cloud, which rises above the flow and, when the flow stops or diverts because of obstacles, the surge cloud often proceeds on. Eruptions also cause a wide range of secondary destructive events, the principal among which are lahars, i.e. mudflows composed by pyroclastic materials and water.

Smaller interplinian eruptions differ considerably from the plinian ones: they occur when the vent is still open or with little effort for opening it, therefore there is a bigger ejection of lava, with lava flows or lava fountains. Blocks, bombs, ashes and lapilli are ejected, but on a much smaller scale and quite close to the volcano. Major damage comes from lahars and other secondary activities, caused by atmospheric changes and particularly by heavy rains.

For the timeframe considered, I exclude the plinian Avellino eruption, which occurred in the Early Bronze Age. Between this one though, and the Pompeii eruption, a few smaller eruptions probably occurred (Fig. 24): one in the 7th century BC, another in 216 BC, and a third at an unknown date.[198] After the Pompeii eruption, written sources describe a small eruptive event in AD 203 (see § 4.1), then a subplinian eruption known as the Pollena eruption, on 6th November 472, followed by two smaller events in 505 and 512, which is the chronological terminal point of this research.[199]

---

[196] Guest *et al.* 2003: 36.

[197] Guest *et al.* 2003: 36. For the AD 472 Pollena eruption Zanella (2008) theorises a temperature range between 260 and 360°C.

[198] Guest *et al.* 2003: 48.

[199] The complete list of ancient sources for the post-79 ancient eruptions is in Colucci Pescatori 1986. The problem of the dating of the Pollena eruption is deeply analysed and resolved by Savino (2004a).

The historical eruptions attested in archaeological sites are mainly those of Pompeii (AD 79) and Pollena (AD 472). Other eruptions are scarcely attested, thus they are less well known.

Apparently, the date of the Pompeian eruption is not a current matter of question. The topic was first debated in 1632, when the abbot Giulio Cesare Braccini[200] argued in favour of the Kalends of November rather than the 24th of August - following the version of some *codices*; the discussion remained open until 1880, when Augustus Mau[201] rejected some of the objections against the traditional date. In 1990 Umberto Pappalardo[202] reopened the discussion and drew attention to some archaeological evidence in favour of a winter date. More recently, some scholars and Grete Stefani in particular, provided much evidence to support a new date for the eruption: the 24th of October.[203] In addition to the 8 main points[204] and the evidence brought forward by the previous scholars, I further noticed in the main publication of the Villa della Pisanella (cat. BRE038) the description of a large amount of olive pomace, dumped outside the villa, east of the threshing floor,[205] which is important because we know from a Pompeian inscription (*CIL* 4.8489) that the traditional day to pick them was the 16th of October. This apparently negligible detail will nevertheless be important for the quantification of the damage caused by the eruption to agriculture (§ 6.4).

4.3. The erupting volcano: a field survey perspective

Through core samples and open-air stratigraphic sections volcanologists produce

[200] Braccini 1632: 11.

[201] Mau 1880.

[202] Pappalardo 1990.

[203] Borgongino 2001; Stefani 2006; Rolandi 2007; Savino 2007.

[204] A large portion of the text, in which I re-list and revise the evidence, had to be cut to fit in the word limit.

[205] Pasqui 1897.

reconstructive maps of eruptive deposits (Figs. 25-26).[206] The map of airfall deposits is often used by Pompeian archaeologists as a source of information rather than result of a study, assuming that it is self-explanatory. This generates the assumption that the spread of airfall deposits corresponds to the area damaged by the eruption and that the deposits are a sort of blanket, which evenly covers the land. Ultimately, these assumptions lead to several mistakes in the reconstruction of the ancient landscape, like in the digital terrain model created by the German Institute, where my overlay of the archaeological sites (Fig. 27, in some cases they are in the middle of the river and in the marshes) might prove it wrong.[207] The map of airfall deposits describes indeed only one effect of the eruption, while others are impossible or very difficult to plot, like the pyroclastic flows/surges. Moreover, the map is drawn to reconstruct the shape and direction of the volcanic cloud and, even if built through core samples, it is not meant to represent the actual distribution of the deposit, because it does not take into account the distortions caused by post-depositional factors (like erosion). This situation observed in the field is indeed more complex, as I show with the following example.

A late Oscan inscribed cippus (cat. SVE005)[208] was found almost 30 years ago at the border between the modern towns of Somma Vesuviana and Sant'Anastasia, at 307 m a.s.l. The cippus shows no traces of dragging, so it was probably in its original context on discovery. Before the discovery, the area was a hill or hummock with two little valleys on the sides and higher steep hills on both sides. For around 20 years the hill was exploited as a quarry (in this period the cippus was found) and therefore most of the hill does not exist anymore and the area is currently used for agriculture, with vegetable gardens, orchards, and vineyards. Less than 5 metres from the spot of the discovery are

[206] The maps are from Rosi and Santacroce 1986. For the Pollena eruption Sulpizio (2005, especially fig. 5) offers a detailed description of the phases of the eruption with the reconstruction of the airfall deposits for each of them, which produce an overall map similar to that one by Rosi. Rolandi (2004: fig. 8) produces a map of the tephra levels of the Pollena eruption, which differs from that of Rosi only for more distant areas, therefore I refer to it just for those areas.

[207] E.g.: Vogel 2010.

[208] The chips is unpublished, I gathered the information from the person who discovered it and kept in his backyard since then.

stratigraphic sections, which clearly show volcanic fills of different phases at the same height. The picture (Fig. 28) displays a section with lapilli dated to the Pompeian eruption. The cippus was found at the bottom of this section. A few metres away, at the same height on the opposite side there is a section with different features, which are typical of one of the prehistoric eruptions (Fig. 29). A few meters downhill, at a slightly higher level, there is a massive section of lava, dated to one of the first eruptions of the volcano, when Mt. Somma was the only vent (Fig. 30). A sketch of the area (Fig. 31) shows that the layers do not overlay evenly like paper files, but similarly to cultural contexts in the archaeological record. Yet, human intervention in this case is limited only to the intensive modern exploitation of the land through quarries.

The stratigraphic sequence can be explained with the analysis of flow deposits, the original geomorphology, and the interaction between these two elements. Flow deposits can be divided into primary (the pyroclastic flows previously described) and secondary ones. Secondary deposits (volcanoclastic deposits) are often ignored by volcanological analysis because they are the result of landslides and rain/mud flows (lahars, rockslide avalanches, flood deposits), which usually occur right after volcanic events, but in a span of time that is not quantifiable with precision.[209] Stronger flows occur during and right after eruptive events, but the unstable nature of the volcanic terrain triggers similar events also in relatively "calm" periods. Flowing down with considerable strength, the mud not only fills valleys/gullies, but sometimes it destroys hillocks and transports downhill volcanic materials from previous eruptions. The consequences for archaeological interpretation are explained below; here it is important to stress how the flows modify the geomorphology and create negative interfaces above which the products of later eruptions accumulate, similarly to archaeological stratigraphy but in vast dimensions. The reconstructive maps offered by volcanologists are therefore inaccurate, because they do not describe empirically the situation on the ground, but

[209] According to Albore Livadie (1998: 44) it may range from the moment of the eruption to some months afterwards.

rather a theoretical situation which implies no geomorphologic features (i.e.: a flat surface).

This first conclusion leads to a second observation, more specifically focused on morphological changes. The strength of the flows is given roughly by altitude and gradient (i.e.: gravity forces); in the case of pyroclastic flows the volcanic ejection needs to be added as additional force. The impact of the flows on the landscape changes not only in proportion to its strength, but also according to the pre-existing geomorphology. Since we lack both pieces of information, it is impossible inductively to calculate the impact of the flows over the land. Yet at least empirically it is possible to compare what changes have occurred in the last few centuries. I have overlaid the map of the present superficial hydrology over the first real topographic map of the north slope of Vesuvius (Fig. 32). The background map was drawn in 1836-40 by the Topographical Office of the Kingdom of the Two Sicilies (Southern Italy), under the rule of the Bourbon kings. Between 1840 and the present two interplinian eruptions (1906 and 1944) and other smaller volcanic events occurred. The comparison between the two maps shows that most of the streambeds changed their original paths by either crossing present streambeds or former hillock tops. Interestingly, on average at 250 m a.s.l. this phenomenon ends and the modern streambeds lie almost exactly on the same path as the past ones. This abrupt variation corresponds to a sharp gradient change of the slope and the presence of a natural terrace. On the western side of the volcano – where the Somma crater opens, lowers and then disappears – this change occurs at a lower altitude (around 200 m a.s.l.), but on the same terrace. By induction I argue that this pattern can be applied to all interplinian eruptions, while subplinian and plinian eruptions provoked more devastating events, but probably kept the same proportion between the upper and lower areas, with the threshold roughly at 250 m a.s.l. In the next chapter this model will be combined with the study of landslides to calculate the damage to agriculture and buildings. In the following three cases the thickness of the volcanic fill differs markedly from what is theorised in the map of eruptive deposits.

In the town of Somma Vesuviana, in the neighbourhood of Starza della Regina (cat. SVE014), some structures pertaining to an enormous villa were found in the 1930s,[210] destroyed by the AD 472 eruption.[211] According to the volcanological map (Fig. 26), the site should be covered by around 20 cm of airfall deposits and 2 m of pyroclastic flow and surge deposits. The stratigraphic sequence at the site (Fig. 33) is quite different: the geological unit pertaining to the AD 472 eruption is 5 m thick: it consists of airfall deposits for about 20 cm, 4 mud flows and 2 debris flows.[212] The AD 472 eruption fills only the lower half of the building, the upper contexts probably pertain to the AD 512 eruption.[213] This eruption discharged much less material, though it consisted of quite strong mudflows. Indeed one of the sections shows a large channel (Fig. 34), up to 5 m deep, which cuts the AD 472 stratigraphy.[214]

The discrepancy between the volcanological map and the particular case could be partially explained by the pre-existing geomorphology of the area. The volcanic fill seemingly becomes thinner on the west side of the actual excavation area. The archaeological site was probably on a hillock or similar geographical feature, probably close to a stream or small river.

A second example is offered by the archaeological site in the town of Pollena Trocchia, in the neighbourhood of Masseria De Carolis (cat. PTR006). The site was discovered in the '80s, but never really excavated until 2006.[215] According to the volcanological map the

---

[210] Della Corte 1932b, see gazetteer for the complete list of references to the site.

[211] Niihori 2007 passim.

[212] Niihori 2007.

[213] Niihori (2007: 134) dates it, by comparison with the study by Principe (2004) but with no chemical analysis, to the later eruption of AD 536. Procopius mentions the eruptions of this period: 512, 536, 553. These are reported in Colucci Pescatori 1986a, but no commentary is provided. Because it is impossible to use scientific analyses for solving the question, I follow the textual/historical interpretation of Savino 2004a, by which the most destructive eruption of the three, very probably the one which leaves bigger deposits on ground, is the 512 one.

[214] Niihori 2007: 137; Perrotta 2006b: 297-8. According to Perrotta (2006b: 301), if formed on the upper steep slopes of the volcano the flows reached the site in 10/18 mins.

[215] Pagano 1988; id. 1991b.

site should present no airfall deposits and around 6 m of pyroclastic flow and surge deposits. The site however is covered only by less than 3 m of secondary deposits of the AD 472 eruption. Above them, there is a thin pinkish context of 10-20 cm (Fig. 35), similar to one found in the site in Somma Vesuviana. Above it is a temporary poorly built structure (Fig. 36), buried by an eruption, very probably the AD 512 one. At the present stage it is impossible to quantify exactly the thickness of this deposit (apparently less than 2 m thick), especially considering the fact that in the small area excavated the fill seems to decrease moving westwards.

A third example can be offered, where no traces of buildings were found, but cultivation furrows.[216] The site lies in the town of Ottaviano, in the neighbourhood of Raggi, on a flat part of the land, at 107 m a.s.l. (cat. OTT003, Fig. 37). It was discovered during the enlargement of a state road. The furrows are buried by the AD 79 eruption and, according to the volcanological map, it should present no traces of air fall deposits and should be covered by 1-2 m of pyroclastic flow and surge deposits. The site shows just 15 cm of ashes with no traces of other kinds of deposits. The upper contexts show traces of humification and exploitation with pottery dated to the 2nd-3rd century AD. The area apparently shows no natural or artificial obstacles; therefore the reconstruction offered by the volcanologists is wrong.

At least for the areas closer to the volcano, the volcanological map is clearly unreliable. For more distant areas, the scheme of the airfall deposits could probably fit better and will be used in the following chapter as a basis for understanding the effects of eruptions on vegetation. It requires however some caveats, as the following example clarifies. The southern necropolis of Abellinum was found in Atripalda (around 2.50 km from the modern town of Avellino), covered by airfall deposits and debris flows pertaining to the Pollena eruption. The airfall deposits alone, which in this open air area are not affected by morphological features, are about ca. 40 cm thick deposit (Fig. 38,

[216] C. Cicirelli, pers. comm.

contexts IV-V),[217] while according to the volcanological map by Rosi we would expect around 10 cm or, according to Rolandi, 20 cm (Fig. 39). A few centimetres of difference might appear a trivial matter, but it makes a considerable change when one calculates the effects of the eruption on agriculture, especially for the cultivation of vegetables and grain (§ 6.4).

Some conclusions can be drawn:

- The maps currently in use are somehow reliable for the airfall deposits in the areas outside the volcano.

- Primary and secondary flows do not affect the territory in a linear/gradual way; instead their power decreases in a step-like model. The main "boundary area" observed for the last two interplinian eruptions is constituted by the terrace between 250 and 200 m a.s.l. This natural terrace, if confirmed by the archaeological data, probably played an important role also during the plinian eruptions.

- Even if the examples offered are few, the archaeological data suggest that the pyroclastic flows/surges, as well as the secondary mud flows, spread from the vent to the plain unevenly because were affected by the existing morphological features.

A methodological corollary to what is stated above is necessary. The ways in which eruptions destroy, fill, and change the land create a relevant distortion in our perception of the archaeological data. Moreover, the double character of the volcano as destroyer and preserver of the sites creates an artificial contraposition between the lack of data for the time ranges far from the eruptions and their abundance for the periods close to an eruption.[218] Interestingly, almost the entire set of data coming from the environs of Vesuvius pertains to the periods preceding the eruptions of Pompeii (AD 79) and Pollena (AD 472) or, better said, shows structures and artefacts still in the open air before these

[217] Colucci Pescatori 1986b: 123-5 and figs. 6-7.

[218] A clear example of the consequences of this distortion is in the following statement, used as conclusion of an article on the Nolan area: "Sono anzi da approfondire i motivi che hanno determinato, come anche in altre zone, la scarsissima presenza di materiale di quei due secoli [i.e. 2nd and 3rd c. AD]" (Sampaolo 1986: 119).

eruptions.

4.4. Lahars, landslides, floods, and hydrogeology

In the previous section I described the eruption dynamics and their effects on archaeological sites. The sample analysis on some archaeological sites revealed that on the north slopes of Vesuvius the most relevant damage is caused by secondary effects of the eruption, which in simpler terms is the mixture of volcanic materials with water and mud - lahars (volcanic mudflows), landslides, and floods.

Landslide/lahar genesis requires "unconsolidated debris, steep slopes, and a water source".[219] During eruptions the ejected debris is very unstable and several heavy rainstorms happen,[220] consequently the most dangerous lahars happen during or right after an eruption. Nevertheless, the unstable nature of volcanic debris, when associated with heavy rainstorms, generates lahars also in periods with no volcanic activity. The strength and the direction of the mudflow are determined by the steepness of the land, the presence of geomorphological features (e.g.: rivers/channels or hills), and the force of the ejection. Lahars travel at velocities as high as 360 km/h[221] and therefore – especially at a higher altitude of the volcano – they are very destructive, fill and overflow the riverbeds, and create new paths. According to the step-like model offered in the previous section, the flow abruptly decreases its strength between 250 and 200 m a.s.l. and flows mostly in existing riverbeds: the flow does not spread evenly on the ground, but rather is stronger/thicker in riverbeds and surrounding areas. This model explains also the different thickness of volcanoclastic debris in archaeological sites that lie at the same altitude.

---

[219] Perrotta 2006b: 299.

[220] Jones 2003: especially p. 253. The effects of eruptions on climate are considerable, but limited to a regional and seasonal scale.

[221] Pierson 1998: 99.

Landslides are quite frequent and dangerous in Campania,[222] both in the Surrentine peninsula and in the mountains that frame the Neapolitan/Nolan plain to the east. The Apennine mountains near Nola have variegated morphology and steep slopes, caused by the nature of the soil, a Mesozoic sedimentary carbonate (limestone), which suffered from erosion and bedrock subsidence toward the centre of the plain.[223] Erosion and subsidence generated several gullies and topographical steps. On the bedrock there are thick volcanic airfall deposits (from decimetres to 6/7 metres) or volcanoclastic deposits (debris and colluvium, up to 20 metres) of the Somma-Vesuvius complex, interlayered with palaeosoils (Figs. 40-41).[224] The deposits mantle an area of about 3,000 km^2 and consist mainly of the products of the Protohistoric eruption (the so-called Avellino eruption, 1800 BC) and less of the late antique one (AD 472), while there is no evidence of the Pompeii eruption. The pyroclastic soils are generally unstable, especially when matched to steep slope angles. The triggering area is where the pyroclastic soil mantle interrupts, i.e. where faults, cuts and scarps in the limestone bedrock create morphological steps or where routes are built.[225] Human intervention cannot really prevent landslides from happening because containing walls and artificial terraces actually raise the risk. Also the tree roots cannot really prevent the land from slipping, because they are unable to reach the bedrock.[226] Under Bourbon rule[227] culverts were built in the plain in order to channel water and debris flows, therefore to limit the effects of landslides, rather than to avoid them. Recently, historical databases have been used to hypothesise for this area a cycle of landslide recurrence in roughly three years, usually in

[222] Collecting the records of landslides from AD 1279 to 2002, Campania is the region with most numerous fatal landslides in Italy (Guzzetti 2005: 22).

[223] De Vita 2006: 126-7.

[224] Bilotta 2005: 369.

[225] Fiorillo 2001: 172.

[226] De Vita 2006: 136.

[227] Del Prete 1998: 120.

November, when heavy rainfalls operate as trigging factors.[228] The cyclic nature of this phenomenon is due to the nature of the soil and to the dynamics of landslides. Pyroclastic materials have high water retention and good water conductivity,[229] consequently seasonal rainfall is firstly absorbed by the soil, increasing its moisture; then, when the soil moisture is close to saturation, the water percolates towards the bedrock, creates water pipes and reaches the plain.[230] Nonetheless, due to the uneven distribution of volcanic debris on the bedrock, the irregularities of the bedrock, and the weight of wet soils, water runoff can be obstructed and trigger slope failures. Landslides are therefore the consequence of the saturation of the volcanic soil, rather than of one heavy rainfall.

The most recent very destructive landslide happened on May 5-6, 1998, and affected the towns at the foot of the Apennine range, between Nola and Sarno. The analysis of this event shows the peculiar features of landslides in this area and contributes to the creation of a model for the past. The landslide consisted of over 100 mass movements in almost all the streambeds and gullies of the Pizzo d'Alvano, the highest peak (1133 m a.s.l.) of the area (Fig. 42). The triggering points were at the top of the gullies, with an average slope angle of 35°/41° and thickness varying from 0.5 to 5 m;[231] the flows reached 72 km/h.[232] Two main forms of landslide were distinguished: hillslope debris flows (a single track on open slope) and channelled debris flow (flow through pre-existing channels and gullies);[233] the second type was the most frequent. The initial mobilised masses increased their volume along the path, reaching a total volume of 3 million cubic

[228] De Vita 2006: 127.

[229] Terribile 2007: 545.

[230] Fiorillo 2004: 274.

[231] Bilotta 2005: 367.

[232] Id.: 368.

[233] Budetta 2004: 297.

metres.[234] The power and velocity of the debris flows exponentially decreased at the Pleistocene and Holocene alluvial fans, because of the abrupt change of angle in the slope and the wide opening of the fans, which spread the debris (Fig. 43). Where not conveyed in natural/artificial channels, the flows ran on and on encountering obstacles their velocity abruptly dropped to zero.[235] Damage and casualties (152) were considerable, but limited to less than 1.38 km^2, which is the total area flooded. Only two of the seven modern towns lying around the mountains were seriously affected by the landslides, and in particular some of the buildings built in the upper part of the alluvial fans (Figs. 44-45).

Floods can be broadly divided into flash-floods and river floods.[236] Flash-floods, shorter but more destructive than river floods, are the result of intense thunderstorms or landslides/lahars, while river floods are driven by continuous rains or melting of snows. To estimate the effects of these phenomena in the landscape, one also needs to take into account the path and distribution of superficial and sub-surface waters, and the presence of lowlands/depressions.

Several streams originate from the slopes of the Somma-Vesuvius complex (Fig. 32). Each eruption changes the upper part of their paths, but the deep gullies remain unchanged and convey the streams towards the river Sebethus. On the Apennines, the shallower gullies and the shorter streams near Nola join the ancient Clanius through canals. There were streams also on the hills around Neapolis, but the modern city has channelled all the surface water. In the recent past the most important streams still existed in open air and were generally defined as "arene".[237] The most important stream was the "arena della Sanità", which was 6 km long and ran in the neighbourhood of the Sanità, on the east side of the city. Several small streams joined this arena or reached the

[234] Bilotta 2005: 367.

[235] Zanchetta 2004: 377, 381.

[236] Diodato 2007: 415.

[237] De Fusco 1993: 87-89.

plain underground, emerging again in the Sebethus. A similar phenomenon is observed for some of the streams on the north slope of the volcano. The waters which do not channel through the gullies are partially absorbed by the ground, they percolate through the volcanic fill, and reach the subterranean aquifer. The aquifer leads to the plain of the Sebethus, where there are several pools, the main of which is in the modern town of Volla (the place was called "Bolla" until the last century and clearly stems from the latin *bulla*, water-bubble, Fig. 46).[238] The case of Volla is particularly interesting to understand the relationship between superficial and deep waters. Volla is located in the middle of the plain between the volcanic reliefs of Neapolis (which belongs to the system of the Phlegraean Fields) and the Somma-Vesuvius complex, but it is on one of the deep aquifers and in line with one of the Mesozoic faults that cross the Campanian plain.

To certain extent, deep water circulation is similar to that of superficial waters, but there are also significant differences (Fig. 47).[239] Part of the meteoric water percolates through the volcanic deposits and flows underground, following the morphology of the impermeable sedimentary deposits, which constitute the alluvial plain. The flow is enriched by the waters coming through the Mesozoic faults of the bedrock; these faults constitute also the preferred "routes" for the underground aquifers (Fig. 48). The map of underground circulation (Fig. 47) shows, differently from the map of superficial waters (Fig. 12), that the water emerging in Volla (and which in antiquity constituted part of the river Sebethus) stems not just from the two volcanic areas, but also from Apennine mountains north of Nola. The map shows also a drainage axis between the east slope of the Somma-Vesuvius complex and the Apennine mountains, but no surface river corresponds to this axis. In contrast, the river Clanius has no corresponding underground flow. The map of the bedrock (Fig. 48) shows also the depressions, among which is prominent that of Acerrae.

By overlaying the information presented, it is now possible to identify three areas

[238] Id.: 82.

[239] Celico 1998: 3-4.

which are particularly sensitive to floods: Acerrae, Volla, and the Nolan plain. The plain of Acerrae lies on a deep depression[240] and in antiquity it was surrounded by the slow flow of the river Clanius. This combination created in antiquity vast marshes, which were reclaimed only in the previous century, and made this area prone to frequent river floods.

The area of Volla and Sebethus receives water from both the volcanic complexes and underground water circulation from the Nolan Apennines. In order to understand if this area suffered from river floods, one needs to know more of the character and size of the river Sebethus (chapter 5). The deep gullies and the gentler angle of the slopes make the north side of the volcano less subject to landslides, but not to lahars. The archaeological sites buried by the AD 472 eruption show thick volcanoclastic deposits. The flows followed some gullies or created new ones, and then reached the plain and the Sebethus. This area is therefore subject to flash-floods.

The plain of Nola is fairly wide and flat. The surrounding Apennine mountains are frequently subject to landslides. Nevertheless, these events have usually a small destructive effect on the plain, because they stop abruptly when they reach the prehistoric alluvial fans. Consequently, we can imagine this area flooded only after uncommonly destructive landslides, for example after an eruption, which ejects huge quantities of unstable volcanic material. During these events also the narrow passage east of the volcano could be flooded.

There is now enough information to understand the interrelation between lahars, landslides, and floods, and their effects on the landscape. The steep Apennine mountains frequently suffer from landslides, which nevertheless are destructive only for the very narrow areas at their feet. During the eruptions, the landslides and the subsequent floods were much more destructive. It is difficult at this stage to identify the boundaries of the area affected by these events and to quantify the thickness of the deposits. A tentative reconstruction of the area affected by floods after the AD 472 eruption was made by

[240] Scandone 1991: 5.

Albore Livadie *et alii* (Fig. 49).[241] The area corresponds basically to the entire Nolan plain, stretching from Acerrae to Nola to Sarno. Interestingly, the plain of Sebethus is not included and the vectors depart only from the Somma-Vesuvius and not from the Apennine mountains. Moreover, the authors define the map as preliminary and aimed for the identification of the sites flooded, rather than to offer a complete reconstructive map of the flood. A second map (Fig. 50) is the product of a more scientific approach. Using a digital terrain model (DTM), Pareschi *et alii*[242] created a GIS and simulated an eruption, for testing which areas would eventually suffer the consequences of a new eruption. Being a model focused on future events, rather than on the past, no peculiar features of past eruptions were included (scale of the eruption, direction of the wind, etc.), but it was built using the worse case scenario dataset.

The link with the archaeological record is challenging. The archaeological record is static per se, while the relationship between humans and nature is dynamic. The evidence in the field shows usually just the last event, the moment in which the site is buried or destroyed. From this point of view, eruptions are good examples of a static relationship. Nevertheless, when a site is far enough from the volcano, the eruption is not destructive: for example, 10 cm of ashes and lapilli on a house roof are not enough to make it collapse and are easy to remove. In this case, the archaeological record shows no trace of the eruption. The way to understand this complex relationship lies therefore not only in collecting the archaeological data, but rather in building a model of the landscape, in which the potential challenges for humans are clear. The model described above shows the instability of the Apennine slopes, recurring destructive events in limited areas, and larger scale damage during eruptions. The archaeological record would show (1) the damage caused by these events on settlements, and (2) the way in which the settlement recovered from these events. The presence or absence of damage and the rapidity of the recovery will tell how proficient the economic system was. For

[241] Albore Livadie 1998: 42, fig. 2.

[242] Pareschi *et al.* 2000b.

example, 20 cm of mud within a urban centre are easy to remove, thus when the economic/bureaucratic system is efficient, the mud is rapidly removed. Similarly, the span of time between the destruction of an important infrastructure (e.g.: paved road) and its reconstruction tells about how well the system worked and how important that infrastructure was. The following examples show some features of this relationship.

In the town of Sarno, in a locale north of Episcopio called Mura d'Arce,[243] there are still visible the massive remains of the Augustan aqueduct of Serino (cat. SAR001; Figs. 51-52). The aqueduct ran, before this tract, mostly in tunnels, emerging not far from Sarno but still quite high, and then descending to 46 m a.s.l. at Mura d'Arce. In this spot the aqueduct runs at the foot of the mountain. It is split into two different branches; the first originally ran along the foot of the mountain and was ruined at some point. The second branch, which is the only one preserved, runs further downhill but joins the end of the first one and heads to Palma Campania.[244] The preserved tract of the aqueduct is, quite unusually, composed of three different parts (Fig. 53): the first is oriented N-S and consists of a massive bastion from which starts a large arch (10 m wide), which ends on a pillar. The second part is oriented NE-SW, parallel to the mountain, constituted by 28 arches (each 1.8 m wide), fortified on the valley side by buttresses (each 3.5 m long). After 108 m the aqueduct continues in the same direction for 27.5 m as a solid structure with just four buttresses and two semi-circular holes for draining the rainfall waters. Then, for the next 44 m in the same direction, the aqueduct partially takes advantage of the rise, the built part is smaller and is constituted by a full wall with 14 niches on the valley front. The third part of the aqueduct turns E-W, descending until it disappears under the hills. Despite the differences, all these parts of the aqueduct are built with the same construction materials and are stratigraphically joined together.

The scholar who studied the site in the past[245] offers a still-valid interpretation. The

[243] Lat. 40°50'14.04"N; long. 14°34'51.54"E.

[244] Elia 1938: 105.

[245] Ead. 1938.

uppermost tract of the aqueduct was probably destroyed by a landslide, the second, lower, tract was built to replace the previous one. The different construction techniques used reflect special needs for this specific place. The first part has a quite wide arch probably to let a stream or channel pass beneath it. Similarly, the arches of the second part let the water pass through, but are reinforced by buttresses, against potential landslides. The other parts are built to be solid and stable. Elia[246] dates the lowermost tract to Tiberius or Claudius, because it is similar in the technique to the uppermost Augustan one, but is stratigraphically later than that. This tract of the aqueduct shows the effects of landslides and the countermeasures adopted.

Another example of the effects of floods and landslides comes from the area around Nola.[247] In Cimitile,[248] in via Domenico Morelli [cat. CIM004], in the portico of a Roman imperial villa, are 1.20 m of alluvial deposits on top of thin pyroclastic deposits (35 cm) of the Pollena eruption (Fig. 54). Above it there are walls of early medieval age, built reusing materials of the previous villa. A second site, in the town of Nola, via Polveriera (cat. NOL025), consists of a house built in the 1st century AD and continuously used until the 3rd c., to which period are dated the last restorations and the creation of a mosaic fountain. Then, the house started to be gradually abandoned until the eruption. The pyroclastic deposits cover the floor to a depth of 30 cm and above them are ca. 32 cm of alluvial deposits. These two examples show that, considering the relatively thin alluvial deposit (which are probably thicker outside the city), the eruption contributed nevertheless to the abandonment of several houses within the city of Nola.[249]

The third example is constituted by the traces of a landslide/flood in the macellum of Neapolis. The macellum lies beneath the church of San Lorenzo (on the east side of the ancient forum) and is formed by a three-sided artificial terrace, which rationalised the N-

[246] Ead. 1938: 111.

[247] Albore Livadie 1998.

[248] Originally it was the *coemeterium* of Nola, then with St. Paulinus it became a pilgrimage centre.

[249] Similarly Mastrolorenzo 2002: 32.

S geomorphological slope of the area. The access to the upper level of the macellum was from the *decumanus maximus*, which corresponds exactly to the modern via dei Tribunali, which lies only few centimetres above the Greek/Roman road; the upper and lower level of the building were connected by stairs. The artificial terrace was built in the 4th c. BC and lasted until the end of the 5th century AD. Around the end of the 5th century (according to pottery analysis) and before the early Christian basilica of Johannes II (bishop of Neapolis from 537 to 557),[250] a violent mudflow occurred. The mudflow was not removed, instead it was used for raising the level of the ground, to obliterate the lower level of the macellum and enlarge the available area of the *insula* for new buildings. The debris includes volcanic materials, although these pertain to prehistoric eruptions of the Phlegraean Fields. For this reason in the past this event was not connected to the AD 472 eruption. Nevertheless I argue that it could be related to that event. Indeed, the area where Neapolis lies and the hills surrounding it consist of volcanoclastic materials of the Phlegraean Fields. The gradient of the slopes is gentler if compared to that of the Apennine mountains, nevertheless intense rainfall caused by the climatic effects of the eruption affected Neapolis too. A similar situation is present in the site at via Carminiello ai Mannesi in Naples, where some potsherds of the second half of the 5th c. AD are buried by a thin context of lapilli and a quite thick and hard debris.[251] Similarly, in the harbour of Neapolis, at the end of the 5th century/early 6th century AD are sandy deposits for about 1 m,[252] probably brought down by some streams after the eruption (Fig. 55).

The example of the Neapolitan macellum, as well as the sites in the Nolan plain, leads us back to the problem of the relationship between humans and nature and its connection to the ancient economy. Indeed the reaction of humans to natural challenges is strictly connected to the organisation of the society and the wealth of its economy. A well-structured and wealthy society would recover more quickly from a natural disaster

[250] De Simone 1985: 251-2. The foundation of the early Christian basilica lies on top of the debris.

[251] Arthur 1994: 61.

[252] Giampaola 2005: 226-8.

than a poor one. In this case, the decision not to remove the volcanoclastic debris and bury the entire area instead of cleaning it confirms the model of a poor organisation and slack economy at the end of the 5th century AD.

Moving to the consequences of floods in the Nolan area, the evidence within the city shows that the deposits could vary according to locality, and considering how much built structures can drastically reduce the speed and strength of the landslides, one expects them to have caused much more damage in the countryside. However, an average fill of 1 m of alluvial deposits within the city was not enough to destroy walls and columns, which were still in place, and therefore the event was not catastrophic *per se* for the city and easy to remove but the entire area was already experiencing economic hardship.

4.5. Bradyseism and subsidence

During an eruption, the discharge of hundreds (subplinian) to billions (plinian) of tons of magma empties the magmatic chamber and weighs down the land causing it to subside. This phenomenon is known as bradyseism and is common for caldera volcanoes, like the Phlegraean Fields. Stratovolcanoes like Somma-Vesuvius are also affected by bradyseism, but on a smaller scale and only in connection with huge explosions. The variation in elevation is not easy to measure, but it can be hypothesised by measuring the changes in sea level on the coastal sites. However, the sea level changes over time because of multiple factors like eustasy, subsidence, volcanic activity.[253] Eustatic effects vary slightly according to different areas, but it is generally accepted that the sea rose in the last two millennia by about 0.50-1.00 m.[254]

Casertano[255] measures a general lowering of the Vesuvian coast from the 1st century AD of ca. 3 m, excluding 1 m of eustatic sea level rise. This theoretical hypothesis is confirmed by recent data from the sites on the coast: in Herculaneum, the ancient shore

[253] De Fusco 1993: 194-5.

[254] Casertano 1970: 171, 192; Golser 1990: 193; De Fusco 1993: 196; Aprile 1999: 58.

[255] Casertano 1970: 192.

is at 4.20 metres below the present sea level;[256] at Torre del Greco, at the locale Ponte di Rivieccio, some villas lie underwater at -4/5 m;[257] at the locale of Murecine, which was on the coast in front of Pompeii, the 1st c. AD villa lies now at 4.5 m below sea level.[258] One can therefore confirm a lowering of ca. 3 m from the 1st c. AD to the present. Some data from the new excavations at the ancient harbour of Neapolis offer a more detailed chronological sequence. Excluding the eustatic interference, measured as 1 m, the paleolevel of the 1st c. AD is -3/-3.5, the paleolevel dated to the 2nd-3rd c. AD is -2.2.[259] The difference of 1 m is therefore probably the effect of the AD 79 eruption, at least for areas as far away as the harbour of Neapolis.

This high-resolution measurement can be used to quantify the effects of the eruption in other areas around the volcano, and in particular its environmental effect on the river Sebethus and on archaeological sites.

The effects of bradyseism on the archaeological sites of the interior probably created significant damage only to the Augustan aqueduct of Serino. The discovery of an inscription at the *caput aquae* in the 1930s[260] revealed that Constantine restored the aqueduct after a long period of disuse; this matches the discovery of a second parallel aqueduct. The two branches of the aqueduct run parallel and, in the tract discovered in the modern town of Palma Campania, close to the Apennines, they are at the same level. Interestingly though, in the portion found in the modern town of San Paolo Belsito, at the locale called La Vigna, the later conduit is higher than the Augustan one by about 1 m (Fig. 56). This difference in height occurred probably just in the plain near the volcano and it is the clear consequence of the bradyseism caused by the AD 79 eruption.

---

[256] Aprile 1999: 58; Pescatore 2001: 84.

[257] Golser 1990: 193.

[258] Patti 2000: 159.

[259] Amato 2007: 5-6.

[260] Sgobbo 1938.

The snippets of information created in the previous sections form a new, dynamic picture of Mt. Vesuvius. The land available for cultivation was about 85 km^2, 15 km^2 more than the present one; the AD 79 eruption occurred in late Autumn, when the harvest of the main cultivars was already finished, thus especially in the areas where the ashes fell for only a few centimetres the damage might have been small (§ 6.4); on the other hand though, living under the volcano meant to deal with the frequent damage caused by landslides/lahars and flash-floods. Furthermore, although it appears clear that a precise reconstruction of ancient streams and hills cannot be achieved, nevertheless the information is sufficient to create some scenarios which will be useful in the next chapters to define the patterns of settlement and cultivation.

5. The river Sebethus and the marshland question

The river Sebethus, and especially the plain along its path, surely played a key-role in the economy of Neapolis, though it is still unclear precisely what. Indeed this area was the only flat land available to the city, therefore potentially the only one that could have sustained the city through grain produce. Nevertheless, in the past centuries and in particular during the 17th and 18th centuries, the plain mostly consisted of marshes; this generated the assumption that a similar situation existed in antiquity and therefore Neapolis had no territory for cultivation.

The modern scholar in search of river Sebethus would be as disappointed as Giovanni Boccaccio[261] who in the mid-14th century found no traces of it, and further surprised in discovering that until recently the slopes of Vesuvius were incised by several streams and the Neapolitan plain was a vast marshland. Indeed today the land between the Phlegraean Fields and the Somma-Vesuvius complex is almost entirely built up and dry; echoes of the recent past reverberate only in some toponyms (e.g. *via Argine*, *chiesa di Sant'Anna alle Paludi*), and occasionally after heavy rains, when some neighbourhoods get flooded.

This chapter reconstructs the history of the Sebethus in the past two millennia with its changes and fluctuations over time. The results of this enquiry are subsequently tested against three models – palaeoclimate, eruptions, and human over-exploitation – to determine the main agent of change and reconstruct the ancient environment.

5.1. The classical sources

There is no modern study about the river Sebethus. The scant literary and epigraphic evidence stimulated debate in 18th-century studies, sometimes with contrasting

[261] Boccaccio 1360: 154r.

opinions.[262] The last academic article on this subject is dated 1902[263] and the arguments provided form the basis for the subsequent books written by local amateur historians until recently.[264]

In recent years volcanologists have made many boreholes, through which they reconstructed the environment before the Avellino eruption (~ 1830 BC). At that time, the Neapolitan plain consisted of a vast lagoon with a small lake (in the neighbourhood of Volla), which during the eruption was filled by 8 to 12 metres of airfall deposits (Fig. 57).[265] The data for the later period are more difficult to read; after the Avellino eruption the neighbourhood of Volla lay at 18 m a.s.l., with a constant slope down towards the modern coastline. There are no environmental reconstructions for this period and the later eruptions. The stratigraphic sequence shows only 1 metre of volcanic fill for the entire period between the Avellino eruption and the present day, which includes three major eruptions: AD 79, 472, and 1631.[266] To reconstruct the past landscape, this chapter will examine the evidence available for the classical age, the entire corpus of Medieval documentary sources, the cartographic maps[267] and landscape paintings which depict the Neapolitan countryside, and other studies for the more recent periods.

For the Classical period, the information on the river comes primarily from Latin passages from poetry, which do not offer an accurate description of what the river looked like. Virgil mentions a "Sebethide Nympha", who generated Sebethus with Telon

---

[262] For example, the hypothesis that the river was actually just a little stream unknown to the Romans, is stressed by Martorelli (1756: 680-2); against his opinion, the polemical dissertation by Vetrano (1767).

[263] de la Ville sur-Yllon 1902.

[264] Mancini 1989; Brillante 2000.

[265] Di Vito 1999.

[266] Sulpizio 2008: fig. 6.

[267] I consulted all the published maps and the entire repository at the Cartographic Military Institute in Florence.

Oebalus, mythical settler of Neapolis.[268] Statius,[269] Columella[270] and others[271] also mention the river. The adjectives used to describe the river differ significantly from those employed for other rivers of Campania, like Clanius[272] or Liternum,[273] which are clearly described as marshy, whereas the Sebethus is dewy.

The image of the river appears on some oboloi minted in Neapolis (400-380 BC ca.)[274] as the head of a young man with horns and the inscription ΣΕΠΕΙΘΟΣ. The iconography follows one of the three options commonly adopted in Southern Italy for river-gods. The other two consist of an entire bull or a bull with a human head. Tauriform river gods are quite common in Greek literature and were used as a symbol of pride for local communities.[275]

For Neapolitan coins the common reverse type is a bull with a human head, sometimes crowned by a flying Nike (Fig. 9). Scholars disagree on the interpretation of this figure,[276] since there are three possible interpretations: the river Sebethus; the river Achelous (father of the Sirens); the god Dionysus-Hebon, who was worshipped in Neapolis, as we know from a passage in Macrobius.[277] There is no conclusive evidence in support of one thesis instead of the others, but considering the series of oboloi with horned head and the inscription ΣΕΠΕΙΘΟΣ, the identification as Sebethus is the most

---

[268] Verg. *Aen.* 7.734-5.

[269] Stat. *Silv.* 1.2.263: "Et pulchra temeat Sebethos alumna".

[270] Colum. 10.134: "Doctaque Parthenope Sebethide roscida lympha".

[271] Dionys. Perieg. 357ff.; Vibius Sequester p.151 Riese (Sebethos Neapoli in Campania). Particularly interesting the reference to the rivers in a letter of St. Ambrose to Severus, bishop in Neapolis, dated AD 393: "Ut illud commune omnium specialiter vobis videatur congruere et convenire, quod ait David de sancta Ecclesia: Ipse fundavit eam et super flumina praeparavit eam (*Ps.* XXIII, 2)", *Ep.* LIX, Migne *PL* XVI, 1182.

[272] Verg. *Georg.* 2.225: "vacuis Clanius non aequus Acerris".

[273] Liv. 22.16.4: "Literni arenas stagnaque"; Silius Italicus *Pun.* 8.530: "Stagnisque palustre Liternum"; for the changes of both rivers in recent times, see Frederiksen 1984: 17-23.

[274] Head HN^2 40.

[275] Taylor (forthcoming).

[276] Rutter 1979: 42-45.

[277] Macrob. *Sat.* 1.18.9.

plausible. This coin type became quite important, because it started to be used as the reverse type for the coins of all other communities in Campania, therefore it might have become a symbol of cultural and economic unity between the coast and the hinterland.

Another piece of information consists in a marble inscription (cat. NAP008), which was found in Naples near Porta del Carmine (the eastern border of the ancient city) during the construction of the new city walls under Ferrante d'Aragona in 1484, and is now lost:[278]

P(ublius) Mevius / Eutychus / aediculam rest(ituit) / Sebetho (*CIL* X, 1480).

The inscription confirms that the river had a cult in the city and – together with the literary passages and the representation on the coins – suggests that the river was culturally relevant for the Neapolitans. The reasons for this cult can be manifold, but it seems legitimate to hypothesise that for some reason it was particularly prominent (e.g.: it was used for cultivation along its path, retting linen or trade).

5.2. Middle Age to the Renaissance

The information available on the river is very scant from the 5th century to the early Middle Ages and mainly consists of a corpus of legal actions dated to the 10th-11th centuries.[279] The name Sebethus does not appear, but often a river is mentioned, commonly defined as "flubius", or "fluvius", and sometimes "Rubeolus".[280] From the 14th century onwards the last term appears more frequently, in the forms of "Rubiolus", "Rivolus", and "Ribius".[281] The river is obviously the same, since the plain is too narrow for two separate rivers, but the ancient name is lost.

The documents of the 10th century inform us also about other minor streams. The

[278] Summonte 1675. For the defensive walls made under the Aragonese rule and the exact localisation of Porta del Carmine, see Santoro 1984: 67-96, with map at p. 77.

[279] Capasso 1881.

[280] "ille fubeo qui vocatur Rubeolu", Capasso 1881: Regesta Neapolitana nn. 532, 564 (1094); Capasso 1881: II, 177-8.

[281] "juxta flumen Ribii", Reg. 1289 e 1290, A, fol. 70-71.

nature and consistency of the data provide a patchy but still useful reconstruction. Several streams are mentioned, three in the two towns of Troccla and S. Nastasa (now Trocchia and Sant'Anastasia): *de rosa*, *de ciraso*, and *de ille mole*;[282] more were on the plain but one was more prominent, the *rio de Silice* in the town of Pomigliano.[283] Others existed near Resina/Ercolano.[284] The streams become channels (*fossati*) along their paths and were used by mills[285] and workshops for spinning (*sfosarii/fosarii*). The water was diverted to ponds to ret flax and hemp.[286] The Arab geographer of the 10th century Ibn Hawqal[287] states that linen production was the main "industrial" activity of Neapolis and regards the quality of the fabric as the best available in the entire Mediterranean basin. Similarly Al Idrisi,[288] an Arab geographer of the 12th century who wrote his treatise for the Norman king Roger of Sicily, calls Neapolis "Nabel el-Kitan" (Neapolis of linen). Like Ibn Hawqal, Idrisi stresses the quality of the fabrics and the richness of the market. The need for ponds to ret flex and hemp implies an intensive use and good management of water sources.

Streams needed frequent cleaning.[289] The irregular path of the river after the eruption, the presence of several ponds, and the accumulation of debris after the strong winter rains facilitated the formation of marshes. At the mouth of the river there was a bridge[290] named firstly Pons padulis, recently Ponte della Maddalena. The documents of

---

[282] Capasso 1881: R.N. nn. 352, 586.

[283] Capasso 1881: R.N. n. 320. The toponym Silice generally refers to a road.

[284] Capasso 1881: R.N. nn. 348, 75, 172, 225.

[285] We know of about 10 mills in the area of the river, of which 8 are along the streams and 2 on the river. See Feniello 2005.

[286] Capasso 1881: R.N. nn. 334, 564.

[287] Ibn Hawqal 1964: 197, 203. The geographer travelled between AD 943 and 969.

[288] Idrîsî 1836: 70, 257, 260, 280-1; Id. 1883: 95 with footnotes.

[289] Capasso 1881: R.N. n. 621: "we need to clean the streams from the bottom and from the top to the river banks".

[290] Capasso 1881: R.N. n.178.

the 10th century do not offer enough information to determine the borders of the marshes, which are mentioned only rarely and mainly for the mouth of the river. The area was fertile and quite intensively exploited; the documents refer to the production of corn and vegetables and, probably higher on the slopes, to the presence of several wine/ oil presses (*palmentum frabitum, palmentum subscetorium*) and orchards.

The name Sebethus occurs again in literature during the rediscovery of the classics. The earliest document attesting this name is dated to the 12th century.[291] The river Sebethus was also the subject of a small enquiry by Giovanni Boccaccio (1313-1375), who was inspired in his quest by the classical and minor medieval sources: "Sebethus, ut quidam dicunt, Campaniae fluvius est apud Neapolim, quem ego vidisse non memini, nisi is sit rivus potius qui a paludibus sub monte Vesevo inter radices eiusdem montis atque Neapolim in mare affluit innominatus, nec alterius nedum aquae, sed nec vestigia unquam apparent".[292] His short report is of particular interest to us, because it describes the area as it appeared in that period, with marshes and a small river. Other sources help define the shape and border of the marshes from the 13th century on. In 1293 Charles I of Anjou operated to reclaim part of the marshes along the coast and in the city of Naples, where at that time marshes extended within the city walls of the Classical period. To reclaim the land, Charles I of Anjou and the following rulers also destroyed the *fosarii*.

Notwithstanding the works carried out by the Anjou kings for land reclamation, by the end of the 14th – beginning of the 15th century the abandonment of cultivated land led to the advance of the marshes, which reached the eastern border of the city, in the area of Forcella (within the Graeco-Roman town walls!), the church of Santa Maria "at the marshes", and also in the extramural neighbourhood of Casanova (eastern side of Naples), where previously king Charles II of Anjou had built a palace with gardens.[293]

---

[291] Sermo Sancti Constantii 1934: 1020: "Hunc Virgilius nutritum a fluminis ipsius nimpha dicit, quod in his locis, hoc est iuxta Neapolim. currit et Sebethus dicitur. Dicitur et alio nomine Rubeolus".

[292] Boccaccio 1360: 154r.

[293] Feniello 2005: 45.

From this point on the *paludes magnae* started, which extended north to the hills of S. Maria del Pianto in Casoria and passed close to the via Summese and included Volla and the town of Ponticelli: an area roughly 30,000 hectares in extent (Fig. 58).

Probably intentionally, in this period the Sebethus/Rubeolo was split into several rivers, along which were several mills (Fig. 59). The river channels received debris and rubbish, partially transported by rains, partially thrown in by peasants. Consequently, they needed frequent cleaning: "consuetum fuerit mundari et expurgari decursum aquarum per eos et certos alios habentes ibi terras vicinas".[294] At the mouth of the river, the debris formed a sandy plain, above which were fishermen of mussels, leather workers, washers of wool and other fabrics, and their buildings.

5.3. The cartographic evidence and the recent period

Until the 17th century there are no maps with significant information on the river and its marshes. Ambrogio Leone (1459-1525, Fig. 60) tried to match ancient sources with the evidence in the field. The maps of the 17th and 18th centuries provide more details. The map by Cartaro (1616, Fig. 61) shows the Ponte della Maddalena and the river split into two parts, which both depart from "la Volla". The road network is also clear.

In the *Campagna Felice* by De Silva (drawn in 1692 for Bulifon, Fig. 62) is the indication of the aqueducts running in the area (dotted line), with the Roman one. The area is depicted also in a painting by Scipione Compagno (1624-1680, Fig. 63), with the Ponte della Maddalena and other little bridges, several mills, the exploited marshes, and the two main roads. The bed of the Sebethus is much smaller than the bridge, because it is obstructed by the debris.

In the map by Karl Weber (1754, Fig. 64)[295] the river Sebethus is accurately drawn, it flows with two separate branches which merge at Ponte della Maddalena. The shortest

[294] Id.: 46.

[295] The map is of particular interest also for the inclusion of the discoveries made in Herculaneum (including the theatre), and some buildings at the Civita (Pompeii)

branch departs from Volla, while the longest is connected to the Regi Lagni (i.e. the Clanis) and reaches the area of Nola. The square fields along and around the rivers are probably the ponds which are closely related to the marshes; they stretch along the plain, reach Volla and include Ponticelli, and extend as far as Cercola, one of the towns on the slopes of the volcano. The painting by Barra (probably 18th century; Fig. 65), is a bird's eye view of the area in that period.

The literary evidence for the 19th century is abundant and provides descriptions of several other streams and springs.[296] After a catastrophic flood in 1822, the Bourbons started the construction of a system of channels in the town of Pollena. Right after the completion of the work, the channels became the centre of a long debate on their efficacy. Indeed they also conveyed debris with the waters, which ultimately filled the channels themselves and caused inundations.

The maps of the 19th century are drawn with advanced techniques and therefore offer more accurate and reliable information. The series of maps by Rizzi Zannoni (1793, Fig. 66) shows marshes spread over an area which is slightly smaller. The map also shows two aqueducts, the first built from Volla to supply Napoli, the second to carry water to the royal palace in Portici. The latter took water from several springs on the north slope of the volcano.

The most important series of maps was drawn at 1:20,000 by the Bourbon Topographical Office in 1836-40 (Fig. 67). The maps are quite detailed and show the marshes – smaller than in the previous periods – and all the springs, channels, and secondary branches of the aqueducts, including those on the slope of the volcano.

Today the entire region appears very different from in the past. There is no trace of the river Sebethus, which until the 1980s was reduced to a little channel near the industrial district of the city. The channels built in the last two centuries are usually

[296] Feniello 2005: 47. The Sciummetiello (little river), one mile from the Sebethus, the Bagnara, the Pascariello, from the hill of Poggioreale; Cozzone, the river of Casoria, Sanseverino, Caracciolo, Sbauzone, Iannazzo and Ferriera.

quite well preserved in the countryside (in the fields or quite high on Mt. Somma), but they are completely dry. Near the towns, they were used in the past 30 years as rural trails and most of them were recently converted into alleys to access illegally built houses or into proper roads. The springs mentioned in the maps are still traceable, but they are quite dry.

5.4. Conclusions on the documentary evidence

In the previous sections this chapter offered the complete documentary evidence available about the river Sebethus, the marshes, and the territory between the north slope of Vesuvius and the city of Naples. The evidence is varied and patchy, therefore the creation of the entire landscape sequence is particularly difficult (the evidence is plotted in figure 68). Nevertheless, the data offered undermine existing theories about the Sebethus and its region, and form the basis for new theories.

According to current scholarly opinion, in antiquity the river Sebethus was small and surrounded by vast unproductive marshes. This interpretation is based on a partial reading of 17th-century sources and the data presented above show its inaccuracy. In antiquity the river played an important role as a link between the city and the communities of the hinterland. Additionally, there is no mention of marshes and the way in which the river is described differs significantly from the account by the same authors of other rivers in the region. The later evidence provides more information about the river and its landscape:

- For the well documented periods, the Neapolitan plain and the north slope of the volcano appear remarkably rich in surface waters. For example, in the 11th century there are eight tributary streams of the Sebethus, in the 19th at least eleven. The discharge of these streams provided enough energy for many water mills and water for two aqueducts (19th century).

- At least from the 10th century, the streams and the river were used to ret flex and hemp. The production of linen was for some centuries the main industrial activity of

Naples, which became the most important linen production centre in the Mediterranean basin.

- One clear factor in the creation and enlargement of the marshes is the intensive diversion of water into artificial ponds for the production of linen and agriculture. This can be assumed from the presence of marshes (13th century) in places where previously lay water mills and from several laws which imposed the cleaning of streambeds, culverts, and channels (especially from the 17th century).

- At their full extent, the marshes covered areas that in antiquity were settled or urbanised. In particular, there were marshes in the eastern neighbourhoods of Naples within the Greek-Roman city walls and on the south side of the river (in the modern town of Ponticelli) where there had been sizeable Roman villas.

In the past two millennia the Sebethus showed variations in shape, discharge, and use. These changes contradict the static model adopted so far for the reconstruction of the ancient Vesuvian landscape. Moreover, no evidence supports the theory of a limited unproductive territory of Neapolis in antiquity.

The evidence for the post-antique periods clarifies that the marshes are not just natural phenomena, they are not static, and can be used for production.[297] The changes in the river's path and the marshes' size could have been caused by one or more of the following agents – climate change, eruptions, land exploitation.

5.5. Palaeoclimate

The reconstruction of ancient climate and its variations throughout time is of paramount importance to understand how the Roman landscape differed from the present one and consequently the importance of surface waters, the length of the river Sebethus, whether the presence/absence of the marshes was climate-related, how wide and arable the countryside of Neapolis was, whether the variations occurred have been

[297] Horden and Purcell 2000: 186-90.

caused by natural phenomena or human intervention.

5.5.1. Methodological remarks

Climate and weather are difficult to measure and analyse. Weather is indeed the result of several non-homogeneous factors, which belong to non-linear dynamic systems. Climate is the average and variations of weather over long periods of time. Climate varies in all scales, both temporal and geographical: the current world climate is not merely a reflection of the climate of each continent/country/location, nor of any of the components forming the local weather.

Past climates are reconstructed through several different analyses (e. g.: tree rings, ice cores, boreholes). Each analysis has its own limits, covers specific fields or geographical areas and therefore the creation of an overall picture is quite a difficult task, because it implies the formulation of a uniform theory, which includes and explains incommensurable data. This complex background leads to the divergent interpretations offered by scholars.

5.5.2. Global vs. regional climate models

Through the analysis of the available data-sets for the northern hemisphere – mainly: human documentary records, tree ring records, and ice core records –, Lamb hypothesised a cyclic pattern in the world climate and formulated the concept of the Medieval Warm Period (~AD 950-1200),[298] followed later by the Little Ice Age (~AD 1450-1850).[299] According to this model, he suggested a period of warmth during the Roman Empire (Fig. 69).

In the last decade, Lamb's global climatic model has been criticised by several scholars in favour of regional models,[300] which nevertheless show a quite complex pattern of

[298] Lamb 1965; id. 1972.

[299] Grove 1988.

[300] Jones and Bradley 1995 *passim* with references. At p.650: "There is no evidence for a world-wide, synchronous and prolonged cold interval to which we can ascribe the term Little Ice Age".

climate variation "that rarely, if ever, follows the actual pattern of hemispheric or global mean variations".[301] The study of Jones and Mann[302] offers the most complete and updated set of palaeoclimatic models. The graphs composed by the authors (Figs. 70-73) are formed by overlaying all the most up to date reconstructions available. Each regional graph shows lines – one of each as representative of a reconstruction from a particular source and area – which differ significantly from each other.[303] These discrepancies within the same region are noted not only for records from different proxies (for example tree rings and ice cores), but also in records from the same proxy.[304] This ultimately contradicts the regional model itself.

Regional and global levels of analysis must be kept separate, because both are valid, but on different levels. The effects of small- (temporal and spatial) scale climatic anomalies are quite different from large scale ones. Indeed, a few consecutive years of high rainfall can cause violent floods and landslides, affecting particular settlements; long-term changes in the climate, such as centuries with high rainfall, create rivers or marshes, which affect on a large scale the settlement pattern and the economy of an entire area.

5.5.3. Getting local

The micro-scale analysis is archaeologically relevant if it is able to provide a reliable reconstruction of the specific palaeoclimate. The data used for the following analysis are taken from the collection by Algranati Mastrocinque,[305] compiled in 1938, of all available documents pertaining to the meteorology and climate in Campania from the Roman period to modern times. The results are shown in figure 74. They clearly show no cyclical pattern in the sequence.

---

[301] Jones and Mann 2004: 19.

[302] Jones and Mann 2004.

[303] For example, in the graph of Eastern Asia (Fig. 71) the record taken from the trees shows an anomaly with a value of +1, but the ice core record taken in Dunde shows a value of almost -3.

[304] E.g. the ice core records for the North Atlantic in fig. 70.

[305] Algranati Matrocinque 1938.

5.5.4. Global proxies for global climate

So far I have argued that regional records reflect local scale changes in climate. In this section I seek proxies of global scale changes and then test them against the area of interest.

Ortolani and his team[306] are still developing a new kind of proxy data for past climate reconstruction. The study focuses on the Mediterranean basin, mainly from 40°N to 42°N. The sample sites[307] are chosen mainly in proximity to archaeological sites, which offer a more accurate dating of the stratigraphic sequence. The evidence shows a cyclical alternation of aggradation and stasis/erosion. During the colder and more humid periods, there has been a constant accumulation of alluvial debris, which covered the anthropic soil and caused the aggradation of the area. On the contrary, for the warmer periods there is a predominance of aeolian desertic sands (calcrete horizons), with stasis of sedimentation on the coastal plain.[308]

The analysis has been carried out on several archaeological sites, including Selinunte, Velia (Fig. 75), and Naples. The alluvial debris are particularly conspicuous in the periods: 520-350 BC, AD 450-750, 1300-1600.[309] The comparison with the analyses of the other locations led Ortolani and Pagliuca to argue that it is possible to reconstruct a cyclic climatic trend in the Mediterranean basin, which corresponds to Lamb's theory:

- Roman period (2nd-4th c. AD) warm-arid climate;

- Early Middle Ages (5th-8th c.) cold-humid climate;

- Middle Ages (11th-14th c.) warm-arid climate;

- Little Ice Age (16th-19th c.) cold-humid climate.[310]

---

[306] Ortolani and Paglica 1998; Caliro et alii 1999; Allocca et alii 2000; Ortolani and Pagliuca 2001.

[307] An almost complete list in Ortolani and Pagliuca 1998.

[308] Ortolani and Pagliuca 2001: 7.

[309] Caliro et alii 1999: 131.

[310] Allocca et alii 2000: 349.

The alternation of aggradation and stasis are local macroscopic effects of global changes in the climate.

5.5.5. Discussion

Global proxies confirm Lamb's model of palaeoclimate, according to which the world has experienced regular climatic fluctuations in the last two millennia. This model does not apply to the last two centuries, during which world temperature increased far beyond the expected fluctuation.[311] Since the regional proxy records do not correspond to the global climatic model, one can infer that the global climate changes have no direct effect on regional proxies. Past climatic fluctuations cyclically altered the coastline, but they did not directly affect the marshes, whose changes do not follow the palaeoclimate's pattern. There is no evidence in support of the idea that temperature and average rainfall changed cyclically and even in that case, the 2°C change would not have affected significantly the rivers' discharge and land cultivation. Therefore it is possible to reconstruct part of the Classical landscape through the evidence from the sources described above.

The Sebethus must have been longer than commonly thought. According to common opinion, the springs of the river are in Volla, where indeed most of the deep rivers from both the Nolan plain and the north slope of Vesuvius emerge. Nevertheless, the cartographic map by the Officio Topografico del Regno di Napoli (1836, Fig. 67) identifies further east the springs, in the neighbourhood of Casalnuovo di Napoli, called Feneria (Fig. 77). Furthermore, Feneria was connected through the canal of Carmigniano (18th c.) to the Clanius near Acerrae. The recent creation of three rail overpasses at Feneria blocked the deep ground water circulation and made the entire area marshy;[312] this testifies to the importance of the area for the regional hydrography and reinforces the hypothesis that originally the Sebethus might have originated at Feneria.

---

[311] As proved, rather than theorised, by objective scientific measurements.

[312] Newspaper article: M.L. Ciminella, "Piloni Tav sbarrano falda acquifera. Ora le case 'galleggiano' su una palude", Corriere della Sera, sez. Corriere del Mezzogiorno, 31 march 2010.

The plain was potentially subject to flooding, which was caused by either bad management of water (creation of channels and ponds) or local weather fluctuations ("bad winters"). Fluctuations in palaeoclimate are not the agent for the formation and transformation of the Neapolitan marshes.

5.6. The place of volcanic debris

Eruptions and accumulation of volcanic debris might have contributed significantly to the creation and transformation of the marshes. The proto-historical eruption of Vesuvius in 1830 BC (the Avellino eruption) filled the lagoon and the small lake which existed between Vesuvius and the Neapolitan hills, therefore theoretically they might also have created the marshes. Unfortunately there is no evidence to determine whether the marshes existed in the Classical period or not, but the presence of archaeological sites in areas which were later covered by marshes proves that there is no direct connection between eruptions and variations in size of the marshes (Fig. 78). According to the data from the maps, the marshes reached their maximum extent in 1450 and were smaller in 1836, despite the great eruption of Vesuvius between them, in 1631. Nevertheless eruptions and replacement of volcanic deposits might have contributed indirectly to the transformation of the marshes, through bradyseism, lahars, and floods. In § 4.5 the effect of bradyseism caused by the AD 79 eruption has been calculated to be roughly 1 metre, which is not enough to create the marshes. The total amount of volcanoclastic debris in the centre of the plain is also 1 metre thick (Fig. 79). This deposit is the result of several lahars and floods which cannot be identified individually, even though I would argue that they are mainly related to the AD 472 eruption. Indeed we noted in § 4.4 that this eruption triggered many landslides of volcanic debris, which slipped from the Apennines to the Nolan plain, where they filled buildings with 30 to 120 cm of debris. This might have changed especially the upper Sebethus, east of Volla. But again the cartographic evidence shows changes in the marshes' size, which are more frequent than the eruptions and cannot be directly related to them, therefore the volcano is not the main agent.

5.7. Marshes: ‘eterogenesi dei fini’, complex systems, and historical narratives

So far the Neapolitan plain has been described as a fragile landscape, in which nevertheless the formation and transformation of the marshes cannot be explained solely as a natural phenomenon. Documentary sources testify to mankind as the main agent of the marshes’ expansion. Peasants split Sebethus and its tributary rivers into several streams and channels for economic purposes (mills and ponds for flax); this activity proceeded intermittently for at least 800 years and contributed significantly to destabilising the environment and triggering floods. The transformation of the marshes is therefore a combination of local weather variations, volcanic instability, and bad management of natural resources. Mankind might have played an important role also in the formation of the marshes, but in that case the predominant factor was probably a conspicuous discharge of volcanic debris, either during the proto-historical or the late antique eruption. I am more inclined towards the latter hypothesis, but my argument is based only on the silence of the sources, thus I prefer to keep open a double scenario. In the event that the marshes existed in antiquity, they should have been pretty small, as the distribution of archaeological sites implies. The inhabitants of the area had the knowledge and the technology to reclaim the marshes, indeed in Cumae and Acerrae deep ditches were excavated to reclaim the land.[313] On the other hand, the spread of the marshes might have been encouraged to produce linen because in general it was sold very profitably (70-1200 denarii per pound in AD 301)[314] and in Italy very few areas met the special requirements for its cultivation. Flax needs an ample supply of water and very good quality soil, because it is entirely pulled from the ground (with the roots), thus it depletes the soil.[315] These conditions are fulfilled only in three areas in the Italian peninsula and these are also the only ones mentioned in the sources: the Po valley, the Tuscan coast, and the Ager Campanus. Cumae was renowned for the production of nets

[313] See § 1.2.1; Giampaola 1997. Alternatively, cypresses were planted along the rivers and in swampy areas, as attested from many passages and archaeological remains in Nola and Pompeii, see § 6.2.

[314] The price is in Diocletian’s Edict (26-28) and refers to the eastern linen.

[315] Gleba 2004: 34.

for fishing and hunting, while Capua was celebrated for the ropes and the tunics and tents of the Samnite army.[316] I would stress nevertheless that the most common and profitable product of linen is the sail,[317] which was used in large quantities not only in the navy, but also for the awnings in theatres and amphitheatres. The Colosseum's *vela* were worked as an honour by the naval veterans of Misenum[318] and this might imply that most of the production for the navy was made locally in the bay of Naples. From this perspective, the plain of the Sebethus might have supported the Ager Campanus in linen production.[319]

Alternatively, the plain was not marshy until the late antique eruption and the river might have been used for trade with the interior, as suggested by the coin types. As in modern times, the river probably originated at Feneria and through a short canal it might have been connected to the Clanius, which provided access to Acerrae and Nola.

Both scenarios contradict the traditional hypothesis according to which Neapolis had no territory and its plain was unproductive. The evidence from the recent history of the plain highlights aspects of the relationship between mankind and environment, which in my opinion are particularly useful for this study and may be summarised with the concepts of non-optimal behaviour, "eterogenesi dei fini" (unintended consequence of intentional actions), complex systems[320] and their description in historical narrative.

Human behaviour is not always optimal, therefore it cannot be inferred positivistically. There is indeed a marked difference between the decisions made by

---

[316] Plin. *N.H.* 19.10; Cato *Agr.* 135; Liv. 9.14, 10.83.

[317] Liv. 28.45; Plin. *N.H.* 19.22; Caes. *B. Gal.* 3.13.

[318] Plin. *N.H.* 19.23-25.

[319] No contexts of the classical period have been analysed in Naples, thus the earliest contexts with flax seeds and linen fibres are dated to the 8th-9th century AD (Arthur 2002: 114, but they are very scant - 4 fragments on a total of 1025).

[320] A complex system is a network of heterogeneous components (agents, processes, etc.) that interact nonlinearly (not derivable from the summations of the activity of individual components); the behaviour of each component depends on the behaviour of others. Typically a complex system exhibits one or more properties (behaviour among the possible properties) not obvious from the properties of the individual parts. This definition is based mostly on Joslyn 2000.

rulers and the actions taken by the rest of the population, who either did not have enough quantity and quality of information,[321] or were unable to use the information properly, or just wanted to pursue individual profit regardless of the consequences.

The marshes' spread can be viewed also as unintended consequence of intentional actions. The Bourbon rulers created many channels to facilitate the flows, but this had the side-effect of also facilitating the flow of volcanic debris, which triggered floods.

The variations in the size of the marshes also provide more insights into the relationship between mankind and the environment. The idea which arises from this chapter is that landscape is a complex system, since it is formed by many interactive and dynamic components, like geomorphology, climate, and land use. The components are both natural and human, and in combination they form geographic features. Components and features interact in a non-linear way;[322] therefore it is difficult to provide a coherent narrative of the landscape in which one effect stems from just one cause. I have proposed so far a three-layered description of the landscape. Nature's static components constitute the background layer. The second layer is formed by catastrophes, i.e. by changes that happened at a precise moment. I define catastrophes as "punctuated changes" (or "event-driven natural history" or – working on Braudelian terminology – "*histoire naturelle événementielle*"), because they represent points in the timeline. In the field, catastrophes provide clear evidence of landscape changes. Nevertheless, catastrophes register events (punctuated changes: "pictures") rather than processes (dynamic changes: "sequences"). Ultimately, they fail to provide a dynamic description of the land.

Processes like the formation and transformation of the Neapolitan marshes are the third landscape layer. Processes are characterised by the combination of asynchronic components and human activity. By asynchronic components I mean components which

---

[321] E.g.: marshes spread diseases, unclean channels trigger floods, too many ponds make the mills ineffective.

[322] i.e. they do not follow the straightforward cause-effect principle, rather they provide an X factor, which combined with the others generates an event.

proceed at different paces, i.e. static ones (deep water hydrography), recurring cyclical ones (seasons), and recurring occasional components (e.g. eruptions).

We can consider the Neapolitan marshes a complex system; this chapter has described its structure and defined its components and their pace. Still, the coexistence of several components with different paces, makes it impossible to create a periodisation or, in other words, to divide-up the past in a way that can be narrated in a linear way. Indeed periodisations can describe only simple events, which can be reduced to either a static (A remains A), a progressive (from A to B), or a cyclic (from A to B to A) movement, whereas complex systems are rather the sum of multiple asynchronic processes.

Horden and Purcell[323] stressed the historiographic need for a new methodology in the study and description of landscape processes, i.e. for finding a way to describe and categorise processes, rather than events. As demonstrated in the case of the river Sebethus, the processes can hardly be simplified in a narrative line. A process is rather described through its characteristics and the interaction between components (reductionism), but the overall picture remains blurry. The relationship between mankind and the environment is per se a complex system, and therefore the analysis of all other instances of this relationship need to follow the same scheme outlined for the marshes, i.e. the structure can be understood, snapshots can be taken, but the long-term historical narrative cannot be achieved. In a more positive way, the snapshots here provided describe, for all historical periods, a landscape that, despite of the common assumptions on marshes, was exploited so much as to become the most characteristic tract of the city of Naples.

[323] Horden and Purcell 2000: 338-9: "relationships between humans and nature are interactive and embedded within a kaleidoscopic environment in which little or nothing is permanent"; 326: "Historians, as much as environmental archaeologists, are prone to 'over-periodising' – searching for phases of pivotal importance, usually catastrophic, with which to divide up the past".

6. Soil classification and land use

This chapter aims to define the percentage of land cultivated in antiquity, how the land was exploited, and what damage the AD 79 eruption caused to agriculture. The chapter is divided into three parts: the first provides a snapshot of the landscape through the definition of cultivated areas before the AD 79 eruption, the second studies the short- and long-term effects of the eruption on cultivations, the third describes the landscape in AD 472.

Environment is apparently the product of natural components, like geomorphology and catastrophes, but in the previous chapter I have stressed the important role played by mankind in natural processes – for example the formation and transformation of marshes. Conversely, land use is apparently the result of human intervention, but it is somehow limited and shaped by nature, as some areas are unsuitable for wine production or stockbreeding.

The theoretical contrast between mankind and environment has a practical reflection on the construction of landscape models. A model based only on the natural component implies a distribution of the species that corresponds to the best use of natural soils, and thus the model is based on the map of the soils and is inductive/predictive. Conversely, a model based only on the human component corresponds to the actual distribution of the species on the land, and thus is deductive/empirical. The empirical approach requires data, which are still too patchy and insufficient for antiquity for the Vesuvian area. Nevertheless, contemporary land use can be employed as a starting point for the empirical reconstruction of the ancient pattern, if the differences between past and present land use are considered (e.g. allochthonous species and economic models).

The model I propose takes advantage of both inductive and deductive approaches through a multi-stage process. First, I establish what were the possible ancient cultivations by overlaying modern land uses on the soil typology; this comparison empirically shows the typology of some areas and the limits within which mankind

operates. Then into this scheme I place the evidence from written sources, ecofacts, and other archaeological data. For an ideal reconstruction of the ancient landscape, a complete and coherent (i.e. sampled using the same methods) dataset of ecofacts - charcoal remains, plant remains (*carporesti*), pollens - would be necessary, which anyway would not directly reflect the neighbouring environment, but rather the wood used for timber and fuel, the food consumed, some of the vegetal species present in the region (up to 10 km of distance from the recovery point). Unfortunately the situation in Campania is far from being ideal.

6.1. Present agricultural land classification

The bedrock, the soils deposited above it, and the vegetation constitute the landscape. The area studied has three types of bedrock: the volcanoes, the limestone mountains, and the alluvial plain in between them. The soils are mostly volcanic, since the eruptive ejecta are spread over a wide area (Fig. 80.a). Volcanic soils are very fertile. They cover only 1% of Earth's land surface, but support more than 10% of the world's population.[324] Volcanic soil well suits any kind of cultivation; therefore it cannot be used to determine which species were cultivated. Campanian fluvial sedimented soil is equally very fertile and not diagnostic of crop type. The overlay of present cultivations (Fig. 80.b-c) on the soil map confirms this interpretation, inasmuch as the same cultivations exist on both soils.

The Hirpinian Apennines are different, since their land is used mainly for timber and hazelnuts. Woodland is present also on the Somma-Vesuvius complex above 400 m and in parts of the Phlegraean Fields. The common feature for these three areas is the steep gradient of the slopes and the higher altitude, rather than the soil typology: soil typology does not affect the cultivation pattern, thus it cannot be used to postulate cultivations. The inductive approach is reliable only for woodland.

The empirical/deductive approach is often used to reconstruct the Pompeian

[324] Ping 2000: 1269.

environment. The species presently cultivated in the area are usually mentioned to suggest or corroborate hypotheses about the past environment. The cultivations on the Somma-Vesuvius complex can be divided into three groups, according to their elevation.[325] On the topmost part of the complex is a mixed forest constituted by European hop-hornbeam, Neapolitan maple, birch, and holm oak. Between 600 and 900 m a.s.l. there are primarily sweet chestnuts (especially on the north slope) and pines (on the southern).[326] On the base and lower slopes of Vesuvius black locust, Scotch and Spanish broom are common, whereas on the lower part of Somma a vast variety of plants, orchards, and vineyards are intensively cultivated.[327] Among the cultivations, vineyards, apples, and apricots are the most common, but walnuts, peaches, and plums are also quite widespread. In the plain there are vineyards and orchards as well, together with fruit garden vegetables like beans, peas, fennels, potatoes, tomatoes, and so forth. On the Apennines there are mainly hazelnuts. This list of species is useful to stress the limits of an uncritical application of present situations to the past; e.g. Foss hypothesises that the vegetation on the Somma-Vesuvius complex consisted of "the same vegetation [which] exists today, except in areas where agriculture encroached".[328] This statement implies that in the Roman period the woodland corresponded to the native vegetation and that it was unexploited, but this is hardly the case. Many species were brought from other habitats in recent times, such as the black locust,[329] which was recently introduced from North America. The role played by mankind in the formation and characterisation is central and this appears more clearly by comparing the maps of land use dated to 1961 and 1999 (letters b and c in Fig. 80), since they are very different from each other. They have in common only the distribution of woodland and their differences only testify to

[325] I quote the species listed in Mazzoleni 1993: 104.

[326] Allevato 2009. In 1916, some pine remains were found at Massa di Somma (north slope of the volcano, near Herculaneum) within the AD 79 ashes (De Fiore 1915-16).

[327] Ruocco 1965: 502.

[328] Foss 2002: 66.

[329] Mazzoleni 1993: 104.

changes in land organisation.

6.2. Land use before the Pompeian eruption

The use of ancient sources for the reconstruction of land exploitation is problematic but necessary because they attest to typical productions that covered most of the land despite traditional scholars rather focus on creating an uncharacterised list of cultivated species. For example, Jashemski and Borgongino[330] offer lists of plants and vegetables attested in literature, art, and every kind of archaeological evidence, thus creating a long list of species which tells us more about the Roman Empire than Campania. My analysis points rather to the identification of typical and intensive cultivations.

Many ancient authors point to the fertility of the Campanian plain, the possibility of getting three/four crops per year, and the fight between Bacchus and Ceres for supremacy on the land.[331] Vergil refers to the richness of the alluvial plain, by which he means the Capuan ploughed soils, the coast near the Vesuvian ridge, and the Clanius.[332]

Mt. Vesuvius is also very fertile and in the sources it is a cultural topos for wine production. Ancient sources describe it as two-thirds covered by vineyards and the upper third by woodland.[333] Martial connects the environs of Vesuvius (before AD 79) to the three gods Hercules, Venus, and Bacchus,[334] who are three figures of speech to represent Herculaneum, Pompeii, and Vesuvius (Bacchus).[335] The latter link is confirmed by the frequent images of Bacchus in most of the rural sites as well as in some inscriptions,[336]

---

[330] Borgongino (in Stefani 2000: 71-75 lists all the species of vegetables found).

[331] Plin. *N.H.* 3.60; Strabo 5.4.3.

[332] Verg. *Georg.* 2.217-225.

[333] Plin. *N.H.* 18.111; Strabo 5.4.8; Flor. 1.11.3-6; Aus. *Mos.* 210; Varro *R.R.* 1.6.3. An indirect reference to vineyards is also in the episode of Spartacus, who escaped Clodius Glabrus' siege of Vesuvius by means of ropes made of vine-twigs: Frontin. 1.5.21; Pluth. *Crass.* 9; Flor. 2.8.4-5.

[334] Mart. 4.44.1.

[335] Gigante 1998.

[336] De Simone 2007. Interestingly, the triad is attested also in an inscription in the villa of Popidius Florus at Boscoreale, see De Simone 2007.

and many passages in ancient sources on Southern Campania,[337] which mention four varieties of grapes:

- the Aminea gemina minor cultivated on the slopes of Vesuvius and on the Surrentine hills, of good quality but low yield;[338]

- the Murgentina, also called Pompeiana, originally from Sicily and transplanted to the Vesuvian area;[339]

- the Holconia (from the Pompeian gens Holconia) probably cultivated in the Ager Pompeianus;

- the Vennuncula/Surcula, produced on Mt. Vesuvius and the Surrentine peninsula and probably the least valued, but the most common, grape.[340]

These four kinds of grapes were used to create many kinds of wines, like the Vesuvinum/Vesvinum/Lymp(h)a Vesuviana,[341] which was the most common, or the Pompeianum and the Surrentinum. Pliny mentions the Trebellicum as one of the new exciting names among Campanian wines.[342] Defrutum was a liquor-like wine, which was created by the reduction of must by cooking.

Pliny mentions the quince of Neapolis as highly valued,[343] while Pompeii and Herculaneum were famous for figs.[344] Other productions were more typical of the plain.

---

[337] Stefani 2005; Renna 1992: 35. Wine production on Mt. Vesuvius are in: Aus. *Mos.* 210; Flor. *Epit.* 1.11(16).5; Cass. Dio *Hist. Rom.* 66.21-23.

[338] Colum. 3.2.10; Plin. *N.H.* 14.21.

[339] Colum. 3.2.27; Plin. *N.H.* 14.34-35.

[340] Plin. *N.H.* 14.34-35; Hor. *Sat.* 2.4.71.

[341] CIL VIII, 22640, 31; CIL IV, 5622.

[342] Athen. 1.27c; Plin. *N.H.* 14.69. The wine is named after the locale where it grows, four Roman miles (i.e. 6 km) from the city. In the same passage Pliny mentions the Cauline wine – produced close to Capua –, and the Trebulan and the Trifoline, which should be in either one or the other territory, while the Pompeian wines are clearly listed after.

[343] Plin. *N.H.* 15.37.

[344] Cato 8.1; Plin. *N.H.* 15.72.70; Macrob. 3.20.1.

Pompeii was famous for one particular kind of onion.[345] The territories of Neapolis and Capua were particularly important for perfume production: Pliny the Elder states that the fame of Campanian perfume surpassed the once extremely popular Corinthian one and that according to a common saying Campanians produced more scent than other people did oil.[346] According to Columella cabbage was widely cultivated throughout Campania, mostly in damp areas, as it requires much water.[347] Cypress was planted along the rivers as well as in muddy areas. Cato[348] names Minius Percennius of Nola as an expert in the plantation and propagation of this tree. Percennius recommends planting cypress in very muddy/swampy land (*pulla*). Varro[349] suggests its use as a boundary-maker between estates, as in his property on Vesuvius, but most likely it was mostly used for stakes and props, as Pliny suggests.[350] Ancient sources mention three species of woodland trees: the hazelnut, the fir, and the chestnut. Hazelnut and fir were planted on the Apennines. Cato mentions the territory of Abella as one of the only three areas, where good hazelnuts were produced.[351] Vitruvius mentions fir only in the Apennine ranges and praises the Campanian fir as the best.[352]

Neapolitan chestnut was particularly famous. Pliny states that the only two edible kinds are from Tarentum and Neapolis.[353] He also provides some details about two particularly good and renowned kinds of chestnut, bred in the territory of Neapolis by

---

[345] Colum. 12.10.1.

[346] Plin. *N.H.* 13.5; 18.111.

[347] Colum. 10.127-139: the shores of Cuma, Capua's rich plain, at Stabiae, in Vesuvian fields, at Neapolis by Sebethus' stream, and at Pompeian marshes. Pliny (*N.H.* 19.140) mentions the Pompeian cabbage too.

[348] Cato 151.

[349] Varro 1.15.

[350] Plin. *N.H.* 16.141.

[351] Cato 8.2. Significantly, the Roman name for the hazelnut is *corylus* or *nux abellana*, which refers to the vast production in the territories of Abella/Abellinum (Borgongino 2006: 36).

[352] Vitruv. 2.10.1.

[353] Plin. *N.H.* 15.94; also Martial (5.78.14-15) emphasises the quality of the Neapolitan ones.

the Roman knight Corellius and his freedman Tereus, after whom they were named.[354]

The species described above can be roughly divided into four areas: mountain, hill, plain, and riverside/marshes. Chestnut is attested in the territory of Neapolis, therefore it would have been grown either on top of Mt. Vesuvius and/or on the Phlegraean Fields. In the sources fir and hazelnut are located on the Apennines, i.e. for the Nolan mountains and beyond, while vineyards are placed on the hills of Mt. Vesuvius and on the Phlegraean Fields, but they could also have been grown in the plain, as today. Orchards could have been located on both the hills and the plain, where plants for perfumes were also planted. In more humid areas of the plain were cypresses and vegetable gardens (e.g. cabbage).

This brief summary of ancient sources shows more than a random list of cultivations. The species mentioned were distinguished for either quality or quantity and they all seem to be object of specialised cultivations, even in the case of species we would not consider cash-crops, like chestnuts and cypresses. I would assume that specialised cultivations were produced in large quantities and hence covered most of the available land and constituted a well-characterised landscape, rather than were part of a random scatter of species.[355]

This implies an efficient and profitable productive system, and consequently a higher production (and maybe even surplus) of a few goods. This model is also confirmed by the story of Corellius mentioned above. Many knights and senators owned land in Campania and were probably more interested in making good profits rather than fulfilling the requests of the local market. From this perspective, Jongman's approach[356] is placed on the opposite side of the theoretical spectrum. Considering the population of Pompeii, he calculates the city's need for grain and the transportation costs for goods, and then

[354] Plin. *N.H.* 17.122.

[355] Jashemski 2002. The other scholars working in the Vesuvian area adopt the same methodology: Stefani 2002; ead. 2005; Borgongino 2006.

[356] Jongman 1988.

imposes an autarchic model on that, according to which the need of the population is satisfied by local resources. In the following pages I will discuss his arguments in detail, but for now I will only focus on the economic model that he implicitly suggests. Jongman's theory appears problematic on both factual and theoretical levels, since he overestimates the costs of transportation; Pompeii is indeed just 40 km (27 miles) from Capua and had a harbour close to the largest Roman hub, Puteoli. On a more theoretical level, Jongman relies on Finley's economic model and Christaller's and Thiessen's geographic theories, which have already been criticised in the introduction. Jongman assumes that the market rules favour the consumption of local products; ultimately this implies that the city uses its territory for the benefit of its population. I think that the economic flows are more complex and closer to Davies' diagram (Fig. 5) and indeed the literary evidence supports my opinion. The example of Corellius is one of many available for showing that the Roman economy of the 1st century AD was stimulated by individual – rather than collective – pursuit of profit. This economic model corresponds to intensive and specialised land use for "market-oriented", or perhaps export-oriented, production of the most profitable goods; basic staples, with lower profit margins, may have been imported, as described by the sources.

6.2.1. Wine

The archaeological evidence is quite patchy, but it is helpful to test the theories presented and locate the cultivations more precisely. I exclude from the discussion the species attested only through sporadic or indirect evidence (e.g. frescoes).

Literary and archaeological evidence suggests that vines were the main cultivation on the slopes of the volcano. Wine production has been much studied for the southern slopes of Vesuvius, because of the farmhouses discovered at the beginning of the 20th century in the Pompeian territory. Scholars used this evidence to hypothesise that the southern slopes of the volcano and the entire Pompeian plain were mostly devoted to

wine production. This theory has been strongly opposed by Jongman,[357] who emphasised the lack of farmhouses in some sections of the volcano and especially on the plain. As an alternative, he suggests that the main production on the plain was grain. Since his arguments are complex and varied, and his conclusions have been widely debated in the past,[358] I will focus here on the main point solely. Jongman's theory is grounded on Rostovzeff's archaeological map of the Pompeian territory which plots only the late-19th-century discoveries made in the town of Boscoreale, north of Pompeii on the slopes of the volcano (Figs. 81-82). These discoveries were not entirely accidental, since they were made (1) by a relatively small group of people, (2) in a narrow non-urbanised area, (3) just a few years before the promulgation of restrictive laws, which basically prevented further exploration. Indeed also in areas where one would expect a higher density of sites, there are occasionally some vast gaps. This is particularly true for the area just outside the northern gates of ancient Pompeii (the yellow area in Fig. 83). The area is considerable, slightly larger than Pompeii itself (6 vs. 5.7 km^2), and considering the very tight pattern just north (in the modern towns of Boscoreale and Boscotrecase) and south of Pompeii, one would expect a similar situation, but since this has been one of the first areas to have been protected by law, no construction or research has been allowed since that time.

Since those early discoveries though, for other sections our knowledge of Pompeian territory has increased substantially. Superintendency officials have inspected public and private construction works more closely, which have been constantly increased in number since the 1960s. I have collected the scattered rescue archaeology reports and plotted them on a map, which reveals a settlement pattern, which is much denser (also and especially on the plain) than that used by Jongman to support his theory (Fig. 84, a more detailed analysis of the settlement pattern is in chapter 7).[359] Moreover, where the

[357] Jongman 1998: 123.

[358] Purcell 1990.

[359] Senatore (1998) has a similar point against Jongman, with fewer data.

gap of information is still present – for example in the Pompeian territory above 100 m – it must be contextualised rather than used as an argument *ex silentio*. The lack of settlement is only apparent if one considers the thickness of the volcanic debris and the spread of modern urbanisation, with the consequent (and mostly unreported) obliteration of archaeological evidence. Conversely though, one cannot extrapolate evidence without a model.

The model I propose is based on the assumption that areas with similar features are similarly settled. It also takes into account the distortion that some features, primarily infrastructure and higher-hierarchy-settlement, can create in site distribution, because the settlement pattern is generally denser close to cities, roads, and key resources. Following this principle, the archaeological evidence for vineyards is divided into four areas: the slopes of the volcano between 100 and 400 m a.s.l., the area uphill from Pompeii between 50 and 100 m a.s.l., the other sectors of Mt. Somma between 50 and 100 m a.s.l. and the plain.

My survey on the north slope of the volcano shows a tight pattern of farmhouses (mainly remains of walls associated with dolia sherds) in between 100 and 400 m a.s.l. Today this area is carved up by several deep gullies, which are the result of two millennia of volcanic destruction associated with fluvial erosion. Despite this loss of data, the pattern is still very dense. In the modern town of Somma Vesuviana – where my survey has been particularly intensive – there are remains of farmhouses on the top of each hillock (200-300 m apart from each other). If we use Columella's figure of 100 iugera as a hypothetical standard size for each estate to evaluate the density and the percentage of land used, the result is striking. I have schematically plotted 100 iugera as a circle having the farmhouse as centre and a radius of 283 m. In most cases, the circle of one villa overlaid the neighbouring villa (Fig. 85). This leads to the conclusion that most of the villas had a property smaller than 100 iugera, but also that the surface of the volcano between 100 and 400 m was entirely exploited. The exploitation of natural resources with a high-volume yield is the only justification for the high cluster density. Indeed, the

distributional pattern does not reflect any alignment with infrastructure or the distance from a city. Therefore one can postulate a similar pattern also on the southern side of the volcano, especially considering that facing south it could have been even more productive. Nevertheless, one still needs to calculate how much of this area was devoted to vineyards and how much wine the grapes produced.

To calculate the amount of wine produced, scholars have used a villa-centred approach. Indeed, from the number of dolia of a wine cellar one can estimate the amount of wine produced and ultimately the size of the vineyard. Still, this method ignores the other cultivations or relies on the ancient sources to calculate the extent of the entire estate. For example, through the Villa della Pisanella, Day[360] hypothesises that 1/3 of the estates were used for other cultivations.[361] This hypothesis stems from Columella,[362] but it has not been tested.

	Estate size	Productivity	Wine produced
Columella (RR III, 7-11)	100 iugera (252,000 m^2)	3 cullei/iugerum	
Pliny (NH XIV,4,52)		7 cullei/iugerum	
Cato (Origines fr. 2 Jordan = Varro, RR I,2,7)		10 cullei/iugerum	
Varro (RR I,2,7)		15 cullei/iugerum	
Day 1932 = Etienne 1982 (Pisanella)	90/100 iugera (66 vy) (252,000 m^2)	3 cullei/iugerum	938 hectolitres
Jashemski 1968 (Foro Boario Pompei)		10 cullei/iugerum	
Jongman 1988		1 culleus/iugerum	
De Caro 1994 (Villa Regina)	10 (2/7 vy) (25,200 m^2)	2-15 cullei/iugerum	100 hectolitres

Table 1 - Average productivity and estate size according to the literary sources and contemporary scholars.

To estimate the amount of wine produced, I calculate the cullei/iugerum production ratio first, then I use eight wine cellars as a sample to reckon the size of the vineyards and the range of production. Finally, I place the villas on the archaeological map to calculate the estate size, and thus the percentage of land covered by vineyards.

There is no agreement among scholars about the productivity of 1 iugerum of

[360] Day 1932.

[361] Day 1932: 183-4.

[362] Columella 4.30.

vineyard. Ancient sources clearly state that it depends on the fertility of the land where the vineyard lies; therefore it fluctuates from 3 to 15 cullei/iugerum. Usually scholars use the low figure of Columella: 3 c./i.; Jongman hypothesises 1 c./i., but he does not mention any evidence in support. Through the archaeological evidence (plant roots) in the so-called Foro Boario in Pompeii, Jashemski[363] calculates around 10 c./i., which according to her corresponds to the present average productivity of the area. I collected some information from a wine producer,[364] whose estates lie on the north slope of the volcano and in the plain. This small enquiry produced the following results:

- Vineyards in the plain produce more grapes than those on the slopes. Indeed volcanic soils on the slopes are poorer in potassium, because weathering decreases its absorption, while in the plain volcanic soils keep both nutrients and moderately moist ground. On the slopes the lack of potassium is compensated by the cultivation of tic bean near the vines, nevertheless the yield is 40% less than on the plain.

- Vineyards on the slopes produce better quality wine than those on the plain. The greater temperature range on the slopes favours the generation of tannins, which improve the quality of wine. The difference in quality between the two areas probably explains why ancient authors define Campanian wines both as good and bad, according to the specific variety. Moreover, this contradicts Tchernia's assumption that all Vesuvian wines were of poor quality.[365]

- Productivity is inversely proportional to quality. Very good quality grapes produce less wine than bad ones. In the environs of Vesuvius, yield ranges between 60% and 75%, usually is around 70%.

- Figures for modern wine production on the slopes roughly correspond to

[363] Jashemski 1973.

[364] Domenico Ceriello, head of the Olivella wine company.

[365] Tchernia 1986: 176-7, based on Plin. *N.H.* 14.70.

> Columella's ratio of 3 cullei per iugerum. The Olivella wine company's estate on the north slope of Vesuvius lies at 200 m a.s.l. and is 4,000 m^2 in area. In 2007 – a quite good year – the estate produced 35 quintals of grapes, which were converted with a yield of 65% to 2,275 litres of wine, corresponding to 2.67 cullei per iugerum.[366]

For the quantification of a villa's wine production, I multiplied the average capacity of a dolium (1.5 cullei = ca. 786 litres)[367] by the number of dolia of a wine cellar. To reckon the size of the vineyard I divided the number of cullei by three, according to the 3 c./i. ratio. The calculations do not take into account some variables: the actual capacity of each dolium, the content of each dolium (they could also contain oil or be empty), and the use of some dolia for ageing the wine. I assume that the vineyard is used to the maximum, and similarly the wine cellar.

Until recently, the Villa della Pisanella was considered the medium-sized Pompeian villa par excellence.[368] Its estate was calculated around 100 iugera, 66 of which were vineyards. In the early 1990s the discovery and full excavation of the Villa Regina – the smallest Pompeian villa – led to some rethinking. A thorough survey of the published villa maps demonstrates that Villa della Pisanella and Villa Regina should be rather placed at the extremes, as the scheme below shows. Moreover, the vineyard calculations of Day for Villa della Pisanella proved to be wrong (45 instead of 66 iugera), and similarly De Caro's for Villa Regina (9 instead of 6,6). The average Vesuvian vineyard was probably between 14 and 22 iugera.

---

[366] Purcell (1985: 13) uses 2 c./i. as general figure for antiquity (although this ratio is taken from the yield of the Champagne), but he seems to embrace Jashemski's figure of 10 c./i. for the Pompeian area. In my opinion the latter figure is incorrect because it is the result of the calculation of how many clusters of grapes a vine can produce, but no wine producer allows the growing and harvest of all clusters, since this practice would produce very weak wine and would impoverish the plant.

[367] Jashemski (1968) calculates an even bigger average capacity of a dolium (1040 litres), based on the dolia found in the so called Forum Boarium at Pompeii.

[368] De Caro 1994.

Code	Conventional Name	N. dolia	Size cellar	Size villa	Size max production	Size max vineyard
BRE038	Pisanella	84	195 m^2	1200 m^2	126 c. = 66,024 l.	42 i. = 10.62 ha
BRE039	Popidius Florus	80	73.4 m^2	784 m^2	120 c. = 62,880 l.	40 i. = 10.11 ha
BRE044	Villa Regina	18	45 m^2	453.5 m^2	27 c.= 14,148 l.	9 i. = 2.27 ha
POM008	Tirone 1	28	86.5 m^2	570 m^2 ca.	42 c. = 22,008 l.	14 i. = 3.54 ha
SCA002	Matrone Spinelli	20	85 m^2 ca.	938 m^2 ca.	30 c. = 15,720 l.	10 i. = 2.53 ha
TER007	Cava Ranieri Villa 2	36	83 m^2	1147 m^2	54 c. = 28,296 l.	18 i. = 4.55 ha
TER011	Cava Ranieri Villa 6	45	74 m^2	650 m^2 (part.)	67.5 c. = 35,370 l.	22.5 i. = 5.69 ha
TER014	Cava Ranieri Villa 1	49	129 m^2	454 m^2 (part.)	73.5 c. = 38,514 l.	24.5 i. = 6.20 ha

Table 2 - Quantification of the maximum production of wine and size of the vineyards.

To calculate the size of the entire estate – and therefore the percentage of it covered by vineyards – one must place the villas in context. Despite the lack of systematic field survey, some areas of the archaeological map show a very dense pattern, from which it is difficult to imagine that something is missing. Three villas have been selected: Villa della Pisanella, the villa of N. Popidius Florus, and the Villa 2 in the Cava Ranieri at Terzigno. A polygon has been created around each villa (Fig. 86). The polygons roughly follow Thiessen's principles, but in order to calculate the maximum extent possible, I assume that the neighbouring villas have a smaller size. For some of the neighbouring sites we do not have enough information, we have just remains of walls, which could be interpreted either as farmhouses, or residential villas, or even cisterns belonging to our villa. In these cases I have created two polygons, one excluding, the other including the neighbouring site, producing the following figures.

Code	Conventional Name	Size max vineyard	Size property	Perc. Vineyard
BRE038	Pisanella	42 i. = 10.62 ha	33/58.5 i. = 8.3/14.8 ha	72%
BRE039	Popidius Florus	40 i. = 10.11 ha	22/43 i. = 5.6/10.9 ha	93%
TER007	Cava Ranieri Villa 2	18 i. = 4.55 ha	24 i. = 6 ha	76%

Table 3 - Calculation of the estate size property and maximum extent of vineyards.

According to these calculations, the vineyards would have covered between 76% and 93% of the entire estate. Taking into account the variables previously ignored and other possible limits, like geomorphology, access paths, and the size of the villas themselves, it is safe to lower the percentage to 66%.

The small size of Pompeian villas is commonly used as argument to support the theory of a low wine production in ancient southern Campania.[369] Vesuvian estates are indeed very small; the largest villa (Villa della Pisanella) cannot have a property larger than 60 iugera, which is one third less than Columella's standard for a minimal estate (100 iugera). Nevertheless, the small-scale production of the individual estate does not correspond necessarily to the scale of the area as a whole. The data provided so far show a very tight settlement pattern, which covers the entire surface available between 100 and 400 m a.s.l. Considering that 1 iugerum is equal to 2,529 m^2 and that the surface available between 100 and 400 m a.s.l. around Vesuvius – according to my reconstruction of the volcano before AD 79 – is 58.8 km^2, the total available land is 23,250 iugera. Two thirds of it – 15,500 iugera / 4,030 ha – were probably devoted to wine production.

According to Columella's ratio, the total production around Vesuvius would have been 46,500 cullei (36,502,500 litres), half of which – 23,250 cullei – on the north slope. 15,500 iugera of vineyard would require an adequate wood supply for the props. According to Columella's figure,[370] one can hypothesise 775 iugera (roughly 200 hectares) of chestnut wood for vine-props, just for the vineyards between 100 and 400 m a.s.l. This piece of information is of particular interest if one considers that on Somma-Vesuvius the surface available for chestnuts (i.e. between 400 and 600 m a.s.l.) was roughly 400 hectares and that more wine was produced on the plain as well.

Moreover, using Columella's (3.3.10) figure of 2100 sesterces for 7 cullei of bad wine (300 HS/c.), one can have a rough figure of the monetary value of the wine production: 13,950,000 sesterces annually for the wine produced between 100 and 400 m. This

[369] Rightly against this perspective is Purcell (1985: 7-8).

[370] Colum. 3.5.3-4: 1 iugerum of chestnut has 3,200 trees, which are enough to cover 20 iugera of vineyard.

amount should be considered the low-end of the estimate, because most likely the vineyards on the slopes of the volcano produced a reasonably good quality of wine. To get a sense of the difference in price between a good and a bad wine, we can refer to two inscriptions from the environs of Vesuvius, where prices are provided using the sextarius (0.546 litres, 1/960 of a culleus) as measuring unit. The first, from Pompeii (CIL 4.1679), provides three prices - 1, 2, and 4 asses; while the second, from a fresco in Herculaneum, shows four jars with their prices - 2, 3, 4, and 4 1/2 asses.[371] By converting these numbers to a HS/c., we would have a range from 240 to 1440 HS/c.; these are retail prices for the local population,[372] thus I guess Columella's statement is not too far off the wholesale price for a bad wine, and we could estimate a good one to be sold for 2-4 times that price.

There is no evidence of wine production above 400 m a.s.l. Between 50 and 100 m, the pattern is equally dense north of Pompeii, but the situation is unclear for the other sectors of the volcano at the same altitude. Indeed, the proximity of Pompeii probably stimulated production nearby, but since the information available for the other sectors of the volcano is patchier, a similar pattern cannot be inferred with certainty. In at least three cases outside the Pompeian area (cat. OTT003, SGE006, TER015), ploughing furrows have been discovered near villas, hence a more varied production was probably in place. On the other hand though, there is clear evidence of wine being produced also at the lowest altitude in the plain, both near Pompeii (cat. POM032, currently 5 m. a.s.l.) and Neapolis (cat. NAP018, 15 m. a.s.l.), in close proximity to the marshes. One could reasonably suggest that ¼ or even ⅓ of the plains around Vesuvius were devoted to wine production. In these cases one would expect a higher yield of grapes, together with a much lower quality of the wine. Following this reasoning, it is possible to make some speculative calculations on how much wine was produced in the Vesuvian plains as well. Using conservative figures on the size of the territories of Neapolis (4,800 ha), Nola

[371] Duncan-Jones 1974: 46.

[372] An inscription in Pompeii (Etienne 1973: 231-3) suggests that 2 asses was the average price for a cheap wine, not 1 as.

(18,000 ha), and Pompeii (10,600 ha) below 100 m a.s.l. (Fig. 87) as well as the conservative ratio of 3 cullei/iugerum and the total extent of vineyards on the plain to ¼ of the entire area, the total amount of wine produced would have been of 100,200 cullei. By adding this amount to the wine produced between 100 and 400 m a.s.l. (46,500 cullei), one reaches the astonishing figure of 146,700 cullei (115,159,500 litres per year, roughly 3,800,000 Dressel 2-4 amphorae). In order to provide an insight into how wide of a population would have benefited from the Vesuvian wine, one can use Cato's (*Agr.* 57) estimate of 250 litres per person per year (as still in use in 18th c. Rome), or a lower figure of 100-120 litres as in 16th c. Valladolid or 18th c. Paris.[373] For the sake of simplicity, I use here Cato's figure, which in this perspective is also the most conservative one and it suffices for 146,010 people if one takes into account only the wine produced between 100 and 400 m a.s.l., or 460,638 people if one includes also the wine produced in the plain, while a figure for wine consumption as low as 100 litres per person per year would be enough for more than one million people (*sic!*). Even the most conservative option is striking for the scale of surplus produced, indeed according to my estimates[374] the population of the three cities and their countryside might have been around 107,000 people, including slaves[375] and children.

6.2.2. Olive oil

Olive oil production is attested by a relatively small but constant number of mills in almost all the farms, and by a very small number of charcoal remains. So probably olive oil was widely produced but in rather small quantities in each unit (mainly for

---

[373] These figures have been taken from Purcell 1985: 13, 15 n.17. Although rather high for the contemporary western culture, Cato's figure fits with the information I gathered from the amateur historians and the old farmers in the environs of Vesuvius. According to them, still three generations ago farmers used to drink one mug of wine per day, it being as big as the German ones used for beer (1 litre). The explanation which has been given to me for such a high consumption of wine was that wine was appreciated mostly for its calorific value, thus this practice was particularly in use among farmers after a long day of work in the field.

[374] The complete discussion on this subject is in the next chapter.

[375] According to Cato (*Agr.* 57) slaves had to drink *lora* (i.e. marc soaked in water), then a mixture (*vina operaria*) in which the quantity of wine varies between 0.25 and 0.5 litres.

consumption in the villa and partially to supply the city needs?). Stefani[376] reports a relatively small number of farms in which the main production was oil,[377] namely three in the Ager Stabianus and four in the Ager Pompeianus; not all these villas can be checked, mostly because site plans are lacking. In the best-documented case (apart from Villa della Pisanella), at the site called "Casa dei Miri", it rather seems the transformation of wine presses into oil presses (which would fit with the model described in the next pages). No evidence of specific oil farms comes from our study area before the Pompeian eruption.

6.2.3. Cereals, legumes, and vegetables

Apparently, in the general picture of the cash crops grain is missing. This lack of evidence can be explained. The lack of records in the pollen analysis is probably due to the fact that both the AD 79 and 472 eruptions happened during the winter, therefore there is no trace of grain in the contexts of the very last phase of the buildings.[378] Furthermore, the surface survey distorts the interpretation of the archaeological record, since grain mills are usually more rare and difficult to find than dolia fragments. Additionally grain mills testify only to bread making, not to grain production. Nevertheless, the hypothesis of grain production in the plain is supported by the discovery of ploughing traces (Fig. 88) dated to the 1st century AD in several areas and indirectly by the sources which testify to the intensive exploitation of the land around Nola,[379] and a passage in Siculus Flaccus which implies at least two centuriation

---

[376] Stefani 2002: 26.

[377] Following Brun 1993 I think that the most noticeable clues to distinguish an olive press from a wine press, is the presence of decanting vats and *trapeta* near the presses. *Cellae oleariae* (Cato 13.2, Varro *R.r.* 1.13.7, Vitruv. 6.8) have not been found yet in southern Campania (Brun 1986: 135-6) and there was no need of *dolia defossa* for the oil which, differently from the must, does not need fermentation.

[378] There exists only one exception, a recently discovered (and unfortunately unpublished) grain basket at the Villa of the Papyri in Herculaneum. In that case though, the small quantity of grain discovered, the proximity to the sea, the lack of "industrial quarters" in the villa, and the small area available for cultivation nearby suggest that the grain was imported (from Egypt via Puteoli?), rather than locally produced.

[379] Livy (23.44.7), reporting the siege by Hannibal, tells us that all fields around the city are cultivated: "Mille fere passuum [ca. 1.5 km] inter urbem erant castraque; eo spatio – et sunt omnia campi circa Nolam – concurrerunt".

phases.[380] The meaning of what is observed in the field is actually rather difficult to assess; the dataset pertaining to pre-79 cultivated soils is rather scant and consists of 8 instances,[381] of which 4 are in the territory of Neapolis,[382] 2 in the territory of Nola,[383] 2 in the territory of Pompeii.[384] In all instances but one[385] some ploughing furrows have been excavated, but it is impossible to assess whether they refer to cereals or vegetables. Although clues are missing on what proportion of the land was used for grain production, one can nevertheless calculate the carrying capacity of the arable plain. Indeed the traces of the centuriation grids for Neapolis, Nola, and Pompeii provide reliable figures on their dimensions (respectively 4800, 18,000, and 10,600 ha); by hypothesising an annual production of 632 kg/ha and a consumption of 160 kg per person[386] I list four possible scenarios.

annual production (kg/people fed)	1/4 of the plain	1/2 of the plain	3/4 of the plain	4/4 of the plain
Neapolis	758,400 kg 4,740 p.	1,516,800 kg 9,480 p.	2,275,200 kg 14,220 p.	3,033,600 kg 18,960 p.
Nola	2,844,000 kg 17,775 p.	5,688,000 kg 35,550 p.	8,532,000 kg 53,325 p.	11,376,000 kg 71,100 p.
Pompei	1,674,800 kg 10,467 p.	3,349,600 kg 20,935 p.	5,024,400 kg 31,402 p.	6,699,200 kg 41,870 p.

Table 4 - Estimate of the annual production of grain and the people potentially fed with it.

Estimates on the number of people inhabiting these cities and their countryside will be discussed in the next chapter (§7.5.1), here it is worth noting that for the scenarios of a very densely populated countryside Neapolis would have not had enough plain to support the grain, Nola would have needed more than half of its plain, Pompeii almost

[380] Siculus Flaccus *Grom.* 16.2,3.

[381] One further site (cat. BTC011) in known only from references, it is Roman but it is unclear whether it is dated to the 1st c. AD or later.

[382] Cat. AFR004, CAS006, NAP010, NAP014.

[383] Cat. OTT003, SGE005.

[384] Cat. TER008, TER015.

[385] Cat. NAP010, where tree holes have been uncovered.

[386] Purcell 1990: 115. I do not have enough evidence to produce what in my opinion are reliable figures.

the entire plain. Especially for Neapolis and Pompeii the picture might be even more dramatic if one raises the annual consumption of grain to 200/220 kg for the entire population or part of it.[387] Lo Cascio's figures[388] are even more striking, since he hypotheses that the average annual consumption of grain was between 200 and 240 kg per person, and that the average annual grain yield was 4.5 quintals per hectare, which produced 3.3 quintals per capita per year; by subtracting the seeds and the three-field rotation, he reaches the conclusion that each person needed 1 hectare to survive, in which case Neapolis' plain would have fed between 1/4 and 1/2 of its urban population (if the entire plain were devoted to grain cultivation), Pompeii would have barely managed to feed the entire urban population, Nola would have managed to feed its citizens and would have had enough for 7,000 more.

Grain, oil, and wine were not the only competitors for the exploitation of the plain, since other cereals, legumes, vegetables, orchards, and woodland might have covered part of it as well. The admirable work by Marina Ciaraldi on three contexts - the content of one dolium in Villa Vesuvio in Scafati,[389] the fodder assemblage from the House of the Chaste Lovers in Pompeii,[390] and the plant assemblages from two other Pompeian houses[391] - informs more on the specific contexts than on the local cultivations. A wider (although difficult) dataset comes from the collection of all vegetal remains uncovered in

[387] Whittaker 1988; Purcell 1990.

[388] Lo Cascio 2005: 20-22.

[389] Ciaraldi 2007: 69-74. The content of the dolium is interpreted as preparation of a medicine; it contained a 30 cm thick layer of peach stones (70%) and walnuts (30%), while the waterlogged plant remains included a huge variety of plants, all in very small quantity (<10), apart from 6 species: myrtle (*Myrtus communis* L., 667 fr.), grape (*Vitis vinifera* L., 280 fr.), silver fir (*Abies alba* Mill., 250 fr.), strawberry (*Arbuteus* cf. *unedo*, 203 fr.), fig (*Ficus carica* L., 127 fr.), beech (*Fagus sylvatica* L., >100). These species are consistent with the general picture of the landscape provided in the next pages.

[390] Ciaraldi 2007: 77-78. Contents above 100 fr.: common cleaver (*Galium aparine* L., 580 fr.), perennial rye grass (*Lolium perenne* L., 248 fr.), horsebean (*Vicia faba* var. *minuta* Alef, 215 fr.), smooth meadow grass (*Poa pratensis* L., 214 fr.), black bindweed (*Fallopia convolvulus* L., 126 fr.). These species and the others identified in this context imply cultivation of grains, as well as the presence of uncultivated land; the presence of horsebean is a rich nutrient for animals and humans as well as a vital nitrogen-fixer for other cultivations, grapes in particular.

[391] The number of fragments for the 1st c. AD is too scant to draw any reliable conclusion.

the Vesuvian cities in the last 3 centuries;[392] this evidence (Tab. 5) is not the result of a systematic collection and in most of the instances the metadata are lacking. Nevertheless, the list of occurrences provides interesting insights at the day of the eruption.

All main cereals are present and, if the number of instances is somehow meaningful in this context, it is not surprising to find wheat and barley equally common and the proso millet widely spread,[393] while the foxtail millet (which takes longer to grow) is less present. Olives and grapes are equally present with the same occurrences, nuts are very commonly consumed, fruits - figs apart - are strangely rather rare.[394] Some vegetable species (e.g.: stone pine, cypress, spanish broom) hint at their endemic presence around Vesuvius, others (e.g.: pomegranate and walnut, generally ripened in October) further confirm the hypothesis of an autumnal date of the eruption. The most interesting piece of information comes from the broad bean; it was a common food among the Romans, but its ubiquity in Pompeii seems to reflect its specialised cultivation well beyond its seasonal availability (it is harvested in June) for the local market. The preference for this legume (and similarly for the lentils) is probably due to its important function as nitrogen fixer for the soil. Still today its cultivation is vital to enrich the volcanic soil in the vineyards and similarly it might have been used in antiquity.

[392] I have elaborated the data provided in Borgongino 2006 and reckoned the instances, not the individuals.

[393] Pliny the Elder (18.100) mentions the very high quality of proso millet from Campania.

[394] Dates are generally considered imported goods, but they might as well be produced in Italy (Varro 1.67).

Species (Eng)	Species (Lat)	Pompeii	Herculaneum	Oplontis	Stabiae	Unknown	Total instances
Broad bean	*Vicia faba* L.	47	22			17	86
Fig	*Ficus carica* L.	16	4			13	33
Wheat	*Triticum* sp.	15	12			4	31
Walnut	*Juglans regia* L.	7	9	3		3	22
Barley	*Hordeum vulgare* L.	5	11			5	21
Lentil	*Lens culinaris* Medikus	5	7			8	20
Onion	*Allium cepa* L.	6	7			6	19
Stone pine	*Pinus pinea* L.	8	10			1	19
Olive	*Olea europaea* L.	11	3			3	17
Grape	*Vitis vinifera* L.	14	2	1			17
Proso millet	*Panicum miliaceum* L.	6	2			4	12
Date	*Phoenix dactylifera* L.	4	5			2	11
Hazelnut	*Corylus avellana* L.	7		2		2	11
Almond	*Amygdalus communis* L.	2	2			5	9
Hemp	*Cannabis sativa* L.	5	1			1	7
Cypress	*Cupressus sempervirens* L.	7					7
Plum	*Prunus domestica* subsp. *domestica* L.	3	2			2	7
Garlic	*Allium sativum* L.	1	4			2	6
Chestnut	*Castanea sativa* Mill.	3	1	1		1	6
Hay		5		1			6
Pomegranate	*Punica granatum* L.		5	1			6
Peach	*Prunus persica* L.	6					6
Bran		5					5
Oak	*Quercus* L.	1	1			3	5
Pear	*Pyrus communis* L.	1	4				5
Durum	*Triticum turgidum* subsp. *durum* L.	1	2			1	4
Common wheat	*Triticum aestivum*	1				3	4
Flax	*Linum* sp.	3		1			4
Foxtail millet	*Setaria italica* L.	4					4
Opium poppy	*Papaver somniferum* L.		1	3			4
Pea	*Pisum sativum* L.	2	1			1	4
Laurel	*Laurus nobilis* L.	3					3
Carob	*Ceratonia siliqua* L.		3				3
Emmer	*Triticum turgidum* subsp. *dicoccon* Schrank		3				3
Fenugreek	*Trigonella foenum-graecum* L.		1			2	3
Black mustard	*Brassica nigra* L.	1	1			1	3
Oat	*Avena sativa* L.	1		1			2
Cotton	*Gossypium* sp.	2					2
Spanish broom	*Spartium junceum* L.	2					2
Apple	*Malus pumila* L.			1		1	2
Oleander	*Nerium oleander* L.			1	1		2
Radish	*Raphanus raphanistrum* L.	1		1			2
Service	*Sorbus domestica* L.	1	1				2
Chickpea	*Cicer arietinum* L.		1				1
Coriander	*Coriandrum sativum* L.		1				1
Cowpea	*Vigna unguiculata* L.	1					1
Lettuce	*Lactuca sativa* L.	1					1
Holm oak	*Quercus ilex* L.	1					1
Myrtle	*Myrtus communis* L.	1					1
Oriental plane	*Platanus orientalis* L.				1		1

Table 5 - List of all vegetal remains found in the Vesuvian cities (data gathered from Borgongino 2006).

6.2.4. Woodland

Pollens have been sampled from 11 stratigraphic units in the ancient harbour of Neapolis; in my opinion the dataset is too scant to be fully reliable and it provides a partial picture of the landscape.[395] Nevertheless, it is interesting to note that almost 50% of all pollen, in all contexts examined, is from oaks, while the rest, not always present in each context, similarly pertains to the deciduous forest; in particular, the species around

[395] Allevato 2010. In general pollens spread up to 10 km, although those of some species spread much more locally.

10% each are holm oak, hornbeam, hazelnut tree, walnut tree, stone pine, less common (2-5% when present) are olive tree, chestnut tree, beech, and silver fir. More interesting is the dataset provided in the magisterial work by Veal[396] on the fuel remains from 4 sites in Pompeii. The results she produced show the predominance of beech (*Fagus sylvatica*, avg. 61.1%) and quite a small percentage of all other species (hornbeam 11.2%, *Quercus* evergreen 5.9%, the others are under 3% each). This implies an economic model of specialised cultivations/exploitation which is coherent with what hypothesised for the Vesuvian vineyards. Furthermore, Veal focuses on the carrying capacity of Vesuvius for this specialised cultivation, since beech best grows above 1000 m a.s.l. For the sake of simplicity, I have reworked the figures she produced, correcting the estimates on the people living in Pompeii and its countryside (14,900-35,800, see next chapter for the details), on the land available on Vesuvius above 1000 m (100 ha ca.), and adopting the scenario in which the smallest portion of woodland is used.[397] Considering that the average annual need for fuel in pre-industrial cultures is 2 tons per person, that 1 hectare of woodland produces 5 tons of fuel, and that in Pompeii 50% of the fuel consists of beech, then at least 1500-7000 ha of beech woodland might have been necessary for the needs of Pompeii and its countryside, over an available land of just 100 ha. If this reasoning is correct, it must imply that Pompeii acquired a considerable portion of the fuel from other territories.

Following this reasoning, I have looked for similar data from the other Vesuvian cities, where unfortunately the evidence is much patchier. In Herculaneum, the extant evidence from the furniture and the construction beams shows the prevalent use of silver fir (*Abies alba*) and cypress (*Cupressus sempervirens*) over the other tree species.[398] Similarly in

---

[396] Veal 2012.

[397] I.e. the one in which the fuel is composed 100% by wood. In reality, in rather 'efficient' economies (like 1st c. AD Italy) the percentage of charcoal over uncharred wood might have been at least 50%, but according to this latter scenario even more land would have been necessary.

[398] For the furniture, over 50 items 39 are of silver fir, 5 of other species, 6 are unidentifiable (Mols 2002: 230). The published information on the wooden beams from that city do not provide any quantitative data, but according to the authors (Moser 2011) these mostly are in silver fir and cypress, with a small percentage of beams in chestnut (*Castanea sativa*) and walnut (*Juglans regia*).

Oplontis, among 51 beams, 20 have been identified as silver fir, 19 as cypress.[399] While cypress was widely cultivated in the plain, the use of silver fir (which best grows above 900 m a.s.l.) poses problems similar to those mentioned for the beech; furthermore, the evidence from these settlements shows the preference for specific tree species for timber similar to that noticed in Pompeii for the fuel. The difference between the use of silver fir and beech is probably tied to their use rather than the places where they have been found. Indeed the recent analyses of the charcoal remains from the AD 79 contexts from the Via Consolare Project in Pompeii show a predominant use of silver fir as timber and of beech as fuel.[400]

Overall, the data presented so far create a pretty clear picture of woodland in the environs of Vesuvius. The countryside was interspersed with a mixed forest typical of the mild temperature, with oaks, hornbeams, walnut trees and, among the fruit trees, fig trees seem to have been the most commonly spread. Hazelnut trees were widely cultivated in the proximal slopes of the Apennines, in Abella, but the pollen record lets us infer also a certain diffusion also near Nola.[401] For the 1st century AD at least, chestnut trees do not seem to be too widely cultivated, though the ancient sources show that that tree was cultivated in a specialised way in the territory of Neapolis. On the other hand, the cypress is well attested in the archaeological record. At the beginning of the 20th century about 100 Roman cypresses were found along the river Sarnus.[402] They were ca. 40 years old when the AD 79 eruption covered them. The trees were arranged in rows NE to SW in quincunx formation at a distance of roughly 3 m (10 Roman feet) apart. Their formation gives support to the hypothesis that they were intensively cultivated. In 1990, near the previous location in the area called San Abbondio, more cypress trunks were found. Cypress wood is very resistant and suggested by Vitruvius[403] for use as timber

[399] Moser 2013. Please note that the cypress is used only for the small vertical beams.

[400] Vairo 2012.

[401] Allevato *et al.* 2010.

[402] Jashemski 2002: 105.

[403] Vitruv. 2.10.

with oak, elm, poplar, and fir. Ancient authors suggest its use for vine props, and probably this would justify its intensive production.[404] Matching the archaeological record with the Latin passages, I hypothesise that it was cultivated along the rivers – Clanius and Sebethus – and in the marshy/muddy areas near them.

Silver fir and beech were probably cultivated on the higher slopes of Vesuvius as well, but it seems unlikely that that surface was sufficient to cover the needs of the towns and settlements around the volcano. Furthermore, fir was particularly suitable for ship construction,[405] and the constant need for it for the Roman navy in Puteoli might have encouraged the regional production in huge quantities. Suppliers would have not travelled much, since the Lattari Mountains above Stabiae are high enough and more land was available (and better suited) beyond Nola, in Hirpinia; thus the most interesting point is not the distance covered and the price paid, but rather the very specialised supply model that this constant provision required and the scale of the economic network, which goes beyond the idea of a countryside bound to its city as in an autonomous economic cell and it stretches beyond the boundaries of the region, in an economic model of interdependency between the settlements in the plain and those in the mountains.

6.3. Animal husbandry, the 600 Senecan sheep, and the piglets of Paulinus

The general understanding of animal husbandry in the environs of Vesuvius still relies on Moeller's study on Pompeian wool production[406] and Jongman's counter-arguments.[407] Moeller's theory implies a producer-city model, prompting Jongman's book in defence of Finley's consumer-city model. To prove his point, Jongman calculates the population of Pompeii, assumes that it required a proportional amount of grain locally available, and therefore deduces that most of the plain was devoted to crop

[404] Colum. *RR* 4.26.1; Plin. *NH* 17.174.

[405] Allevato 2010.

[406] Moeller 1976.

[407] Jongman 1988.

cultivation.[408]

Both theories are problematic in consideration of the observations put forward so far, according to which vineyards were predominant in the Pompeian plain – at least for the better-studied portions of it. Yet the problem of size, aim (i.e. either for consumption within the villa or for trade with the city and other areas), and especially location of animal husbandry in the environs of Vesuvius still stands. It is unclear which portion and what percentage of the territory was devoted to animal rearing and if it was enough for local consumption and export. To address these questions, I use the faunal remains from Pompeii, contextualise them, and compare with better-studied cases. I will not take into account scarcely attested species and I leave aside the pictorial evidence, since it testifies only to which species Romans were accustomed to.[409]

The faunal remains belong to both grazed and hunted species. Remains of hunted species are very scant and consist of antlers and frontal bones of stags and roe deer, red deer, and boar tusks.[410]

Domesticated animals were grazed mostly in the countryside. Indeed no stables or other structures of similar purpose have been yet identified within the city of Pompeii.[411] Many remains and entire skeletons of chickens have been found in several Pompeian gardens and not merely associated with rituals. Likewise a chicken feeder and a bowl with eggs testify to the diffusion of chicken rearing.[412] Although from the lengthy descriptions in ancient sources, and particularly in Palladius,[413] one can presume that birds played an important role in the Roman diet, nevertheless the archaeological

---

[408] This autarchic model has been amply criticised (e.g.: Banaji 1989; Purcell 1990; Scheidel 1992; Senatore 1998).

[409] For an in-depth methodological discussion about use of sources, see King 2002: 401-5.

[410] Stefani 2002: 33; King 2002: 416-8, 444.

[411] Some rooms are often used as stalls for the animals used in the cities, like oxen and horses/mules for carts and mills. The skeleton of a horse/mule has been found still in the stall (I, 8, 12, see King 2002: 422).

[412] Respectively Inv. 41512 and Inv. 18090 A-B. Their specific provenance is unknown.

[413] 1.24-30, where he describes the rearing of doves, turtledoves, thrushes, turkeys, pheasants, geese, and how to build and set a dovecote.

evidence is still too scant to draw reliable figures.[414]

Other small animals could have been reared in the city too. Rabbit remains have been found in Pompeian gardens inside and outside the city-walls.[415] Dormice were fattened in terracotta jars (generally known with the incorrect term "*gliraria*"), even though the only example found comes probably from a countryside farmhouse.[416] Considering the absence of stables and the small dimension of urban green areas, it is hardly possible that other species were grazed in the city, even if a graffito from Pompeii attests to the presence of at least one errant lamb.[417] Nonetheless, sheep/goat by-products were easily available in the Vesuvian cities. Ricottas are painted in many houses in Pompeii and Herculaneum, carbonised fresh-cheese baskets have been found in Pompeii,[418] and two pieces of cheese (*caciotte*) were found in the House of the Skeleton in Herculaneum.[419]

The evidence for animal rearing in the countryside is more substantial. Many carbonised piglets have been found in the Pompeian countryside,[420] similarly sheep/lambs with bronze bells around the neck.[421]

Theoretically it could be possible to calculate the size and economic importance of animal husbandry in the Vesuvian villas through the size of stables, pens, and rooms used to work on fleece and milk, but obviously this calculation faces several difficulties.

Indeed there are only two clear instances of stables; the first is in the Villa della

---

[414] The study of birds is still marginal in archaeozoology and therefore only in few excavations specific sampling strategies are set.

[415] VII 12, 13; in an unspecified Pompeian vineyard; in the villa of M. Livius Marcellus; in the Forum.

[416] Inv. 41515 from unknown location.

[417] A certain Duax asks people in Pompeii if they have seen his lost lamb named Donata (CIL IV, 8983). Until fifty years ago, peasants used to pass through the Vesuvian towns with the flocks to sell fresh milk daily.

[418] Stefani 2002: 33.

[419] Inv. 75311.

[420] The most famous is the one from Villa Regina (Inv. 41530, found in the room XVI).

[421] Stefani 2005: 69 with the following references: PAH I.1: 274; Ruggiero 1881: 304; NSc 1921: 439; NSc 1928: 438.

Pisanella (cat. BRE038), the second is in a farmhouse in Gragnano.[422] The stable in Villa della Pisanella is identified by the presence of some animal skeletons.[423] The room lay in the north corner of the building; it has been explored only partially on two occasions and was probably 3x3 m. A door at the south-eastern corner connected this room to the log store, where many other animal bones (horses, pigs, dogs, and chickens) were found.[424] Considering the disproportion between the number of animals found and the small dimensions of the room, I argue that probably an additional covered area (in wood?) was set outside, taking advantage of one of the outer brick walls of the villa.

In the Gragnano villa the stable (Fig. 89, rooms 1 and 2) is identified by the presence of many horse and ox bones. The room was open to the central peristyle and was roughly 6x13 m wide. Considering the dimensions of the two rooms and the number of large animals found in them, it is hardly possible that those areas were used for many medium- and small-sized animals. This hypothesis is confirmed by the absence of sheep/goat bones in those rooms.

Theoretically it is possible that these animals were kept in open-air courtyards used as pens, but a closer analysis of the best-attested occurrences makes it improbable. The few well-explored villas have a courtyard in one corner of the main building, but this was mainly used as a threshing-floor. For example, in the Villa della Pisanella (cat. BRE038) the courtyard covered 137 m^2; it was paved with cocciopesto and had no manger. The only room which provided access to the courtyard was quite small and used as a storage area for agricultural tools. Similarly in Villa Regina (cat. BRE044), the courtyard was 42.5 m^2, paved with cocciopesto, with no manger. The courtyard was connected to a room clearly identified with a granary.[425]

It is possible that in some cases stables and pens were located in other areas of the

[422] Della Corte 1923.

[423] Two horses, two dogs, one pig, and one chicken; rooms I and J, see next chapter for a full description of the remains in the villa and its thematic maps.

[424] Pasqui 1897: 444-446.

[425] De Caro 1994: 56-63.

estate, far from the main building (even though the need for protection of the cattle makes this improbable);[426] but even if it is plausible that folds were mostly built with perishable materials, it is nevertheless striking that no traces of them have been found so far.

A third and more indirect way to prove intensive (i.e.: market-oriented) animal rearing would be through the presence of rooms specifically used for fleece and milk processing. According to Day, the villa in Gragnano could be a cow cheese factory.[427] Nevertheless, the evidence supporting this theory consists only of one large bronze cauldron (1.06x0.32 m) on a stove (Fig. 89, area C, letter *d*).[428] Considering that eleven small *cubicula* surrounded this room, I would rather suggest that this is a small kitchen with slave quarters. Indeed, another room nearby (Fig. 89, area D) has a similar setting and has been identified with *ergastula* by the presence of shackles for humans. The cattle were probably used for work in the field (grain?). The presence of cattle in this specific part of the region well agrees with Galen's reference to cattle herds on the *Lactarii Montes* in the territory of Stabiae.[429]

Despite the impossibility of providing figures for animal rearing through the architectural remains, some help comes from the many animal bones found in the countryside. Pig bones are the most common; goat/sheep food remains have been found in many places;[430] ox bones are scarce.[431]

Through the evidence from excavations at the Pompeian Forum and in Naples, King reconstructs the trends in Campania from the 6th c. BC to the 6th c. AD and identifies

---

[426] Pallad. 1.36.

[427] Day 1932: 174.

[428] Near the stove were found also an oval cooking pot, a jug, a glass bottle and the remains of a wooden container or a door.

[429] Galen *De meth. med.* 5.12; similarly Simmach. *Ep*. 6.17.

[430] In the house of C. Iulius Polybius, in a bronze pot on unknown provenance, in Stephanus' fullonica, at Villa Regina (Stefani 2005: 68).

[431] Outside the Macellum; in I 6, 7; in the house of C. Iulius Polybius; at Villa Regina (Stefani 2005: 68).

three main phases (Fig. 90).[432] In the first – which runs from the 6th c. BC to the mid-Republic – ox is predominant (it reaches 47%). From the 2nd c. BC to the 5th AD pig meat was the most commonly consumed (about 60%), with an increased presence of sheep/goat (30%), even if the latter's age-at-death pattern suggests that they were grazed primarily for wool and milk. From the late 5th c. AD, the percentage of sheep/goat bones (mainly adults) increases at the expense of pig, while the ox percentage remains constant. Although founded on a very narrow basis of evidence, the datum for the 1st century AD fits within the general picture of animal rearing in central Italy, therefore it implicitly demonstrates that the quantity of sheep locally reared in Pompeii was not uncommon/exceptional (thus it partially undermines Moeller's theory). King's reconstruction for the last phase is more problematic. According to his scheme,[433] the evidence for the increased number of sheep/goat from the late 5th c. AD is supported only by one of the two contexts in Naples (i.e.: Carminiello ai Mannesi).[434] To test his theory, I compared his data with the evidence from the excavation in Pollena Trocchia, Masseria De Carolis (Fig. 91). The contexts from the latter site provide evidence roughly dated to the mid-5th c. AD.[435] To compare coherent datasets, I narrowed the results down to the number of identified specimens (NIS: 730) and the three main groups of animals.[436] 5.1% of the bones are identified with large mammals (mainly ox), 36.4% with sheep/goat, 58.3% with pig. The percentages of this site contradict King's theory of a trend inversion during the 5th c. AD and show instead pattern continuity. Thus the anomaly attested at Carminiello ai Mannesi can be explained either as an exception, or as a peculiar situation of urban sites.

The percentages provided previously do not discriminate between sheep and goats.

[432] King 2002: 406-7.

[433] King 2002: 406, table 25.

[434] The other context is S. Maria.

[435] The *terminus post quem* is the so called Pollena eruption in AD 472. The results here reported include the evidence found in the excavation campaigns 2007-08.

[436] Total: 295. Summary of the other species: unrecognised bones: 64; unrecognised mammals: 196; medium size unrecognised mammals: 367; small mammals (cat, rat, etc.): 581; birds (which includes chicken): 59.

Indeed the two species have very similar bone structures and can be distinguished only by small details on a few bones. King attempts this analysis on the evidence from the Pompeian Forum and hypothesises a ratio of 8 sheep to 1 goat.[437] Both Pompeian and later Neapolitan sheep/goat share a common pattern of kill. The very worn teeth and the fusion of the epiphysis indicate that sheep were usually killed very old, thus they were probably grazed for their wool, rather than for the meat.[438]

Yet the problem of husbandry location is related to the typology of grazing adopted. Transhumant herds were usually larger than farm herds.[439] The larger-scale transhumance – which ancient authors mention – took place in Apulia and Samnium, but probably smaller-scale transhumance involved also other regions. Indeed MacKinnon[440] hypothesises that in west-central Italy only small local or short-distance transhumance took place.

Summarising, the picture arising from the sources identifies two different levels of rearing, which involve different types of organisation. Small- and medium-scale breeding are part of the villa-economy.[441] Animals are mostly kept in pens and stalls to avoid damage to cultivations. Around Vesuvius this kind of evidence is not directly available, since excavations have been limited to the main structures, but also because the farmhouses explored are mainly devoted to wine production. Large-scale rearing is a specialised business, with specific rules and laws. The two methods are unrelated to each other and are generally independent, apart from some overlapping cases. Indeed transhumant flocks pass through cultivated fields in winter, their manure being beneficial for the fields. Moreover, during the winter flocks were probably folded in more

[437] King 2002: 438. This reconstruction does not take into account the possible distortion created by the presence wool shops in the forum or nearby.

[438] King 1994: 381. If one hypothesises their use for meat or milk, one should find a higher percentage of lambs, especially males.

[439] Reaching up to 700-1000 sheep, according to Varro *Rust.* 2.10.11.

[440] MacKinnon 2004: 128.

[441] Kron's (2004) hypothesis of a large-scale livestock farming is not supported by any evidence.

stable structures in the plain. Considering the large size of transhumant flocks, it is highly likely that the structures should have been quite sizeable, thus it would be interesting to understand in what part of the plain these structures were and if they were completely detached from farmhouses.

A passage in Seneca's *Naturales Quaestiones* probably provides evidence for winter folding in the environs of Vesuvius. The seven books were composed probably in AD 65 and are a collection of scientific and moral questions on natural phenomena. In the sixth book on earthquakes, Seneca describes – and many times returns to – the Vesuvian earthquake, which occurred on the 5th of February AD 63.[442] Seneca was familiar with Campania and visited Neapolis the year after the event[443] and subsequently in AD 65;[444] therefore the description comes from reliable sources. Among the effects of the earthquakes, he mentions twice the death of six hundred sheep "*in pompeiana regione*".[445] He further enquires about the possible reason of their death; according to the common opinion – apparently the event was well known among the Romans – the sheep died from the shock suffered, but Seneca suggests a plague instead. In support to his theory, he mentions other cases in which plagues spread after earthquakes. In particular, he hypothesises that the plague was generated by lethal air emerging at the surface from fractures in the ground. Seneca's theory is empirically confirmed by similar events in the environs of Vesuvius. Indeed many gases ("*mofete*") are usually released before, during, and after Vesuvian eruptions, as attested for example in the chronicles of the latest eruption in 1944 and in earlier volcanic events, as described also in one of Sir William Hamilton's reports.[446] Sometimes earthquakes create deep fractures in the surface,

[442] The book on earthquakes is literally built around the Pompeian earthquake (it has a circular narrative structure), which most of the scholars consider also the main stimulus for the creation of the *Naturales Quaestiones*, see De Vivo 1992: 21, 77, with complete list of references. The year of the earthquake – 62 or 63 – has been a matter of wide debate, I agree with Savino's (2009) points and prefer 63, though in any case it would not change the following parts, because everybody agrees it occurred the 5th of February.

[443] Sen. *Epist.* 62; 72.

[444] Tac. *Ann.* 15.33-4.

[445] Sen. *Nat. Quaest.* 6.1.3, 6.27.2.

[446] See also Hamilton 1795: 109.

through which huge quantities of CO_2 are released. The gas concentrates in the soil, and therefore it is poisonous mainly for the animals.[447] The deep faults created by the earthquake were probably few (if too dispersed, the gas would have been hardly poisonous); therefore probably the six hundred sheep were part of 1-3 flocks, concentrated in specific areas. According to the kind of pasturing adopted – in open field, pens, or barns – the flocks would have covered areas of different sizes. Ancient sources do not provide rates for proper grazing, but at least modern rates for sustainable grazing can be used as raw figures for a guesstimate.

Pasturing in open fields involves movement between grazing areas and an average density of 10-15 sheep/hectare.[448] In this case it would be necessary over 40-60 hectares (a square with a side of 0.63 km) to graze 600 sheep. Obviously this figure describes the total land necessary to fully feed the sheep, since they move and pasture in a much more packed fashion, up to the point that only 0.1 ha is necessary for 600 sheep (see below for details). Pasturing in pens requires even more space, 2.5-5 sheep/hectare, because in this case the land must be divided into three pens to allow grass regeneration through rotation. In this case 600 sheep would require over 120-240 hectares (a square with side of 1.55 km). Considering the size of the Vesuvian plains only (i.e. excluding the hills), one can estimate that the carrying capacity of these lands for pasturage to 334,00-501,000 sheep.

The coexistence of sheep and vineyards is problematic.[449] Though ancient sources advise against this practice[450] because sheep eat the vines' leaves, buds, and grapes, one

---

[447] The information is provided in a personal communication by the volcanologist Claudio Scarpati. See also Hamilton 1795: 107: "The first appearance of the mofete, after the late eruption, was on the 17th of June, when a peasant going with an ass to his vineyard, a little above the village of Resina, in a narrow hollow way, the ass dropped down, and seemed to be expiring; the peasant was soon sensible of the mephitic vapour himself, and well knowing its fatal effects, dragged the animal out of its influence, and it soon recovered". For comparative studies on gas effects during eruptions, see Williams-Jones 2000.

[448] 13 sheep/ha, according to the European regulation 2092/91. This low density is necessary to allow the regeneration of the grass.

[449] This idea stems from a private conversation with Annalisa Marzano, who found ethnographic data in support to this theory.

[450] Cato *Agr.* 11.1.

should consider that this problem does not exist in winter, when the earthquake occurred (5th February). Sheep rearing in vineyards during the winter is becoming a common practice among the sustainable wine companies in California. Vineyards can allocate 375-1,000 sheep/ha with no damage caused to the vines and the considerable benefit of weed removal and natural fertilisation.[451]

In summary, the coexistence of sizeable flocks and highly specialised cultivations in the Vesuvian region is possible only in the perspective of winter pasturing in the plain and summer pasturing in the Apennine mountains. Pompeii could get easy and fast access to the mountains through the road to Nuceria, at the feet of the range and distant only 13 kilometres (less than 10 Roman miles). Nola was in an even more favourable position, because Abella is only 6 kilometres (4 Roman miles) away. Abella connected Nola to Abellinum and Beneventum, thus to the main hubs in the Apennines in Hirpinia. The hypothesis of intensive animal trade between Nola and the inner Apennines is supported by two passages in St. Paulinus' Carmina, in which peasants bring piglets for a sacrifice on the tomb of St. Felix. In the first occurrence (*Carmina* 20.65), the peasant brings his pig from the territory of Abellinum; in the second instance, a well-fed pig comes from Apulia through Beneventum (*Carmina* 20.312).

These are valid options within the traditional model of mid-range transhumance. Nevertheless, two *pagi* of Nola have names which suggest flock grazing as their main activity – the pagus Capriculanus, and the pagus Lanita.[452] The lower fringes of the Apennines are very close to Nola (2 km) and are composed of a complex landscape with narrow valleys, low hillocks, and steep mountains. Among these, there is a range which runs from the town of Sarno to Palma Campania (Fig. 92). It is covered almost entirely by woodland and because of very steep slopes (Fig. 93), its top is accessible only through Palma Campania (6 km from Nola) and Quindici (at the south-east end of the Lauro valley,

[451] Mulville 2009. Sheep grazing action saves 12-25 tractor passes, which equates to many days of human labour.

[452] Camodeca 2001.

11 km from Nola and within its territory).[453] The peculiar feature of this range is the presence of several high plateaux (altiplanos). Three of these are still used today for sheep grazing (Figs. 94-95): Palma Campania, Piano di Tribucchi (3 ha); Quindici, località Liporeta (75 ha); Moschiano, frazione Santa Cristina, località Somma (155 ha, Fig. 96), with a total carrying capacity of 2330-3500 sheep (Fig. 97).[454] In my opinion these are valid options for the placement of some Nolan *pagi* and fit within the model of short-range transhumance as theorised by MacKinnon[455] to explain the smaller quantity of sheep bones on the Tyrrhenian side of the peninsula.

Ethnographic data[456] provide insights into how transhumance worked in this region in the past centuries; the model drawn from those is a useful starting point to target research. Among the inhabitants of the north slope of Vesuvius, the memory of sheep flocks pasturing in this land and selling milk and cheese while crossing the town centres in the morning is still vivid; many of the people I have interviewed remember sheep coming downhill from the Somma-Vesuvius (i.e. above 100 m a.s.l.) as well. Interviewees often stated that the shepherds came from Santa Cristina, though unaware of the exact location of that place. Santa Cristina is a neighbourhood in the town of Moschiano, at the end of the valley of Lauro, in the ancient territory of Nola. That place is of particular importance, since it provides access to both the altiplanos of Nola (Fig. 97) and to Hirpinia, but in these days it is not very popular, since most of the traffic towards Hirpina goes through Abella. In order to understand whether the flocks used to come more from the territory of Nola or from Hirpinia, I have used the systematic interviews that Dr. Giovanni Abete (sociolinguist) made in Bagnoli Irpino, one of the towns in the inner Apennines of Hirpinia where sheep rearing is still a prominent business, especially for

[453] On the other hand, it is inaccessible from Sarno and Pompeii, though it stretches south and faces the Pompeian plain. Still today this area is quite remote and of difficult access.

[454] This is a rather conservative figure, since I have included the plains only (see figure).

[455] MacKinnon 2004: 128.

[456] The information provided below is the result of interviews I made during the survey activities and, with a more systematic approach, by Dr. Giovanni Abete and Dr. Valentina Retaro for unpublished studies in sociolinguistics.

the grazing of a particular kind of sheep, called "bagnolese", characterised by a black muzzle.[457] According to the shepherds, there used to be two different kinds of transhumance, one for the cattle towards Puglia, the other for the sheep towards the Terra di Lavoro, by which term they mean not only the Ager Campanus, but also the plain of Nola and the slopes of Vesuvius. Indeed they mention specific neighbourhoods - like Starza della Regina - which lie on the north slope of the volcano. During one of my field surveys, not very far from that *località*, I have seen a sizeable flock of "bagnolese" sheep and, although it was impossible for me to see it entirely, I counted 345 sheep in 0.06 ha (Fig. 98). The size of this flock is larger than that generally reckoned among the interviewees; in Bagnoli Irpino the business - still carried out on a family basis - on average encompasses flocks of ca. 250 sheep. During the Summer, sheep pasture in Hirpinia and young members of the family often look after them, while in winter female members stay in the farm and males move with the flocks to warmer places, taking with them small, portable wooden tents, and foldable pens. Once in the Vesuvian plain, upon agreements with the land owners (manure and cheese in exchange for the use of the land), shepherds move to the properties, set up the pens for a little portion of it, then once the grass is over move the pens to another portion of the same property, and so on until they move to the next property. In Hirpinia shepherds have farms with barns, but there are also proper farmers (whose main business is agriculture) who nevertheless own also about 20 sheep each. In these cases, farmers aggregate themselves in small groups of families, so that in turn each family can take care of the entire flock. Most of the activities described do not leave traces in the field, nevertheless by speculatively projecting them to the classical world, one should look for barns or at least rooms for processing the milk in farms in Hirpinia. Alternatively, one can look at other proxies of this connection between the two areas, as I tentatively do with the late antique pottery in the next chapter.

[457] This species, like most of those currently grazed in Italy, is a rather recent creation (from the 12th century with subsequent cross-breedings), but its appearance is quite different from the other two currently grazed in the neighbouring areas of the same region.

In targeting the areas to investigate further, transhumance paths are a useful starting point. The routes commonly taken into account are those for which there is ample legislation dated to the Bourbon rulers. There is nevertheless a much larger body of rules and regulations to look into. One of these is the Municipal Constitution of the town of Montella[458] (the much larger and prominent city adjacent to Ariano Irpino); it is dated to 1794 but it explicitly copies and confirms the constitution set in 1504.[459] In it,[460] the town of Montella mentions a sort of pastoral league among some towns of Hirpinia and others of the plain of Nola; this agreement among towns was necessary to provide the right to "passare, aquare, gliandare, pascere e pernottare nelli demaniali senza pena alcuna o paga". I have plotted the most relevant localities mentioned in a map (Fig. 99) together with the two main routes still in use in the 20th century to connect the two areas. It is surprising to notice how wide the area covered by the agreement was, as well as the fact that the agreement was set also for the oxen, which in this way could get access to the *tratturi* towards Puglia. The towns of the Vesuvian plain mentioned in the agreement are Lauro, Palma, Nola, Ottaviano, Marigliano, Acerra, Caivano, with access to the valley of Lauro through Montuori and Monteforte. According to the documents and the more recent evidence,[461] the territory of Nola was linked to the mountains near Montella, while the territories around Benevento might have used the *Furculae Caudinae* to reach the *Terra di Lavoro*. Part of lower Hirpinia was covered by the ashes of the AD 472 eruption of Vesuvius, thus it might be easy to find some high resolution data (e.g.: charcoal pits) to start testing this scenario.

Swine grazing was more compatible with agriculture than flock rearing, it was more important for the Romans (it has the most prominent place in the ancient treatises), and

[458] Archivio di Stato di Napoli, *Commissione feudale*, Principato Ultra, proc. 2929, Vol. 507, foll. 102-119.

[459] Article CII of the constitution.

[460] Folio 113, article LXVIII.

[461] Scandone 1911: 141-2.

the archaeological evidence confirms its importance in ancient diet.[462] Swine grazing was widespread and varied. A few piglets were bred in each villa at least for local consumption. Indeed pigs did not need vast areas and were fed chiefly on fruits and vegetables amply available in the villas, like mast, beans, barley etc.;[463] the vast hazelnut woodland along the Apennines probably could have been used for this purpose. Pigs found suitable pasture wherever situated, both in the mountains – as the passages above-mentioned attest – and in the plains, but they prefer marshy areas.[464] Probably parts of the marshy belts along the Campanian rivers were used for this purpose. Due to the lack of evidence though, it is impossible to locate precisely the areas of breeding. Considering the vast demand – especially from the cities – and the potential availability of land suitable specifically for this purpose, there probably existed farms which specialised in pig raising. This hypothesis is supported by the passage of Varro (II 4, 22), in which he states that herds usually ranged between 100 and 150 pigs.

6.4. Short- and long-term consequences of the AD 79 eruption

The study of the Pompeian eruption's effects is apparently very easy to approach. For almost three centuries, scholars of various fields of research took vast advantage of the term "catastrophe", up to the point that today it can be considered almost a theoretical model. This model originated from the study of Pliny's letters to Tacitus[465] and is underpinned by the evidence from Pompeii and Herculaneum. Indeed, the idea of "catastrophe" is convenient to politicians and volcanologists working on the evacuation plans for the next eruption of Vesuvius. The predicted scenarios are very dramatic and summarised at times with concepts like "total destruction", as in a recent article in the National Geographic.[466]

---

[462] See MacKinnon 2001 for an overview of the topic and a theory on two different pig breeds in Roman Italy.

[463] Varro 2.4.5; Colum. 7.9.6-7. In particular for the hazelnut, see Verg. *Georg.* 2.519-522.

[464] Colum. 7.9.6-9.

[465] Plin. *Ep.* 6.16; 6.20.

[466] Hall 2007.

Although for Vesuvius the studies on the effects of the eruptions are still hampered by previous models, in many other contexts this field of research has recently moved from the theory of "catastrophe" to that of "growth stimulus" or "opportunity".[467] Indeed in most of the cases the rich and varied data available for more recent eruptions testify to the rapid economic growth triggered by the consequences of eruptions.

It is indubitable that eruptions destroy settlement and cultivations, but research should move beyond that statement and try to quantify the area and percentage of land affected by eruptive ejecta, the extent of destruction caused to cultivations, and the time which is theoretically necessary for land recovery and return to full productivity. Ultimately, this type of analysis calculates both the effects of the "catastrophe" and the scale of the "opportunity" for new growth. As a further step, the literary and archaeological evidence needs to be overlaid on to this picture to understand how the "cultural system" responded to the opportunities offered by the new landscape. The comparison between the optimal (positivistic) answer to the opportunity and the actual use of the land (empirical approach) will form the basis for the historical analysis and the creation of the interpretative model.

The effects of eruptions on vegetation can be hypothesised using empirical data from recent eruptions and those in the past few centuries, for which we have more complete and reliable data. Apparently the comparison is easy; there are six types of volcanoes[468] and only three types of eruptions.[469] Nevertheless, each group includes many variables and variants to take into account and actually each eruption includes many different phenomena; for example all Plinian and Subplinian Vesuvian eruptions consisted not only of explosions, but also of lava fountains and lava flows, which are typical phenomena of effusive eruptions (see § 4.2). The comparison by typology is therefore very difficult and not really useful.

---

[467] Grattan 2006; Id. 2007.

[468] Fissure v., shield v., lava domes, ash-cinder cones, composite v. (stratovolcano), caldera v.

[469] Magmatic, phraetomagmatic, and phreatic.

These difficulties are bypassed by comparing the individual effects of the eruptions, rather than the typologies of volcanoes and eruptions. To achieve this, first I list the effects of the eruptions by category, including comparative data to quantify each effect; then I use the information available for the AD 79 eruption (e.g. extent of the area covered by tephra falls) to create a map of the eruptive effects on vegetation. This kind of analysis is useful as long as it remains close to the evidence in the field. Schemes created to cover the entire wide range of phenomena inevitably become useless, as in one of the only two studies available on the subject, as I show with the following table.[470]

Volcanic effect	Area affected	Intensity	Time for recovery
Lava flows	Small-medium	High	Centuries
Tephra	Large	Low-high	Years to decades
Pyroclastic flows	Small	High	Decades to centuries
Lahars	Medium	Low-high	Years to centuries

Table 6 - Effects of volcanic phenomena on the surrounding lands (Source: Dale 2005, tab. 8.1).

A closer look at each effect provides a more accurate model.

a. Lava flows: The damage depends mostly on the speed (degree of viscosity). Lava covers the soil entirely and once it cools off, it becomes very hard and uncultivable. The area regains its fertility only after a long time - roughly one century, thanks to the combined action of lichens and soil deposition. The sequence has been studied in depth for the latest eruption of Vesuvius in 1944.[471] In that case, the first colonisers were bacteria and blue algae, then the *Stereocaulon vesuvianum* (a lichen), which slowly created fractures in the lava and, decaying, transformed into thin soil. The wind deposited more soil and the first pioneer species (grass, little shrubs, and other small vegetation) started spreading but still today that land cannot be cultivated.

[470] Dale 2005: table 8.1. I have normalised the terms and removed the irrelevant columns and rows, using Blong (1984: ch. 2) as model. The terms used by Dale are fuzzy, but in a footnote he narrows their meanings. For the areal distribution, by "small" he means "the area immediately in the vicinity of the volcano", "medium" means "the area adjacent the volcano", "large" encompasses "quite a large area" (sic!). About the impact, by "high" he means "most of the vegetation", by "moderate" he means "kill or damage many of the plants, but there is some recovery", and finally by "low" he means "damage to vegetation and most plants recover".

[471] Mazzoleni 1993: 108.

For the Pompeian eruption, lava flows were very probably limited to the west section of the volcano, between the modern towns of Ercolano and Torre del Greco.[472] Considering that in many places the pyroclastic surges and flow deposits above them are very thick, one must consider the effects of the lava flows irrelevant for the growth of new vegetation.

b. Tephra falls and ballistic projectiles (bombs). Volcanic bombs – if very large (Fig. 100) – cause vast damage to cultivations. Yet they form just a small percentage of the total ejecta and are usually found within other thicker deposits (generally lahars), thus overall their impact on vegetation is negligible. Volcanic bombs are attested in the AD 472 deposits (Fig. 100); large ones are very rare in those of AD 79.

Tephra (ashes and lapilli) are ejected by the volcano as a tall column, which reaches the stratosphere. There, the tephra are moved by the wind towards its predominant direction.[473] The heaviest tephra fall near the column, the lightest fall over the land with an elliptical distribution and the thickness of the entire deposit decreases exponentially with distance from the source. Previously (§ 4.3) I have explained the limits and problems of the volcanological maps currently in use, nevertheless volcanological maps are broadly reliable in defining the areas where the tephra fell. Among the maps available, I compared the three most significant ones (Fig. 101).[474] They all provide similar long-range distribution of the tephra, but differ in the short-range for three significant details. Among them, I choose the map by Sigurdsson and Carey, because it is the closest to the archaeological evidence on the north slope of the volcano. For the areas not covered by that map (south of Pompeii), Rosi's map will be used. The result of this overlay (Figs. 102-103) is the basis, on top of which I plot the damage caused by tephra on the vegetation (Fig. 104).

---

[472] Formicola 1990: 136-141.

[473] South-east in the case of the eruption of AD 79. See Rosi 1986: 24-5.

[474] Oldest: Rosi 1986; most authoritative: Sigurdsson 1985, Carey 1987; most recent: Cioni 1999.

Blong[475] studied the effects of the tephra on crops by comparing data from 16 eruptions, most of which happened in Central and South America. I simplified and modified his table as follows.

Tephra fall thickness (cm)	Effects on crops
>200	All vegetation killed
100-150	Most vegetation killed; some recovery
50	Large tree branches break under tephra load
10	Some branches break under tephra load
4	50% loss of lentils; 15-30% loss of wheat, spring barley, peas, hay
2	30% loss of lentils; 5-15% loss of winter wheat, barley, peas, grass seed; vegetables considerably damaged
1.5	Loss of first alfalfa cutting; grass hay winnowed before tephra fall not usable
1	Fruits dropped; vegetable crops somewhat damaged; hay crop loss 25-30% because of prostration
<1	Minor damage to corn and hay; some burned leaf and salt damage of berries

Table 7 - Effects of the tephra on crops (edited from Blong 1984: tab. 7.3).

From this table, I derived a distributional map (Fig. 104), in which in red is the area where all vegetation was killed, in orange the area where some vegetation might have recovered, in yellow the area with minor effects on trees. The table covers mostly the species of South America, thus no information is available for the vineyards. Nevertheless, it is reasonable to assume that vineyards covered by deposits thicker than 100 cm would not have survived.

Blong is aware that his table does not take into account many variants, such as:

- the varying susceptibility of individual species to tephra;[476]

[475] Blong 1984: table 7.3. This section analyses primarily the effects on vegetation. Some studies have been done on the effects of earthquakes on structures, about the tephra, Sigurdsson (1985: 345) calculated that 50 cm of tephra were enough to make roofs collapse.

[476] For example, in the area around Parícutin, 2.5 years after the eruption oaks survived in ash depths up to 178 cm, some pines in depths of 124, hawthorn in depths of 102, trailing arbutus in depths up to 89 (Blong 1984: 320).

- the basal diameter of the trees;[477]
- post-depositional dynamics, such as heavy rainfalls soon after the tephra fell, which washed ash from foliage.[478]

The main difficulty one faces in quantifying the damage to the vegetation is to imagine the exact dynamics of the event. In these regards, Hamilton's reports of the eruptions in 1779 and 1794 are particularly useful. For the eruption in 1779,[479] Hamilton describes the effects of the tephra as witnessed in progressive intensity, which I think corresponds to the path of his journey from Villa Angelica – his residence near Torre del Greco – to the section of the Somma-Vesuvius complex which was most affected by the eruption: the town of Ottaviano, on the north-eastern section of the volcano.[480] Almost at the beginning of his journey, near Pollena, he noticed that the leaves of the trees "were covered with white salts very corrosive".[481] Moving eastwards, he started perceiving the heat of the "fiery shower", which affected trees and vines that he found "still more parched and shrivelled".[482] At one mile and a half from Ottaviano, he found the soil totally covered by ashes and the "leaves and fruit were either entirely stripped from the trees, or remained thinly on them, shrivelled and dried up by the intense heat of the volcanic shower".[483] Moving on he noticed that the straw huts, erected for the watchmen of the grapes, were all burnt.[484] Then he reached the most damaged area, where "the vines and fruit trees were totally stripped of their leaves and fruit, and had the

[477] For the eruption of Parícutin, Blong (1984: 320) notes that "pine seedlings and small trees were killed as a result of excessive bending and burial, while large mature trees suffered from branch breakage under loads of ash. Pines with basal diameter of 10-30 cm survived best because their stems were strong enough to resist excessive bending yet sufficiently flexible to dump part of the ash load and thus avoid breakage".

[478] Blong 1984: 319.

[479] Although this eruption was one of the many in a long sequence of Subplinian eruptions, its ashes travelled as far as the Adriatic sea, and the lapilli as far as Benevento (Arrighi 2001: 133, 139).

[480] This impression is confirmed by the casual mention of rivers and places during his journey.

[481] Hamilton 1780: 51.

[482] Id.: 66.

[483] Id.: 66.

[484] Id.: 69.

appearance of being quite burnt out".[485] Comparing the information provided by Hamilton about this latter location with the volcanic deposits attested in that same area for that eruption, I calculated the total depth of volcanic deposit here around 30 cm.[486] This information can be used to calculate the total amount of tephra necessary – 30 cm – to destroy a vineyard. Nevertheless, in so hypothesising one would be contradicted by the same Hamilton, who continued in the same passage: "but to my great surprise, having visited that country again two days ago, I saw those very trees, which were apple, pear, peach, and apricot, in blossom again, and some with the fruit already formed, and of the size of hazelnuts. The vines there had also put forth fresh leaves, and were in bloom".[487]

More information about the fertility of the ashes comes from another passage in the description of Hamilton, this time about the eruption of July 1794: "A gentleman of the British factory at Naples, having filled a plate with the ashes that had fallen on his balcony during the eruption, and sowed some peas in them, assured me that they came up the third day, and that they continue to grow much faster than is usual in the best common garden soil".[488] Strabo probably referred to something similar when he stated that the ashes from Aetna made the fields near Catana fertile and suitable especially for vineyards.[489]

Hamilton's passages introduce the problem of time and modality of recovery, for which human intervention is of key importance. Indeed on many occasions farmers took advantage of the tephra to increase their yield. For example, after the 1902 Soufrière eruption farmers mixed the freshly fallen tephra – which did not contain sufficient

[485] Id.: 73.

[486] There is not enough evidence in the field to create an isopach map of the tephra deposits, but the type section for this eruption lies in Ottaviano at 190 m a.s.l., which was the most affected area. In this section, the total amount of the deposits is 30 cm thick. See Arrighi 2001: 139, fig. 7, stratigraphic section Zlc.

[487] Hamilton 1780: 73. The eruption happened in August, it means after the normal blooming period.

[488] Hamilton 1795: 93.

[489] Strabo 6.2.3; 5.4.8. In the latter passage Strabo uses the example of Aetna to explain the fertility on Vesuvius. Similarly but on the late antique eruptions of Vesuvius: Procop. *Bell. Goth.* 2.4.29; Cassiod. *Variae* 4.50.

nutrients to support plant life – with the underlying soil.[490] Another technique adopted was to pile the ash in ridges and to plant the crop in trenches dug in the original soil (Fig. 105).[491] Another easy technique is to simply shovel off the tephra; this proved enough and very effective after the latest Vesuvian eruption in 1944, when vine cultivation resumed just a year after the event.[492] Similarly, after the Vesuvian eruption of 1906 the town of Ottaviano was covered by 0.55-1.20 m of tephra; in that case farmers either removed the tephra entirely, or planted their crops in the ash and fertilised them well, with good results.[493]

Especially for cereal crops, vegetables, and small plants like vines, the season in which the eruption happens can vary greatly the effects on the cultivation. For example, after the Vesuvian eruption of the 2nd February 1906, the ash seemed to destroy everything, but the buds of the vines were still closed and by the beginning of May the countryside was again luxuriantly green.[494] Similarly, in the last phase of eruption in Parícutin – from February to the 4th of March 1952 – the volcano exploded 30 mm depth of tephra over the neighbouring fields. Nevertheless, the wheat and barley crops that year were reported to be excellent.[495]

To evaluate how much these variants and factors affected the destruction/re-growth of vegetation around Vesuvius in AD 79, one must consider the date of the eruption and the sowing times. I have already discussed the date of the eruption and supported the autumn date (24th October), rather than the traditional 24th August (see § 4.2). At the time of the eruption the vintage was already done, as many sealed dolia attest (e.g. in Villa Regina at Boscoreale). A wax tablet from Herculaneum informs us that the dolia were usually emptied from the previous year's wine by the 13th of August, therefore they

[490] Blong 1984: 345.

[491] Id.: 345.

[492] This technique was used in the towns of Boscoreale and Terzigno. Jashemski 1979: 615.

[493] Day 1936: 107.

[494] Blong 1984: 348.

[495] Id.: 348.

should have been empty if the eruption happened on the 24th of August.[496] According to Columella, the harvesting usually took place in the second half of September (9.2.75), for Pliny the Elder more specifically between the 24th September and the 11th November (18.74). Therefore the areas less affected by the tephra[497] could probably have been productive the following year.

By the time of the eruption all the other cultivations would also have been harvested already. Nevertheless, the sowing times are important to understand whether the seeds would have been lost under the tephra and consequently if it would have been necessary to remove the tephra in order to set a new cultivation. Sowing times vary in conditions and practice, but they were generally carried out between the autumn equinox and the winter solstice.[498] Usually farmers need to sow early "in areas that are wet and poor in fertility, or cold, or even shaded",[499] but generally the best practice starts on the 10th of November.[500] This is particularly true for ancient southern Campania, for which Columella says the sowing was usually carried out during the first days of November.[501] In this case, theoretically the farmers whose fields were covered by a thick deposit would not have lost the seeds, and those whose fields were covered by just a few centimetres of tephra could have removed the deposit or mixed it with the other soil, and sowed.

The recovery would have taken longer for the soils covered by more than 1 m of tephra. Ernestine Day compared the recovery time of several eruptions and concluded that revegetation depends on the physical condition of the ash: with loose and averagely-drained ash – as in the case of the Pompeian eruption – revegetation usually starts after

---

[496] Camodeca 2000: 72-3; see also Borgongino 2001: 193.

[497] Or where the tephra could have been easily removed. It is difficult to define a threshold, maybe between 50 and 100 cm, according to the preexisting geomorphology, and in particular the gradient and the exposure.

[498] Varro 1.34.1; Colum. 2.8.2; Plin. *Nat. Hist.* 18.224-5.

[499] Colum. 2.8.3.

[500] Plin. *Nat. Hist.* 18.224-5.

[501] Colum. 2.8.3. See also Spurr 1986: 42-3.

three years, whilst in drained and compact ash it takes up to eighteen years.[502] Day further analysed the composition of the Pompeian ashes and noticed they were rich in all necessary nutrients for plants, apart obviously from nitrogen, which is absent in all volcanic ashes.[503] Nevertheless, nitrogen is released naturally with the formation of the humus (i.e. after some life-cycles of plants), or artificially with manure or nitrogen-fixing plants, such as legumes. Consequently, one can cautiously estimate at less than fifteen years the time-span necessary for vegetation to grow again on a thick (more than 1 m) tephra deposit.

c. Pyroclastic surges and flows. These are flows of hot pyroclasts, generated by the collapse of the tephra column. They have a gas-solid dispersion, accumulate in topographic depressions,[504] and move with great energy and speed (up to 200 km/h).[505] Pyroclastic flows and surges are usually combined, the flow being the lower part of the collapsing column and the surge the upper. Compared to pyroclastic flows, surges have a higher percentage of gas, travel farther,[506] and generally leave very thin layers on the ground, whilst the flows form deposits as thick as 15 metres. Further, geomorphology dictates the path of the flow and any obstacle reduces its speed abruptly, whilst the surges pass barriers more easily and travel farther.

During the AD 79 eruption, the tephra column collapsed seven times, precisely after the first deposition of airfall tephra and before the last deposition of ashes in water-rich eruption clouds.[507] Consequently, for the quantification of the damage to cultivations, it is enough to calculate the total thickness of the deposits – adding together both tephra and pyroclasts, since they are interspersed with each other – and their total dispersion. The recovery time is the same as for the tephra deposits, because where the deposit is

[502] Day 1936: 106.

[503] Day 1936: 106.

[504] Rosi 1986: 16.

[505] Dale 2005: 231.

[506] Sigurdsson 1985: 337.

[507] Id.: 338-9.

present, it is covered by the tephra that fell in the last stage of the eruption. For the quantification of damage to livestock and humans, the area is identified by the extent of the pyroclastic surges, because they are the main cause of death. Obviously both animals and humans could have moved from the area beforehand, because the pyroclastic surges started on the second day of the eruption.[508]

The main problem that one faces in studying the pyroclastic deposits is the lack of a distributional model – and consequently of a map – commonly accepted by volcanologists. Indeed, as previously mentioned the emplacement dynamics for both pyroclastic flows and surges depend greatly on the micro-morphology of the area before the eruption, which is unknown.

For the flows, the old model elaborated by Rosi and Santacroce is based on the present morphology of the area (Fig. 106).[509] This model develops a picture in which on the north flank of the volcano the flows are channelled in three directions, whilst the areas in between them have a thinner deposit. According to the model by Sigurdsson (Fig. 107), the flows have a drop-like shape and on the north slope of the volcano they are two: one in the town of Pollena, the second in Somma Vesuviana. In both cases the flows stop at around 300 m a.s.l.

Both maps produce a similar picture for the southern half of the volcano. Pyroclastic surges and flows are very thick in the area of Herculaneum,[510] while the surges reach their farthest point in the Pompeian plain. Both confirm that the south-western rim of the caldera – if it ever existed before AD 79 – was destroyed during the eruption and that the volcano spread flows and surges across the plain.

The map by Cioni (Fig. 108) differs from the other two, because it displays only the areas where the deposit is attested. That map shows deposits mainly between 300 and

[508] Id.: 351-2.

[509] Rosi 1986: 25-6.

[510] Scholars do not agree on the number of casualties in Pompeii. Sigurdsson (1985: 357-362, 379-380) argues that about 2000 people died in Pompeii, 10% of the total population, according to his hypothesis.

200 m. a.s.l., with irregular distribution on the north slope of the volcano. Indeed, both above 300 m. and in between the town of Ottaviano and Somma Vesuviana, Cioni barely finds deposits. In the north-western quadrant of the volcano, the thickness of the flow deposits is broadly between 4 and 8 m.[511] The deposits stop abruptly at 200 m, following the step-like model I hypothesised in § 4.3. According to that model, the gradient of the north slope changes considerably around 250 m, where consequently the flows lose most of their kinetic energy. Cioni's map is the closest to the evidence; therefore it is used here to identify the areas affected by the flows. According to that map, the southern half of the volcano is severely damaged, but the flows do not reach Pompeii. In the north-eastern quadrant there are no traces of the flows, while in the north-western they concentrate between 200 and 300 m, where the deposits range between 4 and 8 m.

Flows destroyed all vegetation in their path by toxic gases, heat, or burial.[512] Cioni[513] notes that two archaeological sites in the town of Ottaviano at 300 m were destroyed by the pyroclastic flows. One can therefore hypothesise that – on the north slope of Vesuvius proceeding downwards until 200 m – most of the vegetation was destroyed by the passage of the flow; the north-eastern quadrant was probably much less affected.

Pyroclastic surges are difficult to plot because they are clouds, which leave deposits of only a few centimetres.[514] Only two maps are available, both by Sigurdsson, but they differ considerably one from the other. In the first (Fig. 109) are identified the six surges which occurred during the eruption. Each surge is identified on the map with a line which represents its maximum extent, but no indication of the deposit's thickness is provided. The second map (Fig. 107) shows the total thickness of the surge deposits, but

[511] This model fits well with the evidence for the AD 1631 Vesuvian eruption, for which it has been possible to reconstruct precisely the extent of the pyroclastic flows, by using the written sources and the pictorial evidence. See Cioni 2000: 489-491, fig. 10.

[512] Dale 2005: 231. The temperature of the pyroclastic flows for the Pompeian eruption has been calculated between 240 and 340°C.

[513] Cioni 1999: 188.

[514] Sigurdsson 1985: 333, 338: "The deposit remaining on the ground after the passage of a surge may be very thin (1 to 15 cm)".

the isopachs neither correspond to the maximum extent of the surges, nor to the sum of each surge, because the lines do not match. Sigurdsson's article does not include the raw data (i.e.: the volcanological sections), from which the maps stem;[515] therefore it is impossible to verify his hypothesis. Nevertheless, being the only – and most authoritative – map available for the pyroclastic surges, it will be used for the purpose of this study.

Surges are basically hot clouds, therefore they cool very quickly and especially on the fringes of the main direction. The abrupt decrease in temperature has been studied for other surges in recent eruptions. For example, during the eruption of Mt. Unzen in Japan (3rd of June 1991), many people saved their lives by keeping the front door of their houses closed, but if they opened them, they had respiration problems and burns on the skin not covered by clothes.[516] For the effects of surges on buildings and vegetation, Sigurdsson's study of the eruption of El Chichón is very useful.[517] In that occasion, buildings placed in marginal areas were damaged very partially: roof tiles were destroyed and some walls facing the volcano were caved in; in proximal areas though, most walls were toppled or entirely obliterated. Vegetation had only a shallow charring, which affected only a few mm of the wood. Many humans and animals died.[518]

Combining these examples with the evidence from Pompeii and Herculaneum, I hypothesise that in the area bounded by the 100 cm isopach all the vegetation burned; between 100 and 50 cm the vegetation was only partially damaged, while the humans and livestock died.

d. Lahars. The main features and effects on the landscape have been discussed in detail in § 4.4. For the Pompeian eruption, lahar deposits are attested only in the area of Herculaneum, where they lie above the pyroclastic flows in the final phase of the

[515] I contacted the author, but I received no answer.

[516] Nakada 2000: 951-954.

[517] Mexico, March-April 1982. Sigurdsson 1984.

[518] Sigurdsson 1984: 29.

eruption.[519]

The reappearance of vegetation on top of lahars may take some time, but it is usually much shorter than the time taken from lavas, as clearly visible in the site of Pollena, where between the eruption of AD 472 and the later eruption in AD 505/512, there is a thin layer (10-20 cm) of pinkish palaeosoil with land-snails, thus grass and undergrowth. Therefore it had taken roughly 15 to 30 years for the creation of shrubs and undergrowth and maybe one or two more decades for the first trees.

e. Acid rains and gases. Acid rains occurred occasionally during some Vesuvian eruptions, but the written records do not report long-term damage to agriculture and the analyses by Day do not show high concentration of acids in the tephra.[520] The major damage comes from the gases, because a high concentration of either carbon dioxide or sulphates kill humans and livestock (see § 7.3). For the eruption of 1794, Hamilton describes this gas as very similar to fixed air, thus it is probably carbon dioxide. According to his report, this gas dried up many vineyards.[521] It is very likely that the extent of the areas affected by the gases corresponds to that of the pyroclastic surges, since no other source of gas (e.g.: fumaroles) is known beyond the limit we use for the surges.

f. Earthquakes and bradyseism. Both have been discussed in detail previously (§ 7.3 and § 4.5) and do not affect the vegetation directly.

g. Tsunami. A tsunami probably occurred during the AD 79 eruption, but it did not affect the inland region.

h. Electric discharges. They have a very limited effect on vegetation and occurred in the area already affected by other phenomena.

---

[519] Rosi 1986: 26.

[520] Day 1936. The discharge of acid volcanic aerosols is typical of other kinds of eruptions, like the fissure ones. See for example the Laki fissure eruption of AD 1783 (Grattan 1994).

[521] Hamilton 1795: 108. He uses the term “mofete”, then widely used to identify all the toxic gases which on occasions killed the Bourbon explorers in Pompeii and Herculaneum.

i. Climatic variations. They generally occur with a huge discharge of acid aerosols, which did not occur during the Plinian eruption. However, climatic variations are limited in time and their effects are proved only for areas where a few degrees' difference can improve or damage cultivations.[522]

The results of each eruptive effect are summed up in a composite map (Fig. 110); the red line identifies the area where all vegetation was killed, the blue where most of the vegetation was killed, with some recovery, and the green where the damage to cultivation was minor. Some conclusions can be drawn from the map:

- All cultivations in the Stabian territory were killed.
- The entire Pompeian production on Vesuvius was destroyed.
- The Pompeian production in the plain was either completely destroyed or mostly damaged.
- The coastal route was entirely destroyed.
- The final section of the Sarnus river and the harbour were engulfed and the river probably changed its path.
- The territory of Nuceria was only partially affected by the eruption.
- The north slope of the volcano was affected in its central part above 200 m, in the western sector the surges reached the plain,[523] while in the eastern part most of the cultivation was not affected.[524]
- The volcanic debris did not affect the river Sebethus and the aqueduct on the north slope of the volcano.

[522] Grattan 2000: 38.

[523] I plotted Sigurdsson's map, but for this area the reconstruction is only speculative and unsupported by any stratigraphic section.

[524] The apparent lack of preserved sites only in this section of the volcano could counter-prove this reconstruction. Indeed the sites are paradoxically more visible and best preserved when covered by the debris of the eruption, while in the area not affected probably life continued and sites could have been obliterated later.

Other side-effects of the eruption cannot be quantified precisely; therefore they have been excluded from the map. In particular, the spread of fire could have played a considerable role in worsening the situation.[525] Plagues also spread after the eruption, even though the main cause cannot be traced back.[526]

The time necessary for the full recovery of the land ranged from 1 to 10 years. Indeed, areas affected only by pyroclastic surges could have returned to productivity the following year, while areas covered by the tephra needed between 3 and 10 years.[527] The area near Herculaneum would have suffered for a longer period. Indeed both lahars and lavas, if not covered by softer deposits, would have taken between 30 years and one century to recover. Therefore, except for the latter area, one can cautiously estimate the recovery time as 10 years or less. This calculation does not include the time necessary for new cultivations to be set up and be productive. For vineyards, it usually takes 5/6 years,[528] for olive trees at least 10 years,[529] even though older olive trees would have been preferred.[530] Summarising, it should have taken roughly 15 years or slightly more for the first new wines from Vesuvius and Stabiae to appear. These figures obviously imply the intention and the ability of farmers to set up vineyards as soon as the land returned to cultivable conditions. This scenario can be compared to the information from literary sources and archaeological evidence.

---

[525] This hypothesis is suggested by a passage from Tacitus' Histories (1.2), even though one must bear in mind that the term "fire" in antiquity was also used for the eruptions, for which there was no specific term.

[526] Cassius Dio 66.21.5: "These ashes, now, did the Romans no great harm at the time, though later they brought a terrible pestilence upon them". The ashes did not bring pestilence and the causes of the spread of the plague can be manifold, such as the destruction of the cultivations, the poisoning of the livestock, the poisoning of the ground waters, even if the simplest reason is probably the decrease of hygienic conditions caused by the arrival of many refugees in the neighbouring towns.

[527] Using Day's arguments and conclusions, one should stay closer to 3 years.

[528] For this information I use as source the owner of a wine-company based on the north slope of Vesuvius. According to his experience, the first new grapes come after 3 years, but the first good wines are available after 5/6 years. Similarly Tchernia (1986: 231), who indicates 5 years.

[529] My source for the olive groves is a producer in Cilento (sourthern modern Campania). The producer states also that in Puglia it generally takes 8/9 years.

[530] In that case, I think the figure of 20 years proposed by Mattingly (1996: 219) is the most reliable.

In December AD 88,[531] Martial composed his famous epigram on Vesuvius,[532] in which the entire area is described as barren and submerged by the ashes. Using different tenses, the poet rhetorically stresses the difference between the landscape before the eruption and in contemporary times. For the description of the region, he allegorically uses Bacchus, Venus, and Hercules to indicate the three areas affected: Vesuvius, Pompeii, and Herculaneum.

In AD 94-95,[533] Statius refers twice to the Vesuvian region, apparently in opposite terms. In the first passage Statius says: "Not so utterly has Vesuvinus' peak and the flaming tempest of the baleful mountain drained of their townsmen the terror-stricken cities; they stand yet and their people flourish", and then asks "[whether you please to visit] the Surrentine hills beloved of fiery Bacchus, which my friend Pollius before all men honours by his dwelling, or the health-giving lake of Aenaria and Stabiae reborn?".[534] This composition is addressed to his wife and was meant to convince her to return to Neapolis. In the first part he probably refers to persistent small-scale volcanic activity; by townsmen he probably means the inhabitants of Neapolis, since both Pompeii and Herculaneum were entirely buried. Interestingly, for the volcano he uses the term Vesuvinus, which is a peculiar hapax, because it recalls the wine production and specifically the Vesuvinum, a term attested archaeologically through inscriptions on amphorae. In the second part he clearly mentions the wine production in the Surrentine peninsula, the resettlement of the area with the villa of his friend Pollio, and the rebirth

---

[531] Moreno Soldevila 2006. The dating is pretty narrow and cannot be earlier, because Book III was composed in Forum Cornelii between 87 and 88.

[532] Martial 4.44: "This is Vesbius, green yesterday with viny shades; here had the noble grape loaded the dripping vats; these ridges Bacchus loved more than the hills of Nysa; on this mount of late the Satyrs set afoot their dances; this was the haunt of Venus, more pleasant to her than Lacaedemon; this spot was made glorious by the fame of Hercules. All lies drowned in fire and melancholy ash; even High Gods could have wished this had not been permitted them" (trans. W.C.A. Ker).

[533] The books from I to III of the Silvae are generally dated after 93 and before book IV, dated to AD 95 (Shackleton-Bailey 2003: 5).

[534] Stat. *Silv.* 3.5.72-74: "Non adeo Vesuvinus apex et flammea diri / montis hiems trepidas exhausit civibus urbes: / stant populisque vigent". 3.5.102-5: "caraque non molli iuga Surrentina Lyaeo, / quae meus ante alios habitator Pollius auget, / Aenarumque lacus medicos Stabiasque renatas" (trans. D.R. Shackleton-Bailey).

of Stabiae.

In the second poem – a verse-letter to his friend Vitorius Marcellus – Statius says: "So I sing to you Marcellus, on the Cumaean shores where Vesuvius spews out its wrath, part assuaged, whirling firebrands to rival Etna's flames. It is very hard to credit! Will the coming generation of men believe – when the crops return, when these deserts have turned green – that cities and people are crushed underneath and that our ancestors' fields have disappeared in such a great inundation? The peak has not yet ceased to threaten destruction. Let that fate stay far from your Teate and this madness not afflict the mountains of the Marruncini".[535] Apparently, this passage provides a quite different picture of the Vesuvian landscape. The differences can be explained in three possible ways:

- Statius provides different descriptions only for rhetorical purposes.
- Vesuvius' activity increased in AD 95.
- The two poems diverge only apparently.

I am inclined to support the third option, because the difference between the two passages is probably caused by the mention of Stabiae in the first and of the buried cities (i.e. Pompeii and Herculaneum) in the latter. From this perspective, it could be possible that – for rhetorical purposes and because of a stronger volcanic activity – in the first passage Statius focused on the recovered zones, while in the second he mentioned the still barren fields. If this hypothesis is correct, one can conclude that Stabiae, the Surrentine peninsula, and part of the volcano (Vesuvinus, north slope?) recovered and were cultivated, while the territories of Pompeii and Herculaneum were still barren.

Around one century and a half after the Pompeian eruption, Cassius Dio describes the volcano as still erupting, but its slopes are now clothed with trees and vines;[536] thus the agricultural production had recovered at some point between Domitian and Dio.

---

[535] Stat. *Silv.* 4.4.78-86 (trans. K.M. Coleman).

[536] Dio 66.21.3.

Land recovery and Imperial decisions provide the two extreme boundaries of human action, but they do not describe the actual use of the land, which is the result of individual decisions and other social and economic factors. With the following example, I provide a glimpse of the individual – and illogical (in the sense of strictly logical or economically-driven) – choice.

During the enlargement of a state road in the Nolan plain,[537] pre-79 cultivation furrows were discovered. According to the maps currently in use, the deposits of the Pompeian eruption should not have covered this area; nevertheless, 10-15 cm of tephra were found on the furrows (Fig. 111, cat. OTT003). The tephra was not thick enough to create any damage to the cultivation, especially considering that the Pompeian eruption occurred after the harvest and before the sowing times, therefore farmers could have easily removed the tephra – or even used it to improve the soil fertility – and restart the cultivation the following year. But in this case farmers did not return to the field until the 2nd-3rd century, as the potsherds in the upper contexts show. This example is not enough to produce a picture of what generally happened after the eruption; probably something similar occurred in other parts of the plain, but in my opinion this should be considered an exception, in view of the fact that both the good condition of the soils and the demand from the cities of Neapolis and Nola would have encouraged an early return to the fields. On the volcano's slopes the situation was worse, because the deposit was thicker and the recovery time longer. Indeed, even when the landowners survived, they probably had not enough capital for a 15-year-long investment. From this perspective, the role played by the *Curatores restituendae Campaniae*[538] appears crucial, as officials in charge of redefining the boundaries and eventually redistributing the land. Upon their arrival, many farmers would have preferred to sell their properties, which both senators and the Imperial family would have had an interest in acquiring. Maybe an indirect proof of this hypothesis comes from the newly discovered Imperial quarries of lava foam

[537] In the town of Ottaviano, neighbourhood Raggi, 107 m a.s.l. Two short reports are in Cicirelli 1998 and ead. 2001, but the information I provide comes from unpublished data.

[538] Suet. *Tit*. 8.4; Cass. Dio 66.24.3-4.

(*cruma di lava*), located on the north slope of Vesuvius and exploited mainly from the 2nd to the mid-3rd century AD for Imperial public buildings in Rome.[539] This kind of reasoning becomes even less speculative by close reading of the passages of Suetonius and Dio, where it is clearly stated that the commission was generating the income necessary to bring relief to the population from derelict property, and the only way to do it was by selling the abandoned properties.

In conclusion, the Pompeian eruption cannot be considered simply a catastrophe. Most of the vineyards were destroyed, but some sections of the land were only partially affected (e.g. the Nucerian territory and the Nolan/Neapolitan plain) or could have recovered very quickly. The highly affected areas could have returned to cultivation after 10 years, 15 to harvest new crops. The picture arising from the literary sources of this period supports the idea of a partial return to cultivation, while the areas of Pompeii and Herculaneum were still largely unexploited. Many factors prevented wine production from returning to the previous level:

- The disappearance of the previous landowners because they either died or were unable to sustain a long-term investment.
- The trends in the wine trade between the end of the 1st and the 2nd c. AD, which were disadvantageous for Italian products.
- The possible interest of the senatorial and Imperial classes in a different use of the land, as for example residential villas and quarries.
- The disappearance of the cities controlling the territories affected by the eruption, in particular Pompeii.

This picture is compatible with the data on Campanian amphorae production in the 2nd and 3rd century AD. As Arthur and Williams clearly pointed out,[540] the Dressel 2-4

[539] See § 3.3 for more details.

[540] Arthur 1995. In more recent articles, Williams (2004; id. 2005) ignored the post-79 evidence and used the traditional concepts of catastrophe and devastation to date the potsherds of "black sand" Dressel 2-4 found in India to the 1st c. AD.

wine amphora form continued to be produced in the late 2nd and early 3rd century AD. Nevertheless, in this period wine amphora production in Italy was characterised by the appearance of "regional" types (e.g.: Spello, Forlimpopoli, Santarcangelo di Romagna, Empoli, Calabria, Naxos). There were at least three fabrics in Campania, two of which – for the high percentage of volcanic inclusions – have been located tentatively near Neapolis and in the environs of Vesuvius.[541] The Campanian amphorae of the 2nd century are a derivation of the Dressel 2-4 and have been found in Ostia, Rome, and in Britain; further, Egyptian papyri of the 3rd century AD mention the import of Aminean wine, which was produced in Neapolis. But notwithstanding the wide distribution, the quantity of Campanian wine produced "had severely diminished", and "only a handful of kilns continued to produce amphorae".[542] From this perspective, Allison's conclusion – "there is no historical or archaeological evidence for a break in Campania's agricultural productivity or in the importance of the exportation of its products to the Roman world, which can be attributed to the destruction of one of its productive areas"[543] – sounds rather speculative and does not take into account some key aspects of agricultural production, which does not require only good, fertile land, but also a solid network of production and distribution in order to take off. The opportunity for the Vesuvian lands to restart after the eruption was certainly there, and the documentary evidence testifies to a standing market of the Campanian wines in distant regions of the Empire, but unless the entire manufacturing shifted to wooden barrels (which might well have been the case, as we will see in the next section), the evidence points to a significant shrinkage of the bulk production, while the export of high-end wines was still present.

In conclusion, it is my impression that the most significant effects of the eruption were on the system rather than on the lands; in AD 79 the economic system of

---

[541] For this latter production, I reject the term "Pompeian" used by Arthur, because it is used only to stress the high percentage of inclusions from Vesuvius, which does not necessarily coincide with the Pompeian territory. Moreover, the former Pompeian territory was probably attributed to other cities, therefore the term "Pompeian" is incorrect.

[542] Arthur 1995: 255.

[543] Allison 2002: 116.

production and distribution was somehow old-fashioned and inefficient, with a pervasive spread of small productive units with a high ratio of workers compared to the size of the estates (according to Columella 3.3.8 six slaves would have been necessary for the 42 iugera of vineyards at Villa della Pisanella, while the villa hosted 12-14 workers),[544] while more efficient productive units operated in the provinces. Yet the 'Vesuvian system' still had the advantage of a well organised structure and a distributive network which allowed small producers to sell even beyond the boundaries of the Empire. The eruption destroyed this system, both the bulk production that the many estates produced together and the trading facilities offered by the city of Pompeii. By contrast one could perceive the importance of the Roman city in organising the production of its countryside, if more information were available on the practicalities of transactions from the villa to the small boats in Pompeii, then to the large cargoes in Neapolis and Puteoli.

6.5. Land use after the Pompeian eruption

Traces of a prompt resettlement around Vesuvius are particularly conspicuous on the north slope. In San Sebastiano al Vesuvio (cat. SSV001), on the ashes covering the remains of a pre-79 villa, lay another building unfortunately explored only in a very small portion (Fig. 112). These later rooms (E, E1) sit right on top of a pre-79 *cella vinaria* (D), and in one of them (E) a *forum* (base block for the emplacement of the wooden orthostats - *arbores*) was discovered. This was interpreted by Cerulli Irelli, who conducted the dig, as part of a wine press, but I would rather link it with olive oil production, because in the environs of Vesuvius this kind of press is never associated with wine production and also because of the discovery of a complete *trapetum* one metre south of room E. Furthermore, by creating a new *torcularium* right above the older *cella vinaria* the new inhabitants could have made no use of the older *dolia*, which despite the destruction caused by Vesuvius to the old walls, were still in order for the must fermentation. The

[544] See next chapter for the calculation of people in villas.

creation of the new settlement has been probably carried out shortly after the Pompeian eruption, since no traces of a humified soil was discovered between the volcanic fill and the new building.[545]

The Roman villa with baths in Pollena Trocchia, località Masseria De Carolis (cat. PTR006) sits right above the ashes of the AD 79 eruption; the *sesquipedales* which form the hypocaust floor are marked with the stamp "DVODOM", dated to 60-93 d.C.[546] Although this represents just a *terminus post quem*, it makes this site the earliest know after the Pompeian eruption. Furthermore both between the AD 79 ashes and the foundation of the walls, as well as just underneath these ashes, there have been found sherds of frescoes, some of which have a decoration typical of the transitional style between the third and the fourth Pompeian styles; this suggests that somewhere underneath the site or in at least in the same area there was another villa before the Pompeian eruption.

In Ponticelli, a neighbourhood at the south-eastern fringes of Napoli, two villas - one built before the Pompeian eruption, the other after it - and a late antique cemetery are set just a few metres apart from each other (Fig. 113).[547] The pre-79 villa (cat. NAP018, Fig. 114) follows the standard configuration of the large villas near Pompeii, like the Villa of Asellius (cat. POM002), since it is provided with a *torcularium* with underground room;[548] the main business consisted in the wine production. The seal found *in situ* made the archaeologists state that the owner was a *C. Olius Ampliatus*. The post-79 villa (cat. NAP003, Fig. 115) is dated through the pottery remains to the 2nd c. AD and was inhabited until the AD 472 eruption. The rooms have been categorised, following the

---

[545] In the report Cerulli Irelli mentions also one sherd of late 1st c. AD *terra sigillata*, which obviously is just a *terminus post quem* and is chronologically unusable without the complete dataset.

[546] Bloch 1947: n. 267.

[547] The information available on these sites is rather scant, the later villa has been excavated only partially in 1985, when parts of it were already destroyed by the work of the *camorra*; the results were published by Paul Arthur in the form of a succinct report (1 page of text) in an issue for the general public. The earlier villa was identified in 1985 but has been excavated (with rescue archaeology standards) a few years ago. The results of the latter activities have not been published yet, I gathered the information from Sergio Cascella, who led the dig and kindly helped me.

[548] As in Villa della Pisanella and in Villa of the Mysteries; this type is typical of the surroundings of Vesuvius.

vertical stratigraphy, into six construction phases. The main working areas have been interpreted as facilities for olive oil production (rooms A17-A18). The nearby necropolis consists of 58 graves which cover an ample timespan.

The scant clues available hint at a partial abandonment of wine production which is replaced by olive oil, necessarily used for micro-regional consumption. This hypothesis fits well with the proposed model of a systemic collapse of the *châine opératoire* related to the wine business, the results of which might have encompassed a more varied and patchy economic landscape, in which portions of the land remained abandoned, others were resettled in a smaller scale for the supply of the local market, others might have reflected new investment on a larger scale. This hypothesis is confirmed by the architectural remains (more sites will be presented both in this chapter and in the next one),[549] but the lack of ecofacts does not allow any guess at the ratios among cultivations, thus on what kind of agricultural economy was taking place in the 2nd c. AD.

The volcanoclastic deposits of the AD 472 eruption provide a richer dataset for late antiquity. The rather depressing scenario described by the documentary evidence, i.e. the unproductiveness of most of the plain (see §2.4), is somehow confirmed by the abandonment of some houses in the city of Nola,[550] but it conflicts with other archaeological evidence, at least in the very few spots documented during rescue archaeology digs. Indeed along the new high-speed train route, in the territory of Neapolis, and along the new enlargements of the state road at the fringes of the territory of Nola, several traces of ploughing furrows have been discovered (Fig. 88).[551] In one instance, also tree holes have been found;[552] in another case, interestingly in the plain

[549] Possibly along these lines should be read also the presence of a *lucus* dedicated to Iuppiter (oak forest?) near Herculaneum, in Torre del Greco, in the late 2nd c. AD (see Pagano 1993).

[550] In via Morelli (cat. CIM004) and via Polveriera (cat. NOL025, see Albore Livadie 1998).

[551] Cat. SGE006, CNN001, SAN016, SAN019, AFR006, CIM002.

[552] Cat. AFR015.

near Acerrae, remains of vine pruning were discovered.[553]

In mid-4th c. AD, while part of Nola and some villas in the countryside started being abandoned (cat. PTR006, TAU004), in larger villas the *partes urbanae* were being converted to *partes rusticae*. This is particularly evident in the villas of Lauro (cat. LAU001) and Somma Vesuviana (cat. SVE014). The villa of Lauro, località San Giovanni del Palco (Fig. 116), originally covered a much ampler portion of the hill; the villa itself was on the topmost terrace where now a church lies, while its baths have been excavated in 1985. These were built under Tiberius and were subsequently enlarged. In the mid-4th century at least the lower terrace was converted to agricultural production: in room 18 the original pavement was replaced by cocciopesto, while the sizeable *nymphaeum* (29) was partially obstructed by a wall in order to create a *torcularium* (rooms 27-28). The press itself is characterised by a *forum* in limestone, an *area* (press bed) in cocciopesto,[554] and a cut in the limestone bedrock to accommodate the counterweight (room 26). The identification of this press with one for the olive oil production is further encouraged by the presence of two *trapeta* in these rooms. Both in the rubble deposits of the earlier phases of this site, and in all the farmhouses of this valley, there were found *dolia* of *cellae vinariae* of the 1st c. AD, thus the presence of a sizeable oil press (rather than one for the wine) might be a sign of a more general switch of this valley and the other hills of the Apennines to olive oil production.[555]

The villa in Somma Vesuviana, località Starza della Regina, has been excavated only partially. What is currently visible encompasses 9 rooms on three terraces and can be

[553] Cat. MRG001. The faunal remains discovered during the excavation consist of 3 cut branches of vines and 2 smaller fragments of downy oak (*Quercus pubescent* Willd.; see Buonincontri 2011). During the dig some samples of charcoal have been collected as well, but unmethodically. The list of the identified fragments lacks any quantification and stops at the genus level. It encompasses: alder (birch?), fraxinus (ash?), oak, *Rosaceae prunoideae*, willow, elm, vine (Ciarallo 2011: fig. 4).

[554] Room 27. From the *area* a small channel in cocciopesto departs towards room 28, where likely were the vats for the oil decanting.

[555] The earliest documentary evidence (10th c. AD) available for this area and the other hills north of Nola testify to oil and hazelnuts as the main products; this trend continued throughout the centuries until today. It is my impression that these lands, characterised by a thin humified soil on top of a limestone bedrock, are better suited to olive groves than vineyards. A working hypothesis is that - like for the marshy plains of Pompeii - this area participated in the large wine business until the system collapsed.

interpreted as the monumental entrance of a villa (fig. 117). In mid-4th century the site underwent several changes to become a large production unit. Part of the mosaic floor in room 1 (Fig. 118) was replaced by cocciopesto with low kerbs, in the SW corner of room 4 an oven was set, room 2 was divided into two parts, the eastern one was used as stalls (because of the presence of both postholes and a manger in *opus caementicium*), while the western one was converted to storage room.[556] In room 8 some wine presses were placed and channels were cut in the pavements of rooms 6 and 7 and along the walls in order to bring the juice of the grapes to the *cella vinaria* set in the lower terrace (12). Currently a small portion of the wine cellar has been uncovered, only one fourth or even less (Fig. 119). Interestingly, the *dolia* are marked with stamps of the 1st c. AD,[557] thus they were probably brought here from an earlier cellar. In my opinion, the motivation to undertake such a radical change to the building can be found in Palladius (1.18), where a late antique *torcularium* is described in detail. Palladius' *torcularium* is different from the previous ones in terms of a few elements, like the presence of the *calcatorium* (treading floor) at a much higher level ("like in a basilica") and the area given over to the wooden barrels, characterised by a cocciopesto floor, low kerbs, and an outgoing pipe to recover the wine, in case one of the barrels bursts. In considering the existing reconstructions of such a *torcularium* rather unlikely,[558] I have created an alternative model starting from the text (Fig. 120). The superimposition of this model onto the site of Somma Vesuviana (Fig. 121) proved to be not only to be a good fit, but also useful to understand the usage of the cocciopesto area with low kerbs in room 1. And indeed, hidden by some debris in the NE corner of the room we have discovered a pipe leading to the channel in the lower terrace; furthermore, the complete sampling of the deposits on that cocciopesto revealed the presence of many fragments of carbonised wood, resins, and pitch. The need to move the earlier *cella vinaria* to this new location can be explained by the necessity to have barrels

[556] Along the western wall some holes were created in the mosaic pavement to allocate some *dolia*, which at the time of the eruption contained remains mostly of olives and walnuts.

[557] CN AEVI / MYSTICI (CIL 10.8333.3); C IVLI / CRISPI (CIL 4.10788); L LVCCEI /PROCLI.

[558] See Plommer 1973: fig. 1.

and presses at a higher level than the *dolia defossa*, in order to facilitate, through channels, the filling of these containers during the vintage. This arrangement of pipes and channels is a common feature of many Vesuvian farmhouses also in the 1st c. AD (Villa della Pisanella among many others), as in this case the terraces are at a considerably higher level and an area is reserved for the barrels. The need to minimise the time between the harvest and the creation of the must is the major concern among ancient and modern wine-makers, because the grapes decay very quickly after the harvest, thus the crushing needs to be carried out within a few hours. This system is therefore especially required in cases of very large vineyards like in this case, where - considering the capacity of each *dolium*[559] and presuming that the entire cellar is at least 4 times wider than what is currently visible (as can be assessed by the channels) - one can calculate that the minimum quantity of wine here produced was similar to that of Villa della Pisanella or Settefinestre (which are the largest ones known in Italy). Furthermore, the presence of wooden planks, pitch, and resins in an area framed by low kerbs in cocciopesto and connected to the channels suggests that barrels - rather than amphorae - were used to transport the wine. This little discovery is of twofold importance, because it proves not only the existence of a sizeable winery in the environs of Vesuvius in the 5th c. AD, but also that at least part of the wine here produced was traded in wooden barrels. This forces us to reconsider the problem of the wine production in late antique Italy entirely.

The general impression gained from the scant evidence available for the AD 472 eruption points to an agricultural economy which differs considerably from what I have advanced for the half of the 1st c. AD. In particular, signs of economic stress are noticeable in all sites, including the ones in which a substantial agricultural activity was still in place at the time of the eruption. Smaller villas were in the process of being abandoned, larger ones changed the function of their lavish rooms. In this perspective

[559] Each of these *dolia* contains 1,500-1,600 lt. of wine, 16 *dolia* have been discovered so far, one of the two channels departing from the presses in room 8 lead westwards beyond the stairs, clearly to the other half part of the cellar. The eastern section encompasses 8 columns and at least 4 rows.

the eruption can be considered a sort of snapshot of the transition towards the Middle Ages, between the dismantling of an economic and social system and the creation of a new one.

This impression is further confirmed when examining the ecofacts from the villas in Somma Vesuviana and Pollena Trocchia, the only ones systematically sampled and analysed for this time period around Vesuvius. The charcoal remains from Somma Vesuviana show the prevalent use of chestnut for both timber and fuel;[560] the beams of the collapsed roof are almost entirely made of chestnut (in one instance manna ash was used for the smaller beams, in another silver fir), while in the fuel remains the chestnut goes beyond 50% in almost all contexts. The other species used for fuel are beech (which is also the main species found still in place in an oven, while the rest are from waste residues), olive, and hazelnut; other species are generally below 10% and on average between 1-2% in each context.

Chestnut is one of the few species Vitruvius does not suggest for construction, thus its abundant use in this site has been associated with the possible presence of a large chestnut forest nearby.[561] It is the general opinion among archaeobotanists that chestnut was introduced in the Italian peninsula during the Middle Ages, when it became a cheap substitute for grain to make flour. Nevertheless, in both Pompeii and Herculaneum chestnut is attested (although only in small percentages), but there is evidence of its use for stakes in two farmhouses[562] and Pliny mentions a sizeable estate, in which the Roman knight Corellius and his freedman Tereus had a quite specialised chestnut cultivation, because they invented two new varieties, named after them;[563] this seems to imply that the chestnut played a certain role in the food economy, although most likely it was used for animal feeding, pigs in particular. Unfortunately the lack of pre-79 ecofacts from the

[560] Allevato 2012.

[561] Di Pasquale 2010.

[562] Villa of Agrippa Postumus at Boscoreale: an inscription (CIL IV 6887) refers to 1023 chestnut poles. Villa at Boscoreale, in the property of Antonio Prisco: an inscription (CIL IV 6886) with 1300 chestnut poles.

[563] Plin. *N.H.* 17.122.

north slope of Vesuvius (or of post-79 ecofacts from the southern slope) prevent us from understanding whether this species was widespread just on the north slope before 79 or whether its cultivation increased all around Vesuvius after the Pompeian eruption.

The dataset from Pollena Trocchia (Tab. 8) provides a useful term of comparison for the charcoal remains in Somma Vesuviana.

Taxa	Timber	Fuel	Unclassifiable	Total	Leaves
Ostrya/Carpinus	5.95	1.8	20.49	**28.24**	✓
***Carpinus* spp.**			0.31	**0.31**	
***Fraxinus* spp.**	0.6	0.65	2.75	**4**	✓
Ulmus		0.41	0.61	**1.02**	✓
Salix/Populus	0.6		0.31	**0.91**	
***Quercus* (decid.)**	19.64	4.49	10.4	**34.53**	
***Quercus* (sempr.)**	2.38	0.16	13.46	**16**	
Corylus avellana	5.36	0.98	1.22	**7.56**	✓
Castanea sativa	21.43	7.67	17.43	**46.53**	✓
Juglans regia		0.98	1.53	**2.51**	✓
Olea europaea	1.19	5.14		**6.33**	
Vitis vinifera		2.45	1.83	**4.28**	
Ficus carica		1.06		**1.06**	✓
Maloideae	2.98	1.22	0.92	**5.12**	✓
***Prunus* spp.**		1.14	1.22	**2.36**	✓
Prunus* sp. *Avium-mahaleb	0.6			**0.6**	
Rhamnus/Phillyrea		0.82		**0.82**	
unidentifiable	12.5	21.06	27.52	**61.08**	

Table 8 - Percentages of identified species and carbonised leaves from Pollena Trocchia. Taxa are sorted by altitude.

The samples from Pollena Trocchia have been collected from contexts belonging to the last phase (end of the 4th to AD 472), and have been sampled more systematically and thoroughly than in Somma Vesuviana.[564] Furthermore, the analysis of the charcoal remains is here complemented with a list of the carbonised leaves discovered in the volcanic debris of the AD 472 and 512 eruptions. The majority of the contexts have been

[564] The charcoal fragments analysed in Pollena Trocchia total 2837, those from Somma Vesuviana 1821. From each context there have been sampled 20 litres to soil.

interpreted as the result of dumping activities and mudflows, thus the uncertainty - for most of them - of whether to assign the charcoal to either timber or fuel. In the contexts where this difference is more noticeable, chestnut (Fig. 122) and oak are the most frequent species, while hop-hornbeam/hornbeam and hazel are frequent among timbers, olive tree among fuels. Overall almost all species identified grow in the plain and on the lower hills, thus are compatible with the environment around the site. This impression is further substantiated by the evidence from the carbonised leaves (Fig. 123), because the species identified are encompassed in the list of those for which there are charcoal remains.

A more general comparison between the species identified on the two sites on the north slope of Vesuvius (Tab. 9) shows a similar pattern, which probably reflects the species available at that time on the slopes of Vesuvius. The most noticeable difference consists in the absence of silver fir and beech in the dataset of Pollena Trocchia; following the scheme outlined for the 1st c. AD it seems likely that these species were imported from the Apennines, thus their absence in Pollena Trocchia might reflect a lower purchasing power at this site. Similarly, the use of fig branches in Pollena Trocchia is a clear sign of the need to burn all sorts of wood available in the closest proximity, because the fig's sap is toxic and the burning of its branches produces much smoke, thus its use as fuel is commonly avoided. In conclusion, the data from these two sites on the one hand offers a view on the species available locally, on the other a sign of a patchier pattern of use, which seems to be more hierarchical and closer to the Middle Ages than to the 1st c. AD.

Taxa (sorted by altitude)	Timber		Fuel		Unclassified	
	Pollena Trocchia	Somma Vesuviana	Pollena Trocchia	Somma Vesuviana	Pollena Trocchia	Somma Vesuviana
Abies alba		x				
Fagus sylvatica				x		
Ostrya/ Carpinus	x		x	x	x	
Acer spp.				x		
Fraxinus spp.	x	x	x	x		
Ulmus		x	x	x		
Quercus (decid.)	x	x	x	x	x	x
Quercus (semp.)		x	x	x	x	x
Salix/Populus	x			x	x	
Corylus avellana				x	x	
Castanea sativa	x	x	x	x	x	
Juglans regia		x	x	x	x	
Olea europaea		x	x	x	x	x
Vitis vinifera			x			
Ficus carica			x			
Maloideae cf. *Malus*						x
Prunus spp.			x		x	
Maloideae	x		x	x		
Coniferae/Pinaceae		x				x
Rhamnus/ Phillyrea			x			

Table 9 - Ubiquity chart of the species found in Pollena Trocchia and Somma Vesuviana.

7. Site distribution and settlement pattern

7.1. Site Classification

7.1.1. The creation of the archaeological map

Rather than an accurate snapshot of settlement patterns over a region, archaeological maps are pictures of what is recorded according to the circumstances of preservation and the methodology applied in the survey. In these regards, the territories of Neapolis and Nola differ considerably from other areas where regional studies have been carried out, because in this region natural phenomena and human activities have significantly altered the landscape and destroyed most of the archaeological evidence; therefore systematic field surveys in this region cannot be conducted. Landscape change (e.g. variations in the size of the marshes, volcanic fills and cuts) is described in the previous chapters, while this section focuses on gaps and distortions encountered in recording the architectural remains. The major loss of data stems from two millennia of settlement overlay and sixty years of post-war urban growth. Since antiquity, this region has been densely inhabited and life continued in the same places throughout the Middle Age, therefore traces of antiquity were either included in new buildings or spoliated. Many instances of these activities are quite evident in Naples (e.g. the theatre, Fig. 124) and in Nola, for which also a substantial body of texts and drawings from the 16th century is available. The situation is more complex in the countryside, where only rarely have discoveries or spoliations been recorded. Noblemen occasionally discovered sites and artefacts in their countryside estates and brought them to their villas in Naples, where unfortunately they were mixed with other acquired antiques of unknown provenance. The most notable case is the 18th-century collection of Greek vases of Felice Maria Mastrilli, who built his collection mostly – but not solely – on the discoveries made in his estates in Nola, where some necropoleis of the ancient city lay (Fig. 125).[565] Similarly, in the past century Senator Santangelo acquired a remarkable set of antiques – from Greek

[565] Lyons 1997; Napolitano 2005; Lyons 2007.

vases to Roman sarcophagi, which still today constitutes one of the largest collections in the National Archaeological Museum in Naples. Although most of his collection came from the antiquarian market, a few items were collected in Pollena Trocchia, where he owned a lavish villa in which the artefacts were displayed. In this case – and similarly in the other occurrences of antiquarian collections – I tried to trace the provenance of the items through the records in the Superintendency and, in this specific case, also through the documents of his friend, the Count Caracciolo di Torchiarolo, who mentions these artefacts in his amateur book on Pollena Trocchia.[566]

Many Roman columns, statues, and inscriptions are still visible in private villas and churches. Though in my notes I have recorded the evidence and included most of it in the database, these items have not been plotted in the archaeological map. It is impossible to trace the exact provenance of these *spolia*, although in some cases (e.g. lava column drums) a local origin is unquestionable. For example, the Romanesque church of Santa Maria del Pozzo, which was built above a Roman cistern and *cella vinaria* (cat. SVE016), is decorated with a coherent set of Roman columns and capitals on the façade. In this case the columns probably come from the *pars urbana* of the villa underneath. Something similar might have occurred in Lauro, where the church of San Giovanni in Palco is set on a terrace above some Roman baths, which pertain to a residential villa (cat. LAU001). This hypothesis is confirmed by an indirect clue: in the church (1880s) of the nearby Lancellotti castle a painting depicts the spoliation of columns from a Roman villa for the creation of the church of San Giovanni (Fig. 126).[567]

A further issue to address is the loss of data for areas in which urbanisation has increased considerably in the past fifty years and especially during the economic boom of the 1980s and 1990s. In those years the city of Naples swallowed up the neighbouring villages, and currently it encompasses circa three million inhabitants. The entire province suffers from very high population density - the highest in Europe with 2600 p/

[566] Caracciolo 1932.

[567] The modern discovery of the baths in the lower terrace occurred one century later, in the 1980s.

km^2,[568] in particular in the belt between Mt. Vesuvius and the sea, where in Portici it is the highest in the world (12,311 p/km^2). The situation is less acute on the north slope of Vesuvius, where on average it is 1350 p/km^2 nevertheless. Population density decreases as one moves further away far from Naples, in the area which roughly corresponds to the ancient countryside of Nola. Here the land is sizeable, the plain was intensively cultivated until 20 years ago, and the Apennines do not facilitate a dense settlement pattern. Nevertheless, in recent years a vast area was built up with a business-to-business trade centre (CIS, Fig. 127) and several shopping centres.

The expansion of built-up areas prevents any field walking in the plain near Naples (Fig. 128). Currently the plain around Nola mostly consists of orchards, the soil is rich in nutrients, thus thick and compact; I have surveyed the field in several places, mostly near archaeological sites, but no archaeological remains were visible. Archaeological sites are more easily detectable on hill slopes and the edges of natural terraces, where heavy rains occasionally reveal almost full-standing Roman walls (Fig. 129). For these areas nevertheless, both on the Somma-Vesuvius complex and on the Apennines, in most of the cases the volcanic fill is too thick to reveal anything on the surface (see §4.3).

When a new site is discovered during the construction of a building, most of the times the contractor – often an affiliate of the Camorra or in close agreement with it – hides the discovery of the archaeological site by destroying it. In many cases nothing remains of the site, either destroyed or covered with cement. This is the case for an Augustan building, probably a temple (Fig. 130, cat. NOL004), which was discovered during the excavation of a new elementary school at the border between the towns of Nola and Ottaviano. Following the rumours which still circulate among amateur historians, I have identified one of the workers who operated at the site and photographed the only preserved capital (hidden in a garage) of the 4 columns originally discovered. Similarly, the Oscan inscription discovered during the exploitation of a quarry (Figs. 131-2, cat.

[568] More than 4 times the density of the province of Rome (778 p/km^2); this is rather astonishing considering that the size of the entire province of Naples (1,171 km^2 islands included) is smaller than the city of Rome alone (1,285 km^2).

SAN007, see also §4.3) was kept in the backyard of one of the workers.[569] After this discovery, a photo of another cippus with the same inscription (and probably coming from the same site) was sent to me anonymously (Fig. 133).

In the rare cases in which the Archaeological Superintendency is summoned, a company of professional archaeologists is hired by the commissioner to carry out the fieldwork. By law the Superintendency (i.e. its official) retains the intellectual ownership of the archaeological data, which generally are not studied or published. Furthermore, the data collection generally consists only of artefacts, while ecofacts and archaeozoological remains are ignored. For the most important discoveries in Campania, a brief report is provided in the annual Magna Grecia conference proceedings, where nevertheless the generic localisation of the sites never allows map plotting. This situation is slowly improving, thanks to a recent regulation by the Ministry of Culture, according to which both public and academic excavations must submit an annual report (with geographic coordinates) to Fasti OnLine.[570] In the case of larger State-funded excavations, like those for the public transportation in Naples, thorough research is carried out and, thanks to the surveillance of a skilled official, the results are published at regular pace. Records of other discoveries are scattered among publications of amateur historians, where generally accurate localisations are not provided.

This general picture considered, my approach towards the search for archaeological sites, and especially towards their localisation and inclusion in the GIS, was necessarily multiform according to the nature of the available evidence. Data have been collected from the Spanish excavation diaries of the Bourbon period to the latest articles, from the amateur books by local historians to datasets recorded in various archives and media

[569] Subsequently, I acted as intermediary between the owners, the officials of the Superintendency, and the Revenue Guard Corps to return these artefacts to the State and make sure that they would be on display in the Archaeological Museum in Nola. Quarries on the slopes of Vesuvius have been the first factor of destruction of archaeological sites; they were owned by the Camorra, which extensively exploited the land in the 1980s and 1990s. I have plotted only the sites for which objective evidence (photos or artefacts) were available, though in many other cases the information provided by the local sources seemed equally reliable.

[570] www.fastionline.org

(paper diaries and reports, photos and maps, entries in databases) stored in the Superintendencies. The information gathered in this fashion has been thoroughly verified in the field and artefacts have been studied independently from the interpretations provided by the excavators/collectors.

Field survey and localisation of sites took much effort, considering the fact that 80% of the sites had no precise localisation[571] and that the remaining 20% were plotted on 1:25,000 maps. A more accurate positioning of the sites through GPS positioning was necessary - and I carried it out - to understand the topology of each site, in particular whether each of them was on a hillock rather than in the adjacent gully, or the relationship of each site with the centuriation grid. Some areas required multiple sessions of fieldwork, either because contingent factors impeded or favoured accessibility and visibility or because the access to new written and oral sources required further research in particular spots. When possible (i.e. in all instances apart from where a site was destroyed by a quarry or covered by a modern building) I have also carried out systematic field walking (with 3 m. spacing between walkers) in the area where the site lay, i.e. in the entire property and in the neighbouring ones. For the town of Pollena Trocchia, I organised more systematic field walking with the help of 15 undergraduates in archaeology.

Where the exact location of a site could not be traced in the field, I used the cartography contemporary to the period of discovery, from the Bourbon map dated to 1830 to more recent cadastral maps stored in the register of property. This painstaking work has been proved of particular use for sites of special interest, as in the case of the "Samnite" necropolis in Ponticelli (cat. NAP001), in the outskirts of Naples, for which no precise localisation was provided at the time of the discovery (early 20th century) and for which also the current Superintendency official is unaware of the precise location.[572]

[571] The reference to the position of the site is commonly made only through the mention of the "località" (a portion of a town which is identified by the name that the locals give to it, mostly through the presence of a farmhouse – Masseria – or a river, or other notable things); although the most prominent "località" are recorded by the Army in their maps, their size and perimeter is variable and therefore it is not plotted.

[572] Giampaola 1985: 300.

Among other things, the localisation of this site has been useful to prove the absence of marshes in this part of the plain in antiquity.

Due to the volcanic fill, the evidence from the field mostly consists of artefacts from the last phases before the AD 79 and AD 472 eruptions, therefore it excludes pottery of the 2nd or 3rd century AD. Obviously this generalisation does not apply to burials, for which a wider chronological spread is attested, from the late 6th century BC to the 5th century AD.

In total, 820 sites have been plotted in the GIS, 506 of which[573] have been included in the gazetteer and used for discussion; the northern half of the volcano encompasses 263 sites. Some of these sites are located in the boundary between cities and in the outskirts of other cities (e.g. Abella and Acerrae); they have been included as useful comparanda for the sites within the territory under investigation and to define its borders. A rapid examination of the archaeological map (Fig. 134) shows ample stretches of land with very few sites, in particular in the territory of Neapolis – east of the river Sebethus – and in the south-western quadrant of the territory of Nola – north of the Augustan aqueduct. In the first case the lack of information is clearly caused by the urban growth of the city, therefore the data are irreparably lost; in the second case, there are still some untouched patches – mostly orchards – where some targeted ground-penetrating radar might produce new evidence. In both cases, the lack/loss of data is partially balanced by the extant remains of the centuriation grids, which are discussed in the next sections. The map also shows two particular alignments roughly at the springs of the river Sebethus, the first running north-south, the second running east-west. These correspond to some of the trenches carried out during the construction of the new railroads for the high-speed trains and provide a snapshot of how much is lost in some built-up areas or still potentially available in cultivated lands. In the case of the new railroads, the available information consisted of a very short description (a few lines) for each of the trenches, which correspond to the cement pillars of the railroad rather than to individual sites.

[573] These sites are in territories outside the territories under enquiry.

Therefore from the data available I have selected the trenches in which there was significant information to plot, like a burial or traces of cultivated land or remains of tracks/roads/centurial axes. The northern slopes of the volcano show a tighter pattern and a higher number of sites, together with some patches of land with no archaeological evidence. In this case as well, the evidence can be misleading, because the higher number of sites is caused by the thorough field research I carried out, scantier modern buildings, and a higher visibility of sites on top of hillocks and on terrace edges. The lack of information can also be explained by the destruction caused by modern quarries and natural changes triggered by eruptive and post-eruptive events, as amply described in chapters 3 and 4.

7.1.2. Definitions

The evidence recorded in the map does not include *spolia* or scattered sherds which might be considered the "background noise" of a site. The evidence has been divided into categories, which are defined empirically – i.e. through a bottom-up approach – in order to keep the richness of the data, to balance the evidence with its interpretation, and to allow a good readability of the map through the definition of a relatively small number of symbols. Therefore these categories do not correspond to typologies of sites, but rather to typologies of evidence, which in some cases (e.g. a Roman wall at the edge of a terrace or found during the creation of a new building) are vague and cannot be forced into a more specific category. The categories include also two separate entries for farmhouses and residential villas; although the evidence from the fully excavated sites in the Pompeian region as well as the results from the field survey on the north slope of the volcano clearly show that the boundary between the two categories is blurry, rather arbitrary, and mostly a modern invention, nevertheless I preferred to keep both, taking into consideration that some units were used mostly for agriculture (e.g. Villa Regina at Boscoreale), while others were furnished also with a lavish *pars urbana*. A more detailed description of the categories is provided below.

Farmhouse: archaeological data – built rural structure with evidence of agricultural activity (dolia fragments, press blocks, etc.). In some cases, though there were no remains of built structures, a high concentration of dolia with other agricultural artefacts has been considered sufficient for the identification of the site as a farmhouse. In the cases in which there were also fragments of wall and pavement decoration (e.g. mosaics tesserae, fragments of frescoes, etc.), the site has been considered as a residential villa with *pars rustica*. Interpretation – agricultural establishment for the residence and labour of a family.

Residential villa: archaeological data – built rural structure with evidence of a richly decorated residential area (e.g. mosaic tesserae, fragments of frescoes, etc.), which might include also evidence of a *pars rustica* (dolia fragments etc.). Interpretation – residential estate, often with a productive area.

Baths: archaeological data – built structure with evidence of a heating system (*praefurnium*, hypocaust floor, *tubuli*) and no traces of a residential area. Interpretation – bath complex.

Burial: archaeological data – built structure clearly identifiable as a *columbarium* by its typology or fragments of decorated tufa slabs (so-called "Samnite tombs") or a skeleton intentionally buried underground, either directly in the earth or in any sort of tomb, e.g. *amphora* and *a cappuccina*. In the cases in which the burials are only a few and are adjacent to a residential villa or a farmhouse, the evidence is categorised as residential villa or farmhouse. Interpretation – burials are proxies either of a residential unit (farmhouse or residential villa), or of a main road, often of both. Many clustered burials form a necropolis, which is a proxy for clustered residential units (hamlets, villages, cities).

Waterworks: archaeological data – built structures which are used to store or convey water. In the cases in which the structure is in close proximity to a farmhouse or a villa, it is categorised as farmhouse or villa. Interpretation – according to the evidence, either a

cistern or an aqueduct or a drainage channel.

Other buildings: archaeological data – built structure, mostly just a portion of an extant wall, for which the accidents of its burial or discovery do not allow the identification of the original kind of building of pertinence. Interpretation – any of the categories mentioned above.

Road: archaeological data – a paved road or a pathway, which along its path might include inscriptions or funerary monuments. Interpretation – either a road, or a countryside path, or an axis of the centuriation grid.

Inscription: archaeological data – an inscribed stone for which the accidents of its burial or discovery do not allow the interpretation of its context. Interpretation – according to the message inscribed, the inscription can be used as proxy for a road (milestone or funerary monument), a villa (funerary monument at the edge of the property), a property boundary or a centuriation node (*cippi*).

Cultivation: archaeological data – ploughing furrows, carbonised trees or tree holes, covered by volcanic ashes. Interpretation – cultivated land.

Other categories include the remaining evidence which is not included in the groups listed above. Apart from one single quarry, attested under the church of Santa Maria del Purgatorio (cat. NAP001) near the Poggioreale prison in Naples, the other evidence consists of four discoveries of columns and capitals in primary contexts (only in one of these cases is it clearly referable to a temple), and 23 occurrences of large quantities of pottery sherds, mostly discovered in the territory of Pompeii during the creation of new wells, therefore with no clear indication of the context, though considering other similar cases in the same region – for which a larger excavation took place – they probably refer to either a farmhouse or a necropolis.

7.2. Modes of settlement

Although the sites recorded in the territories of Neapolis and Nola are many (263), of these only 12 were fully excavated and 20 were partially excavated, while the rest were

investigated through small trenches (rescue archaeology) or were exposed in minimal part (accidental discoveries and field survey). Therefore the importance of the overall data mostly resides in the topology of the sites (for the settlement pattern and land exploitation) and the evidence from the pottery (brickstamps, archaeometric analyses of the fabrics, and shapes of vessels in coarse ware), which is useful for the study of local productions and trade patterns, while the data are insufficient for a typological study of the buildings. This section focuses on the higher resolution data (i.e. the sites which were fully or partially excavated) in order to provide – through *exempla* – some insights into the modes of settlement and the population and it covers the territories of Neapolis and Nola solely.

7.2.1. Pre-Roman sites

The evidence of pre-Roman settlements is rather scant (only 33 sites, Fig. 135) and it mostly consists of burials/necropoleis (20 sites), for which the traditional definition of Samnite or Hellenistic, although artistically correct, can be misleading if strictly read as a chronological or ethnic marker.[574] Within the framework of this research, these burials are important for their position, the scale of clustering, the characterisation of the burial goods for defining economic aspects such as trade patterns, average richness of the communities, and social structures.

In these regards, the most important necropolis is north-east of Naples, in the neighbourhood of Ponticelli, località Purgatorio (cat. NAP001). The site is located at the feet of the Capodichino hill (85 m a.s.l.), in antiquity it probably lay very close to the western bank of river Sebethus,[575] 5 km north-east of Neapolis. On the same axis (probably a road to Nola), at midway from the city (2.11 km), there was a tufa quarry with Greek inscriptions (cat. NAP007). The necropolis was discovered at the beginning of the 20th century and was first published by Giglioli in 1922, unfortunately with no map or

[574] One should bear in mind that towards the end of the 4th c. BC both Neapolis and Nola were already under the political power of Rome, thus the problem of how to label the burials of the 3rd c.

[575] Considering that until the last century that area was marshy. Giampaola (1985: 302) incorrectly states that the river separated this site from Neapolis.

clear contextual information, i.e. the pertinence of the goods to the tombs excavated. In 1985 Giampaola[576] re-examined the evidence and identified the contents of most burials. The available information about the context is scant; the 1920s archive documents briefly describe a small portion (0.70 m wide) of a tall wall (2.20 m) in tufa blocks, which likely was part of the boundary wall of a settlement adjacent to the necropolis.[577] In total 111 tombs were discovered, among which 51 were chest-tombs with flat lid, several *a cappuccina* tombs, some incineration vases dated to the end of the 4th c. BC, while the remaining ones consisted of a simple cut in the ground; artefacts date the necropolis from the middle to the end of the 4th c. BC. The tombs whose datasets have been recovered show a standard set of Campanian (i.e. made in Capua or Neapolis) black-glazed vessels (*skyphos*, *kylix*, small cup, small jar, *askos*, *lekythos*) combined with a common-ware storage amphora or *stamnos* (Fig. 136). Other tombs, with coarser pottery, have a spear head, which in three cases is paired with a *strigilis*. Apart from these latter cases, for which a higher status and a connection with both the 'indigenous' culture and the Greek habits of Neapolis has been argued,[578] overall the tombs have similar shape and contents, thus a homogeneous social status has been suggested. Furthermore, by stressing the differences with the tombs in Neapolis and the similarities with other necropoleis in inland Campania,[579] Giampaola argued that the Neapolitan countryside was inhabited by Samnites.[580] Although a certain similarity with one of the inland necropoleis is indubitable (Fig. 137),[581] nevertheless others are quite different from the Ponticelli one (mostly because of the high percentage of Attic and Campanian painted

[576] Giampaola 1985; Giampaola – d'Henry 1985.

[577] The documentation and preservation of the archaeological remains began after considerable parts of the site had been already destroyed.

[578] Giampaola – d'Henry 1985: 281.

[579] For Neapolis, the necropolis at Castel Capuano; for the inland centres, the necropoleis of Qualiano, Giugliano, some of the tombs in Caivano, Capua, and the necropolis in Cuma which was set after the Samnite conquest.

[580] Giampaola – d'Henry 1985: 283: "Questo conferma quanto è stato più volte notato, cioè che non è Neapolis ad occupare il suo immediato retroterra, ma che al contrario è pressata da insediamenti di genti di cultura diversa, che da poco prima della metà del IV secolo occupano densamente la campagna".

[581] See for example the tomb 96 of the Qualiano necropolis.

vases) and more similar to those in Neapolis.[582] Also storage amphorae in common-ware, which have been interpreted as containers for funerary offerings and cultural marker of the 'indigenous'/Samnite community, are absent in most of the inland necropoleis.

By adding more comparative data from Neapolis and Nola, I would rather suggest that the Neapolitan countryside has common features with both cities, while keeping a specific character. Indeed the storage amphora in common-ware is attested in at least one tomb in Neapolis,[583] although probably in the city the same function was fulfilled by the ubiquitous painted crater and *stamnos*, attested both as Attic import and as local production. The evidence from the Castel Capuano necropolis in Neapolis, although fragmentary, shows a quite marked profile in the 5th c. BC, with the common association of a two-handled small jug in common-ware (traditionally named *anforetta*), crater, *kylix*, and *stamnos*, which were used for the funerary ritual. This practice has no comparison with other Greek cities, while it is attested in Etruscan and Campanian centres.[584] In the 4th c. BC almost all painted vases are Campanian, the crater becomes rare, while two-handled small jugs are still very frequent. In summary, the evidence from the Castel Capuano necropolis defines a specific funerary ritual which is closer to 'Campanian' practices than to Greek ones, and yet it is also marked by the use of the two-handled small jug in common-ware, which is not attested elsewhere.

Moving to the necropolis of Nola, the comparison is hampered by the even smaller quantity of published contexts. The "Ronga" necropolis in via Roma[585] encompasses 42 tombs over a large timespan, from 625 BC to the 2nd c. AD. Burials of the 4th c. BC show a varied assortment of artefacts – mostly black-glazed Campanian pottery, plain and figured Attic pottery, red-figured Campanian vases, and a Nolan figured vase of the so-called "pilastro con la civetta" group. The most frequent shapes are *kylikes* and *skyphoi*,

[582] Necropoleis in Caivano, Frignano Piccolo, Aversa, which are also described in Giampaola 1985.

[583] Tomb 63 in Castel Capuano, see Borriello 1985: 261.

[584] Borriello 1985. The emphatic placement of the crater in the tomb is especially common in the burials of Caudium.

[585] Bonghi Jovino – Donceel 1969.

although no common pattern is identifiable. The storage amphora in common-ware is attested just once (Fig. 138),[586] while the two-handled small jug is absent.

In summary, the Ponticelli necropolis is equally different from those of Neapolis and Nola; black-glazed Campanian pottery, which constitutes the majority of the pottery found in Ponticelli, is common to both cities and to other Campanian necropoleis, while conversely the storage amphora in common-ware is attested only in the Qualiano necropolis. The most reasonable conclusion to draw is that the artefacts from Ponticelli do not have a specific ethnic connotation, but rather show the same accessibility to inexpensive pots as the other centres in Campania, whilst painted pottery was probably less affordable to this community. In a wider perspective, the importance of this site resides mainly in the scale of the settlement it represents (a hamlet/vicus?), considering a minimum of 111 individuals within two generations. The location of the necropolis is also significant, because the site lay very close to the river and the tufa quarries, probably on a main route to the inland, although the grave goods do not provide any insight into the community's main occupations. Furthermore, this is the only attested community in the territory of Neapolis in the 4th c. BC; the other necropoleis which are generally referred to Neapolis[587] are within the centuriation grids of other cities (see §7.3), although probably other Neapolitan communities existed beyond the River Sebethus.

Among the other evidence from pre-Roman sites, it is worth mentioning the drainage channels, and in particular those found at Napoli Botteghelle (cat. NAP007, 2 m wide by 1.90 m deep, filled by 3rd c. BC pottery) and Acerra via Volturno (cat. ACE004, 6 m wide by 2.50 m deep, in use between from the 6th to the 4th c. BC), especially considering that they were filled during the 'Roman period'.

[586] Tomb XLbis.

[587] Giampaola 1985; Giampaola – d'Henry 1985.

7.2.2. Roman pre-79 sites

The archaeological sites buried by the AD 79 eruption debris (Fig. 139) are the majority of the dataset available. They encompass 153 sites, which are spread across all kinds of topographic areas in the territories of Neapolis and Nola with no sign of unusual clustering (i.e. around/along a resource or forming a hamlet). Obviously the areas which are currently less-urbanized provide more evidence, but overall a tight patterning can be observed everywhere, especially on the hills covered by volcanic soil (both on Vesuvius and in the valley of Lauro), while on the drier Apennine hills around Roccarainola it is sparser.

Burials and necropoleis of this period (18 sites in total) are either placed along roads close to the cities or clearly point to a small- or mid-sized villa nearby.[588] The most interesting site is the *columbarium* of a L. Plaetorius (cat. SAN008, Fig. 140) in Sant'Anastasia. The building lies at 165 m a.s.l., near one of the two roads which connect all villages around Vesuvius. Documentary evidence proves that that area was cultivated since at least the 10th c. AD, but interestingly until one century ago it was settled with barely any farmhouses; in 1967, during the construction of a high-rise building, three *columbaria* were discovered, aligned in a row. The first two were immediately destroyed, then the Superintendency was informed and the third one was dug entirely and still stands today, in the basement of the modern building. The funerary monument lay 8 m under the present-day ground level and was covered by the AD 79 ashes. The structure was built like the other two along the boundary wall of what probably was a villa. Beyond the wall was the paved road, which ran E-W like the modern one near it. In the boundary wall was placed a funerary inscription:

L.PLAETORIO . PELL . ET
PLAETORIAE . QVARTAE
CONLIBERATAE . SVAE . ET
FLORO . FILIO . VIX . AN . XVI

[588] E.g. cat. PDA001 with 10 burials; the largest necropolis (cat. CNN004) encompasses 28 inhumed burials of the republican period.

Of the other two *columbaria* nothing remains but another funerary inscription:

SOTERICHO
SVMMARVM
PLAETORI

De Franciscis,[589] who conducted the dig, dated the building to the mid-1st c. AD and the second inscription to the second half of that century. He further stated that they show two generations of the same family, which had in Lucius a freedman, merchant of leather, and in Sotericho an employee of the Imperial *fiscus*. In my opinion the most interesting aspect in them is the lack of connection with any agricultural activity which probably took place in the villa; more generally, this piece of evidence shows that the people inhabiting villas not necessarily had to be free farmers or slaves or absentee landlords. Furthermore, the presence of a road at such altitude, where the path from the sea to Nola was more tortuous and longer than in the plain, suggests that the current studies are missing an entire road network.

The Roman farmhouses which are clearly buried by the AD 79 eruption total 37; for the majority of them only short reports are available, but in some cases they are sufficient to glimpse something about the agricultural production, as in the case of the two farmhouses with wine cellars in Cimitile (cat. CIM003, CIM005), on the outskirts of Nola in a plain currently perceived as not particularly suitable for vineyards. Artefacts from almost all farmhouses on the slopes of Vesuvius include a sizeable quantity of dolia sherds; in many cases they were provided also with a *criptoporticus*, which occasionally is fully preserved and still in use as cellar (e.g.: cat. SVE003, SVE006). The only two sites which have been excavated more extensively are the farmhouse of C. Olius Ampliatus in Ponticelli (cat. NAP018, Fig. 114, previously discussed), and the farmhouse at Marianella in Naples (cat. NAP019, Figs. 141-2). Their architectural plans follow the standard typologies widely in use around Vesuvius, in both cases the main construction material is the Neapolitan tuff, which on the slopes of the volcano is replaced with lava blocks, as on the Apennines with limestone blocks (e.g.: cat. LAU001).

[589] De Franciscis 1974.

Among the 24 residential villas, the most notable is the *Pausilypon* (cat. NAP015), but its exceptional features are not very useful to understand the standard characteristics of the villas in the countryside. In most of the cases only rich bronze artefacts and few standing walls have been discovered. In Ottaviano, at the località Boscariello (cat. OTT019) many fragments of frescoes in 4th Pompeian style were uncovered on top of a hill; the style of these frescoes resembles closely that in use in the sites at the neighbouring town of Terzigno (in the far northern border of the territory of Pompeii) and both areas depended on Nolan workshops. Unsurprisingly, the mosaics discovered in the villas either repeat Hellenistic motifs (cat. NOL025) or follow Italian trends of that time (cat. OTT008). The villa at Bosco De Siervo in Ottaviano (cat. OTT008), although explored in a very limited portion, shows the baths and the cisterns which were just uphill (2.40 m wide, 32 m long; Fig. 143). The provision of water for the villas placed on the slopes of Vesuvius was an important matter, since these were at too high an elevation to be reached by the Augustan aqueduct; in some cases rural cisterns were quite sizeable, like at the farmhouse in Pollena Trocchia at San Martino (cat. PTR002) where the cistern is formed by two identical, parallel vaulted rooms, each 2 m wide and 60 m long.

7.2.2. Roman post-79 sites

The dataset available for the post-79 period on the north slope of Vesuvius encompasses only 61 sites because of a series of converging factors, like the continuity of life of some pre-79 villas (e.g.: NOL024, LAU001, TAU004), the generally reducing number of villas throughout the Roman Empire from the 3rd c. AD onwards, and the destruction caused by Vesuvius in AD 79. On both sides of Vesuvius the evidence mostly consists in burials and probably follows the main roads (Fig. 144). This is clearly the case along the coast near Herculaneum, where also at least one new settlement (cat. TGR023) was set in a panoramic position shortly after the AD 79 eruption, while in the Pompeian region the position of the burials creates a NW-SE alignment (i.e. towards Vesuvius) and a cluster where the bridge across the river Sarnus probably was. On the north slope of Vesuvius most sites are set along the centuriated grids, especially on the axes towards the volcano.

Here farmhouses (10 sites; e.g.: cat. AFR030 and NAP003) and villas (6 sites; e.g.: cat. PTR006 and SVE014) are more numerous than on the other side, but burials are the majority (22 sites).

Among these, almost all sites contain very few burials (1-3 individuals), scarcely any goods. The site in Sant'Anastasia at Starza Vecchia (cat. SAN011) includes 6 *a cappuccina* burials, the latter of which was used for three individuals - man, woman, and child - and included among a few goods a two-handled small jug (though commonly defined *anforetta*) in burnished ware. This artefact seemed to play a particular cultural role in the 5th c. AD burials of the Vesuvian countryside, since it is ubiquitous in many burials and occasionally in villas (e.g.: cat. SVE014), but it is absent in all urban contexts of Neapolis.

A few sites encompass more tombs, 16 (cat. ACE001), 24 (cat. AFR017), 35 (cat. PCA001), and probably pertain to large villas. In only one instance (cat. NAP002) the necropolis might refer to a larger settlement, like a hamlet. The necropolis, although dug only partially, included 52 burials of the 5th c. AD. They show a variety of burial practices operating at the same time: *a cappuccina*, with horizontal *tegulae*, in amphorae, in the bare earth. Burials in amphorae are common around Vesuvius, both for older people (cat. ERC004) and young children (e.g.: cat. PTR006). Compared to the evidence available for the 1st c. AD, the 5th c. AD seems to point to a much poorer economy, if the scarcity of the goods and the higher number of infant burials are valid proxies.

7.3. Land divisions

Campania is renowned for the centuriation grid of the Ager Campanus, which is probably the best documented.[590] Evidence of that grid is clear from air photos, place names, and archaeological evidence, like the cippi found at the intersections. The study of the other centuriation grids of Campania has been less developed and consists of three

[590] Franciosi 2002.

major works, the first by Castagnoli,[591] the second by the '*équipe des Bisontins*' (Fig. 146),[592] the third by Soricelli.[593] The approach used changed slightly according to the author, but in broad terms their datasets are similar because they consist of the present-day air photos and topographic maps of Campania. I tested the grids that they have created (Fig. 147) against the first reliable topographic map, which was created under the Bourbon kings in 1836, and against the information I have gathered so far on the ancient landscapes of Vesuvius, in particular on the transformations occurred to the Neapolitan marshes. Furthermore, by superimposing the map of the sites on the centuriated grids I have gathered additional information, like the position of the sites within the *centuriae* and the orientation of walls[594] and paths/roads (Fig. 148).[595]

In general terms the evidence confirms the existence of the centuriated grids previously hypothesised (Tab. 10), although some important remarks are necessary on both the interpretation of the literary sources and the extension of the grids.

Name	Actus	Module	Orientation	Size (*Bisontins*)	Date (*Bisontins*)
Neapolis	16x16	-	N-26°W	14,500 i./3,625 ha.	Augustus
Nola I - Abella	20x20	706 m	N-0°40'W	42,000 i./10,500 ha.	Sulla
Nola II	20x20	707 m	N-41°30'W	30,000i./7,500 ha.	-
Nola III	20x20	707 m	N-15°E	60,000i./15,000 ha.	Vespasian
Nola IV	16x16	-	N-46°30'E	8,900i./2,225 ha.	Augustus
Nola D	20x20	710 m	N-23°30'E		Post-79 (Soricelli)

[591] Castagnoli 1956.

[592] This is the common name of the group of topographers of Besançon led by Chouquer. Chouquer *et al.* 1987.

[593] Soricelli 2002.

[594] The orientation of the walls has been used by Oettel (1996: 147-162) in the Pompeian countryside to postulate the existence of three centuriations: the Samnite one (N-23-23°W), the Sullan one (N-8-15°W), the triumviral one (N-5-16°E).

[595] My *modus operandi* consisted first in georeferencing each centuriated grid hypothesised by the previous authors (this task proved to be even more demanding than expected, because all grids 'float' in the landscape with no graphic sign of the present-day landscape), then in validating the evidence of the grids (i.e. checking whether the bolder lines in the grids - the actual evidence - were really noticeable in the contemporary maps), then in testing these lines against the Bourbon map (i.e. checking the presence/ absence of these lines and the existence of other signs of similar alignments). The layers with the archaeological evidence and the geographic information were then added to further enrich the picture.

Table 10 - Scheme of the centuriated grids in the territories of Neapolis and Nola.

7.3.1. Neapolis

A passage in the *Liber Coloniarum* (235.15-19) states: "Neapolim, muro ducta. Iter populo debetur ped. LXXX. Sed ager eius Sirenae Parthenopae a Grecis est in iugeribus adsignatus, et limites intercisivi sunt constituti, inter quos postea et miles imp. Titi lege modum iugerationis ob meritum accepit".

The grids hypothesised by the Bisontins show the actual evidence with a bolder line and with thinner lines the maximum extension of the centuriation. In the case of Neapolis the grid covers also the place of the river/marshes and spreads uphill on the steep slopes of Capodichino (Fig. 149). The superimposition of the evidence outlined by the Bisontins on that which I extracted from the Bourbon maps (Fig. 150) reveals that the centuriation was established only south of river Sebethus but it stretched further westwards until it met the grids of Nola. Several Roman sites, both pre-79 and post-79, confirm the existence of this grid (Fig. 151). In particular: the sites SGC001, NAP003, NAP018, PTR006 lay near centurial axes; the post-79 villa PTR005 showed traces of a countryside path with the same alignment of the grid; the roads SAN018 (pre-79 field road), PDA002 (post-79 countryside road), and VOL001 (post-79 paved road) are the actual remains of the centuriation.

The much denser network of roads from the Bourbon maps could either be the 'echo effect' of the Roman grid (often the modern network creates itself within earlier alignments) or the remains of the *limites intercisivi* for the actual division of the individual properties. In either case, the abundance of lines makes me rather sceptical in thinking that the module of 16 actus hypothesised by the Bisontins is the only possible one. In accordance with the textual evidence one could also suggest a Greek division *per strigas* which was later transformed under Titus into square *centuriae*. By keeping a square module with 16x16 *actus* the Bisontins hypothesise 112/125 *centuriae*, while I reckon 100 *centuriae*.

7.3.2. Nola

The existence of multiple centuriation grids in Nola is attested not only by the actual traces in the ground, but also by the literary sources, which mention the deduction of one colony under Sulla,[596] another under Vespasian,[597] and possibly another during the imperial period (Augustus?).[598] Furthermore, a passage in Siculus Flaccus (126 Th.) informs about the difficulties of establishing a new grid in Nola where others were already in place.[599] Nevertheless in consideration of the vast territory available, one should avoid the risk of thinking that each grid entirely replaced the previous ones, but rather that the new ones were set at the fringes of previous ones, overlapping with them only partially.

Nola I is the largest centuriation in this territory (Fig. 152), it stretches like two transects around Nola, according to the Bisontins it reached also the valley of Lauro and the uphill grounds towards Abella, but in my opinion in these cases geomorphology impedes such division. The Bourbon maps substantially confirm the grid[600] set by Castagnoli and the Bisontins, who reckon 208-243 *centuriae* while I am confident of only 200. The quadrant southwest of Nola, for which no traces of the grid are noted, is worth 80 additional *centuriae*.

Nola II covers the southern and the southwestern quadrants around Nola (Fig. 153); it partially overlays Nola I but it is confirmed mostly by the pre-79 sites on the slopes of

[596] Liv. *Per.* 89: "Sulla Nolam in Samnio recepit. XLVII legiones [i.e. 47,000 soldiers] in agros captos deduxit et eos his divisit". The title of Felix Augusta Nola (CIL 10.1244) and the fact that Sulla had a villa in the Nolan territory (Plin. *N.H.* 12.11) further underpin the existence of a Sullan deduction.

[597] *Lib. Col.* 236.3-6: "Nola, muro ducta colonia Augusta. Vespasianus Aug. deduxit. Iter populo debetur ped. CXX. Ager eius limitibus Sullanis militi fuerat adsignatus, postea intercisivis mensuris colonis et familiae est adiudicatus".

[598] CIL 10.1273: "decurio adlectus ex veteribus Nola".

[599] "Evenit aliquando, ut in Nolano comperimus, idemque divisio non ab uno punto concessit, sed ex diversis limitibus, qui oblique inter se concurrint. Ergo videndum est qua significantia linearum regio dinosci possit".

[600] The grid is further confirmed by 3 pre-79 sites (cat. MRG001, NOL018, CIM003) and by one post-79 site (cat. CIM004).

Vesuvius, both in the town of Ottaviano,[601] which is closest to Nola, and in Sant'Anastasia,[602] at the boundary with the Neapolitan grid. Of particular importance is the 2nd-1st c. BC farmhouse OTT023 with ploughing furrows aligned with the grid, other traces of ploughing furrows with the same orientation not far from this site (OTT021), and the remains of one paved road right in the centre of Ottaviano (OTT010) although in the middle of a *centuria*. The Bisontins calculate around 150 *centuriae*, I reckon 135, although for the maximum extension of the grid 188 *centuriae* should be added.

Nola III potentially covers a huge area, since alignments compatible with this grid are visible even beyond Acerrae and near Suessula, for a total of roughly 400 *centuriae* (Fig. 154). In reality the grids are denser in the plain north of Vesuvius (modern Marigliano) and south of Ottaviano, beyond Nola II, in the plain between Vesuvius and Sarnum. The Bisontins reckon 300 *centuriae* while in my opinion they should be lowered to 100. The sites that confirm this grid are uphill in Somma Vesuviana, along the main axis that leads towards Marigliano, and are both pre-79 and post-79.[603]

Nola IV is a small grid at the foothills of the Apennines, along the town of Sarno (Fig. 155). The Bisontins reckon 70 *centuriae*, I can hypothesise up to 62. This grid does not really affect the territory of Nola.

Nola D has been identified by Soricelli and interpreted as reflection of the new land acquisition of Nola in the former territory of Pompeii after the AD 79 eruption (Fig. 156). It substantially encompasses two foci, the first in the town of Somma Vesuviana, the other between Pompeii and Sarno, and could range between 77 and 190 *centuriae*. Although most of the traces identified by Soricelli are visible also in the Bourbon maps, I am sceptical about the focus of Somma, since all lines fall into *limites intercisivi*, rather than main axes. On the other hand the lines north of Pompeii form a more solid grid, although no site has been found next to any of them.

---

[601] Cat. OTT020, OTT019, OTT011, OTT016, OTT008.

[602] Cat. SAN004, SAN005, SAN013, SAN014, SAN015.

[603] Cat. SVE032, SVE010, SVE027, SVE033, SVE017.

7.3.3. Dating problems

The rationale used by the Bisontins[604] to date the grids stems from the assumption that similar centuriation modules have been set in the same period and each module is dated through the ancient sources. In this fashion, the oldest module of 705 m in the Ager Campanus is considered older than the 706 m one, the first dated to the Gracchi, the second to Sulla or Caesar.

Similarly, the centuriation of Neapolis is dated to the Augustan period because the module of 16 actus is the same used by Augustus in the ager Calenus, in Acerrae,[605] and Atella.[606] In consideration of the difficulties encountered in tracing back the module and the mention of a Greek land assignations, I am cautious in dating it to Augustus, while drawing also on the archaeological evidence it is clear that the grid was functioning also after the Pompeian eruption, thus it is possible that Titus resettled this area. This hypothesis might find some support in the term οἰκισταὶ, used by Cassius Dio[607] also in another passage (47.14.4), in which he defines with this term the people appointed to reassign the land to the soldiers, after it was taken by the triumviri from those proscribed in 43 BC. I would therefore suggest that the main role of the οἰκισταὶ was to redistribute the land,[608] thus start a new centuriation, which would have defined also the new political boundaries of the surviving cities, rather than revitalise the dead ones. Furthermore, a passage in Statius' *Silvae* (3.5.78-79) explicitly mentions "our Parthenope, scant neither in natives nor in *coloni*".

For the Nolan centuriations it is even harder to provide a relative and absolute dating. Overall I agree with the sequence created by the Bisontins, because Nola II seems to

[604] Chouquer 1987: 224-231.

[605] *Lib. Col.* 229.21-23.

[606] *Lib. Col.* 230.1-3.

[607] 66.22-24; see also Ps. Aurel. Vict., *Epit.* 9.12-14; Zon. 11.18.

[608] Their activity obviously included also the restoration of the main monuments and roads in the region: Neapolis (CIL 10.1481), Nola (AE 1994.413), Nuceria (AE 1994.404), Salernum (AE 1951.200; AE 1902.40).

expand and remodulate Nola I, and the same can be said for Nola III. The archaeological evidence, although inconclusive, might encourage the dating of Nola I to Sulla, Nola II to Augustus (since one axis follows his aqueduct), Nola III to Vespasian, Nola D at some point after AD 79 (both Titus and Hadrian have been suggested).

It is the general opinion that each colony created by Sulla provided the land for 4,000-5,000 veterans, with an average assignation of 20-30 iugera for each soldier, while Augustus raised the land to 50 iugera.[609] Playing with these figures, one can have a sense of how many soldiers were allocated to these lands (Tab. 11).

centuriation	centuriae	iugera	veterans (20i.)	veterans (50i.)
Neapolis	100	12,800	640	256
Nola I	200	40,000	2000	800
Nola II	135	27,000	1350	540
Nola III	100	20,000	1000	400

Table 11 - Number of veterans for each centuriation by portions of 20 and 50 iugera.

In conclusion, despite the apparently vast territory available for Nola, even in the best-case scenario in which the entire plain (worth 320 *centuriae* in Nola I) was assigned, only 3,200 veterans (i.e. up to 6 *cohortes*) could be allocated with a small patch of land of 20 iugera, while in a more realistic scenario only 1 to 4 *cohortes*. This piece of information explains the difficulties of settling veterans in this portion of Italian land both in consideration of the limited space available and in regards to the already heavily inhabited territory.

7.4. Infrastructure

The study of the complex network of roads and paths in ancient southern Campania is a tantalising one, since the literary, epigraphic, and even pictorial evidence is quite rich, but the archaeological data are rather scant. This portion of the region was crossed by

[609] Mele 1991.

two main routes, the via Capua-Rhegium (Fig. 157), commonly known also as via Popilia or via Annia,[610] and the via Appia, which ran north of the territory of Nola, right beyond the Apennine hills of Roccarainola and San Felice a Cancello. Of slightly lesser importance, but probably equal traffic, were the coastal road which ran from Cumae and Puteoli, through Neapolis, Herculaneum, and Stabiae, to the temple of Minerva at Punta della Campanella,[611] and the road connecting Nola to Abella, Abellinum, then merging with the roads towards Apulia. The *Tabula Peutingeriana* shows also two roads linking the coast to the hinterland, one departing from Neapolis, through Atella, to Capua, the other from Pompeii to Nuceria, but the network was far more complex than this and the *Tabula Peutingeriana*, despite the *diverticula* depicted for Pompeii and Nuceria, can hardly be considered a comprehensive map. In particular it is striking to notice how, regardless of one passage of Livy,[612] scholars still ignore the road connecting Neapolis to Nola. Although no remains of this road have been discovered so far, it seems likely that its path ran along the foothills of Capodichino and followed the present-day Via Nazionale delle Puglie; the presence of a tuff quarry (cat. NAP007) and a village (cat. NAP001) along that axis makes this hypothesis even more likely.

Another passage, this time from Paulinus (*Carm.* 19.505-540), mentions a village on the slopes of Vesuvius and a thief coming from there; it is a circumstantial clue of a road connecting the two areas. Until two centuries ago an old, countryside road connected the coastal route to the towns on the northern slopes of the volcano to Nola; the older generations tell stories of the manure merchants coming from Torre del Greco until the 1950s from the road known as the "strada del pittore" (*scil.* Luca Giordano); on the other half of the road, sheep flocks - although rarely these days - still use a secondary but straight road from Nola to the towns on the volcano. This road was much in use during

[610] In the *Tabula Peutingeriana* the road passes through Capua, Suessula, Nola, Ad Teglanum (either Palma Campania or Sarno), Nuceria.

[611] Several milestones have been found along its path: in Naples (CIL 10.6940), in San Giovanni a Teduccio (CIL 10.6936), at Resina in Ercolano (CIL 10.6937-6938), at Stabiae (CIL 10.6939)

[612] Liv. 8.26: "Nolani per aversam partem urbis via Nolam ferente effugiunt".

the 14th-15th centuries, it was known as “via Summese” (Figs. 58, 61, 64, 65, 66), but today it is a combination of high-traffic town roads and narrow countryside paths.

Medieval documents and archaeological evidence further substantiate the existence of this road and allow a fairly accurate reconstruction of its path. It departed as a *diverticulus* of the coastal road just a few kilometres south of the bridge (Fig. 63) that crossed the river Sebethus,[613] along the present-day via Luigi Volpicella in San Giovanni a Teduccio, which merged into one centurial axis of Neapolis; the latter joined with the lower axis of the Nola I centuriation, which crossed with the main axis of Nola II towards Nola. Several sites lay along its path (see §7.3.1), some of which (like cat. SAN009) clearly point to the existence of a road near them. In Somma Vesuviana, along this path buried in a garden, a late antique miliarium (AD 383-393, cat. SVE026) was discovered[614] and a portion of the last bit of the paved road has been discovered at via Anfiteatro Laterizio just outside the ancient city walls of Nola (cat. NOL010).

The entire archaeological dataset on roads, centurial axes, and countryside paths for the territories of Neapolis and Nola encompasses 29 records and gives the impression of a very dense network. Among these, of particular importance are the traces of a paved road in the centre of the town of Ottaviano (cat. OTT010), which is uphill from both the via Summese and the Capua-Rhegium, but along the centurial axis of Nola II which gathers several sites in the same town. Another paved road has been found in via Feudo at Nola (cat. NOL009) and it is probably part of the Capua-Rhegium, while the paved road found at Volla in via Filichito (cat. VOL001) is oriented NE-SW and might be part of the road from Neapolis to Nola. Closer to Neapolis, two roads have been discovered heading

---

[613] At the third mile: “de loco Tertium quod est foris flubeum"; see Capasso 1881, documents 5, 65, 72, 218, 554, 555, 669. The earliest of these documents is dated to 917, the latest to 1137. The toponym still exists there today through the name of the chapel “Tierzo a Barra”.

[614] The miliarium has been dated through the two inscriptions on it:
(D.M.F.) VALER/CONSTANTIN/R.F. INVICTO AVG./DIVI COSTAN/PIIM FILIO
(DOMINIO NOSTRO FLAVIO) VALERIO/COSTANTINO/ROMANO FELICI INVICTO AVGVSTO/DIVI COSTANTII/ PIISSIMO FILIO
Second inscription:
DDD. NNN./VALENTINIA/THEODOSI/HARCADI/R. AVG. CO./BONO REIP./NATIS
DOMINIS NOSTRIS/VALENTINIANO/THEODOSIO/HARCADIO/ROMANIS AVGVSTIS CORONATIS/BONO REIPVBLICAE/NATIS

SE; the first of these was unearthed near Porta Nolana in 1837 (cat. NAP005) and an inscription in honour of the athlete Marcus Aurelius Artemidorus (cat. NAP006) was found next to it; probably this was the starting point of the coastal road towards Stabiae. Another road was recently discovered during the work for the underground station at Piazza Garibaldi (cat. NAP004). The road ran towards SE and has been dated to the 2nd c. BC - 2nd c. AD; it probably crossed the river (thus no marshes in this area), despite what more imaginative hypotheses suggest.[615]

Roads ran also along the line of the Augustan aqueduct, as in the tract discovered in Sant'Anastasia, where next to the pillar traces of an unpaved road with the remains of a camp fire have been unearthed (cat. SAN010). Nevertheless, the path of the aqueduct did not follow any road or centurial axis, apart from a small portion in Palma Campania. The Augustan aqueduct of Serino played a relevant role in the life of almost all cities in the environs of Vesuvius; recent works[616] revamped its study, but the only viable map is still that produced by Abate in 1862 following the explorations made by Lettieri[617] in the 1530s. Both Lettieri and Abate deliberately ignored the side branches of the aqueduct, since their task was to provide water to Naples. In the 1930s[618] the discovery of an inscription at the *caput aquae* in Serino gave emphasis also to the other centres supplied by it and listed in the inscription, namely Nola, Acerrae, Atella, Cuma, in addition to its well-known final points, Puteoli, Baiae, and Misenum with the Piscina Mirabilis. The inscription praised the restoration works undertaken by Constantine and his sons, and in recent years traces of both the original tract (Figs. 51-53) and its later restoration (Fig. 56) have been brought to light, but the exact path of its branches is still unknown. The gazetteer that I have produced includes 41 sites for the typology labelled "waterworks"; it includes in some cases the actual remains of the aqueduct (e.g.: cat. SGE002, SVE001,

[615] De Caro 2008: 121-2: "La nuova strada trovata a piazza Garibaldi sembra dirigersi dall'estremità orientale della platea meridionale, forse da una porta non ancora identificata sul prolungamento della platea stessa oltre la porta Furcillensis, verso il bel mezzo delle paludi" (*sic!*).

[616] Ohlig 2001; Keenan-Jones 2010.

[617] Lettieri 1803.

[618] Sgobbo 1938.

SAN010, SAN017, AFR001), in other cases cisterns (cat. PTR003, SAN012, SAN013, OTT021, OTT022) located uphill from the aqueduct which provided water for the villas spread in the countryside. Of particular importance are one inscription, found in Sant'Anastasia at a much higher altitude than the aqueduct, which attests the derivation of water from it (thus the water might have come from an additional branch uphill),[619] and a water channel on the higher slopes of Somma Vesuviana, which might have provided additional water to the aqueduct.[620]

7.5. Populating the countryside

To calculate the rural population in the environs of Vesuvius, the most suitable evidence comes from the sites buried by the AD 79 eruption. This dataset is particularly useful, because it includes well-preserved sites, some of which have been entirely excavated. Nevertheless, one should bear in mind that before the eruption many changes in the economy were happening, and these affected both the agricultural produce and the settlement pattern. So far the literature mostly focused on the effects of the earthquake dated to AD 62/63,[621] but it is important to remember that this was just the biggest among many others, as commonly happens before a Plinian eruption. Scholars often remark that the city was under restoration at the time of the AD 79 eruption, both public buildings and private houses, but somehow it is generally implied that life, especially in the countryside, continued as before. Another fact of general knowledge is the change of ownership, for which the Villa of the Mysteries is used as an example. Buildings in the countryside might have been affected by the earthquake as well, but probably less than in the city, as it appears evident from some direct and indirect clues. For example, the considerable number of richly decorated door frames (70) stored in the depot room (V) of the Villa della Pisanella (Fig. 158) certainly do not belong to the villa

[619] cat. SAN024, CIL 10.1291a: "Caesius C[3] / C(aius) Caesius C(ai) f(ilius) [3] / et L() Aquae eius".

[620] Cat. SVE029. The channel is 80 cm wide, 145 cm tall, and has been explored for 175 cm.

[621] See for example the contributions in: *Archäologie und Seismologie* (De Simone 1995).

itself, since it did not have that many doors. Among the hypotheses proposed to explain their presence there (as well as the presence of silverware in the room under the wine presses), the most plausible suggests that they were brought from a Pompeian *domus*, while it was being restored.[622] And indeed villas had more space around, were not attached to other buildings, in most cases consisted only of one storey, and depended less on infrastructures like aqueducts; therefore one can assume that in general they suffered less damage than the houses in the city.

Nevertheless, the effects of the earthquake overshadow the importance of other, more long-term causes of disruption. Indeed the analysis of the pottery, and especially of the wine amphorae across the Mediterranean basin suggests that already before the eruption wine production was already reduced in the Italian peninsula, because of the growing foreign market of the provinces.[623] This situation affected the wine production in the environs of Vesuvius, and probably this explains better the slow, and low recovery after the earthquake in AD 62. This premise is fundamental to calculate the population around Vesuvius, because if one sets the timeframe to the day before the eruption, and the evidence is rich enough, as in the cases of the Villa dei Misteri or of the Villa della Pisanella, to provide evidence of the very last moment before the eruption, therefore it would reflect also the changes which occurred after the earthquakes, during the last 17 years before the eruption. Nevertheless, especially for the countryside the evidence is only rarely rich enough to provide these details. In most of the cases, there are no records of the artefacts found and the only evidence available is the architectural remains, which mostly reflect the time when they were built, i.e. before both the earthquake and the contraction of the wine economy. Therefore, if one wants to use mostly the architectural remains, one should bear in mind that they offer a snapshot of the early 1st c. AD, rather than AD 79.

---

[622] According to the another theory, the doors would have been stolen from another house. In my opinion this theft would have been quite difficult to achieve in practice and probably smaller objects would have been preferred.

[623] See §6.4; Tchernia 1984; Purcell 1985.

7.5.1. The population of the cities

To calculate the inhabitants of the cities, one needs to assess the average population per hectare. This number is calculated through the analysis of the number of average inhabitants per house and the space taken by public buildings. Pompeii has been the playground for this kind of studies and basically provided the numbers currently in use, therefore it is worth describing and investigating it in more detail. Fiorelli[624] took some Pompeian *insulae* as a proxy for the calculation of the population in the entire city. He did not take into account the inhabitants of the upper floors and reached a total figure of 12,000 inhabitants. Nissen almost doubled this figure and hypothesised 20,000. Other scholars provided other amounts: Beloch 15,000, Eschebach 8,000-12,000, Russell 7,000-7,500. Most of the criticisms raised by scholars against each other is based on guesses or figures of other preindustrial periods, rather than on data; this makes the entire discussion impossible – because the data used are not homogeneous – and any real advancement improbable. This is the case also with Jongman,[625] who reckons the figures produced by Eschebach for the city of Pompeii (8,000-12,000) improbable if compared to the figures for the countryside. For the latter though, he uses pre-industrial (AD 1600) figures of the Ager Campanus: 0.56 people per hectare, with peaks up to 1.6 around Vesuvius. Since he hypothesises that the Pompeian territory covered 20,000 hectares, the Pompeian territory should have encompassed 36,000 people (1.8 people per hectare). This produced a ratio according to which 25-33% of the total population resided in the city, which in his opinion is too high to be plausible.

The latest prominent work on the subject has been done by Wallace-Hadrill. He revised all previous theories and took some *insulae* as a sample for a more detailed analysis, but in consideration of the many caveats on reckoning, he did not risk producing a final figure. His caveats are methodologically important, because they are

[624] See Wilson 2010 for the relevant list of references.

[625] Jongman 1988: 112.

valid for all kinds of houses. Since I agree with this reasoning and will use his arguments also for the calculations on the villas, it is worth summarising them. Wallace-Hadrill basically stresses the impossibility[626] of reckoning how many sleepers slept per bed, how many beds were not slept in on a regular basis, and how many people slept elsewhere than in beds, i.e. on mattresses on the floor. He further discusses problems of chronology and development, since houses changed shape and function over time, therefore one should bear in mind that the evidence we are looking at is only a snapshot, rather than a persistent picture. These methodological remarks are correct, nevertheless I think it is worth taking the risk of being mistaken, and ranges can be used to get at least an idea of the figures. Archaeology deals with partial information and uncertainties on a regular basis, but rough figures are useful at least as starting point for further investigations. Theories are continuously tested, changed and improved when new evidence is brought forward and this will also be the case. On the total number of inhabitants of Pompeii, Wallace-Hadrill takes no position,[627] but leans towards the figure of 10,000, rather than its double, though clearly this is just a guesstimate, rather than a real estimate based on reasoning.

Wilson[628] revised the problem of the number of inhabitants per city by establishing valid multipliers for each city, which would include also public areas.[629] Previously other scholars have formulated figures as varied as between 100 and 400 people per hectare. For Pompeii, Wilson accepts a figure of 11,000-11,500 people, which with over 64-67 hectares it gives a population density of ca. 166-175 people per hectare. But he tends[630] for Roman cities towards a figure which ranges between 150-250 people per hectare,

---

[626] Wallace-Hadrill 1991: 202-3.

[627] Wallace-Hadrill 1994: 91-117.

[628] Wilson 2010.

[629] Lo Cascio (1999: 165) states that Beloch's attempt to calculate the population through the extension of walled areas is not convincing. Beloch uses the figure of 70-100 ha for Neapolis, 64.7 for Pompeii. On the other hand though, for Pompeii Lo Cascio uses as minimum 8,000 (Eschebach) and maximum 20,000 (Nissen), which produces an average of 120-300 people per hectare.

[630] Wilson 2010: 210.

which should increase for some cities, like Trajanic Timgad, Ostia, and Rome.

For Italy, he reckons a total of 1,547,000 inhabitants in the cities, of which 1,000,000 in Rome, smaller numbers between 30,000 and 40,000 inhabitants for the largest cities, while the other major cities would have had between 5,000 and 25,000 inhabitants, with an average of 15,000, which multiplied by 25 such cities gives 375,000 inhabitants. If the total population of Italy was around 12,000,000 people,[631] then the people living in the cities would have been around 13%, around 25% if we think that the total amount was just 6,000,000, which in his opinion is too large a percentage for pre-industrial periods.

Using Wilson's estimates of how many people per hectare might have lived in the cities (150-250 p/ha), I have produced the following figures (Tab. 12) for the cities in central and southern ancient Campania:

City	Size (in hectares)	Estimated population
Capua	177	26,550-44,250
Nuceria	113	16,950-28,250
Neapolis	75	11,250-18,750
Nola	73	10,950-18,250
Pompeii	64	9,600-16,000 (10,000-12,000?)
Atella	53	7,950-13,250
Suessula	45	6,750-11,250
Abella	29	4,350-7,250
Acerrae	20	3,000-5,000
Herculaneum	14	2,100-3,500
Calatia	11	1,650-2,750

Table 12 - Estimate of the number of inhabitant for most of the Campanian cities.

Sorting this list by city size, the prominence of Capua stands out clearly, since it is twice the size of Neapolis and Nola, which are very similar and almost in the middle of the list. Surprisingly, Nuceria is the second in the list and is double the size of Pompeii;

[631] Wilson 2010: 233.

this piece of information is of particular importance to reckon the relationship between the two cities, their differences and the size of their territories, which should be somehow proportional to the size of the cities. Furthermore, it is interesting to notice that the cities are distributed in the region roughly following a lattice pattern; smaller towns are in between larger towns and the largest are the cities, the farthest are the smaller towns, this is quite evident in the case of Capua, also thanks to the wide land around it. The number of inhabitants for these cities will be used in the following section to understand the ratio between people living in the city and in the countryside.

7.5.2. The rural population in the environs of Vesuvius

The rural population is generally calculated by dividing the rural sites hierarchically and assessing an average population for each site rank. Comparative data from later periods are useless (but potentially they are useful indicators for the degree of change over time). Jongman[632] uses the data available for AD 1600 Terra di lavoro (Ager Campanus) to infer the population in the Pompeian territory in antiquity. According to those figures, there was on average a population of 1.6 people per hectare.

Witcher argues that the people living in the suburbium of Rome were about 0.6 per hectare within 50 km of Rome, 0.42 between 50 and 100 km. Fentress[633] makes it clear for her survey in Jerba that she is using some arbitrary assessments of population per site: "estimates of this sort record population figures derived from a calculation of, for example, a pottery scatter covering 60 m^2 with a density of 1 person per 10 m^2, yielding a population of 6". So she counted the sites, then she divided them into three categories: farms, villages, and villas. Then she multiplied by 5-10 the dependents in case of farms, this being a low estimate if we consider it consisted of just one family, and a high estimate which includes the dependants. For the villages, she assumed 8 to 16

[632] Jongman 1988: 72-3.

[633] Fentress 2009: 133.

households, giving a figure for the village of 40-80, which needs to be compared to Witcher's estimate of 50-200, with an informed guess of 100. For villas she estimates between 30 and 50, while Witcher gives between 15 and 50, with an informed guess at 25. Then she tries to hypothesise the number of missing sites were, so she provides two figures, the first in which she counts only the sites found, the second in which she calculated the hypothetical sites. For the island of Jerba, Fentress (2009: 138) reckons 31,000 inhabitants, 50% of whom lived in cities. This gives an overall population of 0.52 people per hectare, which is close to Witcher's 0.6 for the inner suburbium. Without the cities, the population density is reduced to 0.3. In the case of the Albegna Valley, the population density is of 0.21 people per ha, 0.19 people per ha if one counts only the countryside.[634] In 1936, this area had 0.22 people per ha and only 14% of the population lived in the cities. This average population is very much lower than the estimate of Lo Cascio, who reckons 0.28 people per ha.

The main problem in the calculation of inhabitants per villa resides mainly in understanding what the main use of some rooms was and how many people could sleep in a room. In my opinion, recently the theoretical problems have started overshadowing the reality. Indeed, even if it is hard to figure out what the main use of a room was, in many cases there are clear clues to its use. Also, the predominant current theory, according to which the use of the rooms can be flexible, does not take into account the fact that dimensions restrict considerably the possible use of a room. A small or large entrance creates different patterns of privacy and most likely rooms with large entrances and large dimensions were used as triclinia, because in small rooms the triclinium could not be accommodated. In the case of Villa della Pisanella (Fig. 158), the use of the rooms on the ground floor can be quite clearly identified and for those on the upper floor there can be only few uncertainties; Pasqui records in detail the whole set of artefacts found in each room, especially the bed remains. By matching these data with the decoration of the rooms and the quality of the objects found, one can potentially specify the level of wealth

[634] Fentress 2009: 143.

of the individual inhabitant, which ultimately allows the distinction between slaves and owners.

Because recent scholarship has strongly emphasised the impossibility of reckoning the number of inhabitants and the flexible use of the rooms, I would like to contradict some of these assumptions by referring in more detail to the evidence from the Villa della Pisanella. Although the Villa della Pisanella is probably the most famous and studied Roman villa after Settefinestre, nevertheless most of the published maps are inaccurate, because they ignore some of the data published by Pasqui in 1894. The unplotted information includes for example the plan of the upper floor and the data about the objects discovered in each room. For this reason I thought it useful to create three thematic maps of the villa. In the first are the artefacts (Fig. 158), in the second the corpses are plotted (Fig. 159), while the third picture uses the information available for each room to label their main function (Fig. 160). Before moving to a more detailed analysis of each room, it is useful to summarise the most noticeable differences with the data and interpretation which are commonly accepted:

- The map published by Pasqui in 1897 does not include the later excavation of the villa, which during the first campaign was still buried under a modern road and was only partially excavated in its north-western corner; I have added these parts to the map. Furthermore, the original maps do not include the discoveries made outside the villa - a charcoal pit, the vineyard with holm oaks, the vegetable garden, the pergola, which I plotted according to the accurate description provided in the publication. I have also completed the drawing of walls as described in the text, this is particularly important for the north-western corner, which encompassed two rooms – a woodshed and a stable. Pasqui describes also the two areas on the upper floor, but he provides the map of only the upper floor on the north-east corner of the villa, while in the description he clearly states that two rooms were also in the front. These parts have also been added to the map of the building.

- The current interpretation of the rooms' functions in Villa della Pisanella in some

cases differs from that provided by Pasqui, sometimes uncritically. I thoroughly reviewed Pasqui's publication and generally speaking I find his interpretation more reliable than others. I disagree with him in some cases: the room B (the first on the left by the main entrance door) is interpreted by Pasqui as the bedroom of the *atriensis*. It indeed included a *kline*, but I rather reckon it as the ante-room to the *triclinium*, which Pasqui interprets otherwise. The use of the rooms on the upper floor in the north-eastern corner as described by Pasqui is unclear. I argue that some rooms were originally richly decorated and two or maybe three of them might have been decorated bedrooms.

Moving to a more organic description of the villa, one can start from the artefacts, because they provide an interesting snapshot of the villa at the exact time of the eruption.

It is very likely that this villa was a productive unit of an absentee landlord, as many remains of another building were found; probably these came from the owner's main residence, which was likely to be in the city of Pompeii. These remains do not include just the famous set of silverware, but also two bronze bathtubs (A) and more than 70 wooden doors with bronze handles (V), and many marble slabs (b). These remains were not the original furniture of this building, because for example the bathtubs could not fit in any of the rooms and the wooden doors were too many for this building. Very probably this furniture belonged to a house in the city, because if the owner had another villa in the countryside, he would have had enough space to store these objects while the restoration was taking place and probably the other countryside residence would have not suffered too much from the earthquakes, but similarly to this villa it would have suffered minor damage. This villa was under restoration and the function of many rooms changed from its original purpose. For example, the bedroom G was under restoration at the moment of the eruption, this explains the large quantity of tools discovered there. The *torcularium* (P) was used as a temporary bedroom, because at the time of the discovery a bed was standing right in the centre of the room and the "treasure" was placed in the room underneath the presses. This also proves that the wine processing had

already taken place, the *dolia* (Q) were full of wine, while the oil processing was still in progress, which is proved by the olive pulp discovered right outside the villa (east of Z). In many other rooms various objects were piled. In the upper floor, marble slabs were stored along the walls (b). This kind of evidence raises the problem of what kind of evidence one should take into account for the calculation of the people living in the villa. The solution comes from the timeframe one sets; by ignoring the later evidence in the villa, which reflect the situation in AD 79, one can take some point in the 1st century AD, thus ignore the restoration in process and focus on the structure and the nature of the building, rather than its last use before the eruption. The general impression that one gets by reading the detailed account of the artefacts in the villa is that the shrinking economy and the insecurity created by the earthquakes did change considerably the use of some rooms, as is clearly attested also in some houses in Pompeii. Keeping this in mind one can still use the artefacts found in the house to understand which rooms were originally used as bedrooms and who slept in these rooms. On the ground floor there are three bedrooms surely used by the owners (D, F, G), the second of which should have been the master's bedroom. In front of the rooms there were closets and chests with clothes and rich artefacts. Some of the rooms on the upper floor, in the north-eastern corner, were also richly decorated. Rooms c, d, e are large enough just to be bedrooms, but room c has just a very simple wall decoration and is provided with an antechamber, so probably only two of these were used as bedrooms; another room in the upper floor (g) is richly decorated, but it is very long and does not fit with the general shape of a bedroom. Therefore I find it sensible to reckon only two rooms as bedrooms (d, e). Servants/slaves lived in a compact group of rooms on the ground floor (R). These were 6 originally, and one was added later. The latter included two beds, one of which was for a small child. Pasqui argues that these rooms are clearly for slaves and there is enough evidence to agree with him, because the pottery and the other artefacts discovered clearly define a poor social group and are very similar. Only the artefacts in the first room on the left are slightly different. They include the usual set of dishes and pots, but a

candelabrum and a few bronze vessels are included. For this reason Pasqui argues it belonged to the head of the servants. The small room on the upper floor in the front of the building has been interpreted as the room of the *vilicus* (i). Indeed this room had access to a sizeable room with amphorae (j) and was provided – together with the bed – with coins, gems, and two candelabra, but on the other hand it included also a poor hearth, which consisted of half an amphora.

In total one can reckon for the owners and their guests 5 bedrooms, 6 for the slaves (one of which included a small bed for a child). Interestingly, at the time of the eruption all beds of the slaves were in place, while among the richest beds of the owners, only two have been found, one in the ante-chamber of the dining room, the other was particularly rich and therefore was stored together with the other precious objects in the *torcularium*. Unfortunately only for this latter bed do we have the precise dimensions, 1.40 x 2.20 x 0.75 m. Of particular interest is of course the width, which raises again the problem faced by Wallace-Hadrill about the size of the beds and how many people they could fit. The size of 1.40, according to modern standards, is in between the beds for one (0.90) and two (1.70) people. This means that for all beds in the house one could potentially double the number of the inhabitants, if one suggests that nobody slept alone. Following this idea, one should conclude that the house might have hosted between 11 and 22 people + 1 child, of which 6/12+1 were slaves. One should consider that these figures represent the sleeping capacity of the house, rather than the number of people actually living in the villa, which is the figure one needs to calculate the population in the countryside. From this perspective, I think it would be reasonable to reckon only the rooms of the slaves (6) and one should consider that probably not all of them were couples, also because the owner may have preferred to have young boys for the work in the fields. Therefore it seems plausible to me that 3 of the 6 rooms included couples, which brings the total to 10, if one includes the young child.

In summary, the rooms' dimensions and the artefacts found in the villa helped identifying the slave quarter and the room used by the head of the slaves, the area of the

landlords, and the quarter on the first floor. Each cubiculum was identified by the remains in it; cubicula had standard dimensions, with only small variations according to the rank of the inhabitant. Dimensions vary from 2 x 2.8 to 2.7 x 3.5 m. The beds have standard dimensions of 2.2 x 1.4 m. All bedrooms had just one bed, apart from one case in which the second bed is much smaller and has been correctly interpreted as the bed of a child. For the Villa della Pisanella a reasonable guesstimate of the inhabitants is therefore between 12 and 14 people.

Following this rationale, I have applied the general 'rules' from Villa della Pisanella to understand the evidence from the smallest farmhouse in the Vesuvian countryside, Villa Regina. Here (Fig. 161) the cubicula have similar dimensions than in Villa della Pisanella. Indeed they vary from 2.4 x 3 to 2.8 x 4 m, apart from just one larger room (2.7 x 5.2), for which we do not have in any case accurate measurements, because it was on the upper floor and was preserved only partially. Therefore also in this case it is difficult to hypothesise that there was more than one bed per room, because it seems clear that it was impossible to accommodate more than one bed, and in the few cases in which this would have been barely possible, no other furniture could be fitted in. Therefore this allows a quite accurate calculation of the inhabitants per house. For the Villa Regina, De Caro[635] calculates between 5 and 12 people, but I reckon 6 bedrooms, with just one bed per room, and one room with space for 2-3 beds. Therefore I provide a guesstimate between 7 and 9 people.

The Villa of Popidius Florus can be used as a third example. The description of the upper floor is not very accurate, and the number of beds can be between 10 and 17. I would propose a guesstimate of 14 people.

This way of proceeding works on the premises that no seasonal workers were employed, that no more than one person would have slept in one bed, that no other places were used outside the villa as bedrooms for the slaves. Ancient sources indicate that landlords stayed mainly in the town and visited the rural property only rarely. In the

[635] De Caro 1994: 124-5.

case of Cicero, we know he had many properties around Vesuvius. We should also take into account the possibility that rooms were left empty for guests; this is particularly important for residential villas, and therefore they should be reckoned.

To calculate the number of people per square metre, one needs to calculate the size of the estates as well. The average estate size has been calculated in the previous chapter and the evidence from other villas near Villa della Pisanella and the Villa of Popidius Florus are sufficiently close to estimate that the first had an estate of circa 14.8 ha, the latter circa 10.9 ha. De Caro hypothesised that the estate of Villa Regina was about 8 iugera, which is close to the smaller property size reckoned by ancient sources (10 iugera, 2.52 ha). Unfortunately the area where it lies shows traces of only a few villas, therefore there is not enough evidence to guesstimate the estate size. Using Theissen polygons, the size is too large (17.6 ha) and considering how patchy the evidence is for this part of the region, I think it is not justified. Therefore to reckon the size of this villa's estate, I used the proportion between wine cellar and estate size as reckoned in other villas and applied it to Villa Regina. In detail, if we follow the proportions of Popidius Florus it should be 2.45 ha, Terzigno Villa 2 should be 3 ha, and Pisanella 3.17 ha. Therefore the Villa Regina estate should be between 2.45 and 3.17 ha.

In summary, Villa della Pisanella's estate was about 14.8 ha and had between 12 and 14 people (0.8-0.95 p/ha); Villa Regina's estate was probably about 3 ha and had between 7 and 9 people (2.3-3 p/ha); Popidius Florus' estate was 10.9 ha and hosted between 10 and 17 people (0.5-1.5 p/ha). The figures for Villa della Pisanella and the Villa of Popidius Florus are somehow coherent, between 0.8 and 1.5, while the Villa Regina figures are quite high; this can be explained only in part by the fact that, being a very small agricultural unit, it was economically inefficient, because it had to host a minimum number of workers, probably at least a family, which was in any case too large for the small estate. Even lowering the number of the inhabitants to 5 members, the villa would have still had a very high ratio (1.6).

Overall the figures from these villas produce a quite high population density in

comparison with the size of the estates, which is very close to Jongman's data for AD 1600 Campania (1.6 p/ha), but very high if compared with the other areas mentioned (Jerba 0.52; Roman suburbium 0.6; Albegna 0.2). There is no easy solution for this conundrum; one could either think that the entire population of the villas resided in the cities and the workers moved regularly to the countryside to work – which seems unlikely and considering the short distance from the villas to the city it would be very inefficient and the urbanisation rate would seem rather high – or that somehow the estates were much larger, but considering the tight pattern of villas and the fact that they are quite spread in the countryside (i.e. without any alignment which would suggest a sort of clustering along a main route), this also seems quite unlikely.

Moving to the more general picture, by estimating the size of each town's territory some figures can be produced. I took into consideration the cities of Neapolis, Nola, and Pompeii;[636] in order to simplify the division of the land and the calculation of the areas, I have narrowed the territories to the plain and the slopes of Vesuvius, i.e. omitting the Apennines, indeed there is not enough data to hypothesise whether there were settlements and how tight the pattern might have been in this area. In defining the borders of each town, I have followed the extensions of the centuriation grids and considered the distance from the smaller towns.

These considerations brought me to produce the following figures (Tab. 13).

City	City's inhabitants	Territory size	Countrymen (0.5-1.5)	Urbanisation rate
Neapolis	11,250-18,750	6,270 ha	3,135-9,405	78-64%
Nola	10,950-18,250	19,470 ha	9,735-29,205	52-38%
Pompeii	9,600-16,000	12,070 ha	6,035-18,105	61-46%

Table 13 - Estimates on citizens and countrymen of Neapolis, Nola, and Pompeii.

The urbanisation rate seems extremely high, especially for Neapolis where it almost reached 80%. Considering that the figures of the territory size cannot really change and

[636] For the estimate of people living in the cities, I follow Wilson 2010: 210.

that the population density in the countryside is already above the average (e.g. 0.6 for the Roman suburbium), there is no easy escape from this conundrum. One could hypothesise, considering the higher figures from Villa Regina, that the population density might rise to 2.5 people per hectare; this would lower the pressure on the city of Pompeii to 34% (28% if one presumes that the city hosted no more than 12000 inhabitants). Nevertheless, Villa Regina seems to be rather the exception and the very small dimensions of the villa necessarily created a very inefficient economic system, simply because the villa hosted more people than needed for the exploitation of the land. In broader terms, considering the ratios provided by Columella (3.3.8, where 1 *vinitor* per 7 iugera of vineyard) and Pliny (*N.H.* 17.215, where 1 *vinitor* per 10 iugera of vineyard) even Villa della Pisanella was a rather inefficient estate having - in 42 iugera of vineyard - 12-14 workers instead of 4-6.

8. Trade

In order to get a comprehensive picture of the trade patterns taking place in the environs of Vesuvius, one might need complete datasets, which should encompass material from the ubiquitous potsherds to the animal bones to the ecofacts, from both the area under investigation and the neighbouring ones (for comparanda), sampled and studied in the same way from a statistically significant number of sites. Obviously this information is not available and although in the past chapters I tried to emphasise the interdependency of the Vesuvian plains and the Apennine altiplanos, some solid reckoning is needed to 'weigh' the scale of the trade and the dependency rate of one area against each other.

Within this general framework and considering the entire system as a 'complex system' (see §5.7 for its definition), the selection of one proxy alone obviously would not provide a miniature picture of the whole - like the reconstruction of an entire vessel from a rim sherd -, but rather a partial view, like a piece of a puzzle for which one needs most of the pieces in order to guess the general picture. Nevertheless, even by narrowing the research to the only three datasets currently available, I hope to provide at least for those a view on the geographic boundaries and the proportions of the economic flows. Intentionally the following sections cover only marginally the 'big trade' of wine and oil (and the vessels shipped with them), for which a quite sizeable bibliography and pretty solid models exist already, but rather focus on the micro-regional trade patterns, their boundaries, and the kind of market models that can be hypothesised from the evidence currently available.

8.1. Brickstamps in AD 79

Despite their erratic appearance, brickstamps have always been collected, thus they can be considered a sort of 'lowest common denominator' for all sites in ancient Campania, and can be used to easily define the boundaries of this specific trade network. In the territories of Neapolis and Nola I have gathered 30 different names and compared

them with the datasets available in the *CIL* and in more recent articles on Pompeii (106 names), Herculaneum (44), Stabiae (16), and the Ager Campanus (45).[637]

In general all datasets show a coherent picture, in which the majority of the names are attested in very few sites (1-3), while the rest is either spread on a micro-regional scale or is widely distributed across the Mediterranean basin. Some examples from the north slope of Vesuvius can help to draw a sharper picture. The first category of very local names includes brickstamps like "Anni Primo Cins", discovered only in the theatre of Nola,[638] or "Cn. Domi Salutaris" found solely in one site in Sant'Anastasia.[639] Other brickstamps, found in 1-3 sites on the north slope, either are part of a well-defined micro-regional network which includes the north slope of Vesuvius, the city and territory of Nola, Stabiae, the city and territory of Pompeii[640] - but exclude the coastline (i.e. Herculaneum and its territory like the sites in Torre del Greco)[641] - or are part of a much wider network which, despite being scantily present on the north slope, includes major locations of the Roman empire. This is the case of "Cn(aei) Domi(ti) Salutaris", found in Sant'Anastasia (cat. SAN005) as well as in Pompeii,[642] Rome,[643] Nemi,[644]

---

[637] The brickstamps for the Ager Campanus include both the names listed in the CIL and those coming from several private collections of local origin and listed in the unpublished notes of one of the curators of the Museo Campano di Capua. After the WWII bombing the majority of these brickstamps were lost. The brickstamps listed in the CIL for Nola are very few (4), while for Neapolis the record is very rich (203) because it encompasses the stamps uncovered also in the neighbouring town and later acquired by private collectors.

[638] Cat. NOL005, see Sampaolo 1991.

[639] Cat. SAN005.

[640] E.g. "A. Fufici Primigeni" found at Contrada Piana in Carbonara di Nola (Della Corte 1929: 204) and in Boscotrecase (cat. BTC045); "M. Luccei Quartionis" found in Somma Vesuviana (cat. SVE003, SVE012), in San Sebastiano (cat. SSV001), and in Pompeii (*CIL* 4.2787; 10.8047.10a-d); "Sex. Obi. F." found in Somma Vesuviana (cat. SVE011), San Paolo Belsito (cat. SPB002), and Pimonte (countryside of Stabiae, see *NSc* 1925: 417); "M. Aerius Mi." found in Somma Vesuviana (cat. SVE011), in Boscoreale (cat. BRE023, BRE027), in Pompeii (*CIL* 10.8042.6a-c), at Stabiae (Magalhaes 2006: 3 & 56).

[641] But it does not work the other way around, since brickstamps from Herculaneum and Torre del Greco are also found in Pompeii, as in the case of "Iulio Philocalo" (cat. TGR014 and *CIL* 4.2648).

[642] *CIL* 10.8048.17.

[643] *CIL* 15.1093.1-6.

[644] *CIL* 15.1093.4.

Bononia,[645] Carthago;[646] similar are the cases of "M. Cimoni"[647] and "Lepidi".[648] On some samples of the latter brickstamp from Herculaneum archaeometric analyses have been carried out and a production area in the Phlegraean Fields has been argued;[649] this hypothesis fits well with the samples that I have gathered in Pollena Trocchia, for which in a pale clay both volcanic inclusions and tufa chunks are observable. This brickstamp has been linked also to other similar ones with the fuller version "M. Aemili Lepidi", identified with the consul who governed in AD 11. Other brickstamps (e.g. "Abdae Liviae" and "Chresti") were found in several centres of Campania and, although absent in the territory under scrutiny, they are similarly widespread across the empire and testify to the existence of sizeable workshops.

To another category belong two brickstamps, "A. Appulei Hilarionis"[650] and "C. Pinni Laurini",[651] which differently from the others are widespread (on 8 different sites) on the north slopes of Vesuvius, in the valley of Lauro, in Pompeii and Stabiae, but are absent outside. The samples that I have collected show features (clay and inclusions) typical of Vesuvian products, thus a local origin can be implied. The cognomen *Laurinus* might be a reference to the Nolan pagus of the *Laurinienses* (*CIL* 10.1238) and the present-day valley of Lauro, but the exact location of these 'Vesuvian' workshops is unfortunately still unknown.

Overall this brief summary of the evidence shows a rather fragmented market for

---

[645] *CIL* 15.1093.5.

[646] *CIL* 8.22636.2.

[647] Found in Sant'Anastasia (cat. SAN005), Rome, Carthago, Saguntum, Tarraco.

[648] Found in Pollena Trocchia (cat. PTR002) as well as in Neapolis, Herculaneum and Torre del Greco, Capri, Ager Campanus, Rome, Luni, Ravenna, Gallia Narbonensis (Saintes Maries de la Mer, Domessargues, Rochefort-du-Gard, Jonquieres Lodevois, Vaison-la-Romaine, Orange, Piolenc, Avignon, Le Pontet), Aquitania (Recoules-Previnquieres, Lectoure, Saint-Bertrand-de-Comminges, Agen).

[649] Pagano 1990: 150-160.

[650] Cat. PTR002, SAN002, SVE003, SVE006, SVE009, SVE012, PCA002, and in one unidentified location in Pollena Trocchia.

[651] Cat. PTR002, PTR006, SAN002, SVE003, SVE006, SVE010, SVE032, and in two unidentified locations in Lauro.

bricks, in which many small workshops operate while a few large ones either are ubiquitous around Vesuvius or are based elsewhere and probably benefit from the trade of other products (like the wine for which a diffusion from the main harbours of the bay to Gaul can be argued). It is also interesting to note that, within the region, at least for this specific trade the environs of Vesuvius create a consistent micro-regional unit which is quite different from the Phlegraean Fields and the Ager Campanus.

8.2. Pottery trade patterns in AD 472

A more elaborate understanding of the trade patterns can be achieved through a comprehensive analysis of the pottery assemblages. For the territory under scrutiny the ampler dataset comes from the contexts buried by the AD 472 eruption. The 5th c. AD is a moment of important transformation in the patterns of production and trade in the Mediterranean basin because on the one hand the Tunisian productions continued despite the Vandal conquest, while on the other regional and micro-regional productions became more prominent. In general, the panorama which arises from the pottery evidence is much richer and varied than what is observable in the 1st c. AD and somehow it is coherent with the hypothesis of an ongoing dismantlement of the previous urban and social structure in favour of a patchier landscape of production. In this perspective, the short-range diffusion of the local products is a useful tool to unveil the deep-rooted interactions among micro-regional areas.

The current scholarship covers only a small percentage of the sites, and pottery assemblages have been published inconsistently, making the comparison among datasets challenging. In particular, publications cover sites from the Phlegraean Fields to Neapolis, Nola, the late antique site near Pompeii, and some sites in Hirpinia (Abellinum, San Giovanni di Pratola Serra, and Beneventum). They can be divided broadly into those

providing a wider picture,[652] brief reports on specific contexts,[653] and comprehensive catalogues which nevertheless lack quantitative analyses, thus useful mostly for the typology of the vessels.[654] Quantitative data are available solely for the theatre of Neapolis[655] and for two sites studied within the project I lead, which are the suburban villa in via Saccaccio at Nola and the villa with baths in Pollena Trocchia.[656]

In consideration of the evidence currently available, I have proceeded with a multistage analysis, focusing first on the distribution of imported vessels by comparing quantitative data, then on defining the boundaries of the micro-regional productions through the comparison of vessel types and fabrics.

In the mid-5th century AD the pottery circulating in the territories of Neapolis and Nola was predominantly of regional craftsmanship, but African tableware and cooking ware continued to be imported. The comparison between the assemblages from Neapolis' theatre, the villa at Nola, and the site in Pollena Trocchia reveals a quite similar percentage[657] of Common/Coarse Ware (Neapolis 42%, Nola 49%, Pollena Trocchia 59%), while the rest of the assemblages is composed of Cooking Ware (respectively 23%, 15%, 30%) and African imports – ARS, African Cooking Ware, and lamps (Fig. 162). Although the ratio between African imports and local productions is the same in Neapolis and Nola (avg. 32% vs. avg. 45%), in Pollena Trocchia the imports are much scanter (ca. 10% vs. 59%). The pie-charts of pottery classes in Neapolis, Nola and Pollena Trocchia show a similar trend in the first two sites, which are two prominent hubs respectively on the coast and in the hinterland. Both in Neapolis and Nola cooking and coarse/common ware

[652] Arthur 1982; Arthur 1998; De Carolis 1997.

[653] De Carolis 2009; Mukai 2010; Aoyagi 2007; Carsana 2007; Carsana 2009; Colucci Pescatori 1986; Di Giuseppe 1998; Freed 1983; Martucci, Toniolo 2011; De Rossi et al. 2010; De Bonis et al. 2009.

[654] Arthur 1994; Lupia 1998; Peduto 1992.

[655] Ciarocchi 2010.

[656] Martucci et al. 2012; De Simone et al. 2013; Martucci, De Simone, D'Italia 2014; Martucci et al. 2014; De Simone et al. in press; De Simone, Martucci in press.

[657] The figures provided are the NMI calculated on the entire datasets available. On the problems of reckoning see De Simone et al. in press. On the spread of pottery from the coast to the hinterland see also Martin 2005.

cover about three quarters of the market, with similar quantities of lamps, ARS and amphorae. In Pollena Trocchia, however, they cover much more than three quarters, representing 82% of the total of the circulating pottery. Unfortunately this division between imported vessels and locally-produced ones can only partially be represented by this division into classes. Indeed the umbrella term 'cooking ware' commonly comprises both regional and imported productions. Within our framework cooking ware includes artefacts from four productive districts: Campania, Africa, Pantelleria island and the Levant. Among the cooking ware found in Neapolis, the African cooking ware and the Pantellerian ware are respectively 17% and 13% of the total, while in Pollena Trocchia they are respectively 8.53% and 2%. In Neapolis also the Eastern cooking ware is present (6%), while it is absent in Pollena Trocchia.

The conclusion that could be drawn from these data is that cooking and common/ coarse ware, mostly of regional and micro-regional production, is more widely distributed in a minor site in the countryside rather than in its city. Furthermore, it is interesting to note that the distributional pattern for the ARS seems to be more dependent on the site hierarchy than on distance, thus it might have been distributed through central markets.

The local products competed with the imported ARS and, according to the context, they either replaced the ARS or were used side-by-side with the imported ones. Until recently, it was generally assumed that kilns used for the manufacture of Campanian Slipped ware were only in the Ager Falernus[658] and southern Latium;[659] nevertheless, the archaeometric analyses that with my group we carried out on samples from Pollena Trocchia unveiled additional productions, which in consideration of the volcanic inclusions could probably be localised in the environs of Vesuvius.[660] Therefore, beyond the imports from across the Mediterranean (mostly from modern Tunisia), a regional

[658] Arthur 1998.

[659] Arthur, Whitehouse 1982.

[660] Martucci et al. 2012.

koinè of Campanian classes and shapes - especially for the coarse ware and the burnished ware - can be easily outlined. Within the region several workshops operated, for these it is still difficult to assess the range of action, because the archaeometric analyses currently cover only a few sites. According to Arthur the vessels in Neapolis show the inclusions typical of the Ager Falernus, while the samples taken on both sides of the volcano and interestingly in Cumae as well (see next section) reveal the use of Vesuvian inclusions.

In order to distinguish and single-out the micro-regional productions, with my group I have isolated two vessel shapes - a two-handled jug in burnished ware (often found in funerary contexts) and a (bread-)cooking dish with central hole in coarse ware. Both shapes are ubiquitous around Vesuvius and in Nola, but are absent in Neapolis and in the Phlegraean Fields. The two-handled jug in burnished ware is attested in many variants, thus a low standardisation can be inferred.[661] The local spread of these products, interestingly tied to specific culinary and funerary habits, seems to imply a kind of distribution in which vicinity - rather than hierarchy - is the most important factor. In practical terms, it might refer to a short-range circulation of products among the villas and hamlets around the volcano.

A further micro-regional production in common ware, yet again absent in Neapolis, can be identified by its reducing/oxidizing firing founds in some artefacts in Pollena Trocchia from an unknown productive area. This firing is combined with partially or totally polished surface and it is mostly used to make casseroles in cooking ware. We carried out archaeometric analyses, for which we found parallels in San Giovanni di Pratola Serra, in the Apennines. The fabric is hard, rough, rich in quartz, feldspar and mica inclusions. Volcanic inclusions are absent, while is present an arenaceous component accompanied by Argillaceous Rock Fragments. The main visual characteristic is the presence of an inner grey core with outer orange rims. In Campania, the shapes

[661] An interesting imitation of this shape has been found in Hirpinia and is currently on display at the Museo Irpino in Avellino.

associated with this fabric are attested in Benevento, at the church of Santa Sofia. This production, although typical of Hirpinia and formally derived from the widespread inner Italian "Calle di Tricarico" typology, is present with very few vessels solely around Vesuvius and testifies to a third trade flow, this time moving from Hirpinia to the Vesuvian countryside, thus along the paths used by the shepherds.

In conclusion, the evidence encourages me in hypothesising the presence of multiple trade patterns operating at the same time within a complex system. At least three different routes can be identified. The first is used for the imported goods, and moves from the harbour in Neapolis towards Beneventum. This trade follows the main routes and marginalises the small centres, therefore it is hierarchical: Nola is provided with the same quantity of imported goods as Neapolis, while the site in Pollena Trocchia, although closer to Neapolis and within its territory, shows a smaller quantity of imports. The second route links the sites on the slopes of Vesuvius. It shows tight connectivity, preference for particular shapes which are not attested in the cities, therefore it is cross-boundary and independent from the cities. The last route links the Apennines to the Vesuvian plain; this route suggests considerations on interdependency between the plain and the mountains.

The coexistence of multiple trade patterns operating at the same time can somehow appear odd if they are considered from the traditional viewpoint of centralised distribution hubs; nevertheless, the evidence presented hints at a more complex picture of trade, in which fuel and clay for the territory of Neapolis are partially provided by the Apennines, volcanic inclusions for the production of pottery in the Phlegraean Fields are quarried on the slopes of Vesuvius, etc. Therefore, in imaging the pottery trade as part of a more economically substantial trade of perishable goods, it seems reasonable to hypothesise that luxury goods were sold by specialised merchants in the main cities, while multiple small workshops were in place in the countryside, as well as goods from Hirpinia were brought to the plain along with the flocks during the winter pasturing, as occurred until two generations ago. In order to make these scenarios less conjectural,

and our understanding of late antique Campania sharper, it is necessary to conduct more research on ecofacts and broaden the quantity of archaeometric analyses on the pottery.

8.3. Longue durée trade

In general the study of the pottery, from its production to its trade, is bound to the shapes of the vessels and their development throughout time, thus it follows the human cycles - a few generations - until certain productions end or mutate into new shapes. Nevertheless, beyond the fashion of particular shapes and the general economic trends, there are some natural resources which are continuously exploited. Among these, the volcanic inclusions of the Somma-Vesuvius complex - used as temper for most of the pottery produced in Campania, are a case of particular interest, because differently from other volcanic resources available in the region, like the pozzolana for the mortar or the *cruma di lava* for the vaults or the lava for the olive mills, do not have special intrinsic qualities which could explain why they were preferred over other similar volcanic inclusions from the Phlegraean Fields or Pithecusae.

In recent years the volcanic inclusions typical of the Somma-Vesuvius complex have been targeted and identified: calcic clinopyroxene in both its varieties, the colourless (diopside) and the dark green (salite), sanidine, biotite, sometimes with garnet and olivine (especially in the bricks); the association of these minerals with the scoria of leucite create a distinctive profile of the Somma-Vesuvius complex which differs considerably from the products of the other volcanoes in the region.

I have gathered the information on the pottery which unquestionably used tempers from the Somma-Vesuvius throughout time and listed below:

- Coarse ware of Pompeii (1st c. AD), for which at least six kilns have been also identified.
- Coarse ware and tableware of Puteoli (1st c. AD), similar to that produced in Pompeii and of uncertain production.

- Coarse ware and slipware ('vernice rossa interna') from Cumae (1st c. BC - 2nd c. AD), for which a kiln has also been identified.

- Late antique cooking ware and burnished ware from Neapolis (3rd-7th c. AD), for which production wastes have been discovered in the area of the macellum (church of San Lorenzo Maggiore). Probably many kilns were in place also around Vesuvius.

- The Greek-Italic amphorae MGS III, IV, V, VI (4th-3rd c. BC) produced at Pithecusae/ Ischia, where both the kilns and their production waste have been discovered.

- Dressel 1, 2-4 amphorae with Vesuvian inclusions. Among the wide production of these amphora types a group characterised by 'black-sand' volcanic inclusions was identified; more recently, within this group a smaller one, distinctively with Vesuvian inclusions has been singled out; more analyses would be necessary to test to what percentage of the 'black-sand' amphorae are Vesuvian or just Campanian.

- Late antique amphorae (7th-9th c. AD) produced in Misenum, for which also a kiln has been identified.

With regard to the clay used for these vessels, it is difficult to ascertain its provenance, since the only meaningful difference noticeable is the percentage of CaO, which is just a proxy of a marine or fluvial origin. Nevertheless it is still useful in the case of the Greek-Italic amphorae produced in Ischia, which use clay from the same island (but inclusions from the Somma-Vesuvius complex), while interestingly the clay used in Neapolis at the same time for the production of the Campana A is of fluvial origin, thus it might have come from the clay altiplanos in Hirpinia rather than from Ischia, i.e. the trade of primary resources between Neapolis and Pithecusae was not reciprocal.

The most interesting part is that volcanic inclusions used for the coarse ware production in many workshops in Campania come from the Somma-Vesuvius complex. This information is of particular importance for two reasons, first because some of these workshops, like those in Cumae or Pithecusae, lay in volcanic areas, which easily could have provided the sort of inclusion they needed to make pottery (indeed there is no

functional difference between these inclusions for that purpose); the second reason has to be sought in the fact that this resource continued to be exploited for centuries, regardless of the shape of the pots produced, economic trends which favoured some areas over others, and especially regardless of the AD 79 eruption. The network related to this production is actually even more complex than one might think, because for example the amphorae produced in Pithecusae also carried the wine produced on the slopes of Vesuvius, therefore there was an even larger resource exchange. Furthermore, this network is not limited to the Vesuvian area, especially if we consider that it was not autonomous for clay and wood (or better charcoal), and both were necessary for the pottery production. It is harder to trace back the provenance of these resources, but at least for the clay the percentage of calcium oxides can help differentiate between the clay which originated from the sea (e.g. in Pithecusae) and the clay originating in the mainland. In same cases, as for the workshop in Cumae, the low percentage of CaO (<6%) let us think that the clay used there was quarried from the land. As a working hypothesis I would suggest that this clay came from the Apennines, where the land is rich in clay hills and where also the wood/charcoal could have been provided in large quantities.

The most relevant consequence of this brief analysis lies in the model of land exploitation that can be derived from it. The exploitation of Vesuvian debris for the pottery creation crosses the political boundaries of the cities around the bay and apparently is a counter-intuitive and economically inefficient practice, because equally useful volcanic inclusions were readily available also in the other areas, i.e. the Phlegraean Fields and Pithecusae.

The explanation for this alleged oddity can be ascribed to a 'human fault', i.e. an influence of non-optimal behaviour (Fig. 7, quadrant IV) because of poor quantity/ quality of information, which might as well include the use of volcanic inclusions of a particular colour because they were regarded as more effective than others (as occurred with the pozzolana for the mortar). Alternatively, in a more cost-efficient perspective, the preference of the volcanic inclusions from Vesuvius might stem from the easiness of

exploitation or the cheapness of the product, which could result from a specialised trade which despite the vast changes in human history remained constant for more than a millennium. In these regards it is interesting to note that the most important marker of Vesuvian inclusions - the leucitic scoria - is very scant in the debris of the AD 79 eruption, while it is abundant, and easily recognisable, in the ejecta of the proto-historical eruption of Avellino and in that which occurred in AD 472, thus these materials were either collected along the rivers Sebethus and Sarnus - as potters generally do - or were purposefully exploited in the few spots where the proto-historical eruption emerged as outcrop.

In either case, the exploitation of this resource testifies to the complex (and cross-boundary) network of trades involved in this as in many other productions.

9. Conclusions

This study investigated the territories of Neapolis and Nola in order to understand what role they played in the economy of their cities and in Campania. It further explored the difficult relationship between mankind and the fragile landscape of Vesuvius, how eruptions changed settlement patterns, exploitation strategies, and how people dealt with other smaller natural disasters that frequently occurred in this area.

The multilayered analysis (static landscape, natural phenomena, land exploitation, settlement pattern) carried out so far has produced a structured view of the ancient environment and varied pieces of information which are here used to answer the questions posed in §1.2.3, moving from the particular facts to the general theories on the Roman economy.

1. Settlement pattern. Despite the quite patchy evidence, there are signs of a very dense pattern; this is quite clear where the modern urbanisation stopped - on the slopes of the volcano (100-400 m a.s.l.), as well as in the plain both through the signs of centuriation and in all the spots where rescue archaeology has been carried out, revealing in all instances cultivated fields. In AD 79 villas were ubiquitous, while the scant evidence available for the pre-Roman period and late antiquity hints at a more sparse pattern, probably with a higher nucleation rate (hamlets/pagi). During the 1st c. AD, both sides of the volcano were intensively exploited for wine production while the evidence for the plain is insufficient to assess whether the tight pattern of vineyards existed also in the Nolan plain.

2. Life in the shadow of Vesuvius. The information gathered allow us to move beyond the polarised view of the volcano as either destroyer or provider of great abundance; despite the undoubtable fertility of the soil, its productivity rate - at least for the vineyards on its slopes - today does not seem to exceed what could be considered as the norm (3 c./i.). Conversely the instability of the volcanic soil, matched with the presence of topographic lows and the steep Apennines, make us consider what made

this region so densely populated. In my opinion the greatest advantages were the constantly mild climate and especially the proximity of diverse landscapes, which easily provided all sorts of products but metals. The closeness of these ecosystems to several cities and harbours created a tight network, whose advantages can be easily understood with the model of a "small-world network". In particular I would stress two specific features, the first in regards to the role played by "well-informed agents" in reducing non-optimal behaviours (Fig. 7), and the economic benefits deriving from this.[662] Secondly this model explains how the loss of two nodes - Pompeii and Herculaneum - did not hamper the stability of the regional system.

3. Differences among the economies of Neapolis, Nola, and Pompeii. From a countryside perspective, these cities shared a similar exploitation of the slopes of Vesuvius for wine production, but differed considerably in the extension of their countryside areas, from the narrow plain of Neapolis to the vast hills of Nola. Considering that the three cities roughly had the same dimensions, one could postulate differences in the economies of the cities, with Nola more reliant on its orchards and pasturage (as the ancient sources and the epigraphic evidence suggest) while Neapolis invested in manufacture (e.g. pottery, perfumes) and trade. A similar scheme can be used to understand the differences between Capua and Puteoli and to state more generally that one single recipe cannot define all kinds of Roman cities and that the peculiar character of each city can be defined only by including also its territory in the equation.[663] On a higher level of abstraction, despite the very densely populated countryside we notice an extremely high urbanisation rate,[664] which seems to contrast with Finley's model and ultimately points to a more "modern" kind of economy.

[662] Jackson 2011: 1.

[663] Keay and Earl 2011: 276.

[664] Lo Cascio 2009: 99.

City	Size (ha)	City's inhabitants	Territory (plain ha)	Territory (tot. ha)	Countrymen (plain 0.5-1.5)	Countryside (total 0.5-1.5)
Capua	177	26,550-44,250	36,000	36,000	17,900-53,700	17,900-53,700
Nuceria	113	16,950-28,250	7,300	16,500	3,600-10,750	8,200-24,580
Neapolis	75	11,250-18,750	4,320	13,900	2,122-6,370	6,900-20,700
Nola	73	10,950-18,250	19,560	30,510	9,750-29,200	15,200-45,650
Pompeii	64	9,600-16,000 (10,000-12,000 ?)	9,570	11,500	4,750-14,260	5,700-17,750
Atella	53	7,950-13,250	5,900	5,900	2,900-8,800	2,900-8,800
Suessula	45	6,750-11,250	(660)	(660)	300-920	300-920
Abella	29	4,350-7,250	n.a.	n.a.	n.a.	n.a.
Acerrae	20	3,000-5,000	(660)	(660)	300-920	300-920
Herculaneum	14	2,100-3,500	1,280	2,055	630-1900	1,000-3,000
Calatia	11	1,650-2,750	(660)	(660)	300-920	300-920

Table 14 - Estimates on the size and population of some of the cities in southern ancient Campania their territories (Cumae, Puteoli, Baiae, and Misenum have not been included because of insufficient data).

4. Effects of the Pompeian eruption. The comparison between the effects of the eruption on vegetation (Fig. 110) and the archaeological map of the post-AD 79 sites (Fig. 144) suggests that overall the resettlement did not create a pattern as dense as it was before the eruption but also that it differed considerably according to the cities. In the territories of Neapolis and Nola often the new sites had been set right after the eruption in the exact spot of the previous ones, in some cases as larger villas, in others as poorly made agricultural units, somehow hinting at a higher social divide. Conversely the former territory of Pompeii - probably divided between Nola and Nuceria - shows very few signs of resettlement, while in the former territory of Herculaneum some villas on the coast were resettled and a few other sites appeared. In my opinion these differences should not be attributed to social factors such as the fear of new eruptions, but rather to the role played by the cities in the organisation of the countryside, i.e. the need to create a place where the social and economic

networks could take place.

5. The role played by Neapolis and Nola in the regional system. The geographic position of the cities of Campania, matched with the ranking by size of the area within their city walls, creates a fairly regular Christaller lattice, in which both Neapolis and Nola are placed in the third level, after Capua and Puteoli, as well as Nuceria. An informed/historical weighting of the road network confirms that, at least in the 1st c. AD, both cities were second-rank nodes in the regional system. Nevertheless this model cannot be trickled down to the territories, whose sizes vary regardless of the dimensions of the cities they refer to; this can be explained by hypothesising a variable degree of dependence of each city on its countryside and vice versa, ultimately caused by the scale of surplus produced by each of the two parts and the direction of the economic flows. Indeed the pottery analysis revealed that some productions were typical of the environs of Vesuvius and were traded cross-boundary in the countryside, excluding the cities. Following this thread, I am under the impression that the transformation of ranking lists into a hierarchical model / dendritic system, is not very useful to describe this kind of economic flows, because these models imply that economic resources were siphoned from the small towns to the large ones,[665] while the evidence points to more complex interactions.

6. Autarky vs. dependency. Within the Moeller-Jongman debate on the agricultural exploitation of Campania, the figures provided in §6.2.3 show that at least some of the cities were reliant on outside sources for the provision of some basic staples, like grain and fuel. We can work on the figures of the previous chapters and investigate whether there was an economic convenience in preferring wine over grain. According to Columella (3.3.10), 1 culleus of ordinary wine was priced at 300 HS, which means 900 HS per iugerum if we keep the proportion of 3 c./i., which means 3,600 HS/ha. On the other hand for the grain we know that in Pompeii 1 modius of

[665] But obviously large cities favour the creation of specialised shops and services (because they can match the high threshold population required), thus inevitably operate also as attraction poles.

wheat costed 3-7.5 HS;[666] considering that 1 modius corresponds to 8.62 litres, which contains 6.8 kg of wheat, we can convert the price to 0.44-1.1 HS/kg; by using the figure of 632 kg/ha,[667] we can conclude that the crop of 1 ha planted with wheat would have been worth 278-695 HS, while by planting it with vines the crop would have been worth - in the worst-case scenario - 3,600 HS. In this perspective ancient Campania shows that the combination of easily available goods - either as (State-subsidised?) overseas imports or as inexpensive trades from the neighbouring region - with the quest for profit brought to the compartmenting of areas within the region and a considerable interdependency between areas. Through an evolutionary perspective, the creation of the "wine district", i.e. the tight clustering of small productive units, might have been the key factor to the economic success of the environs of Vesuvius, at least until the mid-1st c. AD; meanwhile though, the further development of this model, with less-fragmented estates and bulkier production,[668] allowed Gaul and Spain to be economically more efficient,[669] thus more competitive.

7. The broader picture. A tale of two cities can hardly portray the complexity of the Roman economy but it rather confirms that the variety noticed among provinces[670] and within provinces existed also in the Italian peninsula; furthermore, by moving to geographically larger scales of reference - from Campania to Roman southern Campania, to the micro-regional area around Vesuvius, to the individual cities with and without their territories - one notices considerable variations between cities and also between cities and their territories. This somehow obvious statement nevertheless has consequences when one tries to reckon Empire-wide general figures on the rate of urbanisation or uses the city as basic unit to describe a region, as

[666] Rathbone 2009: 304.

[667] Nota bene: according to the ancient sources this figure is more than astronomical; according to Varro (1.44.1) and Columella (2.9.2) the average is 5 modii per iugerum - 135 kg/ha - the maximum being 10 modii per iugerum (Columella 2.9.1-2).

[668] Wilson 2009: 213.

[669] Marzano 2013.

[670] Bowman and Wilson 2009: 8-9.

appears clear even by a superficial comparison between Campania and Hirpinia;[671] it further confirms that the theoretical framework of complex systems is more suitable than reductionism to describe general phenomena. Nevertheless, as much as Pompeii provides useful insights into the Roman world, so the tale of the two cities is not just an instance of local historiography, but it can illuminate regional peculiarities and discrete features of the Roman economy. On a regional level, the most interesting aspect - despite the still partial information gathered for Campania - is the divergence from some trends witnessed in other parts of the Empire, in particular the very high urbanisation rate, the *hypercephalie*[672] of Capua and Puteoli, as well as the likely deviation from Zipf's rank-size graph[673] show how much Campania differed from the exploited provinces. More in general, the identification of multiple trade patterns operating at the same time allowed the creation of a model which moves beyond the territorial limits of cities and regions, by focusing on micro- and inter-regional trade patterns, and in which more emphasis is given to the economic agents[674] (e.g. wine-producers, shepherds, and merchants) and to the reliance of some areas on others. In my opinion, the concept of "degree of dependence" can become a useful tool to define the character of a city or a region through the relationships with other areas. Through that concept it would be possible to emphasise the level of openness of a city/region and the intensity of commerce (i.e. of human interaction) instead of its monetary relevance;[675] this would be useful especially for those goods, like wood, whose trade might have been cheap but not petty. In these regards ancient Campania shows a high compartmentalisation,[676] or degree of dependence of each micro-regional area on the others, from which one can

[671] Fariello and Lambert 2009.

[672] Hanson 2011.

[673] Marzano 2011.

[674] Fulford 2009: 255-6.

[675] Bowman and Wilson 2009: 12-13.

[676] Bowman and Wilson 2009: 15.

deduce a high specialisation of each economic agent but not necessarily a high productivity for each of its units.

Further developments of this research could be carried out in the following directions:

a. Fill in the gaps. Two specific aspects are worth investigating, the cultivations in the Nolan plain (through targeted test-trenches) and the role of the small cities at the boundaries of this system, like Acerrae, through a reassessment of the pottery evidence.

b. Better define the economic flows. The methodology used in §8.2 could be applied in more sites to test that model and single out the diffusion of specific products.

c. Create a network of the economic agents. A thorough study of the inscriptions of Campania and the neighbouring regions, and the inclusion of names and their connections in software platforms like Gephi or Cytoscape would allow the creation of a complex network, through which it will be possible to identify the "hub-agents" and the boundaries of the system.

d. Study the degree of dependence in other areas of the Empire. The approach used in this work to quantify the available land, the settlement pattern, the population, the trade patterns and ultimately the degree of dependence of some staples can be replicated in the regions where a dense settlement pattern can be noted and boundaries defined, like in the Po valley.

I hope that this tale of two cities expanded - both geographically and chronologically - our understanding of the environs of Vesuvius beyond Pompeii and Herculaneum and that the economic model here proposed will be considered a progression in the study of ancient Campania. I also hope that the light shed on the "dark side" of the volcano will encourage more research in this area, not only to test models and fill gaps, but also to provide the means to the sons of Vesuvius to identify themselves as a community.

Bibliography

Abate, F. (1862), *Primi studi sull'acquedotto Claudio. Rapporto al signor sindaco di Napoli*, (Napoli: Stamperia dell'Iride).

Accorona, F., et al. (1985), 'La fornace di corso Umberto', *Napoli antica* (Napoli: Macchiaroli), 378-85.

Adamo Muscettola, S. (1984), 'Napoli e l'immaginario antico tra '600 e '800', *Prospettiva*, 39 2-10.

Adams, G.W. (2006), *The Suburban Villas of Campania and their Social Function*, (British Archaeological Reports International Series 1542, Oxford: Archaeopress).

Alagi, G. (1971), 'La zona vesuviana dal I al IV secolo', *Campania Sacra*, II 3-13.

Albore Livadie, C., et al. (1990), 'Evoluzione geomorfologica, neotettonica e vulcanica della piana costiera del fiume Sarno in relazione agli insediamenti anteriori all'eruzione del 79 d.C.', in Albore Livadie, C. and F. Widemann (eds.), *Volcanologie et Archéologie* (Pact, 25, Strasbourg: Rixensart), 237-56.

Albore Livadie, C., G. Mastrolorenzo, and G. Vecchio (1998), 'Eruzioni pliniane del Somma-Vesuvio e siti archeologici dell'area nolana', in Guzzo, P.G. and R. Peroni (eds.), *Archeologia e Vulcanologia in Campania. Atti del Convegno, Pompei 21 dicembre 1996* (Napoli: Arte tipografica), 39-86.

Albore Livadie, C. (ed.) (1999), *L'Eruzione vesuviana delle "Pomici di Avellino" e la facies di Palma Campania (Bronzo antico): Atti del Seminario internazionale di Ravello, 15-17 luglio 1994*, Territorio storico ed ambiente, 2, Bari: Edipuglia)

Alcock, S. (1993), *Graecia Capta. The landscapes of Roman Greece*, (Cambridge: Cambridge University Press).

Alcock, S. and J.F. Cherry (2004), *Side-by-Side Survey: Comparative Regional Studies in the Mediterranean World*, (Oxford: Oxbow Books).

Algranati Mastrocinque, G. (1938), *Notizie meteorologiche e climatologiche della Campania*, (Ricerche sulle variazioni storiche del clima italiano, II, Bologna: Nicola Zanichelli Editore).

Alisio, G.C. (1984), *Napoli nel Seicento. Le vedute di Francesco Cassiano de Silva*, (Napoli: Electa).

Allen, J.R.M., et al. (2002), 'Holocene environmental variability - the record from Lago Grande di Monticchio, Italy', *Quaternary International*, 88 69-80.

Allevato, E. and G. Di Pasquale (2009), 'Archaeobotanical data from Vesuvius region in the Roman period: state of the art and perspective', in Macfarlane, R.T. and G.F. De Simone (eds.), *Apolline*

Project vol.1: Studies on Vesuvius' North Slope (Provo (UT) - Napoli: Brigham Young University - Università degli Studî Suor Orsola Benincasa Napoli),

Allevato, E., et al. (2010), 'Pollen-wood analysis at the Neapolis harbour site (1st-3rd century AD, southern Italy) and its archaeobotanical implications', *Journal of Archaeological Science*, 37 2365-75.

Allevato, E., et al. (2012), 'Persistence of the cultural landscape in Campania (Southern Italy) before the AD 472 Vesuvius eruption: archaeoenvironmental data', *Journal of Archaeological Science*, 39 399-406.

Allison, P.M. (2002), 'Recurring tremors: the continuing impact of the AD 79 eruption of Mt Vesuvius', in Torrence, R. and J. Grattan (eds.), *Natural Disasters and Cultural Change* (London: Routledge), 107-25.

Allocca, F., et al. (2000), 'Cyclical Climate-Environment Variations during the Holocene in Campania', *Sicily: a natural laboratory in the Mediterranean area stucture, seas, resources and hazards: Proceedings of the 79 Riunione estiva della Società Geologica Italiana held in Palermo (Italy) on September 21-23, 1998* (Memorie della Società Geologica Italiana, 55, Roma: Società Geologica Italiana), 345-52.

Allroggen-Bedel, A. (1974), *Maskendarstellungen in der römisch-kampanischen Wandmalerei*, (München: Fink).

Allroggen-Bedel, A. (1993), 'Gli scavi di Ercolano nella politica culturale dei Borboni', in Franchi dell'Orto, L. (ed.), *Ercolano, 1738-1988: 250 anni di ricerca archeologica. Atti del Convegno internazionale Ravello-Ercolano-Napoli-Pompei, 30 ottobre-5 novembre, 1988* (Roma: L'Erma di Bretschneider), 35-40.

Amato, L., et al. (2007), 'L'evoluzione del paesaggio costiero tra Parthenope e Neapolis: dagli antefatti geologici tardopleistocenici alle fluttuazioni della costa in epoca storica', *People/ environment relationships from the Mesolithic to the Middle Ages: recent Geo-Archaeological findings in Southern Italy, 3rd September 2007*, 4-6.

Ambrose, P. (ed.) (1969), *Analytical human geography: a collection and interpretation of some recent work*, Concepts in Geography, 2, London: Longmans)

Amigues, J. *Les fetes romaines illustrées. Feuillets de l'album d'un voyageur par Jules Amigues*, ed. Escalles, Ch., (Traditions & Monuments de Rome Pontificale).

Andreau, J. (1974), *Les Affaires de Monsieur Jucundus*, (Collection de l'Ecole française de Rome, 19; Roma: Ecole française de Rome).

André, J.-M. (1966), *L'Otium dans la Vie Morale et Intellectuelle Romaine des Origines à l'Époque Augustéenne*, (Paris:).

Annese, C. (2000), 'Le ceramiche tardoantiche della domus B', in Volpe, G. (ed.), *Ordona X. Ricerche archeologiche a Herdonia (1993 –1998)* (Bari: Edipuglia), 285-342.

Antonelli, F., G. Nappi, and L. Lazzarini (2001), 'Roman millstones from Orvieto (Italy): petrographic and geochemical data for a new archaeometric contribution', *Archaeometry*, 43.2 167-89.

Antonelli, F., L. Lazzarini, and L. Luni (2005), 'Preliminary study on the import of lavic millstones in Tripolitania and Cyrenaica (Libya)', *Journal of Cultural Heritage*, 6 137-45.

Antonelli, F. and L. Lazzarini (2010), 'Mediterranean trade of the most widespread Roman volcanic millstones from Italy and petrochemical markers of their raw materials', *Journal of Archaeological Science*, 37 2081-92.

Antonietti, A. and C. Vanzetti (1961), *Carta della utilizzazione del suolo d'Italia*, (Milano: Feltrinelli).

Aoyagi, M., C. Angelelli, and S. Matsuyama (2005), 'Lo scavo della cd. Villa di Augusto a Somma Vesuviana (NA). Campagne 2002-2004', *Rendiconti Pontificia accademia*, LXXVIII 75-109.

Aprile, F., M. Conte, and G. Rolandi (1999), 'The buried town of Herculaneum and the local coastal morphology before the Vesuvius eruption of A.D. 79', *Il Quaternario*, 12.1 57-62.

Arrighi, S., C. Principe, and M. Rosi (2001), 'Violent strombolian and subplinian eruptions at Vesuvius during post-1631 activity', *Bulletin of Volcanology*, 63 126-50.

Arthur, P. (1990), 'L'ambiente', in Amalfitano, P., G. Camodeca, and M. Medri (eds.), *I Campi Flegrei: un itinerario archeologico* (Venezia: Marsilio), 3-5.

Arthur, P. (1991), *Romans in Northern Campania: Settlement and Land-use around the Massico and Garigliano Basin*, (Archaeological Monographs of the British School at Rome, 1; London: British School at Rome).

Arthur, P. (ed.) (1994), *Il complesso archeologico di Carminiello ai Mannesi, Napoli (Scavi, 1983-1984)*, Galatina: Congedo)

Arthur, P. (1998), 'Local pottery in Naples and northern Campania in the sixth and seventh centuries', in Saguì, L. (ed.), *Ceramica in Italia: VI-VII secolo: Atti del convegno in onore di John W. Hayes: Roma, 11-13 maggio 1995* (Biblioteca di archeologia medievale, 14, Firenze: All'insegna del giglio), 491-510.

Arthur, P. (2002), *Naples from Roman Town to City-State*, (Archaeological Monographs of the British School at Rome, 12; London: British School at Rome & Università degli Studi di Lecce).

Arthur, P. (2007), 'Pots and boundaries. On cultural and economic areas between Late Antiquity and the early Middle Ages', in Bonifay, M. and J.-C. Tréglia (eds.), *LRCW 2: Late Roman Coarse Wares, Cooking Wares and Amphorae in the Mediterranean: Archaeology and Archaeometry* (BAR International Series, 1662, Oxford: Archaeopress), 15-27.

Arthur, P. and D.F. Williams (1995), 'Campanian wine, Roman Britain and the third century', *Journal of Roman Archaeology*, 5 250-60.

Asheri, D. (1966), *Distribuzioni di terre nell'antica Grecia*, (Torino: Accademia delle Scienze).

Attema, P. (1999), 'Cartography and landscape perception: a case study from central Italy', in Gillings, M., D. Mattingly, and J. van Dalen (eds.), *Geographical Information Systems and Landscape Archaeology* (Archaeology of Mediterranean landscapes, 3, Oxford: Oxbow Books), 23-34.

Attema, P. and T. de Haas (2011), 'Rural Settlement an Population Extrapolation: A Case Study from the Ager of Antium, Central Italy (350 BC - AD 400)', in Bowman, A. and A. Wilson (eds.), *Settlement, Urbanization, and Population* (Oxford: Oxford University Press), 97-140.

Attema, P.A.J. and G. Schörner (eds.) (2012), *Comparative issues in the archaeology of the Roman rural landscape*, JRA Supplementary Series, 88, Portsmouth (RI): Journal of Roman Archaeology)

Avella, L. (1974), *La regione di Nola preromana (storia, ipotesi e scoperte)*, (Napoli-Roma:).

Baker, V.R. (1987), 'Paleoflood hydrology and extraordinary flood events', *Journal of Hydrology*, 96 79-99.

Banaji, J. (1989), 'Review of: W. Jongman, The Economy and Society of Pompeii', *Journal of Roman Studies*, 79 229-13.

Barker, G. (1989), 'The archaeology of the Italian shepherd', *Proceedings of the Cambridge Philological Society*, 35 1-19.

Barker, G. (1995), *A Mediterranean Valley. Landscape Archaeology and Annales History of the Biferno Valley*, (London-New York: Leicester University Press).

Barker, G. (2002), 'A Tale of Two Deserts: Contrasting Desertification Histories on Rome's Desert Frontiers', *World Archaeology*, 33.3 488-507.

Barker, G. and J. Lloyd (eds.) (1991), *Roman Landscapes: archaeological survey in the Mediterranean region*, Archaeological Monographs of the British School at Rome, 2; London: British School at Rome).

Baynes, N.H. (1943), 'The Decline of the Roman Power in Western Europe. Some Modern Explanations', *The Journal of Roman Studies*, 33 29-35.

Bell, T., A.I. Wilson, and A.J. Wickham (2002), 'Tracking the Samnites: landscape and communications routes in the Sangro Valley, Italy', *American Journal of Archaeology*, 106.2 169-86.

Beloch, J. (1882), 'Le fonti di Strabone nella descrizione della Campania', *Atti dell'Accademia nazionale dei Lincei. Classe di scienze morali, storiche e filologiche. Memorie*, s.III, 10

Beloch, J. (1890), *Campanien. Geschichte und Topographie des antiken Neapel und seiner Umgebung*, (2 edn., Breslau: E. Morgenstern).

Beloch, J. (1898), 'Le città dell'Italia antica', *Atene e Roma*, I.6 257-78.

Beloch, J. (1989), *Campania. Storia e topografia della Napoli antica e dei suoi dintorni*, (Napoli: Bibliopolis).

Benassai, R. (2000), 'La tomba dipinta nolana Weege 30', in Cappelli, R. (ed.), *Studi sull'Italia dei Sanniti* (Milano: Electa), 78-81.

Bernabò Brea, L. (1981), *Menandro e il teatro greco nelle terracotte liparesi*, (Genova: SAGEP).

Bertoldi, R., D. Rio, and R. Thunell (1989), 'Pliocene–Pleistocene vegetational and climatic evolution of the south-central Mediterranean', *Palaeogeography, Palaeoclimatology, Palaeoecology*, 72 263-75.

Bilotta, E., et al. (2005), 'Geotechnical characterisation of pyroclastic soils involved in huge flowslides', *Geotechnical and Geological Engineering*, 23 365-402.

Binazzi, G. (1986), 'Orso, Cassiano e Apollinare. Appunti sulla diffusione di culti al seguito delle milizie', *Romanobarbarica*, 9 5-24.

Black, J. (2003), *Italy and the Grand Tour*, (New Haven: Yale University Press).

Bloch, H. (1947), 'The Roman Brick-Stamps not published in Volume XV 1 of the "Corpus Inscriptionum Latinarum"', *Harvard Studies in Classical Philology*, 56-57 1-128.

Blong, R.J. (1984), *Volcanic Hazards: a Sourcebook on the Effects of Eruptions*, (Sydney: Academic Press).

Boccaccio, G. (1360), *De montibus, sylvis, fontibus, lacubus, fluminibus, stagnis, seu paludibus, et de nominibus maris liber*, (Venezia: Wendelin of Speier).

Bodel, J. (1997), 'Monumental villas and villa monuments', *Journal of Roman Archaeology*, 10 5-35.

Bologna, F. (1979), 'Le scoperte di Ercolano e Pompei nella cultura europea del XVIII secolo', *Parola del passato*, 34.188-189 377-404.

Bonghi Jovino, M. (1971), 'Una maschera fittile di produzione nolana', *Archeologia Classica*, XXIV 45-46.

Bonghi Jovino, M. and R. Donceel (1969), *La necropoli di Nola preromana*, (Napoli: Libreria Scientifica Editrice).

Bonghi Jovino, M. and M. Niro (1993), 'Nola', *Bibliografia topografica della colonizzazione greca in Italia e nelle isole tirreniche, XII* (Pisa-Roma: Scuola Normale Superiore, Ecole Française de Rome, Centre J. Bernard, Naples), 373-84.

Borgongino, M. (2006), *Archeobotanica: reperti vegetali da Pompei e dal territorio vesuviano*, (Studi della Soprintendenza archeologica di Pompei, 16, Roma: L'Erma di Bretschneider).

Borgongino, M. and G. Stefani (2001), 'Intorno alla data dell'eruzione del 79 d.C.', *Rivista di Studi Pompeiani*, XII-XIII 177-215.

Borriello, M.R., et al. (1985), 'Le necropoli urbane', *Napoli antica* (Napoli: Macchiaroli), 228-30.

Bowman, A. and A. Wilson (2009), 'Quantifying the Roman Economy: Integration, Growth, Decline?', in Bowman, A. and A. Wilson (eds.), *Quantifying the Roman Economy* (Oxford: Oxford University Press), 3-84.

Braccini, G.C. (1632), *Dell'incendio fattosi nel Vesuvio a XVI di dicembre MDCXXXI e delle sue cause ed effetti*, (Napoli:).

Bragantini, I. (ed.) (1991), *Ricerche archeologiche a Napoli. Lo scavo di Palazzo Corigliano*, Napoli: Istituto Universitario Orientale)

Brancaccio, G. (1984), 'La figurazione della Campania e del Molise nella cartografia napoletana del secolo XVIII', *Archivio Storico per le Province Napoletane*, CII 343-64.

Braudel, F. (1972), *The Mediterranean and the Mediterranean World in the Age of Philip II (trans. 2nd ed.)*, (London: Collins).

Brillante, B. (2000), *Sebeto. Storia e mito di un fiume*, (Napoli: Massa editore).

Brogiolo, G.P. (1996), 'Conclusioni', in Brogiolo, G.P. (ed.), *La fine delle ville romane: trasformazioni nelle campagne tra tarda antichità e alto Medioevo* (Documenti di Archeologia, 11, Mantova: Società Archeologica Padana), 107-10.

Brun, J.-P. (1986), *L'oléiculture antique en Provence: les huileries du département du Var*, (Paris: Centre National de la Recherche Scientifique).

Brun, J.-P. (1993), 'La discrimination entre les installations oléicoles et vinicoles', *Bulletin de Correspondence Hellenique*, Suppl. XXVI 511-37.

Bryson, R.A. and C. Padoch (1981), 'On the Climate of History', in Rotberg, R.I. and T.K. Rabb (eds.), *Climate and history: studies in interdisciplinary history* (Princeton: Princeton University Press), 3-17.

Brádzil, R., et al. (2005), 'Historical Climatology in Europe - The state of the art', *Climatic Change*, 70 363-430.

Brückner, H. (1986), 'Man's impact on the evolution of the physical environment in the Mediterranean region in historical times', *GeoJournal*, 13.1 7-17.

Buck, C.D. (1904), *A Grammar of Oscan and Umbrian*, (Boston:).

Budetta, P. and R. de Riso (2004), 'The mobility of some debris flows in pyroclastic deposits of the northwestern Campanian region (southern Italy)', *Bulletin of Engineering Geology and the Environment*, 63 293-302.

Buffone, L., et al. (1999), 'Le macine rotatorie in rocce vulcaniche di Pompei', *Rivista di Studi Pompeiani*, X 117-30.

Buffone, L., et al. (2003), 'The Millstones of Ancient Pompeii: A petro-archaeometric study', *European Journal of Mineralogy*, 15 207-15.

Bugno, M. (2009), 'Echi su Nola', in De Simone, G.F. and R.T. Macfarlane (eds.), *Apolline Project vol. 1: Studies on Vesuvius' North Slope and the Bay of Naples* (Napoli: Università degli Studî Suor Orsola Benincasa Napoli), 122-32.

Bulwer Lytton, E. (1834), *The last days of Pompeii*, (London:).

Buonincontri, M., E. Allevato, and G. Di Pasquale (2011), 'Dati archeobotanici preliminari da Marigliano: per una storia del paesaggio dell'agro nolano', in Vecchio, G. and N. Castaldo (eds.), *Territorio e archeologia nell'area dell'antica Clanis/Regi Lagni* (Marigliano: 63-70.

Burnham, B. and J.S. Wacher (1990), *The 'Small Towns' of Roman Britain*, (London:).

Caliro, S., et al. (1999), 'L'Area Urbana di Napoli: principali caratteristiche geologiche, stratigrafiche ed ambientali', *Geologia delle grandi aree urbane: progetto strategico CNR: Bologna, 4/5 novembre 1997* (Bologna: Regione Emilia Romagna), 119-44.

Callender, M.H. (1965), *Roman amphorae: with index of stamps*, (London: Oxford University Press).

Calzolari, M. (1994), *Toponimi fondiari romani. Una prima raccolta per l'Italia*, (Annali dell'Università di Ferrara, Sezione VI - Lettere, vol.VII, n.3, Ferrara: Università degli Studi di Ferrara).

Calzolari, M. (1995), 'Contributi toponomastici alla ricostruzione della rete stradale dell'Italia romana', *Opere di assetto territoriale ed urbano* (Atlante tematico di topografia antica, 3, 1994, Roma: L'Erma di Bretschneider), 35-67.

Camodeca, G. (2000), 'Le tavolette cerate di Ercolano', in Pagano, M. (ed.), *Gli antichi ercolanesi: antropologia, società, economia* (Napoli: Electa), 71-74.

Camodeca, G. (2001), 'I pagi di Nola', in Lo Cascio, E. and A. Storchi Marino (eds.), *Modalità insediative e strutture agrarie nell'Italia meridionale di età romana* (Bari: Edipuglia), 413-33.

Camuffo, D. and S. Enzi (1991), 'Istruzione per la catalogazione dei dati d'archivio per una ricostruzione di climatologia storica', *Bollettino geofisico*, 14.1 133-44.

Cantilena, R. (2004), 'Presenza e funzioni della moneta nelle chorai delle colonie greche della Campania', *Presenza e funzioni della moneta nelle chorai delle colonie greche dall'Iberia al Mar Nero. Atti del XII Convegno organizzato dall'Università Federico II e dal Centro internazionale di studi numismatici, Napoli 16-17 giugno 2000* (Roma: Istituto italiano di numismatica), 171-93.

Capaldi, C. (2004), 'Rilievi in calcare dall'anfiteatro di Nola', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, 78 439-69.

Capasso, B. (1881), *Monumenta ad Neapolitani ducatus historiam pertinentia*, (Napoli: Francesco Giannini).

Caracciolo, A. (1908), *Sull'origine del villaggio di Trocchia a proposito di un marmo esistente nella sua Chiesa parrocchiale*, (Napoli: Libreria Detken & Rocholl).

Caracciolo, A. (1932), *Sull'origine del villaggio di Trocchia, sulle disperse acque del Vesuvio e sulla possibilità di uno sfruttamento del Monte Somma a scopo turistico*, (Napoli: F. Sangiovanni e figlio).

Carettoni, G. (1941), 'S. Paolo Belsito (Nola). Tombe in località 'Campo Stella'', *Notizie degli scavi di antichità*, 85-92.

Carey, S. and H. Sigurdsson (1987), 'Temporal variations in column height and magma discharge rate during the 79 A.D. eruption of Vesuvius', *Geological Sociery of American Bulletin*, 99 303-14.

Carrington, R.C. (1931), 'Studies in the Campanian "villae rusticae"', *Journal of Roman Studies*, 21 110-30.

Carrington, R.C. (1933), 'Notes on the Building Materials of Pompeii', *Journal of Roman Studies*, 23 125-38.

Carroccia, M. (1995), 'Questioni di metodo nella lettura della Tabula Peutingeriana e problemi di viabilità romana nel territorio abruzzese-molisano', *Rivista di Topografia Antica*, V 111-30.

Carsana, V. and C. Scarpati (1998), 'La ceramica dipinta a bande', in Lupia, A. (ed.), *Testimonianze di epoca altomedievale a Benevento, Lo scavo del Museo del Sannio* (Napoli: 134-64.

Carsana, V., V. D'Amico, and F. Del Vecchio (2007)a, *La ceramica campana a figure nere: tipologia, sistema decorativo, organizzazione delle botteghe*, (Mediterranea, Suppl. 2, Pisa: Serra).

Carsana, V., V. D'Amico, and F. Del Vecchio (2007)b, 'Nuovi dati ceramologici per la storia economica di Napoli tra tarda antichità ed altomedioevo', in Bonifay, M. and J.-C. Tréglia (eds.), *LRCW 2. Late Roman Coarse Wares* (Oxford: Archaeopress), 423-37.

Carsana, V. (2009), 'La ceramica comune e da cucina da contesti tardo antichi da Napoli', in Pasqualini, M. (ed.), *Les céramiques communes d'Italie et de Narbonnaise: structures de production, typologies et contextes inédits, IIe siècle av. J.-C.-IIIe siècle apr. J.-C* (Collection du Centre Jean Bérard, 30, Napoli: Centre Jean Bérard), 673-83.

Casale, A. and A. Bianco (1979), 'Primo contributo alla topografia del suburbio pompeiano', *Pompei 79* (Suppl. Antiqua, 4, Roma: Buffetti), 27-56.

Casertano, L. and E. Pinna (1970), 'Variazioni del litorale vesuviano e fenomeni bradisismici', *Atti della Accademia Pontaniana*, 19 1-32.

Castagnetti, A. (1979), *L'organizzazione del territorio rurale nel Medioevo: circoscrizioni ecclesiastiche e civili nella Langobardia e nella Romania*, (Torino: Giappichelli).

Castagnoli, F. (1956), 'Tracce di centuriazioni nei territori di Nocera, Pompei, Nola, Alife, Aquino, Spello', *Atti dell'Accademia nazionale dei Lincei. Classe di scienze morali, storiche e filologiche. Rendiconti*, ser.8, v.11, fasc.11-12 373-78.

Cavassa, L. (2009), 'La production de céramique commune à Pompéi. Un four de potier en Regio I, insula 5, 2', in Pasqualini, M. (ed.), *Les céramiques communes d'Italie et de Narbonnaise: structures de production, typologies et contextes inédits, IIe siècle av. J.-C.-IIIe siècle apr. J.-C* (Collection du Centre Jean Bérard, 30, Napoli: Centre Jean Bérard), 95-104.

Celico, P., et al. (1998), 'Caratterizzazione idrogeologica e idrogeochimica dell'area vesuviana', *Bollettino della Società Geologica Italiana*, 117.1 3-20.

Cera, G. (2003), 'Il territorio di Cubulteria', *Carta Archeologica della Campania, 1* (ATTA, suppl. XV, 1, Roma: Erma di Bretschneider), 21-235.

Cerchiai, L. (1995), *I Campani*, (Biblioteca di Archeologia, 23; Milano: Longanesi).

Cerchiai, L. (2010), *Gli antichi popoli della Campania: Archeologia e Storia*, (Roma: Carocci editore).

Cerulli Irelli, G. (1965), 'S. Sebastiano al Vesuvio - Villa rustica romana', *Notizie dagli scavi di antichità*, s.VIII, vol.XIX, Suppl. 161-78.

Cerulli Irelli, G. (1975), 'Intorno al problema della rinascita di Pompei', in Andreae, B. and H. Kyrieleis (eds.), *Neue Forschungen in Pompeji und den anderen vom Vesuvausbruch 79 n. Chr. verschütteten Städten* (Recklinghausen: Bongers), 291-98.

Cerulli Irelli, G. (1977), 'Una officina di lucerne fittili a Pompei', *L'Instrumentum domesticum di Ercolano e Pompei nella prima età imperiale* (Roma: Erma di Bretschneider), 53-72.

Champion, T.C. (ed.) (1989), *Centre and Periphery: comparative studies in archaeology*, One World Archaeology, 11; London: Unwin Hyman)

Cherry, J.F. (1987), 'Power in space: studies of the state', in Wagstaff, J.M. (ed.), *Landscape and culture: geographical and archaeological perspectives* (Oxford: Basil Blackwell), 146-72.

Cherry, J.F. (1991), *Landscape archaeology as long-term history: northern Keos in the Cycladic Islands from earliest settlement until modern times*, (Monumenta Archaeologica, 16; Los Angeles: UCLA Institute of Archaeology).

Chester, D.K. (1993), *Volcanoes and Society*, (London: Edward Arnold).

Chianese, G. (1938), 'Ruderi di villa romana a Napoli in contrada S. Rocco di Capodimonte', *Campania romana: studi e materiali 1* (Napoli: Rispoli), 371-74.

Chisholm, M. (1979), *Rural settlement and land use: an essay in location*, (London: Hutchinson).

Chouquer, G., et al. (1987), *Structures agraires en Italie centro-méridionale: cadastres et paysages ruraux*, (Roma: Ecole française de Rome).

Christaller, W. (1933), *Die zentralen Orte in Süddeutschland: Eine ökonomisch-geographische Untersuchung über die Gesetzmässigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischen Funktionen*, (Jena: Gustav Fischer).

Christie, N. (1996), 'Barren fields? Landscape and settlements in late Roman and post-Roman Italy', in Shipley, G. and J. Salmon (eds.), *Human Landscapes in Classical Antiquity: Environment and Culture* (London: Routledge), 254-83.

Ciaraldi, M. (2007), *People and plants in ancient Pompeii: a new approach to urbanism from the microscope room*, (Accordia Specialist Studies on Italy, 12, London: Accordia Research Institute).

Ciarallo, A. (1990), 'Le problematiche botaniche dell'area archeologica vesuviana', in Matroroberto, M. (ed.), *Archeologia e botanica* (Roma: L'Erma di Bretschneider), 17-32.

Ciarallo, A. (2002), 'Risorse naturali e colture in area vesuviana nel 79 d.C.', in Petrone, P.P. and F. Fedele (eds.), *Vesuvio 79 A.D. Vita e morte ad Ercolano* (Napoli: Fridericiana Editrice Universitaria), 105-9.

Ciarallo, A. (2003), 'Testimonianze di domesticazione di alcune specie vegetali in area vesuviana', *Ambiente e paesaggio nella Magna Grecia. Atti del quarantaduesimo Convegno di studi sulla Magna Grecia, Taranto, 5-8 ottobre 2002* (Convegni di studi sulla Magna Grecia, Taranto, XLII, 2002, Napoli: Istituto per la storia e l'archeologia della Magna Grecia), 465-72.

Ciarallo, A. (2011), 'Ipotesi di ricostruzione archeoambientale del territorio di Marigliano in epoca tardo-antica', in Vecchio, G. and N. Castaldo (eds.), *Territorio e archeologia nell'area dell'antica Clanis/ Regi Lagni* (Marigliano: 55-61.

Ciasca, R. (1928), *Storia delle Bonifiche del Regno di Napoli*, (Bari: Laterza).

Cicirelli, C. (1989), 'Comune di Ottaviano. Via San Domenico', *Rivista di Studi Pompeiani*, III 253.

Cicirelli, C. (1993)a, 'S. Gennaro Vesuviano', *Rivista di Studi Pompeiani*, VI 247-50.

Cicirelli, C. (1993)b, 'Terzigno. Località Boccia al Mauro, Cava Ranieri', *Rivista di Studi Pompeiani*, VI 228-39.

Cicirelli, C. (1995), 'Comune di Ottaviano - Località Bosco De Siervo', *Rivista di Studi Pompeiani*, VII 185-88.

Cicirelli, C. (1998), 'Comune di Ottaviano - Località Raggi', *Rivista di Studi Pompeiani*, IX 241-43.

Cicirelli, C. (1999), 'Mosaico inedito da una villa romana scoperta ad Ottaviano', *AISCOM. Atti del V Colloquio dell'Associazione Italiana per lo studio e la conservazione del mosaico, Roma 3-6 novembre 1997* (Ravenna: Edizioni del Girasole), 345-50.

Cicirelli, C. (2001), 'Indagini archeologiche nei comuni di S. Gennaro Vesuviano e Ottaviano', *Rivista di Studi Pompeiani*, XII-XIII 253-59.

Cifelli, F. (1992), 'Prime considerazioni sulla composizione mineralogica dei materiali fittili', in Peduto, P. (ed.), *S. Giovanni di Pratola Serra: Archeologia e storia nel ducato longobardo di Benevento* (Salerno: Laveglia), 263-68.

Cinque, A. and F. Russo (1986), 'La linea di costa del 79 d.C. fra Oplonti e Stabiae nel quadro dell'evoluzione olocenica della Piana del Sarno (Campania)', *Bollettino della Società Geologica Italiana*, 105 111-21.

Cioni, R., R. Santacroce, and A. Sbrana (1999), 'Pyroclastic deposits as a guide for reconstructing the multi-stage evolution of the Somma-Vesuvius Caldera', *Bulletin of Volcanology*, 60 207-22.

Cioni, R., et al. (2000), 'Plinian and Subplinian Eruptions', in Sigurdsson, H. (ed.), *Encyclopedia of Volcanoes* (San Diego: Academic Press), 477-94.

Cioni, R., et al. (2004), 'Temperatures of the A.D. 79 pyroclastic density current deposits (Vesuvius, Italy)', *Journal of Geophysical Research*, 109 1-18.

Civetta, L., et al. (1998), 'Storia eruttiva del Somma-Vesuvio', in Guzzo, P.G. and R. Peroni (eds.), *Archeologia e Vulcanologia in Campania. Atti del Convegno, Pompei 21 dicembre 1996* (Napoli: Arte tipografica), 9-16.

Clarke, D. (1973), 'Archaeology: the loss of innocence', *Antiquity*, 47 6-18.

Clarke, D. (1979), *Analytical archaeologist: collected papers of David L. Clarke*, (London - New York: Academic Press).

Colletta, T. (2002), 'Napoli e Amalfi città portuali e marittime dell'altomedioevo (IX-XI secolo): un confronto', *Storia dell'urbanistica. Campania, VI* (Napoli:

Collis, J. (1986), 'Central Place Theory is Dead: Long Live the Central Place', in Grant, E. (ed.), *Central Places, Archaeology and History* (Department of Archaeology and Prehistory, University of Sheffield), 37-39.

Colonna, F. (1889), 'Iscrizioni provenienti da antiche tombe presso la strada di Capodichino ed avanzi di edifici presso i Ponti Rossi', *Notizie degli scavi di antichità*, 193-95.

Colonna, G. (1991), 'Le civiltà anelleniche', in Pugliese Carratelli, G. (ed.), *Storia e Civiltà della Campania. L'Evo antico* (Napoli: Electa), 25-64.

Colucci Pescatori, G. (1986)a, 'Fonti antiche relative alle eruzioni vesuviane ed altri fenomeni vulcanici successivi al 79 d.C.', in Livadie, C.A. (ed.), *Tremblements de terre, éruptions volcaniques et vie des hommes dans la Campanie antique* (Bibliothèque de l'Institut Français de Naples, Deuxième série, Volume VII, Napoli: Centre Jean Bérard - Institut Français de Naples), 134-41.

Colucci Pescatori, G. (1986)b, 'Osservazioni su Abellinum tardo-antica e sull'eruzione del 472 d.C.', *Tremblements de terre, éruptions volcaniques et vie des hommes dans la Campanie antique* (Bibliothèque de l'Institut Français de Naples, Deuxième série, Volume VII, Napoli: Centre Jean Bérard - Institut Français de Naples), 121-33.

Conticello de' Spagnolis, M. (1994), *Il pons Sarni di Scafati e la via Nuceria-Pompeios*, (Monografie della Soprintendenza Archeologica di Pompei, 8; Roma: Erma di Bretschneider).

Corcia, N. (1866), 'Dell'origine della città di Irina presso Nola', *Atti Accademia Napoli*, II 190-216.

Cosgrove, D.E. (1984), *Social Formation and Symbolic Landscape*, (London:).

Cosgrove, D.E. and S. Daniels (eds.) (1988), *The Iconography of Landscape: Essays on the Symbolic Representation, Design and Use of Past Environments*, Cambridge:

Cotton, M.A. and G.P.R. Métraux (1985), *The San Rocco Villa at Francolise*, (London: British School at Rome).

Cunliffe, B.W. (1985), 'Aspects of urbanization in northern Europe', in Grew, F. and B. Hobley (eds.), *Roman urban topography in Britain and the western Empire: proceedings of the third conference on urban archaeology organized jointly by the CBA and the Department of Urban Archaeology of the Museum of London* (London: Council for British Archaeology), 1-5.

Cuntz, O. (1929), *Itineraria Romana*, (Leipzig: Teubner).

Càssola, F. (1985), 'Problemi di storia neapolitana', *Neapolis. Atti del venticinquesimo Convegno di studi sulla Magna Grecia, Taranto, 3-7 ottobre 1985* (Convegni di studi sulla Magna Grecia Taranto XXV, Napoli: Arte tipografica), 37-81.

Càssola, F. (1991), 'La conquista romana. La regione fino al V secolo d.C.', in Pugliese Carratelli, G. (ed.), *Storia e Civiltà della Campania. L'Evo antico* (Napoli: Electa), 103-50.

d'Agostino, B. (1974), 'Il mondo periferico della Magna Grecia', in d'Agostino, B., E.P. Arias, and G. Colonna (eds.), *Popoli e civiltà dell'Italia antica, II* (Roma: Spazio Tre), 179-271.

d'Agostino, B. (1992), 'Greci, Campani e Sanniti: città e campagna nella regione Campania', in Maetzke, G. (ed.), *La Campania fra il VI e il III secolo a.C.: Atti del XIV Convegno di studi etruschi e italici, Benevento, 24-28 giugno 1981* (Galatina: Congedo), 73-83.

D'Arms, J.H. (1970), *Romans on the Bay of Naples: a social and cultural study of the villas and their owners from 150 B.C. to A.D. 400*, (Cambridge: Harvard University Press).

D'Onofrio, A.M. and B. d'Agostino (eds.) (1987), *Ricerche archeologiche a Napoli: lo scavo in largo S. Aniello (1982-1983)*, Napoli: Istituto Universitario Orientale)

Dale, V.H., J. Delgado-Acevedo, and J. MacMahon (2005), 'Effects of modern volcanic eruptions on vegetation', in Martí, J. and G.G.J. Ernst (eds.), *Volcanoes and the Environment* (Cambridge: Cambridge University Press), 227-49.

Davies, J.K. (1998), 'Ancient economies: models and muddles', in Parkins, H.M. and C.J. Smith (eds.), *Trade, traders and the ancient city* (London - New York: Routledge), 225-56.

Day, E.B. (1936), 'Recovery of Vegetation in the Ash Erupted by Vesuvius in 79 (Concluded)', *The Classical Weekly*, 29.14 105-10.

Day, F. (1932), 'Agriculture in the life of Pompeii', *Yale Classical Studies*, 3 165-208.

De Boer, J.Z. and D.T. Sanders (2002), *Volcanoes in Human History. The Far-Reaching Effects of Major Eruptions*, (Princeton: Princeton University Press).

De Bonis, A., et al. (2009), 'Le ceramiche comuni di Cuma', in Pasqualini, M. (ed.), *Les céramiques communes d'Italie et de Narbonnaise: structures de production, typologies et contextes inédits, IIe siècle av. J.-C.-IIIe siècle apr. J.-C* (Collection du Centre Jean Bérard, 30, Napoli: Centre Jean Bérard), 309-30.

De Caro, S. (1983), 'Una nuova tomba dipinta da Nola', *Rivista dell'Istituto nazionale d'archeologia e storia dell'arte*, VI-VII 71-95.

De Caro, S. (1992), 'La scoperta, il santuario, la fortuna', *Alla ricerca di Iside. Analisi, studi e restauri dell'Iseo pompeiano nel Museo di Napoli* (Roma: Arti), 3-21.

De Caro, S. (ed.) (1994), *Il Museo Archeologico Nazionale di Napoli*, Napoli: Electa Napoli)

De Caro, S. (1994), *La villa rustica in località Villa Regina a Boscoreale*, (Roma: Giorgio Bretschneider Editore).

De Caro, S. (2000), 'Dati recenti sul tardoantico nella Campania settentrionale', *L'Italia meridionale in età tardoantica, Atti del XXXVIII Convegno di Studi sulla Magna Grecia* (Taranto: 223-42.

De Caro, S. (ed.) (2000), *Il gabinetto segreto del museo archeologico nazionale di Napoli*, Napoli: Electa Napoli)

De Caro, S. (2003), 'L'attività archeologica a Napoli e Caserta nel 2002', *Ambiente e paesaggio nella Magna Grecia* (Convegni di studi sulla Magna Grecia, Taranto, 42 - 2002, Taranto: Istituto per la storia e l'archeologia della Magna Grecia), 569-621.

De Caro, S. (2005), 'La situazione in Campania. Cuma e Napoli', *Tramonto della Magna Grecia. Atti del quarantaquattresimo Convegno di studi sulla Magna Grecia: Taranto, 24-28 settembre 2004* (Convegni di studi sulla Magna Grecia, Taranto, XLIV, 2004, Taranto: Istituto per la storia e l'archeologia della Magna Grecia), 643-61.

De Caro, S. and D. Giampaola (2004), 'La metropolitana approda nel porto di Neapolis', *Civiltà del Mediterraneo*, II.VII, 4-5 49-64.

De Caro, S. and D. Giampaola (2008), 'La circolazione stradale a Neapolis e nel suo territorio', in Mertens, D. (ed.), *Stadtverkehr in der antiken Welt* (Palilia, 18, Wiesbaden: Ludwig Reichert Verlag), 107-24.

De Carolis, E. (1997)a, 'Il territorio vesuviano dopo il 79 d.C.', *I Beni Culturali*, 5.6 10-14.

De Carolis, E. (1997)b, 'L'area vesuviana nel I sec. d.C.', *I Beni Culturali*, 5.1 56-59.

De Carolis, E. (1997)c, 'Testimonianze archeologiche in area vesuviana posteriori al 79 d.C.', *Archeologia, uomo e territorio. Rivista dei Gruppi Archeologici d'Italia*, 16 17-32.

De Carolis, E. (1998), 'Rinvenimenti di tombe posteriori al 79 d.C. in area vesuviana', *Pompei oltre la vita. Nuove testimonianze dalle necropoli* (Napoli: 113-15.

De Carolis, E. and G. Soricelli (2005), 'Il sito di via Lepanto a Pompei: brevi note sul Tardoantico in area vesuviana', in Volpe, G. and M. Turchiano (eds.), *Paesaggi e insediamenti rurali in Italia meridionale fra Tardoantico e Altomedioevo. Atti del Primo Seminario sul Tardoantico e l'Altomedioevo in Italia Meridionale (Foggia 12-14 febbraio 2004)* (STAIM 1, Bari: Edipuglia), 513-32.

De Carolis, E., et al. (2009), 'Ceramice tardo antiche da Pompei', in Pasqualini, M. (ed.), *Les céramiques communes d'Italie et de Narbonnaise: structures de production, typologies et contextes inédits, IIe siècle av. J.-C.-IIIe siècle apr. J.-C* (Collection du Centre Jean Bérard, 30, Napoli: Centre Jean Bérard), 651-71.

De Fiore, O. (1915), 'Alberi del Monte Somma incendiati e sepolti dall'eruzione vesuviana del 79', *Zeitschrift für Vulkanologie*, II 67-75.

De Franceschini, M. (2005), *Ville dell'agro romano*, (Monografie della carta dell'agro romano, 2, Roma: L'Erma di Bretschneider).

De Franciscis, A. (1963), 'Vetri antichi scoperti ad Ercolano', *Journal of Glass Studies*, V 137-39.

De Franciscis, A. (1966), 'L'attività archeologica nelle province di Napoli e Caserta', *Filosofia e scienze in Magna Grecia* (Convegni di studi sulla Magna Grecia, Taranto V, 1965, Napoli: Arte tipografica), 173-91.

De Franciscis, A. (1967), 'Nola. Sepolcro romano', *Bollettino d'arte*, LII 197.

De Franciscis, A. (1974), 'Un monumento sepolcrale ed altre antichità a S. Anastasia (Napoli)', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, n.s. XLIX 225-31.

De Franciscis, A. (1976), 'Pollena Trocchia', in Stillwell, R. (ed.), *The Princeton Encyclopedia of Classical Sites* (Princeton: Princeton University Press), 721.

De Franciscis, A. (1983), 'Tito e la Campania nella documentazione archeologica', *Atti Congresso Internazionale di Studi Flaviani, Rieti 1981* (Rieti: 147-59.

De Fusco, R. (ed.) (1993), *Napoli sopra & sotto*, Napoli: Luca Torre)

De Juliis, E.M. (1996), *Magna Grecia: l'Italia meridionale dalle origini leggendarie alla conquista romana*, (Bari: Edipuglia).

de la Bédoyère, G. (1993), *Roman villas and the countryside*, (London: English Heritage Books).

de la Ville sur-Yllon, L. (1902), 'Il Sebeto', *Napoli Nobilissima*, XI.VIII 113-16.

de Ligt, L. and P.W. de Neeve (1988), 'Ancient periodic markets: festivals and fairs', *Athenaeum*, 66 391-416.

de Ligt, L. (1993), *Fairs and Markets in the Roman Empire*, (Amsterdam: Gieben).

De Martino, F. (1952), 'Le istituzioni di Napoli greco-romana', *Parola del passato*, 7 333-43.

De Martino, F. (1991), 'Attività economica e realtà sociale', in Pugliese Carratelli, G. (ed.), *Storia e civiltà della Campania. L'evo antico* (Napoli: Electa), 193-233.

De Rossi, G. (2005), 'Indicatori archeologici della produzione e diffusione del vino della Baia di Napoli in età altomedievale', in Volpe, G. and M. Turchiano (eds.), *Paesaggi e insediamenti rurali in Italia meridionale fra Tardoantico e Altomedioevo. Atti del Primo Seminario sul Tardoantico e l'Altomedioevo in Italia Meridionale (Foggia 12-14 febbraio 2004)* (STAIM 1, Bari: Edipuglia), 541-49.

De Sena, E. (2005), 'An Assessment of Wine and Oil Production in Rome's Hinterland: Ceramic, Literary, Art Historical and Modern Evidence', in Santillo Fritzell, B. and A. Klynne (eds.), *Roman villas around the Urbs: Interaction with Landscape and Environment. Proceedings of a Conference Held at the Swedish Institute in Rome, September 17-18 2004* (Roma: 135-49.

De Seta, C. (1980), 'Topografia territoriale e vedutismo a Napoli nel Settecento', *Civiltà del '700 a Napoli 1734-1799, vol.II* (Firenze: Centro Di), 14-37.

De Simone, A. (1973), 'La base decorata di colonna di Pollena Trocchia', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, XLVIII 49-56.

De Simone, A. (1985), 'S. Lorenzo Maggiore in Napoli: il monumento e l'area', *Neapolis. Atti del venticinquesimo Convegno di studi sulla Magna Grecia, Taranto, 3-7 ottobre 1985* (Convegni di studi sulla Magna Grecia Taranto XXV, Napoli: Arte tipografica), 233-53.

De Simone, A. (1997), 'La terra del Vesuvio: i dati archeologici e la cultura dell'antico', in Luongo, G. (ed.), *Mons Vesuvius* (Napoli: Fiorentino), 27-42.

De Simone, A. (1998), 'Ercolano 1992-1997. La villa dei Papiri e lo scavo della città', *Cronache Ercolanesi*, 28 7-59.

De Simone, A. (1999), 'L'area orientale: nota per la storia del territorio', in Lebro, M. (ed.), *Le Frontiere della Città. L'area orientale di Napoli, dall'analisi ai progetti* (Napoli: L'immediato possibile), XXXIII-XIX.

De Simone, A. and S.C. Nappo (eds.) (2000), *Mitis Sarni opes. Nuova indagine archeologica in località Murecine*, Napoli: Denaro)

De Simone, A. (2002), 'Villa Arianna: configurazione delle strutture della basis villae', in Bonifacio, G. and A.M. Sodo (eds.), *Stabiae: storia e architettura. 250° anniversario degli scavi di Stabiae 1749-1999: Convegno internazionale Castellammare di Stabia, 25-27 marzo 2000* (Roma: L'Erma di Bretschneider), 41-52.

De Simone, G.F. and S. Matsuyama (2006), 'New light on the "dark side" of Vesuvius', *Herculaneum Archaeology*, 4 5.

De Simone, G.F. (2007), 'Alcune note sul culto di Bacco in area vesuviana', in Di Mauro, A. (ed.), *Antiquitates Summae* (Salerno: D'Avino), 50-56.

De Simone, G.F. (2008), 'Il territorio nord-vesuviano e un sito dimenticato di Pollena Trocchia', *Cronache Ercolanesi*, 38 329-49.

De Simone, G.F. and R.T. Macfarlane (eds.) (2009), *Apolline Project vol.1: Studies on Vesuvius' North Slope and the Bay of Naples*, Napoli-Provo (UT): Suor Orsola Benincasa - Brigham Young University)

De Simone, G.F., et al. (2009), 'Pollena Trocchia, località Masseria De Carolis: Campagne d'indagine 2006-2009', *Rivista di Studi Pompeiani*, XX 153-54.

De Simone, G.F., A. Perrotta, and C. Scarpati (2011), 'L'eruzione del 472 d.C. ed il suo impatto su alcuni siti alle falde del Vesuvio', *Rivista di Studi Pompeiani*, XXII 61-71.

De Stefano, P. and Carsana V. (eds.) (1987), *Archeologia e trasformazione urbana, Notiziario 12. Programma straordinario di edilizia residenziale per la città di Napoli*, Napoli: Arti Grafiche Boccia)

De Vita, P., D. Agrello, and F. Ambrosino (2006), 'Landslide susceptibility assessment in ash-fall pyroclastic deposits surrounding Mount Somma-Vesuvius: Application of geophysical surveys for soil thickness mapping', *Journal of Applied Geophysics*, 59 126-39.

De Vivo, A. (1992), *Le parole della scienza: sul trattato de terrae motu di Seneca*, (Salerno: Pietro Laveglia).

Degrassi, A. *Inscriptiones Italiae XIII.2*, (Roma:).

Degryse, P. and J. Schneider (2008), 'Pliny the Elder and Sr-Nd isotopes: tracing the provenance of raw materials for Roman glass production', *Journal of Archaeological Science*, xx 1-8.

Del Prete, M., F.M. Guadagno, and A.B. Hawkins (1998), 'Preliminary report on the landslides of 5 May 1998, Campania, southern Italy', *Bulletin of Engineering Geology and the Environment*, 57 113-29.

Delano Smith, C. (1981), 'Valley changes: some observations from recent field and archive work in Italy', in Barker, G. and R. Hodges (eds.), *Archaeology and Italian Society: Prehistoric, Roman and Medieval Studies* (BAR 102, Oxford: British Archaeological Reports), 239-47.

Della Corte, M. (1923), 'Pompei. Scavi eseguiti da privati nel territorio Pompeiano. VII. Villa rustica esplorata dal sig. Carlo Rossi-FIlangieri. in Comune di Gragnano', *Notizie dagli scavi di antichità*, 275-84.

Della Corte, M. (1925), 'Trocchia (Napoli) - Scoperte di antichità nel territorio del comune', *Notizie degli scavi di antichità*, 415.

Della Corte, M. (1932)a, 'Pollena Trocchia - Cella vinaria e piscina, presso i ruderi di una villa rustica', *Notizie degli scavi di antichità*, 311-14.

Della Corte, M. (1932)b, 'Somma Vesuviana. Ruderi romani', *Notizie degli scavi di antichità*, 309-10.

Della Corte, M. (1933), 'Augustiana', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, n.s.13 69-93.

Della Corte, M. (1965), *Case ed abitanti di Pompei*, (Napoli:).

Della Corte, M. (2009), 'Augustus in his last visit to Campania: Capri and Apragopolis; Octavianum and Summa Villa', in De Simone, G.F. and R.T. Macfarlane (eds.), (Napoli-Provo (UT): Suor Orsola Benincasa - Brigham Young University), 144-56.

Dench, E. (1995), *From Barbarians to new men*, (Oxford: Oxford University Press).

di Fusco, N. and E. Di Caterina (1998), *Il Vesuvio*, (Napoli: Electa).

Di Gennaro, A. and F. Terribile (eds.) (1999), *I suoli della provincia di Napoli*, Firenze: SELCA)

Di Gennaro, A. (ed.) (2002), *I sistemi di terre della Campania*, Firenze: SELCA)

Di Giuseppe, H. (1998), 'La fornace di Calle di Tricarico: produzione e diffusione', in Saguì, L. (ed.), *Ceramica in Italia : VI-VII secolo (Atti del convegno in onore di John W. Hayes, Roma 1995)* (Firenze: All'Insegna del Giglio), 735-52.

Di Jorio, A. (1827), *Notizie su gli Scavi di Ercolano*, (Napoli: Dalla stamperia francese).

Di Mauro, A. (2003), *'A Terra 'e zi' Fattella. Ipotesi toponomastiche*, (Baronissi: Ripostes).

Di Pasquale, G., et al. (2010), 'Reworking the idea of chestnut (Castanea sativa Mill.) cultivation in Roman times: New data from ancient Campania', *Plant Biosystems*, 144.4 865-73.

Di Vito, M.A. (1999), 'Distribuzione dei depositi dell'eruzione delle "Pomici di Avellino" nell'area napoletana e ricostruzione del paleoambiente prima e dopo l'eruzione', in Albore Livadie, C. (ed.), *L'Eruzione vesuviana delle "Pomici di Avellino" e la facies di Palma Campania (Bronzo antico): Atti del Seminario internazionale di Ravello, 15-17 luglio 1994* (Territorio storico ed ambiente, 2, Bari: Edipuglia), 83-89.

Dierichs, A. (1997), *Erotik in der Römischen Kunst*, (Mainz am Rhein: von Zabern).

Diodato, N. (2007), 'Climatic fluctuations in southern Italy since the 17th century: reconstruction with precipitation records at Benevento', *Climatic Change*, 80 411-31.

Dobran, F. (1993), *Global Volcanic Simulation of Vesuvius*, (Pisa: Giardini).

Donceel, C. (1971), 'Recherches topographiques et historiques sur la ville de Nola et sa région', *Revue des archéologues et historiens d'art de Louvain*, IV 259-65.

Donceel, R. (1962), 'Timée et la mention d'une fondation chalcidienne de Nole dans Trogue-Pompée et Silius Italicus', *Bulletin de l'Institut historique belge de Rome*, 34 27-55.

Donceel, R. (1963)a, 'Le texte de Polybe (II, 17, 1) sur la présence des Etrusques en Campanie', *Bulletin de l'Institut historique belge de Rome*, 35 5-12.

Donceel, R. (1963)b, 'Nouvelles recherches archéologiques en Campanie, 1957-1963', *L'Antiquité classique*, 32 587-606.

Donceel, R. (1964)a, 'Nouvelles recherches archéologiques en Campanie, 1957 - 1963', *L'Antiquité classique*, 33 128-40.

Donceel, R. (1964)b, 'Nouvelles recherches archéologiques en Campanie, 1957-1963, II', *L'Antiquité classique*, 33 128-40.

Donceel, R. (1964)c, 'Une Chimère sur une frise à métopes figurées d'époque augustéenne, à Nole', *Bulletin de l'Institut historique belge de Rome*, 36 5-31.

Donceel, R. (1972), 'Une inscription inédite de Nole et la date du sénatus-consulte "de collegiis tenuiorum"', *Bulletin de l'Institut historique belge de Rome*, 42 27-71.

Duncan-Jones, R.P. (1974), *The Economy of the Roman Empire. Quantitative Studies*, (Cambridge: Cambridge University Press).

Duncan-Jones, R.P. (1990), *Structure and scale in the Roman economy*, (Cambridge:).

D'Arms, J.H. (1977), 'Ville rustiche e ville di "otium"', in Zevi, F. (ed.), *Pompeii 79. Raccolta di studi per il decimonono centenario dell'eruzione vesuviana* (Napoli: Macchiaroli Editore), 65-86.

Ebanista, C. (ed.) (1999), *La parrocchiale di S. Felice nel complesso basilicale di Cimitile*, Napoli-Roma: LER)

Ebanista, C. (2003), 'Dinamiche insediative nel territorio di Cimitile tra tarda antichità e Medioevo', in Brandenburg, H. and L. Ermini Pani (eds.), *Cimitile e Paolino di Nola: la tomba di S. Felice e il centro di pellegrinaggio: trent'anni di ricerche. Atti della giornata tematica dei Seminari di archeologia cristiana, Ecole française de Rome, 9 marzo 2000* (Città del Vaticano: Pontificio istituto di archeologia cristiana), 43-86.

Ebanista, C. (2005), 'Il ruolo del santuario martiriale di Cimitile nella trasformazione del tessuto urbano di Nola', in Vitolo, G. (ed.), *Le città campane fra tarda antichità e alto medioevo* (Salerno: Laveglia), 313-77.

Elia, O. (1938), 'Un tratto dell'acquedotto detto "Claudio" in territorio di Sarno', *Campania Romana: studi e materiali, vol.1* (Napoli: Rispoli), 99-111.

Engels, D.W. (1990), *Roman Corinth. An alternative model for the classical city*, (Chicago: University of Chicago).

Epigrafia della produzione (1994), *Epigrafia della produzione e della distribuzione: actes de la VIIe Rencontre franco-italienne sur l'épigraphie du monde romain organisée par l'Université de Roma - La Sapienza et l'École française de Rome sous le patronage de l'Association internationale d'épigraphie grecque et latine, Rome, 5-6 juin 1992*, (Collection de l'Ecole française de Rome 193, Roma: Università di Roma "La Sapienza" - École française de Rome).

Etienne, R. (1973), *La vita quotidiana a Pompei*, (Milano: Il Saggiatore).

Etienne, R. (1982), 'Villas du Vésuve et structure agraire', *La regione sotterrata dal Vesuvio, studi e prospettive. Atti del Convegno Internazionale, 11-15 novembre 1979* (Napoli: Università degli Studi di Napoli Federico II), 183-91.

Febbraro, S. and D. Giampaola (2009), 'Scarti di ceramica comune di età ellenistica dallo scavo di piazza Nicola Amore a Napoli: dati preliminari sulla produzione', in Pasqualini, M. (ed.), *Les céramiques communes d'Italie et de Narbonnaise: structures de production, typologies et contextes inédits, IIe siècle av. J.-C.-IIIe siècle apr. J.-C* (Collection du Centre Jean Bérard, 30, Napoli: Centre Jean Bérard), 117-32.

Fedeli, P. (2005), 'Le fonti letterarie', *Tramonto della Magna Grecia. Atti del quarantaquattresimo Convegno di studi sulla Magna Grecia: Taranto, 24-28 settembre 2004* (Convegni di studi sulla Magna Grecia, Taranto, XLIV, 2004, Taranto: Istituto per la storia e l'archeologia della Magna Grecia), 19-50.

Federico, C., et al. (2002), 'Magma-derived gas influx and water-rock interactions in the volcanic aquifer of Mt. Vesuvius, Italy', *Geochimica et Cosmochimica Acta*, 66.6 963-81.

Federico, C., et al. (2004), 'Geochemical monitoring of groundwaters (1998-2001) at Vesuvius volcano (Italy)', *Journal of Volcanology and Geothermal Research*, 133 81-104.

Feniello, A. (2005), *Les campagnes napolitaines à la fin du moyen âge. Mutations d'un paysage rural*, (Collection de l'école française de Rome, 348, Roma: École française de Rome).

Fentress, E. (2009), 'Peopling the Countryside: Roman Demography in the Albegna Valley and Jerba', in Bowman, A. and A. Wilson (eds.), *Quantifying the Roman Economy: Methods and Problems* (Oxford Studies on the Roman Economy, 1, Oxford: Oxford University Press), 127-61.

Fiengo, G. (1988), *I Regi Lagni e la bonifica della Campania Felix durante il viceregno spagnolo*, (Biblioteca dell'Archivio Storico Italiano, XXIV; Firenze: Olshki).

Finley, M.I. (1973), *The Ancient Economy*, (Berkeley: University of California Press).

Finley, M.I. (1977), *Economy and Society in Ancient Greece*, (London: Chatto & Windus).

Fiorelli, G. (1860), *Pompeianarum Antiquitatum Historia*, (Napoli:).

Fiorillo, F., et al. (2001), 'The December 1999 Cervinara landslides: further debris flows in the pyroclastic deposits of Campania (southern Italy)', *Bulletin of Engineering Geology and the Environment*, 60 171-84.

Fiorillo, R. (2003), 'La ceramica della plebs di S. Maria di Rota a Mercato S. Severino (Sa): simbolismo bizantino e tradizione longobarda nella produzione campana altomedievale', *Atti del III Congresso Nazionale di Archeologia Medievale* (Firenze: All'Insegna del Giglio), 127-34.

Fiorillo, F. and R.C. Wilson (2004), 'Rainfall induced debris flows in pyroclastic deposits, Campania (southern Italy)', *Engineering Geology*, 75 263-89.

Formicola, F., et al. (1990), 'Archeologia, geologia e vulcanologia nel territorio di Torre del Greco: tre discipline a confronto', in Albore Livadie, C. and F. Widemann (eds.), *Volcanologie et Archéologie* (Pact, 25, Strasbourg: Rixensart), 125-81.

Foss, J.E. (1988), 'Paleosols of Pompeii and Oplontis', in Curtis, R.I. (ed.), *Studia Pompeiana & Classica in honor of Wilhelmina F. Jashemski* (New Rochelle: Aristide D. Caratzas), 127-44.

Foss, J.E., et al. (2002), 'Paleosols of the Pompeii area', in Jashemski, W.M. Feemster and F.G. Meyer (eds.), *The Natural History of Pompeii* (Cambridge: Cambridge University Press), 65-79.

Foss, P. and J.J. Dobbins (eds.) (2007), *The World of Pompeii*, Routledge)

Foy, D. and M.-D. Nenna (2001), *Tout feu tout sable: mille ans de verre antique dans le Midi de la France*, (Aix-en-Provence: Edisud).

Franchi, C. (1774), 'Dissertazione su l'origine, sito e territorio di Napoli',

Franciosi, G. (ed.) (2002)a, *Ager Campanus*, Napoli: Jovene)

Franciosi, G. (ed.) (2002)b, *La romanizzazione della Campania antica, vol. 1*, Napoli: Jovene)

Frankovich, R. and H. Patterson (eds.) (2000), *Extracting Meaning from Ploughsoil Assemblages. The Archaeology of Mediterranean Landscapes 5*, Oxford: Oxbow)

Frayn, J.M. (1984), *Sheep-rearing and the wool trade in Italy during the Roman period*, (Liverpool: Cairns).

Frayn, J.M. (1993), *Markets and Fairs in Roman Italy*, (Oxford:).

Frederiksen, M. (1981), 'I cambiamenti delle strutture agrarie nella tarda repubblica: la Campania', in Giardina, A. and A. Schiavone (eds.), *Società romana e produzione schiavistica. L'Italia: insediamenti e forme economiche* (Roma-Bari: Laterza), 265-88.

Frederiksen, M. (1984), *Campania*, ed. Purcell, N., (London: British School at Rome).

Fulford, M. (1982), 'Town and country in Roman Britain - a parasitical relationship?', in Miles, D. (ed.), *The Romano-British countryside: studies in rural settlement and economy* (BAR 103 (ii), Oxford: British Archaeological Reports), 403-19.

Fulford, M.G. (1987), 'Economic interdependence among urban communities of the Roman Mediterranean', *World Archaeology*, 19.1 58-75.

Fulford, M. (2009), 'Approaches to Quantifying Roman Trade: Response', in Bowman, A. and A. Wilson (eds.), *Quantifying the Roman Economy* (Oxford: Oxford University Press), 250-58.

Fulvio, L. and F. Colonna (1891), 'Nuove scoperte entro la città e nel suo suburbio', *Notizie degli scavi di antichità*, 374-75.

Gabba, E. (1972), 'Urbanizzazione e rinnovamenti urbanistici nell'Italia centro-meridionale del I sec. a.C.', *Studi classici e orientali*, 21 73-112.

Gabba, E. (1975), 'Mercati e fiere nell'Italia romana', *Studi classici e orientali*, 24 141-63.

Gabba, E. and M. Pasquinucci (1979), *Strutture agrarie e allevamento transumante nell'Italia romana (III-I Sec. a.C.)*, (Pisa: Giardini).

Gaffney, V., H. Patterson, and P. Roberts (2001), 'Forum Novum-Vescovio: Studying Roman urbanism in the Tiber Valley', *Journal of Roman Archaeology*, 14 59-79.

Galasso, G. (1965), *Mezzogiorno medievale e moderno*, (Torino: Einaudi).

Gallottini, A. (1994), 'Le stampe come fonte della topografia antica', *Rivista di Topografia Antica*, IV 119-28.

García y García, L. (1998), *Nova bibliotheca pompeiana: 250 anni di bibliografia archeologica*, (Monografie della Soprintendenza archeologica di Pompei, 14, Roma: Bardi).

Garner, B.J. (1965), 'Models of Urban Geography and Settlement Location', in Chorley, R.J. and P. Haggett (eds.), *Models in Geography* (London: Methuen), 303-60.

Garnsey, P.D.A. (1979), 'Where did Italian peasants live?', *Proceedings of the Cambridge Philological Society*, 25 1-25.

Garnsey, P.D.A. (1988), 'Mountain economies in Southern Europe', in Whittaker, C.R. (ed.), *Pastoral economies in classical antiquity* (Cambridge: Cambridge Philological Society), 196-202.

Gasparri, C. (1986), 'Dionysos', *Lexicon iconographicum mythologiae classicae, III* (Zürich-München: Artemis), 414-514.

Gasperetti, G. (1996), 'Produzione e consumo della ceramica comune da mensa e dispensa nella Campania romana', in Batz, M. (ed.), *Les céramiques communes de Campanie et de Narbonnaise (Ier s. av. J.-C.-IIe s. ap. J.-C.): la vaisselle de cuisine et de table: Actes des journées d'étude organisées par le Centre Jean Bérard et la Soprintendenza Archeologica per le Province di Napoli e Caserta, Naples, 27-28 mai 1994* (Collection du Centre Jean Bérard, 14, Napoli: Centre Jean Bérard), 19-63.

Gell, W. (1832), *Pompeiana: The topography, edifices and ornaments of Pompeii*, (London: Rodwell & Martin).

Gentile, A. (1955), *La romanità dell'agro campano alla luce dei suoi nomi locali. 1. Tracce della centuriazione romana*, (Napoli: Pironti).

Ghilardi, M., C.J. Goddard, and P. Porena (eds.) (2006), *Les cités de l'Italie tardo-antique (IVe-VIe siècle): institutions, économie, société, culture et religion*, Collection de l'Ecole française de Rome, 369, Roma: Ècole française de Rome)

Giampaola, D. and G. D'Henry (1985), 'Il territorio', *Neapolis. Atti del venticinquesimo Convegno di studi sulla Magna Grecia, Taranto, 3-7 ottobre 1985* (Convegni di studi sulla Magna Grecia Taranto XXV, Napoli: Arte tipografica), 273-84.

Giampaola, D. (1985), 'Ponticelli', *Napoli antica* (Napoli: Macchiaroli), 302-12.

Giampaola, D. (2004), 'Dagli studi di Bartolomeo Capasso agli scavi della Metropolitana: ricerche sule mura di Napoli e sull'evoluzione del paesaggio costiero', *Napoli Nobilissima*, V.I-II 39-50.

Giampaola, D., M. Sica, and G. Ronga (1997), 'Appunti per la storia del paesaggio agrario di Acerra', *Uomo, acqua e paesaggio. Atti dell'incontro di studio sul tema Irreggimentazione delle acque e trasformazione del paesaggio antico* (Atlante tematico di topografia antica. Supplementi, 2, Roma: Erma di Bretschneider), 225-38.

Giampaola, D. and V. Carsana (2004), 'Il mare torna a bagnare Neapolis', *Archeologo subacqueo*, X.1, 28 15-19.

Giampaola, D., V. Carsana, and G. Boetto (2004), 'Il mare torna a bagnare Neapolis. Parte II: dalla scoperta del porto al recupero dei relitti', *Archeologo subacqueo*, X.3, 28 15-19.

Giampaola, D., et al. (2005)a, 'La scoperta del porto di Neapolis: dalla ricostruzione topografica allo scavo e al recupero dei relitti', *Archeologia Maritima Mediterranea. An International Journal on Underwater Archaeology*, 2 47-91.

Giampaola, D., et al. (2005)b, 'Napoli: trasformazioni edilizie e funzionali della fascia costiera', in Vitolo, G. (ed.), *Le città campane fra tarda antichità e alto medioevo* (Salerno: Laveglia), 219-44.

Giampaola, D. and B. D'Agostino (2005), 'Osservazioni storiche e archeologiche sulla fondazione di Neapolis', in Harris, W.V. and E. Lo Cascio (eds.), *Noctes Campanae. Studi di storia antica ed archeologia dell'Italia preromana e romana in memoria di Martin W. Frederiksen* (Itala Tellus, 1, Napoli: Luciano Editore), 49-80.

Giangiulio, M. (1985), 'I culti', (Convegni di studi sulla Magna Grecia Taranto XXV, 101-56.

Giangiulio, M. (1986), 'Tra terra e mare: i culti del litorale', *Atti e Memorie della Società Magna Grecia*, XXI.1-2 7-8.

Giardina, A. (1981), 'Allevamento ed economia della selva in Italia meridionale: trasformazioni e continuità', in Giardina, A. and A. Schiavone (eds.), *Società romana e produzione schiavistica* (I, 87-113.

Gigante, M. (1998), 'Bacco e il Vesuvio', *I culti della Campania antica* (Roma: Giorgio Bretschneider Editore), 213-18.

Giordano, C. (1979), *La gens Cominia in Nola e il suo contributo alla colonizzazione dell'Africa Romana. Spettacoli anfiteatrali in Nola e l'origine della città di Comiziano alla luce dei graffiti pompeiani*, (Boscoreale: Il gazzettino Vesuviano).

Gleba, M. (2004), 'Linen production in pre-Roman and Roman Italy', in Alfaro, C., J.P. Wild, and B. Costa (eds.), *Purpurae Vestes: Actas del I Symposium Internacional sobre Textiles y Tintes del Mediterráneo en época romana* (Valencia: Universitat de València), 29-37.

Goethe, J.W. von (1815), *Italienische Reise*, (Stuttgart:).

Golser, C., M. Pagano, and F. Russo (1990), 'Evidenze archeologiche sommerse a Torre del Greco e loro implicazioni sull'andamento della linea di costa vesuviana del 79 d.C.', in Albore Livadie, C. and F. Widemann (eds.), *Volcanologie et Archéologie* (Pact, 25, Strasbourg: Rixensart), 183-95.

Gorden, M. (1927), 'The Ordo of Pompeii', *Journal of Roman Studies*, XVII

Goscinny, R. and A. Uderzo (1964), *Astérix Gladiateur*, (Paris: Hachette).

Grattan, J. (2006), 'Aspects of Armageddon: An exploration of the role of vulcanic eruptions in human history and civilization', *Quaternary International*, 151 10-18.

Grattan, J. and D.J. Charman (1994), 'Non-climatic factors and the environmental impact of volcanic volatiles: implications of the Laki fissure eruption of AD', *The Holocene*, 4 101-6.

Grattan, J. and D.D. Gilbertson (2000), 'Prehistoric "settlement crisis", environmental changes in the British Isles, and vulcanic eruptions in Iceland: An exploration of plausible linkages', in McCoy, F.W. and G. Heiken (eds.), *Volcanic Hazards and Disasters in Human Antiquity* (Boulder (CO): The Geological Society of America),

Grattan, J. and R. Torrence (eds.) (2007), *Living under the shadow: cultural impacts of volcanic eruptions*, One World Archaeology, 53; Walnut Creek, CA: Left Coast)

Graven, A. (1865), *Studio sull'antico Sebeto*, (Napoli:).

Greco, C. (1974), *Fasti di Somma*, (Napoli: Edizioni del delfino).

Greco, E. (1994), 'Urbanistica napoletana: continuità dell'Antico', in Zevi, F. (ed.), *Neapolis* (Napoli: Banco di Napoli), 35-53.

Greco, E. (1995), 'Latium et Campania', *Enciclopedia dell'arte antica classica e orientale, Secondo Supplemento, III* (Roma: Istituto della Enciclopedia italiana), 291-97.

Greene, K. (1986), *The archaeology of the Roman economy*, (London: Batsford).

Grifa, C. and V. Morra (2009), 'La production de céramique commune à Pompéi. Studio petrografico sui reperti ceramici', in Pasqualini, M. (ed.), *Les céramiques communes d'Italie et de Narbonnaise: structures de production, typologies et contextes inédits, IIe siècle av. J.-C.-IIIe siècle apr. J.-C* (Collection du Centre Jean Bérard, 30, Napoli: Centre Jean Bérard), 105-7.

Grove, J.M. (1988), *The Little Ice Age*, (London: Methuen).

Guadagno, G. (1982), 'Contributi epigrafici per la storia amministrativa e la topografia ercolanese', *La regione sotterrata dal Vesuvio, studi e prospettive. Atti del Convegno Internazionale, 11-15 novembre 1979* (Napoli: Università degli Studi di Napoli Federico II), 193-210.

Guadagno, G. (1993), 'Pagi e vici della Campania', in Calbi, A., A. Donati, and G. Poma (eds.), *L'epigrafia del villaggio* (Epigrafia e antichità, n.12, Faenza: 407-44.

Guadagno, G. (2001), *Viticoltura e vini vesuviani in età romana*, (Boscotrecase:).

Guarino, V., D. Mauro, and P. Peduto (1998), 'Un tentativo di recupero di una stratigrafia e materiali vari da collezione: il caso del complesso ecclesiastico di S. Restituta a Lacco Ameno di Ischia', *Archeologia Medievale*, 15 439-69.

Guest, J., et al. (2003), *Volcanoes of Southern Italy*, (Bath: The Geological Society London).

Guiot, J. (1992), 'The combination of historical documents and biological data in the reconstruction of
climate variations in space and time', in Frenzel, B., C. Pfister, and B. Gläser (eds.), *European Climate Reconstructed from Documentary Data: Methods and Results* (Stuttgart - Jena - New York: Gustav Fischer), 93-104.

Guzzetti, F., C.P. Stark, and P. Salvati (2005), 'Evaluation of Flood and Landslide Risk to the Population of Italy', *Environmental Management*, 36.1 15-36.

Guzzo, P.G. (ed.) (2000), *Casali di ieri casali di oggi. Architetture rurali e tecniche agricole nel territorio di Pompei e Stabiae*, Napoli: Arte tipografica)

Guzzo, P.G. (2003), 'Paesaggi a Pompei fino al 79 d.C.', *Ambiente e paesaggio nella Magna Grecia. Atti del quarantaduesimo Convegno di studi sulla Magna Grecia, Taranto, 5-8 ottobre 2002* (Convegni di studi sulla Magna Grecia, Taranto, XLII, 2002, Napoli: Istituto per la storia e l'archeologia della Magna Grecia), 447-64.

Haggett, P., A.D. Cliff, and A. Frey (1977), *Locational analysis in human geography I: Locational models*, (London: Edward Arnold).

Hall, S.S. (2007), 'Vesuvius: Asleep for Now', *National Geographic*, 9

Hamilton, W. (1780), 'An Account of an Eruption of Mount Vesuvius, Which Happened in August, 1779. In a Letter from Sir William Hamilton, K. B. F. R. S. to Joseph Banks, Esq. P. R. S.', *Philosophical Transactions of the Royal Society of London*, 70 42-84.

Hamilton, W. (1795), 'An Account of the Late Eruption of Mount Vesuvius. In a Letter from the Right Honourable Sir William Hamilton, K. B. F. R. S. to Sir Joseph Banks, Bart. P. R. S.', *Philosophical Transactions of the Royal Society of London*, 85 73-116.

Harris, W.V. and E. Lo Cascio (2005), *Noctes Campanae. Studi di storia antica ed archeologia dell'Italia preromana e romana in memoria di Martin W. Frederiksen*, (Itala Tellus, 1, Napoli: Luciano Editore).

Harvey, P. (1980), *The History of Topographical Maps: Symbols, Pictures and Surveys*, (London:).

Heinz, C., et al. (2004), 'Holocene vegetation changes in the northwestern Mediterranean: new palaeoecological data from charcoal analysis and quantitative eco-anatomy', *Holocene*, 14 621-27.

Hennig, R. (1904), *Katalog bemerkenswerter Witterungsereignisse von den ältesten Zeiten bis zum Jahre 1800*, (Abhandlungen des Königlich Preussischen meteorologischen Instituts 2).

Herrmann, L. (1956), 'Géorg. II,223-224', *Latomus*, XV 240.

Herter, H. (1957), 'Bacchus am Vesuv', *Rheinisches Museum für Philologie*, 100 101-14.

Heurgon, J. (1942), *Recherches sur l'histoire, la religion et la civilisation de Capoue préromaine*, (Paris: de Boccard).

Hingley, R. (1989), *Rural settlement in Roman Britain*, (London: Seaby).

Hitchner, R.B. (1989), 'The organisation of rural settlement in the Cillium-Thelepte region', *L'Africa romana*, 6 387-402.

Hodder, I. (1979), 'Locational models and the study of Romano-British settlement', in Clarke, D.L. (ed.), *Models in Archaeology* (London: Methuen), 887-909.

Hodder, I., et al. (eds.) (1995), *Interpreting Archaeology: Finding Meaning in the Past*, London: Routledge)

Hodder, I. and C. Orton (1976), *Spatial Analysis in Archaeology*, (Cambridge: Cambridge University Press).

Hodges, R. (1987), 'Spatial Models, Anthropology and Archaeology', in Wagstaff, J.M. (ed.), *Landscape and culture: geographical and archaeological perspectives* (Oxford: Basil Blackwell), 118-33.

Hodge, A.T. (1992), *Roman Aqueducts and Water Supply*, (London:).

Hodges, R. and D.B. Whitehouse (1983), *Mohammed, Charlemagne, and the Origins of Europe*, (London: Duckworth).

Holford-Strevens, L.A. (1979), 'Nola, Vergil, and Paulinus', *The Classical Quarterly*, XXIX 391-93.

Hope Simpson, R. (1983), 'The Limitation of Surface Surveys', in Keller, D.R. and D.W. Rupp (eds.), *Archaeological survey in the Mediterranean area* (BAR International Series 155, Oxford: British Archaeological Reports), 45-47.

Hopkins, K. (1980), 'Taxes and trade in the Roman Empire', *Journal of Roman Studies*, 70 101-25.

Horden, P. and N. Purcell (2000), *The Corrupting Sea: a study of Mediterranean history*, (Oxford: Blackwell Publishing).

Horster, M. (2001), *Bauinschriften römischer Kaiser: Untersuchung zur Inschriftenpraxis und Bautätigkeit in den Städten des westlichen "Imperium Romanum"*, (Stuttgart: Steiner).

Huckstep, N. (1981), 'Historical source materials and the reconstruction of past climates', in Delano Smith, C. and M.J. Parry (eds.), *Consequences of Climatic Change* (Nottingham: Dept. of Geography, University of Nottingham), 119-23.

Hughes, J.D. (1983), 'How the ancients viewed deforestation', *Journal of Field Archaeology*, 10 436-45.

Hughes, J.D. (1994), 'Forestry and forest economy in the Mediterranean region in the time of the Roman empire in the light of historical sources', in Frenzel, B. (ed.), *Evaluation of Land Surfaces Cleared from Forests in the Mediterranean Region during the Time of the Roman Empire* (1-14.

Huntington, E. (1917), 'Climatic Change and Agricultural Exhaustion as Elements in the Fall of Rome', *The Quarterly Journal of Economics*, 31.2 173-208.

Iasiello, I.M. (2007), *Samnium. Assetti e trasformazioni di una provincia dell'Italia tardoantica*, (Bari: Edipuglia).

Ibn Hawqal, M. (1964), *Configuration de la terre (Kitab surat al-Ard)*, (Beyrouth: Commission internationale pour la traduction des chefs-d'œuvre).

Idrîsî, M.d.M. (1836), *Géographie d'Édrisi*, (Paris: Imprimerie Royale).

Idrîsî, M.d.M. (1883), *L'Italia descritta nel 'Libro del re Ruggero'*, (Atti della Reale Accademia dei Lincei, ser.2, vol.8; Roma: Salviucci).

Imbrighi, G. (1957), *I santi nella toponomastica italiana*, (Roma:).

Imhoof-Blumer, F. (1886), 'Zur Münzkunde Grossgriechenlands, Siciliens, Kretas etc.', *Numismatische Zeitschrift*, 205-86.

Istituto Geografico Militare (ed.) (1989), *Atlante aerofotografico delle sedi umane in Italia. Parte terza, La centuriazione romana*, Firenze: Istituto Geografico Militare)

Jackson, M.O. (2011), in Benhabib, J., A. Bisin, and M.O. Jackson (eds.), *The Handbook of Social Economics* (Amsterdam: North Holland Press), 1-96.

James, P., D. Chester, and A. Duncan (2000), 'Volcanic soils: their nature and significance for archaeology', in McGuire, W.J., et al. (eds.), *The Archaeology of Geological Catastrophes* (London: Geological Society), 317-38.

James, P.A., C.B. Mee, and G.J. Taylor (1994), 'Soil erosion and the archaeological landscape of Methana, Greece', *Journal of Field Archaeology*, 21 395-416.

Jarrett, R.D. (1991), 'Palaeohydrology and its value in analyzing floods and droughts', *National Water Summary 1988-1989. Hydrologic Events and Floods and Droughts* (105-16.

Jashemski, W.F. (1968), 'Excavations in the "Foro Boario" at Pompeii: A Preliminary Report', *American Journal of Archaeology*, 72.1 69-73.

Jashemski, W.F. (1979), 'Pompeii and Mount Vesuvius, A.D.79', in Sheets, P.D. and D.K. Grayson (eds.), *Volcanic Activity and Human Ecology* (New York: Academic Press), 587-622.

Jashemski, W.M. Feemster and F.G. Meyer (eds.) (2002), *The natural history of Pompeii*, Cambridge: Cambridge University Press)

Jenkins, I. and K. Sloan (1966), *Vases and Volcanoes: Sir William Hamilton and His Collection*, (London: British Museum Press).

Johannowsky, W. (1963), 'Gli Etruschi in Campania', *Klearchos*, 19 62-75.

Johannowsky, W. (1981), 'Testimonianze materiali del modo di produzione schiavistico in Campania e nel Sannio Irpino', in Giardina, A. and A. Schiavone (eds.), *Società romana e produzione schiavistica. L'Italia: insediamenti e forme economiche* (Roma-Bari: Laterza), 299-310.

Johannowsky, W. (1985), 'L'organizzazione del territorio in età greca e romana', *Napoli antica* (Napoli: Macchiaroli), 333-40.

Johannowsky, W. (1986)a, 'Lauro di Nola', in Johannowsky, W., et al. (eds.), *Le ville romane dell'età imperiale* (Napoli: Società Editrice Napoletana), 87-96.

Johannowsky, W. (1986)b, 'Terrae motus: un'iscrizione nucerina relativa al restauro del teatro', in Livadie, C.A. (ed.), *Tremblements de terre, éruptions volcaniques et vie des hommes dans la Campanie antique* (Bibliothèque de l'Institut Français de Naples, Deuxième série, Volume VII, Napoli: Centre Jean Bérard - Institut Français de Naples), 91-93.

Johnson, G.A. (1972), 'A Test of the Utility of Central Place Theory in Archaeology', in Ucko, P.J., R. Tringham, and G.W. Dimbleby (eds.), *Man, Settlement and Urbanism* (London: Duckworth), 769-85.

Jones, P.D. and R.S. Bradley (1995), 'Climatic variations over the last 500 years', in Bradley, R.S. and P.D. Jones (eds.), *Climate since A.D. 1500* (London: Routledge), 649-65.

Jones, P.D., et al. (2003), 'Surface climate responses to explosive volcanic eruptions seen in long European temperature records and mid-to-high latitude treering density around the Northern Hemisphere', in Robock, A. and C. Oppenheimer (eds.), *Volcanism and the Earth's Atmosphere* (Geophysical monograph, 139, Washington DC: American Geophysical Union), 239-54.

Jones, P.D. and M.E. Mann (2004), 'Climate over past millennia', *Reviews of Geophysics*, 42 1-42.

Jongman, W. (1988), *The economy and society of Pompeii*, (Amsterdam: J.C. Gieben).

Joslyn, C. and L. Rocha (2000), 'Towards semiotic agent-based models of socio-technical organizations', *Proc. AI, Simulation and Planning in High Autonomy Systems (AIS 2000) Conference, Tucson, Arizona* (Tucson: 70-79.

Kajanto, I. (1965), *The Latin cognomina*, (Helsinki: Helsingfors).

Kaneko, T. and alii (2005), 'Determination of the burial age of the "Augustus' villa" (Italy)', *Geochimical Journal*, 39 537-78.

Katz, R.W. and B.G. Brown (1992), 'Extreme events in a changing climate: variability is more important than average', *Climatic Change*, 21 289-302.

Keay, S. and G. Earl (2011), 'Town and Territories in Roman Baetica', in Bowman, A. and A. Wilson (eds.), *Settlement, Urbanization, and Population* (Oxford: Oxford University), 229-75.

Keenan-Jones, D. (2010), 'The Aqua Augusta. Regional water supply in Roman and late antique Campania', (Macquarie University).

King, A. (1994), 'Mammiferi', in Arthur, P. (ed.), *Il complesso archeologico di Carminiello ai Mannesi, Napoli (Scavi, 1983-1984)* (Galatina: Congedo), 366-406.

King, A. (1999), 'Diet in the Roman world: a regional inter-site comparison of the mammal bones', *Journal of Roman Archaeology*, 12.1 168-202.

King, A. (2002), 'Mammals. Evidence from wall paintings, sculpture, mosaics, faunal remains, and ancient literary sources', in Jashemski, W.M. Feemster and F.G. Meyer (eds.), *The Natural History of Pompeii* (Cambridge: Cambridge University Press), 401-50.

Kirsch, W. (1989), 'Spätantike Dichtungen als Quellen zur Sozialgeschichte: (Paulinus von Nola, Paulinus von Pella)', *Index*, XVII 275-82.

Kotzebue, A.F.F. von (1805), *Erinnerungen von einer Reise aus Lievland nach Rom und Neapel*, (Berlin: Frölich).

Kron, G. (2004), 'Roman Livestock Farming in Southern Italy: the Case against Environmental Determinism', in Clavel-Lévêque, M. and E. Hermon (eds.), *Espaces intégrés et ressources naturelles dans l'Empire Romain* (Luxeuil: Presses Universitaires de Franche-Comté), 119-34.

La Regina, A. (2000), 'Il trattato tra Abella e Nola per l'uso comune del santuario di Ercole e di un fondo adiacente', in Cappelli, R. (ed.), *Studi sull'Italia dei Sanniti* (Milano: Electa), 214-22.

La Rocca, E. and D. Angelillo (1971), *Nola. Dalle origini al Medioevo*, (Napoli:).

Labrot, G. (1979), *Baroni in città. Residenze e comportamenti delle aristocrazie napoletane. 1530-1734*, .

Laffi, U. (1974), 'Problemi dell'organizzazione paganico-vicanica nelle aree abruzzesi e molisane', *Athenaeum*, 52 336-39.

Laforgia, E. (1981), *Edificio termale romano di Fuorigrotta (Napoli)*, (Accademia di archeologia lettere e belle arti di Napoli, Monumenti, IV; Napoli: Arte tipografica).

Lamb, H.H. (1965), 'The early medieval warm epoch and its sequel', *Palaeogeography, Palaeoclimatology, Palaeoecology*, 1 13-37.

Lamb, H.H. (1972), *Climate: present, past and future*, (London: Methuen).

Lamb, H.H. (1982), *Climate, History and the Modern World*, (London - New York: Methuen).

Lancaster, L.C. (2005), *Concrete vaulted construction in Imperial Rome: innovations in context*, (Cambridge: Cambridge University Press).

Lancaster, L.C. (2006), 'The Lightweight Volcanic Scoria in the Concrete Vaults of Imperial Rome: Some Evidence for the Trade and Economy of Building Materials', in Mattusch, C.C., A.A. Donohue, and A. Brauer (eds.), *Proceedings of the XVIth International Congress of Classical Archaeology, Boston, August 23-26, 2003. Common Ground: Archaeology, Art, Science, and Humanities* (Oxford: Oxbow), 212-16.

Lancaster, L.C. (2011), 'Provenancing of lightweight volcanic stones used in ancient Roman concrete vaulting: evidence from Rome', *Archaeometry*, in press.

Lanzoni, F. (1927), *Le diocesi d'Italia dalle origini al principio del secolo VII (an. 604)*, (Faenza: Lega).

Larew, H.G. (1988), 'Oak (Quercus) Galls Preserved at Herculaneum in A.D. 79', in Curtis, R.I. (ed.), *Studia Pompeiana & Classica in Honor of Wilhelmina F. Jashemski* (New Rochelle (NY): Aristide D. Caratzas), 145-48.

Leiwo, M. (1994), *Neapolitana: a study of population and language in Graeco-Roman Naples*, (Helsinki: Societas Scientiarum Fennica).

Leone, A. (1735), *De agro Nolano, delectus scriptorum rerum neapolitanarum*, (Napoli:).

Leone, A. (1997), *Nola*, (Napoli: Istituto Geografico Editoriale).

Leone, D. (2000), 'Le ceramiche tardoantiche della fattoria di Posta Crusta', in Volpe, G. (ed.), *Ordona X. Ricerche archeologiche a Herdonia (1993-1998)* (Bari: Edipuglia), 387-436.

Lepore, E. (1967), 'La vita politica e sociale', *Storia di Napoli, vol.1, L'età classica* (Napoli: Società Editrice Storia di Napoli), 139-372.

Lepore, E. (1968), 'Per una fenomenologia storica del rapporto città-territorio in Magna Grecia', *La città e il suo territorio. Atti del settimo Convegno di studi sulla Magna Grecia, Taranto 8-12 ottobre 1967* (Convegni di studi sulla Magna Grecia, Taranto VII, 1967, Napoli: Arte tipografica),

Lepore, E. (1976), 'Timeo in Strabone V, 4, 3 C 242-243 e le origini campane', *L'Italie préromaine et la Rome républicaine: mélanges offerts à Jacques Heurgon* (Roma: École française de Rome), II, 573-85.

Lepore, E. (1985), 'La città romana', *Napoli antica* (Napoli: Macchiaroli), 115-22.

Lepore, E. (1989)a, *Colonie greche dell'Occidente antico*, (Roma: Nuova Italia Scientifica).

Lepore, E. (1989)b, *Origini e strutture della Campania antica. Saggi di storia etno-sociale*, (Bologna: Mulino).

Leroy, S.A.G., et al. (1996), 'The high sensitivity of the palynological record in the Vico maar lacustrine sequence (Latium, Italy) highlights the climatic gradient through Europe for the last 90 ka.', *Quaternary Science Reviews*, 15 189-201.

Leroy, S.A.G. (2006), 'From natural hazard to environmental catastrophe: Past and Present', *Quaternary International*, 158 4-12.

Leroy, S.A.G., H. Jousse, and M. Cremaschi (2006), 'Impact of rapid environmental changes on humans and ecosystems', *Quaternary International*, 150 1-2.

Lettieri, P. (1803), 'Discorso circa l'antica pianta et ampliatione della città di Napoli et de l'itinerario del acqua che anticamente flueva et dentro et fora la pred. Città per aquedocti mirabili', in Giustiniani, L. (ed.), *Dizionario geografico-ragionato del Regno di Napoli, 6* (Napoli: Vincenzo Manfredi), 382-411.

Leveau, P. (1970), 'Prospections archéologiques autour de Cherchell. Méthodes et premier bilan', *Revue d'Histoire et de Civilisation du Maghreb*, 7-21.

Leveau, P. (1982), 'Une ville et ses campagnes. L'exemple de Caesarea de Maurétanie', *Villes et campagnes dans l'empire romain* (Marseille: Université de Provence), 77-90.

Leveau, P. (1983), 'La ville antique et l'organisation de l'espace rurale: villa, ville, village', *Annales. Économies, sociétés, civilisations*, 4 920-42.

Leveau, P. (1984), *Caesarea de Maurétanie: une ville romaine et ses campagnes*, (Collection de l'École française de Rome, 70; Roma: École française de Rome).

Leveau, P. (1990), 'L'organisation de l'espace agricole en Afrique à l'époque romaine', *L'Afrique dans l'occident romain (Ier siècle av. J.-C. - IVe siècle ap. J.-C.): Actes du colloque organisé par l'École française de Rome sous le patronage de l'Institut national d'archéologie et d'art de Tunis (Rome, 3-5 décembre 1987)* (Collection de l'Ecole française de Rome, Roma: L'Erma di Bretschneider), 129-41.

Leveau, P. (1994), 'Dal paesaggio naturale al paesaggio coltivato. Dati archeologici relativi ai grandi lavori agricoli in età romana: il drenaggio delle paludi nella Bassa Provenza', in Carlsen, J., P. Ørsted, and J.E. Skydsgaard (eds.), *Landuse in the roman Empire* (Analecta Romana Instituti Danici, Supplementum XXII, Roma: L'Erma di Bretschneider), 73-78.

Lewit, T. (2004), *Villas, Farms and the Late Roman Rural Economy (third to fifth centuries AD)*, (2nd edn., BAR International Series, 568; Oxford: Archaeopress).

Lezzi Hafter, A., C. Isler Kerényi, and C. Donceel (1980), *Auf classische Boden gesammelt*, (Fieldmeilen:).

Ling, R. (1996), 'Villae rusticae at Boscoreale', *Journal of Roman Archaeology*, 9 344-50.

Lo Cascio, E. (1999), 'The Populationof Roman Italy in Town and Country', in Bintliff, J. and K. Sbonias (eds.), *Reconstructing past population trends in Mediterranean Europe (3000 B.C.-A.D. 1800)* (Archaeology of Mediterranean landscapes, 1, Oxford: Oxbow), 161-71.

Lo Cascio, E. (ed.) (2000), *Mercati permanenti e mercati periodici nel mondo romano: atti degli Incontri capresi di storia dell'economia antica, Capri 13-15 ottobre 1997*, Pragmateiai, 2; Bari: Edipuglia)

Lo Cascio, E. and P. Malanima (2005), 'Cycles and Stability. Italian Population before the Demographic Transition (225 B.C. - A.D. 1900)', *Rivista di Storia Economica*, XXI.3 5-40.

Lo Cascio, E. (2009), 'Urbanization as a Proxy of Demographic and Economic Growth', in Bowman, A. and A. Wilson (eds.), *Quantifying the Roman Economy* (Oxford: Oxford University Press), 87-106.

Lund, J. (2000), 'Transport Amphorae as Evidence of Exportation of Italian Wine and Oil to the Eastern Mediterranean in the Hellenistic Period', in Lund, J. and P. Pentz (eds.), *Between Orient and Occident: Studies in Honour of P.J. Riis* (Copenhagen: Aarhus University Press), 77-99.

Luongo, G., et al. (2003), 'Impact of the AD 79 explosive eruption on Pompeii, II. Causes of death of the inhabitants inferred by stratigraphic analysis and areal distribution of human casualties', *Journal of Volcanology and Geothermal Research*, 126 169-200.

Luongo, G. (ed.) (1997), *Mons Vesuvius. Sfide e catastrofi tra paura e scienza*, (Napoli:).

Lupia, A. (1998), *Testimonianze di epoca altomedievale a Benevento. Lo scavo del Museo del Sannio*, (Napoli:).

Lyons, C.L. (1997), 'The Neapolitan context of Hamilton's antiquities collection', *Journal of the History of Collections*, 9.2 229-39.

Lyons, C.L. (2007), 'Nola and the historiography of Greek vases', *Journal of the History of Collections*, 19.2 239-48.

Lösch, A. (1954), *The economics of Location*, (New Haven:).

MacKinnon, M. (2001), 'High on the Hog: Linking Zooarchaeological, Literary, and Artistic Data for Pig Breeds in Roman Italy', *American Journal of Archaeology*, 105.4 649-73.

MacKinnon, M. (2004), *Production and consumption of animals in Roman Italy: integrating the zooarchaeological and textual evidence*, (Portsmouth: Journal of Roman Archaeology).

MacMullen, R. (1970), 'Market-days in the Roman Empire', *Phoenix*, 24 333-41.

Macrì Li Gotti, M.V. (1977), 'Greco λαυκελαρχεύω, etrusco lucairce, miceneo rawaketa', *Memorie della Classe di Scienze morali e storiche dell'Accademia dei Lincei*, CXI 273-84.

Magny, M., C. Miramont, and O. Sivan (2002), 'Assessment of the impact of climate and anthropogenic factors on Holocene Mediterranean vegetation in Europe on the basis of palaeohydrological records', *Palaeogeography, Palaeoclimatology, Palaeoecology*, 186 47-59.

Maiuri, A. (1959), 'Sul De Nola di Ambrogio Leone', *Studi in onore di Riccardo Filangieri, II* (Napoli: 261-71.

Majone, G. (1865), *Dell'esistenza del Sebeto nella pendice settentrionale del Monte Somma*, (Napoli:).

Manacorda, D. (1981), 'Produzione agricola, produzione ceramica e proprietari nell'ager Cosanus nel I a.C.', in Giardina, A. and A. Schiavone (eds.), *Società romana e produzione schiavistica. Merci, mercati e scambi nel Mediterraneo* (Roma-Bari: Laterza), 3-54.

Mancini, G. (1989), *Σεπειθος. Misterioso Sebeto*, (Napoli: il Quartiere ponticelli).

Mariotti Lippi, M. and M. Mori Secci (1997), 'Aeropalynology in the Roman City Pompeii (Italy)', *Alliona*, 35 241-47.

Martindale, J.R. (1980), *Prosopography of the Later Roman Empire*, (Cambridge:).

Martorelli, G. (1756), *De regia theca calamaria in regia academia, sive Μελανοδοχείῳ eiusque ornamentis*, (Napoli: Simonii fratres typographi).

Martorelli, L. (2006), 'Retour d'Égypte tra illuminismo ed eclettismo', in De Caro, S. (ed.), *Egittomania. Iside e il mistero* (Napoli: Electa), 231-45.

Marturano, A. (2008), 'Sources of ground movement at Vesuvius before the AD 79 eruption: Evidence from contemporary accounts and archaeological studies', *Journal of Volcanology and Geothermal Research*, 177 959-70.

Marzano, A. (2011), 'Rank-Size Analysis and the Roman Cities of the Iberian Peninsula and Britain: Some Considerations', in Bowman, A. and A. Wilson (eds.), *Settlement, Urbanization, and Population* (Oxford: Oxford University), 196-228.

Marzano, A. (2013), 'Agricultural Production in the Hinterland of Rome: Wine and Olive Oil', in Bowman, A. and A. Wilson (eds.), *The Roman Agricultural Economy* (Oxford: Oxford University), 85-106.

Marzano, A. (2013), 'Capital Investment and Agriculture: Multi-Press Facilities from Gaul, the Iberian Peninsula, and the Black Sea Region', in Bowman, A. and A. Wilson (eds.), *The Roman Agricultural Economy* (Oxford: Oxford University), 107-42.

Maróti, E. (1976), 'The vilicus and the villa-system in ancient Italy', *Oikumene*, 1 109-24.

Mastroberardino, P. (2002), 'Vines and Wines in Ancient Pompeii: an Ancient Technology Revivified', in Renn, J. and G. Castagnetti (eds.), *Homo Faber: Studies on Nature, Technology and*

Science at the Time of Pompeii (Studi della Soprintendenza archeologica di Pompei, 6, Roma: L'Erma di Bretschneider), 57-62.

Mastrolorenzo, G., et al. (2002), 'The 472 AD Pollena eruption of Somma-Vesuvius (Italy) and its enviromental impact at the end of the Roman Empire', *Journal of Volcanology and Geothermal Research*, 113 19-36.

Mattingly, D.J. (1988)a, 'Oil for export? A comparison of Libyan, Spanish and Tunisian olive oil production in the Roman empire', *Journal of Roman Archaeology*, 1 33-56.

Mattingly, D.J. (1988)b, 'The olive boom. Oil surpluses, wealth and power in Roman Tripolitania', *Libyan Studies*, 19 21-41.

Mattingly, D.J. (1990), 'Paintings, presses and perfume production at Pompeii', *Oxford Journal of Archaeology*, 9.1 71-90.

Mattingly, D.J. (1993), 'Understanding Roman Landscapes', *Journal of Roman Archaeology*, 6 33-56.

Mattingly, D.J. (1996), 'First fruit? The olive in the Roman world', in Shipley, G. and J. Salmon (eds.), *Human Landscapes in Classical Antiquity: Environment and Culture* (London: Routledge), 213-53.

Mattingly, D.J. (1997), 'Beyond belief? Drawing a line beneath the consumer city', in Parkins, H.M. (ed.), *Roman urbanism: Beyond the consumer city* (London - New York: Routledge), 210-18.

Mattingly, D.J. (2009), 'Peopling Ancient Landscapes: Potential and Problems', in Bowman, A. and A. Wilson (eds.), *Quantifying the Roman Economy* (Oxford: Oxford University Press), 163-74.

Mattingly, D.J. and J. Salmon (eds.) (2001), *Economies beyond agriculture in the classical world*, London - New York: Routledge)

Mau, A. (1880), 'Review of: Pompei e la regione sotterrata dal Vesuvio nell'anno LXXIX', *Bullettino dell'Instituto di corrispondenza archeologica*, 92-95.

Mazzarella, A. and N. Diodato (2002), 'The alluvial events in the last two centuries at Sarno, southern Italy: their classification and power-law time-occurrence', *Theoretical and Applied Climatology*, 72 75-84.

Mazzoleni, S. and M. Ricciardi (1993), 'Primary succession on the cone of Vesuvius', in Miles, J. and D.W.H. Walton (eds.), *Primary Succession on Land* (Oxford: Blackwell Publishing), 101-12.

McIlwaine (1988), *Herculaneum. A guide to printed sources*, (Napoli: Bibliopolis).

Meiggs, R. (1982), *Trees and Timber in the Ancient Mediterranean World*, (Oxford: Oxford University Press).

Mele, A. (1985), 'Neapolis: la città greca', *Napoli antica* (Napoli: Macchiaroli), 103-8.

Mele, A. (1991), 'Le popolazioni italiche', *Storia del Mezzogiorno, I.1* (Napoli: Edizioni del Sole), 237-300.

Mele, A. (1994), 'Napoli antica: storia di una città', in Zevi, F. (ed.), *Neapolis* (Napoli: Banco di Napoli), 11-26.

Mercogliano, A. (1997), 'Il disegno della piana di Nola nell'antichità. La necropoli nolana. Le basiliche di Cimitile', *L'ager Nolanus ed i suoi monumenti. Nola e Cimitile nell'antichità* (Nola: 51-115.

Meyer, F.G. (1988), 'Food Plants Identified from Carbonized Remains at Pompeii and Other Vesuvian Sites', in Curtis, R.I. (ed.), *Studia Pompeiana & Classica in Honor of Wilhelmina F. Jashemski* (New Rochelle (NY): Aristide D. Caratzas), 183-229.

Mielsch, H. (1999), *La villa Romana*, (Firenze: Giunti).

Miller, K. (1916), *Itineraria Romana*, (Stuttgart:).

Millet, M. (1991), 'Roman towns and their territories: an archaeological perspective', in Rich, J. and A. Wallace-Hadrill (eds.), *City and country in the ancient world* (London-New York: Routledge), 169-89.

Mingazzini, P. (1946), *Latium et Campania. Surrentum*, (Forma Italiae, Firenze: Sansoni).

Moeller, W.O. (1976), *The wool trade of ancient Pompeii*, (Studies of the Dutch archaeological and historical society, 3; Leiden: E.J. Brill).

Mols, S.T.A.M. (2002), 'Identification of the woods used in the furniture at Herculaneum', in Jashemski, W.M. Feemster and F.G. Meyer (eds.), *The Natural History of Pompeii* (Cambridge: Cambridge University Press), 225-34.

Monti, P. (1991), *Ischia altomedievale, Ricerche storico-archeologiche*, (Ischia:).

Moormann, E.M. 'Guides in the Vesuvius Area Eternalised in Travelogues and Fiction', *Rivista di Studi Pompeiani*, 14 31-48.

Morel, J.-P. (1981)a, *Céramique campanienne, Les formes*, (Roma:).

Morel, J.-P. (1981)b, 'La produzione della ceramica campana: aspetti economici e sociali', in Giardina, A. and A. Schiavone (eds.), *Società romana e produzione schiavistica. Merci, mercati e scambi nel Mediterraneo* (Roma-Bari: Laterza), 81-97.

Morel, J.-P. (1985), 'La ceramica campana A nell'economia della Campania', *Napoli antica* (Napoli: Macchiaroli), 372-78.

Morel, J.-P. (1986), 'Remarques sur l'art et l'artisanat de Naples antique', *Neapolis, Atti del XXV Convegno di Studi sulla Magna Grecia, Taranto, 3-7 ottobre 1985* (Taranto: 305-56.

Moreno Soldevila, R. (2006), *Martial, Book IV. A Commentary*, (Mnemosyne Supplement, 278; Leiden: Brill).

Morley, N. (1996), *Metropolis and hinterland. The city of Rome and the Italian economy 200 B.C.-A.D. 200*, (Cambridge: Cambridge University Press).

Morley, N. (1997), 'Cities in context: urban systems in Roman Italy', in Parkins, H.M. (ed.), *Roman urbanism: Beyond the consumer city* (London - New York: Routledge), 42-58.

Moser, D., O. Nelle, and G. Di Pasquale (2011), 'The Romans, the wood and the forest: state of the art and new data from the Vesuvis area (Naples, Italy)', *Saguntum*, extra 11 113-14.

Moser, D., et al. (2013), 'Archaeobotany at Oplontis: woody remains from the Roman Villa of Poppaea (Naples, Italy)', *Vegetation History and Archaeobotany*, 22.5 397-408.

Mukai, T., et al. (2010), 'Nota preliminare sui materiali ceramici rinvenuti nel corso delle campagne di scavo 2002-2007 nella "Villa di Augusto" a Somma Vesuviana', *Amoenitas*, 1 221-35.

Mulville, K. (2009), 'Grazing Sheep in Vineyards', *Holistic Management in Practice*, 127 9-11.

Musti, D. (1988)a, 'La spinta verso il Sud: espansione romana e rapporti "internazionali"', *Storia di Roma, 1* (Torino: UTET), 527-42.

Musti, D. (1988)b, *Strabone e la Magna Grecia: Città e popoli dell'Italia antica*, (Padova: Esedra).

Nakada, S. (2000), 'Hazards from Pyroclastic Flows and Surges', in Sigurdsson, H. (ed.), *Encyclopedia of Volcanoes* (San Diego: Academic Press), 945-55.

Napoli, M. (1949), 'Napoli. Colombari romani in via Salvatore Tommaso', *Notizie degli scavi di antichità*, 148-53.

Napoli, M. (1967), 'Topografia e archeologia', *Storia di Napoli, vol.1, L'età classica* (Napoli: Società Editrice Storia di Napoli), 373-508.

Napoli, M. (1997), *Napoli greco-romana*, (Napoli: Colonnese).

Napolitano, S. (2005), *L'antiquaria settecentesca tra Napoli e Firenze. Felice Maria Mastrilli e Gianstefano Remondini*, (Firenze: Edizioni Firenze).

Neuerburg, N. (1965), *L'architettura delle fontane e dei ninfei nell'Italia antica*, (Napoli: Macchiaroli editore).

Nicotera, P. (1950), 'Sulle rocce laviche adoperate nell'antica Pompei', in Maiuri, A. (ed.), *Pompeiana: raccolta di studi per il secondo centenario degli scavi di Pompei* (Biblioteca della Parola del Passato, 4, Napoli: Macchiaroli), 396-424.

Nieto, X. (1997), 'Le commerce de cabotage et de redistribution', in Pomey, P. (ed.), *La navigation dans l'antiquité* (Aix-en-Provence: Edisud), 146-59.

Niihori, K., et al. (2007), 'Detailed Stratigraphical and Geological Characteristics of Volcanic and Epiclastic Deposits Burying a Roman Villa on the Northern Flank of Mt. Vesuvius (Italy)', *Bulletin of the Earthquake Research Institute*
University of Tokyo, 82 119-78.

Nuti, L. (1994), 'The Perspective Plan in the Sixteenth Century: The Invention of a Representational
Language', *The Art Bulletin*, 76.1 105-28.

Oettel, A. (1996), *Fundkontexte römischer Vesuvvillen im Gebiet um Pompeji: die Grabungen von 1894 bis 1908*, (Mainz am Rhein: Philipp von Zabern).

Ohlig, C. (2001), *De Aquis Pompeiorum. Das Castellum Aquae in Pompeji: Herkunft, Zuleitung und Verteilung des Wassers*, (Nijmegen: Books on Demand).

Olcese, G., M. Picon, and G. Thierrin Michael (1996), 'Il quartiere ceramico sotto la chiesa di Santa Restituta a Lacco Ameno d'Ischia e la produzione di anfore e di ceramica in età ellenistica', *Bollettino di Archeologia*, 39-40 7-29.

Olcese, G. (1999), 'La produzione di anfore e ceramica a vernice nera a Ischia in età ellenistica: il quartiere artigianale sotto la chiesa di Santa Restituta a Lacco Ameno', *Proceedings of the XVth International Congress of Classical Archaeology, Amsterdam, July 12-17, 1998 : classical archaeology towards the third millenium: reflections and perspectives* (Amsterdam: Allard Pierson Museum), 290-93.

Olcese, G. (2004), 'Anfore greco-italiche antiche: alcune osservazioni sull'origine e sulla circolazione alla luce di recenti ricerche archeologiche ed archeometriche', in De Sena, E.C. and H. Dessales (eds.), *Metodi e approcci archeologici: l'industria e il commercio nell'Italia antica. Archaeological methods and Approaches: Industry and Commerce in Ancient Italy* (BAR International Series 1262, Archaeopress), 173-92.

Olcese, G. (2010), *Le anfore greco italiche di ischia: archeologia e archeometria*, (Roma: Quasar).

Oliveri, D. (1934), 'Di alcune tracce di vie romane nella toponomastica italiana', *Archivio Glottologico Italiano*, XXVI 185-208.

Olshki, F. and S. Di Marco (eds.) (1990), *Viaggi in Europa, secoli XVI-XIX : catalogo del fondo Fiammetta Olschki*, Firenze: Olshki)

Ortalli, J. (1996), 'La fine delle ville romane: esperienze locali e problemi generali', in Brogiolo, G.P. (ed.), *La fine delle ville romane: trasformazioni nelle campagne tra tarda antichità e alto Medioevo* (Documenti di Archeologia, 11, Mantova: Società Archeologica Padana), 9-20.

Ortolani, F. and S. Pagliuca (1998), 'Variazioni climatiche cicliche e modificazioni dell'ambiente fisico "tipo effetto serra" durante il periodo storico nell'area mediterranea. Previsioni per il prossimo futuro', in Frega, G. (ed.), *Tecniche per la difesa dall' inquinamento. Atti del 18° Corso di aggiornamento, settembre 1998* (Cosenza: Editoriale Bios), 259-312.

Ortolani, F. and S. Pagliuca (2001), 'Variazione climatica, disponibilità e richiesta idrica per l'agricoltura nel prossimo futuro nell'Italia Meridionale', *Transnational Workshop on Managing Water Demand in Agriculture through Pricing: Research Issues and Lessons Learned, CNR-ISPAIM, 24–26 May, Telese Terme, Italy*,

Ostrow, S.E. (1979), 'The topography of Puteoli and Baiae on the eight glass flasks', *Puteoli*, 3 77-140.

Paci, G. (1991), 'Tito a Salerno', *Epigrafia. Actes du colloque en mémoire de Attilio Degrassi* (Roma: Ecole Française de Rome), 691-704.

Pagano, M. (1988), 'Pollena Trocchia. Rinvenimento di strutture romane del II secolo d.C.', *Rivista di Studi Pompeiani*, II 244-45.

Pagano, M. (1991)a, 'La villa romana di contrada Sora a Torre del Greco', *Cronache Ercolanesi*, 21 149-86.

Pagano, M. (1991)b, 'Pollena Trocchia. Scavo in località Masseria De Carolis e ricognizioni nel territorio comunale', *Rivista di Studi Pompeiani*, V 231-36.

Pagano, M. (1993), 'Un "lucus" di Giove alle radici del Vesuvio', *Les bois sacrés* (Napoli: Centre Jean Bérard), 53-55.

Pagano, M. (1995), 'L'area vesuviana dopo l'eruzione del 79 d.C.', *Rivista di Studi Pompeiani*, VII 35-44.

Pagano, M. (1995), 'La circolazione stradale a Neapolis e nel suo territorio', in Quilici, L. and S. Quilici Gigli (eds.), *Interventi di bonifica agraria nell'Italia romana* (Atlante tematico di topografia antica, 4, Roma: Erma di Bretschneider), 211-18.

Pagano, M. (1997), *I diari di scavo di Pompei, Ercolano e Stabia di Francesco e Pietro La Vega (1764-1810). Raccolta e studio di documenti inediti*, (Roma: L'Erma di Bretschneider).

Pagano, M. (2003), 'La rinascita di Stabiae (dal 79 d.C. al tardo impero)', *Rivista di Studi Pompeiani*, XIV 247-55.

Pagano, M. (2005), *I primi anni degli scavi di Ercolano, Pompei e Stabia*, (Roma: L'Erma di Bretschneider).

Pagano, M. and R. Prisciandaro (2006), *Studio sulle provenienze degli oggetti rinvenuti negli scavi borbonici del Regno di Napoli. Una lettura integrata, coordinata e commentata della documentazione*, (Studi e ricerche della Soprintendenza per i Beni Archeologici del Molise, 1, Castellammare di Stabia (NA): Nicola Longobardi Editore).

Pagliara, A. (1999), 'Ausonia terra, 2. Stato della questione ed area di stanziamento degli Ausones', *Rivista di Cultura Classica e Medioevale*, XLI.2 173-200.

Painter, K. (ed.) (1980), *Roman Villas in Italy*, British Museum Occasional Papers, 24; London:

Panella, C. (1981), 'La distribuzione e i mercati', in Giardina, A. and A. Schiavone (eds.), *Società romana e produzione schiavistica. Merci, mercati e scambi nel Mediterraneo* (Roma-Bari: Laterza), 55-80.

Panella, C. (1989), 'Le anfore italiche del II secolo d.C.', *Amphores romaines et histoire économique: Dix ans de recherche: Actes du colloque* (Roma: Ecole française de Rome), 139-78.

Pannuti, U. (1983), 'Il 'Giornale degli scavi' di Ercolano (1738-1756)', *Atti dell'Accademia nazionale dei Lincei. Classe di scienze morali, storiche e filologiche. Memorie*, ser.8, vol.26.3 161-410.

Pappalardo, U. (1990), 'L'eruzione Pliniana Del Vesuvio Nel 79 D.c.: Ercolano', in Albore Livadie, C. and F. Widemann (eds.), *Volcanologie et archéologie* (Strasbourg: Rixensart), 197–215.

Pappalardo, U. (2001), 'Vesuvio. Grandi eruzioni e reinsediamenti', in Lo Cascio, E. and A. Storchi Marino (eds.), *Modalità insediative e strutture agrarie nell'Italia meridionale di età romana* (Bari: Edipuglia), 435-53.

Pappalardo, U. (2006), 'Mozart, Iside e Pompei', in De Caro, S. (ed.), *Egittomania. Iside e il mistero* (Napoli: Electa), 221-29.

Pareschi, M.T., et al. (2000)a, 'A geographical information system for the archaeological area of Pompeii', in McGuire, W.J., et al. (eds.), *The Archaeology of Geological Catastrophes* (Geological Society Special Publication, 171, London: Geological Society), 143-58.

Pareschi, M.T., et al. (2000)b, 'GIS and Volcanic Risk Management', *Natural Hazards*, 21 361-79.

Parkins, H.M. (1997), 'The 'consumer city' domesticated? The Roman city in élite economic strategies', in Parkins, H.M. (ed.), *Roman urbanism: Beyond the consumer city* (London - New York: Routledge), 83-111.

Parkins, H.M. (1998), 'Time for Change? Shaping the future of the ancient economy', in Parkins, H.M. and C.J. Smith (eds.), *Trade, Traders and the Ancient City* (London: Routledge),

Parma, A. (1981), 'Presenze romane nel territorio di S. Anastasia', *1° Convegno dei Gruppi Archeologici della Campania. Pozzuoli 19-20 aprile 1980* (Roma: Gruppi Archeologici d'Italia), 133-43.

Parma, A. (2002), 'Stabiae e la classis Misenensis', in Bonifacio, G. and A.M. Sodo (eds.), *Stabiae: storia e architettura. 250° anniversario degli scavi di Stabiae 1749-1999: Convegno internazionale Castellammare di Stabia, 25-27 marzo 2000* (Roma: Erma di Bretschneider), 185-88.

Parslow, C.C. (1995), *Rediscovering Antiquity: Karl Weber and the Excavations of Herculaneum, Pompeii, and Stabiae*, (Cambridge: Cambridge University Press).

Pasqui, A. (1897), 'La villa pompeiana della Pisanella presso Boscoreale', *Monumenti Antichi dei Lincei*, VII 397-554.

Patroni, G. (1900), 'Nola. Scoperte di Antichità', *Notizie dagli scavi di antichità*, 106-10.

Patterson, H. (2004), *Bridging the Tiber. Approaches to Regional Archaeology in the Middle Tiber Valley*, (British School at Rome Archaeological Monograph 13, Roma: British School at Rome).

Patterson, J.R. (1987), 'Crisis: what crisis? Rural change and urban development in imperial Apennine Italy', *Papers of the British School at Rome*, 55 115-46.

Patti, O. (2000), 'Il sito di Murecine nella paleogeografia di Pompei', in De Simone, A. and S.C. Nappo (eds.), *Mitis Sarni opes. Nuova indagine archeologica in località Murecine* (Napoli: Denaro),

Peacock, D.P.S. (1980), 'The Roman Millstone Trade: A Petrological Sketch', *World Archaeology*, 12.1 43-53.

Peacock, D.P.S. (1986), 'The production or Roman millstones near Orvieto, Umbria, Italy', *The Antiquaries Journal*, LXVI 45-51.

Peacock, D.P.S. (1989), 'The Mills of Pompeii', *Antiquity*, 63 205-14.

Peacock, D.P.S. and D.F. Williams (1986), *Amphorae and the Roman economy: an introductory guide*, (London: Longmans).

Perrotta, A., et al. (2006), 'Burial of Emperor Augustus' villa at Somma Vesuviana (Italy) by post-79 AD Vesuvius eruptions and reworked (lahars and stream flow) deposits', *Journal of Volcanology and Geothermal Research*, 158 445-66.

Perrotta, A., C. Scarpati, and G. Luongo (2006), 'Volcaniclastic resedimentation on the northern slope of Vesuvius as a direct response to eruptive activity', *Landslides*, 3.4 295-301.

Pescatore, T., et al. (1999), 'Ricostruzione paleogeografica delle aree circostanti l'antica città di Pompei (Campania, Italia) al tempo dell'eruzione del Vesuvio del 79 d.C.', *Bollettino della Società Geologica Italiana*, 118 243-54.

Pescatore, T., et al. (2001), 'Holocene Coastal Environments near Pompeii before the A.D. 79 Eruption of Mount Vesuvius, Italy', *Quaternary Research*, 55 77-85.

Pierson, T.C. (1998), 'An empirical method for estimating travel times for wet volcanic mass flows', *Bulletin of Volcanology*, 60 98-109.

Pietro, L., et al. (1981), 'L'acquedotto di S. Paolino e la problematica della distribuzione delle acque nel territorio', *1° Convegno dei Gruppi Archeologici della Campania. Pozzuoli 19-20 aprile 1980* (Roma: Gruppi Archeologici d'Italia), 123-32.

Ping, C.L. (2000), 'Volcanic soil', in Sigurdsson, H. (ed.), *Encyclopedia of Volcanoes* (San Diego: London Academic Press), 1259-70.

Pinto, J.A. (1976), 'Origins and Development of the Ichnographic City Plan', *The Journal of the Society of Architectural Historians,* 35.1 35-50.

Pisapia, M.S. (1981), 'L'area ercolanese dopo l'eruzione del 79: evidenze archeologiche. La necropoli di Via Doglie ad Ercolano', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, 56 63-74.

Plommer, H. (1973), *Vitruvius and Later Roman Building Manuals*, (Cambridge: Cambridge University Press).

Pochmarski, E. (1972), 'Ein zweiter Basler Dionysos', *Antike Kunst*, 15 73-75.

Pontrandolfo, A. and B. D'Agostino (1990), 'Greci, Etruschi e Italici nella Campania e nella Lucania tirrenica', *Crise et transformation des sociétés archaïques de l'Italie antique au Ve siècle av. J.-C* (Collection de l'École française de Rome, 137, Roma: École française de Rome), 101-16.

Potter, T.W. (1976), 'Valleys and settlement: some new evidence', *World Archaeology*, 8.2 207-19.

Potter, T.W. (1979), *The Changing Landscape of South Etruria*, (London: Paul Elek).

Potter, T.W. (1981), 'Marshland and drainage in the classical world', *The Evolution of Marshland Landscapes* (British Archaeological Reports International Series 243, Oxford: Oxford University), 1-19.

Poulter, A. (1987), 'Townships and villages', in Wacher, J. (ed.), *The Roman World* (London-New York: Routledge), 1.388-411.

Prosdocimi, A.L. (2000), 'Il sannita', in Cappelli, R. (ed.), *Studi sull'Italia dei Sanniti* (Milano: Electa), 208-13.

Pugliese Carratelli, G. (1952), 'Testi e documenti. Fonti per la storia di Napoli antica', *Parola del passato*, VII 370-419.

Pugliese Carratelli, G. (1991), 'I Greci in Campania', in Pugliese Carratelli, G. (ed.), *Storia e Civiltà della Campania. L'Evo antico* (Napoli: Electa), 69-101.

Purcell, N. (1985), 'Wine and wealth in ancient Italy', *Journal of Roman Studies*, 75 1-19.

Purcell, N. (1987), 'Town in country and country in town', in MacDougall, E.B. (ed.), *Ancient Roman Villa Gardens* (Dumbarton Oaks Colloquium on the History of Landscape Architecture, X, Washington: Dumbarton Oaks), 187-203.

Purcell, N. (1988)a, 'Sheep Farming in Roman Italy', *Classical Review*, 38.1 96-99.

Purcell, N. (1988)b, 'The Italian Wine Trade', *Classical Review*, 38.1 99-101.

Purcell, N. (1990), 'The economy of an ancient town', *Classical Review*, 40.1 111-16.

Purcell, N. (1995), 'The Roman villa and the landscape of production', in Cornell, T.J. and K. Lomas (eds.), *Urban Society in Roman Italy* (London: UCL Press), 151-79.

Quilici Gigli, S. (2005), 'Per la lettura della viabilità in Campania', in Vitolo, G. (ed.), *Le città campane fra tarda antichità e alto Medioevo* (Salerno: Laveglia), 13-27.

Quilici, L. and S. Quilici Gigli (eds.) (2004), *Carta archeologica e ricerche in Campania. Fascicolo 1: comuni di Alvignano, Baia e Latina, Caiazzo, Castel Campagnano, Castel di Sasso, Dragoni, Piana di Monte Verna, Ruviano*, Roma: L'Erma di Bretschneider)

Quindici, V. (1984), *Nola antica*, (Nola: Scala).

Rackham, O. (1992), 'Trees and woodland in the history and archaeology of the landscape', in Bernardi, M. (ed.), *Archeologia del paesaggio: IV Ciclo di lezioni sulla ricerca applicata in archeologia, Certosa di Pontignano (Siena), 14-26 gennaio 1991* (Firenze: All'Insegna del Giglio), 249-64.

Rackham, O. (1996), 'Ecology and pseudo-ecology: the example of ancient Greece', in Shipley, G. and J. Salmon (eds.), *Human Landscapes in Classical Antiquity: Environment and Culture* (London: Routledge), 16-43.

Randsborg, K. (1991), *The First Millennium AD in Europe and the Mediterranean*, (Cambridge: Cambridge University Press).

Rathbone, D. (2009), 'Earnings and Costs: Living Standards and the Roman Economy', in Bowman, A. and A. Wilson (eds.), *Quantifying the Roman Economy* (Oxford: Oxford University), 299-326.

Raviola, F. (1995), *Napoli origini*, (Hesperìa, 6; Roma: Erma di Bretschneider).

Reale, O. and P. Dirmeyer (2000), 'Modeling the effects of vegetation on Mediterranean climate during the Roman Classical Period: Part I: Climate history and model sensitivity', *Global and Planetary Change*, 25 163-84.

Reale, O. and S. Jagadish (2000), 'Modeling the effects of vegetation on Mediterranean climate during the Roman Classical Period: Part II. Model simulation', *Global and Planetary Change*, 25 185-214.

Remondini, G.S. (1747), *Della Nolana Ecclesiastica Storia (I-III)*, (Napoli:).

Renna, E. (1992), *Vesuvius Mons: Aspetti del Vesuvio nel mondo antico tra filologia archeologia vulcanologia*, (Napoli: Procaccini).

Rescigno, C. (2000), 'La ceramica comune', in Miniero, P. (ed.), *Il sacello degli Augustali di Miseno* (Napoli: Electa), 75-81.

Riccardi, A. and A. Rosauro (2002), *La storia tra le storie di Pollena Trocchia*, (Napoli: Edizioni Magna Graecia).

Riede, F. (2007), 'The Laacher See-eruption (12,290 BP) and material culture change at the end of the Allerød in Northern Europe', *Journal of Archaeological Science*, (in press), 1-9.

Rizzi Zannoni, G.A. (1793), *Topografia dell'agro napoletano con le sue adiacenze*, (Napoli:).

Rizzi Zannoni, G.A. (1993), *Atlante geografico del Regno di Napoli*, (Messina: Rubbettino).

Roberts, B.K. (1996), *Landscape of Settlement: Prehistory to the present*, (London - New York: Routledge).

Rocco, A. (1942), 'Stele provenienti dal territorio dell'antica Neapolis', *Rendiconti Accademia Napoli*, n.s. XXII 77-92.

Rolandi, G., P. Petrosino, and J. Mc Geehin (1998), 'The interplinian activity at Somma-Vesuvius in the last 3500 years', *Journal of Volcanology and Geothermal Research*, 82 19-52.

Rolandi, G., R. Munno, and I. Postiglione (2004), 'The A.D. 472 eruption of the Somma volcano', *Journal of Volcanology and Geothermal Research*, 129 291-319.

Rolandi, G., et al. (2007), 'The 79 AD eruption of Somma: The relationship between the date of the eruption and the southeast tephra dispersion', *Journal of Volcanology and Geothermal Research*, 169 87-98.

Romanelli, D. (1818), *Antica topografia istorica del regno di Napoli*, (Napoli: Stamperia Reale).

Romizzi, L. (2001), *Ville d'otium nell'Italia antica*, (Aucnus 10, Napoli: Edizioni scientifiche italiane).

Rosi, M. and R. Santacroce (1983), 'The A.D. 472 "Pollena" eruption: volcanological and petrological data for this poorly-known, plinian-type event at Vesuvius', *Journal of Volcanology and Geothermal Research*, 17 249-71.

Rosi, M. and R. Santacroce (1986), 'L'attività del Somma-Vesuvio precedente l'eruzione del 1631: dati stratigrafici e vulcanologici', in Albore Livadie, C. (ed.), *Tremblements de terre, éruptions volcaniques et vie des hommes dans la Campanie antique* (Bibliothèque de l'Institut Français de Naples, Deuxième série, Volume VII, Napoli: Centre Jean Bérard - Institut Français de Naples), 15-33.

Rosi, M. (1997), 'Rappresentazione del territorio e della città', in Rosi, M. (ed.), *Napoli nella cartografia storica* (Napoli: Giannini), 5-14.

Rosini, C.M. (1797), *Dissertationis isagogicæ ad Herculanensium voluminum explanationem pars prima*, (Napoli: Regia Typographia).

Rossiter, J.J. (1981), 'Wine and oil processing at Roman farms in Italy', *Phoenix*, 35 345-61.

Rossiter, J.J. (2000), 'Interpreting Roman villas', *Journal of Roman Archaeology*, 13 572-77.

Rostovzev, M. (1973), *Storia economica e sociale dell'impero romano*, (Firenze: La Nuova Italia).

Ruffo, F. (2010), *La Campania antica, appunti di storia e di topografia: Parte I - dal Massico-Roccamonfina al Somma-Vesuvio*, (Napoli: Denaro Libri).

Ruggiero, A. (1983), 'La Vita Felicis di Paolino di Nola come fonte per la conoscenza della religiosità popolare in Campania nei secoli IV e V', in Ruggiero, A., H. Crouzel, and G. Santaniello (eds.), *Paolino di Nola: momenti della sua vita e delle sue opere* (Diocesana), 161-98.

Ruggiero, M. (1881), *Degli scavi di Stabia dal MDCCXLIX al MDCCLXXXII*, (Napoli:).

Ruggiero, M. (1885), *Storia degli scavi di Ercolano ricomposta su' documenti superstiti*, (Napoli:).

Ruggiero, M. (1888)a, *Degli scavi di antichità di terraferma: dell'antico regno di Napoli, dal 1743 al 1876*, (Napoli: V. Morano).

Ruggiero, M. (1888)b, *Degli Scavi di Antichità nelle Province di Terraferma dell'Antico Regno di Napoli dal 1748 al 1876*, (Napoli:).

Ruocco, D. (1965), *Campania*, (Le Regioni d'Italia, 13, Torino: Unione Tipografico-Editrice Torinese).

Rutter, N.K. (1979), *Campanian Coinages: 475-380 BC*, (Edinburgh: Edinburgh University Press).

Rutter, N.K. (1986), 'La monetazione di Neapolis fino al 380 a.C.', in numismatici, Centro internazionale di studi (ed.), *La monetazione di Neapolis nella Campania antica: Atti del VII Convegno del Centro internazionale di studi numismatici: Napoli, 20-24 Aprile 1980* (Napoli: Arte tipografica), 67-89.

Sack, R.D. (1980), *Conceptions of Space in Social Thought: A Geographic Perspective*, (London:).

Saller, R. (2001), 'The non-agricultural economy: superceding Finley and Hopkins?', *Journal of Roman Archaeology*, 14.2 580-84.

Sampaolo, V. (1986), 'Dati archeologici e fenomeni vulcanici nell'area nolana. Nota preliminare', in Livadie, C.A. (ed.), *Tremblements de terre, éruptions volcaniques et vie des hommes dans la Campanie antique* (Bibliothèque de l'Institut Français de Naples, Deuxième série, Volume VII, Napoli: Centre Jean Bérard - Institut Français de Naples), 113-19.

Santoro, L. (1984), *Le mura di Napoli*, (Roma: Istituto Italiano dei Castelli).

Savino, E. (2004)a, 'A proposito del numero e della cronologia delle eruzioni vesuviane tra il V e il VI sec. d.C.', in Senatore, F. (ed.), *Pompei, Capri e la Penisola Sorrentina. Atti del quinto ciclo di conferenze di geologia, storia e archeologia. Pompei, Anacapri, Scafati, Castellammare di Stabia, ottobre 2002 - aprile 2003* (Capri: Oebalus), 511-21.

Savino, E. (2004)b, 'Considerazioni sulla data dell'eruzione vesuviana del 79 d.C.', in Senatore, F. (ed.), *Pompei, Capri e la Penisola Sorrentina. Atti del quinto ciclo di conferenze di geologia, storia e archeologia. Pompei, Anacapri, Scafati, Castellammare di Stabia, ottobre 2002 - aprile 2003* (Capri: Oebalus), 369-75.

Savino, E. (2005)a, *Campania tardoantica (284-604 d.C.)*, (Bari: Edipuglia).

Savino, E. (2005)b, 'La Campania del IV secolo: un esempio di 'sistema agrario tardoantico'', in Volpe, G. and M. Turchiano (eds.), *Paesaggi e insediamenti rurali in Italia meridionale fra Tardoantico e Altomedioevo. Atti del Primo Seminario sul Tardoantico e l'Altomedioevo in Italia Meridionale (Foggia 12-14 febbraio 2004)* (STAIM 1, Bari: Edipuglia), 533-39.

Savino, E. (2006), 'Landolfo Sagace, Hist. Rom. 18, 15-16. Considerazioni sui rapporti tra Bizantini e Longobardi beneventani nell'Italia meridionale del VII sec.', *Oebalus*, 1 273-85.

Savino, E. (2007), 'Fra Campania e Roma: note sulla cronologia del regno di Tito', *Oebalus*, 2 239-47.

Savino, E. (2009)a, 'L'area vesuviana in età tardoantica: modalità insediative e strutture produttive', in De Simone, G.F. and R.T. Macfarlane (eds.), *Apolline Project vol.1: Studies on Vesuvius' North Slope and the Bay of Naples* (Napoli: Suor Orsola Benincasa - Brigham Young University), 240-46.

Savino, E. (2009)b, 'Nerone, Pompei e il terremoto del 63 d.C.', in Storchi Marino, A. and G.D. Merola (eds.), *Interventi imperiali in campo economico e sociale da Augusto al Tardoantico* (Pragmateiai, 18, Bari: Edipuglia), 225-42.

Sbonias, K. (1999), 'Introduction to Issues in Demography and Survey', in Bintliff, J. and K. Sbonias (eds.), *Reconstructing past population trends in Mediterranean Europe (3000 B.C.-A.D. 1800)* (Archaeology of Mediterranean landscapes, 1, Oxford: Oxbow), 1-20.

Sbordone, F. (1957), 'La Campania nella Geografia di Strabone', in Ranieri, L. (ed.), *Atti del XVII Congresso Geografico Italiano* (Bari: Cressati), III, 591-600.

Sbordone, F. (1972), 'Timeo, Strabone e il golfo di Napoli', *Studi classici in onore di Quintino Cataudella* (Catania: Università di Catania, Facoltà di lettere e filosofia), II, 409-16.

Scandone, F. (1911), *L'alta valle del Calore*, (Napoli: Dekten & Rocholl).

Scandone, R., et al. (1991), 'The structure of the Campanian Plain and the activity of the Neapolitan volcanoes (Italy)', *Journal of Volcanology and Geothermal Research*, 48 1-31.

Scandone, R., L. Giacomelli, and P. Gasparini (1993), 'Mount Vesuvius: 2000 Years of Volcanological Observations', *Journal of Volcanology and Geothermal Research*, 58 5-25.

Scarano Ussani, V. (2003), 'Con sollecitudine di principe e affetto di padre', in D'Ambrosio, A., P.G. Guzzo, and M. Mastroroberto (eds.), *Storie da un'eruzione: Pompei, Ercolano, Oplontis* (Milano: Electa), 19-25.

Scarpato, R. (1983), *Apolline e Trocla. Storia, tradizioni e immagini di Pollena Trocchia*, (Napoli: ci.esse.ti. cooperativa editrice).

Scatozza Höricht, L. (1985), 'Ville nel territorio ercolanese', *Cronache Ercolanesi*, 15 131-65.

Scatozza Höricht, L.A. (2001), *Materiali votivi e luoghi di culto nel territorio di Avella*, (Napoli: Liguori).

Scheidel, W. (1992), 'Neuen Wein in leere Schläuche: Jongman's Pompeii, Modelle und die Kampanische Landwirtschaft', *Athenaeum*, 80 207-13.

Scherillo, A. (1982), 'Il Vesuvio prima e dopo Plinio', *La regione sotterrata dal Vesuvio, studi e prospettive. Atti del Convegno Internazionale, 11-15 novembre 1979* (Napoli: Università degli Studi di Napoli Federico II), 945-55.

Schnapp, A. (2007), 'Introduction: Neapolitan effervescence', *Journal of the History of Collections*, 19.2 161-64.

Schumm, S.A. (1979), 'Geomorphic Thresholds: The Concept and Its Applications', *Transactions of the Institute of British Geographers*, n.s. 4.4 485-515.

Senatore, F. (1998), ''Ager Pompeianus': viticoltura e territorio nella piana del Sarno nel I sec. d.C.', *Pompei, il Sarno e la Penisola Sorrentina* (Pompei: Rufus), 135-57.

Senatore, F. (2001), 'Stabiae: storia dell'insediamento', in Camardo, D. and A. Ferrara (eds.), *Stabiae, dai Borbone alle ultime scoperte* (Castellammare di Stabia: Longobardi), 23-38.

Sermo Sancti Constantii (1934), 'Sermo de virtute et Sermo de transitu Sancti Constantii', in Hofmeister, A. (ed.), *Monumenta Germaniae Historica, SS, 30.2* (Leipzig: K.W. Hiersmann), 1017-22.

Sersale, R. and C.S. Porcelli (1974), 'Campania - Basilicata - Calabria', in Veniale, F. and C. Palmonari (eds.), *Giacimenti di argille ceramiche in Italia* (Bologna: Cooperativa libraria universitaria), 177-94.

Servizio Idrografico (1941), *Carta delle irrigazioni nella Campania*, (Roma: Istituto Poligrafico dello Stato).

Sgobbo, I. (1926), 'Napoli. Avanzi di case e di tombe romane', *Notizie degli scavi di antichità*, 74-84.

Sgobbo, I. (1938), 'Serino. L'acquedotto romano della Campania: "Fontis Augustei Aquaeductus"', *Notizie degli scavi di antichità*, 75-97.

Shackleton-Bailey, D.R. (2003), *Statius Silvae*, (Cambridge: Cambridge University Press).

Sigurdsson, H., S. Carey, and J.M. Espindola (1984), 'The 1982 eruptions of El Chicón volcano, Mexico: stratigraphy of pyroclastic deposits', *Journal of Volcanology and Geothermal Research*, 23 11-37.

Sigurdsson, H., et al. (1985), 'The Eruption of Vesuvius in A.D. 79', *National Geographic Research*, 332-87.

Sigurdsson, H. and S. Carey (2002), 'The eruption of Vesuvius in A.D. 79', in Jashemski, W.M. Feemster and F.G. Meyer (eds.), *The Natural History of Pompeii* (Cambridge: Cambridge University Press), 37-64.

Sigurdsson, H. (2007), 'The environmental and geomorphological context of the volcano', in Dobbins, J.J. and P. Foss (eds.), *The world of Pompeii* (London-New York: Routledge), 43-62.

Simonelli, P. (1972), 'Nuovi ritrovamenti di iscrizioni in Nola', *Atti della Accademia Pontaniana*, 21 385-408.

Skinner, P. (1994), 'Urban communities in Naples, 900-1050', *Papers of the British School at Rome*, 62 279-99.

Social Sciences Foundation Course Team (ed.) (1970), *Understanding society: readings in the social sciences*, London: Open University Press)

Solari, A. (1950), 'La espansione sannita in Silvium apula e in Nola campana', *Atti dell'Accademia nazionale dei Lincei. Classe di scienze morali, storiche e filologiche. Rendiconti*, V, 8a ser 371-75.

Solimeno Cipriano, A. (1982), 'Testimonianze letterarie sulle città sepolte dal Vesuvio', *La regione sotterrata dal Vesuvio, studi e prospettive. Atti del Convegno Internazionale, 11-15 novembre 1979* (Napoli: Università degli Studi di Napoli Federico II), 265-73.

Sommella, P. (1978), 'Forma e urbanistica di Pozzuoli romana', *Puteoli*, 2 1-98.

Sommella, P. (1991), 'Città e territorio nella Campania antica', in Pugliese Carratelli, G. (ed.), *Storia e civiltà della Campania. L'Evo antico* (Napoli: Electa), 151-91.

Soricelli, G. (1987), 'Appunti sulla produzione di terra sigillata nell'area flegro-napoletana', *Puteoli*, 11 107-22.

Soricelli, G. (1997)a, 'Ceramiche fini tardo-antiche dall'area vesuviana', *Rivista di Studi Pompeiani*, VIII 143-48.

Soricelli, G. (1997)b, 'La regione vesuviana dopo l'eruzione del 79 d.C.', *Athenaeum*, 85 139-54.

Soricelli, G. (2001)a, 'Divisioni agrarie romane e viabilità nella piana nocerino-sarnese', in Senatore, F. (ed.), *Pompei tra Sorrento e Sarno* (Roma: 299-319.

Soricelli, G. (2001)b, 'La regione vesuviana tra secondo e sesto secolo d.C.', in Lo Cascio, E. and A. Storchi Marino (eds.), *Modalità insediative e strutture agrarie nell'Italia meridionale di età romana* (Bari: Edipuglia), 455-72.

Soricelli, G. (2002), 'Divisioni agrarie romane e occupazione del territorio nella piana nocerino-sarnese', in Franciosi, G. (ed.), *Ager Campanus* (Napoli: Jovene), 123-29.

Soricelli, G. (2004), 'La produzione di terra sigillata in Campania', in Poblome, J., et al. (eds.), *Early Italian Sigillata* (Leuven: Peeters), 299-307.

Spurr, M.S. (1986), *Arable cultivation in Roman Italy: c.200 B.C.-c.A.D. 100*, (London: Society for the Promotion of Roman Studies).

Stazio, A. (1987), 'Monetazione delle «poleis» greche e monetazione degli «ethne» indigeni', in Pugliese Carratelli, G. (ed.), *Magna Grecia. Lo sviluppo politico, sociale ed economico* (Milano: Electa), 151-72.

Stefani, G. (1992), 'Fontane nelle case delle città vesuviane', *Domus - Viridaria - Horti Picti. Pompei, Casina dell'Aquila, 5 luglio - 12 settembre 1992* (Le Mostre 15, Napoli: Bibliopolis), 49-61.

Stefani, G. (2000), 'Le ville rustiche del territorio vesuviano', *Casali di ieri casali di oggi. Architetture rurali e tecniche agricole nel territorio di Pompei e Stabiae* (Napoli: Arte tipografica), 13-19.

Stefani, G. (ed.) (2002), *Uomo e ambiente nel territorio vesuviano. Guida all'Antiquarium di Boscoreale*, Ercolano: Marius)

Stefani, G. (ed.) (2005), *Cibi e sapori a Pompei e dintorni: Antiquarium di Boscoreale, 3 febbraio-26 giugno 2005*, Pompei: Flavius)

Stefani, G. (2006), 'La vera data dell'eruzione', *Archeo*, XXII.10 10-13.

Stolberg, F.L. zu *Travels through Germany, Switzerland, Italy, and Sicily*, trans. Holcroft, T., .

Storchi Marino, A. (2009), 'Munificentia principis e calamità naturali', in Storchi Marino, A. and G.D. Merola (eds.), *Interventi imperiali in campo economico e sociale da Augusto al Tardoantico* (Bari: Edipuglia), 183-224.

Stärk, E. (2001), 'Über Nola und Nolaner: (Cael. or. frg. Quint. inst. 8, 6, 53 ; Auson. epigr. 75, 5 Green)', *Hermes*, 129.2 232-38.

Sulpizio, R., et al. (2005), 'A complex, Subplinian-type eruption from low-viscosity, phonolitic to tephri-phonolitic magma: the AD 472 (Pollena) eruption of Somma-Vesuvius, Italy', *Bulletin of Volcanology*, 67 743-67.

Sulpizio, R., et al. (2008), 'Comment on: "The dark nature of Somma-Vesuvius volcano: Evidence from the ~3.5 ka BP Avellino eruption" by Milia A., Raspini A., Torrente M.M.', *Quaternary International*, 192 102-9.

Summonte, A. (1675), *Historia della città e Regno di Napol*, (Napoli: All'insegna della Sirena).

Talbert, R.J.A. (2000), *The Barrington Atlas of the Greek and Roman World*, (Princeton: Princeton University Press).

Tarpin, M. (2003), *Vici et pagi dans l'Occident romain*, (Collection de l'Ecole française de Rome, 299; Roma: Ecole française de Rome).

Taylor, R. (forthcoming), 'River Raptures: Containment and Control of Water in Greek and Roman Constructions of Identity', in Kosso, C. and A. Scott (eds.), *The Nature and Function of Water, Baths, and Hygiene from Antiquity through the Renaissance* (Amsterdam: Brill),

Taylor, R. and J.D. Alchermes (in press), *A Documentary History of Neapolis*, (New York: Italica Press).

Taylor, R. (in press), 'Roman Neapolis and the Landscape of Disaster', in De Simone, G.F. and R. Taylor (eds.), *The Landscape of Vesuvius* (Oxford: Oxford University Press),

Tchernia, A. (1984), 'I vigneti italiani da Augusto a Domiziano: continuità e cambiamenti', *Opus*, III 477-85.

Tchernia, A. (1986), *Le Vin de l'Italie romaine: essai d'histoire économique d'après les amphores*, (Bibliothèque des Écoles françaises d'Athènes et de Rome, 261; Roma: Écoles françaises de Rome).

Terribile, F., et al. (2007), 'Landslide processes and Andosols: the case study of Campania region, Italy', in Arnalds, Ó., et al. (eds.), *Soils of Volcanic Regions in Europe* (Berlin - Heidelberg: Springer), 545-63.

Thomsen, R. (1947), 'The Iter Statements of the Liber Coloniarum', *Classica et Mediaevalia*, IX.1 37-81.

Thornes, J.B. (1987), 'The Palaeo-ecology of Erosion', in Wagstaff, J.M. (ed.), *Landscape and Culture: Geographical and Archaeological Perspectives* (Oxford: Basil Blackwell), 37-55.

Tobler, W.R. (1963), 'Geographic Area and Map Projection', *Geographical Review*, 53.1 59-78.

Todisco, E. (1999), *I veterani in Italia in età imperiale*, (Bari: Edipuglia).

Todisco, L. (1993), *Scultura greca del IV secolo*, (Milano: Longanesi).

Tomber, R. and J. Dore (1998), *The National Roman fabric reference collection: a handbook*, (London: Museum of London Archaeology Service).

Tozzi, P. (1972), *Storia padana antica: Il territorio fra Adda e Mincio*, (Milano: Ceschina).

Traina, G. (1988), *Paludi e bonifiche del mondo antico*, (Roma: L'Erma di Bretschneider).

Tringham, R. (1972), 'Introduction: Settlement patterns and urbanization', in Ucko, P.J., R. Tringham, and G.W. Dimbleby (eds.), *Man, Settlement and Urbanism* (London: Duckworth), xix-xxviii.

Trout, D.E. (1995), 'Christianizing the Nolan countryside : animal sacrifice at the tomb of St. Felix', *Journal of Early Christian Studies*, 3.3 281-98.

Trump, D.H. (1966), *Central and Southern Italy before Rome*, (London:).

Tsuyuzaki, S. (1989), 'Analysis of Revegetation Dynamics on the Volcano Usu, Northern Japan, Deforested by 1977-1978 Eruptions', *American Journal of Botany*, 76.10 1467-77.

Tsuyuzaki, S. (1991), 'Species Turnover and Diversity during Early Stages of Vegetation Recovery on the Volcano Usu, Northern Japan', *Journal of Vegetation Science*, 2.3 301-6.

Ugolini, F.C. and R.J. Zasoski (1979), 'Soils Derived from Tephra', in Sheets, P.D. and D.K. Grayson (eds.), *Volcanic Activity and Human Ecology* (New York: Academic Press), 83-12.

Vairo, M.R. (2012), 'L'ambiente e il valore dell'uso del legno nella Campania antica: l'antropologia di due siti romani', (Università del Salento).

Valenza Mele, N. (1993), 'Napoli (1)', *Bibliografia topografica della colonizzazione greca in Italia e nelle isole tirreniche, XII* (Pisa-Roma: Scuola Normale Superiore, Ecole Française de Rome, Centre J. Bernard, Naples), 165-239.

Vallat, J.-P. (1981), 'Centuriazioni, assegnazioni, regime della terra in Campania alla fine della repubblica e all'inizio dell'impero', in Giardina, A. and A. Schiavone (eds.), *Società romana e produzione schiavistica. L'Italia: insediamenti e forme economiche* (Roma-Bari: Laterza), 289-98.

Vallat, J.-P. (1992), 'Cadastre, fiscalité et paysage: exemples en Italie et au Proche Orient dans l'Antiquité', in Bernardi, M. (ed.), *Archeologia del paesaggio: IV Ciclo di Lezioni sulla Ricerca applicata in Archeologia, Certosa di Pontignano (Siena), 14-26 gennaio 1991* (Firenze: All'insegna del Giglio), 483-509.

Vallat, J.-P. (2001), 'Temps longs et temps court, structures et conjonctures dans l'économie rurale de la Campanie romaine', in Lo Cascio, E. and A. Storchi Marino (eds.), *Modalità insediative e strutture agrarie nell'Italia meridionale di età romana* (Bari: Edipuglia), 583-89.

Vallotto, M. and M. Verità (2002), 'Glasses from Pompeii and Herculaneum and the Sands of the Rivers Belus and Volturno', in Renn, J. and G. Castagnetti (eds.), *Homo Faber: Studies on Nature, Technology, and Science at the Time of Pompeii* (Studi della Soprintendenza archeologica di Pompei, 6, Roma: L'Erma di Bretschneider), 63-73.

Vandermersch, C. (1994), *Vins et amphores de grande Grèce et de Sicile, IVe-IIIe s. avant J.-C.*, (Napoli: Centre Jean Bérard).

Vargas Macciucca, M. (1793), *Territorio napoletano antico e nuovo*, (Napoli:).

Varone, A. (1965), 'Un miliario del Museo dell'Agro nocerino e la via di Nocera al porto di Stabia (e al capo Ateneo)', *Apollo. Bollettino dei Musei Provinciali del Salernitano*, V 59-85.

Varone, A. (1991), 'L'area vesuviana: le strade', *Viae Publicae Romanae. Mostra Castel Sant' Angelo 11-25.IV.1991* (Roma: 95-96.

Veal, R. (2012), 'From context to economy: charcoal as an archaeological interpretative tool. A case study from Pompeii (3rd c. B.C.-A.D. 79)', in Schrüfer-Kolb, I. (ed.), *More than just numbers? The role of science in Roman Archaeology* (JRA Supplementary Series, 91, Portsmouth (RI): Journal of Roman Archaeology), 19-51.

Venuti, M. (1748), *Descrizione delle prime scoperte di Ercolano*, (Roma:).

Vera, D. (1999), 'Massa fundorum. Forme della grande proprietà e poteri della città in Italia fra Costantino e Gregorio Magno', *Mélanges de l'Ecole française de Rome. Antiquité,* 111.2 991-1025.

Vetrano, A. (1769), *Sebethi vindiciæ: sive Antonii Vetrani dissertatio de Sebethi antiquitate, nomine, fama, cultu, origine, prisca magnitudine, decremento, atque alveis adversus J. Martorellium*, (Napoli: Typographia Paciana).

Vicari, F. (2001), *Produzione e commercio dei tessuti nell'Occidente romano*, (BAR 916, Oxford: British Archaeological Reports).

Vita-Finzi, C. (1969), *The Mediterranean valleys: geological changes in historical times*, (London: Cambridge University Press).

Vlad Borrelli, L. (1965), 'Pireo', *Enciclopedia dell'arte antica classica e orientale* (Roma: Istituto della Enciclopedia Italiana), 180-89.

Vogel, S. and M. Märker (2010), 'Reconstructing the Roman topography and environmental features of the Sarno River Plain (Italy) before the AD 79 eruption of Somma–Vesuvius', *Geomorphology*, 115 67-77.

Volpe, G. (2005), 'Documenti per la storia e l'archeologia dell'Italia meridionale tardoantica e altomedievale', in Volpe, G. and M. Turchiano (eds.), *Paesaggi e insediamenti rurali in Italia meridionale fra Tardoantico e Altomedioevo. Atti del Primo Seminario sul Tardoantico e l'Altomedioevo in Italia Meridionale (Foggia 12-14 febbraio 2004)* (STAIM 1, Bari: Edipuglia), 11-21.

Wagstaff, J.M. (1983), 'Geography, archaeology and environment: II, A human geographer's view', *The Geographical Journal*, 149 323-25.

Wagstaff, J.M. (1987), 'The New Archaeology and Geography', in Wagstaff, J.M. (ed.), *Landscape and Culture: Geographical and Archaeological Perspectives* (Oxford: Basil Blackwell), 26-26.

Wallace-Hadrill, A. (1991)a, 'Elites and trade in the Roman town', in Rich, J. and A. Wallace-Hadrill (eds.), *City and country in the ancient world* (Leicester-Nottingham Studies in Ancient Society 2, London - New York: Routledge), 241-72.

Wallace-Hadrill, A. (1991)b, 'Houses and Households: Sampling Pompeii and Herculaneum', in Rawson, B. (ed.), *Marriage, Divorce, and Children in Ancient Rome* (Oxford: Clarendon Press), 191-227.

Wallace-Hadrill, A. (1994), *Houses and Society in Pompeii and Herculaneum*, (Princeton: Princeton University Press).

Walsh, P.G. (1984), 'Paulinus of Nola and Virgil, XV', in Livingstone, E.A. (ed.), *Studia patristica, XV: Papers presented to the 7th International conference on patristic studies held in Oxford 1975* (Berlin: Akad.-Verl.), 117-21.

Ward-Perkins, J.B. (1970), 'Città e Pagus; Considerazioni sull'organizzazione primitiva della Città nell'Italia centrale', *Atti del convegno di studi sulla città etrusca e italica preromana, Bologna 1966* (Bologna: Società di Storia Patria), 293-97.

Ward-Perkins, J.B. (1972), 'Central authority and patterns of rural settlement', in Ucko, P.J., R. Tringham, and G.W. Dimbleby (eds.), *Man, Settlement and Urbanism* (London: Duckworth), 867-82.

Weber, M. (1978), *Economy and Society*, (Berkeley: University of California Press).

Weiss, R. (1969), *The Renaissance Discovery of Classical Antiquity*, (Oxford: Basil Blackwell).

White, K.D. (1967), 'Latifundia: a critical review of the evidence on large estates in Italy and Sicily up to the end of the first century AD', *Bulletin. Institute of Classical Studies, University of London*, 14 62-67.

Whitehouse, D. (1985), 'Dark Age Naples', (Convegni di studi sulla Magna Grecia Taranto XXV, 285-88.

Whitehouse, D. (1986), 'Napoli tra tardoantico e altomedioevo', *Atti e Memorie della Società Magna Grecia*, XXI.1-2 9-10.

Whitehouse, R.D. and J.B. Wilkins (1989), 'Greeks and natives in south-east Italy: approaches to the archaeological evidence', in Champion, T.C. (ed.), *Centre and Periphery: Comparative Studies in Archaeology* (One World Archaeology, London: Unwin Hyman), 102-26.

Whittaker, C.R. (1983), 'Late Roman trade and traders', in Garnsey, P., K. Hopkins, and C.R. Whittaker (eds.), *Trade in the Ancient Economy* (London: 162-80.

Whittaker, C.R. (1985), 'Trade and aristocracy in the Roman empire', *Opus*, 4 49-75.

Whittaker, C.R. (ed.) (1988), *Pastoral economies in classical antiquity*, Proceedings of the Cambridge Philological Society, supplement 14, Cambridge: Cambridge Philological Society)

Whittaker, C.R. (1990), 'The consumer city revisited: the vicus and the city', *Journal of Roman Archaeology*, 3 110-18.

Whittaker, C.R. (1995), 'Do theories of the ancient city matter?', in Cornell, T.J. and K. Lomas (eds.), *Urban society in Roman Italy* (London: UCL Press), 9-26.

Widemann, F. (1986), 'Les effects économiques de l'éruption de 79. Nouvelles données et nouvelle approche', in Livadie, C.A. (ed.), *Tremblements de terre, éruptions volcaniques et vie des hommes dans la Campanie antique* (Bibliothèque de l'Institut Français de Naples, Deuxième série, Volume VII, Napoli: Centre Jean Bérard - Institut Français de Naples), 107-12.

Widemann, F. (1990), 'Implications économiques des désastres volcaniques: le court et le long terme dans le cas de Pompéi', in Albore Livadie, C. and F. Widemann (eds.), *Volcanologie et archéologie: Actes des ateliers Européens de Ravello, 19-27 novembre 1987 et 30-31 mars 1989* (Pact, 25, Strasbourg: Rixensart), 217-31.

Williams, D.F. (2004), 'The Eruption of Vesuvius and its Implications for the Early Roman Amphora Trade with India', in Eiring, J. and J. Lund (eds.), *Transport amphorae and trade in the Eastern Mediterranean: Acts of the international colloquium at the Danish Institute at Athens, September 26-29, 2002* (Monographs of the Danish Institute at Athens, 5, Aarhus: Aarhus University Press), 441-50.

Williams, D.F. and D.P.S. Peacock (2005), 'The Eruption of Vesuvius and Campanian Dressel 2-4 Amphorae', in Pollini, J. (ed.), *Terra marique: Studies in art history and marine archaeology in honor of Anna Marguerite McCann on the receipt of the gold medal of the Archaeological Institute of America* (Oxford: Oxbow), 140-48.

Williams-Jones, G. and H. Rymer (2000), 'Hazards of volcanic gases', in Sigurdsson, H. (ed.), *Encyclopedia of Volcanoes* (San Diego: Academic Press), 997-1004.

Williams-Thorpe, O. (1988), 'Provenancing and Archaeology of Roman Millstones from the Mediterranean Area', *Journal of Archaeological Science*, 15 253-305.

Wilson, A. (2009), 'Approaches to Quantifying Roman Trade', in Bowman, A. and A. Wilson (eds.), *Quantifying the Roman Economy* (Oxford: Oxford University Press), 213-49.

Wilson, A. (2011), 'City Sizes and Urbanization in the Roman Empire', in Bowman, A. and A. Wilson (eds.), *Settlement, Urbanization, and Population* (Oxford: Oxford University), 161-95.

Wilson, A.I. (1999), 'Commerce and industry in Roman Sabratha', *Libyan Studies*, 30 29-52.

Wilson, A.I. (2002), 'Urban production in the Roman world: the view from North Africa', *Papers of the British School at Rome*, 70 231-73.

Wilson, A.I. (2007), 'Villas, horticulture and irrigation infrastructure in the Tiber Valley', in Coarelli, F. and H. Patterson (eds.), *Mercator Placidissimus: The Tiber Valley in Antiquity. New research in the upper and middle river valley (Proceedings of the Conference held at the British School at Rome, 27-28 Feb. 2004)* (Roma: British School at Rome - Edizioni Quasar),

Wilson, A.I. (2010), 'City sizes and urbanisation in the Roman Empire', in Bowman, A. and A. Wilson (eds.), *Settlement, Urbanisation and Population* (Oxford Studies on the Roman Economy, 2, Oxford: Oxford University Press), 192-239.

Witcher, R. (2011), 'Missing persons? Models of Mediterranean Regional Survey and Ancient Populations', in Bowman, A. and A. Wilson (eds.), *Settlement, Urbanization, and Population* (Oxford: Oxford University), 36-75.

Woodward, D. (ed.) (1987), *Art and cartography: six historical essays*, Kenneth Nebenzahl, Jr., lectures in the history of cartography, Chicago: University of Chicago Press)

Wringley, E.A. (1990), 'Metropolitan cities and their hinterlands: stimulus and constraints to growth', in Aerts, P. and P. Clark (eds.), *Metropolitan Cities and their Hinterlands in Early Modern Europe* (Leuven: 12-20.

Zanchetta, G., et al. (2004), 'Characteristics of May 5-6, 1998 volcaniclastic debris flows in the Sarno area (Campania, southern Italy): relationships to structural damage and hazard zonation', *Journal of Volcanology and Geothermal Research*, 133 377-93.

Zanella, E., et al. (2008), 'Deposition temperature of the AD 472 Pollena pyroclastic density current deposits, Somma-Vesuvius, Italy', *Bulletin of Volcanology*,

Zevi, F. (1980), 'Gli scavi di Ercolano', *Civiltà del '700 a Napoli 1734-1799, vol.II* (Firenze: Centro Di), 58-74.

Zevi, F. (1988), 'Gli scavi di Ercolano e le 'Antichità'', *Le Antichità di Ercolano* (Napoli: Banco di Napoli), 9-38.

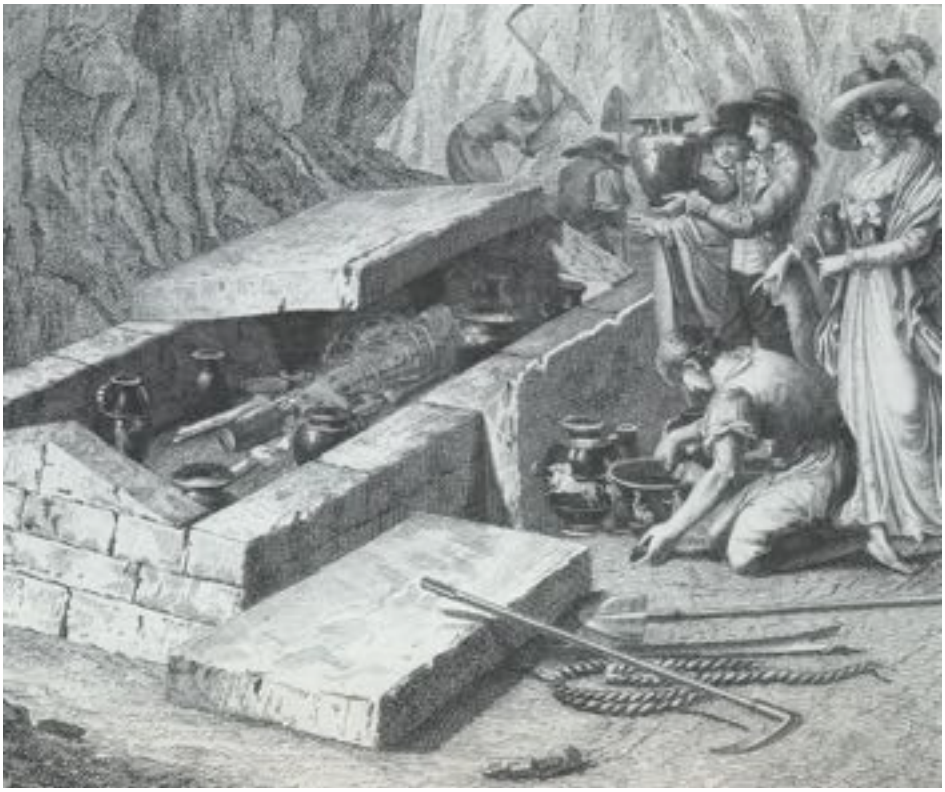


Figure 1 - Sir William Hamilton and his wife during the discovery of a tomb in the Nolan countryside (etching by Christoph Heinrich Kniep, 1786-88).

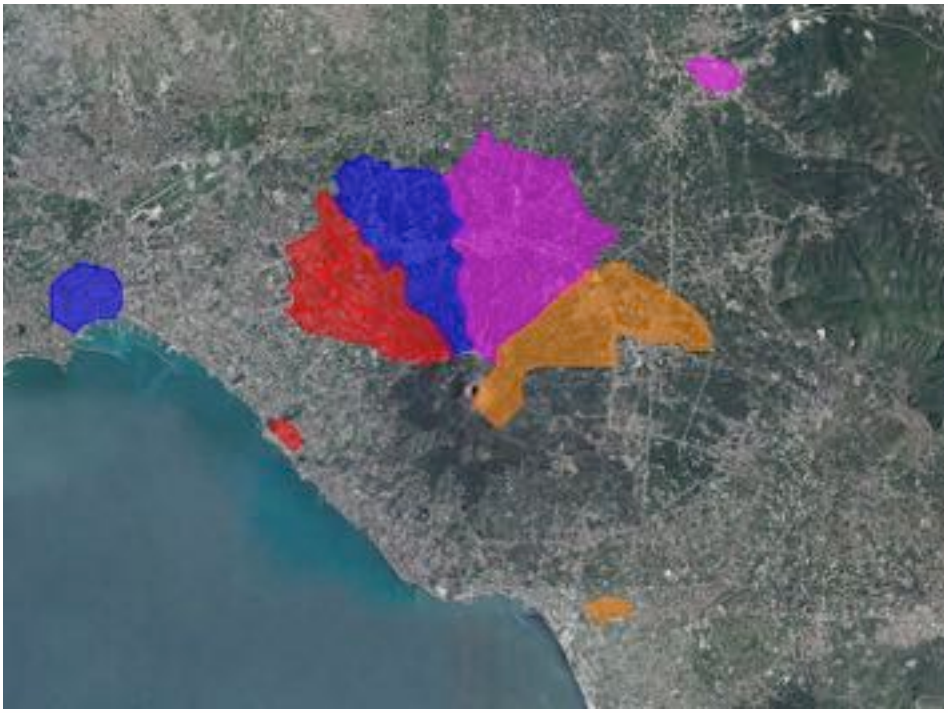


Figure 2 - Present administrative divisions of the north slope of Vesuvius in four offices. Red: Ufficio Scavi di Ercolano; Blue: Ufficio Scavi di Napoli; Magenta: Ufficio Scavi di Nola; Orange: Ufficio Zone Periferiche Pompei.

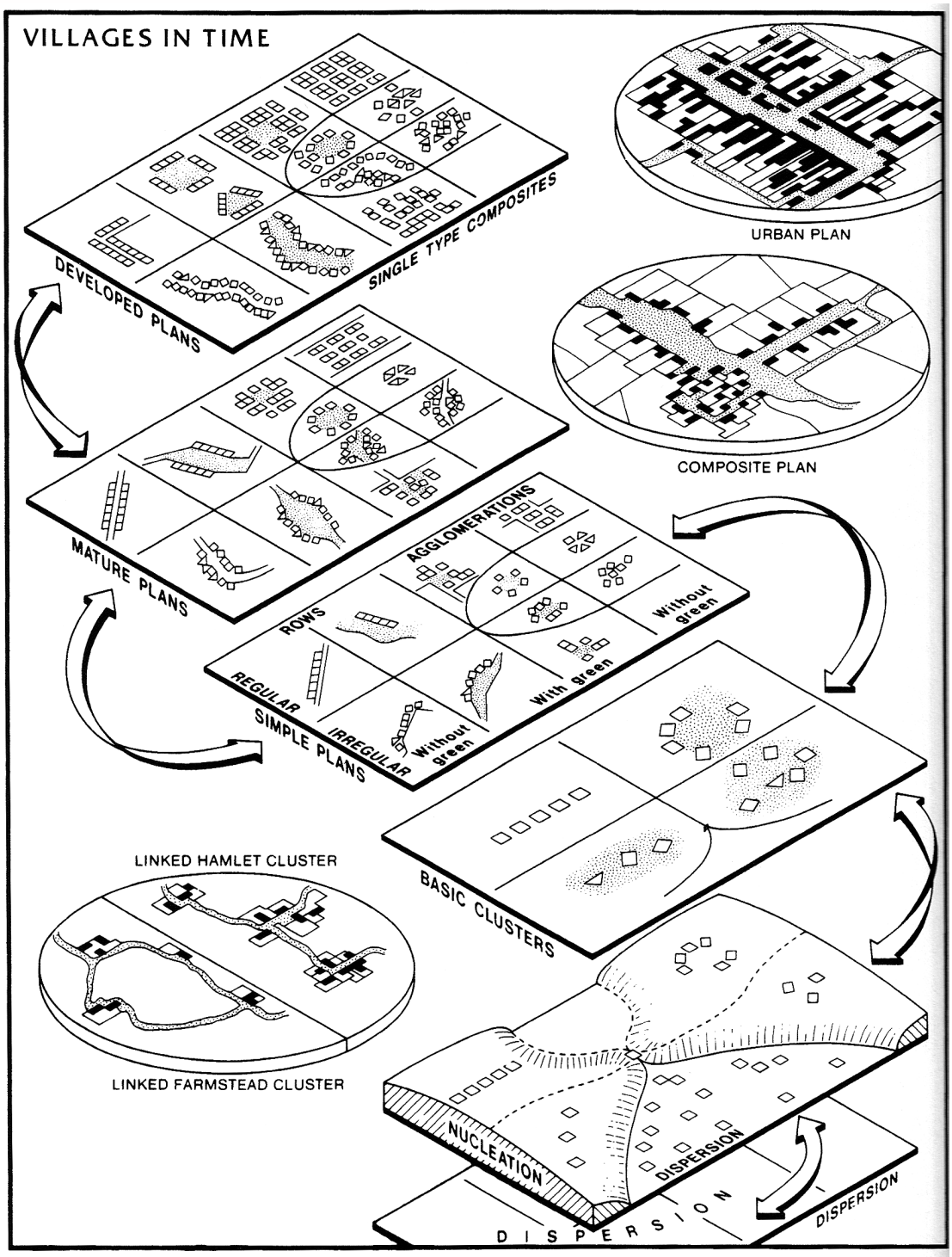


Figure 3 - Scheme of settlement developments in time (Roberts 1996, p.116, fig.5-10).

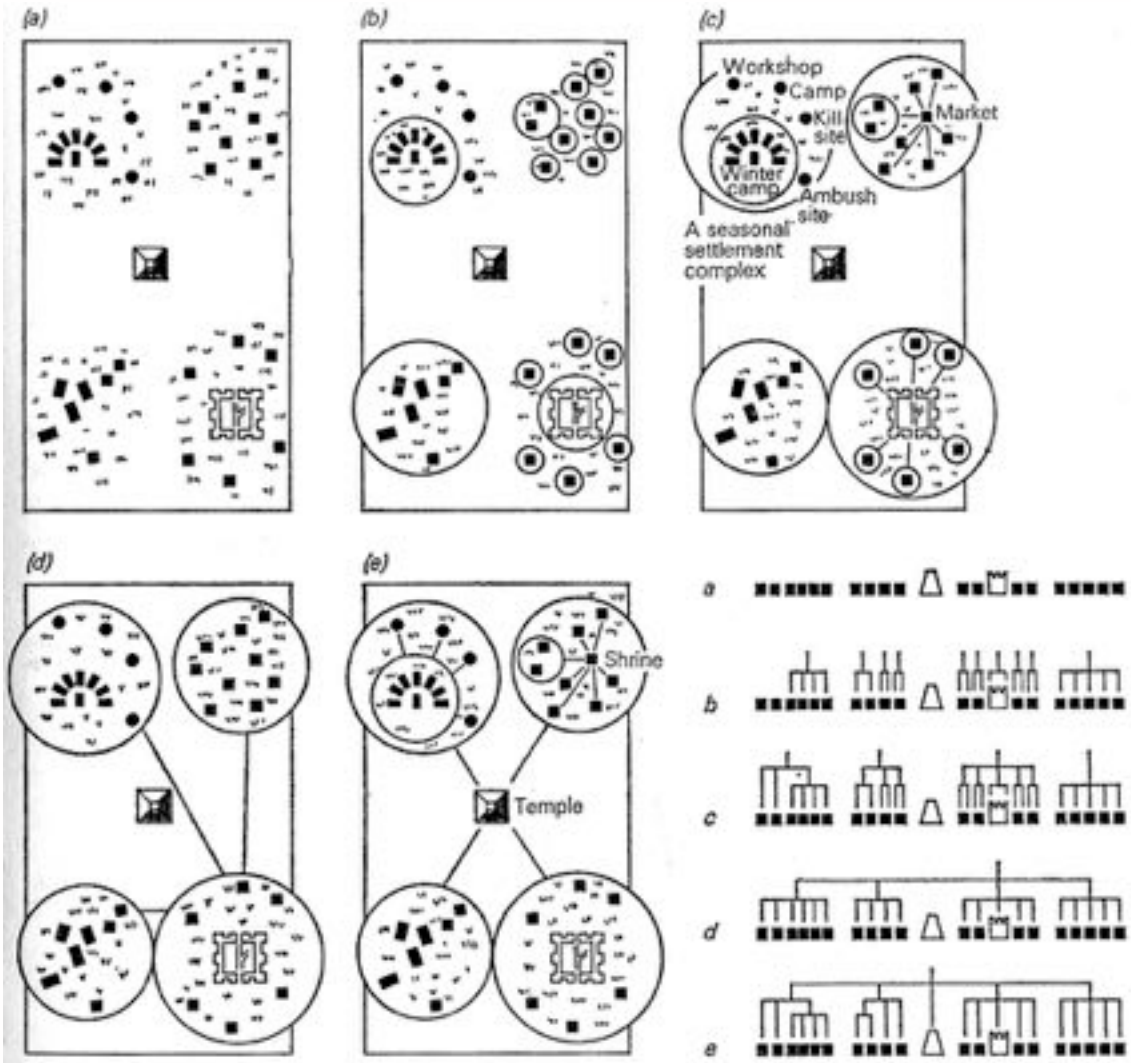


Fig.4-9. The articulation of sites into hierarchical relationships. (*a*) Archaeological ruins whose contemporaneity has been established; (*b*) spheres of domestic activity; (*c*) local networks; (*d*) political networks; (*e*) religious networks; (*f*) hierarchies of the inter-relationships in *a* to *e*. Source: Chang 1972.

Figure 4 - Chang's articulation of sites into hierarchical relationships (after Hodder – Orton 1976, p.65, fig.4.9).

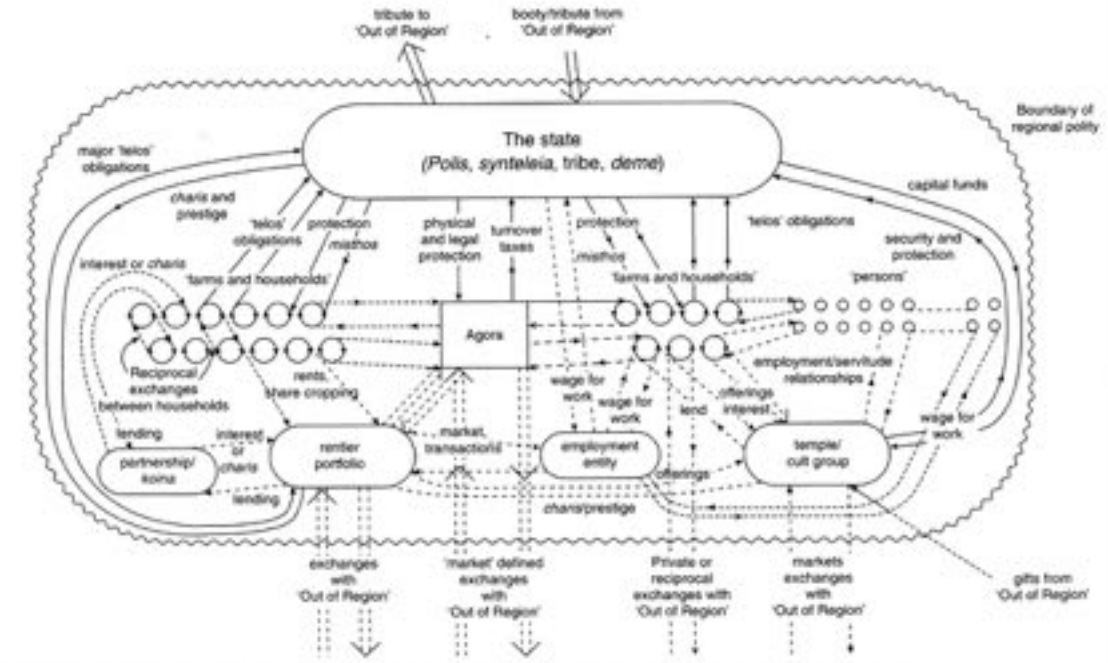


Figure 11.3 A flow diagram of resource movement, stage 3: interactions with the public economy

Figure 5 - Davies' flow diagram of resource movement (Davies 1998, p.249, fig.11.3).

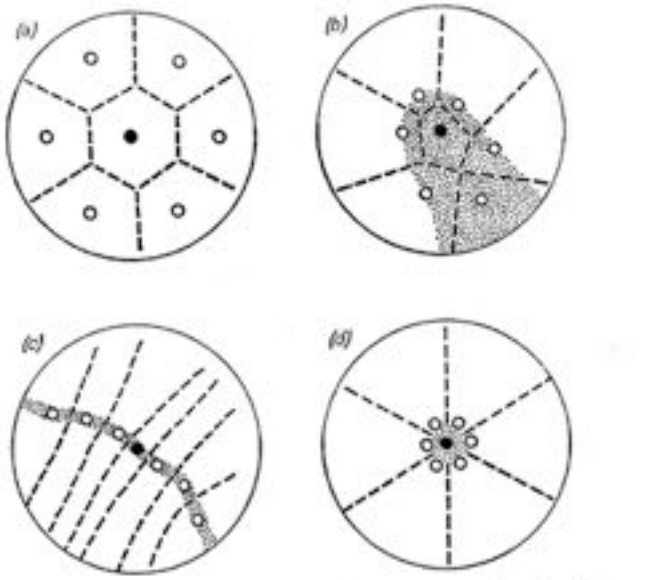


Fig.4.22. Sequence of settlement patterns associated with an increasingly localised resource (stippled areas). Source: Haggett 1965.

Figure 6 - Examples of localised resources (Hodder – Orton 1986, p.85, fig.4.22).

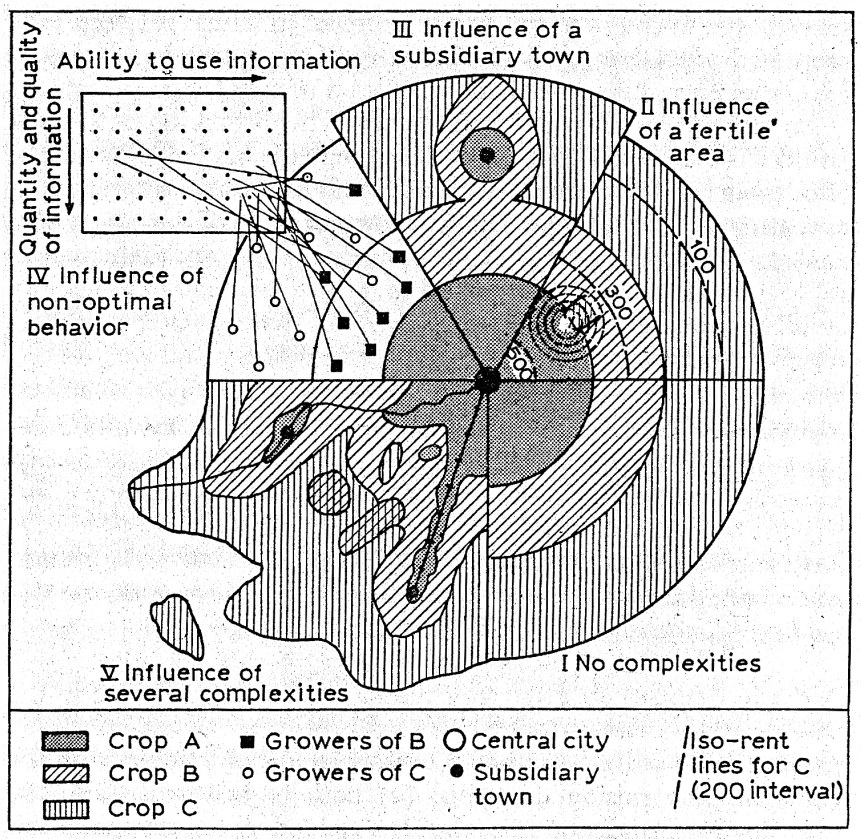


Fig. 19.23 The von Thünen zones under several complicating conditions. (Behavioural matrix after Allan Pred, 'Behaviour and Location: Foundations for a Geographic and Dynamic Location Theory', pt 1, *Lund Studies in Geography*, series B, *Human Geography*, no. 27 (1967) 25, 76.

Figure 7 – von Thünen's model distortion, please note the influence of non-optimal behaviour (Understanding Society 1970, p.313, fig.19.23).



Figure 8 - Barrington Atlas map of Latium et Campania (Talbert 2000, table 44, detail).



Figure 9 - Coins minted by Neapolis.



Figure 10 - Distribution of the amphorae with the stamp TR. LOISIO (Olcese 2010: 166).

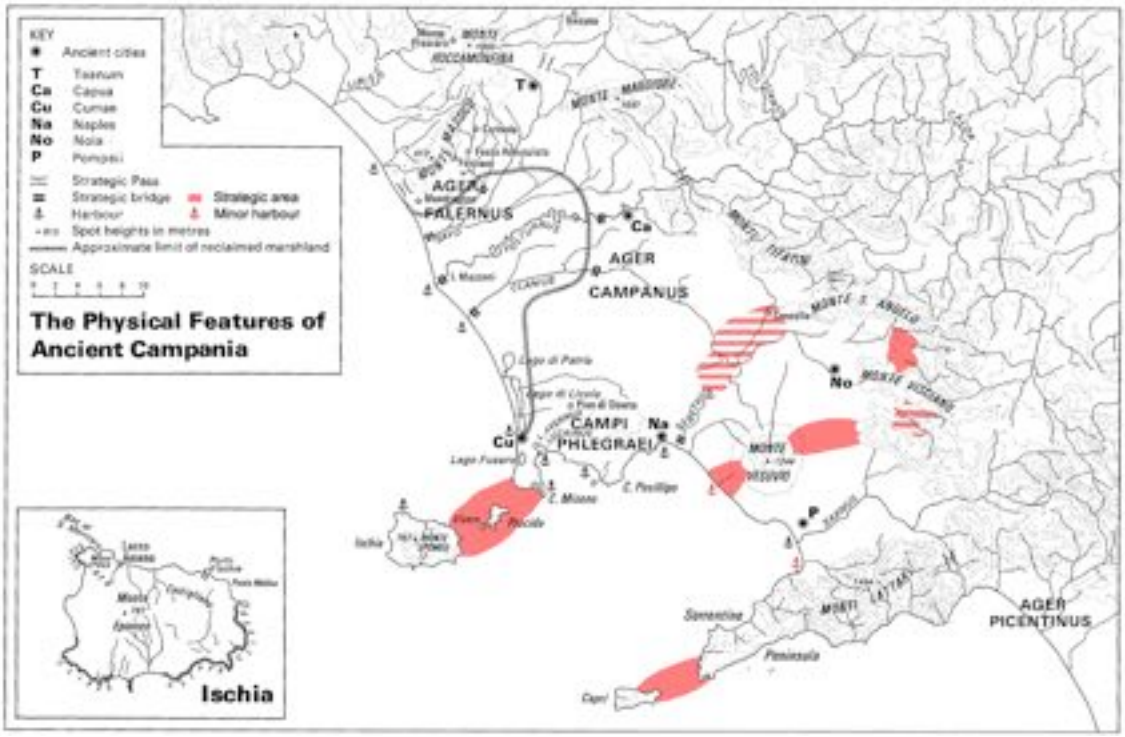


Figure 11 – Map of the physical features of Campania with strategic passes, harbours and areas (modified from Frederiksen 1984, map 1).



Figure 12 – Distribution of surface waters around the Somma-Vesuvius complex. In red, the modern administrative division (overlaid by the author).

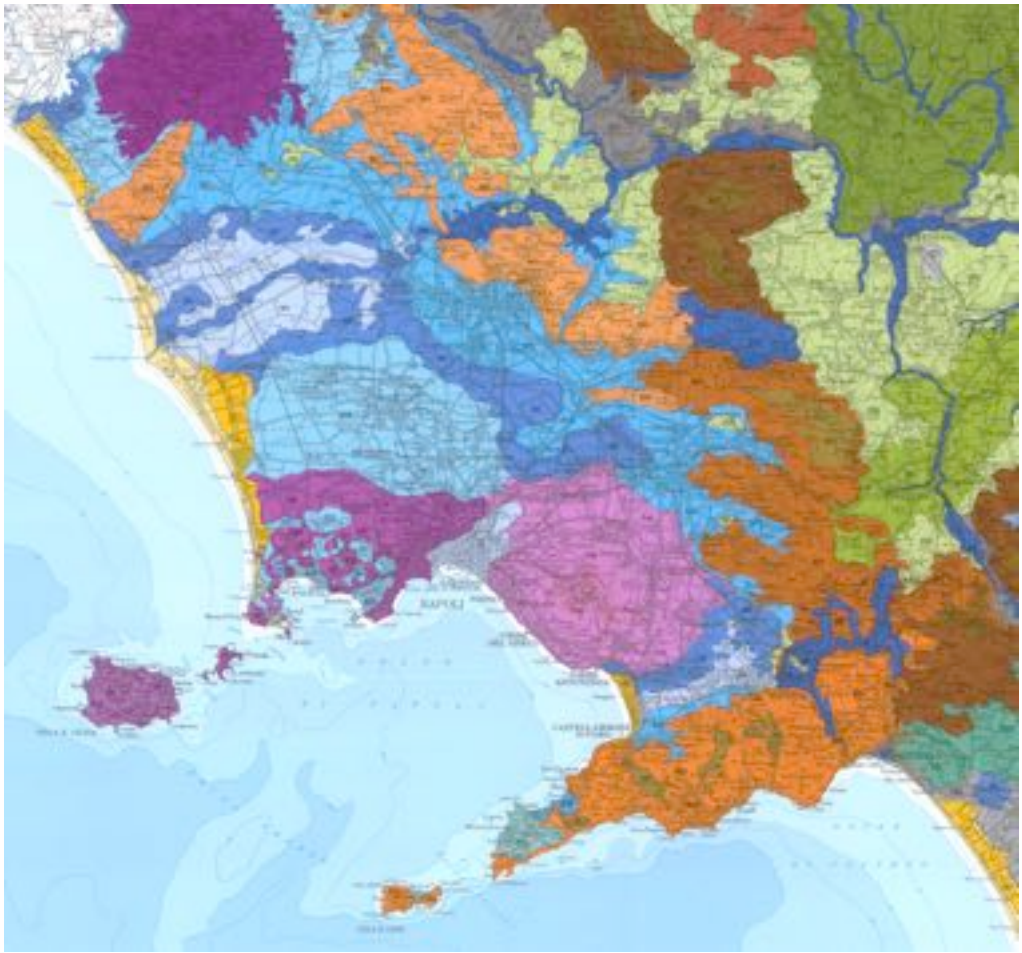


Figure 13 – Geological map of Campania (Source: Di Gennaro 2002). Violet: volcanic areas; azure: piedmont areas pertaining to volcanic reliefs; light blue: piedmont areas pertaining to limestone reliefs; dark blue: alluvial plains; green: clay hills; orange/brown: limestone reliefs; yellow: coastal plain.



Figure 14 – Photo of the Somma-Vesuvius complex from Naples.



Figure 15 – Panoramic photo of the northern flanks of Vesuvius.



Figure 16 – The atrio del Cavallo.



Figure 17 – Detail of the fresco in the lararium of the House of the Centenary in Pompeii.

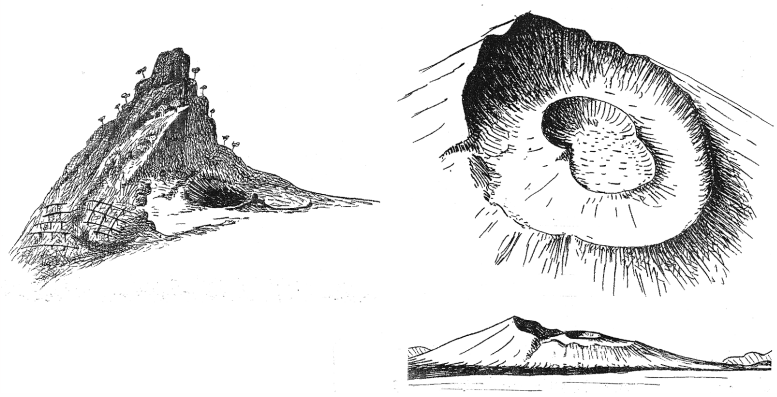


Fig. 18 – Sketch of the painting and reconstructive hypothesis by Scherillo (1982).



Figure 19 – Drawing of the volcanic activity of Vesuvius during the years 1631/1689 by Antonio Bulifon.

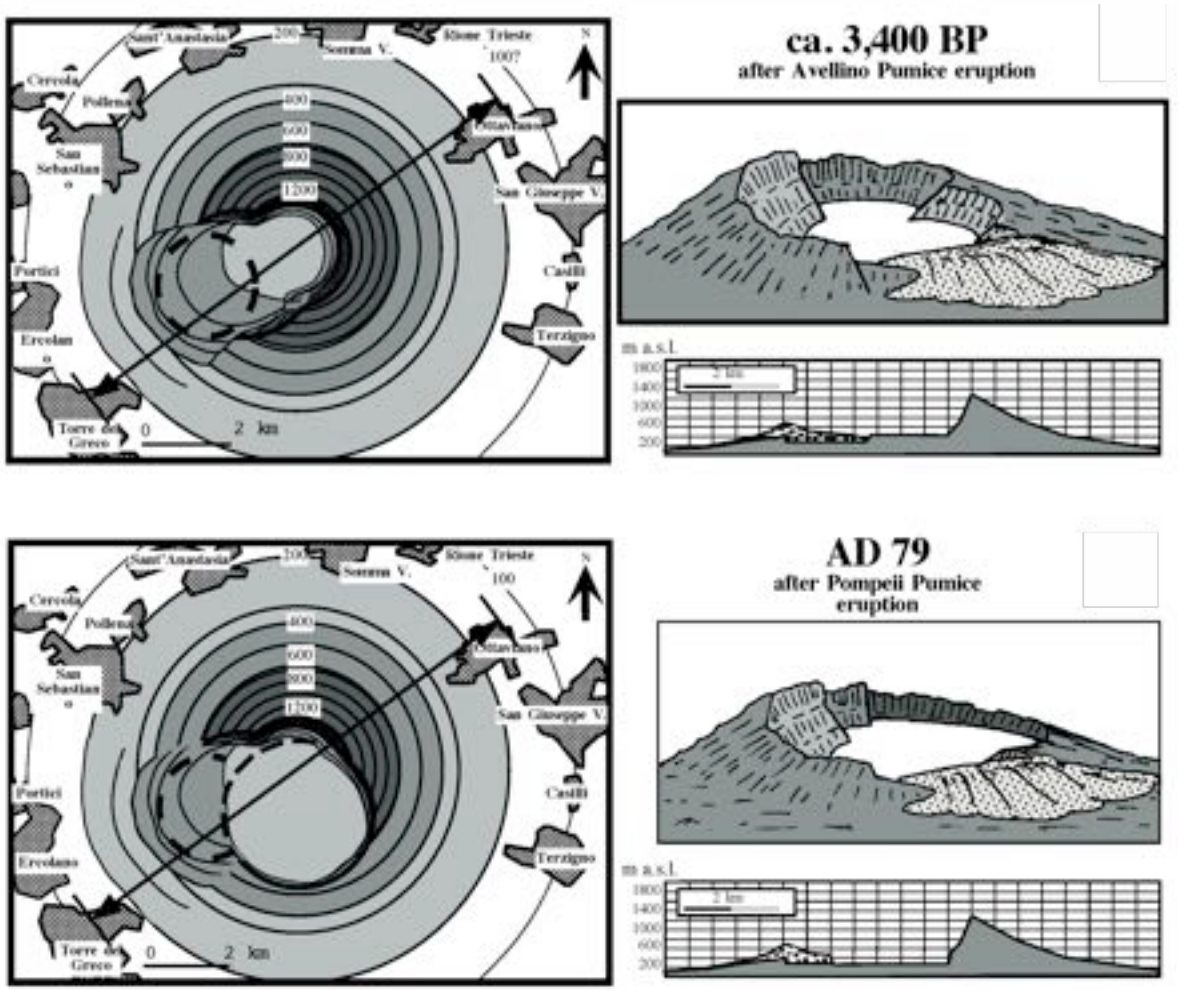
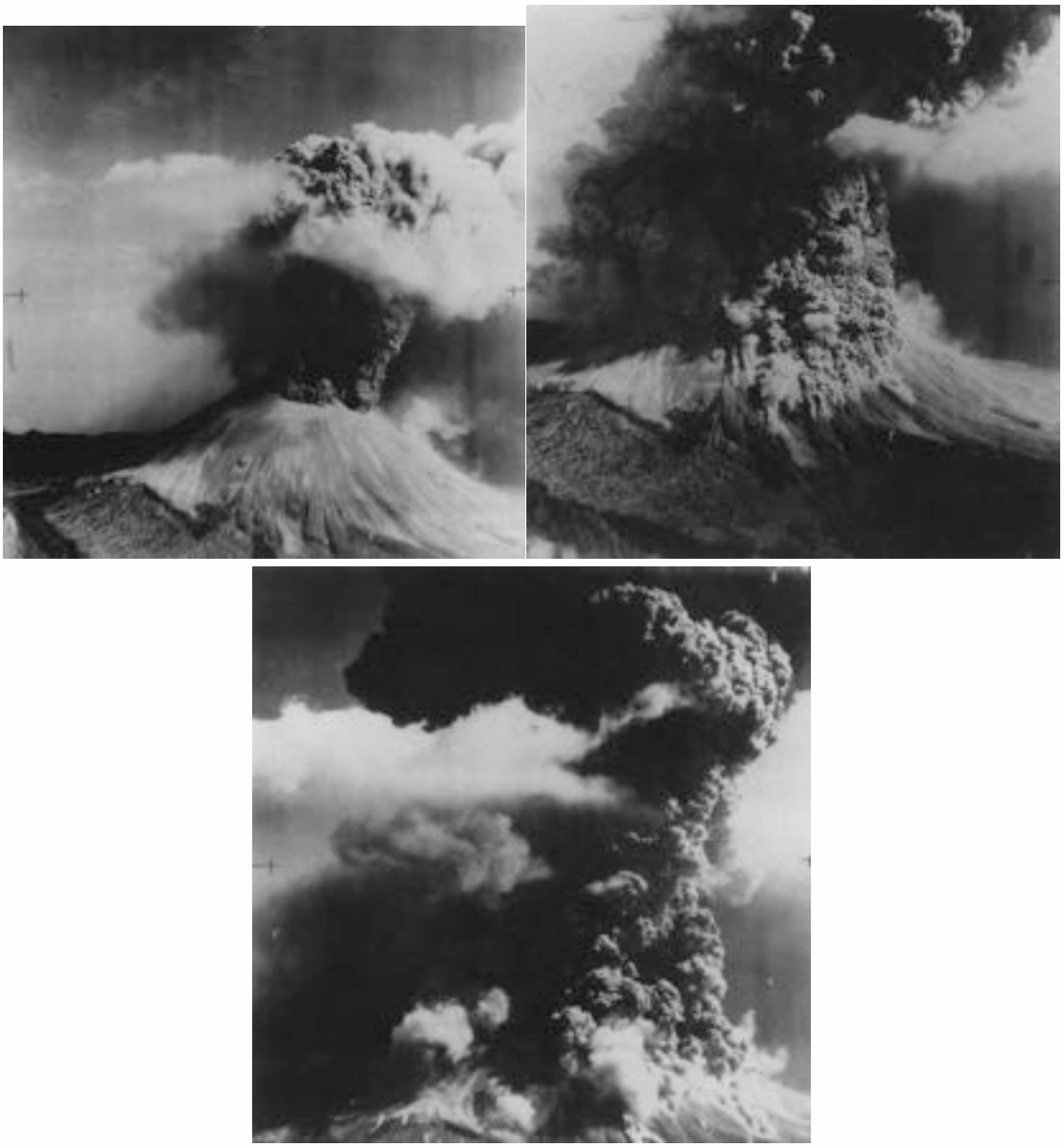


Figure 20 - Hypothetical reconstructions of how the Somma-Vesuvius complex was before (above) and after (below) the AD 79 eruption (Source: Cioni 1999: 219, fig. 12, letters D and E).



Figures 21-23 – Air photos of the collapse of the volcanic column during the eruption of Mt. Vesuvius the 23rd of March 1944.

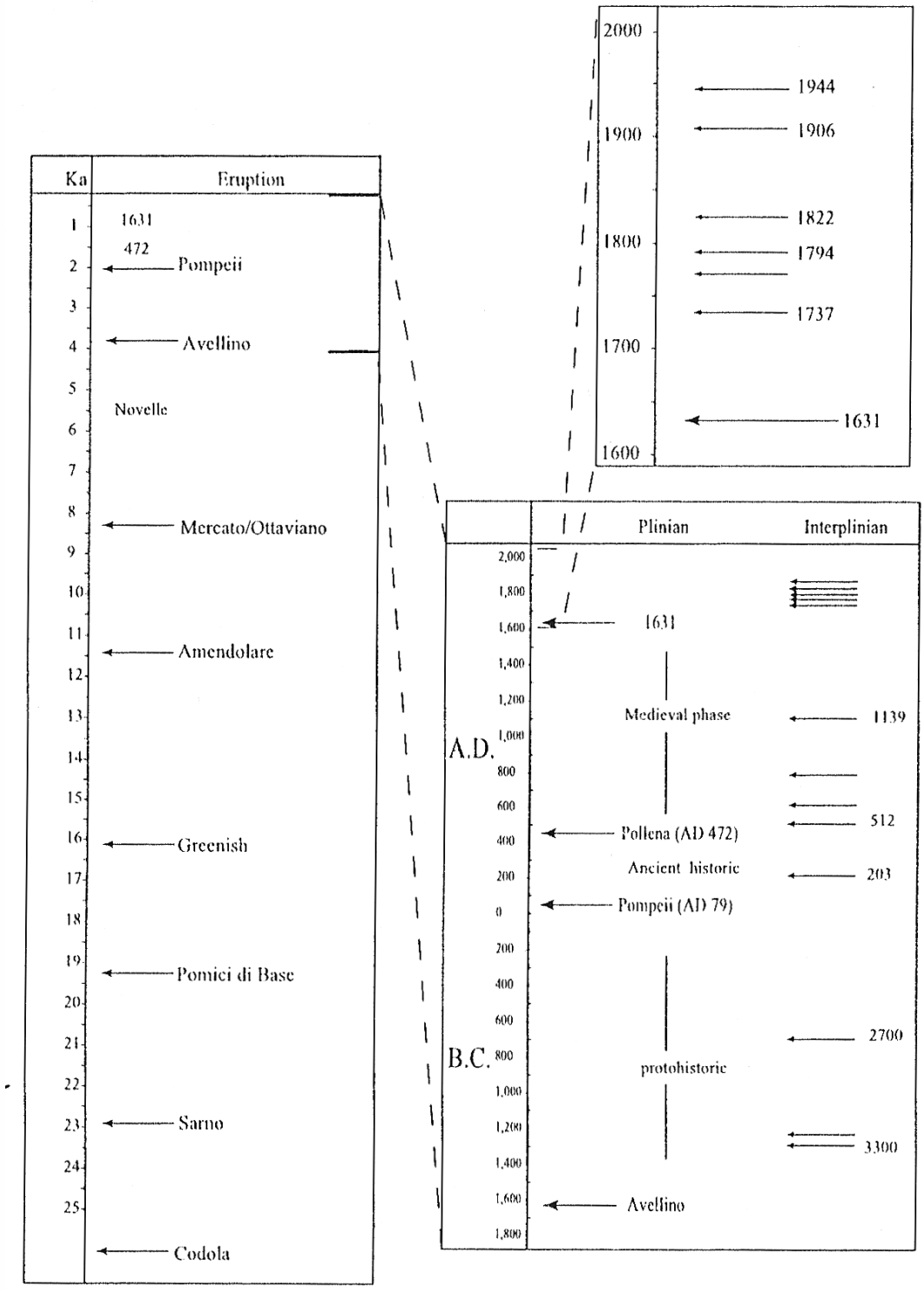


Fig. 2.11. Chronological chart of eruptions from Vesuvius.

Figure 24 – Chronological chart of eruptions (Source: Guest 2003, Fig. 2.11, p.46).

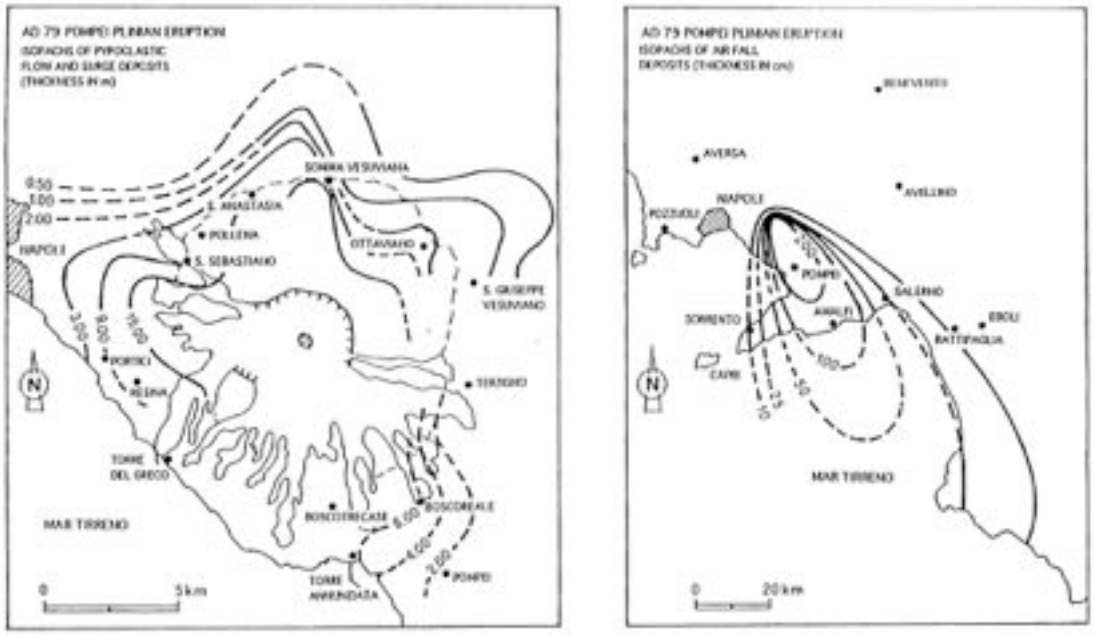


Figure 9. The AD 79 Pompei plinian eruption deposits. Isopachs of pyroclastic flow and surge, and of air fall deposits (Rosi et al., 1987).

Figure 25 – AD 79 eruption deposits (Source: Dobran 1993, fig. 9, p. 15, from Rosi 1987).

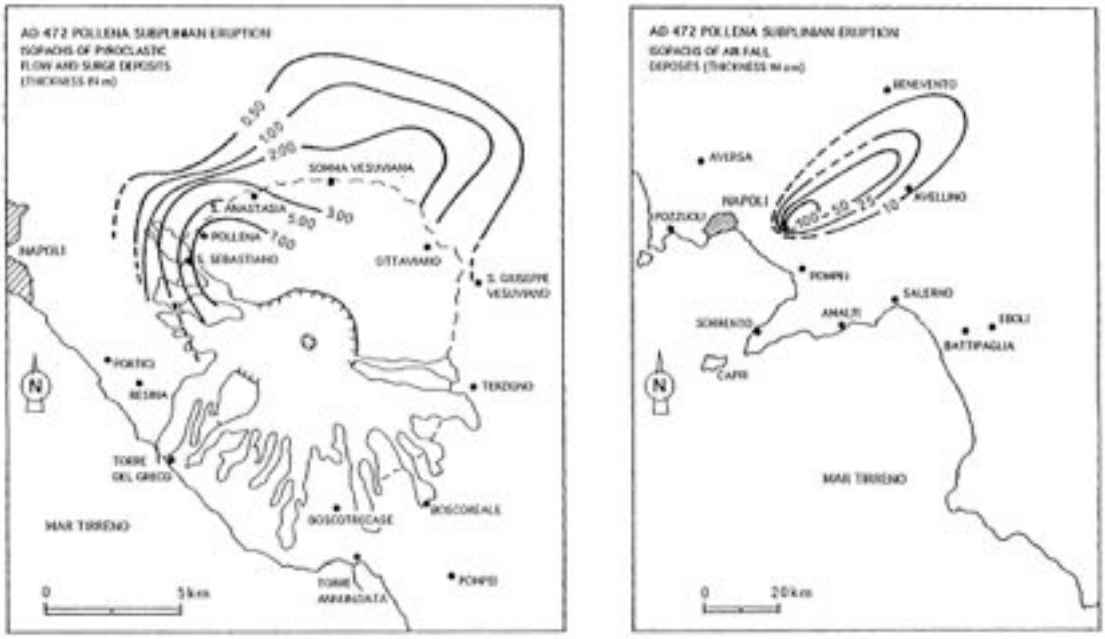


Figure 10. The 472 Pollena plinian eruption deposits. Isopachs of pyroclastic flow and surge, and of air fall deposits (Rosi et al., 1987).

Figure 26 – AD 472 eruption deposits (Source: Dobran 1993, fig. 10, p. 16, from Rosi 1987).

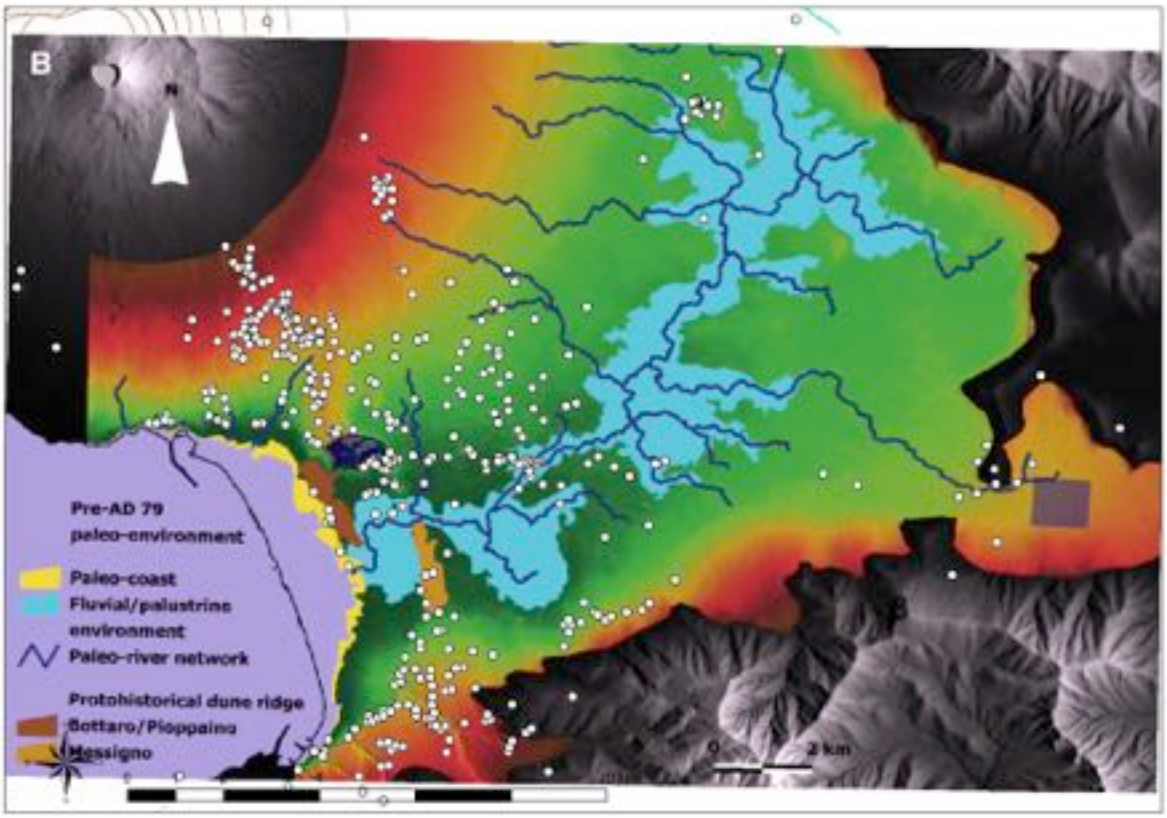


Figure 27 - Reconstruction of the Pompeian countryside according to Vogel 2010 with, overlaid, the archaeological map of the sites in that area, according to the data I have collected. Please note the presence of sites also in areas where the presence of marshes and the river Sarnus have been hypothesised.



Figure 28 – Somma Vesuviana, Oscan cippus site: sequence of Pompeian-like section.



Figure 29 – Somma Vesuviana, Oscan cippus site: prehistoric section.



Figure 30 – Somma Vesuviana, Oscan cippus site: lava blocks.

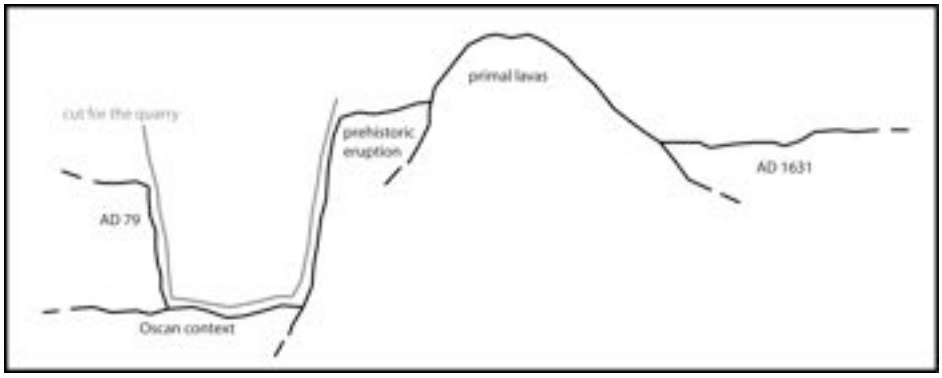


Figure 31 – Reconstructive sketch of the volcanic strata in the site of the Oscan cippus.

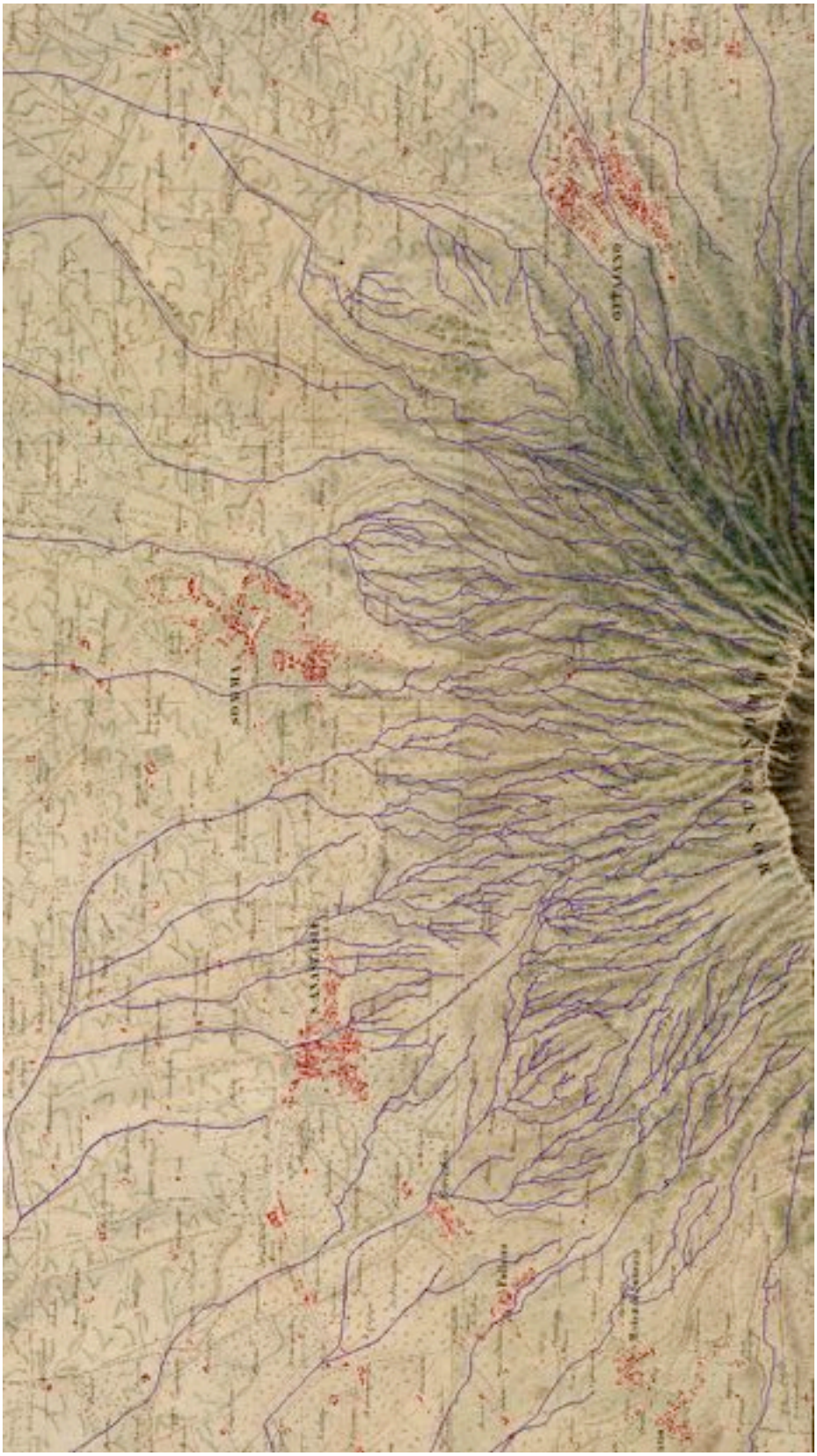


Figure 32 – Composite map of the north slope of Vesuvius in 1836 with present hydrological features (blue lines). The modern streams cross the ancient gullies in the uppermost part of the volcano, but in the lowermost part they roughly correspond to the ancient ones.

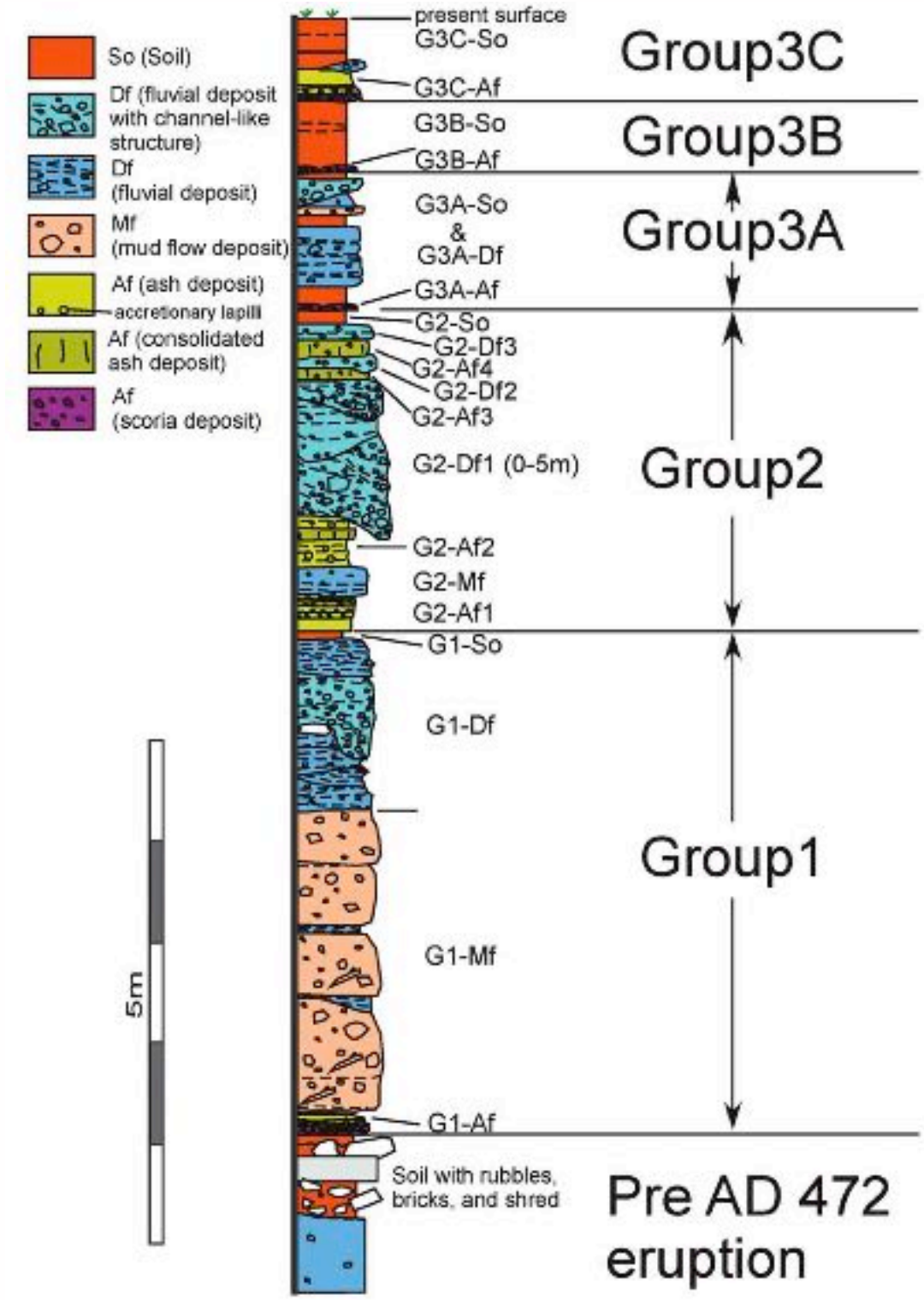


Fig. -. Stratigraphic section at the excavation site.

Figure 33 – Somma Vesuviana, neighbourhood of Starza della Regina: stratigraphic section.

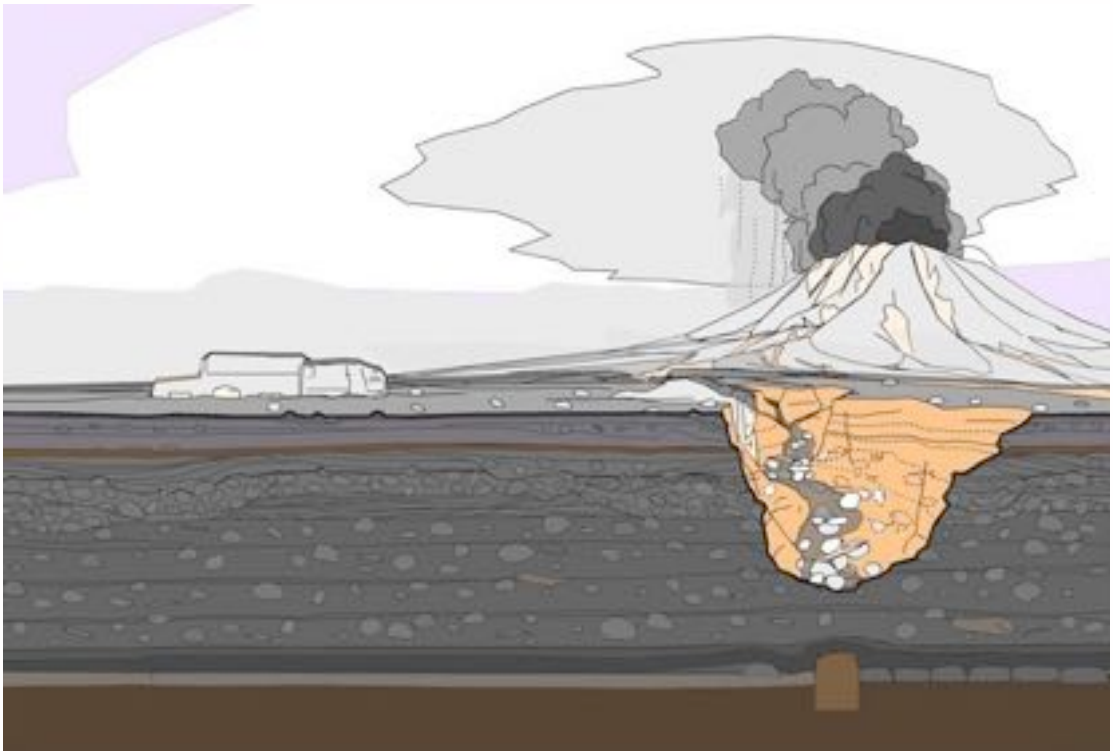


Figure 34 – Somma Vesuviana, neighbourhood of Starza della Regina: reconstructive drawing of the cut caused by debris flows pertaining to (post-)512 eruptions.



Figure 35 - Pollena Trocchia, neighbourhood of Masseria De Carolis: stratigraphic section with volcanoclastic fill and humified soil above it.



Figure 36 - Pollena Trocchia, neighbourhood of Masseria De Carolis: the post-472 structure.



Figure 37 - Ottaviano, neighbourhood Raggi: ploughing furrows buried by the AD 79 ashes.

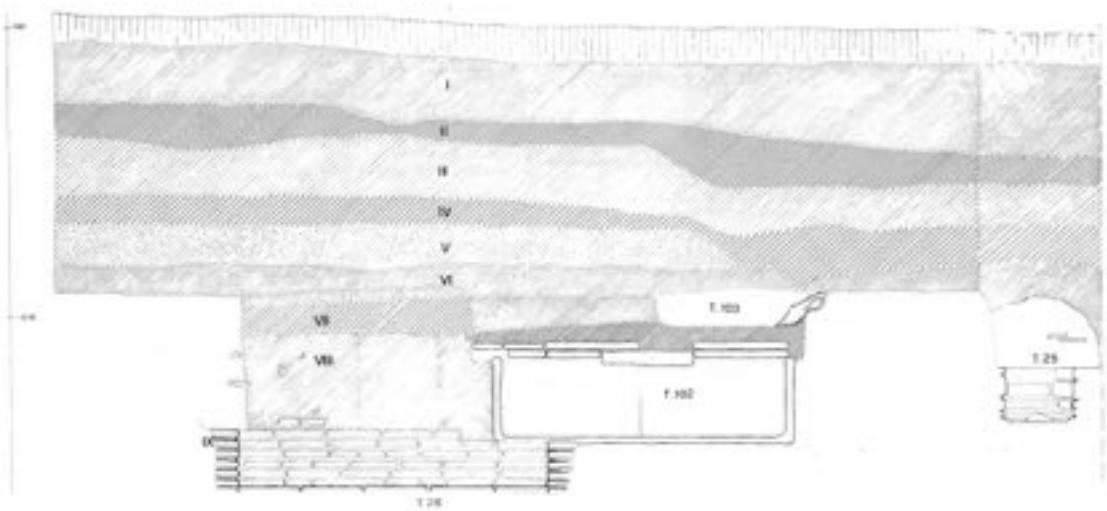


Fig. 7. Atripalda (*Abellinum*). Necropoli meridionale: Sezione II, b.

Figure 38 – Atripalda, via Cesinali necropolis. The context nr. V is constituted by loose lapilli, context IV by compact ashes, context III by alluvial deposits (debris flows).

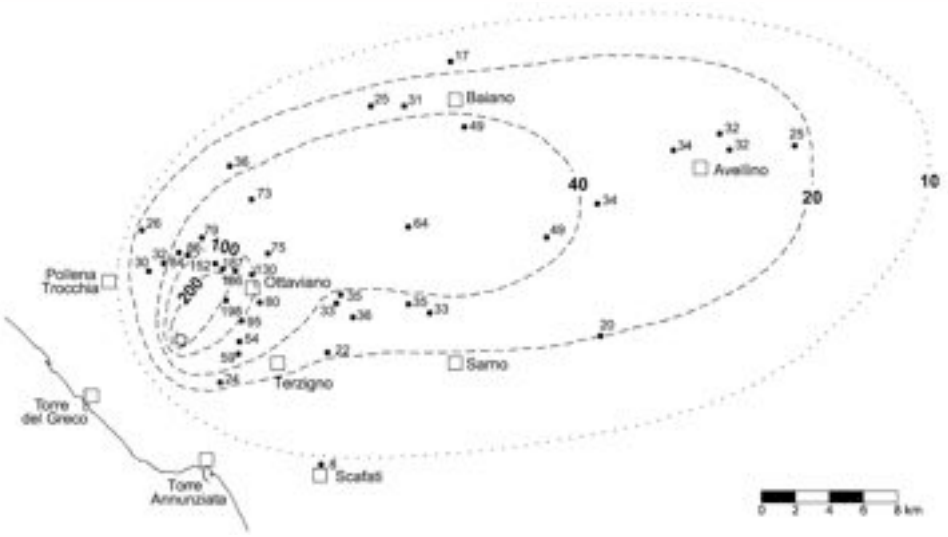
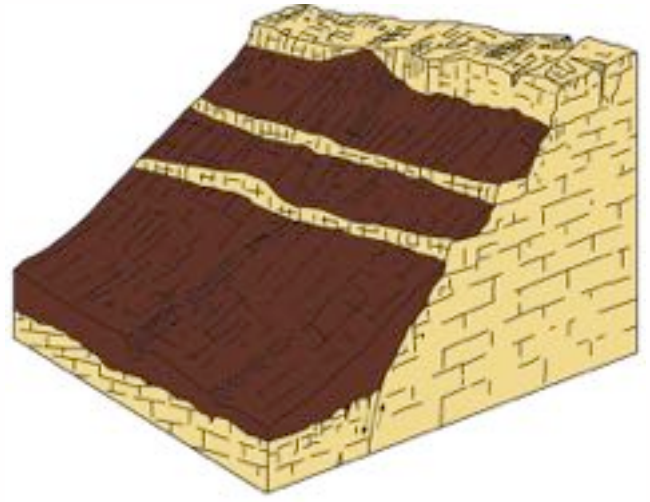


Figure 39 – Isopach map of the AD 472 eruptive fall deposits according to Rolandi (2004: fig. 8).



Sketch indicating the varying thicknesses of pyroclastic deposits over stepped limestone relief

Figure 40 – Reconstructive sketch of the stepped limestone relief with pyroclasic deposits on top (Source: Del Prete 1998, p. 116, fig. 6).

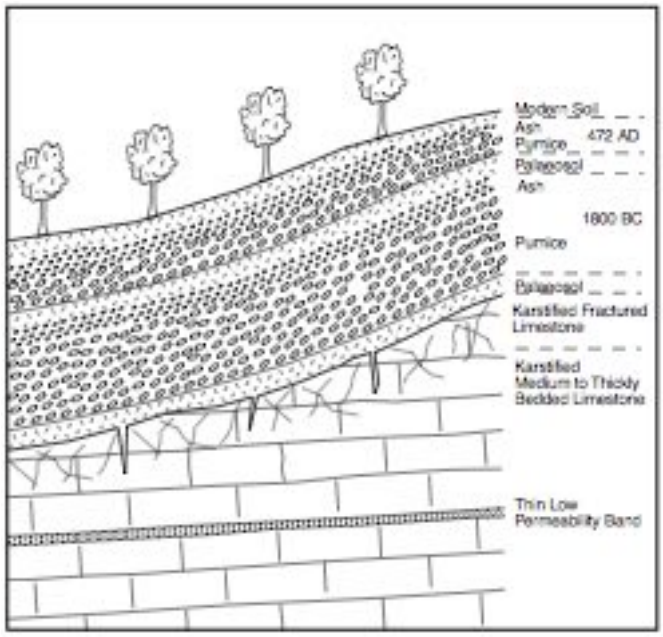


Fig. 4
Schematic profile of the pyroclastic deposits in the area of the P.zo d'Alvano

Figure 41 – Profile of the limestone bedrock with pyroclastic deposits (Source: Del Prete 1998, p. 115, fig. 4).

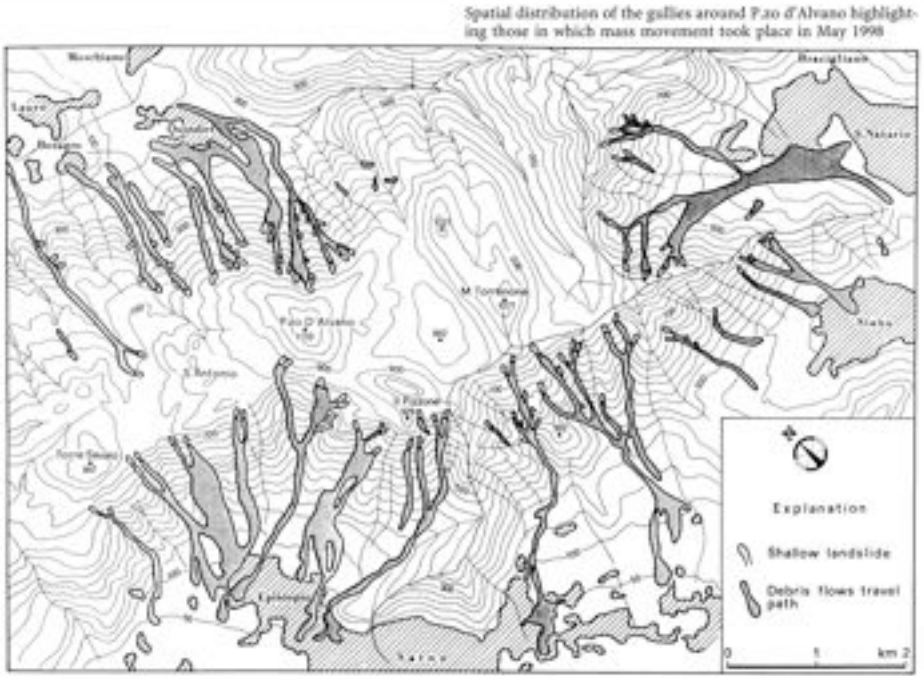


Figure 42 – Distribution and paths of landslides during the 5-6 May 1998 (Source: Del Prete 1998, p. 116, fig. 7).

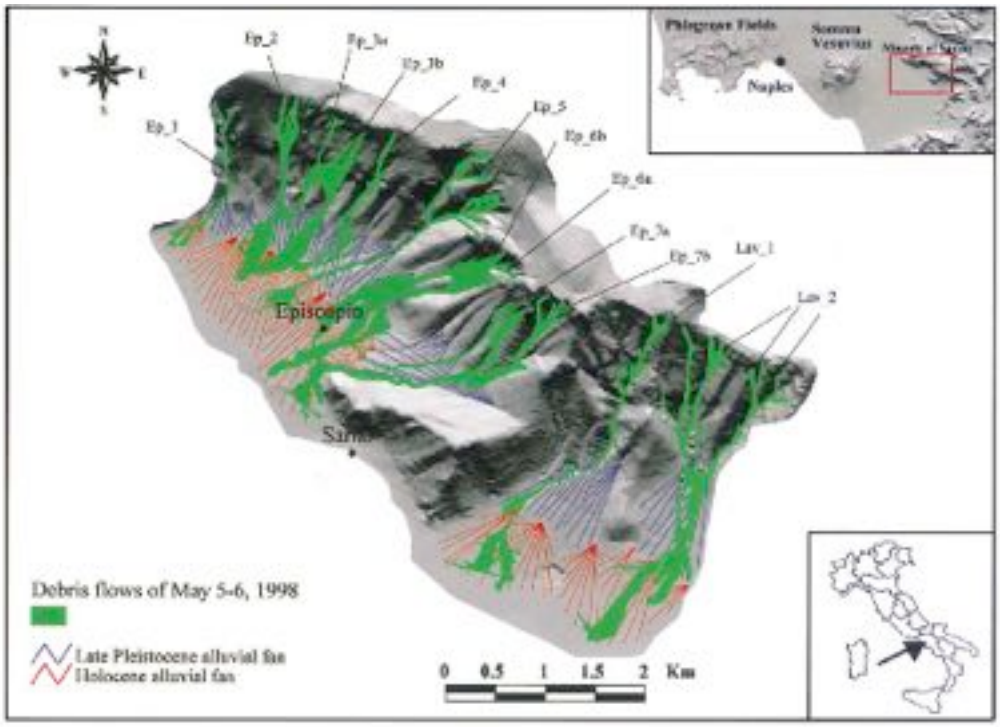


Fig. 1. Shadow relief of Sarno^Episcopio area. The 2-m step DEM is obtained from May 8, 1998 aerial photos (scale 1: 13 000). Green areas show the debris flows source and spreading areas, while red and blue lines indicate the late Pleistocene and Holocene alluvial fans, respectively. The different disrupted basins are labelled as Ep for the Episcopio area and Lav for Lavorate one.

Figure 43 – Distribution of debris flows in the Sarno-Episcopio area (Source: Zanchetta 2004, p. 378, fig. 1).



Figure 44 – One of the areas where the 1999 landslide originated, in the modern town of Cervinara. Note the path of the flow and the mix of volcanoclastic debris (grey) and limestone clasts (white) (Source: Fiorillo 2001, p. 176, fig. 13).



Figure 45 – The effects of the 1999 landslide in Ioffredo, the topmost neighbourhood (at the apex of a vent) in the town of Cervinara (Source: Fiorillo 2001, p. 177, fig. 17).

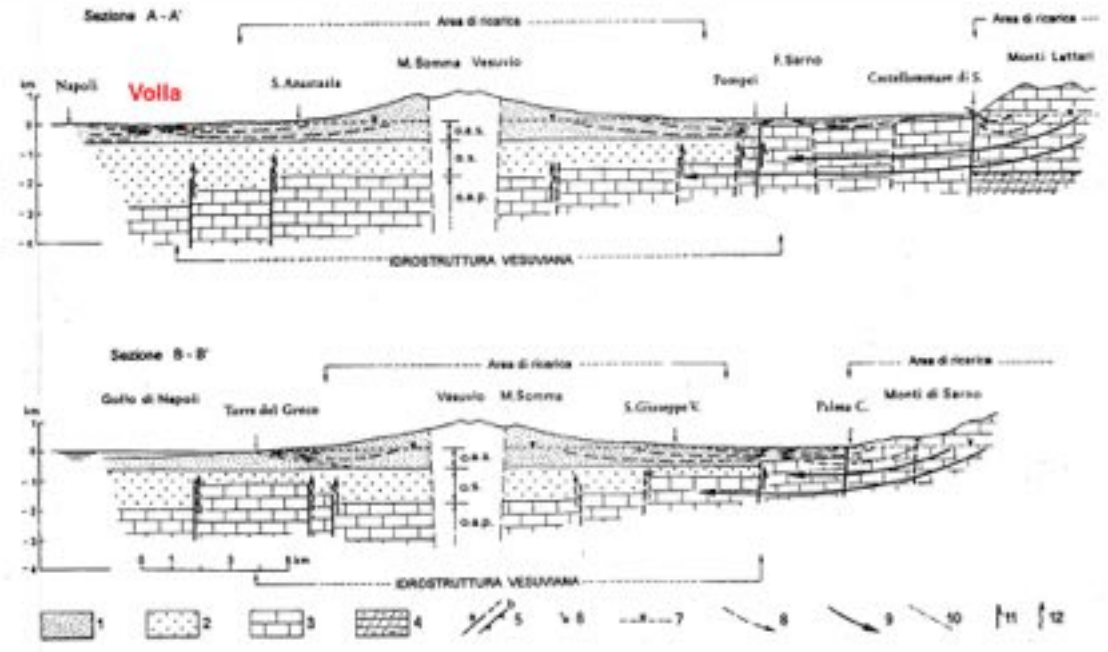


Fig. 5 - Sezioni idrogeologiche schematiche: 1) Prodotti eruttivi, depositi marini, detritici e depositi alluvionali del Quaternario (o.a.s.: orizzonte acquifero superficiale). 2) Depositi argillosi marini, prodotti eruttivi, depositi clastici e terrigeni del Quaternario-Miocene (o.s.: orizzonte semipermeabile). 3) Rocce carbonatiche del Mesozoico (o.a.p.: orizzonte acquifero profondo). 4) Rocce calcareo-silico-marnose delle «Unità Lagonegresi» (orizzonte complessivamente impermeabile). 5) Principali discontinuità tettoniche: a) principali faglie dirette; b) sovrascorrimento. 6) Sorgenti. 7) Livello piezometrico. 8) Circuiti idrici sotterranei superficiali. 9) Circuiti idrici sotterranei profondi. 10) Interfaccia acqua dolce-acqua salata. 11) Risalite particolarmente concentrate di fluidi profondi. 12) Risalite di fluidi profondi.

Figure 46 – Schematic sections of hydrological features of Vesuvius (Source: Celico 1998, p. 9, fig. 5).

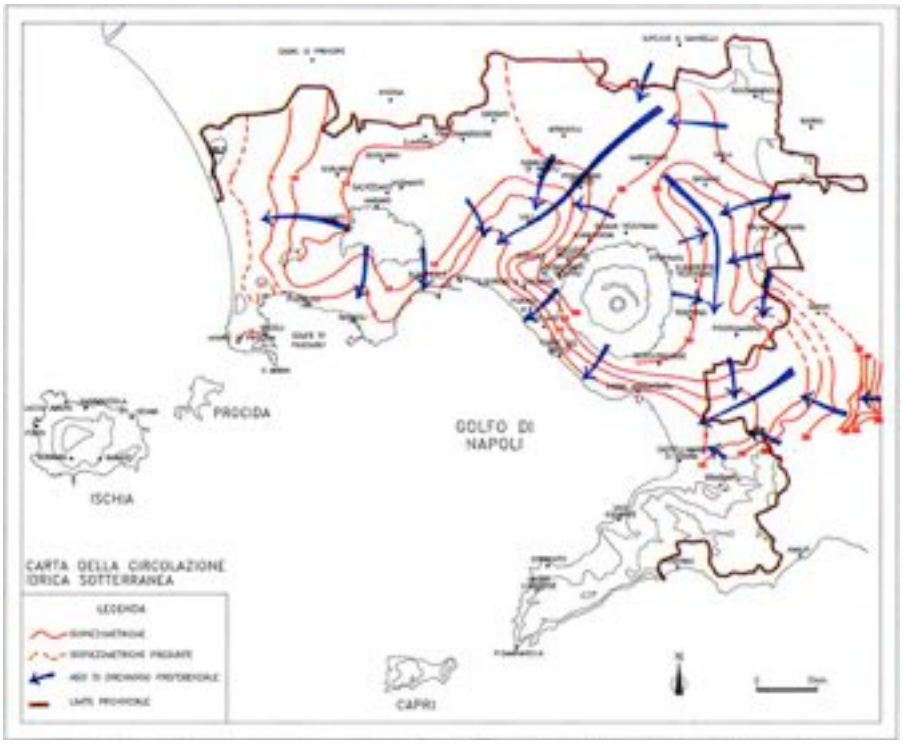


Figure 47 – Map of subterranean water circulation of the Campanian plain (Source: De Fusco 1993).

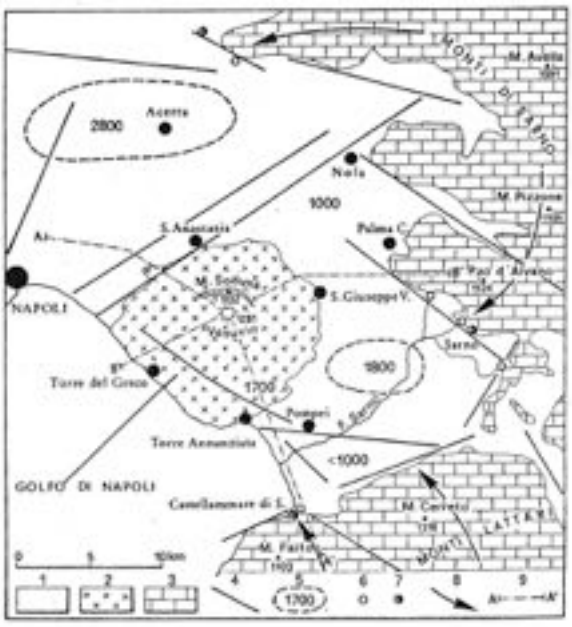


Fig. 1 - Schema strutturale e idrogeologico del settore meridionale della Piana Campana (da La Torre et alii, 1982 e da Celico, 1978; modificato): 1) Prodotti piroclastici e depositi alluvionali (Quaternario); permeabilità media, per porosità. 2) Lave e piroclastiti del Somma-Vesuvio (Quaternario); permeabilità da media ad elevata, per fessurazione e porosità. 3) Rocce carbonatiche mesozoiche; permeabilità elevata, per fratturazione e carsismo. 4) Faglie del substrato mesozoico profondo. 5) Zone depresse del substrato mesozoico e relativa profondità, in metri al di sotto del l.m. 6) Principali sorgenti (portata 0.5-3.0 m³/s). 7) Sorgenti minerali (salinità totale >1000 ppm). 8) Principali direzioni del flusso idrico sotterraneo negli acquiferi carbonatici. 9) Traccia di sezione (cfr. fig. 5).

Figure 48 – Scheme of the bedrock structure of the Campanian plain. The lines represent the faults, the dashed lines the depressions (Source: Celico 1998, p. 5, fig. 1).

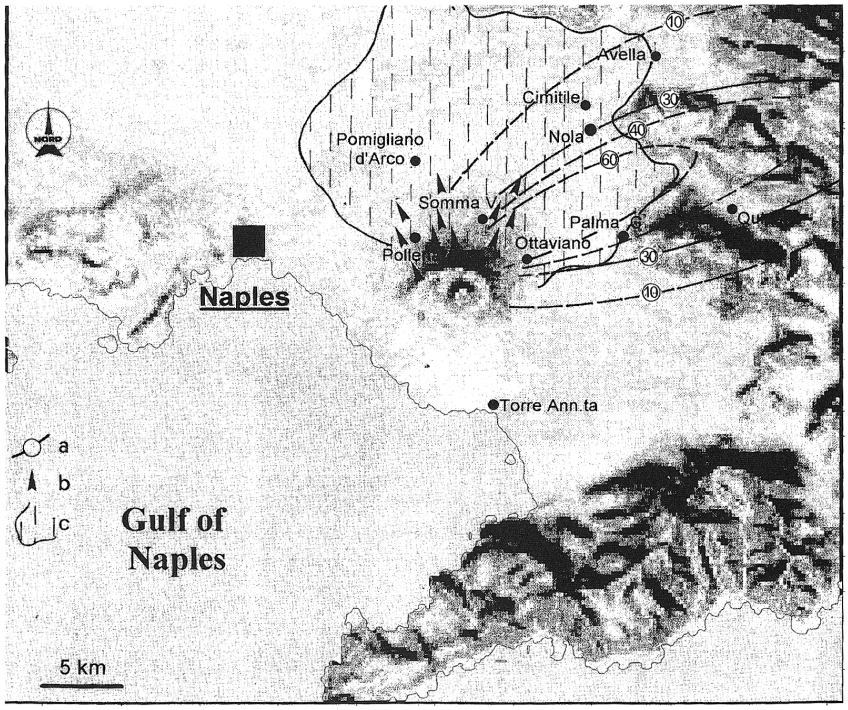


Fig. 2 - Mappa delle isopache dei depositi da *fall* (spessori in cm) e delle alluvioni dell'eruzione di Pollena.

Figure 49 – Map of the isopachs of the airfall deposits and flooded area pertaining to the AD 472 eruption (Source: Albore Livadie 1998, p. 42, fig. 2).

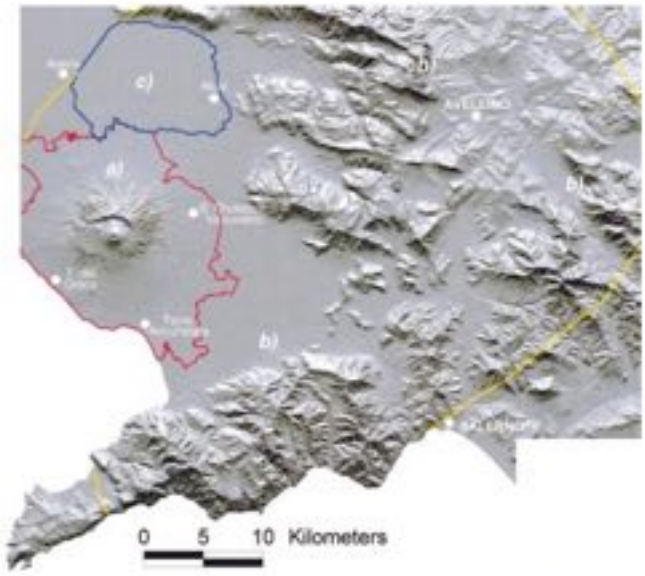


Figure 4. Hazard volcanic map of the Vesuvian area: (a) area exposed to proximal phenomena; the boundaries are those of the 19 municipalities around the cone, (b) area exposed to fallout (and lahars), the boundary defines the area of improbability 5% of having tephra blankets heavier than 200 Kg/m^2, (c) area exposed to floods (and fallout) (after Barberi *et al.*, 1992; Santacroce *et al.*, 1998).

Figure 50 – Hazard volcanic map of the Vesuvian area (Source: Pareschi 2000, fig. 4).



Figure 51 - Sarno, neighbourhood Mura d'Arce: remains of the Roman aqueduct.



Figure 52 - Sarno, neighbourhood Mura d'Arce: remains of the Roman aqueduct.



Figure 53 - Sarno, neighbourhood Mura d'Arce: plan of the aqueduct (Source: Elia 1938: 105, fig.1).



Figure 54 - Nola, via Polveriera: part of a Roman column buried by scoria fall (AL) and debris flow (R4) deposits (Source Mastrolorenzo 2002: 31, fig.6j).

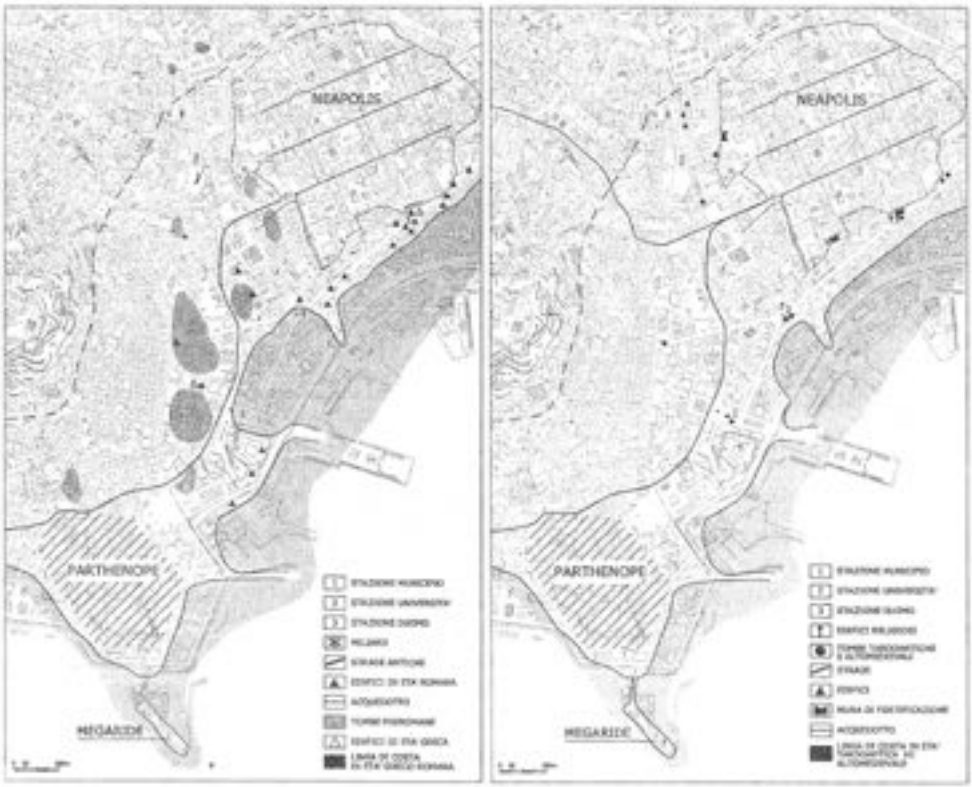


Fig. 2. Ricostruzione della linea di costa fra *Parthenope* e *Neapolis* in età ellenistico-romana con localizzazione delle aree di scavo delle stazioni e indicazione dei principali rinvenimenti.

Fig. 3. Ricostruzione della linea di costa fra *Parthenope* e *Neapolis* in età tardoantica e altomedievale con localizzazione delle aree di scavo delle stazioni e indicazione dei principali rinvenimenti.

Figure 55 – Reconstructive maps of the coastline between Parthenope and Neapolis in Hellenistic-Roman (left) and late antique-early medieval (right) periods (Source: Giampaola 2005, p. 222, 227, figs. 2-3).



Fig. 7 - Sequenza eruttiva del Somma-Vesuvio e i due cunicoli dell'acquedotto in loc. La Vigna.

Figure 56 – San Paolo Belsito, loc. La Vigna: the two aqueducts of Serino (Source: Albore Livadie 1998, p. 50, fig. 7).

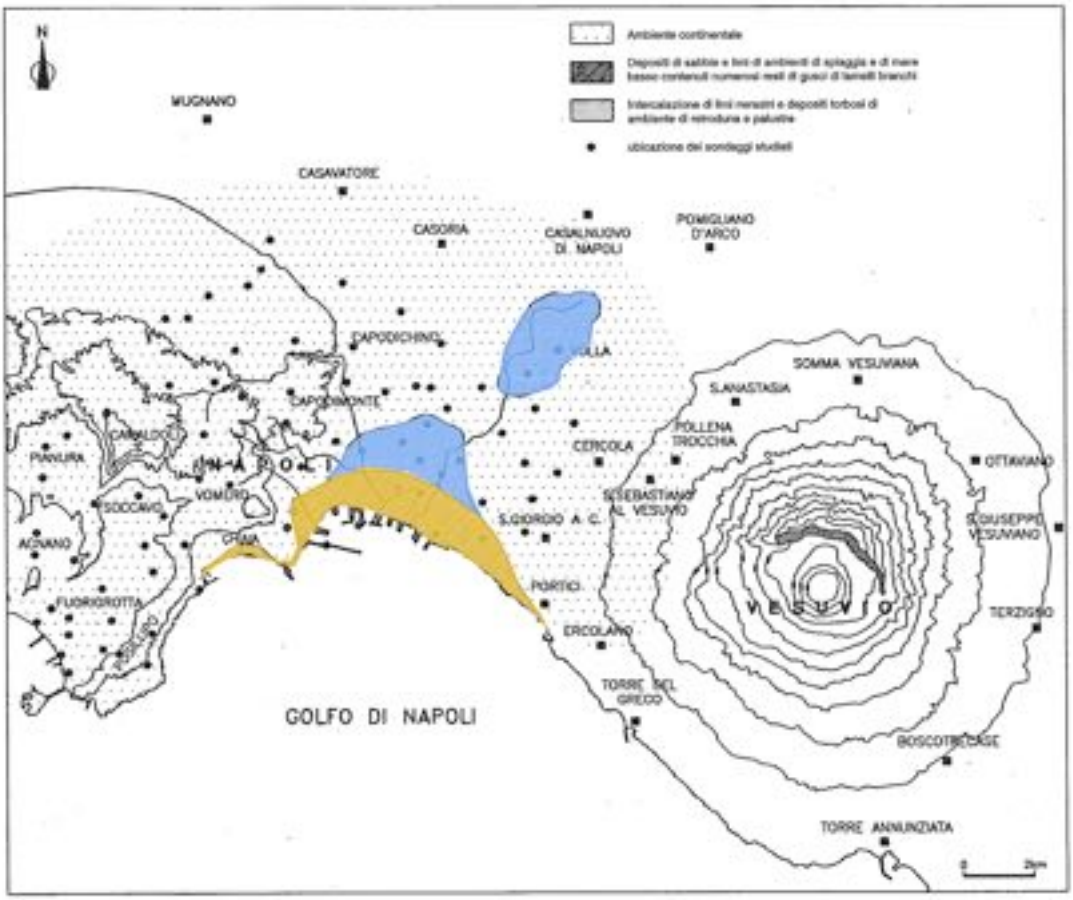


Figure 57 - Neapolitan countryside; yellow: beach, blue: lagoon/marshes (Di Vito 1999).

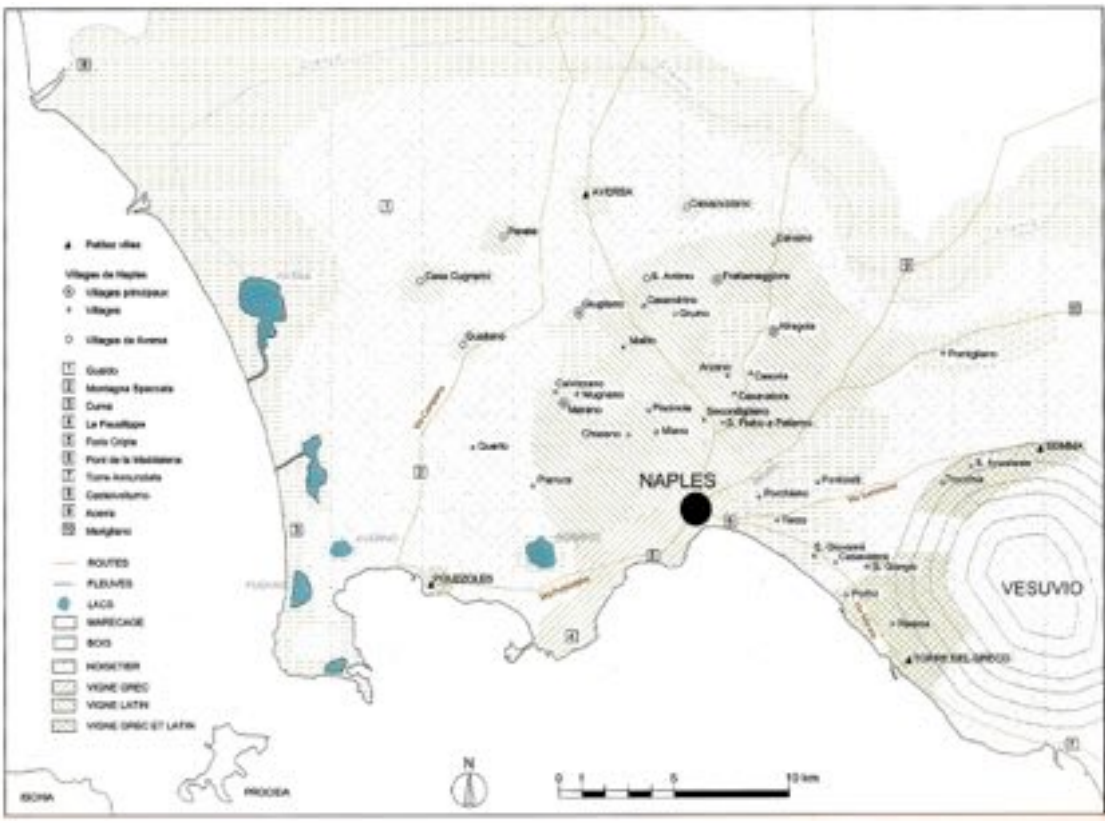


Figure 58 – The Neapolitan landscape in 14th-15th centuries (Source: Feniello 2005, tab.1).

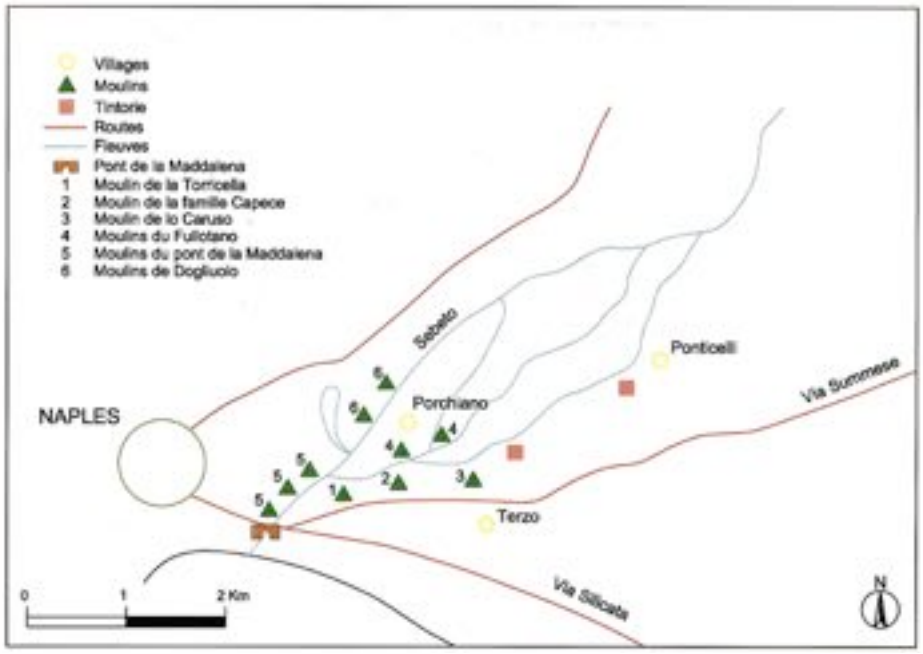


Figure 59 – Map of mills and dyeing plants in 14th-15th centuries (Source: Feniello 2005, tab. 4).

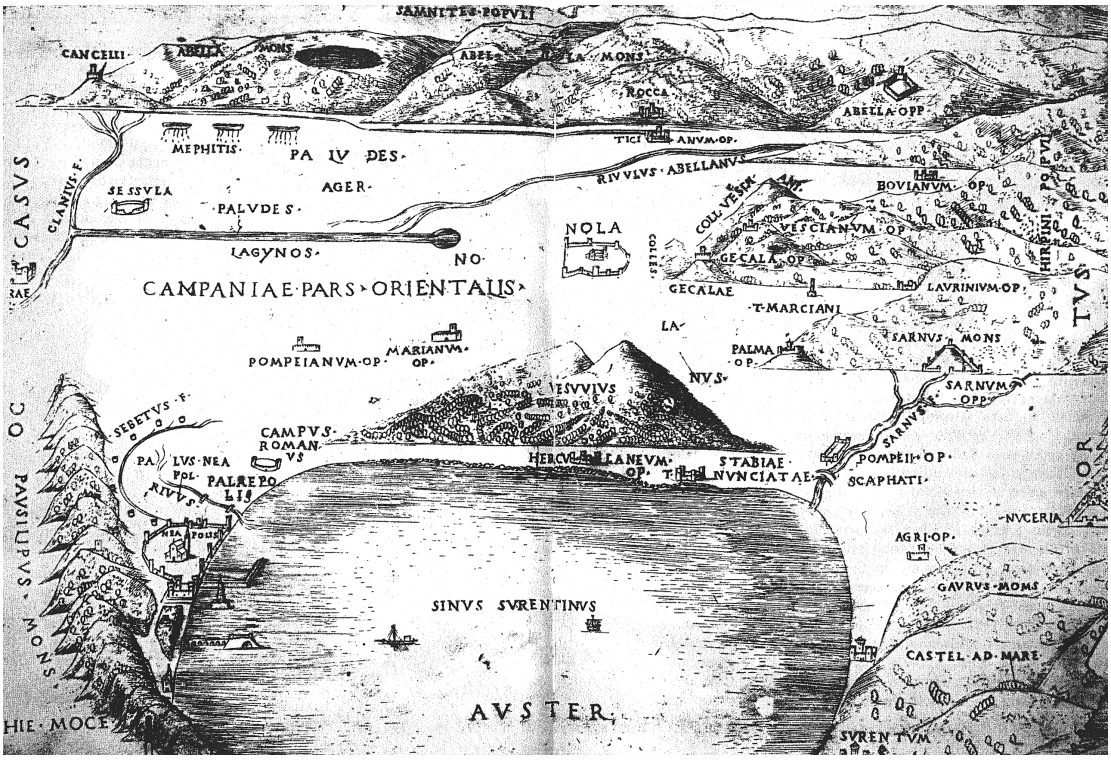


Figure 60 – Map by Ambrogio Leone of the Ager Nolanus, end of the 15th century (Leone 1735).



Figure 61 – M. Cartaro, Regy Lagni (1616 ca.).

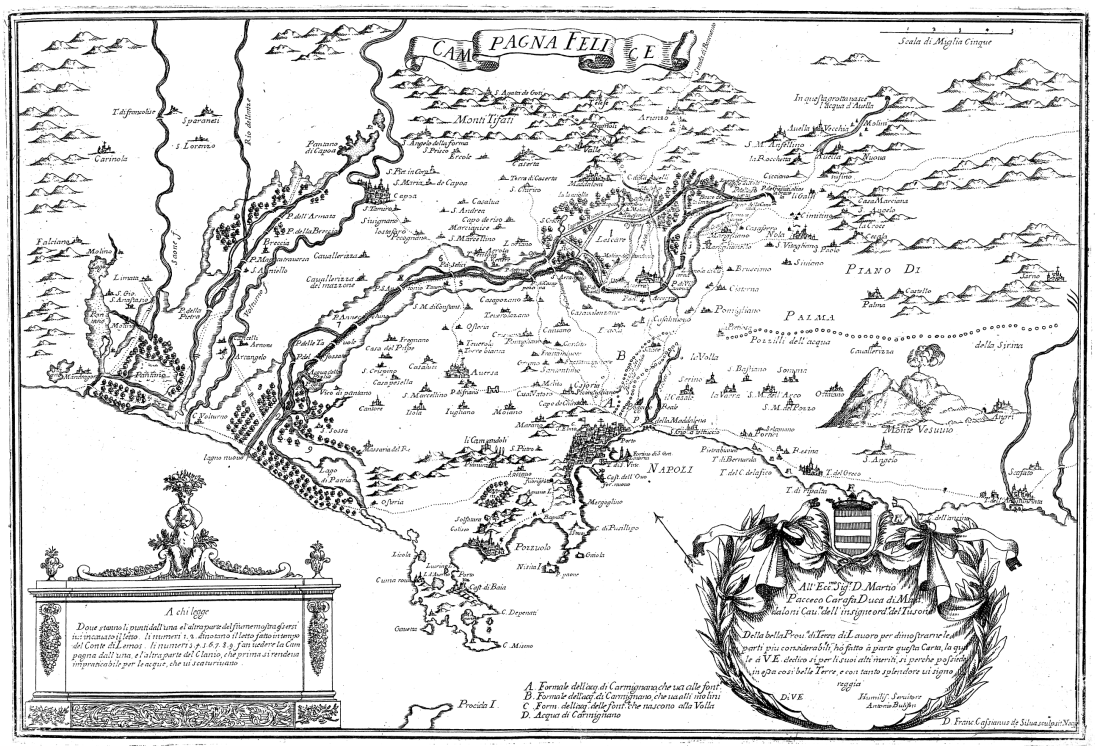


Figure 62 – De Silva – Bulifon, Campagna Felice, 1692.



Figure 63 – Scipione Compagno, Eruzione del Vesuvio, ca. 1631.

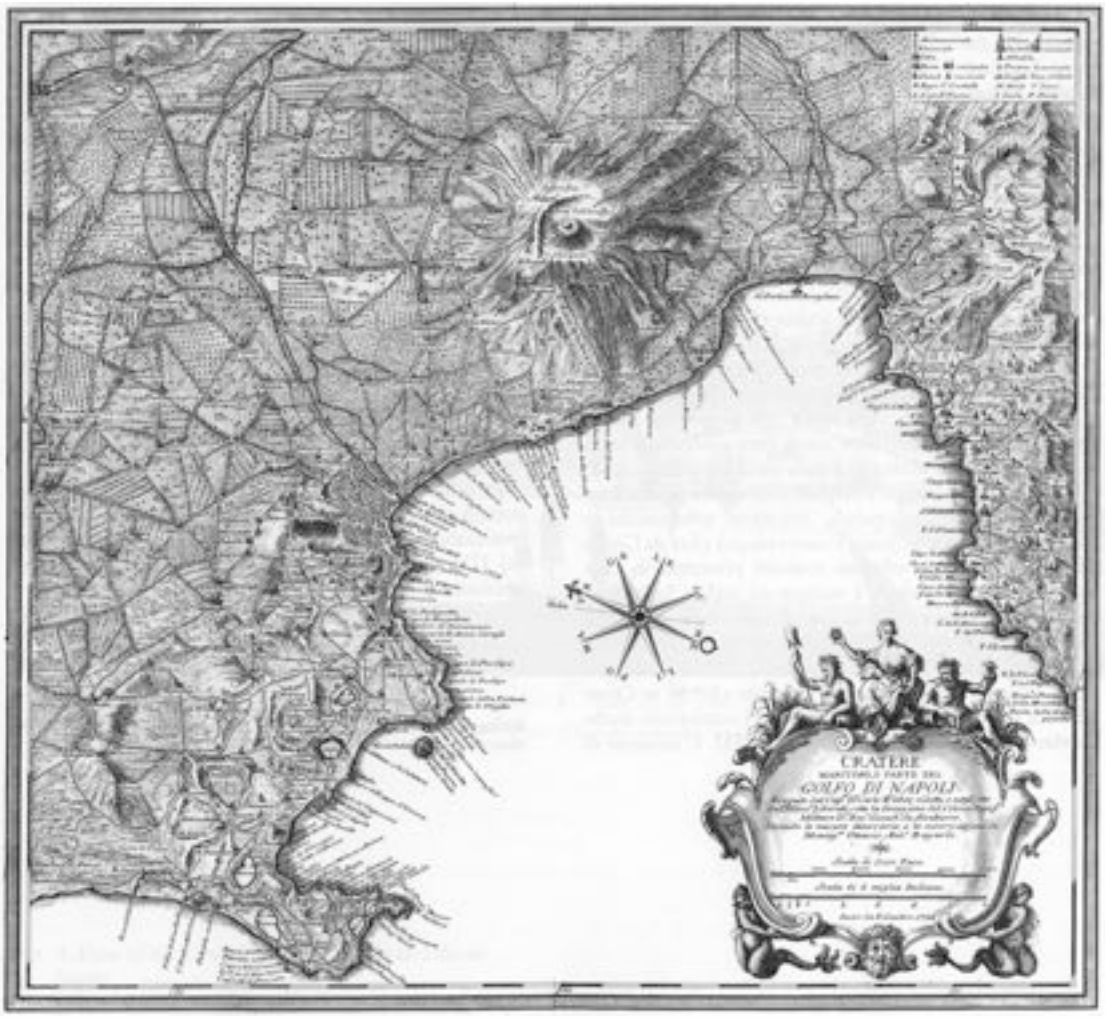


Figure 64 – Karl Weber, Cratere Marittimo (1754).



Figure 65 – D. Barra, Il borgo di Loreto con il Vesuvio in eruzione.



Figure 66 – G.A. Rizzi Zannoni, Topografia dell'Agro Napoletano, 1793.



Figure 67 – Officio Topografico del Regno di Napoli, detail of the map of Napoli (1836-40).

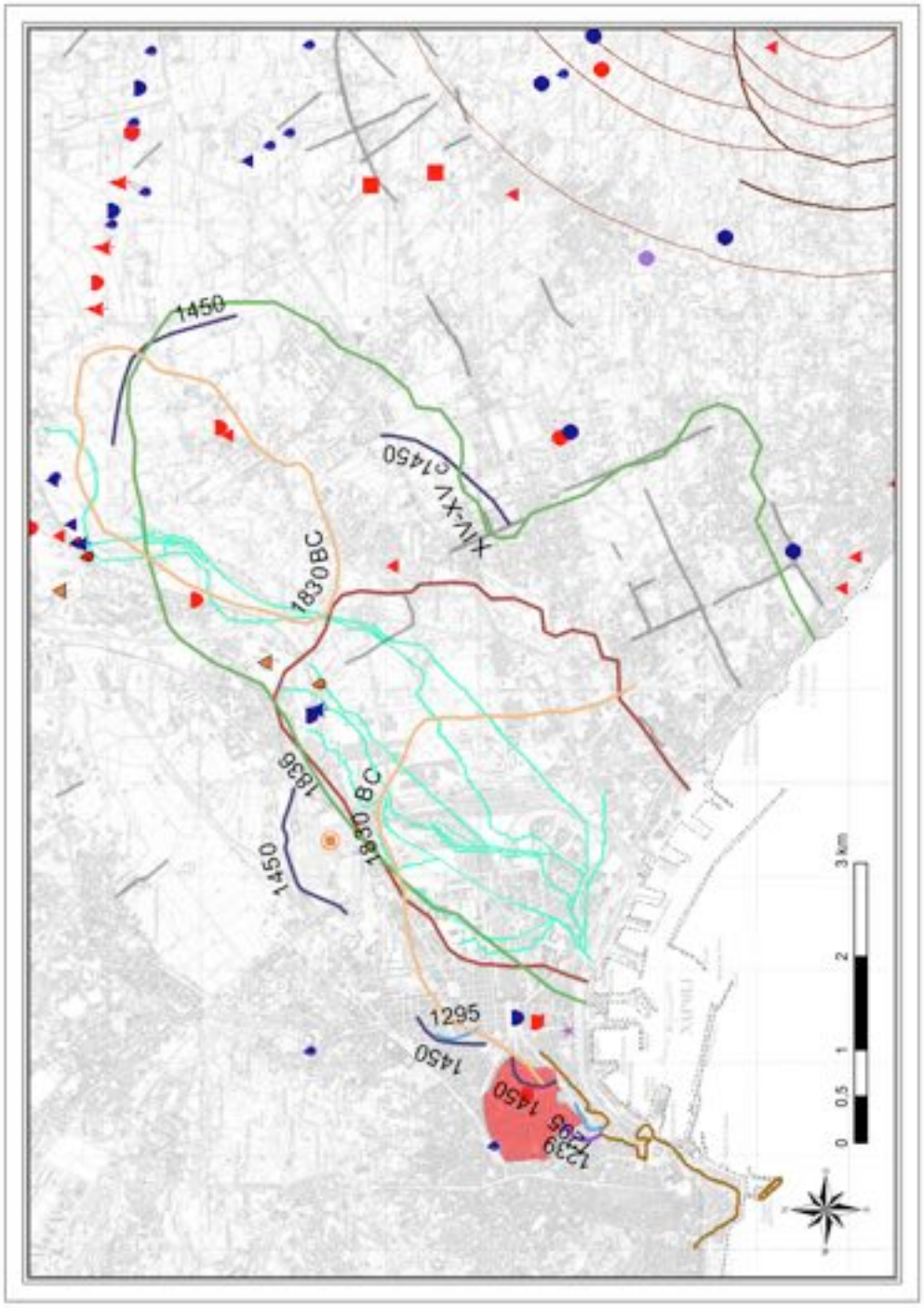
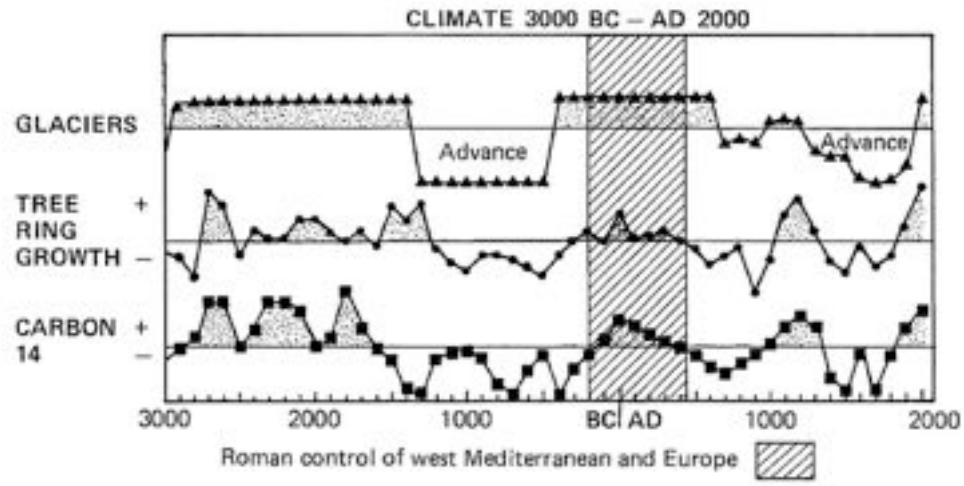


Figure 68 – Map of Sebethus' marshes with their limits at various dates. Red: Neapolis in the Classical age; dotted line: the present coastline; purple: Classical shore according to Giampaola 2005b. Sources: rivers and 1836: Officio Topografico del Regno di Napoli 1836 (here, Fig. 56); 1239, 1295, 1450: documentary sources; 1830 BC: Di Vito 1999; XIV-XV c.: Feniello 2005. Note the presence of archaeological sites in areas later covered by the marshes.



30. Indicators of world climate over the last 5000 years place the Roman empire into an interesting context. The growth rate of Bristlecone Pines in California matches the phases of expansion and contraction of north American and European glaciers with some precision, whilst the fluctuating levels of carbon 14 in the atmosphere are a reflection of solar radiation. The well-documented medieval warm period and the rapid warming of the last few centuries show up clearly on all three graphs; there was evidently a similar warm phase between 200 BC and AD 400, which coincides neatly with the period of the Roman empire in the west. (Audio-Visual Centre, University of Newcastle; based on data published by Denton and Karlen 1973, La Marche 1974 and Eddy 1981)

Figure 69 - Source: Greene 1986, p.83, fig. 30.

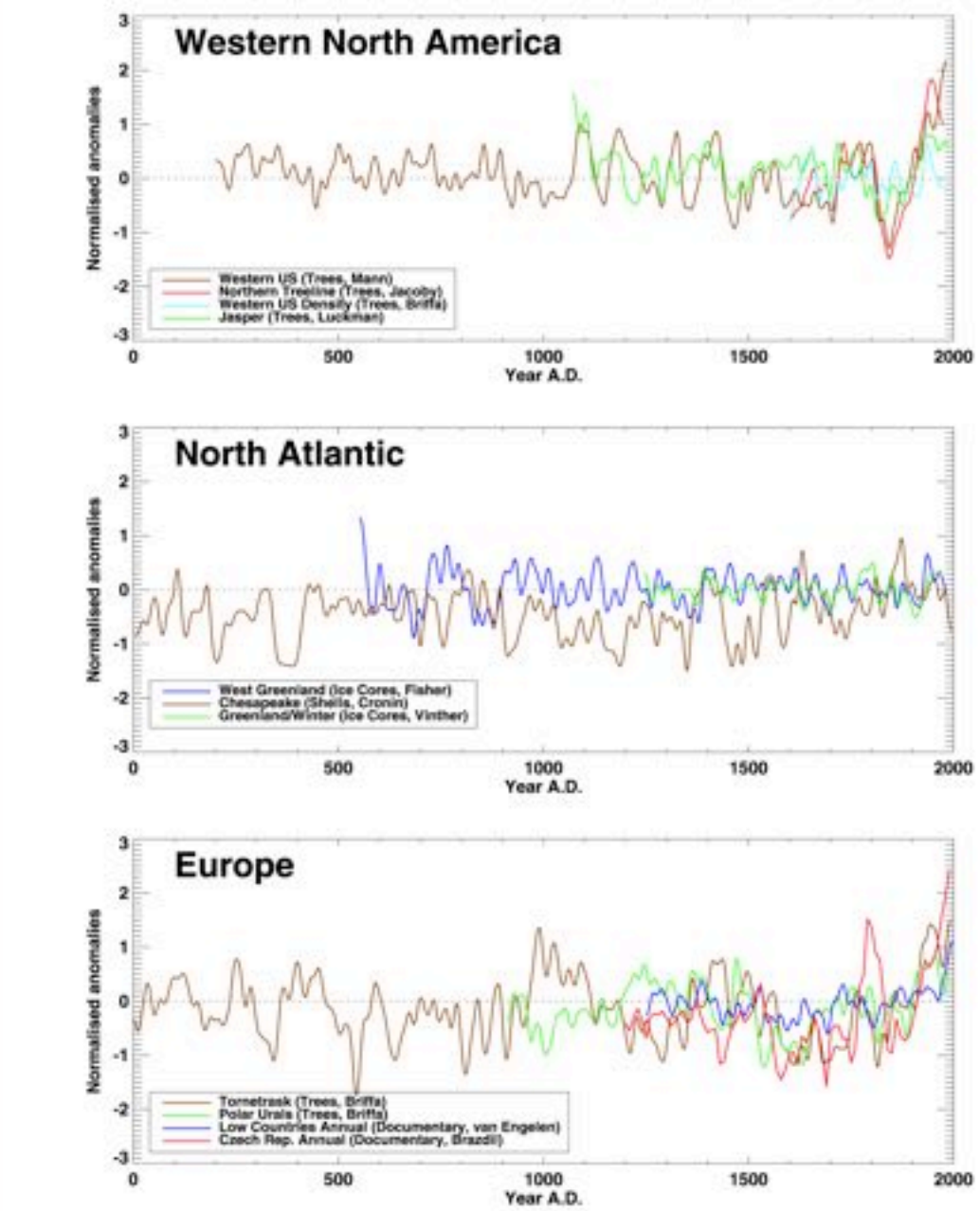


Figure 4. Local and regional proxy temperature reconstructions by continent. Source references for all series are given in Table 1. Each series has been normalized over the period 1751–1950 and then smoothed with a 50-year Gaussian filter. For the decadally resolved data the normalization period is the 20 decades from 1750 to 1949, smoothed using a 5-decade filter.

Figure 70 – Local and regional proxy temperature reconstructions by continent (Source: Jones and Mann 2004 fig.4 p.13).

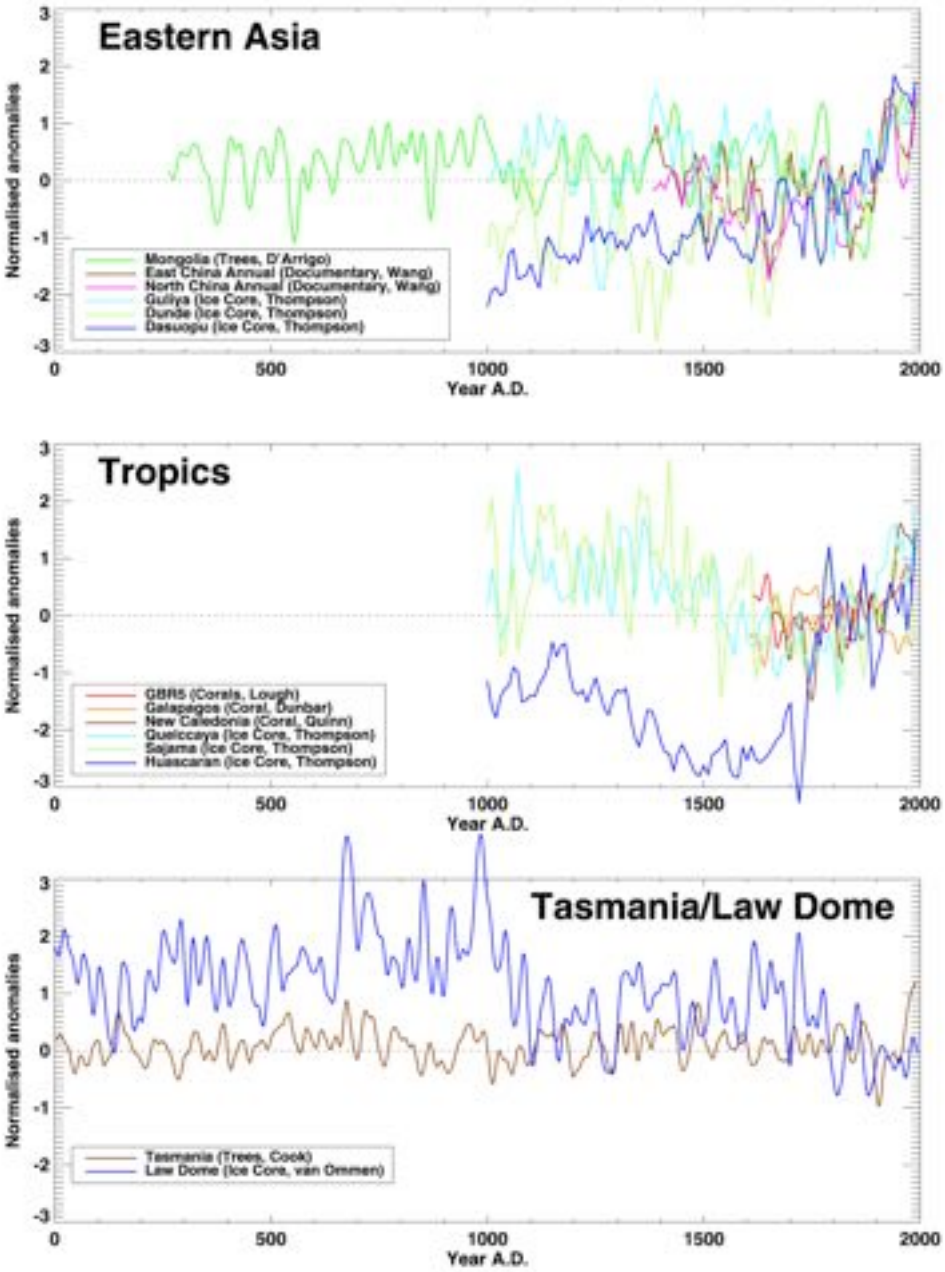


Figure 4. (continued)

Figure 71 – Local and regional proxy temperature reconstructions by continent (Source: Jones and Mann 2004, fig.4 pag.13).

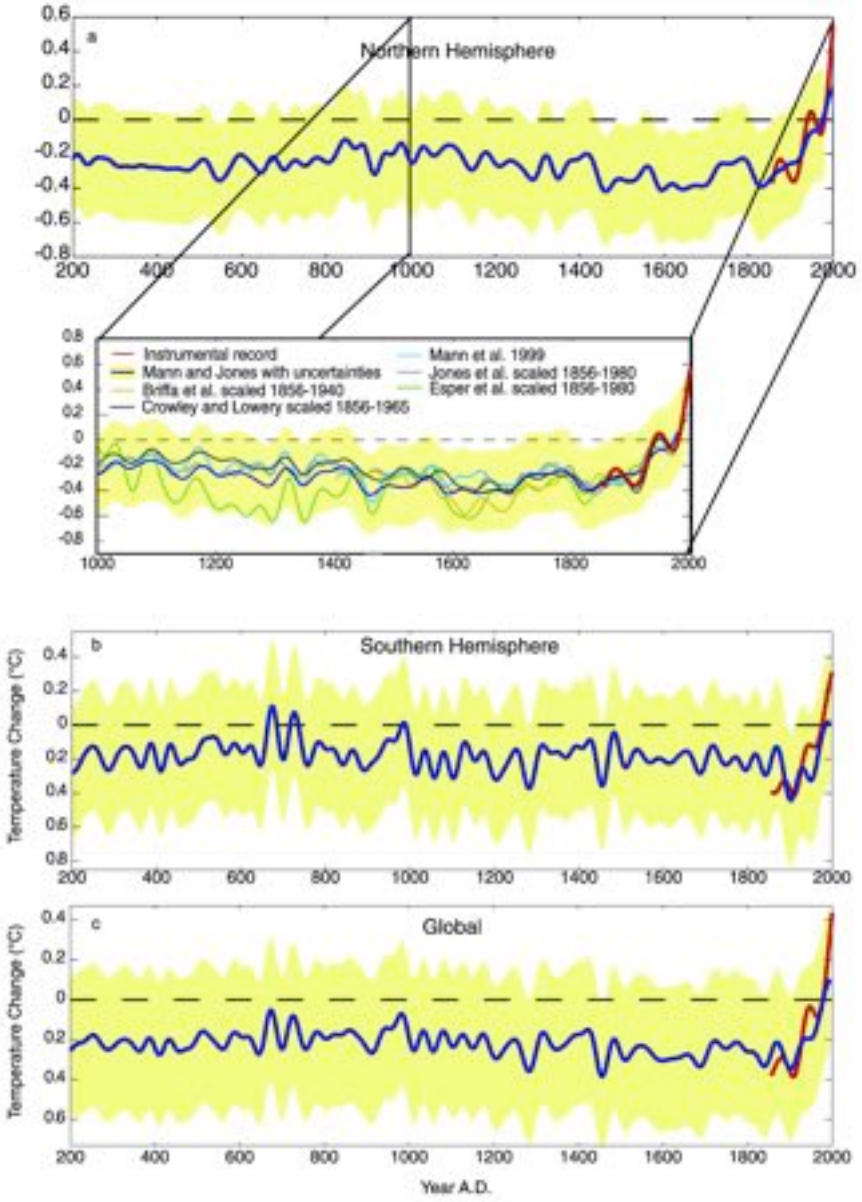


Figure 5

Figure 5. Reconstructions of (a) Northern Hemisphere (NH), (b) Southern Hemisphere (SH), and (c) global mean (GLB) annual temperatures over the past one to two millennia. The expansion in Figure 5a compares a number of different NH estimates over the past 1000 years, while the main plot shows the proxy reconstructions back to A.D. 200 of *Mann and Jones* [2003], updated through 1995 as described in the text. Smoothed (40-year low-passed) versions of these series are shown to highlight the low-frequency variations. We avoid an ad hoc smoothing approach [e.g., *Soon et al.*, 2004] by employing, as in the work of *Mann and Jones* [2003], objectively determined boundary constraints. We make use in each case of the boundary constraint among the three lowest-order constraints [*Park*, 1992] that minimizes the mean square error between the smoothed and raw data [see *Ghil et al.*, 2002; *Mann*, 2004]. The instrumental NH [*Jones et al.*, 1999], SH, and GLB series (red) through A.D. 2003, smoothed in this manner, are shown for comparison. Shown also (yellow shading) is the 95% confidence interval in the reconstruction (i.e., the positive and negative 2 standard error limits of the smoothed reconstructions). The various other (smoothed) NH reconstructions shown in the enlargement to Figure 5a have been scaled by linear regression against the smoothed instrumental NH series over the common interval 1856–1980, with the exception of the "Briffa et al." series, which has been scaled over the shorter 1856–1940 interval owing to a decline in temperature response in the underlying data discussed elsewhere [*Briffa et al.*, 1998a]. The *Crowley and Lowery* [2000] series shown here replaces an incorrect version of the series shown in similar previous comparisons [e.g., *Mann et al.*, 2003a].

Figure 72 – Reconstruction of annual temperatures (Source: Jones and Mann 2004 fig.5 pag. 16).

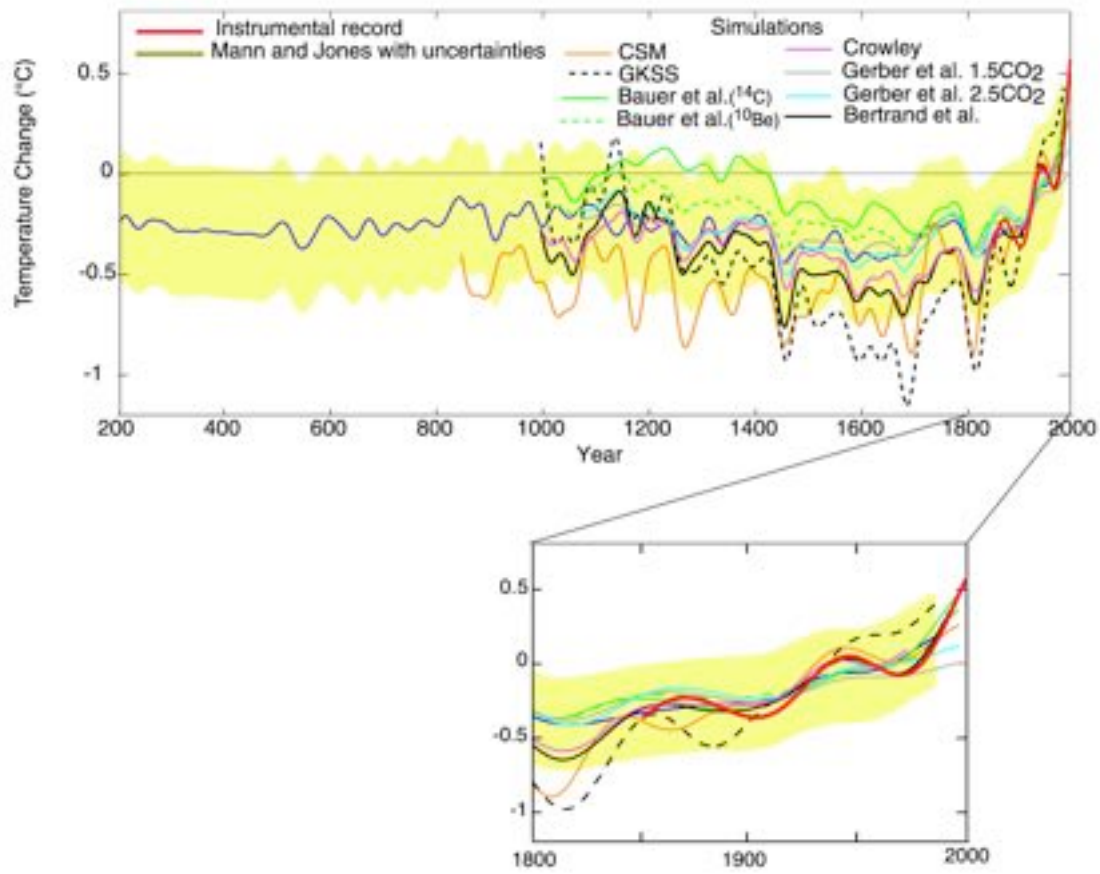


Figure 8. Model-based estimates of NH temperature variations over the past two millennia. Shown are 40-year smoothed series based on the convention used for Figure 5. The simulations are based on varying radiative forcing histories (see Figure 7 and associated discussion), employing a hierarchy of models including one-dimensional energy balance models [*Crowley*, 2000], two-dimensional reduced complexity models [*Bauer et al.*, 2003; *Bertrand et al.*, 2002; *Gerber et al.*, 2003], and full three-dimensional atmosphere-ocean general circulation models (GKSS, Geesthacht, Germany [*Gonzalez-Rouco et al.*, 2003; H. von Storch et al., personal communication, 2003] and Climate System Model (CSM) (C. Ammann et al., personal communication, 2003). Shown for comparison is the instrumental NH record (1856–2003) and the proxy-based estimate of *Mann and Jones* [2003] through 1995 with its 95% confidence interval (see Figure 5). Models have been aligned vertically to have the same mean over the common 1856–1980 period as the instrumental series (which is assigned zero mean during the 1961–1990 reference period). The expansion provides a view of the changes over the past two centuries.

Figure 73 – Temperature variations in the northern hemisphere over the past two millennia (Source: Jones and Mann 2004 fig.8 p.28).

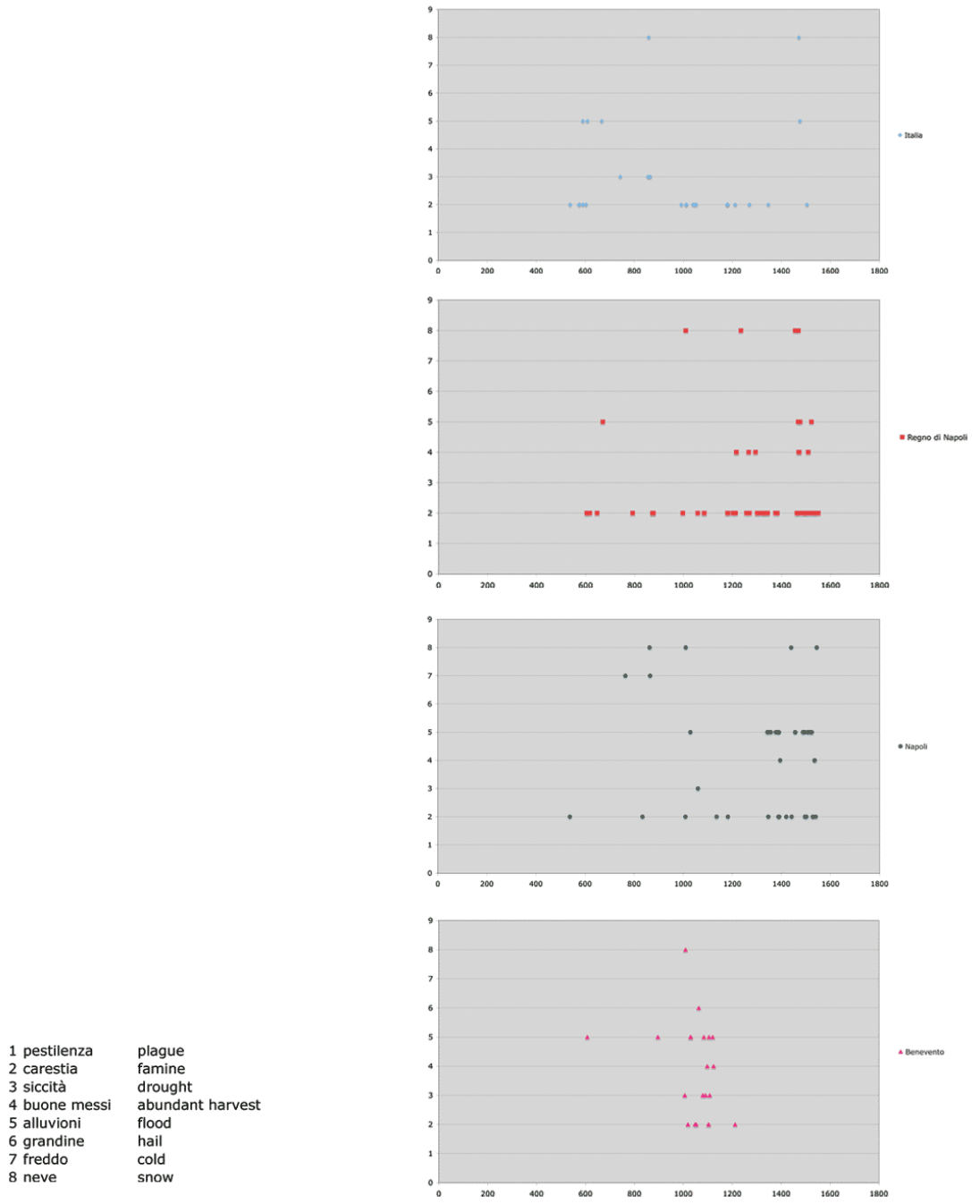


Figure 74 – Graphs of the climate anomalies according to the documentary evidence.

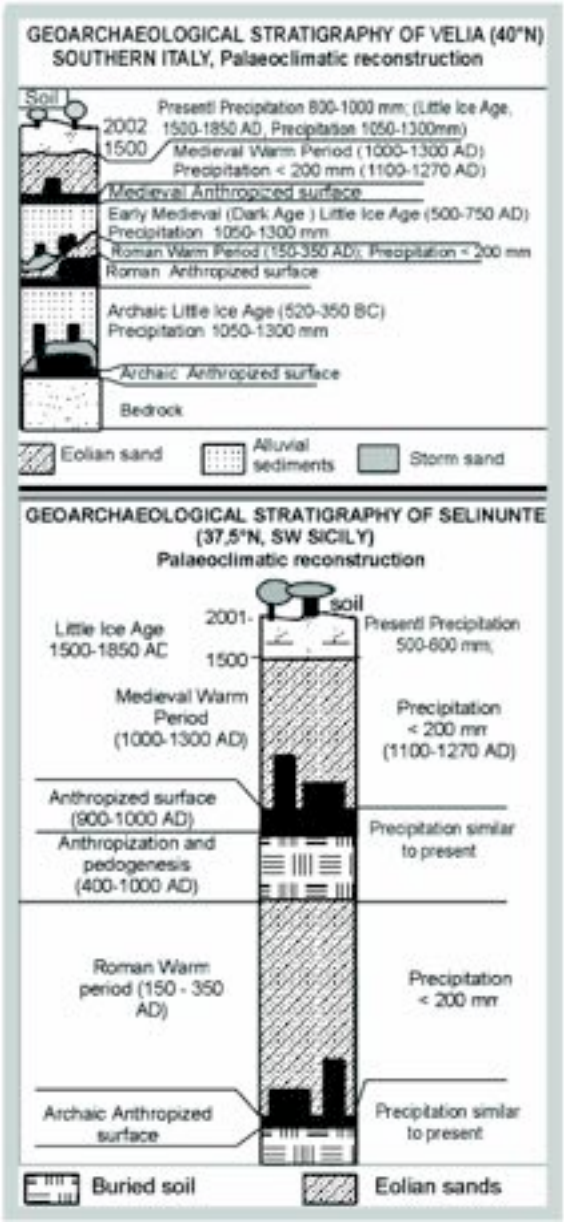


Figure 75 – Stratigraphies of Velia and Selinunte (Source: Ortolani 2001, fig.3, p.4).

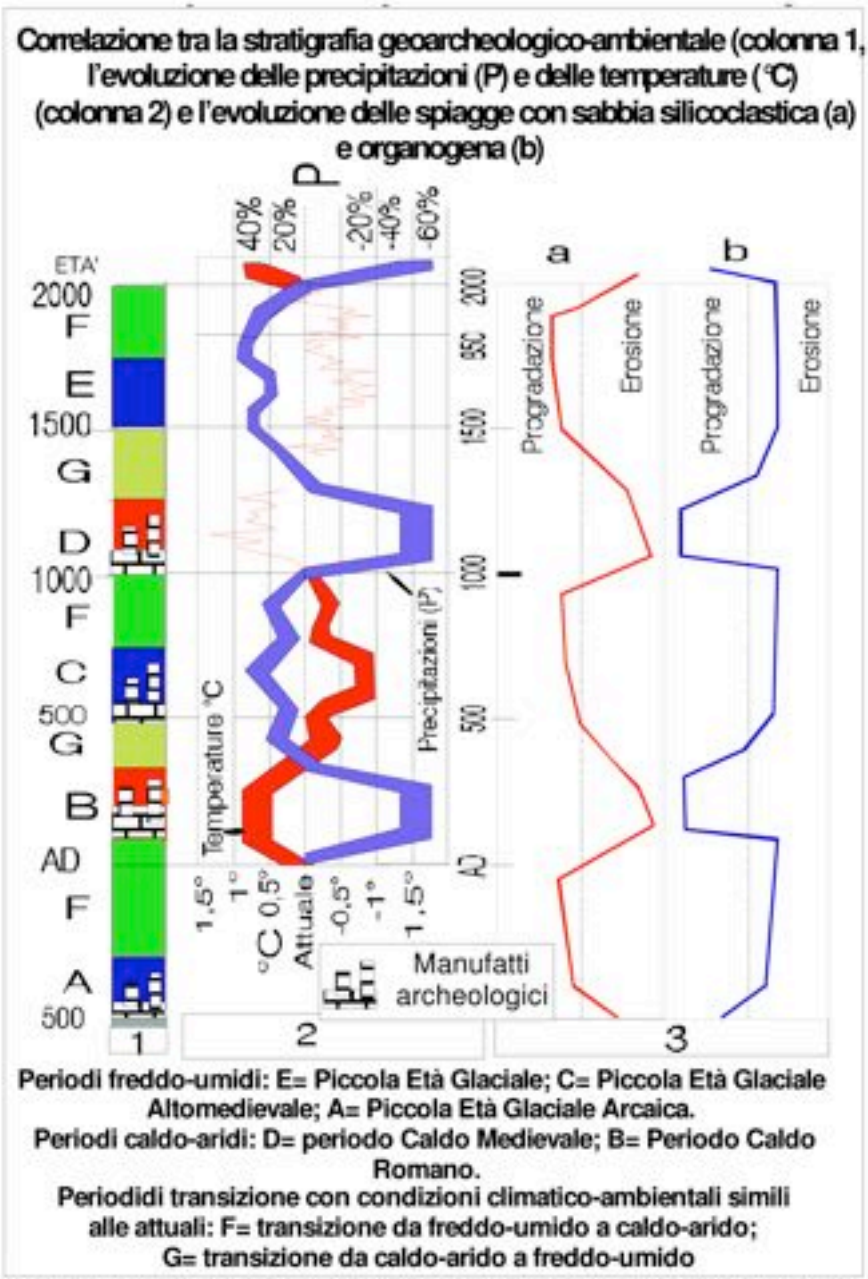


Figura 4: *correlazione tra la stratigrafia geoarcheologico-ambientale (colonna 1), l'evoluzione delle temperature e delle precipitazioni (colonna 2), delle spiagge con sabbia silicoclastica (colonna 3, a) e organogena (colonna 3, b).*

Figure 76 – Correlation between geoarchaeological stratigraphy and temperature/rainfall (Source: Ortolani unpublished).

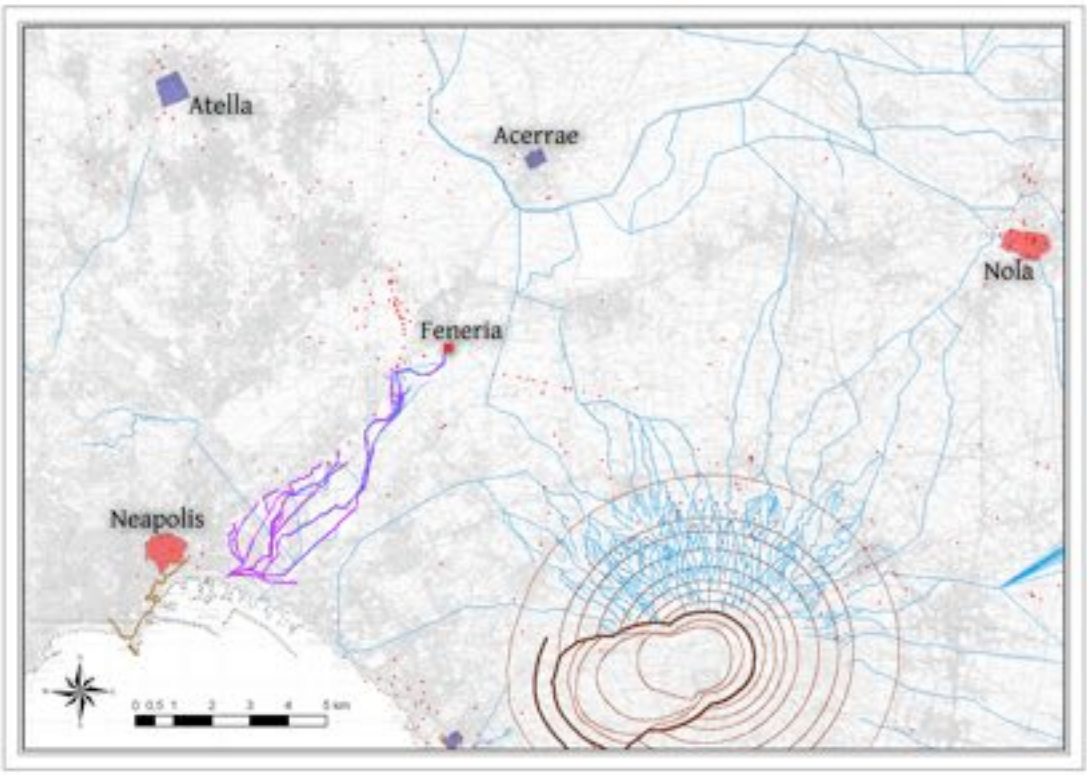


Figure 77 - Localisation of the toponym Feneria.

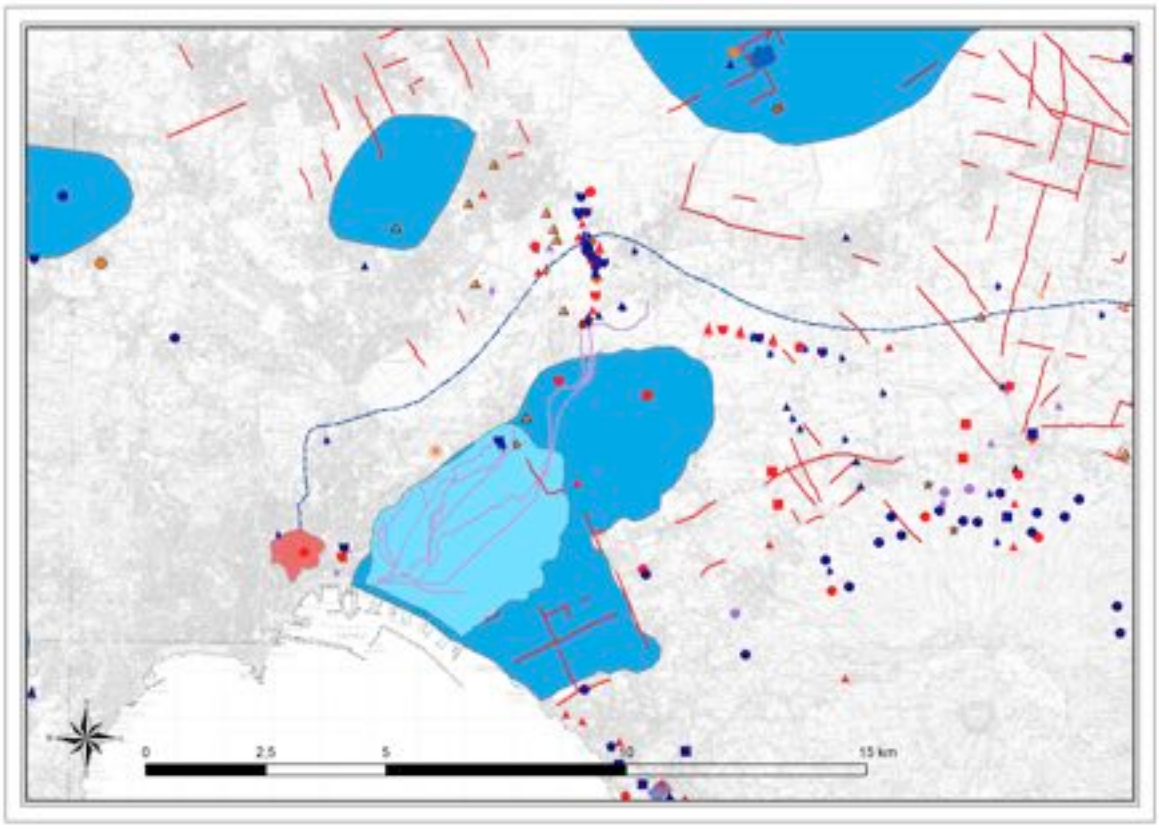


Figure 78 - The countryside of Neapolis, the marshes, and the archaeological sites. Blue: marshes during the 14th-15th centuries; light blue: marshes in 1836; red lines: centuriation grids.

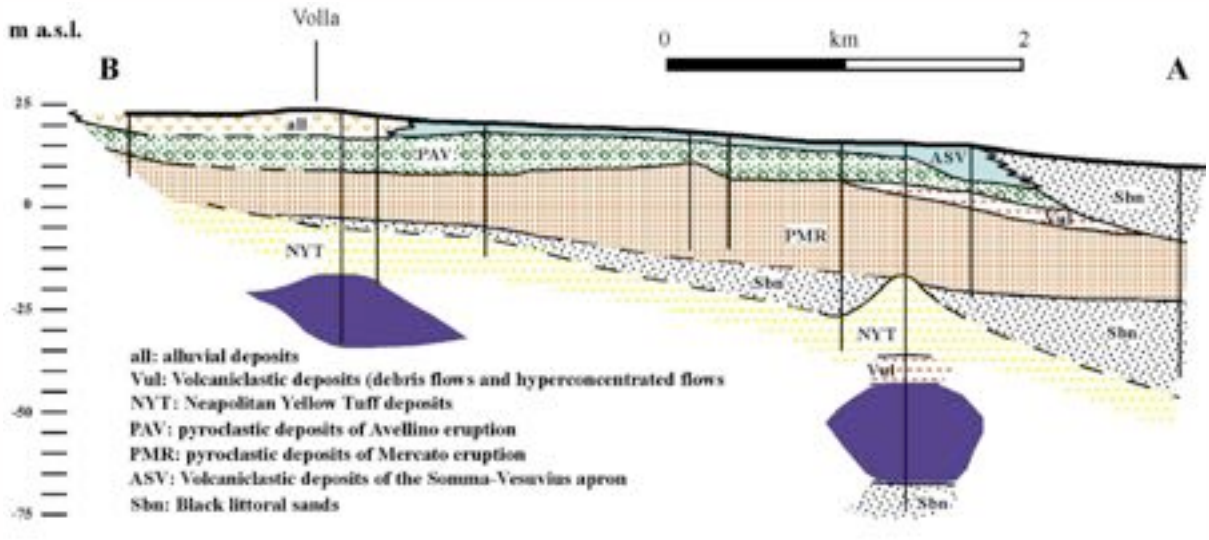


Figure 79 - NE-SW stratigraphic section of the Neapolitan plain (Source: Sulpizio 2005: 6).

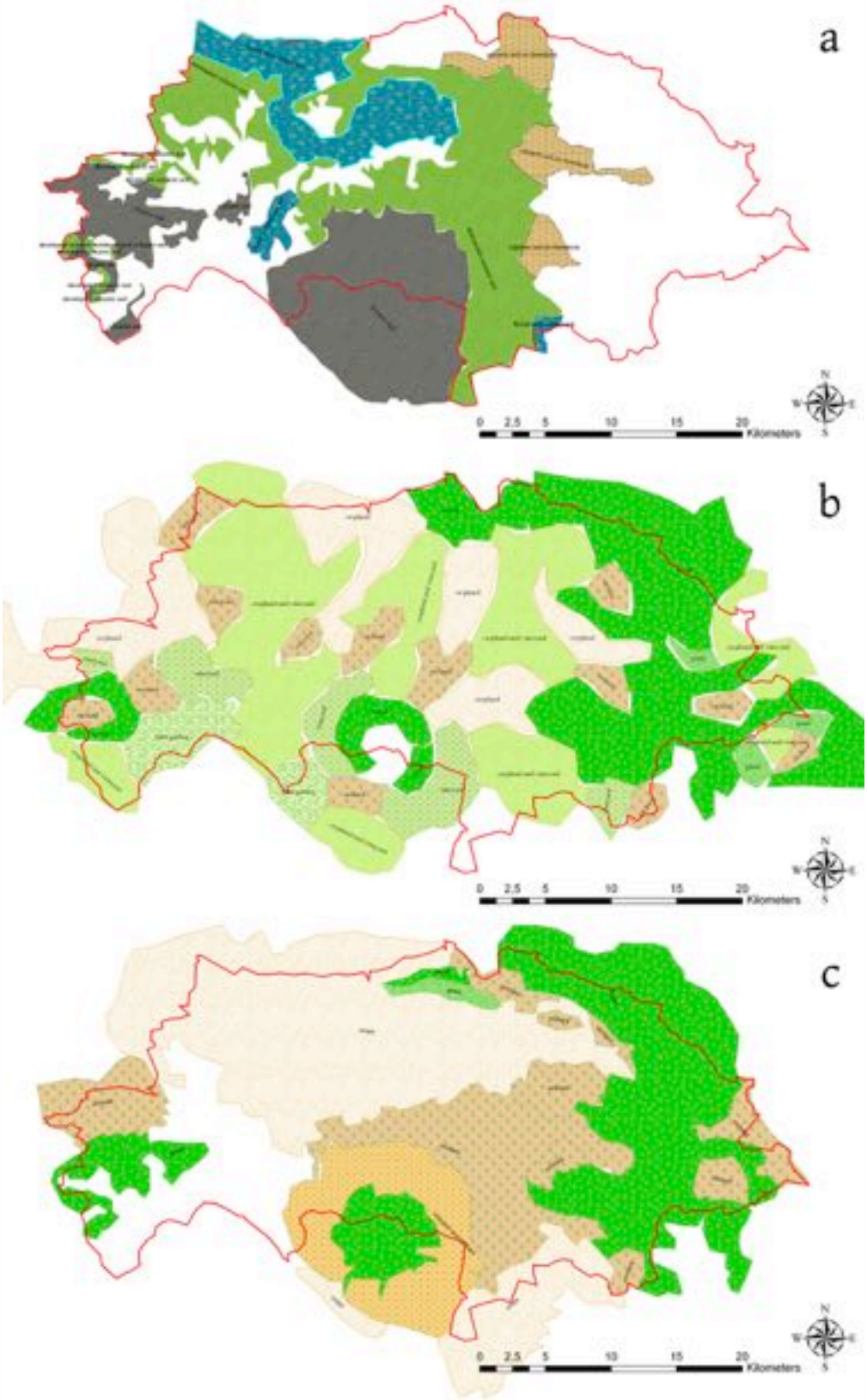


Figure 80 – a: typology of soils (based on Di Gennaro 2002): grey - volcanic soils, green - sedimented volcanic soils, blue - sedimented fluvial soils, orange - volcanic soil on limestone; b: land use in the '60s (based on Antonietti 1961); c: present land use (based on Di Gennaro 1999). Legend for b and c: green - wood, orange - vineyard and orchard, beige - orchard, yellow - crop, light green - cropland and vineyard.

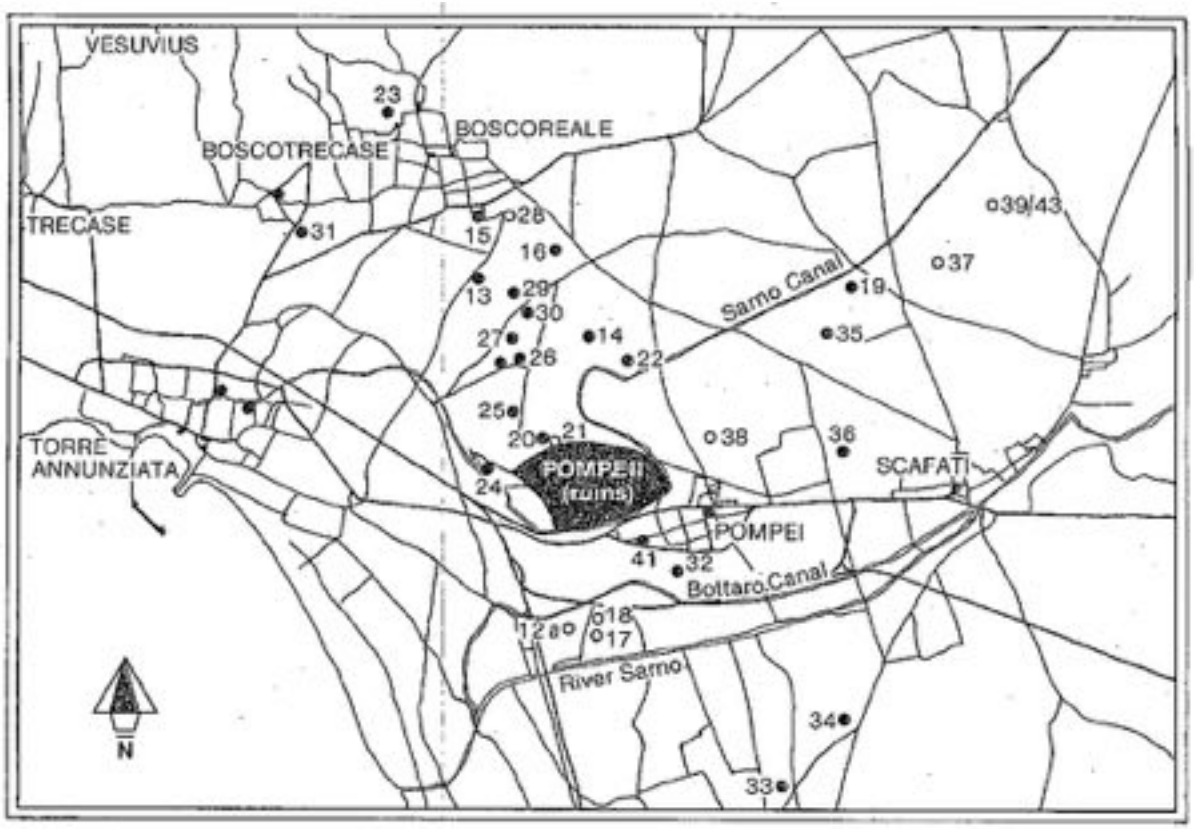


Figure 81 - Archaeological map of the Pompeian countryside according to Jongman (Source: Jongman 1988: 114, fig. V).

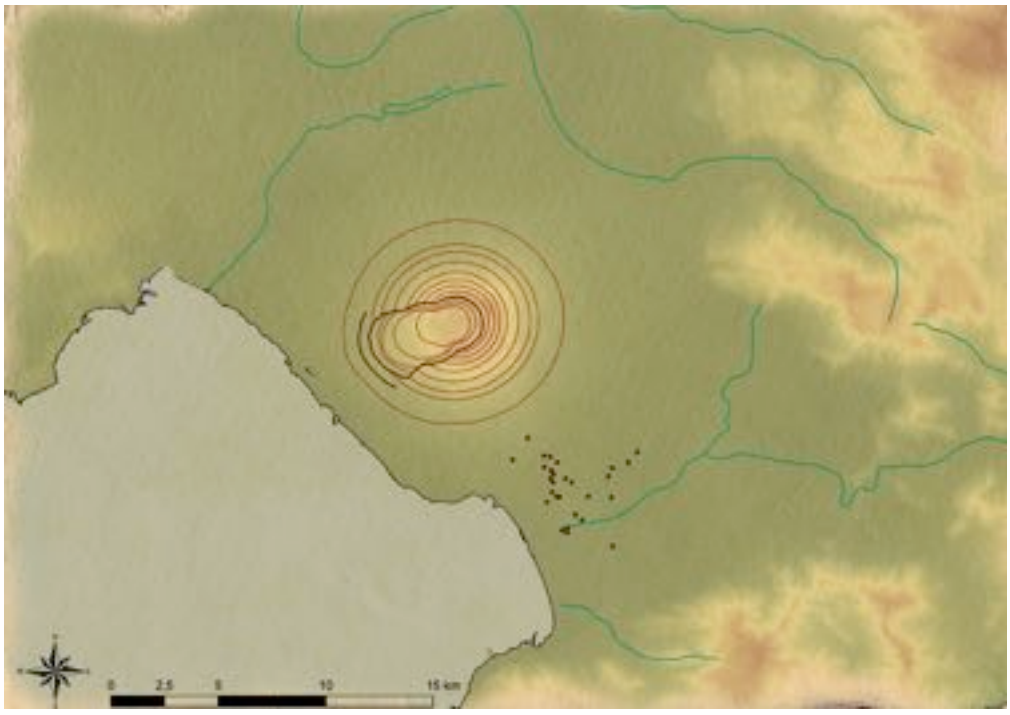


Figure 82 - The evidence used by Jongman in the wider territorial perspective.

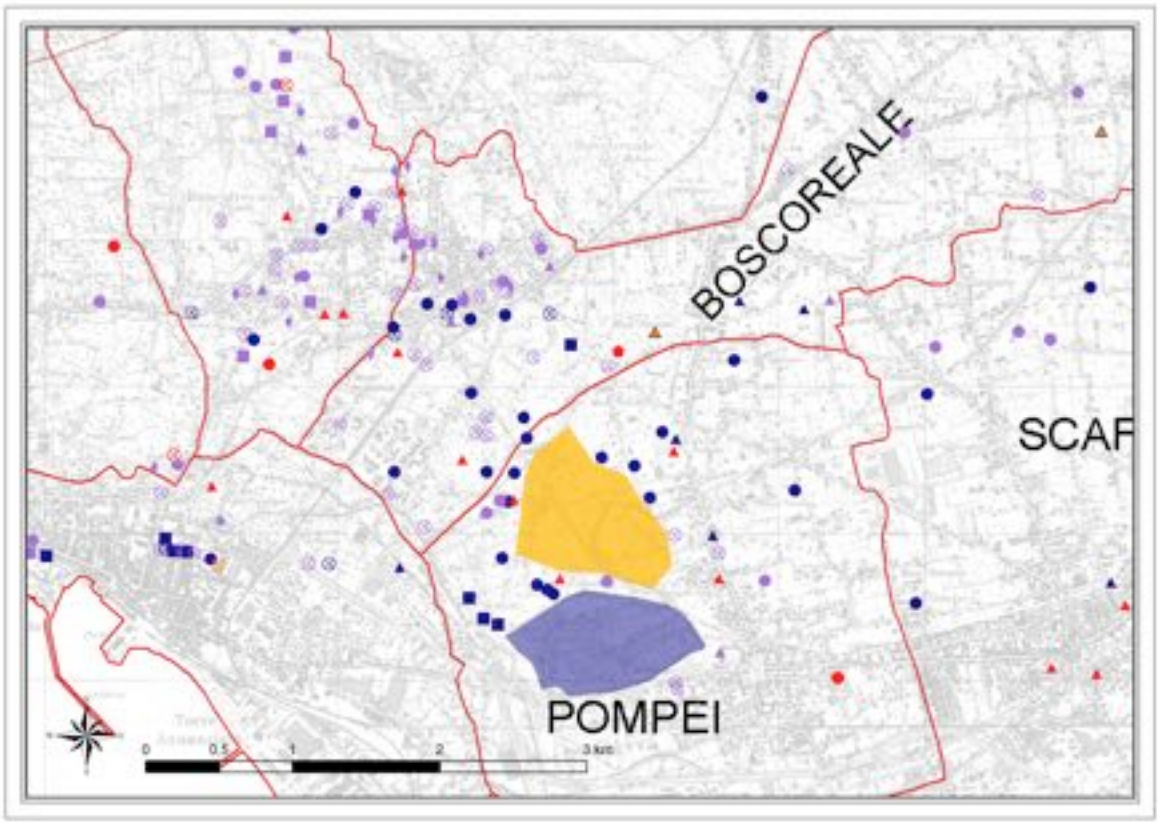


Figure 83 - The vast area (yellow) north of ancient Pompeii, which has never been investigated.

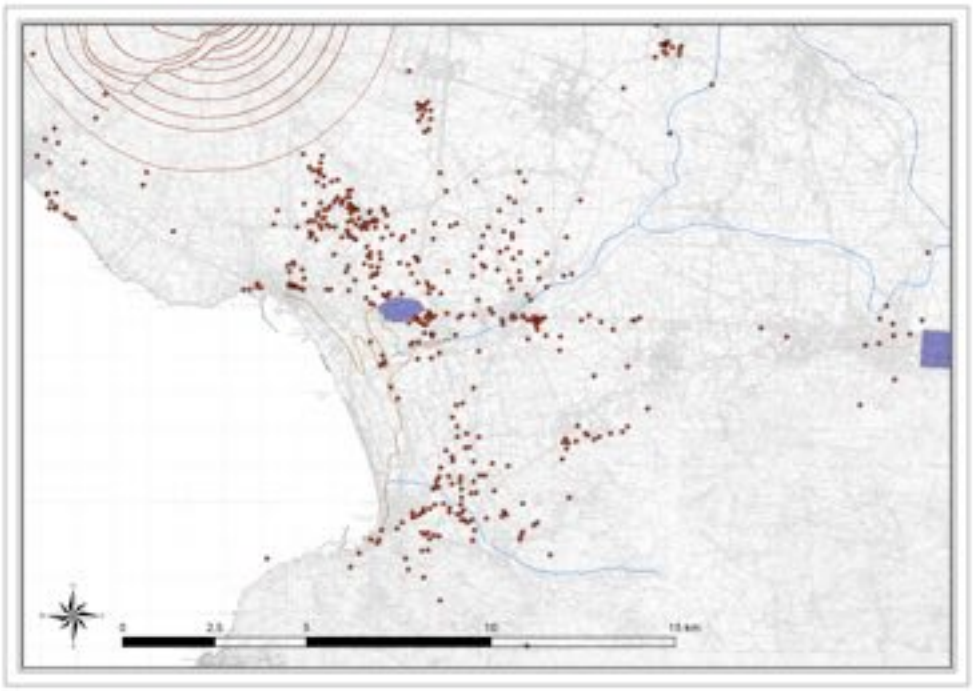


Figure 84 - Archaeological map of the Pompeian countryside.

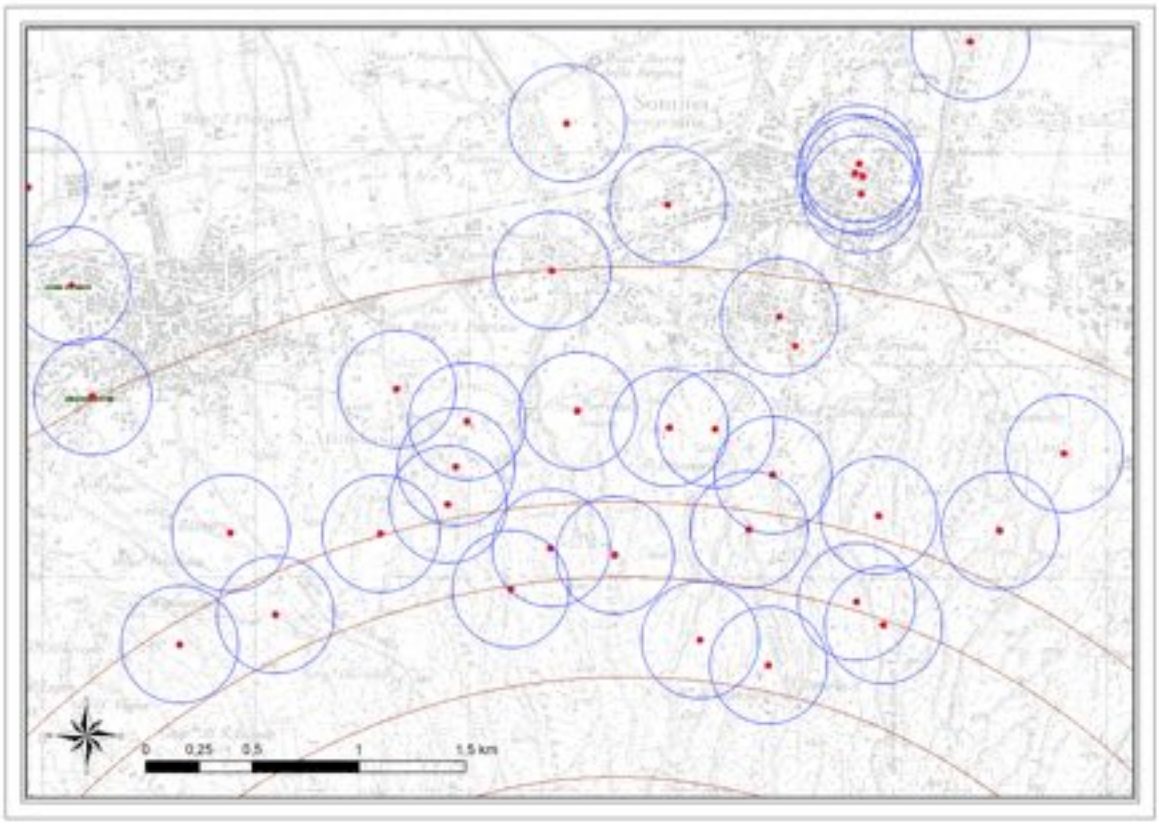


Figure 85 - Archaeological map of the north slope of Vesuvius (above 100 m. a.s.l.) with 100 iugera circles around sites.

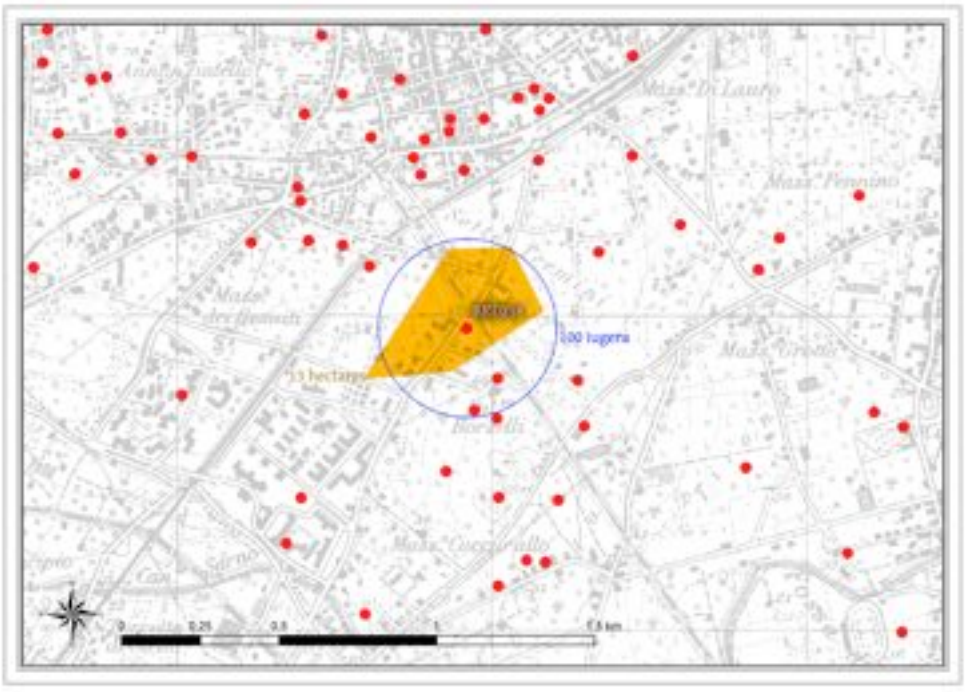


Figure 86 - Villa della Pisanella and the neighbouring villas.

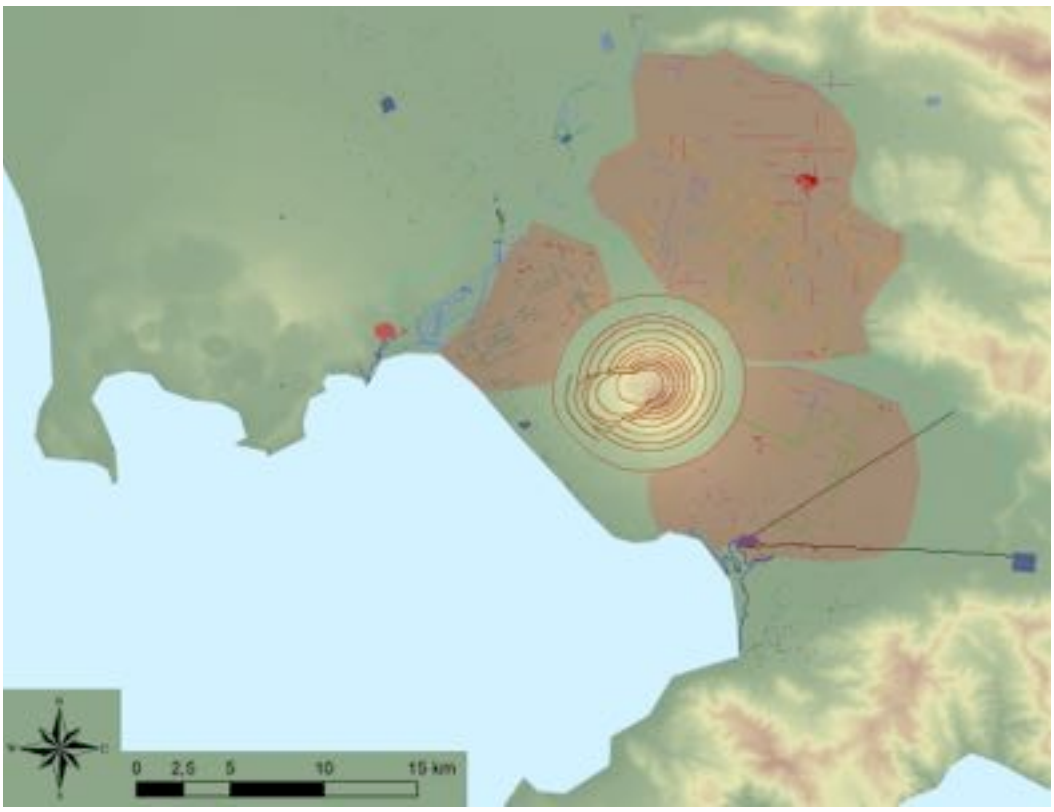


Figure 87 - Arable plain of the territories of Neapolis, Nola, and Pompeii (red areas).

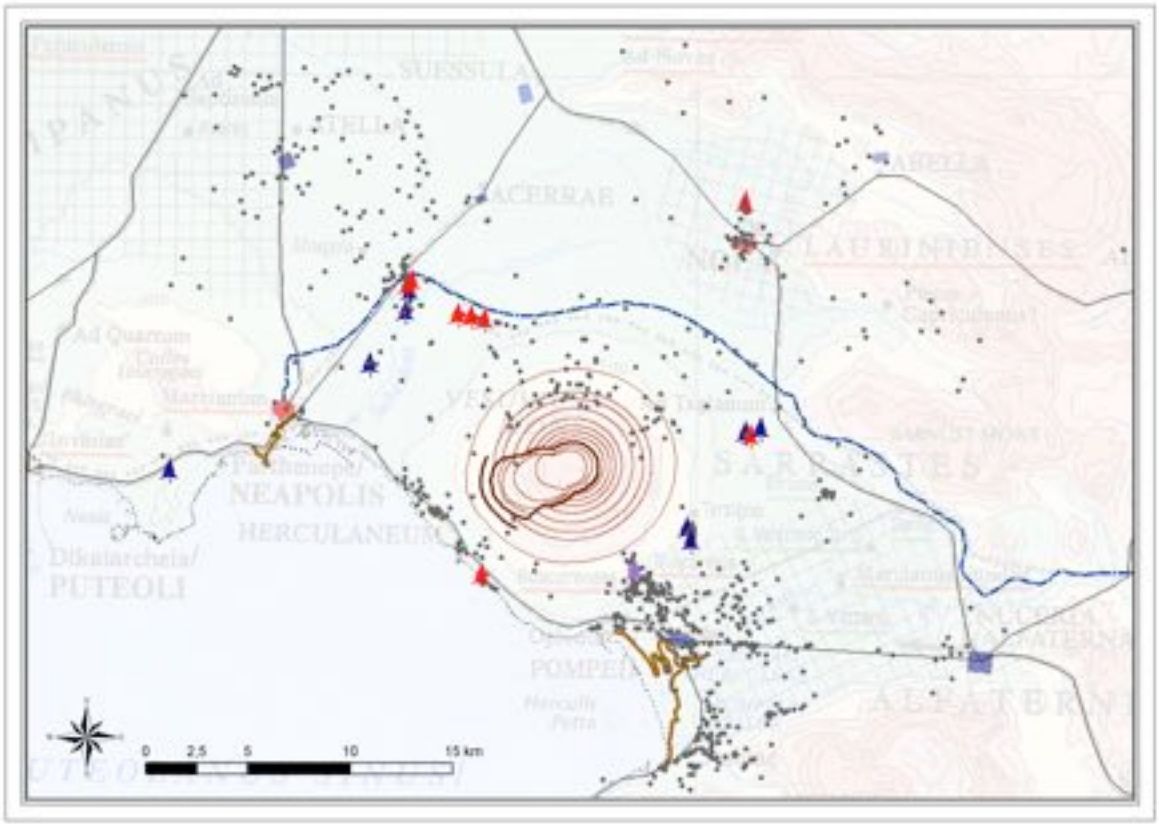


Figure 88 - Archaeological map of the environs of Vesuvius with localization of the sites where traces of cultivation have been found (tree symbol); pre-79 sites are in blue, post-79 sites are in red, the lilac site is generically dated to the Roman period.

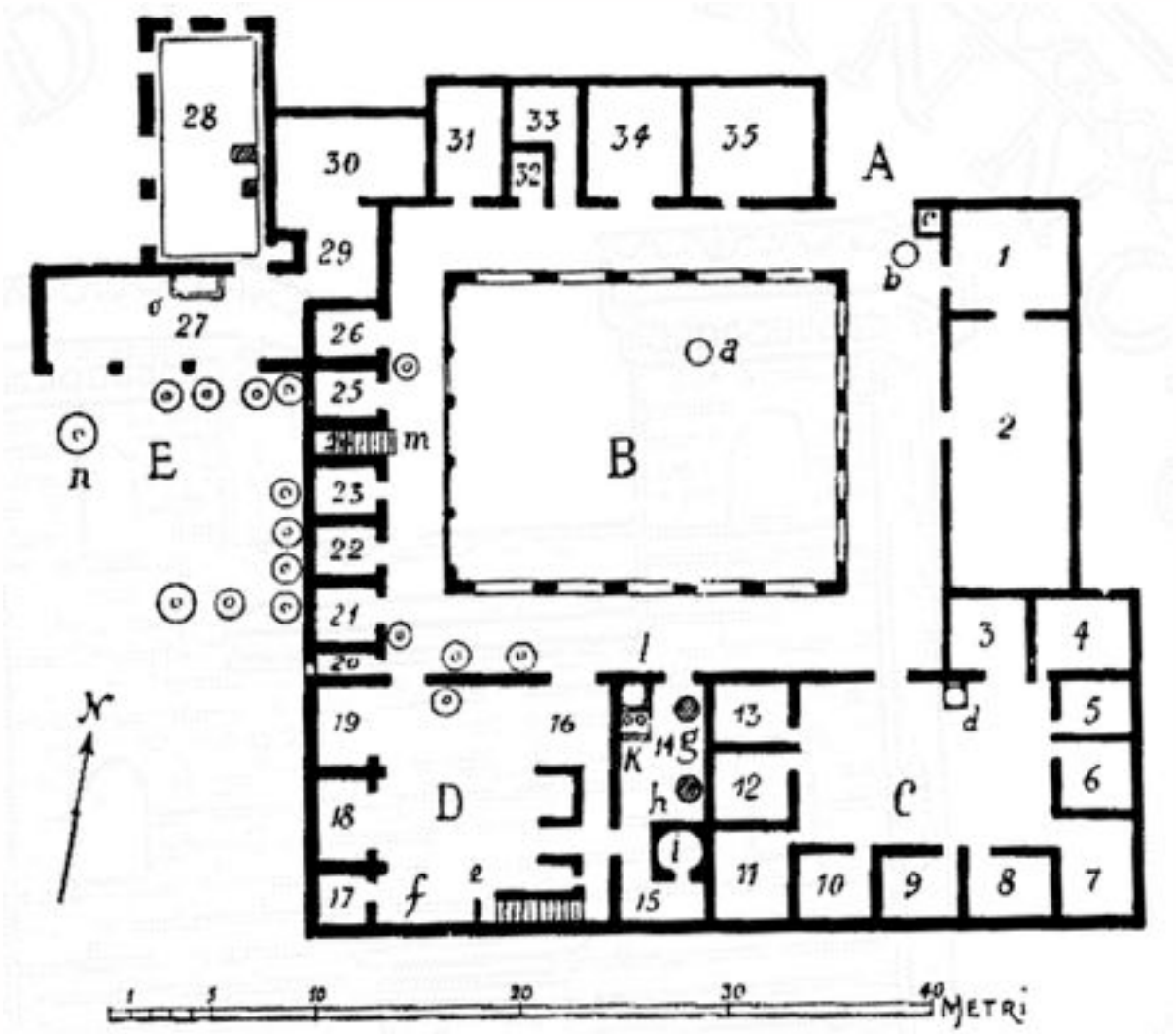


Figure 89 - Plan of the Roman villa in Gragnano.

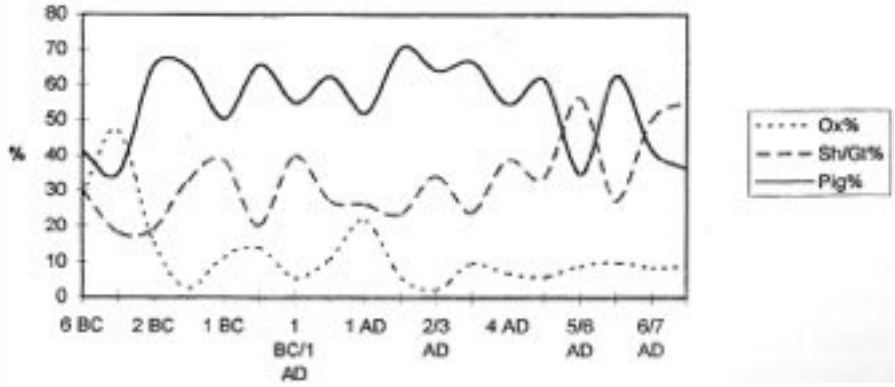
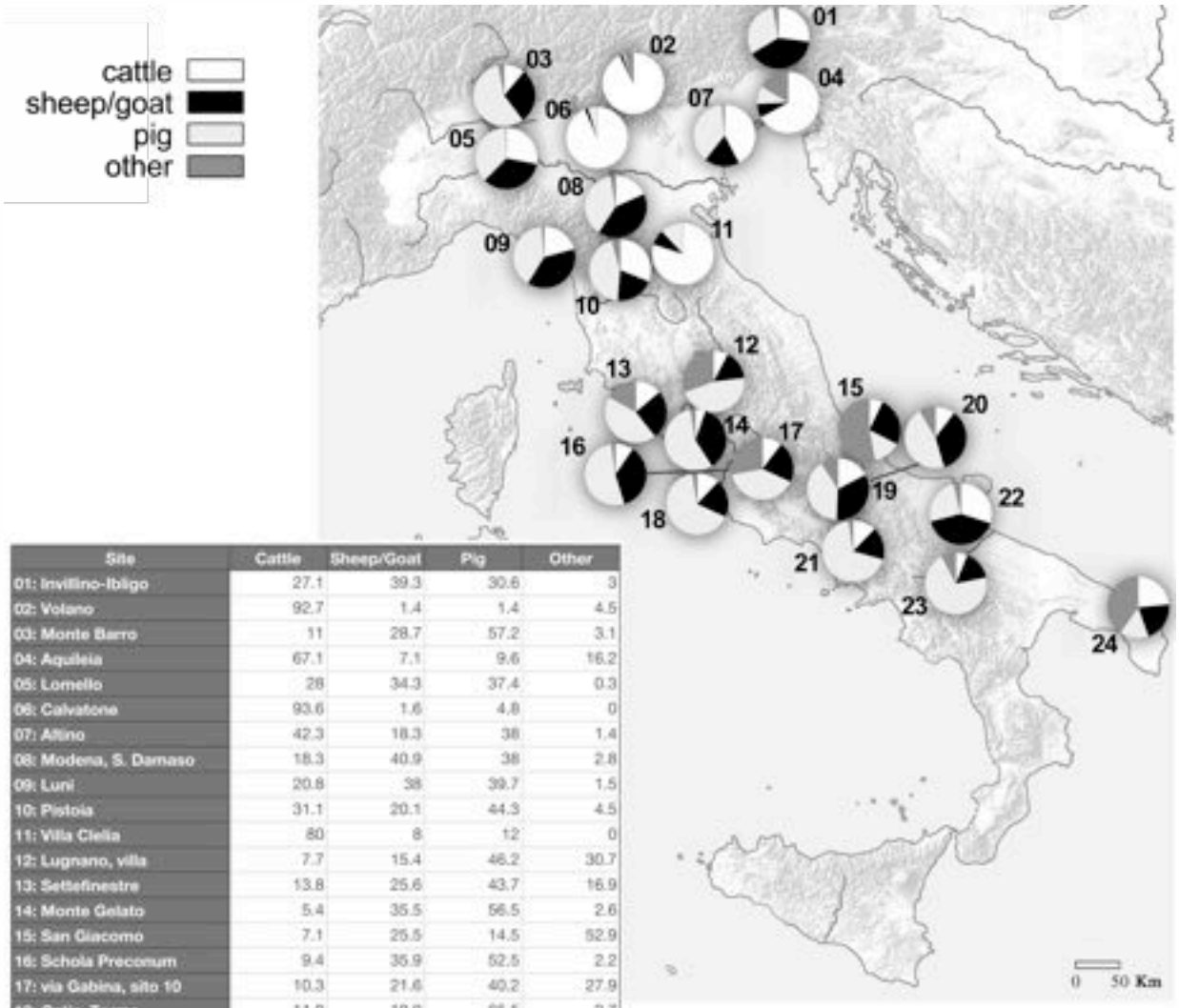


Figure 90 – Graph of Campanian bone percentages (King 2002: 406, fig. 337).



Site	Cattle	Sheep/Goat	Pig	Other
01: Invillino-Ibligo	27.1	39.3	30.6	3
02: Volano	92.7	1.4	1.4	4.5
03: Monte Barro	11	28.7	57.2	3.1
04: Aquileia	67.1	7.1	9.6	16.2
05: Lomello	28	34.3	37.4	0.3
06: Calvatone	93.6	1.6	4.8	0
07: Altino	42.3	18.3	38	1.4
08: Modena, S. Damaso	18.3	40.9	38	2.8
09: Luni	20.8	38	39.7	1.5
10: Pistoia	31.1	20.1	44.3	4.5
11: Villa Clelia	80	8	12	0
12: Lugnano, villa	7.7	15.4	46.2	30.7
13: Settefinestre	13.8	25.6	43.7	16.9
14: Monte Gelato	5.4	35.5	56.5	2.6
15: San Giacomo	7.1	25.5	14.5	52.9
16: Schola Praecomum	9.4	35.9	52.5	2.2
17: via Gabina, sito 10	10.3	21.6	40.2	27.9
18: Ostia, Terme	11.9	19.9	65.5	2.7
19: Campochiaro	17.3	33.4	40.2	9.1
20: Matrice	10.3	35.1	46.1	8.5
21: Capua, Carillo	12.2	17.1	68.3	2.4
22: Herdonia	29.9	41.1	25.3	3.7
23: San Giovanni	6.1	15.6	70.7	7.6
24: Otranto	23.4	21.1	15.4	40.1
Napoli				
Carminiello	7.6	47.9	32.3	12.2
Girolomini	6.6	35.2	57.2	1
S. Patrizia	1.6	19	77	2.4
S. Maria La Nova	9.5	25.7	59.5	5.3
via San Paolo	17	30.7	45.5	6.8
Pollena Trocchia	5.1	36.4	58.3	
Standard values	5 - 10	30 - 35	60 - 70	

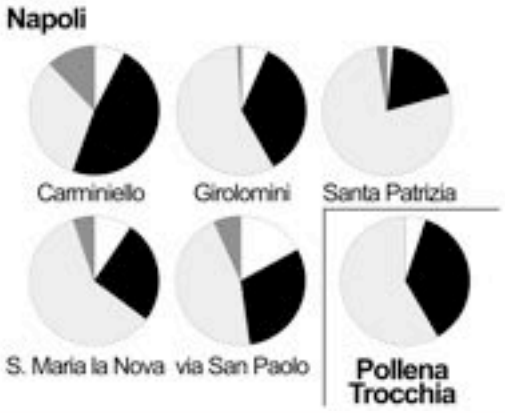


Figure 91 - Map of Italy with pie charts on animal bones from contexts of the 5th century AD (data gathered from MacKinnon 2004).



Figure 92 - View of the plain of Nola from Palma Campania, località Tribucchi.



Figure 93 - The geologic faults near Palma Campania.



Figure 94 - Barn for the sheep in Piano di Tribucchi.



Figure 95 - Sheep flock pasturing in Piano di Tribucchi.



Figure 96 - The Somma altiplano in frazione Santa Cristina.

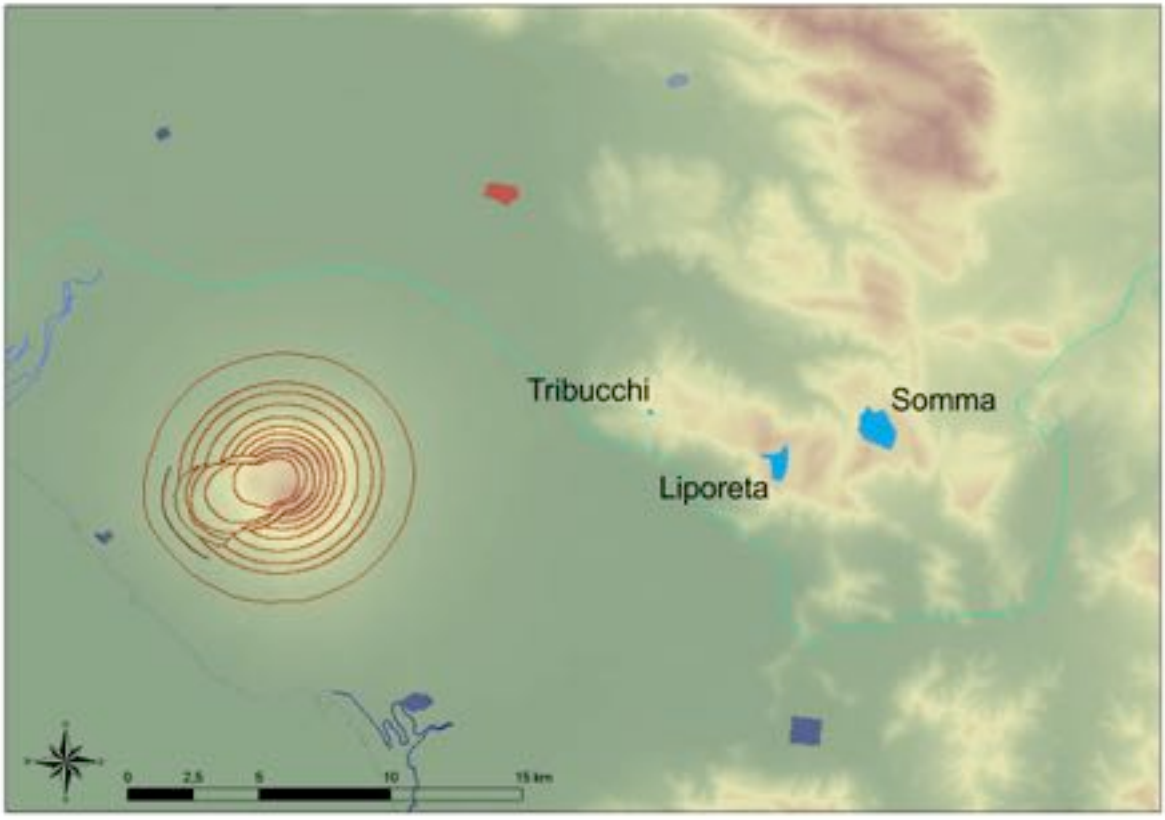


Figure 97 - Location of the three altiplanos of Nola.



Figure 98 - The “bagnolese” sheep flock in Somma Vesuviana.

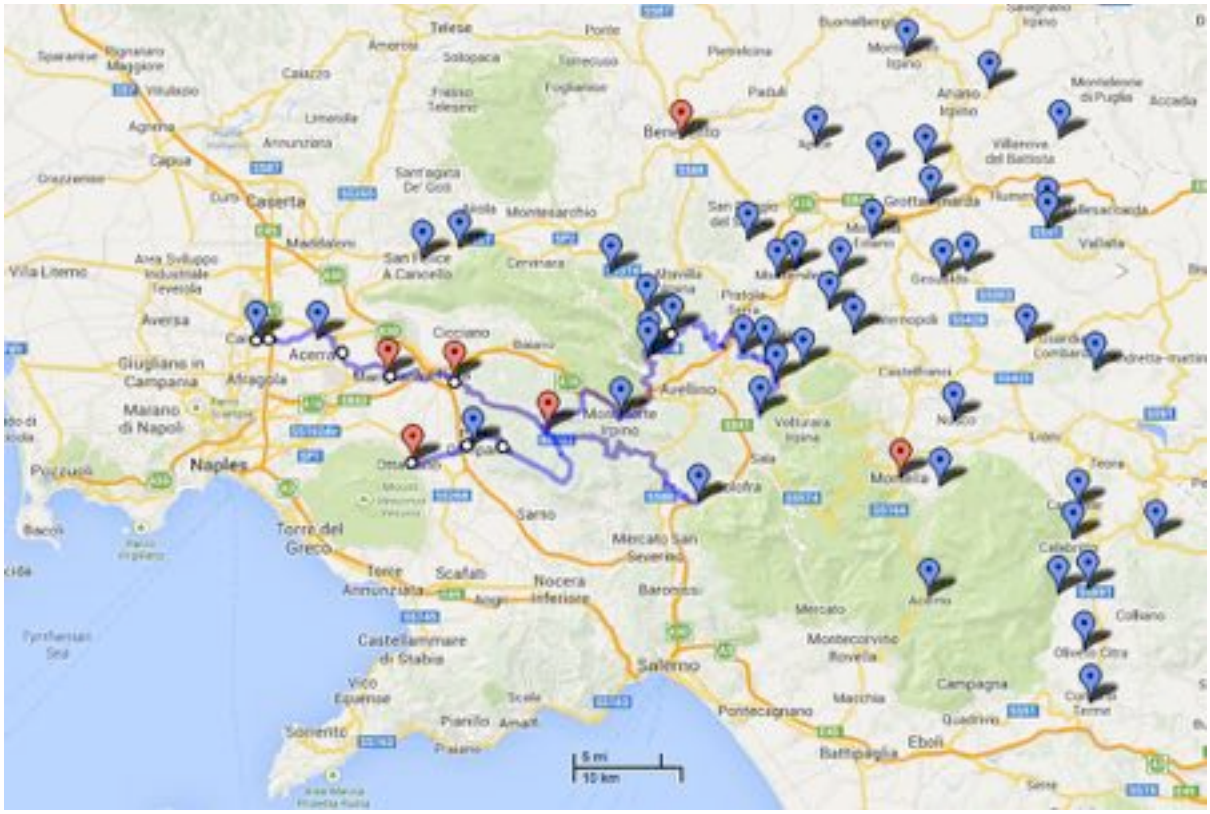


Figure 99 - Main localities of the pastoral league and main routes to the Nolan plain.



Figure 100 – A volcanic bomb (height around 1.5 m) found in the so-called Villa of Augustus in Somma Vesuviana, within the lahars of the AD 472 eruption.

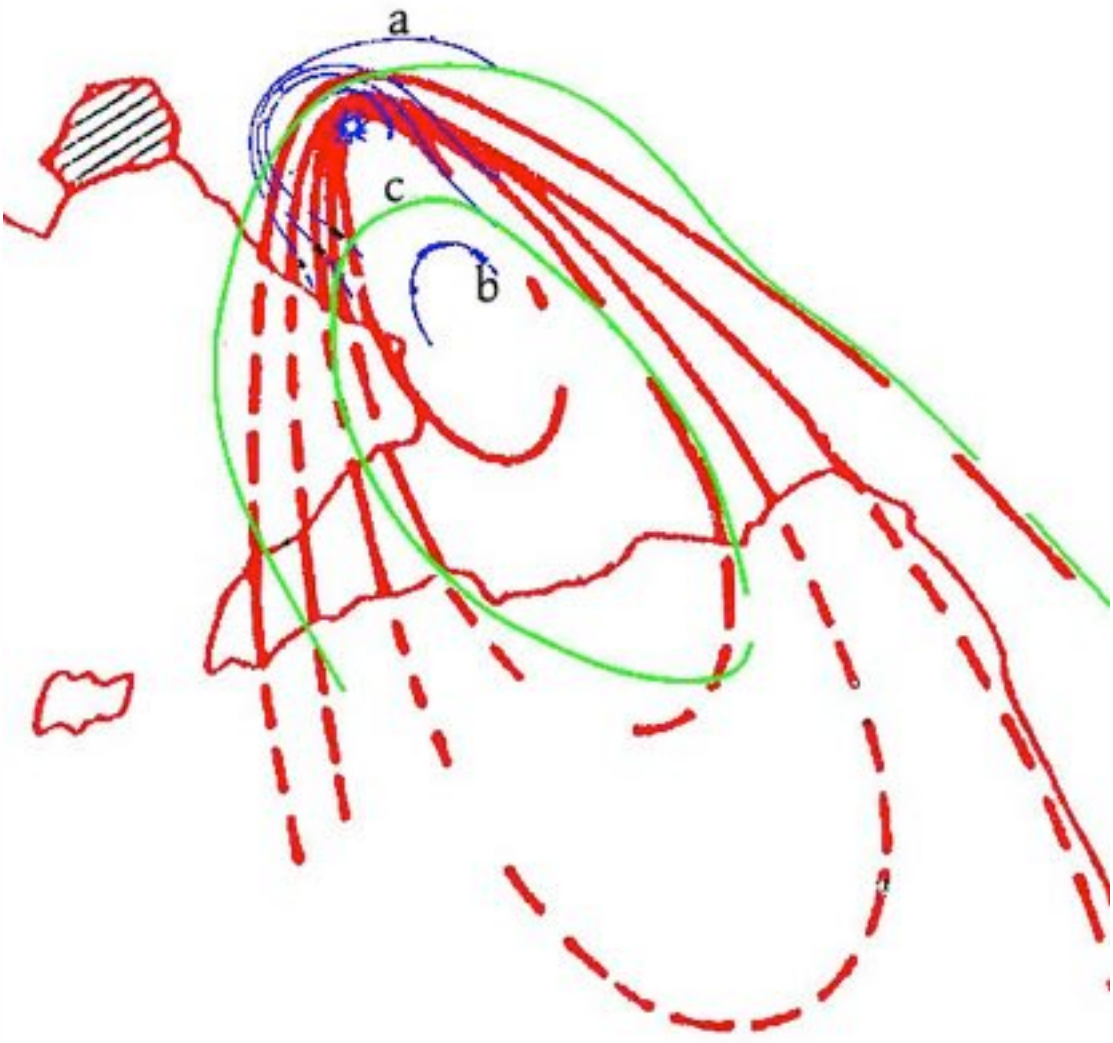


Figure 101 – Composite isopach map of tephra distribution. In red Rosi-Santacroce 1986; in blue Sigurdsoon-Carey (Carey 1987); in green Cioni et al. 1999.

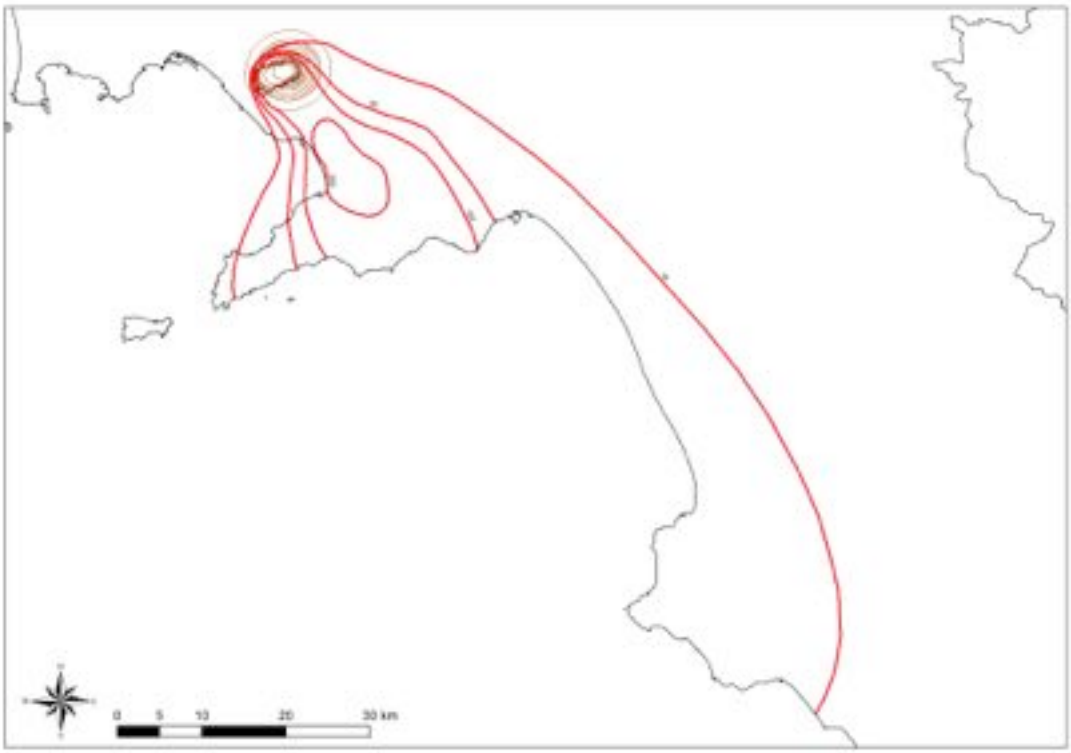


Figure 102 – Isopach map of tephra distribution (modified from Rosi-Santacroce 1986 and Carey 1987).

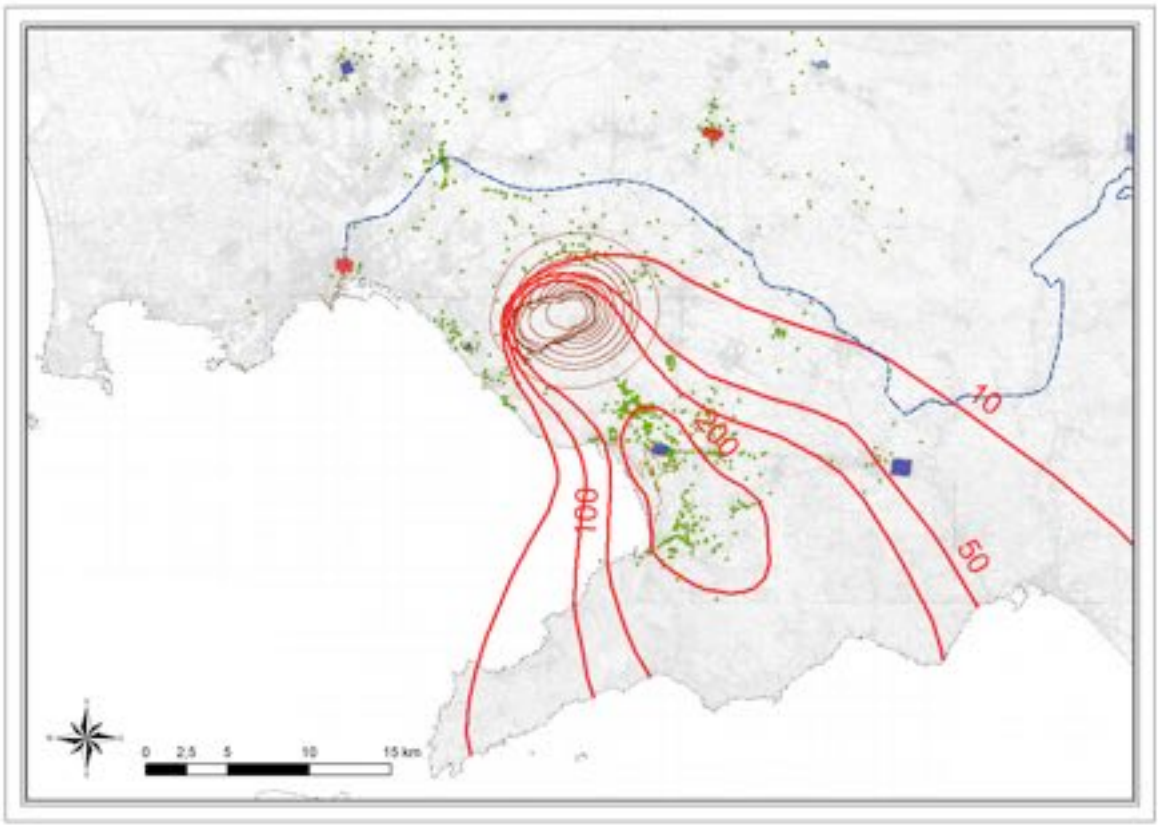


Figure 103 - Isopach map of tephra distribution (detail).

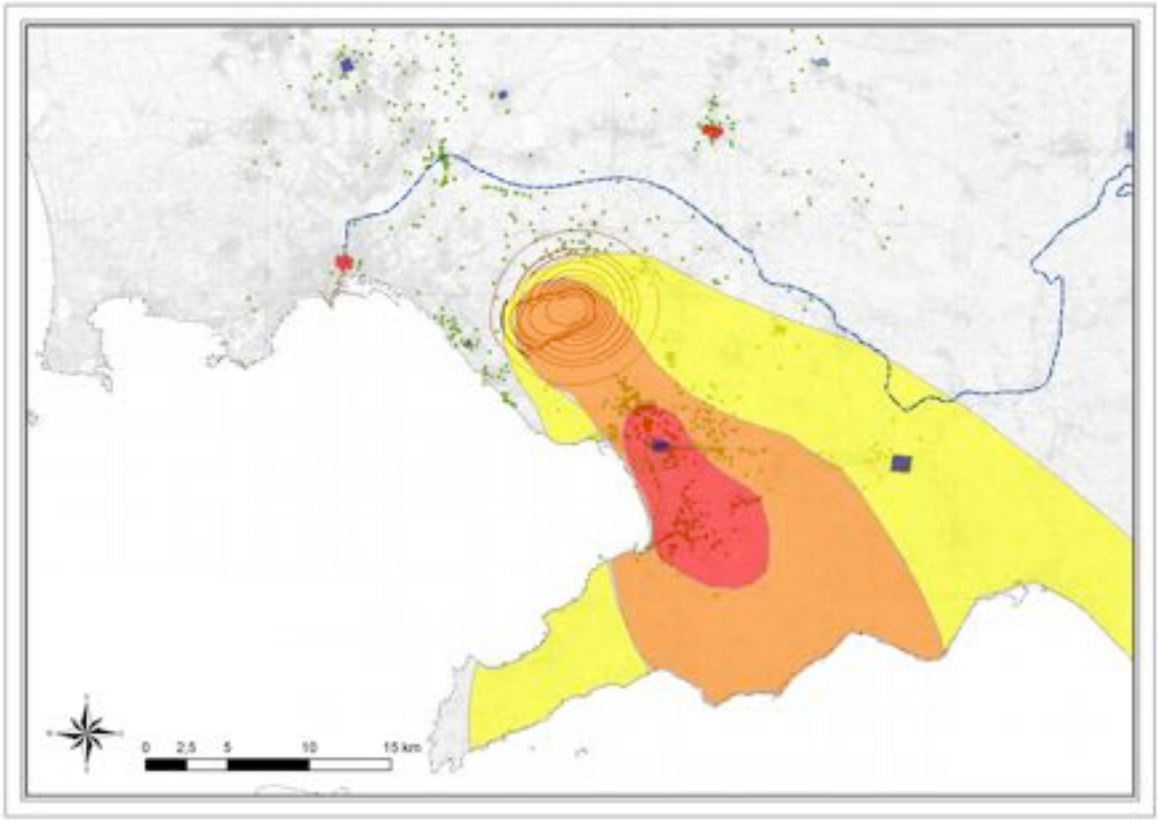
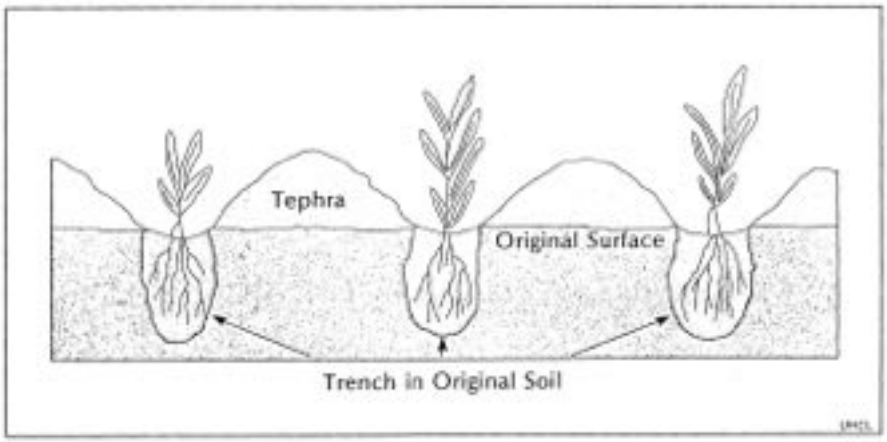


Figure 104 – Map of the damage caused by the tephra. In red: all vegetation killed; in orange: most vegetation killed, with some recovery; in yellow: minor damage to trees.



A technique used around Soufrière, St Vincent, following the 1902 eruption to allow the successful planting of sugar cane, arrow root and other crops (after HMSO, 1903: 156).

Figure 105 – Technique used around Soufrière to allow successful planting (Source: Blong 1984, p. 345, fig. 7.12).

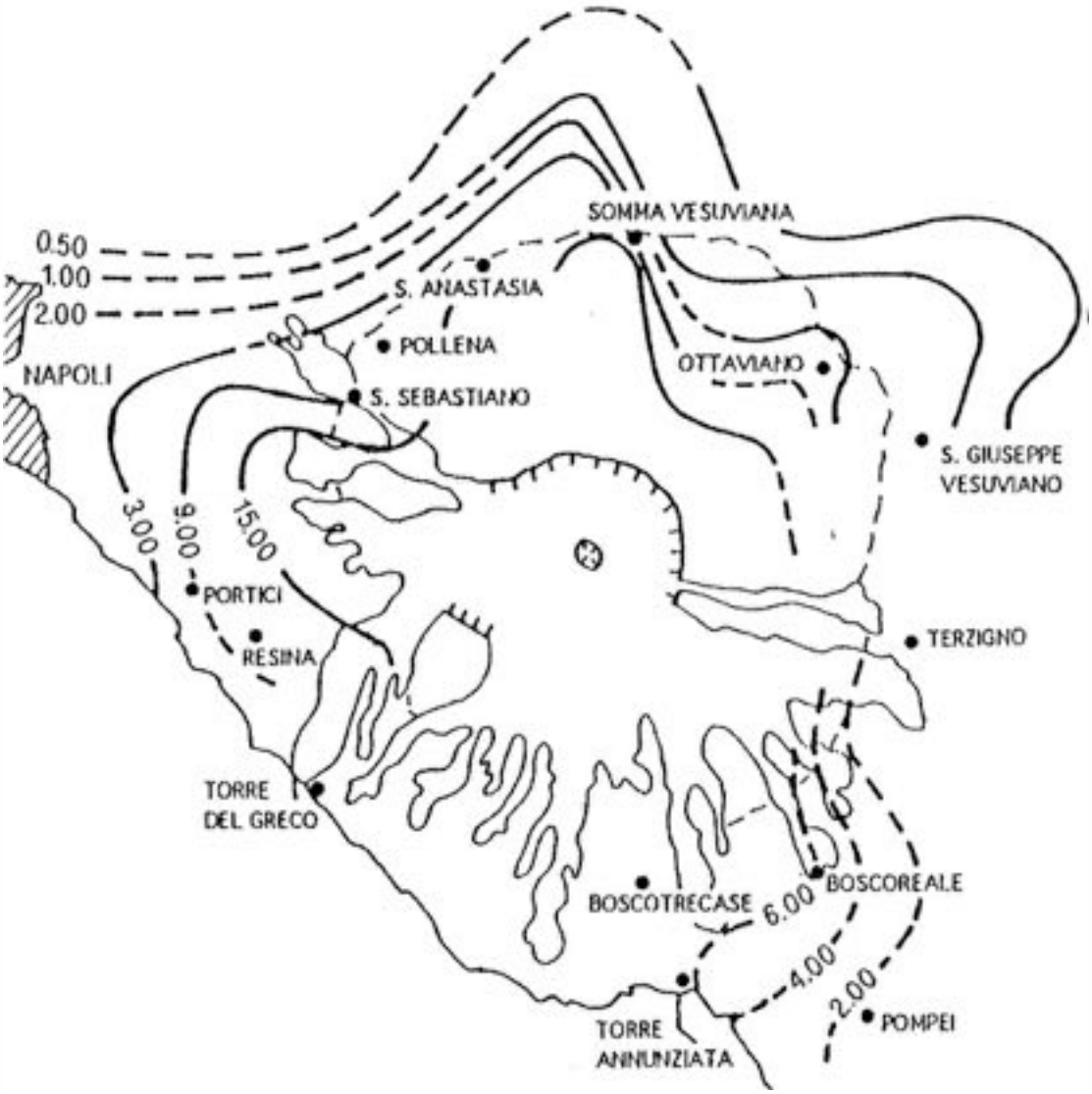


Figure 106 – Isopachs of pyroclastic flow and surge (Source: Dobran 1993, fig. 9, p. 15, from Rosi 1987).

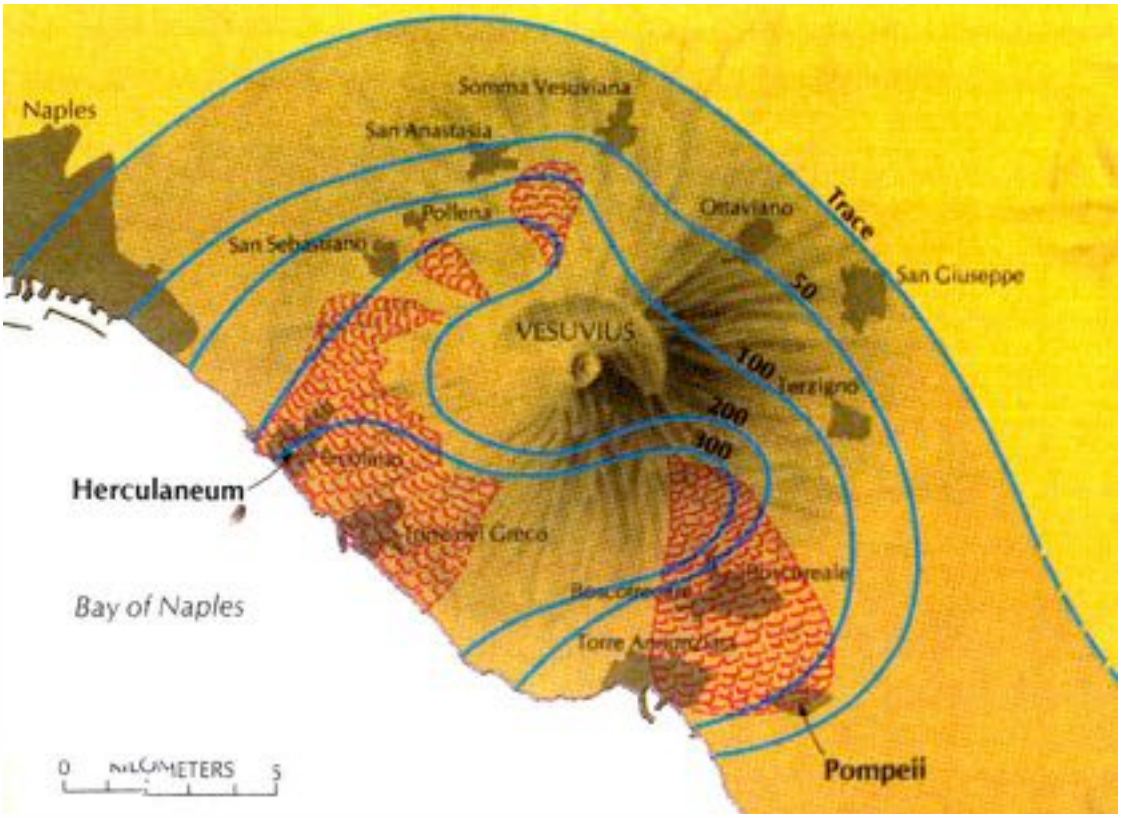


Figure 107 – Isopachs of the total surge deposits (blue, centimetres) and areas affected by pyroclastic flows (red) (Source: Sigurdsson 1985: 379, fig. 49).

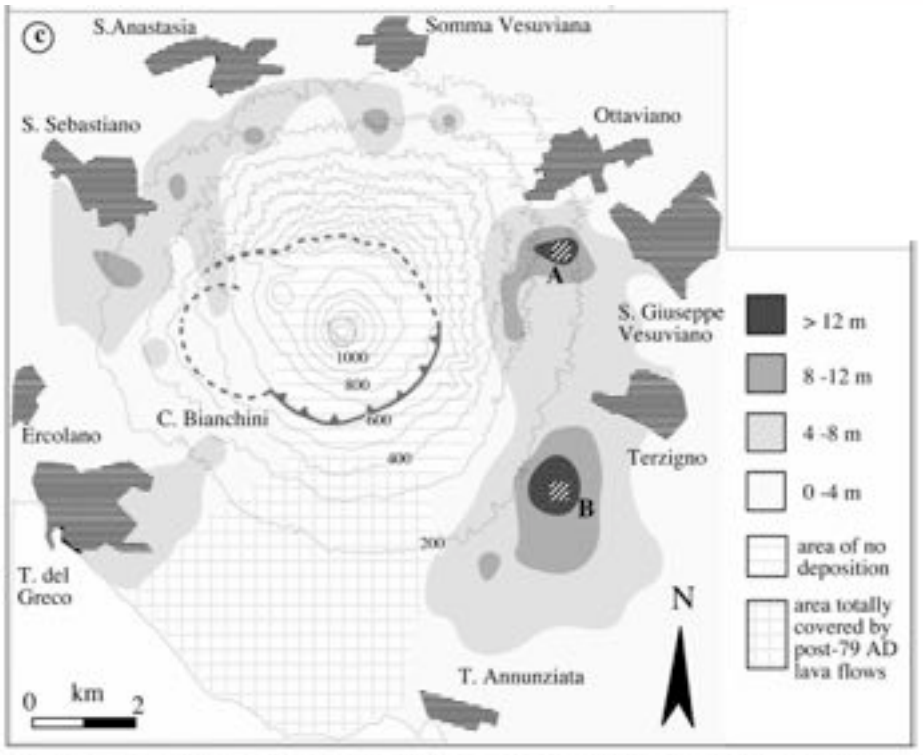


Fig. 11a–c The Pompei eruption (79 AD). **a** Generalized stratigraphic section of the pyroclastic deposits. **b** Grain-size and component analyses of breccia deposits from *A* and *B* sections. **c** Isopach map of the pyroclastic flow deposits and inferred caldera rim

Figure 108 – Isopach map of pyroclastic flow deposits (Source: Cioni 1999: 217, fig. 11c).

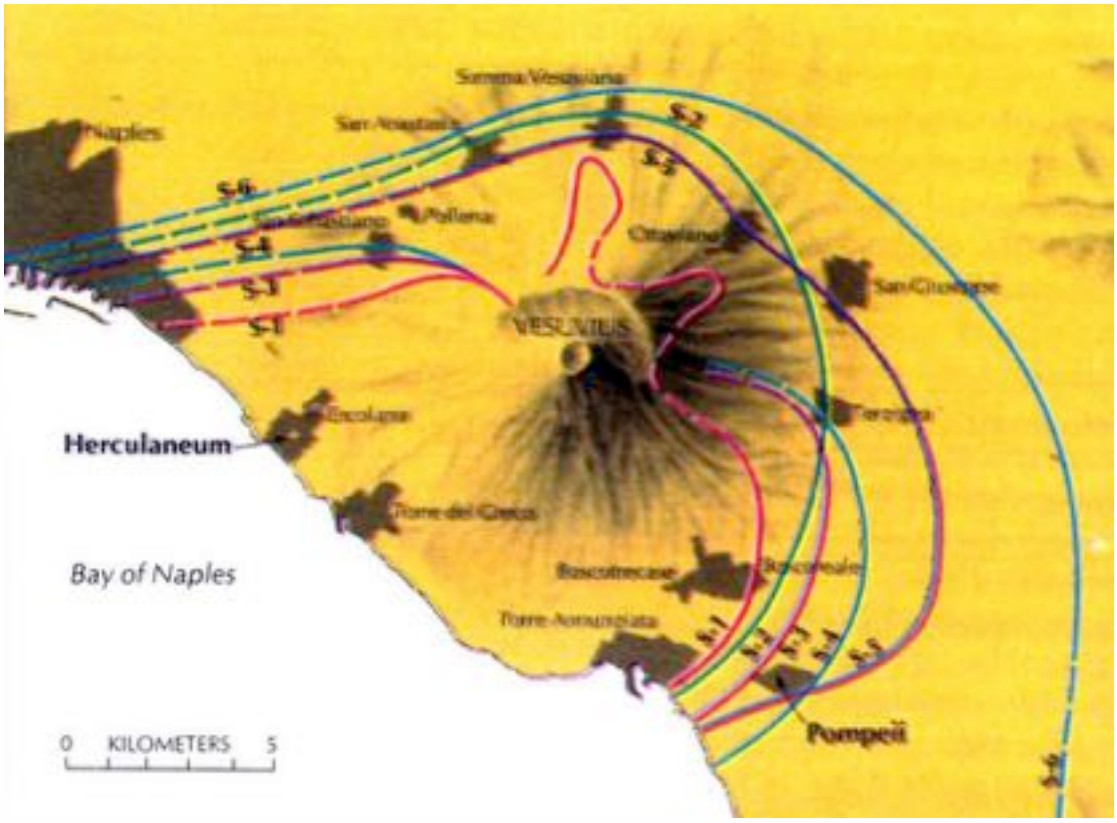


Figure 109 – Distribution of pyroclastic surges around Vesuvius during the AD 79 eruption (Source: Sigurdsson 1985: 377, fig.48; same as: Sigurdsson 2007: 56, fig. 4.5).

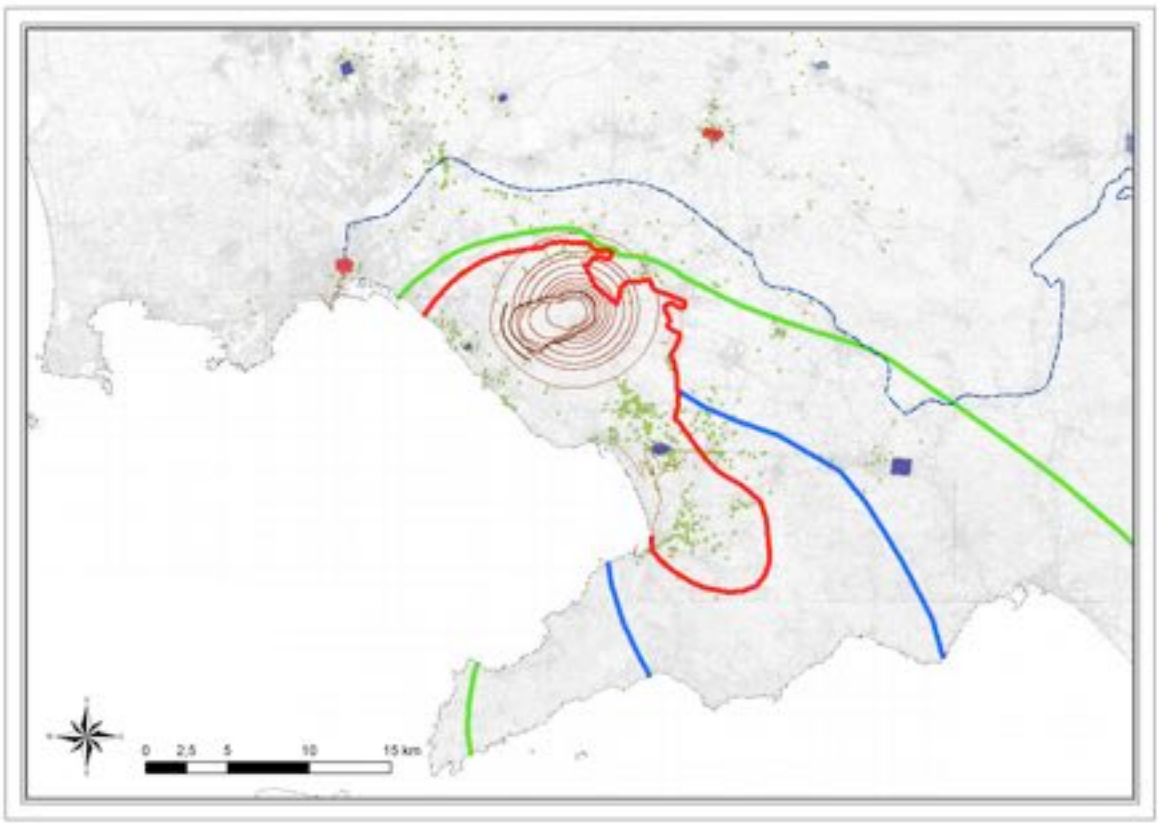


Figure 110 – Cumulative map of the effects on crops. In red: all vegetation killed; in blue: most vegetation killed, some recovery; in green: minor damage to cultivations.



Figure 111 – Ottaviano, località Raggi (cat. n. OTT003). Traces of ploughing furrows covered by 15 cm of tephra.

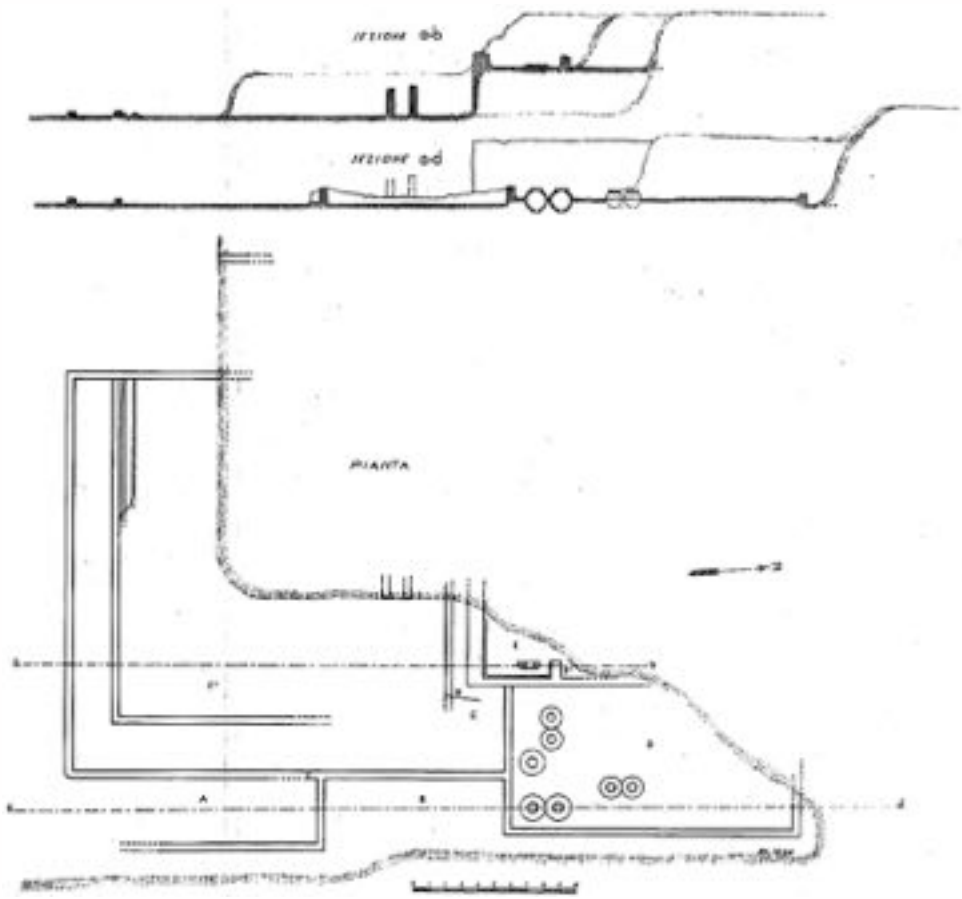


Figure 112 - Map and section of the Roman villa in San Sebastiano al Vesuvio (cat. n. SSV001, source Cerulli Irelli 1965: fig. 2).



Figure 113 - Satellite photo and overlaid map of the sites in Ponticelli: 1. the post-79 villa (cat. n. NAP003); 2. the late antique cemetery (cat. n. NAP002); 3. the pre-79 villa (cat. n. NAP018).

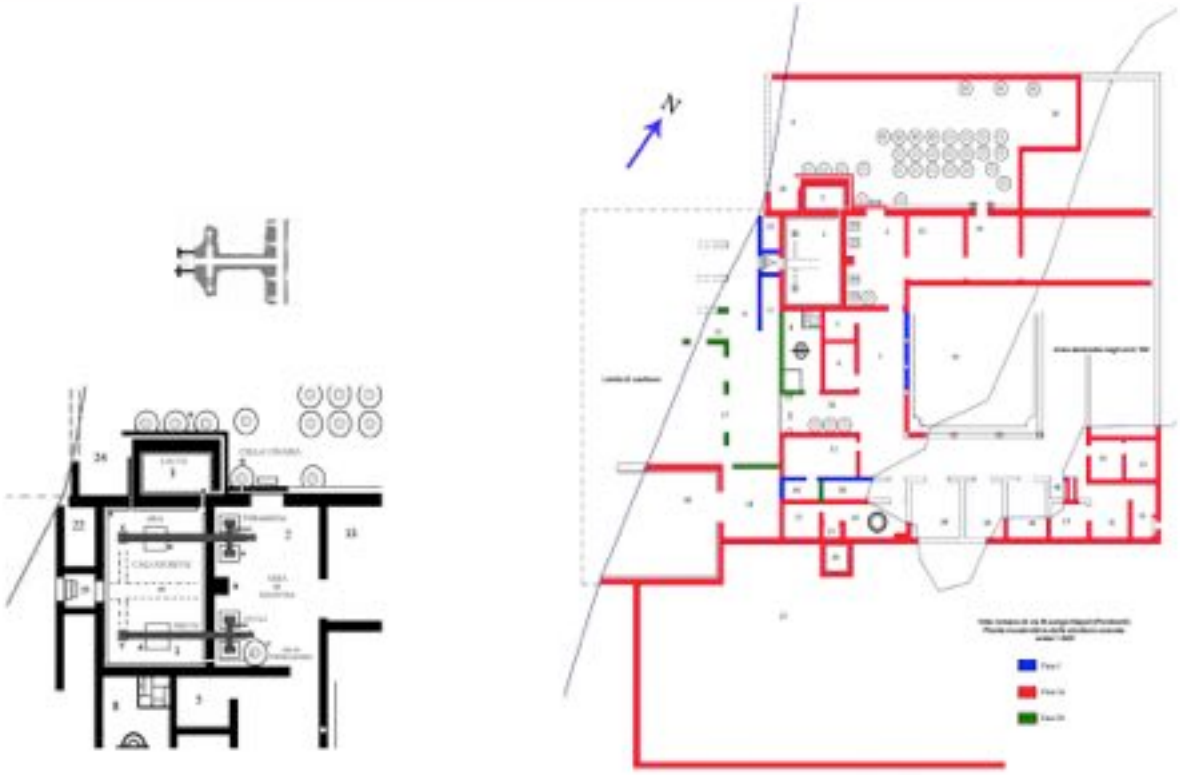


Figure 114 - Napoli, località Ponticelli, map of the villa of C. Olius Ampliatus (cat. n. NAP018; courtesy of S. Cascella).

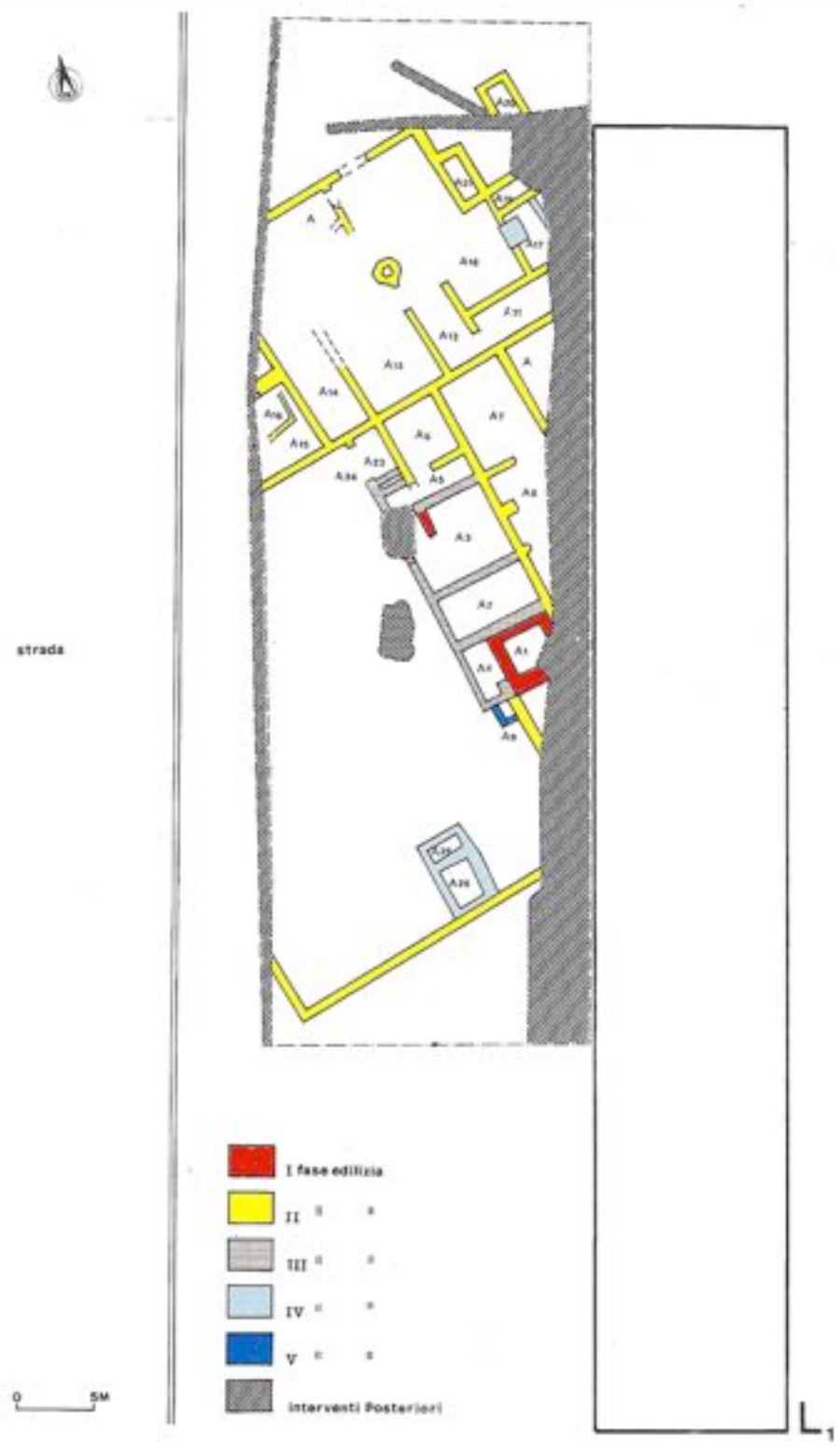


Figure 115 - Napoli, località Ponticelli, map of the post-79 villa (cat. n. NAP003; source: De Stefano 1987: 62).



Figure 116 - Lauro, località San Giovanni del Palco (cat. n. LAU001); map of the villa.



Figure 117 - Somma Vesuviana, località Starza della Regina (cat. n. SVE014), reconstruction of the *frons villae*.

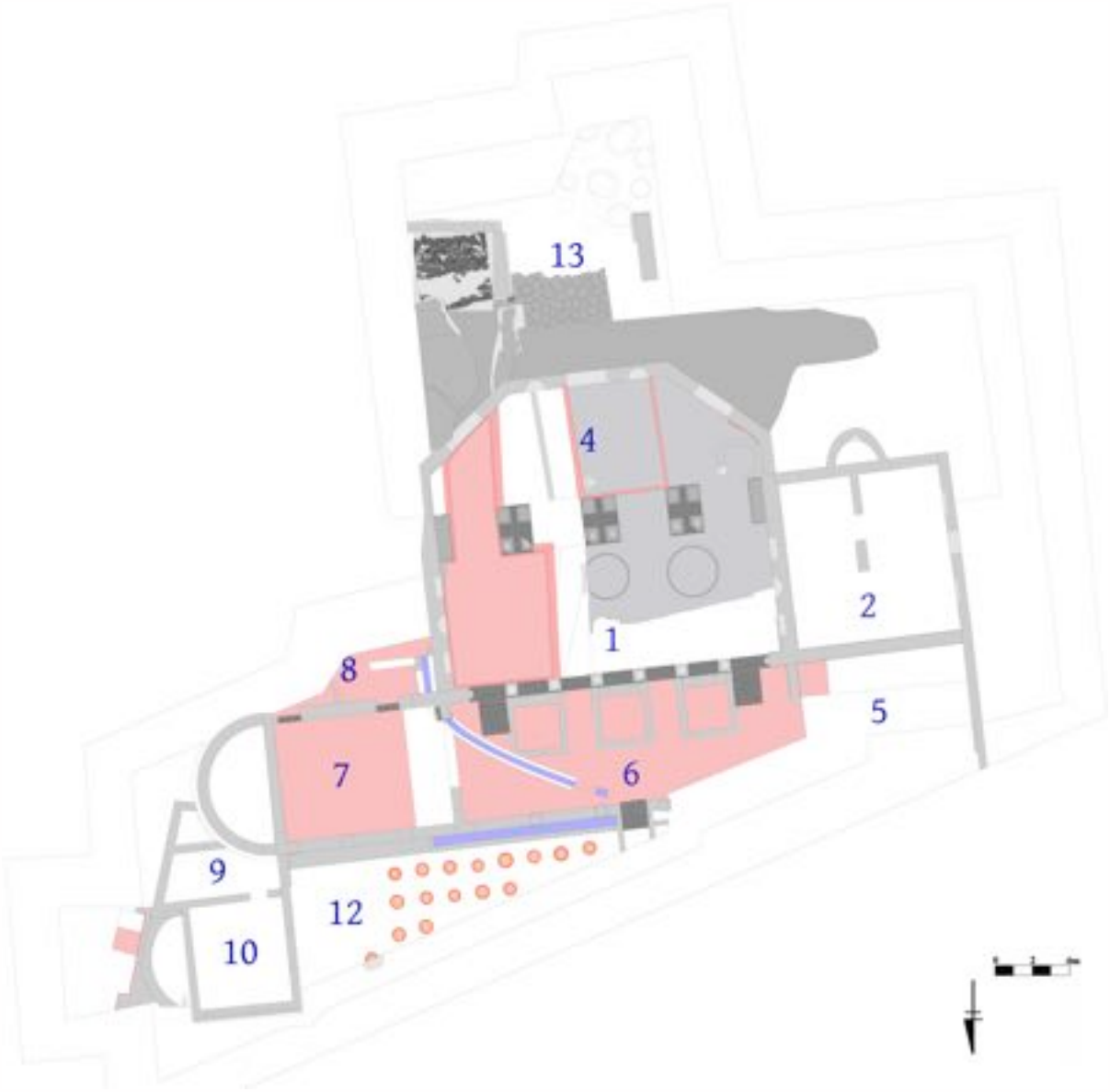


Figure 118 - Somma Vesuviana, località Starza della Regina (cat. n. SVE014), map of the site.



Figure 119 - Somma Vesuviana, località Starza della Regina (cat. n. SVE014), vertical shot of the *cella vinaria* (room 12).

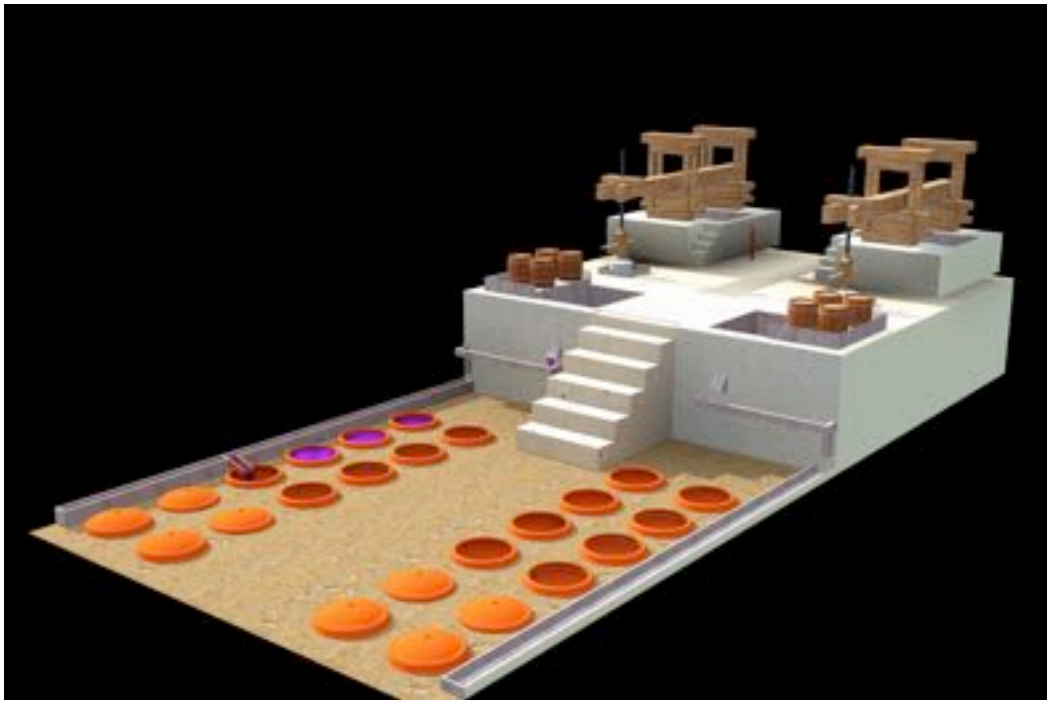


Figure 120 - 3D model of the *torcularium* as described by Palladius (1.18).



Figure 121 - Map of the villa in Somma Vesuviana with overlay of the key areas of the Palladian *torcularium*.

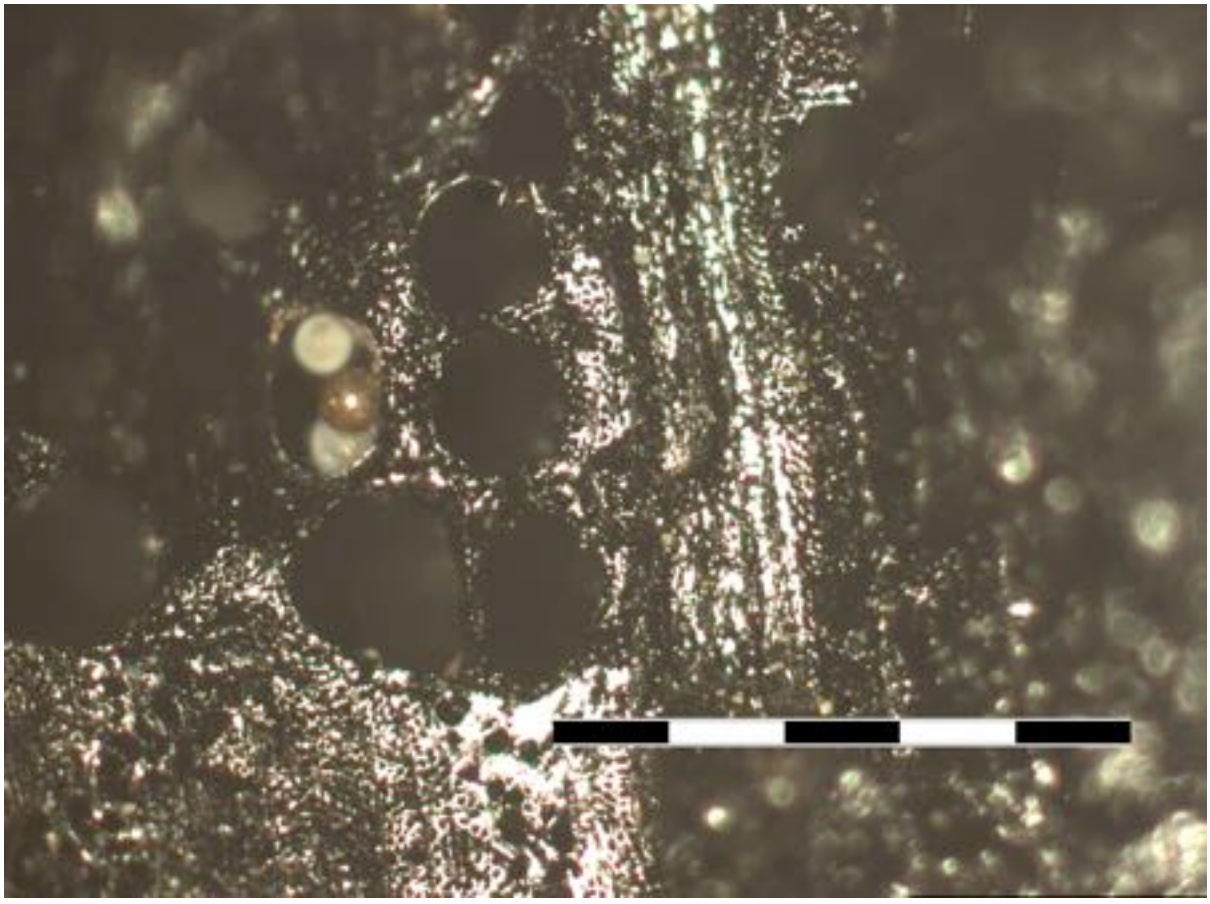


Figure 122 - Cross section (20x) of chestnut (*Castanea sativa*) from Pollena Trocchia.



Figure 123 - Carbonized fig leaf (*Ficus carica*) in the AD 512 ashes.



Figure 124 - Photo of the thatre of Neapolis.



Figure 125 - Drawing of the red-figured crater by the Painter of Suessula from the correspondence of Mastrilli (Source Napolitano 2005: fig. 1).



Figure 126 - Fresco in the church of the Lancellotti Castle in which is depicted Nicola Orsini (1396), Count of Nola, during the spoliation of the Roman villa (cat. n. LAU001) for the creation of the church of San Giovanni del Palco.



Figure 127 - The CIS trade centre in the territory of Nola.

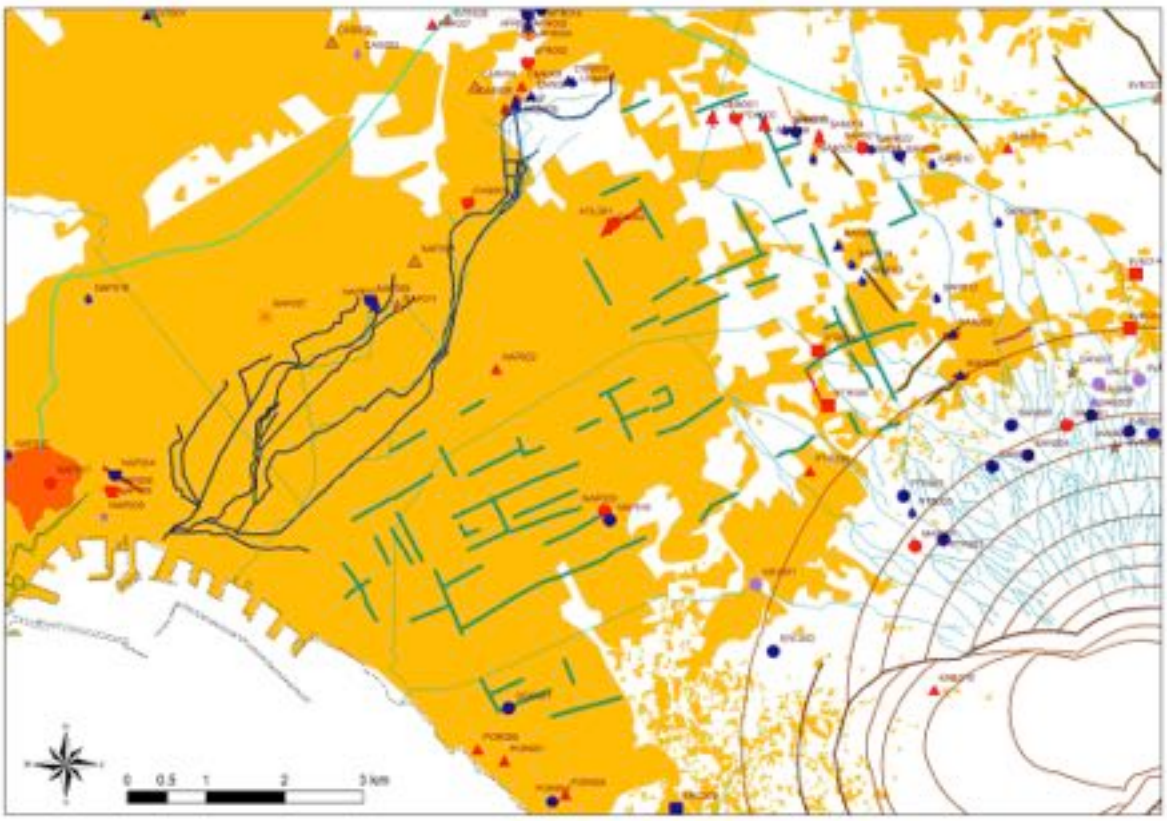


Figure 128 - Degree of modern urbanisation in the ancient territory of Neapolis. In yellow are the built-up areas.



Figure 129 - Somma Vesuviana, località Raia al Cavone (cat. n. SVE010); remains of Roman walls protruding on the edge of the hillock.



Figure 130 - Augustan marble capital probably pertaining to a temple (cat. n. NOL004).



Figure 131 - Oscan cippus (cat. n. SAN007).



Figure 132 - Drawing of the inscription on the Oscan cippus (cat. n. SAN007).



Figure 133 - Photo of another Oscan cippus, probably from the same site as the previous one.

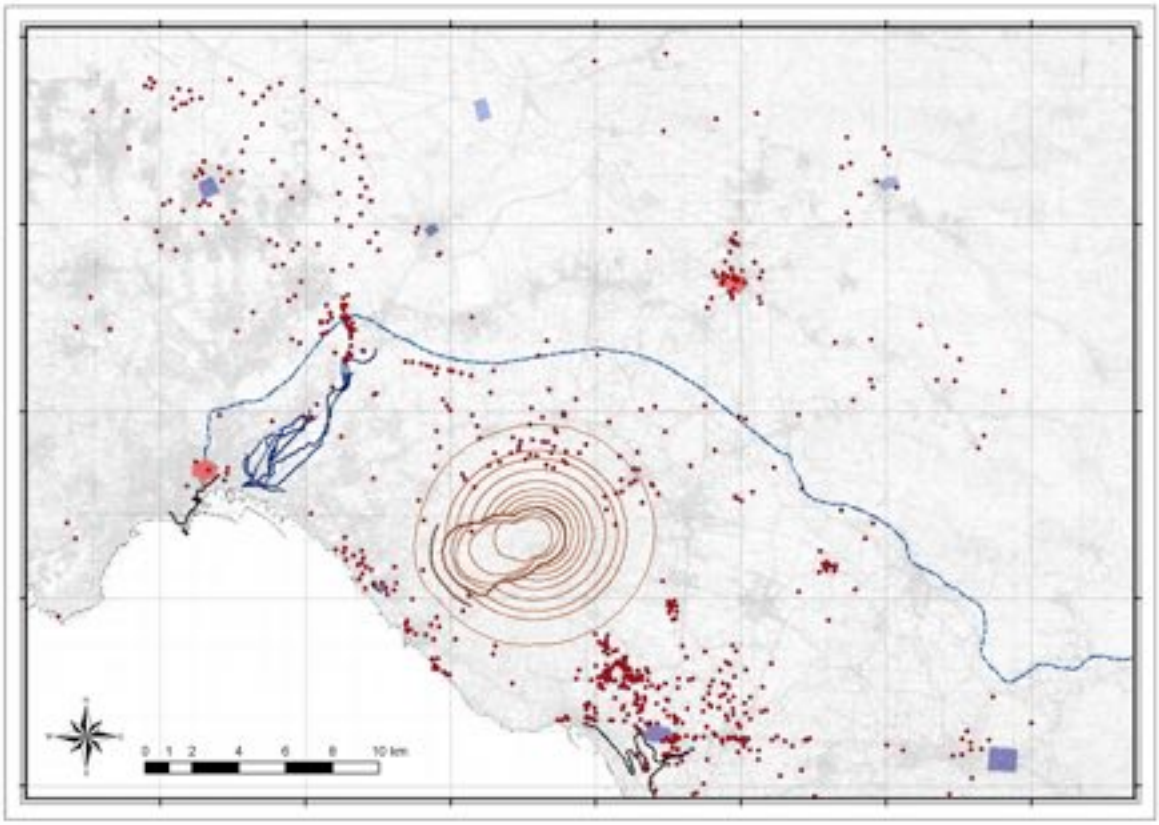


Figure 134 - Archaeological map of the environs of Vesuvius.

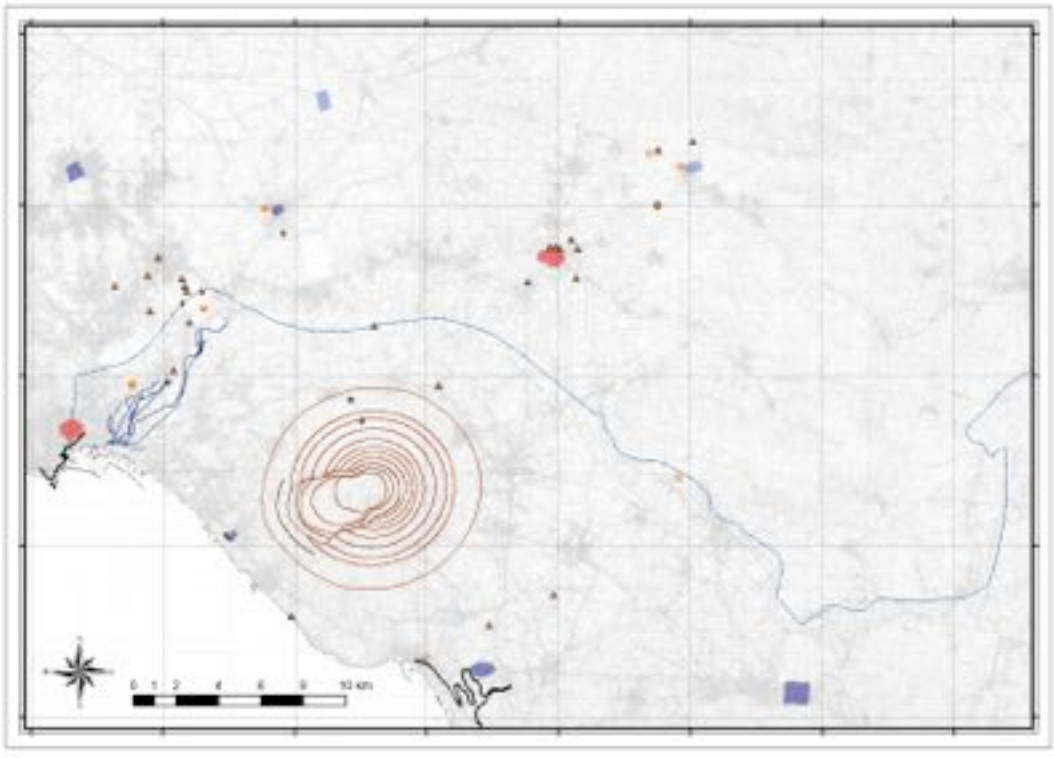


Figure 135 - Archaeological map of the pre-Roman sites.

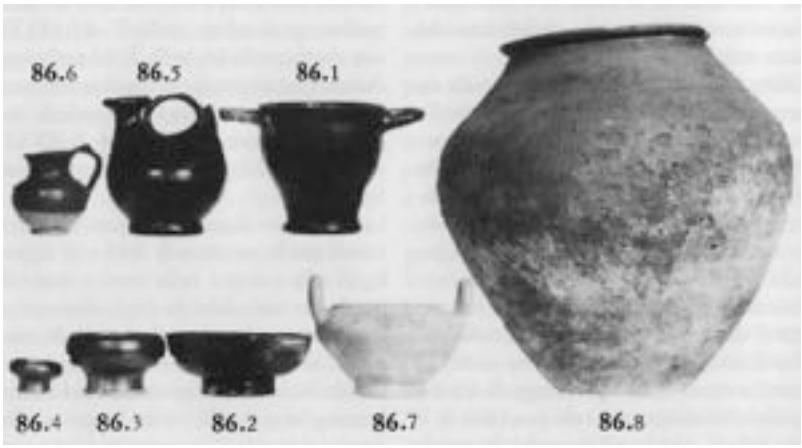


Figure 136 - Goods from grave 86 of the Purgatorio necropolis in Naples, neighbourhood Ponticelli (cat. n. NAP001; source: Giampaola - d'Henry 1985).



Figure 137 - Example of one tomb goods (grave 96) from the necropolis of Qualiano (Source: Giampaola - d'Henry 1985).

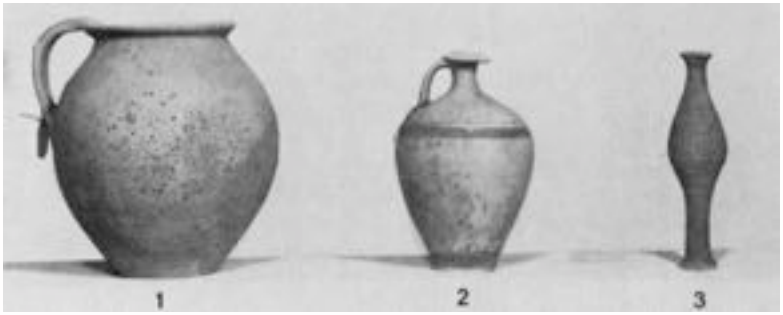


Figure 138 - Goods from the tomb XLbis of the "Ronga" necropolis (Source: Bonghi Iovino - Donceel 1969).

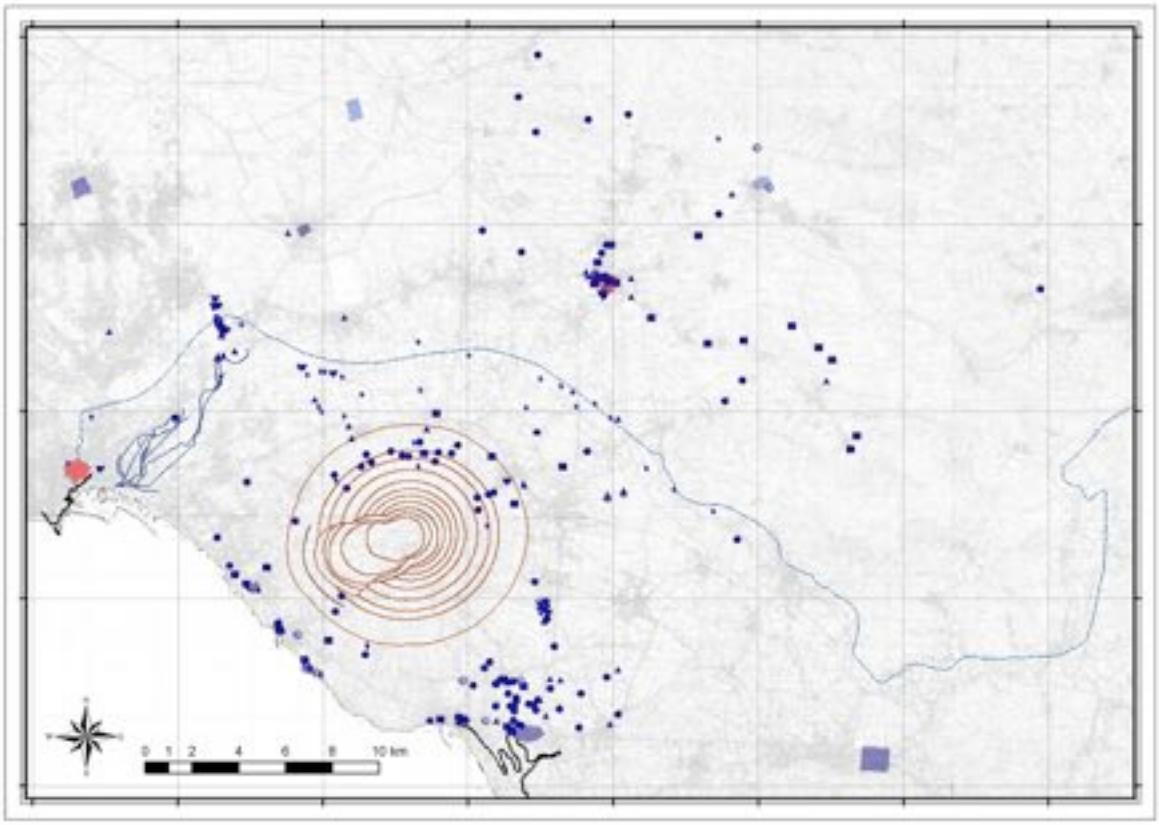


Figure 139 - Archaeological map of the Roman pre-AD 79 sites.

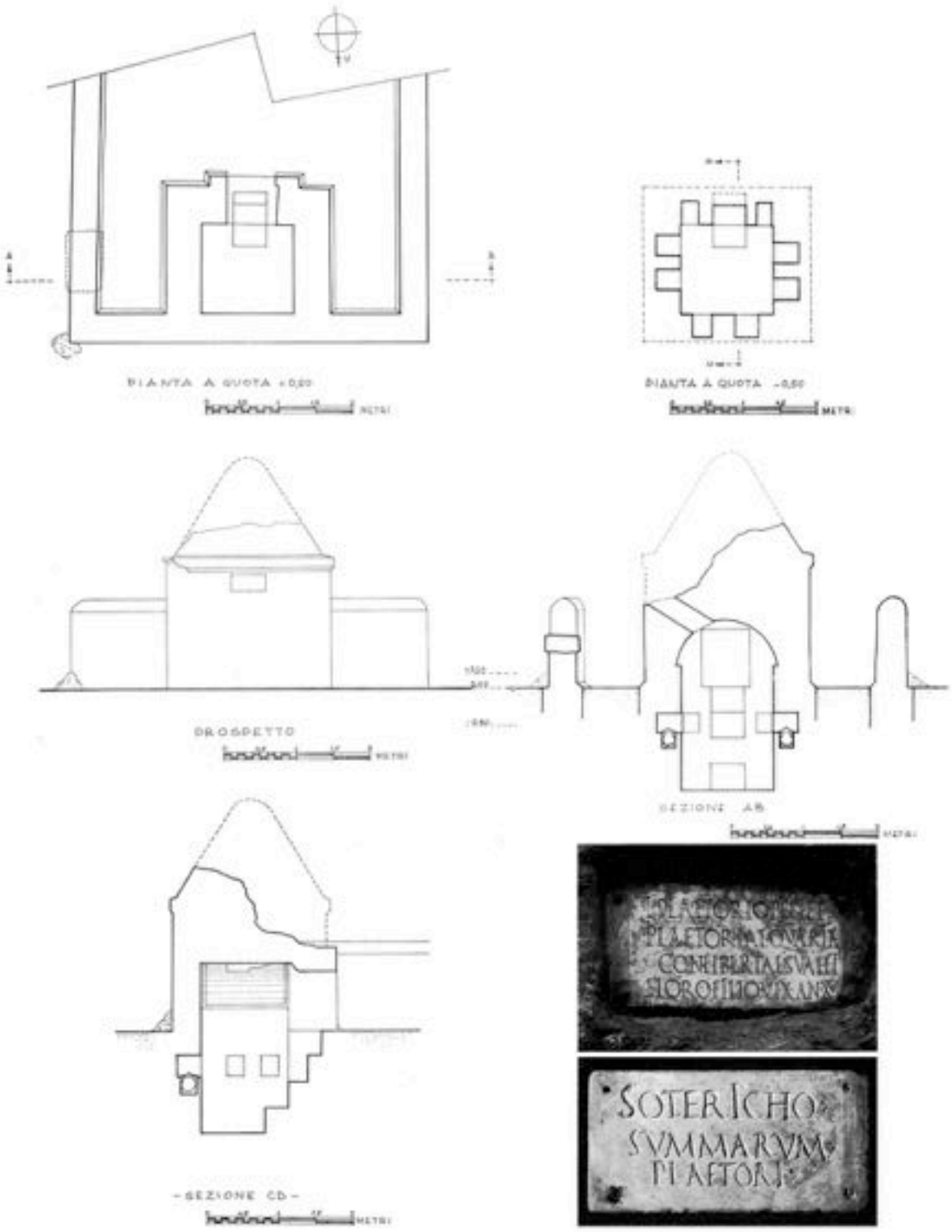


Figure 140 - Map, sections, and photos of the funerary monument of L. Plaetorius (cat. n. SAN008; source: De Franciscis 1974).

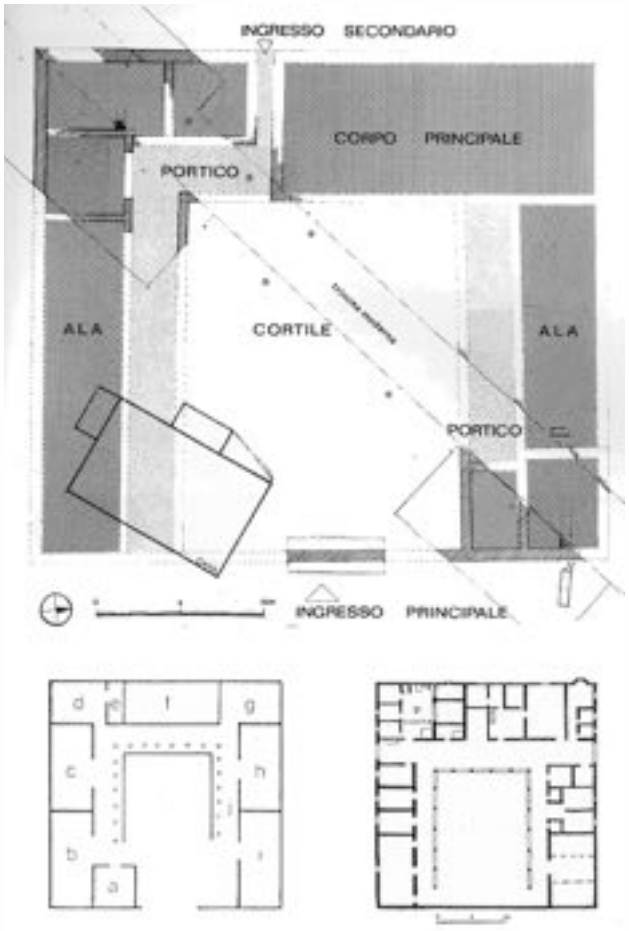


Figure 141 - Map of the site of Naples Marianella (cat. n. NAP019).



Figure 142 - Photo of the area C of the villa at Marianella (cat. n. NAP019).

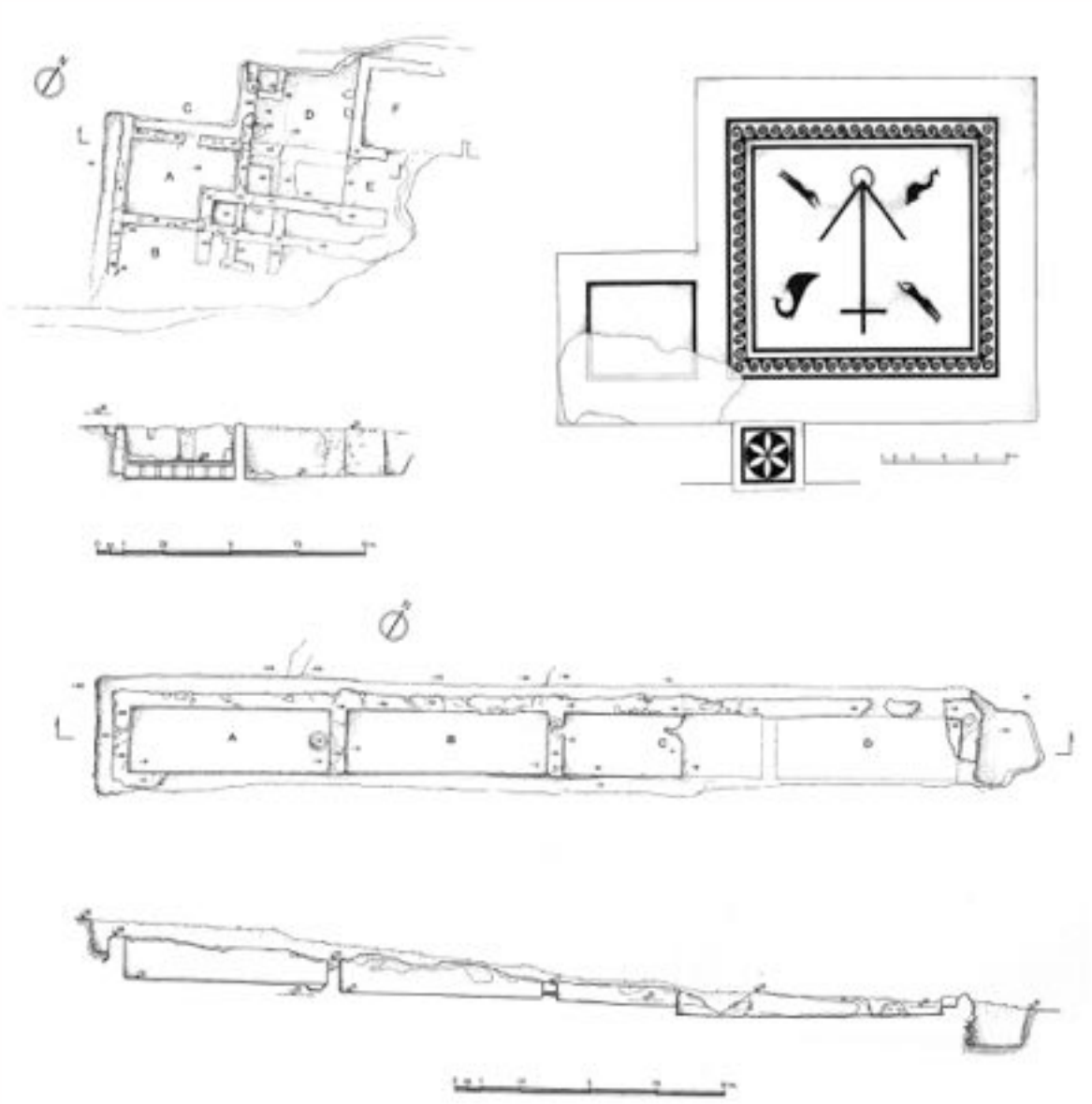


Figure 143 - Map and section of the villa of Ottaviano at Bosco De Siervo (cat. n. OTT008; source: Cicirelli 1995).

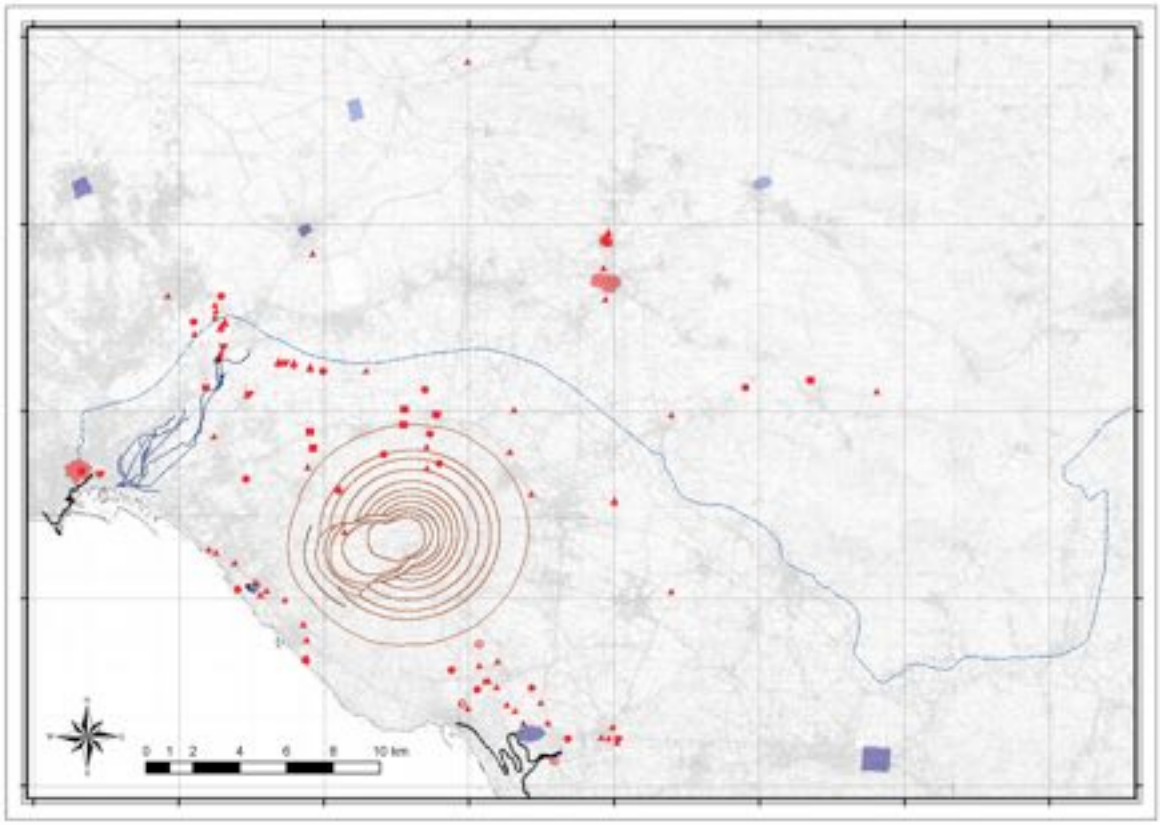


Figure 144 - Archaeological map of the post-AD 79 sites.

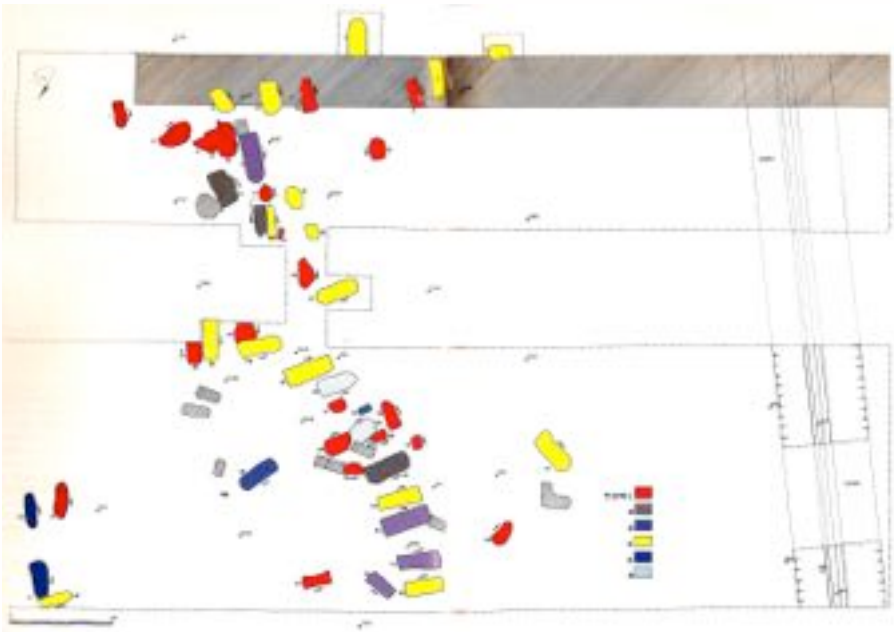


Figure 145 - Map of the burials at the site of Ponticelli via Botteghelle (cat. n. NAP002; source: De Stefano 1987).



Figure 146 - Centurial grids of ancient southern Campania as hypothesised by the Bisontins (in the original publication each grid 'floats' on a white background with no contextual information, thus each of them has been georeferenced and superimposed on the others in order to be used).

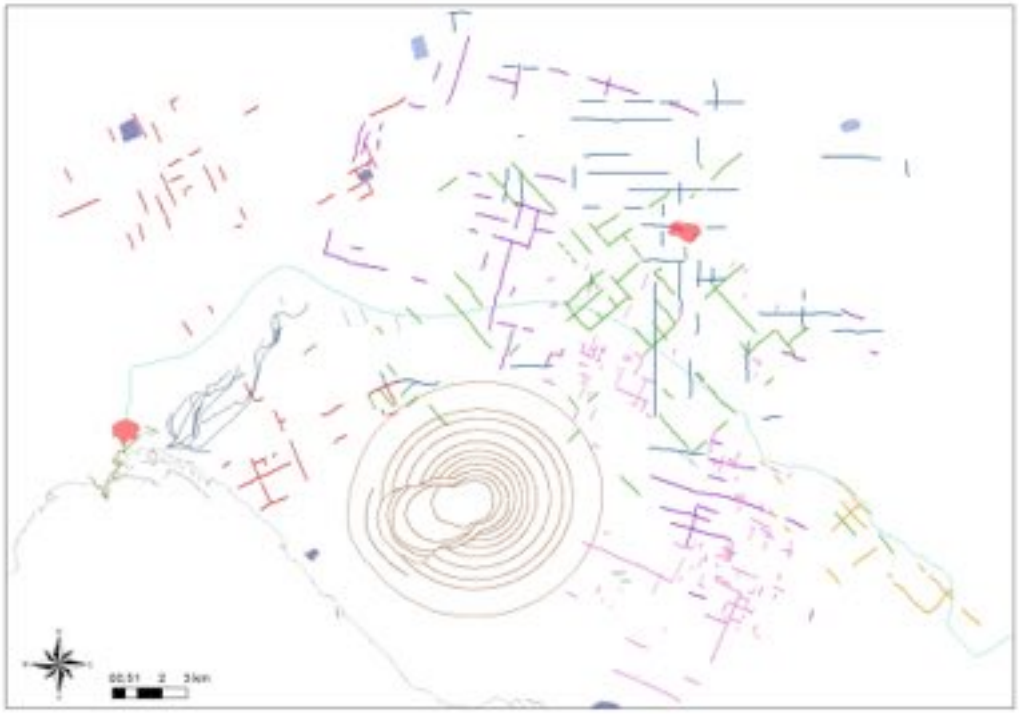


Figure 147 - The actual evidence identified by the Bisontins for the construction of the grids.

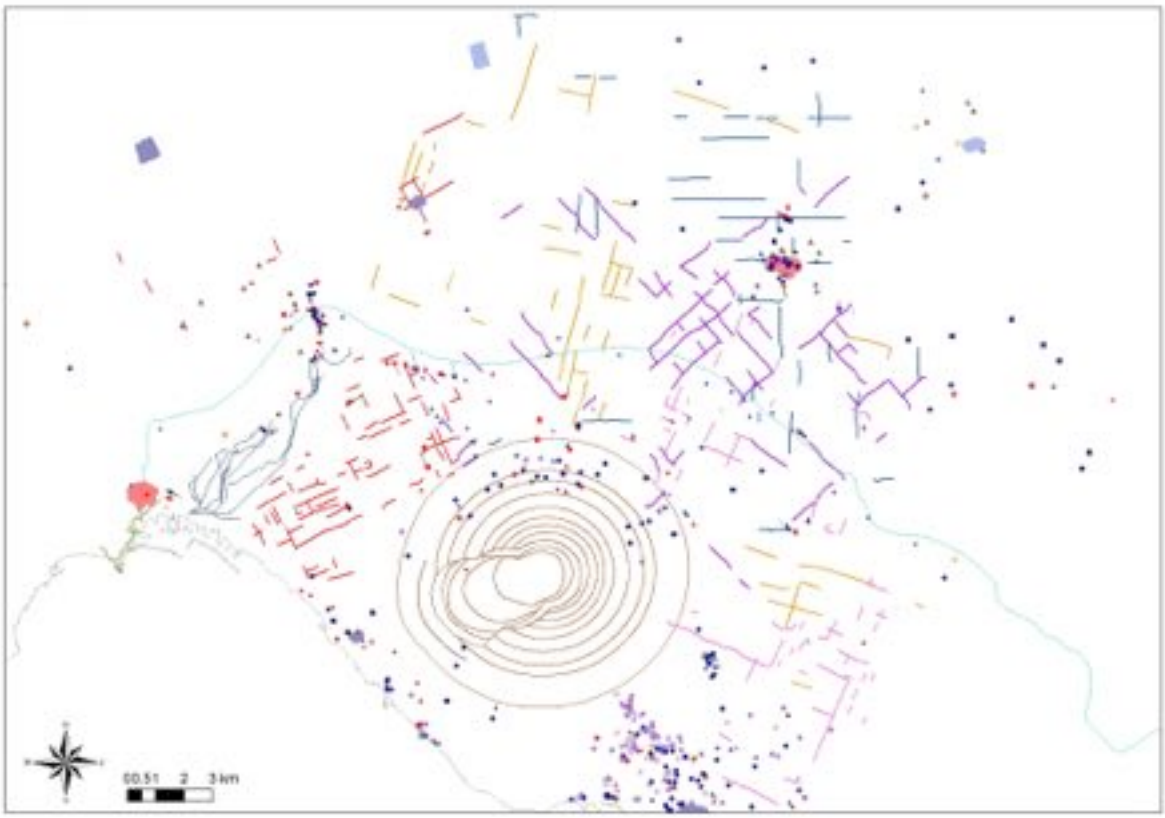


Figure 148 - The evidence for the grids found in the Bourbon maps with superimposition of the archaeological map.



Figure 149 - Centuriation grid of Neapolis as hypothesised by the Bisontins.

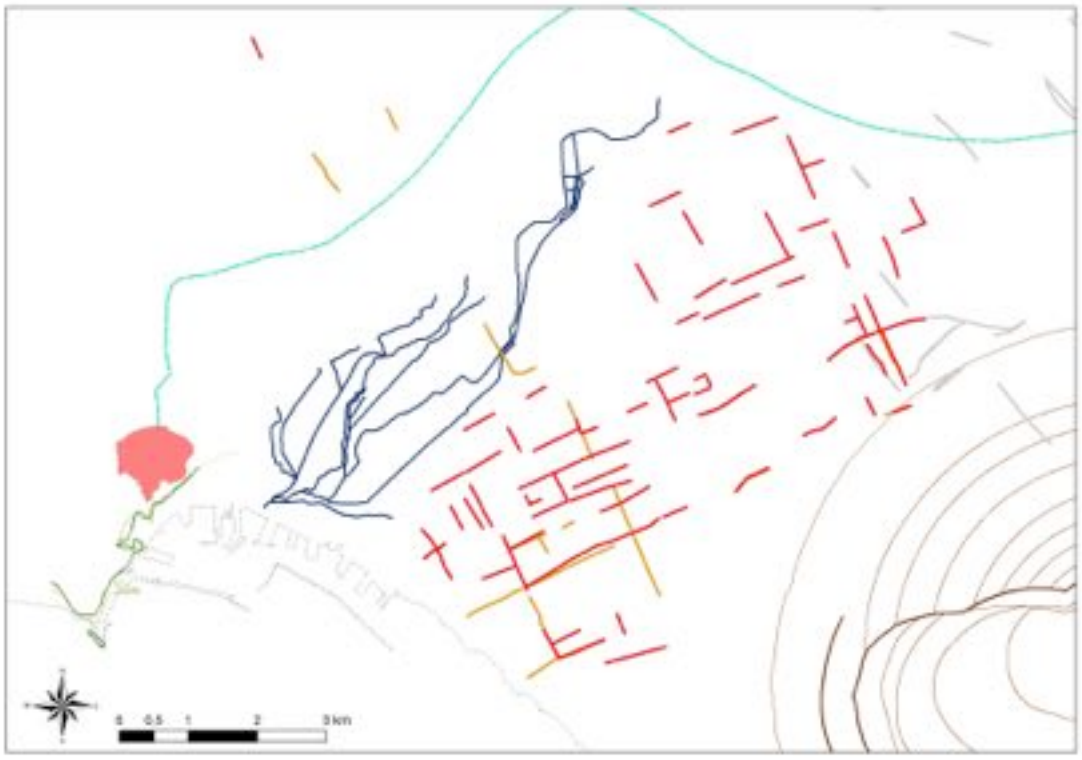


Figure 150 - Traces of the centuriation of Neapolis as identified by the Bisontins (orange) and by the author (red) from the Bourbon maps.

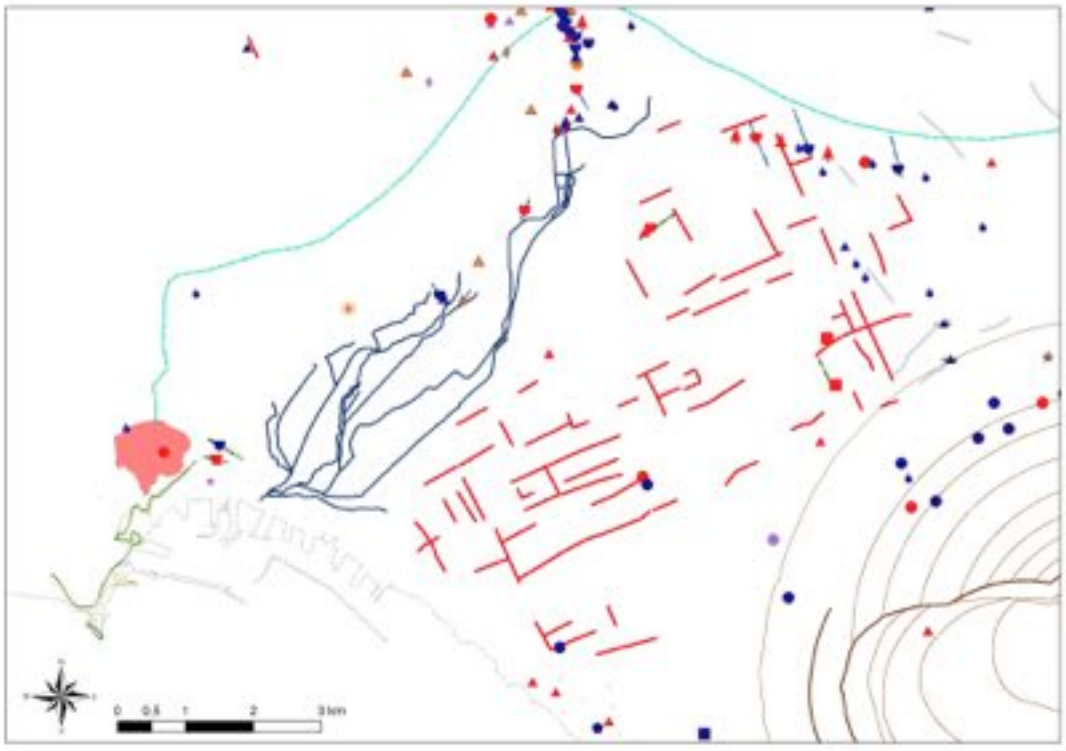


Figure 151 - Archaeological map of the Neapolitan countryside with superimposition of the traces of the centurial grid from the Bourbon maps.



Figure 152 - Traces of the centuriation of Nola I as identified by the Bisontins (orange) and by the author (red) from the Bourbon maps.

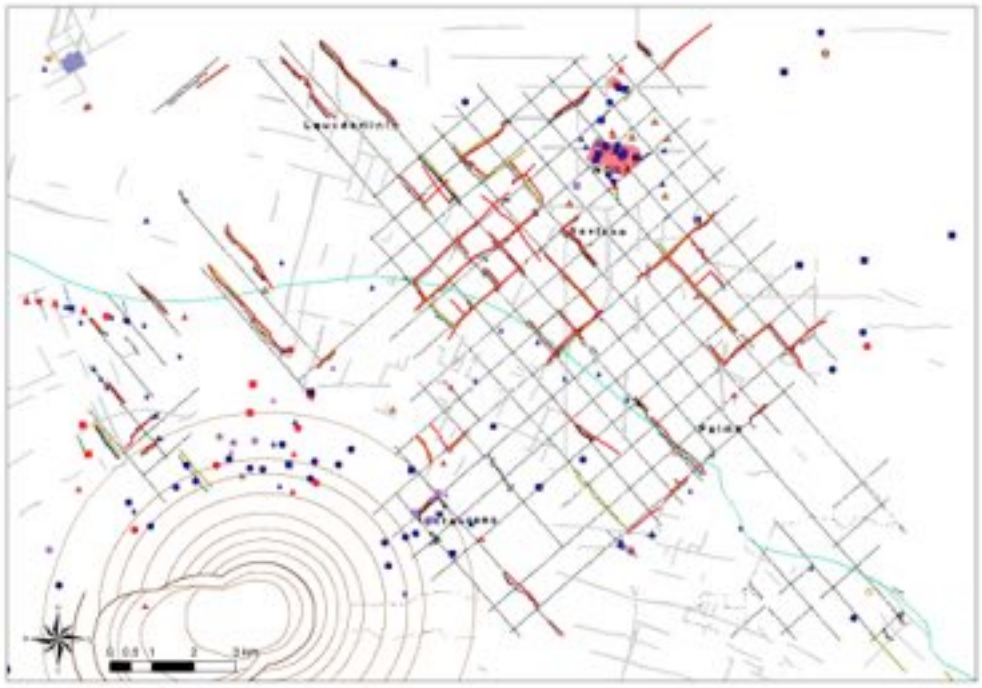


Figure 153 - Traces of the centuriation of Nola II as identified by the Bisontins (orange) and by the author (red) from the Bourbon maps.

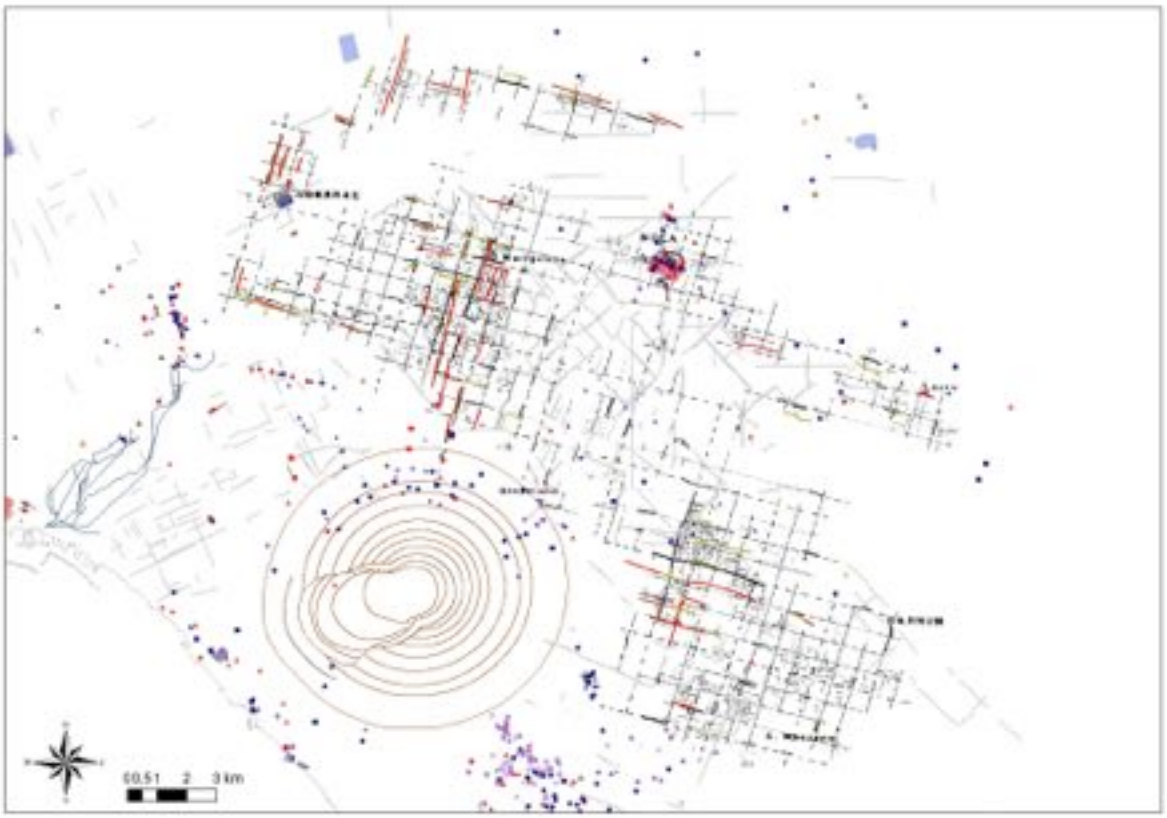


Figure 154 - Traces of the centuriation of Nola III as identified by the Bisontins (orange) and by the author (red) from the Bourbon maps.

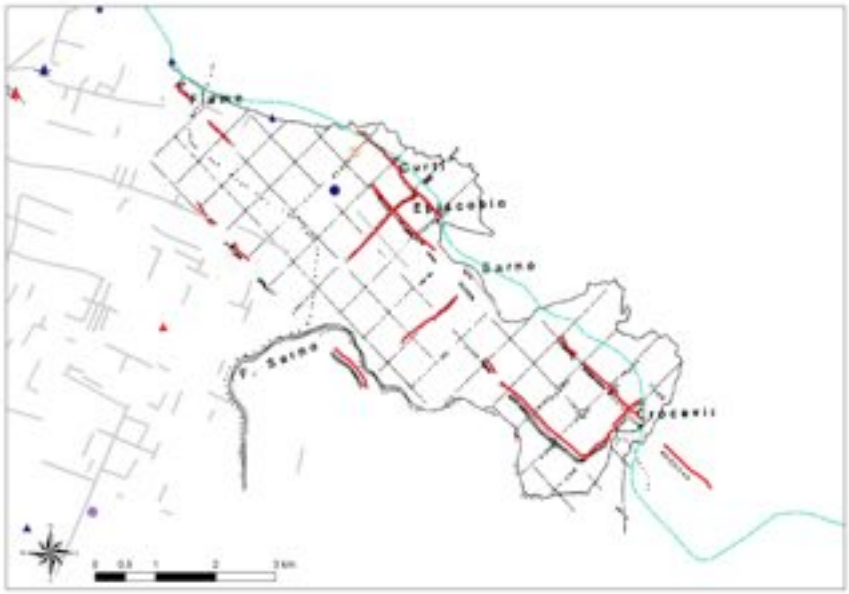


Figure 155 - Traces of the centuriation of Nola IV as identified by the Bisontins (orange) and by the author (red) from the Bourbon maps.

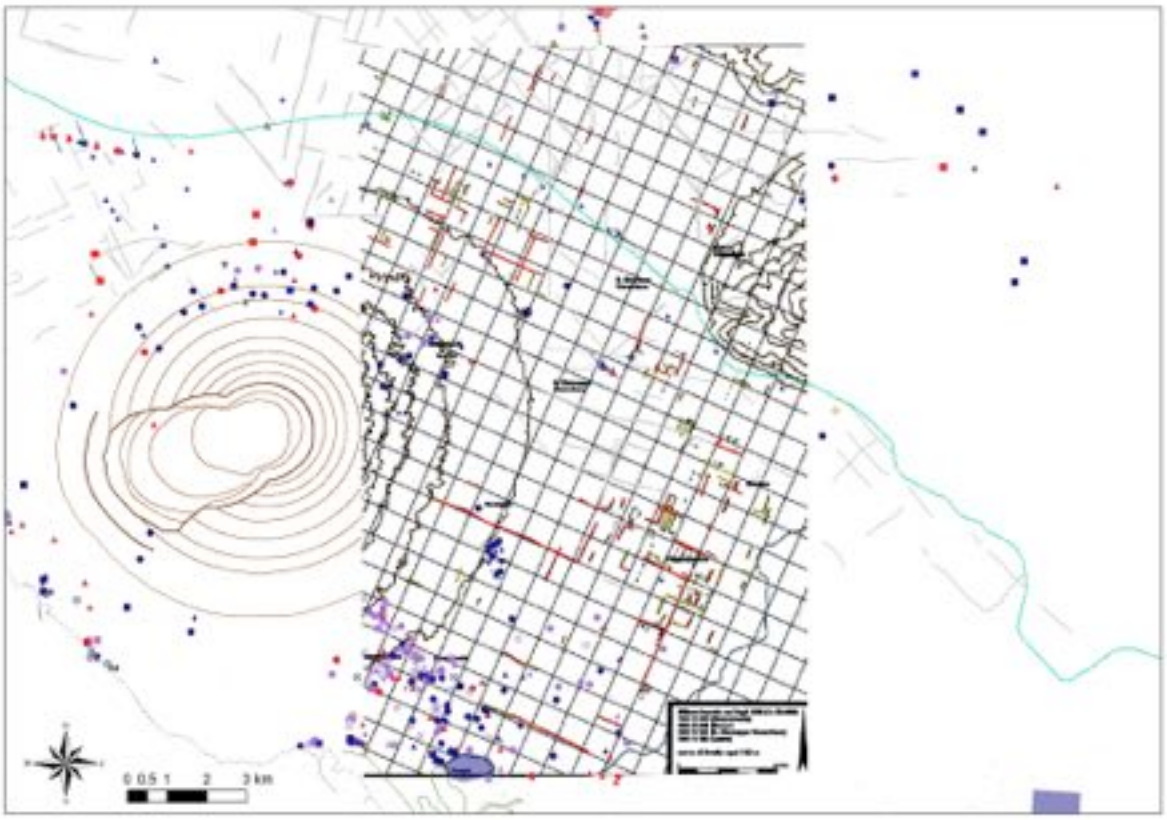


Figure 156 - Traces of the centuriation of Nola D as identified by Soricelli (orange) and by the author (red) from the Bourbon maps.

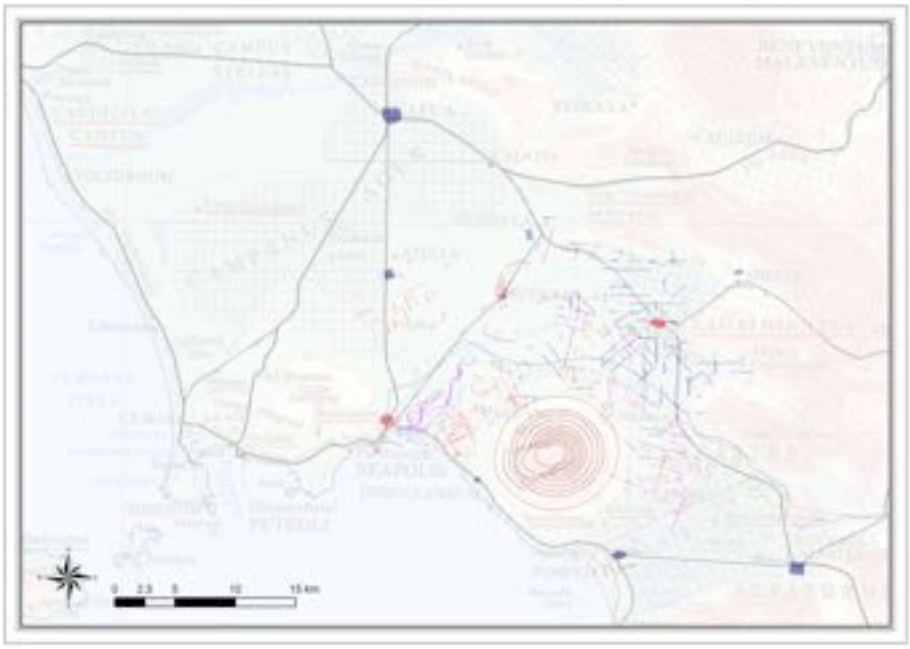


Figure 157 - Network of main roads in ancient Campania.

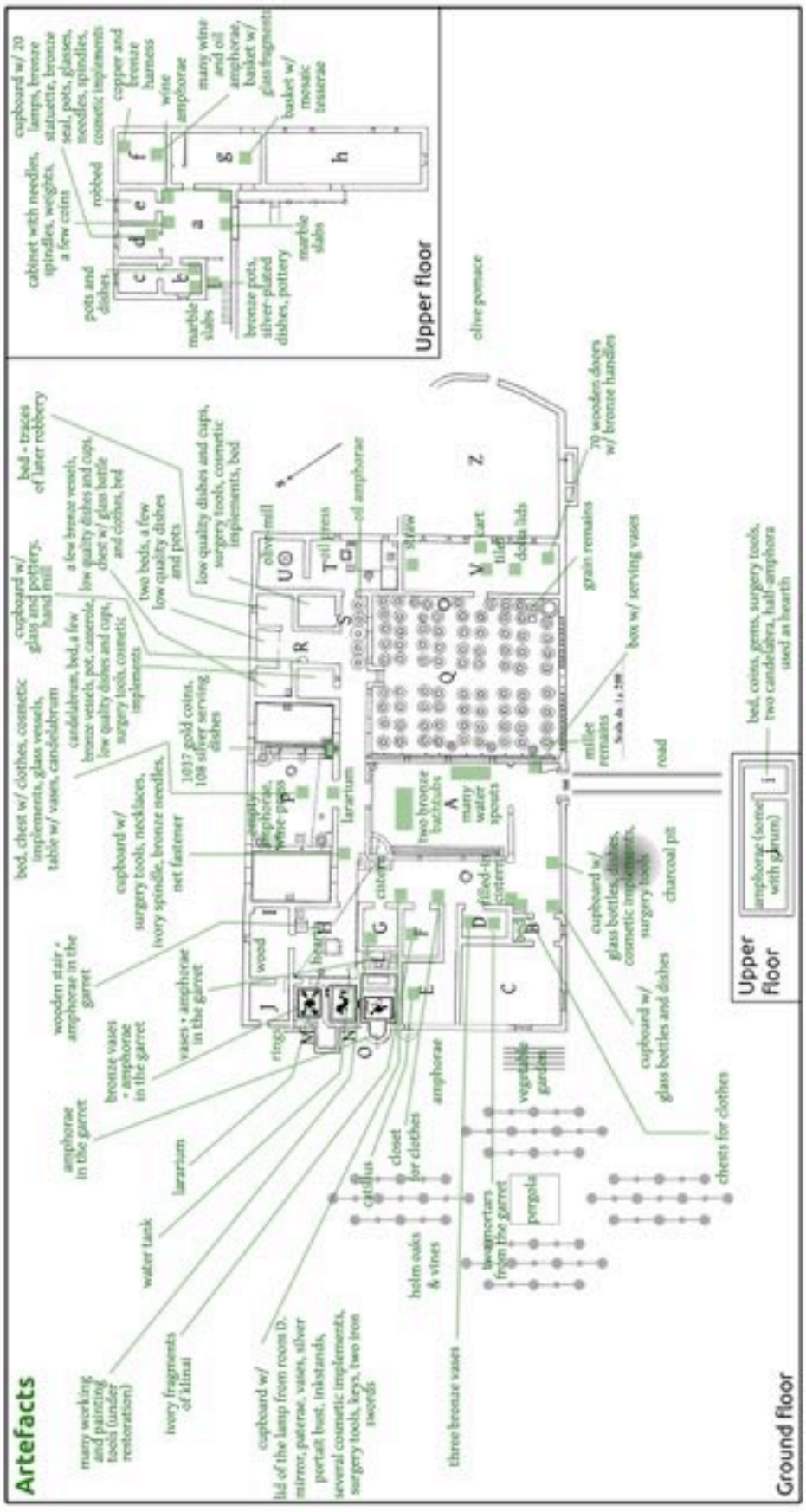


Figure 158 - Villa della Pisanella, thematic map of the artefacts.

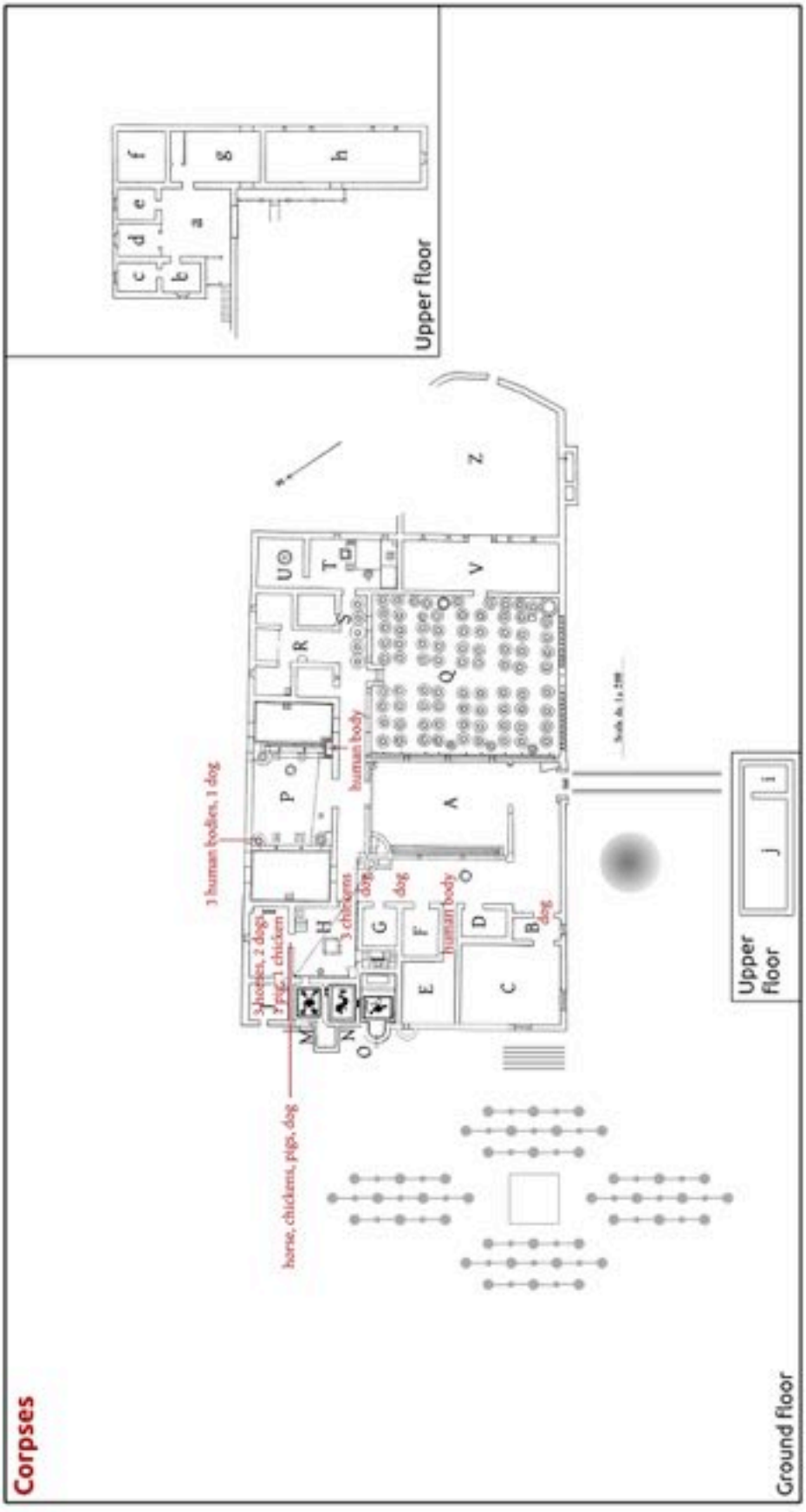


Figure 159 - Villa della Pisanella, thematic map of the corpses.

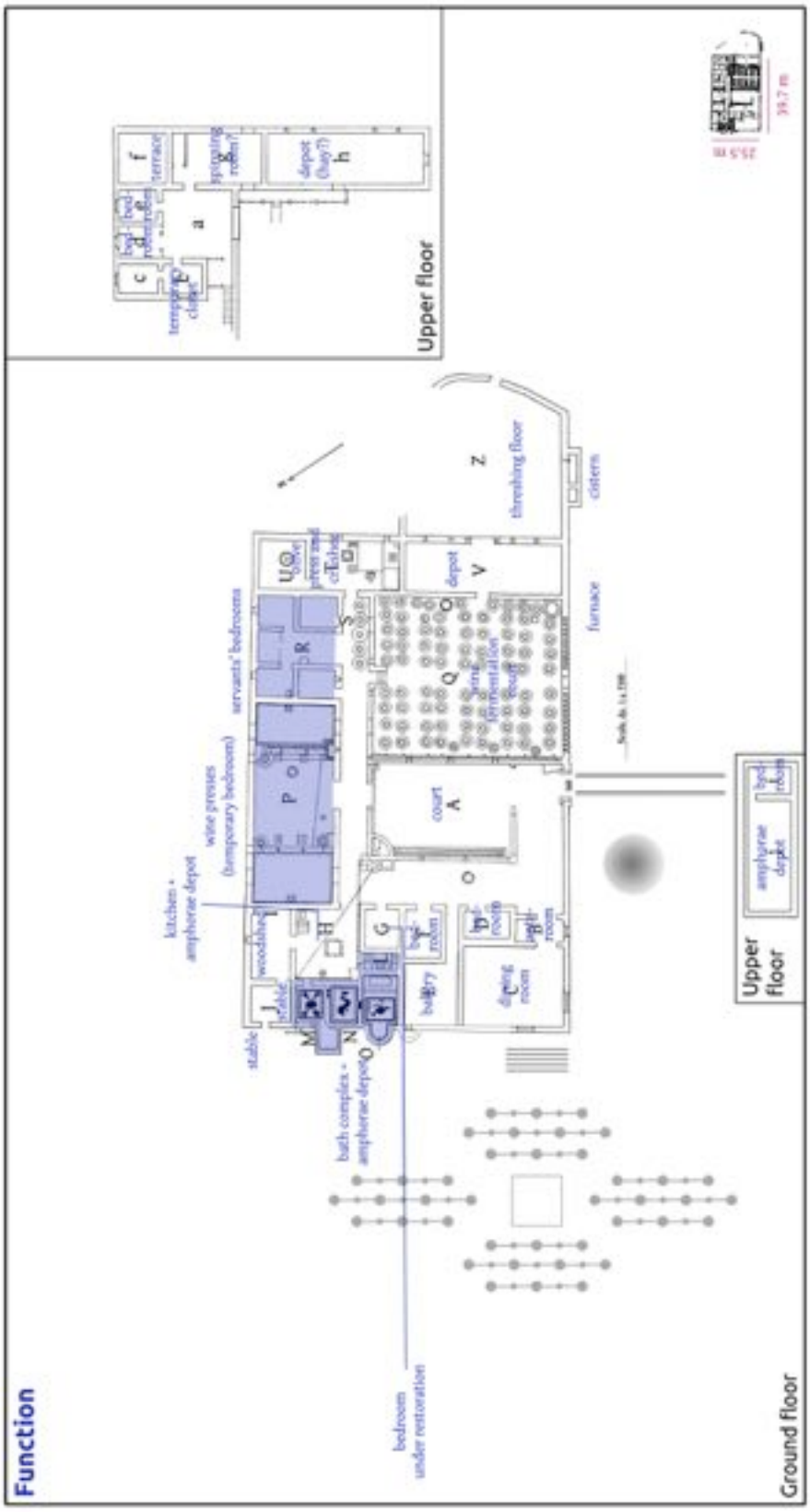


Figure 160 - Villa della Pisanella, thematic map of the rooms' functions.



Figure 161 - Thematic map of Villa Regina at Boscoreale.

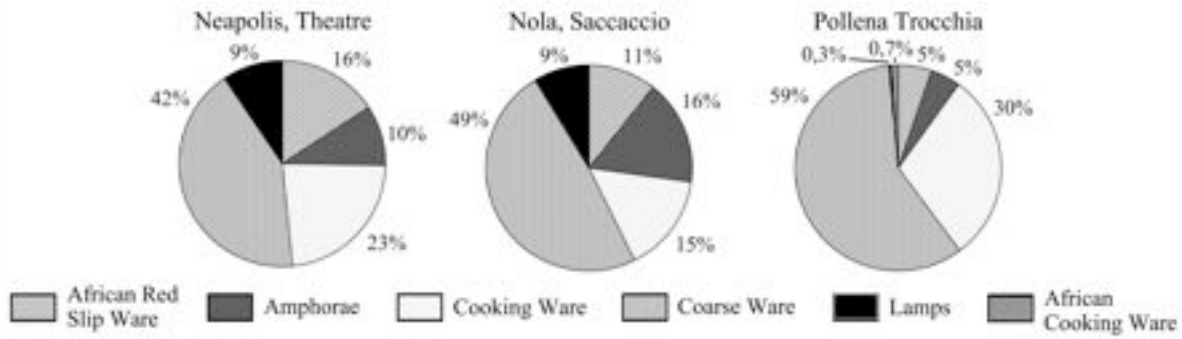


Figure 162 - Pie charts of pottery classes found in the contexts of the 5th c. AD in three sites of Campania.



Figure 8 - Map of ancient Campania according to the Barrington Atlas of the Greek and Roman World (Talbert 2000, table 44, detail)

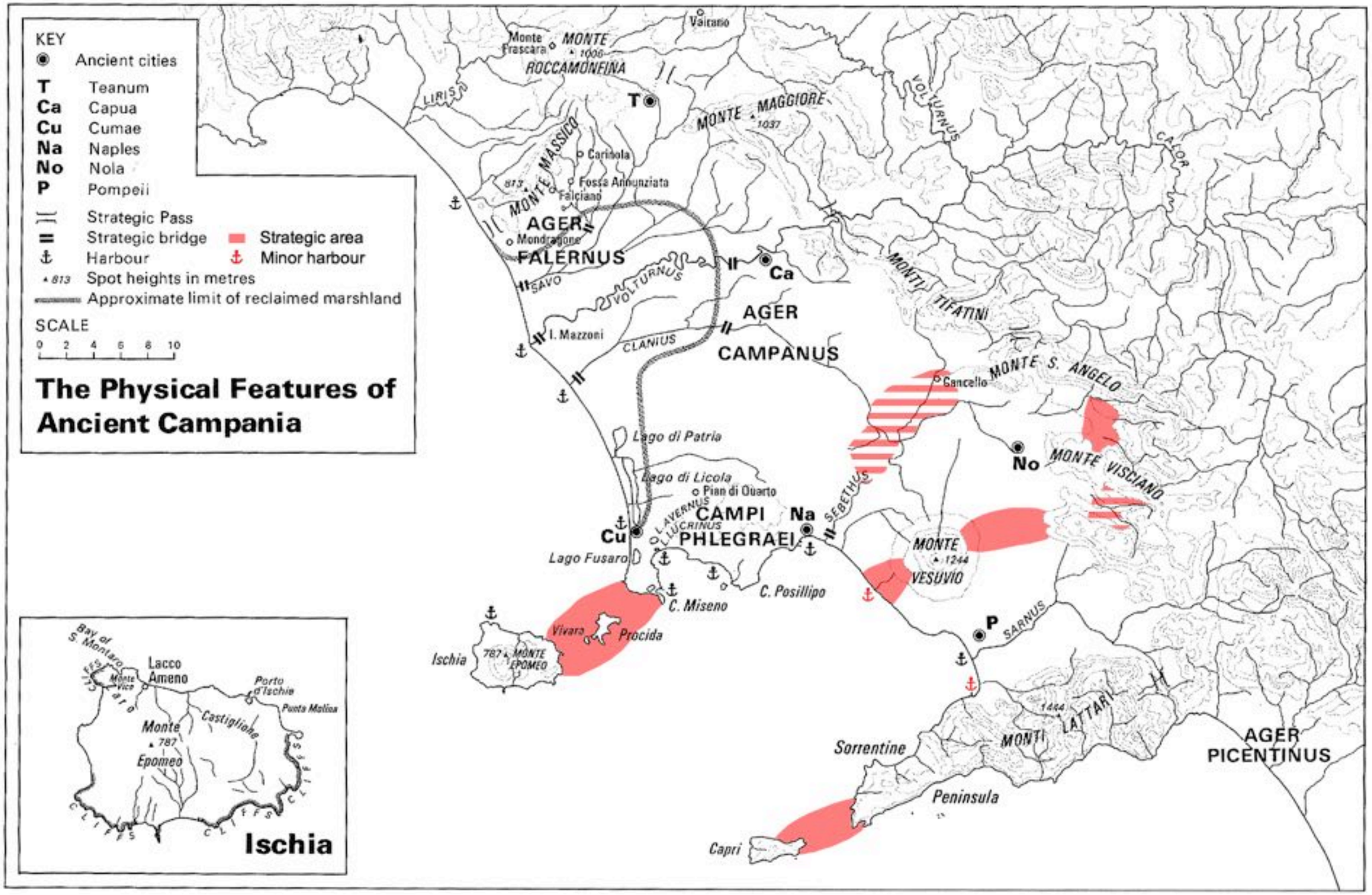


Figure 11 – Map of the physical features of Campania with strategic passes, harbours and areas (modified from Frederiksen 1984, map 1)

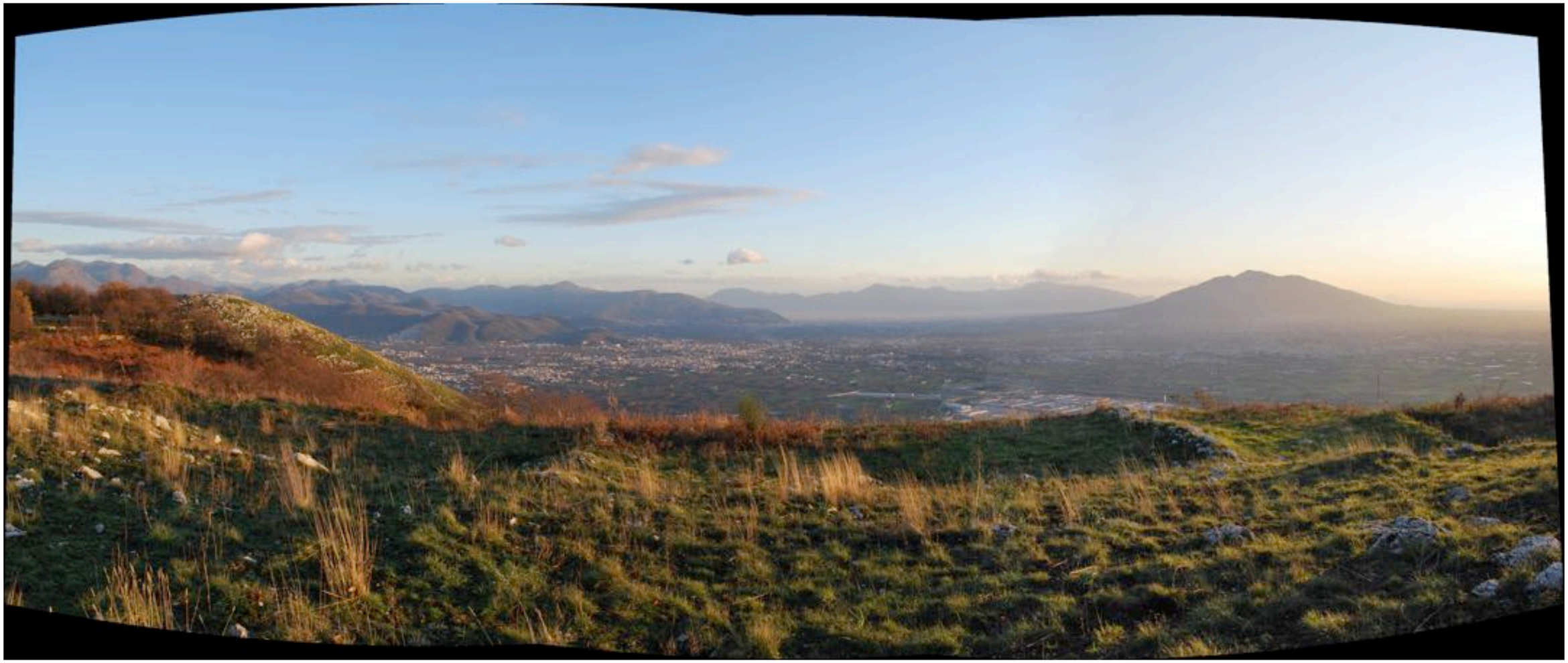


Figure 15 - Composite panoramic photo of the northern flanks of Vesuvius and the Nolan Apennines from San Felice a Cancello, località Palombara.

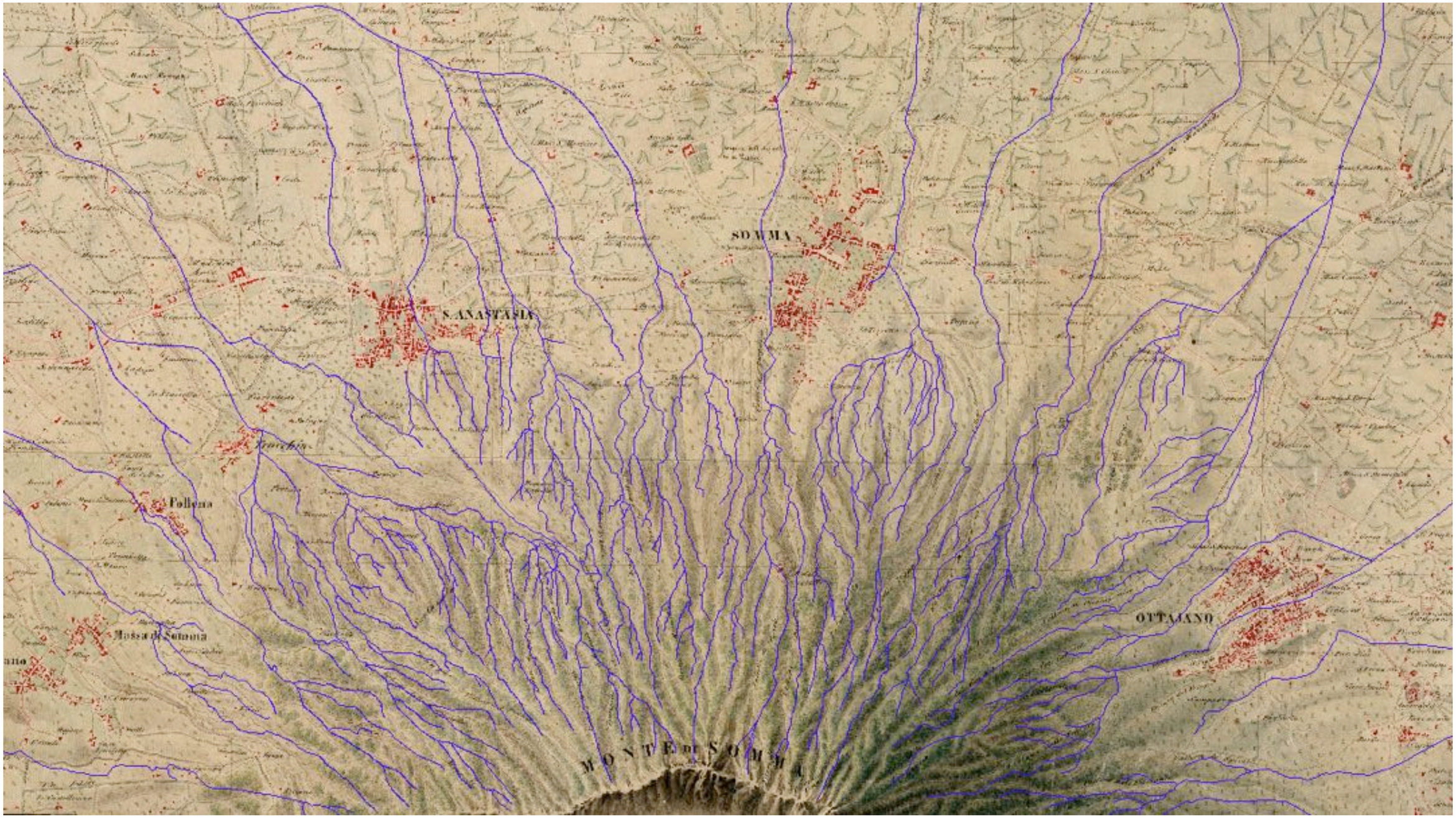
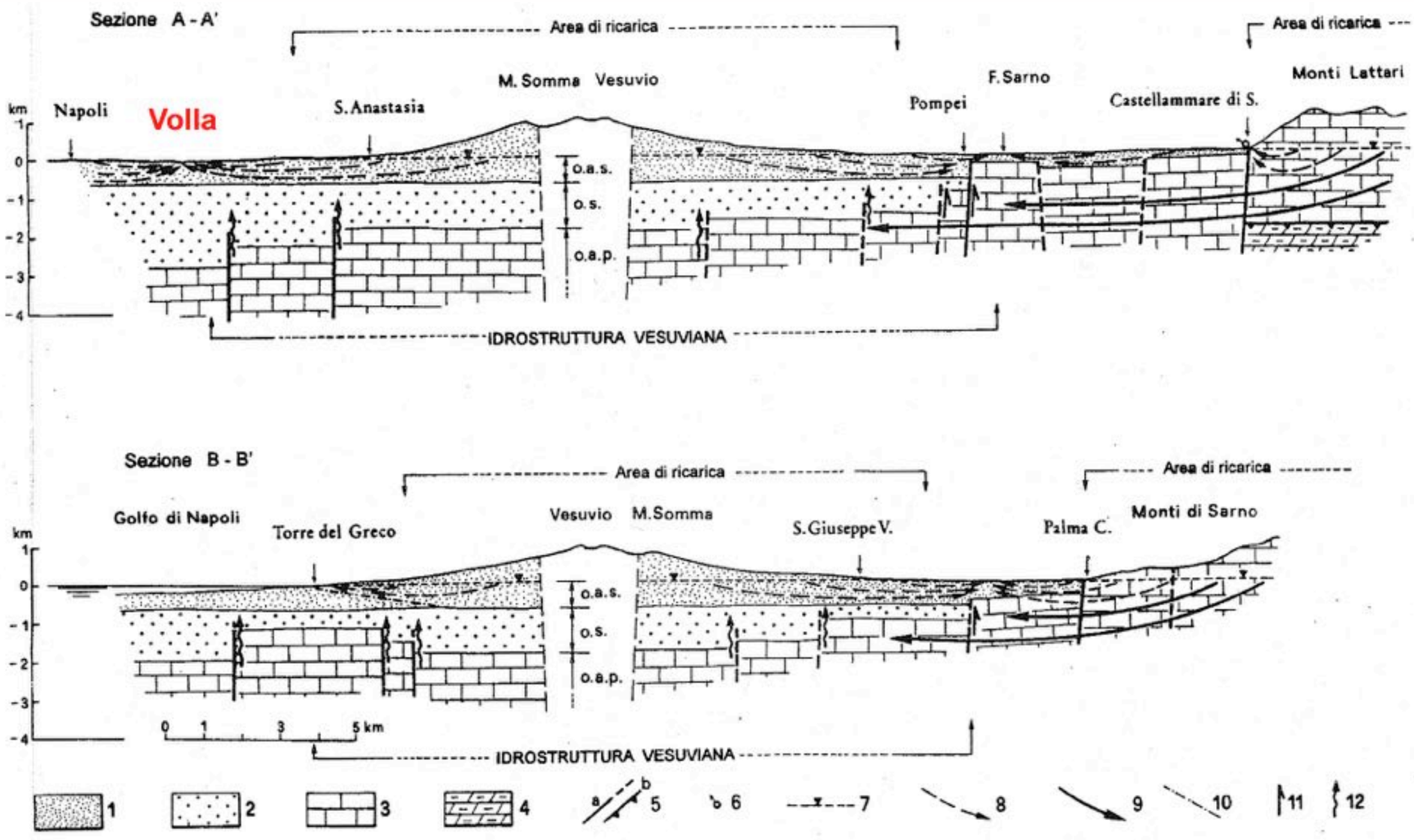


Figure 32 – Composite map of the north slope of Vesuvius in 1836 with present hydrological features (blue lines). The modern streams cross the ancient gullies in the uppermost part of the volcano, but in the lowermost part they roughly correspond to the ancient ones.



Sezioni idrogeologiche schematiche: 1) Prodotti eruttivi, depositi marini, detritici e depositi alluvionali del Quaternario (o.a.s.: orizzonte acquifero superficiale). 2) Depositi argillosi marini, prodotti eruttivi, depositi clastici e terrigeni del Quaternario-Miocene (o.s.: orizzonte semipermeabile). 3) Rocce carbonatiche del Mesozoico (o.a.p.: orizzonte acquifero profondo). 4) Rocce calcareo-silico-marnose delle «Unità Lagonegresi» (orizzonte complessivamente impermeabile). 5) Principali discontinuità tettoniche: a) principali faglie dirette; b) sovrascorrimento. 6) Sorgenti. 7) Livello piezometrico. 8) Circuiti idrici sotterranei superficiali. 9) Circuiti idrici sotterranei profondi. 10) Interfaccia acqua dolce-acqua salata. 11) Risalite particolarmente concentrate di fluidi profondi. 12) Risalite di fluidi profondi.

Figure 46 - Schematic sections of hydrological features of Vesuvius (Source: Celico 1998: 9, fig. 5).

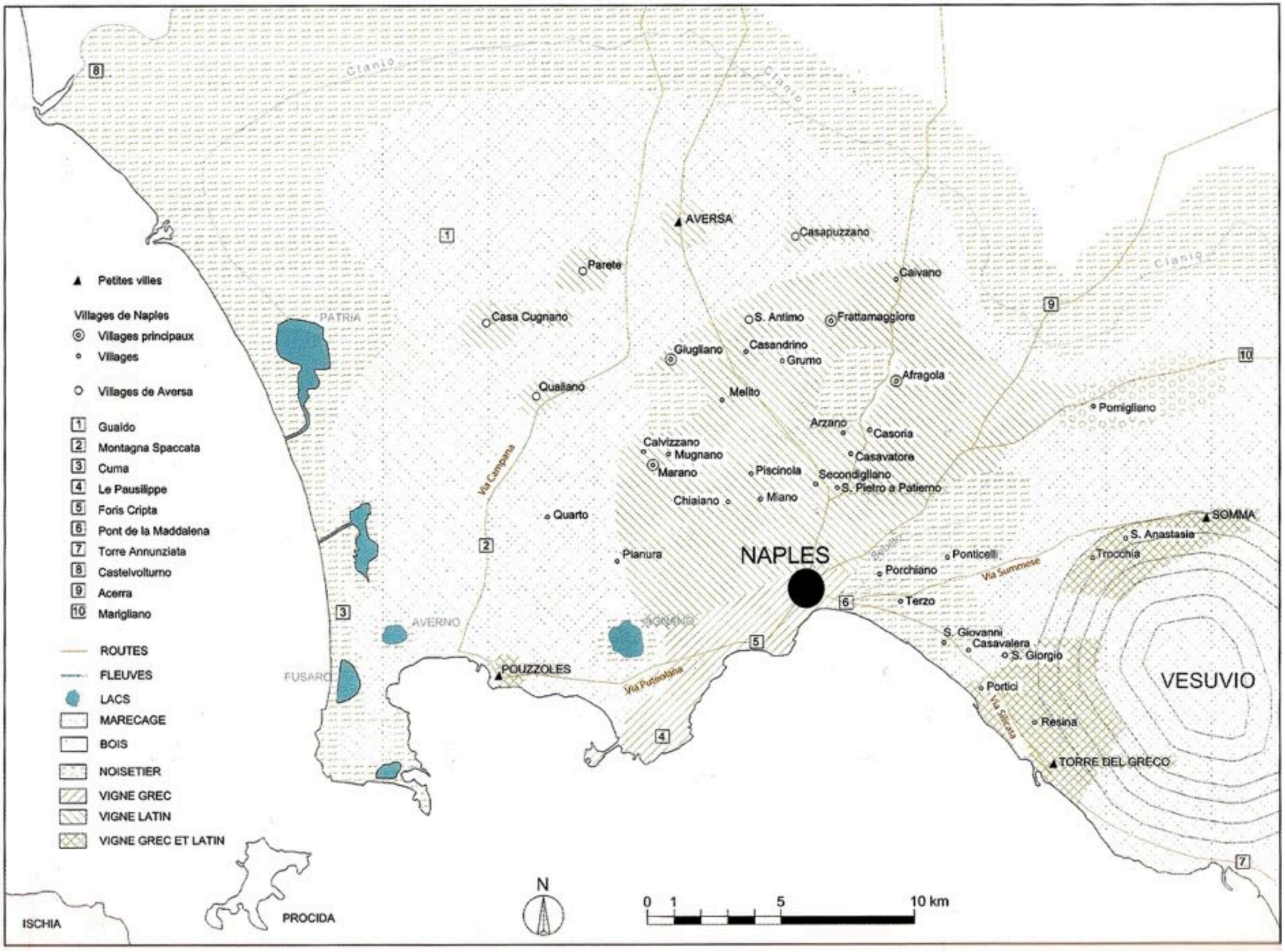


Figure 58 – The Neapolitan landscape in the 14th-15th centuries (Source: Feniello 2005, tab.1).

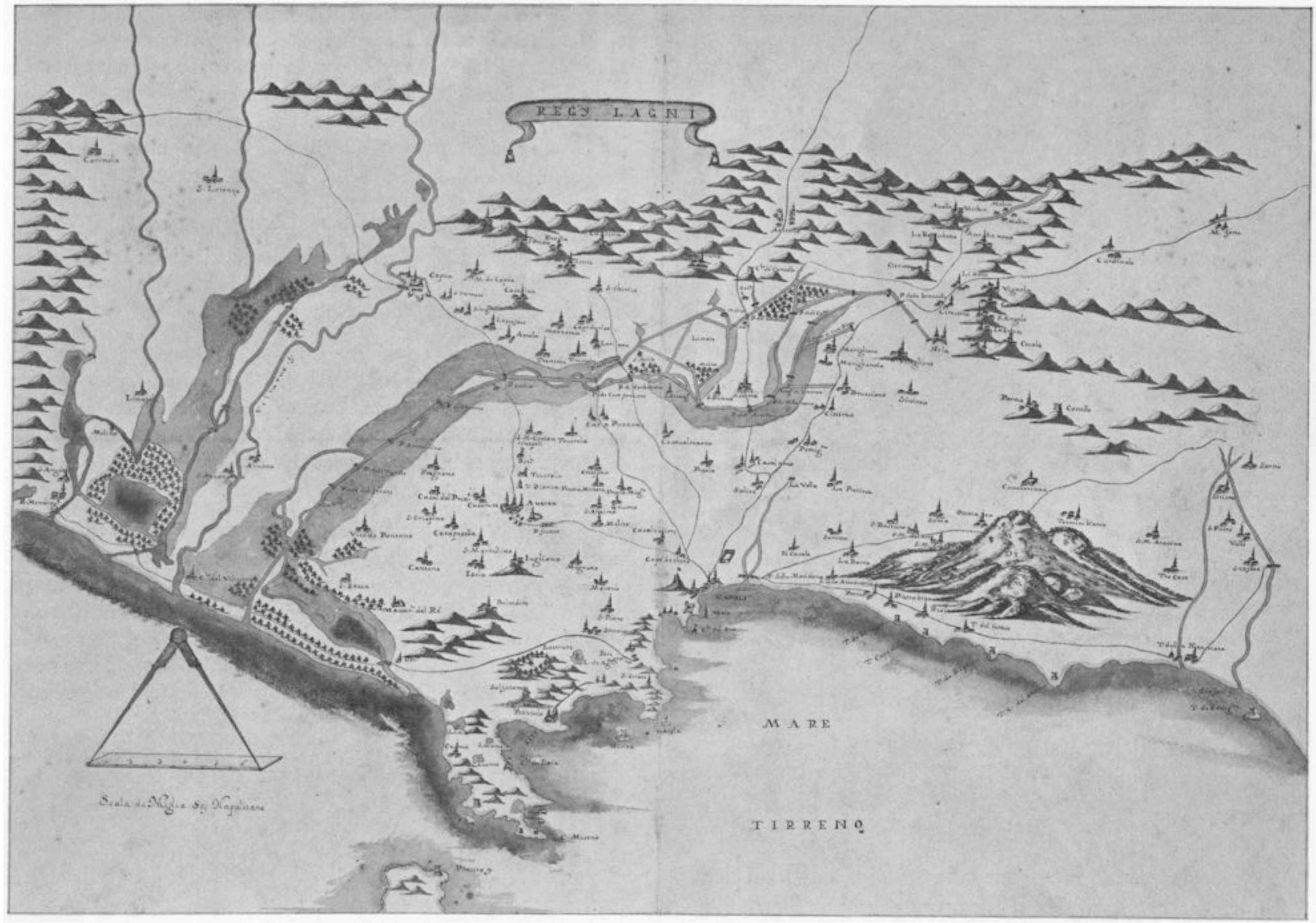


Figure 61 – M. Cartaro, Regy Lagni (1616 ca.).

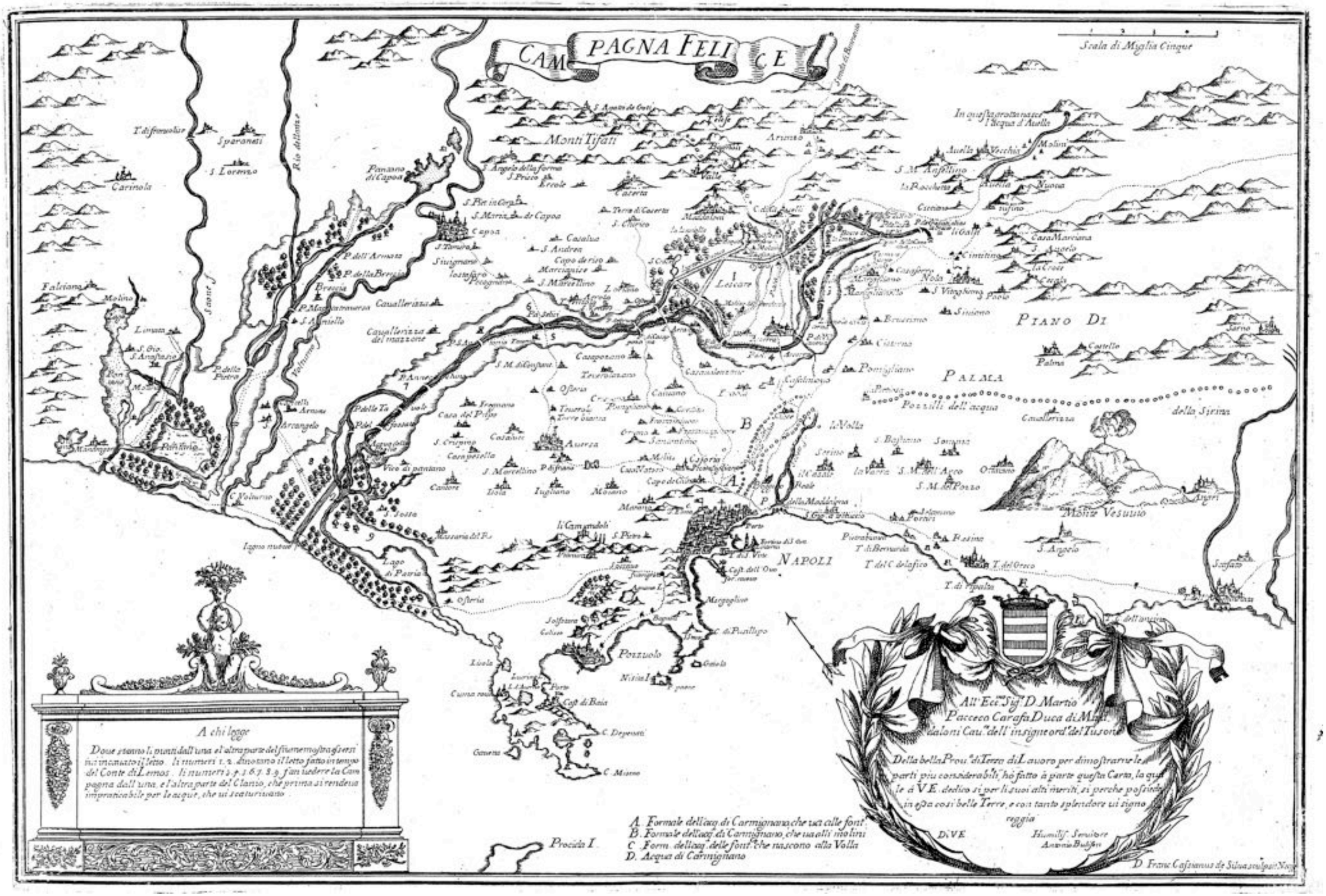


Figure 62 – De Silva – Bulifon, Campagna Felice, 1692.

CRATERE
MARITTIMO, O PARTE DEL
GOLFO DI NAPOLI
Estratto dal Capt.n D. Carlo Weber ridotto, e rettificato
da D. Gius.e Liberoti, sotto la direzzione del Colonn.o Prof.re
Militare D. Roc.o Gioach.o de Alcubierre,
Secondo le misure itinerarie, e le osservazioni di
Monsig.r Ottavio Ant.o Bayardi.
Scala di 3000. Tese.
Scala di 6. miglia Italiane.
Incise da P. Gaultier. 1754

Figure 64 – Karl Weber, Cratere Marittimo (1754).

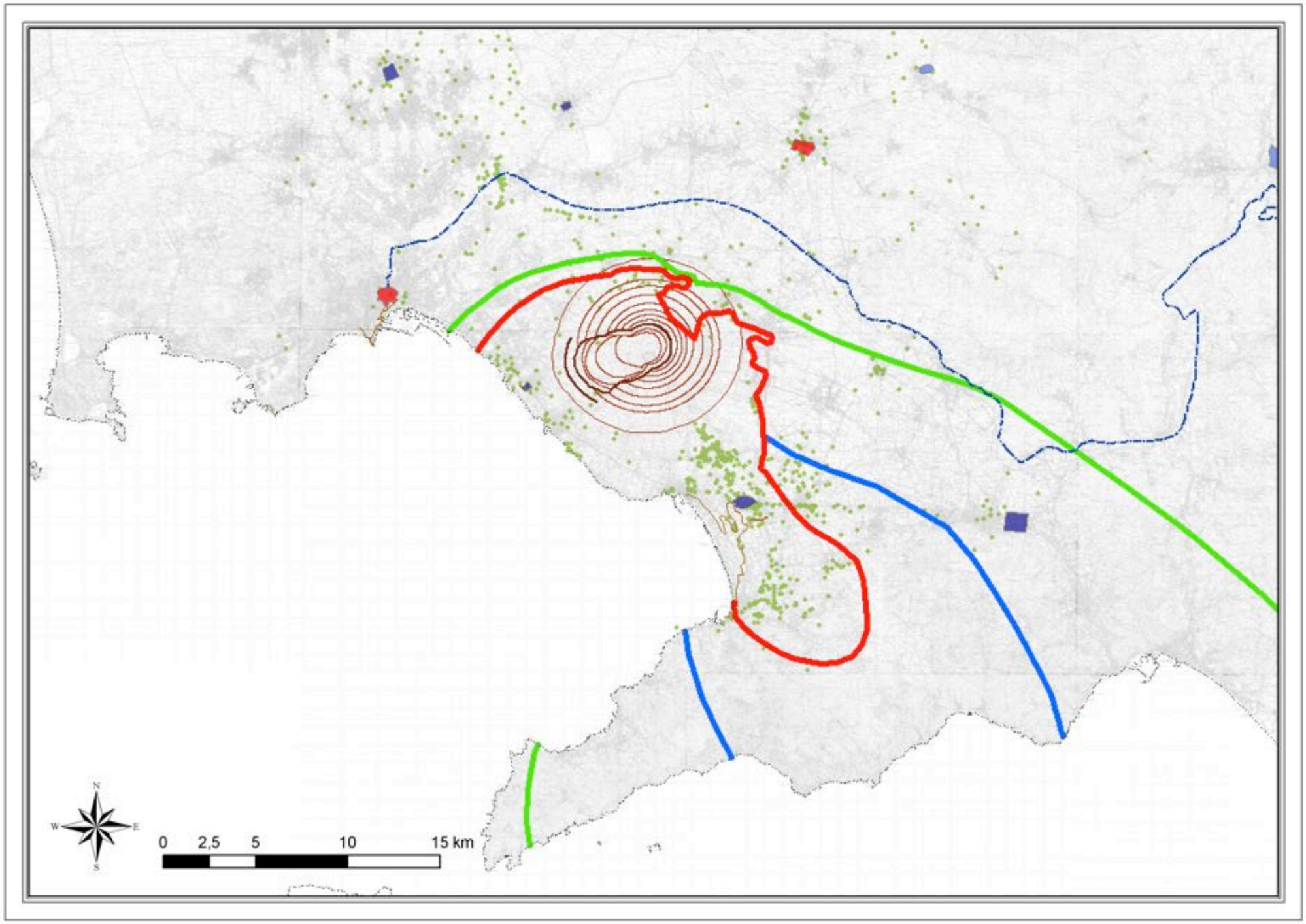
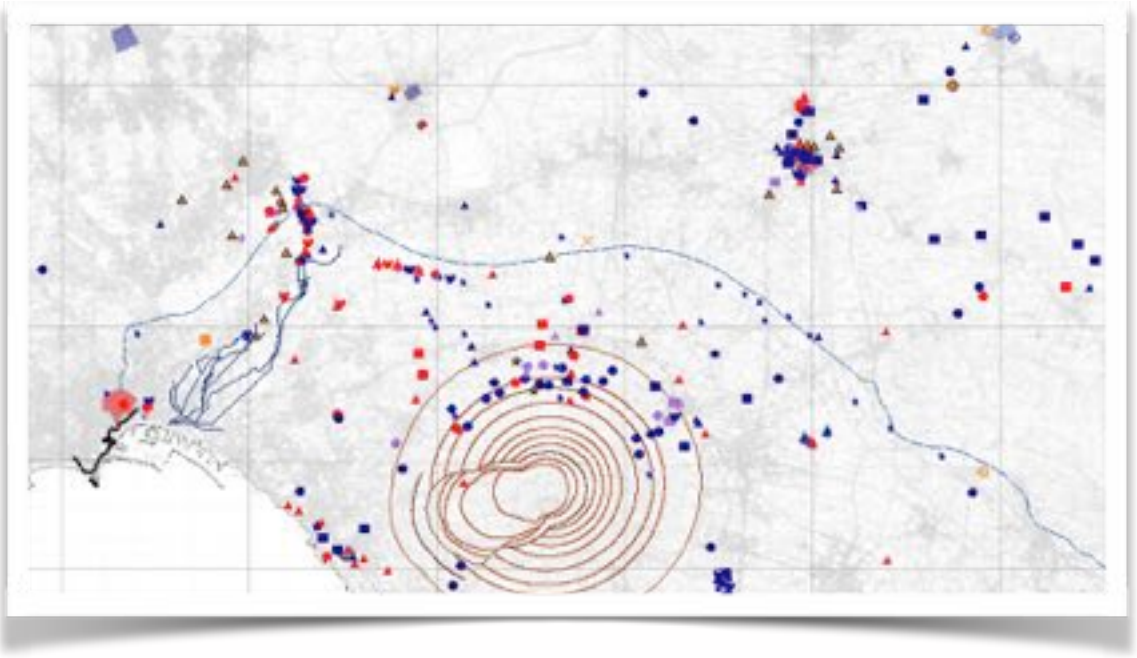


Figure 110 – Cumulative map of the effects on crops. In red: all vegetation killed; in blue: most vegetation killed, some recovery; in green: minor damage to cultivations.

The Dark Side of Vesuvius:
Landscape Change and the Roman Economy
Site gazetteer

Girolamo Ferdinando De Simone



A thesis submitted for the degree of
Doctor of Philosophy
at the University of Oxford

St. John's College
Michaelmas Term 2014

ACE001

Town Acerra
Località via Pinna
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation
Category 03 - burial
Description 16 Late Antique burials

References GIS Regione: 184INE267

ACE002

Town Acerra
Località via Pinna
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 04 - waterworks
Description 3rd-2nd c. BC drainage channels

References GIS Regione: 184INE267

ACE003

Town Acerra
Località via Calabria
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description Early Imperial necropolis

References GIS Regione: 184INE270

ACE004

Town Acerra
Località via Volturno
Date Pre-Roman

Localization Excellent **Investigation** Rescue excavation
Category 08 - road
Description 3rd c. BC road (E10°S) with burials and drainage channel

References GIS Regione: 184INE268

AFR001

Town Afragola
Località Taglia
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Serino aqueduct

References GIS Regione: 184ISE162

AFR002

Town Afragola
Località Salice
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (N30°W)

References GIS Regione: 184ISE129

AFR003

Town Afragola
Località Salice
Date Pre-Roman

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Hellenistic-Republican E-W centurial axis

References GIS Regione: 184ISE62

AFR004

Town Afragola
Località Cimino
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description N-S ploughing furrows

References GIS Regione: 184ISE150

AFR005

Town Afragola
Località Cimino
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (NW-SE)

References GIS Regione: 184ISE149

AFR006

Town Afragola
Località Masseria Aiello
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description Late Antique ploughing furrows (NW-SE) and well

References GIS Regione: 184ISE144

AFR007

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (N26°W)

References GIS Regione: 184ISE141

AFR008

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (NW-SE)

References GIS Regione: 184ISE8

AFR009

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (NW-SE)

References GIS Regione: 184ISE106

AFR010

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (N27°W)

References GIS Regione: 184ISE102

AFR011

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (NW-SE) and burial

References GIS Regione: 184ISE109

AFR012

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (N27°W)

References GIS Regione: 184ISE103

AFR013

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (NW-SE) 4 m wide, drainage channel (3.70 m wide, 2.20 deep) and burial

References GIS Regione: 184ISE111

AFR014

Town Afragola
Località Masseria Aiello
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (ESE-WNW)

References GIS Regione: 184ISE32

AFR015

Town Afragola
Località Masseria Aiello
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description 3rd-5th c. AD tree holes

References GIS Regione: 184ISE155

AFR016

Town Afragola
Località Masseria Aiello
Date Pre-Roman

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Hellenistic drainage channel (NW-SE), 2.40 m wide, 1.70 m deep, covered by a Roman centurial axis with same orientation

References GIS Regione: 184ISE108

AFR017

Town Afragola
Località Masseria Aiello
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 24 late antique burials

References GIS Regione: 184ISO30

AFR018

Town Afragola
Località La Taglia
Date Roman pre-79

Localization Good **Investigation** Rescue excavation

Category 04 - waterworks

Description T-shaped drainage channel. The largest branch is 3 m wide and is E-W oriented, the other is 2 m wide and is NE-SW oriented

References GIS Regione: 184ISE159

AFR019

Town Afragola
Località La Taglia
Date Roman post-79

Localization Good **Investigation** Rescue excavation

Category 03 - burial

Description 3rd c. AD burial

References GIS Regione: 184ISE165

AFR020

Town Afragola
Località la Taglia
Date Roman pre-79

Localization Good **Investigation** Rescue excavation

Category 04 - waterworks

Description Two NW-SE drainage channels, the first of which is 1.30 m wide and .80 deep

References GIS Regione: 184ISO34

AFR021

Town Afragola
Località la Taglia
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (E-W) and burial

References GIS Regione: 184ISE166

AFR022

Town Afragola
Località la Taglia
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Centurial axis (E-W)

References GIS Regione: 184ISE167

AFR023

Town Afragola
Località la Taglia
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 3rd-4th c. AD burial

References GIS Regione: 184ISO32

AFR024

Town Afragola
Località la Taglia
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Pre-79 centurial axis and two 3rd c. AD burials

References GIS Regione: 184ISO41

AFR025

Town Afragola
Località Saggese
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Two paths, the first N56°E, the second N70°E

References GIS Regione: 184ISO39

AFR026

Town Afragola
Località Saggese
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse with late antique necropolis

References GIS Regione: 184ISO38

AFR027

Town Afragola
Località Cantariello
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 5 burials (2nd-3rd c. AD)

References GIS Regione: 184ISO20

AFR028

Town Afragola
Località Cantariello
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Hellenistic pottery

References GIS Regione: 184ISO8

AFR029

Town Afragola
Località Cantariello
Date Roman

Localization Good **Investigation** Reference
Category 03 - burial
Description Several burials of unclear dating

References GIS Regione: 184ISO6

AFR030

Town Afragola
Località Cantariello
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description 2nd c. AD farmhouse with torcular

References GIS Regione: 184ISO3

AFR031

Town Afragola
Località Cantariello
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Burial

References GIS Regione: 184ISO4

AFR032

Town Afragola
Località Cantariello
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 6 burials dated to 310 BC ca.

References GIS Regione: 184ISO2

AFR033

Town Afragola
Località Cantariello
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Necropolis (mid-4th c. BC)

References GIS Regione: 184ISO5

AFR034

Town Afragola
Località Cantariello
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Hellenistic necropolis (end 4th c. BC)

References GIS Regione: 184ISO7

AFR035

Town Afragola
Località Mezzomiglio
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 3 Hellenistic burials (4th-3rd c. BC)

References GIS Regione: 184ISO12

AFR036

Town Afragola
Località via Cavallotti
Date Roman post-79

Localization Good **Investigation** Reference
Category 03 - burial
Description 2 burials

References GIS Regione: 184ISO1

AFR037

Town Afragola
Località Cantariello
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 8 Hellenistic burials (310 BC ca.)

References GIS Regione: 184ISO2

AVE001

Town Avella
Località Paenzano
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 01 - farmhouse
Description Hellenistic farmhouse

References GIS Regione: 185IVNE86

AVE002

Town Avella
Località Purgatorio
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 01 - farmhouse
Description Late Republican farmhouse

References GIS Regione: 185IVNE88

AVE003

Town Avella
Località San Nazzaro
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 03 - burial
Description Necropolis from the Orientalising to Late Antiquity. The main group (conocchie) can be dated to the early Imperial period

References

AVE004

Town Avella
Località Santa Candida
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 11 - other buildings
Description Arcaic-Hellenistic Sanctuary

References GIS Regione: 185IVNE46

AVE005

Town Avella
Località Anfiteatro
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 11 - other buildings
Description Roman amphitheatre

References

AVE006

Town Avella
Località Seminario
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 11 - other buildings
Description Samnite-Roman sanctuary

References GIS Regione: 185IVNE44

AVE007

Town Avella
Località Bosco di Castello
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Orientalising necropolis

References GIS Regione: 185-12

AVE008

Town Avella
Località Caulicelle
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 04 - waterworks
Description Roman aqueduct

References

AVE009

Town Avella
Località Forestelle-Fieno
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Orientalising necropolis

References

AVE010

Town Avella
Località Campopiano
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 11 - other buildings
Description Classical-Republican Age Sanctuary

References

BRE001

Town Boscoreale
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman artefacts

References Casale 1979: 35, n. 24

BRE002

Town Boscoreale
Località Balzani
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman necropolis and walls

References Casale 1979: 35, n. 22; Pagano 1995: n. 50

BRE003

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 35, n. 19

BRE004

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 07 - column/statue
Description Roman artefacts and marble statue

References Casale 1979: 36-37, n. 35

BRE005

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 08 - road
Description Roman road

References Casale 1979: 36, n. 34

BRE006

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 48, n. 132

BRE007

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman amphora

References Casale 1979: 44, n. 92

BRE008

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman amphorae and jugs

References Casale 1979: 44, n. 87

BRE009

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 35, n. 18

BRE010

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 34, n. 17

BRE011

Town Boscoreale
Località Massa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Opus spicatum pavement

References Casale 1979: 44, n. 85

BRE012

Town Boscoreale
Località Di Lauro
Date Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman necropolis

References Casale 1979: 34, n. 16

BRE013

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman artefacts

References Casale 1979: 39, n. 51

BRE014

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 39, n. 52

BRE015

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman walls and dolia

References Casale 1979: 39, n. 50

BRE016

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman amphorae

References Casale 1979: 39, n. 49

BRE017

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 39, n. 48

BRE018

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 34, n. 15

BRE019

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman tegulae with stamps

References Casale 1979: 47, n. 124

BRE020

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Artefacts of the Roman and later periods

References Casale 1979: 39, n. 47

BRE021

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman room with alligned amphorae

References Casale 1979: 44, n. 86

BRE022

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Remains of a roman villa

References Casale 1979: 51, n. 162

BRE023

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa rustica of M. Livius Marcellus

References Della Corte 1929: 178-188; Day 1932: 185, tav. C, n. 39; Della Corte 1954: 437 ff.; Rostovzev 1957: 35, nota 26, n. 38; Casale 1979: 33, n. 12

BRE024

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 11 - other buildings
Description Roman perimetral wall

References Casale 1979: 48, n. 130

BRE025

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman necropolis

References Casale 1979: 34, n. 14

BRE026

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa rustica

References Sogliano 1898: 419-422; Day 1932: tav. B, C, n. 15; Rostovzev 1957: 33, nota 26, n. 15

BRE027

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa rustica

References Della Corte 1921: 436-442; Carrington 1931: 116, 122, fig. 16, n. 28; Day 1932: tav. A, C, n. 28; Rostovzev 1957: 34, nota 26, n. 28; Casale 1979:

BRE028

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 31, n. 7

BRE029

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Cella vinaria

References Casale 1979: 33, n. 11

BRE030

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 39, n. 46

BRE031

Town Boscoreale
Località Masseria dei Gesuiti
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Wine amphorae

References Casale 1979: 46, n. 108

BRE032

Town Boscoreale
Località Masseria dei Gesuiti
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Late Antique burial

References Casale 1979: 49, n. 144; Pagano 1995: n. 23

BRE033

Town Boscoreale
Località Masseria dei Gesuiti
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 40, n. 59

BRE034

Town Boscoreale
Località Masseria dei Gesuiti
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 44-45, n. 93

BRE035

Town Boscoreale
Località Sette Termini
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 43, n. 71

BRE036

Town Boscoreale
Località Sette Termini
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 02 - residential villa
Description Villa of P. Fannius Synistor

References Barnabei 1901; Carrington 1931: 112, 119, 127, 129, n.16; Day 1932: 177, 184, 187, tav. B, C, n. 16; Della Corte 1954: 429 ss.; Rostovzev 1957:

BRE037

Town Boscoreale
Località Masseria dei Gesuiti
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 36, n. 31

BRE038

Town Boscoreale
Località Pisanella
Date Roman pre-79

Localization Good **Investigation** Complete excavation
Category 01 - farmhouse
Description Villa della Pisanella (Lucius Cecilius Jucundus)

References NSc 1876: 196; NSc 1877: 17, 96, 128; NSc 1895: 207-214; NSc 1896: 204 -206, 230-236; Pasqui 1897; NSc 1899: 14-16; Carrington 1931: 111, 113,

---

BRE039

Town Boscoreale
Località Palazzo Borzelli
Date Roman pre-79

Localization Good **Investigation** Complete excavation
Category 01 - farmhouse
Description Villa of N. Popidius Florus

References NSc 1921: 442 ss.; Carrington 1931: 111, 112, 119, 127, 129, n. 29; Day 1932: tav. A, B, C, n. 29; Della Corte 1954: 448 ss.; Rostovzev 1957: 34,

---

BRE040

Town Boscoreale
Località Palazzo Borzelli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 4

BRE041

Town Boscoreale
Località Palazzo Borzelli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 45, n. 94

BRE042

Town Boscoreale
Località Palazzo Borzelli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 45, n. 95

BRE043

Town Boscoreale
Località Palazzo Borzelli
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Christian burials

References NSc 1897: 109; Sogliano 1915: 503; Casale 1979: 42, n. 68; Pagano 1995: n. 24

BRE044

Town Boscoreale
Località Regina
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 01 - farmhouse
Description Villa Regina

References Casale 1979: 41, n. 62; De Caro 1994

BRE045

Town Boscoreale
Località Masseria Pennino
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 31, n. 6

BRE046

Town Boscoreale
Località Masseria Pennino
Date Roman post-79

Localization Good
Investigation Accidental discovery
Category 12 - baths
Description Post-79 bath complex

References Sogliano 1915: 498; Cerulli Irelli 1975: 296; Casale 1979: 43, n. 74; Pagano 1995: n. 25

BRE047

Town Boscoreale
Località Masseria Pennino
Date Pre-Roman

Localization Good
Investigation Accidental discovery
Category 03 - burial
Description Pre-Roman necropolis

References Casale 1979: 47, n. 126

BRE048

Town Boscoreale
Località Capone
Date Roman pre-79

Localization Good
Investigation Accidental discovery
Category 03 - burial
Description Funerary monument of the Gens Arria

References NSc 1929: 188-9; Casale 1979: 42, n. 67

BRE049

Town Boscoreale
Località Capone
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman tombs

References Casale 1979: 44, n. 84

BRE050

Town Boscoreale
Località Capone
Date Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman tombs

References Casale 1979: 39, n. 55

BRE051

Town Boscoreale
Località Masseria Tedesco
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls and many tegulae

References Casale 1979: 39, n. 54

BRE052

Town Boscoreale
Località Masseria Tedesco
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Dolium and other Roman pottery

References Casale 1979: 45, n. 97

BRE053

Town Boscoreale
Località la Marchesa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Cocciopesto pavement

References Casale 1979: 48, n. 131

BRE054

Town Boscoreale
Località la Marchesa
Date Pre-Roman

Localization Poor **Investigation** Accidental discovery
Category 03 - burial
Description Pre-Roman necropolis

References Casale 1979: 47, n. 127

BRE055

Town Boscoreale
Località Andriulli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 48, n. 134

BRE056

Town Boscoreale
Località Cuccurullo
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 40, n. 58

BRE057

Town Boscoreale
Località Palazzo Borzelli
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa rustica

References Fergola 1987; Fergola 1988

BRE058

Town Boscoreale
Località Cuccurullo
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References De Caro 1994: n. 15

BTC001

Town Boscotrecase
Località Pennino del Mercante
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 38, n.43

BTC002

Town Boscotrecase
Località Masseria Carotenuto
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 01 - farmhouse
Description Rural room with oven

References Sogliano 1886: 131-2; Casale 1979: 43, n.72

BTC003

Town Boscotrecase
Località via Cantinelle
Date Roman

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Roman hospitalia (?)

References Casale 1979: 35, n. 27

BTC004

Town Boscotrecase
Località Campanariello
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman oven

References Casale 1979: 38, n. 42

BTC005

Town Boscotrecase
Località Campanariello
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Villa rustica

References Casale 1979: 35, n. 28

BTC006

Town Boscotrecase
Località Pescioni
Date Roman

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman building

References Casale 1979: 36, n. 32

BTC007

Town Boscotrecase
Località Pescioni
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Post-79 walls

References Sogliano 1901: 23; Sogliano 1915: 499; Cerulli Irelli 1975: 296; Casale 1979: 49, n. 142; Pagano 1995: n.28

BTC008

Town Boscotrecase
Località Pescioni
Date Roman

Localization Good **Investigation** Partial excavation
Category 02 - residential villa
Description Residential villa

References Ruggiero 1888: 60ss.; Casale 1979: 45, n. 98

BTC009

Town Boscotrecase
Località Pescioni
Date Roman

Localization Good **Investigation** Accidental discovery
Category 04 - waterworks
Description Roman drainage channel

References Casale 1979: 45, n. 99

BTC010

Town Boscotrecase
Località Casa Vitelli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Apsidal room with frescoes

References Casale 1979: 45, n. 101

BTC011

Town Boscotrecase
Località Casa Vitelli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 10 - cultivation
Description Roman cultivations and pottery

References Casale 1979: 45, n. 100

BTC012

Town Boscotrecase
Località Casa Vitelli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 39, n. 56

BTC013

Town Boscotrecase
Località Casa Vitelli
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman walls probably pertaining to a farmhouse

References Casale 1979: 35, n. 25

BTC014

Town Boscotrecase
Località Raiola
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 45, n. 105

BTC015

Town Boscotrecase
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 04 - waterworks
Description Roman aqueduct

References Casale 1979: 42, n. 70

BTC016

Town Boscotrecase
Località Balzani
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa of L. Arellius Successus

References Sogliano 1899: 297-9; Della Corte 1913: 191ff.; Carrington 1931: 111, 113, n. 23; Day 1932: 186, n. 23; Della Corte 1954: 450; Rostovzev 1957:

BTC017

Town Boscotrecase
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 45, n. 102

BTC018

Town Boscotrecase
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman coins and pottery

References Casale 1979: 45, n. 103

BTC019

Town Boscotrecase
Località Balzani
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Cella vinaria

References Della Corte 1929: 189-190; Day 1932: n. 40; Rostovzev 1957: n. 39; Casale 1979: 37, n. 36

BTC020

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Small Roman arches

References Casale 1979: 45, n. 104

BTC021

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman wall

References Casale 1979: 37, n. 37

BTC022

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 44, n. 91

BTC023

Town Boscotrecase
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 35, n. 23

BTC024

Town Boscotrecase
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 43, n. 78

BTC025

Town Boscotrecase
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Columnade

References Casale 1979: 43, n. 79

BTC026

Town Boscotrecase
Località Balzani
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman pottery (mainly amphorae and dolia)

References Casale 1979: 43, n. 80

BTC027

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls and tegulae

References Casale 1979: 47, n. 125

BTC028

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 35, n. 20

BTC029

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 07 - column/statue
Description Roman statue

References Casale 1979: 48, n. 128

BTC030

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman artefacts

References Casale 1979: 35, n. 21

BTC031

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman artefacts

References Casale 1979: 38, n. 41

BTC032

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman farmhouse

References Casale 1979: 39, n. 45

BTC033

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman stuccoes and amphorae

References Casale 1979: 44, n. 90

BTC034

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls and tegulae

References Casale 1979: 48, n. 136

BTC035

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 43, n. 77

BTC036

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Wall with frescoes

References Casale 1979: 51, n. 160

BTC037

Town Boscotrecase
Località Annunziatella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls and tegulae

References Casale 1979: 44, n. 83

BTC038

Town Boscotrecase
Località Oratorio
Date Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Mosaic tesserae and skeletons

References Casale 1979: 45, n. 106

BTC039

Town Boscotrecase
Località Oratorio
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman tunnel and pottery

References Casale 1979: 44, n. 82

BTC040

Town Boscotrecase
Località Oratorio
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman amphorae

References Casale 1979: 44, n. 81

BTC041

Town Boscotrecase
Località Oratorio
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Opus reticulatum wall

References Casale 1979: 45, n. 96

BTC042

Town Boscotrecase
Località Torretta
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Post-79 Roman bath complex

References Casale 1979: 41, n. 64; Pagano 1995: n. 22

BTC043

Town Boscotrecase
Località Torretta
Date Roman

Localization Good **Investigation** Field survey
Category 09 - pottery
Description Roman pottery and cocciopesto fragments

References Casale 1979: 46, n. 107

BTC044

Town Boscotrecase
Località Torretta
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 38-9, n. 44

BTC045

Town Boscotrecase
Località Torretta
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa of Agrippa Postumus

References Della Corte 1922: 459-478; Carrington 1931: 111-129, fig. 16, n. 31; Day 1932: 177, 185, n. 31; Della Corte 1954: 414ff.; Rostovzev 1957: 34, 71

BTC046

Town Boscotrecase
Località Torretta
Date Roman

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Roman walls with frescoes

References Casale 1979: 44, n. 89

BTC047

Town Boscotrecase
Località Torretta
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Post-79 building and coins

References Casale 1979: 44, n. 88; Pagano 1995: n. 21

BTC048

Town Boscotrecase
Località Annunziatella
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Roman burial

References Pagano 1995: n. 26

BTC049

Town Boscotrecase
Località Raiola
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 03 - burial
Description Three burials in 4th-5th c. AD amphorae

References Zevi 1982: 336; Pagano 1995: n. 27

CAS001

Town Casoria
Località Squillace
Date Pre-Roman

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 13 burials (end 4th - beginning 3rd BC)

References GIS Regione: 184ISO10

CAS002

Town Casoria
Località via Padula
Date Pre-Roman

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 16 burials (4th-3rd c. BC)

References GIS Regione: 184ISO9

CAS003

Town Casoria
Località via Castagna
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman scattered potsherds

References GIS Regione: 184ISO15

CAS004

Town Casoria
Località Palude
Date Pre-Roman

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 4 burials of the 3rd c. BC

References GIS Regione: 184ISO18

CAS005

Town Casoria
Località Lufrano
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Late Antique N-S drainage channel

References GIS Regione: 184ISE132

CAS006

Town Casoria
Località Lufrano
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description Late republican - early Imperial ploughing furrows

References GIS Regione: 184ISE133

CAS007

Town Casoria
Località Lufrano
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Post-79 drainage channel and ploughing furrows

References GIS Regione: 184ISE138

CAS008

Town Casoria
Località Lufrano
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Late Antique field road (N30°E)

References GIS Regione: 184ISO22

CASX01

Town Casoria
Località Carbonella
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 05 - inscription
Description Inscription of the fratry of the Ilariani for Munantius Ilarianus (2nd c. AD)

References GIS Regione: 184ISO11

CES001

Town Cesinali
Località Urciuoli
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery
Category 04 - waterworks
Description Urciuoli tract of the Roman aqueduct

References

CIM001

Town Cimitile
Località Santuario San Felice
Date Roman post-79

Localization Excellent **Investigation** Complete excavation
Category 11 - other buildings
Description St. Felix' sanctuary

References Ebanista 2003: n. 1

CIM002

Town Cimitile
Località via Trivice d'Ossa
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation
Category 10 - cultivation
Description Post-79 ploughing furrows

References Ebanista 2003: n. 16

CIM003

Town Cimitile
Località via Manzoni
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 01 - farmhouse
Description Farmhouse with wine torcular

References Ebanista 2003: n. 12

CIM004

Town Cimitile
Località via Morelli
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation

Category 02 - residential villa

Description Villa's portico with marble pavement and two Hadrianic marble column

References Ebanista 2003: n. 9

CIM005

Town Cimitile
Località vico Nutrice
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation

Category 01 - farmhouse

Description Cella vinaria

References Ebanista 2003: n. 5

CIM006

Town Cimitile
Località via S. Elena
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery

Category 02 - residential villa

Description Columnade and mosaic floor of a residential villa

References Ebanista 2003: n. 4

CIM007

Town Cimitile
Località via Pozzonuovo
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation
Category 11 - other buildings
Description Late antique structures

References Ebanista 2003: n. 2

CNN001

Town Casalnuovo di Napoli
Località Filichito
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description Post-79 ploughing furrows (E16°N)

References GIS Regione: 184ISE78; 184ISE77; 184ISE76; 184ISE75

CNN002

Town Casalnuovo di Napoli
Località Feneria
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Late Republican - early Imperial shallow drainage channels

References GIS Regione: 184ISE94

CNN003

Town Casalnuovo di Napoli
Località Feneria
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 1 inhumation burial of a child

References GIS Regione: 184ISE97

CNN004

Town Casalnuovo di Napoli
Località Feneria
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 28 Republican inhumation burials

References GIS Regione: 184ISE98

CNN005

Town Casalnuovo di Napoli
Località Lufrano
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description 2 burials

References GIS Regione: 184ISE130

CNN006

Town Casalnuovo di Napoli
Località via Arcora, 42
Date Roman pre-79

Localization Excellent **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Abate 1864

CVT001

Town Casavatore
Località via B. Croce
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 03 - burial
Description Roman burial

References GIS Regione: 184ISO21

DOM001

Town Domicella
Località Domicella
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse

References Della Corte 1929; GIS Regione: 185IVSE53

DOM002

Town Domicella
Località Mancuso
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse

References GIS Regione: 185IVSE210

DOM003

Town Domicella
Località Bosco
Date Roman post-79

Localization Fair **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman-Medieval villa

References GIS Regione: 185IVSE123

ERC001

Town Ercolano
Località Resina
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 02 - residential villa
Description Villa dei Papiri

References Scatozza Höricht 1985: n. 1

ERC002

Town Ercolano
Località Orfanotrofio
Date Roman pre-79

Localization Fair **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman farmhouse

References Scatozza Höricht 1985: 163, n. 5

ERC003

Town Ercolano
Località Pugliano
Date Roman pre-79

Localization Fair **Investigation** Partial excavation
Category 02 - residential villa
Description Roman residential villa

References Scatozza Höricht 1985: 162, n. 2

ERC004

Town Ercolano
Località via Doglie
Date Roman post-79

Localization Good **Investigation** Complete excavation
Category 03 - burial
Description Post-79 Roman burials

References Pisapia 1981; Scatozza Höricht 1985: n. 14; Pagano 1995: n. 12

ERC005

Town Ercolano
Località via Marconi
Date Roman post-79

Localization Good
Investigation Partial excavation
Category 03 - burial
Description Late Antique burials

References Scatozza Höricht 1985: n. 11

ERC006

Town Ercolano
Località Ercolano
Date Roman pre-79

Localization Good
Investigation Accidental discovery
Category 03 - burial
Description Roman necropolis

References Scatozza Höricht 1985: n. 10

ERC007

Town Ercolano
Località Gabella del Pesce
Date Roman post-79

Localization Fair
Investigation Accidental discovery
Category 12 - baths
Description 2nd c. AD bath complex

References Scatozza Höricht 1985: n. 12
Pagano 1995: n. 11

ERC008

Town Ercolano
Località Colli Mozzi
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman burial

References Pagano 1995: n. 9

ERC009

Town Ercolano
Località villa Aprile
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Roman burial

References Pagano 1995: n. 54

ERC010

Town Ercolano
Località Osservatorio
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Roman burial

References Pagano 1995: n. 41; GIS Regione: 184IINE0000015

LAU001

Town Lauro
Località Torre
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 02 - residential villa
Description Villa Lauro

References GIS Regione: 185IVSE56

MAS001

Town Massa di Somma
Località la Castelluccia
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 01 - farmhouse
Description Olive mill

References Pagano 1991: 234-5

MER001

Town Mercogliano
Località viale San Modestino
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse

References GIS Regione: 185INO21

MOS001

Town Moschiano
Località La Carità
Date Roman post-79

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Late antique necropolis

References GIS Regione: 185-58

MRG001

Town Marigliano
Località Faibano, via Sentino
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse (2nd c. BC-late 1st c. AD) with small necropolis (7 burials)

References

MUG001

Town Mugnano di Napoli
Località via Conte Mirabelli, 42
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description E-W Roman road

References GIS Regione: 184IVSE147

MUG002

Town Mugnano di Napoli
Località Paparelle
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation

Category 01 - farmhouse

Description Hellenistic farmhouse with well, drainage channels and pools (oil/wine production?)

References GIS Regione: 184ISO52

MZN001

Town Marzano di Nola
Località Cimitero
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation

Category 02 - residential villa

Description Roman villa

References GIS Regione: 185IVSE60

NAP001

Town Napoli
Località Ponticelli - Purgatorio
Date Pre-Roman

Localization Fair **Investigation** Complete excavation

Category 03 - burial

Description Greek necropolis with 111 burials dated from middle to the end of the 4th c. BC

References Giglioli 1922
Giampaola 1985

NAP002

Town Napoli
Località Ponticelli
Date Roman post-79

Localization Good **Investigation** Partial excavation
Category 03 - burial
Description Late Antique necropolis (end of the 4th-5th c. AD)

References Pagano 1995: n. 53

NAP003

Town Napoli
Località Ponticelli
Date Roman post-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman farmhouse with necropolis (from the 2dn to the 6th c. AD)

References De Stefano 1987: 61-67
Pagano 1995: n. 52

NAP004

Town Napoli
Località Piazza Garibaldi
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 08 - road
Description S-E road (2nd BC-2nd AD)

References De Caro 2008: 121-2; GIS Regione: 184ISO53

NAP005

Town Napoli
Località via San Cosmo fuori porta
Date Roman post-79

Localization Good
Investigation Rescue excavation
Category 08 - road
Description Road

References Fusco 1863: 8-10

NAP006

Town Napoli
Località via San Cosmo fuori Porta
Date Roman post-79

Localization Good
Investigation Rescue excavation
Category 03 - burial
Description Funerary monument with inscription of Marcus Aurelius Artemidorus, placed along a paved Roman road

References Fusco 1863

NAP007

Town Napoli
Località Santa Maria del Pianto
Date Pre-Roman

Localization Good
Investigation Accidental discovery
Category 13 - quarry
Description Tuff quarry with Greek marks and letters

References Greco 1994: 43

NAP008

Town Napoli
Località presso piazza Mercato
Date Roman

Localization Fair **Investigation** Reference
Category 05 - inscription
Description Dedicatory inscription to Sebethus

References Summonte 1675

NAP009

Town Napoli
Località Cupa Vicinale San Severino
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Roman countryside road (N20°W)

References GIS Regione: 184ISO23

NAP010

Town Napoli
Località Cavalcavia Botteghelle
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description Pre-79 cultivated area (tree holes), covered by a late antique drainage channel (E-W)

References GIS Regione: 184ISO27

NAP011

Town Napoli
Località Cavalcavia Botteghelle
Date Pre-Roman

Localization Good **Investigation** Rescue excavation

Category 04 - waterworks

Description 4th-3rd c. BC drainage channel (NE-SW, 2 m wide x 1.90 m deep), filled by 3rd c. BC pottery

References GIS Regione: 184ISO25

NAP012

Town Napoli
Località Complesso degli Incurabili
Date Roman pre-79

Localization Good **Investigation** Rescue excavation

Category 04 - waterworks

Description Cistern of the Serino aqueduct

References GIS Regione: 184ISO61

NAP013

Town Napoli
Località via Terracina
Date Roman post-79

Localization Excellent **Investigation** Complete excavation

Category 12 - baths

Description Bath complex

References

NAP014

Town Napoli
Località Area stadio San Paolo
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 10 - cultivation
Description Ploughing furrows

References GIS Regione: 184IIINE102

NAP015

Town Napoli
Località Posillipo
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 02 - residential villa
Description Pausilypon Villa

References GIS Regione: 184IINE1

NAP016

Town Napoli
Località Ponti Rossi
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery
Category 04 - waterworks
Description Claudian arches of the Serino aqueduct

References

NAP017

Town Napoli
Località Carminiello ai Mannesi
Date Roman post-79

Localization Excellent **Investigation** Complete excavation
Category 12 - baths
Description Bath complex

References

NAP018

Town Napoli
Località Ponticelli
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 01 - farmhouse
Description Farmhouse of C. Olius Ampliatus, buried by the AD 79 eruption

References Cascella (in press)

NAP019

Town Napoli
Località Marianella, Cupa Marfella
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman farmhouse set in the first half of the 1st c. AD above a Republican building. Pottery of the 2nd c. AD and late antique was also discovered.

References De Stefano 1987: 67-69

NOL001

Town Nola
Località via Feudo
Date Roman post-79

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Burials and road (2nd c. AD)

References Zevi 1982: 338; Ebanista 2005: 318-320

NOL002

Town Nola
Località Piazzolla di Nola
Date Roman pre-79

Localization Good **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Lettieri 1803; D'Avino 1993: 5

NOL003

Town Nola
Località Villa De Siervo
Date Roman pre-79

Localization Good **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Lettieri 1803; D'Avino 1993: 5

NOL004

Town Nola
Località Villa Albertini
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery
Category 07 - column/statue
Description 4 Augustan capitals

References

NOL005

Town Nola
Località località Castellorotto, via
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 11 - other buildings
Description Nola's theatre (traditionally known as amphitheatre)

References Sampaolo 1991; Ebanista 2005: n. 15

NOL006

Town Nola
Località Masseria d'Angerio
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 11 - other buildings
Description Nola's amphitheatre (late Republic - early Augustan)

References Sampaolo 1991; Ebanista 2005: n. 2

NOL007

Town Nola
Località Masseria d'Angerio
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 11 - other buildings
Description Late Republican city walls

References Ebanista 2005: n. 3

NOL008

Town Nola
Località Palazzo Orsini
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 12 - baths
Description Baths and part of a paved road

References Ebanista 2005: n. 5

NOL009

Town Nola
Località via Feudo
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 08 - road
Description Paved road

References Ebanista 2005: n. 17

NOL010

Town Nola
Località via Anfiteatro Marmoreo
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery

Category 08 - road

Description Paved road and parts of walls in opus reticulatum, opus vittatum, and fragments of frescoes in 4th Pompeian style

References Ebanista 2005: n. 16

NOL011

Town Nola
Località via De Sena
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery

Category 02 - residential villa

Description Domus and part of the decumanus

References Ebanista 2005: n. 4

NOL012

Town Nola
Località Piazza Duomo
Date Roman pre-79

Localization Excellent **Investigation** Reference

Category 11 - other buildings

Description Forum (?)

References Ebanista 2005: n. 7

NOL013

Town Nola
Località Piazza d'Armi
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Pre-Roman necropolis

References Ebanista 2005: n. 9

NOL014

Town Nola
Località Duomo
Date Roman pre-79

Localization Excellent **Investigation** Reference
Category 11 - other buildings
Description Jupiter's temple

References Ebanista 2005: n. 8

NOL015

Town Nola
Località Chiesa di San Biagio
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 12 - baths
Description Baths

References Ebanista 2005: n. 6

NOL016

Town Nola
Località via San Felice
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 02 - residential villa
Description Republican domus

References Ebanista 2005: n. 10

NOL017

Town Nola
Località via Tommaso Vitale
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 02 - residential villa
Description Fountain, part of a domus

References Ebanista 2005: n. 11

NOL018

Town Nola
Località via Circumvallazione
Date Roman pre-79

Localization Poor **Investigation** Rescue excavation
Category 02 - residential villa
Description Residential villa of the 1st c. AD

References Ebanista 2005: 316

NOL019

Town Nola
Località via San Massimo
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Necropolis (120 burials dated from the 7th to the 3th c. BC)

References Ebanista 2005: 317

NOL020

Town Nola
Località via San Massimo
Date Roman post-79

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Late Antique burials (3rd-4th c. AD)

References Ebanista 2005: 317

NOL021

Town Nola
Località Torricelle
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 03 - burial
Description Funerary monuments

References Ebanista 2005: n. 1

NOL022

Town Nola
Località Masseria Sarnella
Date Pre-Roman

Localization Good **Investigation** Reference
Category 03 - burial
Description Burials of the 4th c. BC

References Ebanista 2005: 318

NOL023

Town Nola
Località via Seminario
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 4th c. BC burial

References Avella 1988: n. 33; Ebanista 2005: 318

NOL024

Town Nola
Località via Saccaccio
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 02 - residential villa
Description Residential villa set in the 2nd c. BC, with later phases in the 1st AD and 3rd-4th AD

References Sampaolo 1991; Ebanista 2005: 320-2, n. 14

NOL025

Town Nola
Località via Polveriera
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 02 - residential villa
Description 1st c. BC villa, with later phase in the 3rd AD

References Ebanista 2005: 322, n. 13

NOL026

Town Nola
Località via Merliano
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 02 - residential villa
Description Opus reticulatum rooms

References Ebanista 2005: n. 12

NOL027

Town Nola
Località Campostella
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 2 burials (3rd c. BC)

References Avella 1988: n. 32; Ebanista 2005: 320

NOL028

Town Nola
Località via Seminario
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Funerary monument

References Avella 1988: n. 27

NOL029

Town Nola
Località via Sant'Agata
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 03 - burial
Description Funerary monument

References Avella 1988: n. 3

NOL030

Town Nola
Località Masseria Catapano
Date Roman pre-79

Localization Excellent **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Abate 1864

NOL031

Town Nola
Località Giugliano
Date Roman pre-79

Localization Excellent **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Abate 1864

NOL032

Town Nola
Località via Roma
Date Pre-Roman

Localization Excellent **Investigation** Partial excavation
Category 03 - burial
Description Necropolis (42 burials) from ca. 625 to mid-2nd century BC

References Bonghi Jovino 1969

OTT001

Town Ottaviano
Località alveo San Leonardo
Date Roman pre-79

Localization Fair **Investigation** Accidental discovery
Category 09 - pottery
Description Roman pottery

References Cola 1915

OTT002

Town Ottaviano
Località alveo San Leonardo
Date Roman pre-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Vaulted rooms with human bones and amphorae

References Cola 1915

OTT003

Town Ottaviano
Località Raggi
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description NE-SW ploughing furrows

References Cicirelli 1998: 241-243; Cicirelli 2001: 253-259

OTT004

Town Ottaviano
Località via San Domenico
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 2nd c. AD inhumation burial

References Cicirelli 1989: 253; Pagano 1995: n. 42

OTT005

Town Ottaviano
Località Castello del Principe
Date Roman pre-79

Localization Good **Investigation** Accidental discovery

Category 01 - farmhouse

Description 20x5 Roman walls with pre-79 pottery nearby

References Saviano 1988: 41

OTT006

Town Ottaviano
Località Montevergine
Date Roman pre-79

Localization Fair **Investigation** Reference

Category 01 - farmhouse

Description Roman walls, bricks, tegulae, cocciopesto, and dolia fragments

References Maiuri 1938: 288-9; Menotti 1983: 333; D'Ascoli 1985: 20; Saviano 1988: 42, 44

OTT007

Town Ottaviano
Località Carcovella
Date Roman pre-79

Localization Good **Investigation** Reference

Category 01 - farmhouse

Description Opus incertum tuff wall (N-S orientation) with bricks, tegulae, cocciopesto, and dolia nearby

References Rossi 1983: 333-334

OTT008

Town Ottaviano
Località Bosco De Siervo
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 02 - residential villa
Description Roman residential villa with bath complex

References Cicirelli 1995: 185-188; Pagano 1995: n. 43; Cicirelli 1999: 345-350

OTT009

Town Ottaviano
Località piazza Annunziata
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 02 - residential villa
Description Roman pavements and walls

References STAV

OTT010

Town Ottaviano
Località via Piazza
Date Roman pre-79

Localization Fair **Investigation** Accidental discovery
Category 08 - road
Description Roman road and opus reticulatum walls

References STAV

OTT011

Town Ottaviano
Località
Date Roman

Localization Fair **Investigation** Reference
Category 01 - farmhouse
Description Walls, tegulae, amphorae and other Roman pottery

References STAV

OTT015

Town Ottaviano
Località via San Giovanni
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 09 - pottery
Description Roman dolium

References STAV

OTT016

Town Ottaviano
Località via San Giovanni
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 02 - residential villa
Description Mosaic pavement

References STAV

OTT017

Town Ottaviano
Località Fontana
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery

Category 01 - farmhouse

Description N-S wall with white plaster, other opus incertum walls in several points nearby

References Menotti 1983: 333

OTT018

Town Ottaviano
Località via Gianturco
Date Roman

Localization Fair **Investigation** Accidental discovery

Category 03 - burial

Description Roman burials

References STAV

OTT019

Town Ottaviano
Località Boscariello
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation

Category 02 - residential villa

Description Roman residential villa with 4th style frescoes and productive area

References Cicirelli 1991: 213; Cicirelli 1993: 239-241

OTT020

Town Ottaviano
Località Toppa, Mass. dei Librai
Date Roman pre-79

Localization Good **Investigation** Accidental discovery

Category 02 - residential villa

Description Area with Roman potsherds, cocciopesto, fragments of frescoes, mosaic tesserae

References Cicirelli 1991: 213-214

OTT021

Town Ottaviano
Località Raggi
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation

Category 04 - waterworks

Description Inspection specus of a side branch of the Serino aqueduct

References Cicirelli 2001: 257-8

OTT022

Town Ottaviano
Località Mazzamei
Date Roman pre-79

Localization Good **Investigation** Accidental discovery

Category 04 - waterworks

Description Circular cistern

References STAV

OTT023

Town Ottaviano
Località Raggi
Date Roman pre-79

Localization Good **Investigation** Rescue excavation

Category 01 - farmhouse

Description Roman farmhouse (2nd-1st BC) with cocciopesto floor and square pool. NW-SE ploughing furrows nearby

References Cicirelli 1993: 241-247; Cicirelli 2001: 253-259

OTTX01

Town Ottaviano
Località Castello del Principe
Date Roman pre-79

Localization Good **Investigation** Reference

Category 03 - burial

Description Funerary inscription and statue

References D'Ascoli 1985: 22-23; Saviano 1988: 46; D'Avino 1996: 7-8

PCA001

Town Palma Campania
Località Jerola, via de Fazio
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation

Category 03 - burial

Description 35 inhumation burials, most of which pertaining to children (2nd-4th c. AD)

References GIS Regione: 185IVSO3

PCA002

Town Palma Campania
Località Ponte Tirone
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 04 - waterworks
Description Serino aqueduct

References

PCA003

Town Palma Campania
Località Taverna delle Torricelle
Date Roman pre-79

Localization Good **Investigation** Reference
Category 04 - waterworks
Description Tract of the Serino aqueduct

References Bourbon map (1836-40)

PDA001

Town Pomigliano d'Arco
Località contrada Frasso
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 10 burials

References GIS Regione: 184ISE1

PDA002

Town Pomigliano d'Arco
Località Filichito
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Post-79 Road (N22°W)

References GIS Regione: 184ISE70

PGM001

Town Poggiomarino
Località Ceraso
Date Roman post-79

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Roman burial

References Pagano 1995: n. 40

POM001

Town Pompei
Località Civita
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Farmhouse

References NSc 1921: 461 ss.; Carrington 1931: 119, n. 30; Day 1932: tav. A, B, C, n. 30; Rostovzev 1957: 34, nota 6, n. 30; Casale 1979: 30, n. 3

POM002

Town Pompei
Località Civita
Date Roman pre-79

Localization Good **Investigation** Complete excavation
Category 01 - farmhouse
Description Villa rustica of Asellius

References NSc 1921: 426 ss.; Carrington 1931: 111, n. 27; Day 1932: 185, tav. A, B, C, n. 27; Della Corte 1954: 449; Rostovzev 1957: 34, nota 26, n. 27;

POM003

Town Pompei
Località Civita
Date Roman pre-79

Localization Good **Investigation** Complete excavation
Category 01 - farmhouse
Description Farmhouse

References NSc 1921: 423 ss.; Carrington 1931: 122, n. 26; Day 1932: tav. C, n. 26; Rostovzev 1957: 34, nota 26, n. 26; Casale 1979: 41, n. 65

POM004

Town Pompei
Località Civita
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Post-79 burial

References Casale 1979: 49, n. 145

POM005

Town Pompei
Località Civita
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Pre-79 farmhouse

References Casale 1979: 49, n. 145

POM006

Town Pompei
Località Civita
Date Roman

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Criptoporticus

References Casale 1979: 43, n. 75

POM007

Town Pompei
Località Civita
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Casale 1979: 51, n. 158

POM008

Town Pompei
Località Tirone
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Farmhouse

References NSc 1895: 214-215; NSc 1897: 391 ss.; Carrington 1931: 121, n. 14; Day 1932: tav. A, B, C, n. 14; Rostovzev 1957: 33, nota 6, n. 14; Casale 1979:

POM009

Town Pompei
Località Grotta
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Farmhouse

References Casale 1979: 51, n. 159; PHS 1, 1983: 325; RSP 1, 1987: 159-160

POM010

Town Pompei
Località Grotta
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Funerary monument

References Casale 1979: 41, n. 63; PHS 1, 1983: 41

POM011

Town Pompei
Località Spinelli
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa rustica of Domitius Auctus

References NSc 1899: 392 ss.; Carrington 1931: 111, n. 19; Day 1932: 186, tav. B, C, n. 19; Della Corte 1954: 447; Rostovzev 1957: 34, nota 26, n. 19; Casale

POM012

Town Pompei
Località Civita
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Farmhouse with funerary monument nearby

References NSc 1921: 415 ss.; Carrington 1931: 121, n. 25; Day 1932: tav. A, C, n. 25; Rostovzev 1957: 34, nota 26, n. 25; Casale 1979: 35, n. 26

POM013

Town Pompei
Località Fossa di Valle
Date Roman pre-79

Localization Good **Investigation** Complete excavation
Category 01 - farmhouse
Description Farmhouse

References NSc 1903: 64 ss.; Carrington 1931: 117, n. 22; Day 1932: 186, tav. B, C, n. 22; Rostovzev 1957: 34, nota 26, n. 22; Casale 1979: 36, n. 30

POM014

Town Pompei
Località Fossa di Valle
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman building

References Casale 1979: 47, n. 122

POM015

Town Pompei
Località Masseria Vaiano
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Walls, dolia, amphorae, and tegulae

References Casale 1979: 43, n. 76

POM016

Town Pompei
Località Crapolla
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Farmhouse

References NSc 1928: 375; Casale 1979: 49, n. 146

POM017

Town Pompei
Località Villa dei Misteri
Date Roman pre-79

Localization Good **Investigation** Complete excavation
Category 02 - residential villa
Description Villa of the Mysteries

References NSc 1910: 139 ss.; NSc 1922: 480 ss.; Maiuri 1931; Day 1931: tav. B, C, n. 24; Della Corte 1954: 420 ss.; Rostovzev 1957: 34, nota 26, n. 24; Casale

POM018

Town Pompei
Località Scavi d'Aquino
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Post-79 necropolis with building

References NSc 1900: 69; Casale 1979: 48, n. 129; Pagano 1995: n. 30

POM019

Town Pompei
Località Scavi d'Aquino
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa rustica of T. Siminius Stephanus

References NSc 1897: 337 ss.; NSc 1898: 494 ss.; NSc 1899: 236 ss.; NSc 1900: 69 ss.; Carrington 1931: 112, n. 20; Day 1932: 186, tav. B, C, n. 20; Della Corte

POM020

Town Pompei
Località Scavi d'Aquino
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Farmhouse

References NSc 1899: 439-497; NSc 1900: 30-599; Carrington 1931: 117, n. 21; Day 1932: tav. C, n. 21; Rostovzev 1957: 34, nota 26, n. 21; Casale 1979: 47,

POM021

Town Pompei
Località Tirone
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Farmhouse

References De Caro 1983: 325

POM022

Town Pompei
Località Stazione
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 01 - farmhouse
Description Farmhouse

References Van der Poel 1984: 338, n. 46

POM023

Town Pompei
Località Suburbio
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 02 - residential villa
Description Villa di Diomede

References

POM024

Town Pompei
Località Suburbio
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 02 - residential villa
Description Villa di Cicerone

References

POM025

Town Pompei
Località Crapolla
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Pre-79 burials

References De Caro 1994: n. 24

POM026

Town Pompei
Località Crapolla
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References RSP 1, 1987: 161

POM027

Town Pompei
Località Crapolla
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description 4th-5th c. AD burials

References PHS 1, 1983: 327; Pagano 1995: n. 31

POM028

Town Pompei
Località Santuario
Date Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman burials

References De Caro 1994: n. 34

POM029

Town Pompei
Località Porta Anfiteatro
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References De Caro 1994: n. 32

POM030

Town Pompei
Località Porta Anfiteatro
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References De Caro 1994: n. 33

POM031

Town Pompei
Località Bottaro
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 11 - other buildings
Description Post-79 walls

References Pagano 1995: n. 32

POM032

Town Pompei
Località via Lepanto
Date Roman post-79

Localization Excellent **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman farmhouse (middle 3rd-5th c. AD)

References Pagano 1995: n. 33

POM033

Town Pompei
Località Cimitero, via Nolana
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description Late antique burial

References De Carolis 1997

POR001

Town Portici
Località via Paladino
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Roman burial

References Scatozza Höricht 1985: 165, n. 13; Pagano 1995: n. 7; GIS Regione: 184IINE0000050

POR002

Town Portici
Località Villa dell'Epitaffio
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 12 - baths
Description Roman baths

References Scatozza Höricht 1985: 150-2, n. 4

POR003

Town Portici
Località Scuderie Reali
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 02 - residential villa
Description Roman residential villa with 3rd style paintings

References Scatozza Höricht 1985: 146-150, n. 3

POR004

Town Portici
Località Largo Croce
Date Roman post-79

Localization Good **Investigation** Complete excavation
Category 03 - burial
Description Roman burial with inscription and coin of Faustina

References Pagano 1995: n. 8

POR005

Town Portici
Località Granatello
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description 3rd c. AD burials with inscription

References Pagano 1995: n. 49

PTR001

Town Pollena Trocchia
Località Castelluccia
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Mortarium of a trapetum, opus incertum walls

References De Simone 2008

PTR002

Town Pollena Trocchia
Località San Martino
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman farmhouse with cistern

References Pagano 1988; Pagano 1991; Pagano 1995: n. 5; De Simone 2008

PTR003

Town Pollena Trocchia
Località San Martino
Date Roman pre-79

Localization Fair **Investigation** Field survey

Category 04 - waterworks

Description Roman cistern built with tufa blocks and internally covered with plaster. It consists of at least two large vaulted rooms 60x2 m each

References Della Corte 1932; De Simone 2008

PTR004

Town Pollena Trocchia
Località via Verdi
Date Roman post-79

Localization Good **Investigation** Rescue excavation

Category 03 - burial

Description Roman burial in African amphora and many potsherds

References Pagano 1988; Pagano 1991; Pagano 1995: n. 4; De Simone 2008

PTR005

Town Pollena Trocchia
Località San Gennariello
Date Roman post-79

Localization Good **Investigation** Partial excavation

Category 02 - residential villa

Description Roman residential villa with shrine to Bacchus

References De Franciscis 1966: 188; Pagano 1988; Pagano 1991; Pagano 1995: n. 3; De Simone 2008

PTR006

Town Pollena Trocchia
Località Masseria De Carolis
Date Roman post-79

Localization Excellent **Investigation** Partial excavation
Category 02 - residential villa
Description Roman residential villa with bath complex

References Pagano 1988; Pagano 1991; Pagano 1995: n. 2; De Simone 2008

PTRX01

Town Pollena Trocchia
Località
Date Roman

Localization Excellent **Investigation** Accidental discovery
Category 06 - altar
Description Roman altar with bucrania and garlands

References De Simone 2008

PTRX02

Town Pollena Trocchia
Località
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery
Category 07 - column/statue
Description Column basis

References De Simone 2008

PVL001

Town Pago del Vallo di Lauro
Località San Pietro di Pago
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 02 - residential villa
Description Roman villa

References GIS Regione: 185IVSE63

QUI001

Town Quindici
Località Santa Lucia
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 02 - residential villa
Description Roman villa

References GIS Regione: 185IVSE65

QUI002

Town Quindici
Località San Teodoro
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 02 - residential villa
Description Roman villa

References GIS Regione: 185IVSE64

RRN001

Town Roccarainola
Località Calcara Pagliara
Date Roman pre-79

Localization Good **Investigation** Reference

Category 01 - farmhouse

Description Roman farmhouse with potsherd of sigillata italica and lamps. Necropolis nearby

References GIS Regione: 185IVNO691

RRN002

Town Roccarainola
Località Cammarano
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation

Category 01 - farmhouse

Description Roman farmhouse with necropolis

References GIS Regione: 185IVNO686

RRN003

Town Roccarainola
Località Monte Fellino
Date Roman pre-79

Localization Excellent **Investigation** Field survey

Category 01 - farmhouse

Description Late republican farmhouse

References GIS Regione: 185IVNO687

SAN001

Town Sant'Anastasia
Località Menolara
Date Roman post-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Roman farmhouse

References

SAN002

Town Sant'Anastasia
Località Menolara
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Some orbites of 4/5 mills, a tufa altar, pre-79 brick stamps

References

SAN003

Town Sant'Anastasia
Località Migliaccione
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Fragments of dolia and tegulae, bronze vase, coin of Nero

References

SAN004

Town Sant'Anastasia
Località Migliaccione
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Opus incertum walls

References

SAN005

Town Sant'Anastasia
Località Olivella
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman farmhouse

References De Franciscis 1974: 227

SAN006

Town Sant'Anastasia
Località Menolara
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Burial

References

SAN007

Town Somma Vesuviana
Località
Date Pre-Roman

Localization Fair **Investigation** Accidental discovery
Category 05 - inscription
Description Oscan cippus

References

SAN008

Town Sant'Anastasia
Località Murillo di Trocchia
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 03 - burial
Description Roman colombarium of L. Plaetorius with 8 niches for the ashes

References De Franciscis 1974: 228-231

SAN009

Town Sant'Anastasia
Località
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery
Category 03 - burial
Description Remains of an opus reticulatum wall, probably a columbarium

References

SAN010

Town Sant'Anastasia
Località Ponte di Ferro
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 04 - waterworks
Description Pillar of the Serino aqueduct

References

SAN011

Town Sant'Anastasia
Località Starza Vecchia
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation
Category 03 - burial
Description 5 Late Antique burials

References Parma 1988; Pagano 1995: n. 1

SAN012

Town Sant'Anastasia
Località Passaguai
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 04 - waterworks
Description Roman cistern in opus latericium 15 m x 2.40 high

References Della Corte 1932: 308; De Franciscis 1974: 225-227

SAN013

Town Sant'Anastasia
Località Foresta
Date Roman pre-79

Localization Good **Investigation** Accidental discovery

Category 04 - waterworks

Description Roman T-shaped vaulted cistern. The two branches are 18 and 6 m long, each is 2 m wide and 2.20 high, excluding the vault

References Della Corte 1932: 308; De Franciscis 1974: 225

SAN014

Town Sant'Anastasia
Località Foresta
Date Roman pre-79

Localization Good **Investigation** Accidental discovery

Category 04 - waterworks

Description Roman cistern 9x3x4 m

References Della Corte 1932: 308; De Franciscis 1974: 225

SAN015

Town Sant'Anastasia
Località Costanzi
Date Roman pre-79

Localization Good **Investigation** Partial excavation

Category 03 - burial

Description Roman burials

References De Franciscis 1974: 227

SAN016

Town Sant'Anastasia
Località Filichito
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description Post-79 ploughing furrows (N23°E)

References GIS Regione: 184ISE68

SAN017

Town Sant'Anastasia
Località Carafa
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Serino aqueduct (N47°W)

References GIS Regione: 184ISE2

SAN018

Town Sant'Anastasia
Località Carascosa
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Pre-79 field road (N11°E)

References GIS Regione: 184ISE64

SAN019

Town Sant'Anastasia
Località Carascone
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description Post-79 ploughing furrows (E9°S)

References GIS Regione: 184ISE56

SAN020

Town Sant'Anastasia
Località Carascosa
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Early Imperial drainage channel (E-W)

References GIS Regione: 184ISE50

SAN021

Town Sant'Anastasia
Località Carascosa
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Post-79 postholes and holes for dolia

References GIS Regione: 184ISE47

SAN022

Town Sant'Anastasia
Località Carascone
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Serino aqueduct with service road on its southern side

References GIS Regione: 184ISE45

SAN023

Town Sant'Anastasia
Località Carascosa
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description Late Republican road (N12°E)

References GIS Regione: 184ISE37

SAN024

Town Sant'Anastasia
Località Palmendola
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery
Category 04 - waterworks
Description Inscription attesting the derivation of water from an aqueduct

References CIL 10.1291a

SAN025

Town Sant'Anastasia
Località Masseria La Preziosa
Date Roman pre-79

Localization Excellent **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Lettieri 1803

SANX01

Town Sant'Anastasia
Località piazza II ottobre
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 07 - column/statue
Description Statue of Pudicitia, probably from a funerary monument of the end of the 1st c. BC

References De Franciscis 1974: 227-8

SAR001

Town Sarno
Località Mura d'Arce
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 04 - waterworks
Description Serino Aqueduct

References Elia 1938; GIS Regione: 185IVSE2

SAR002

Town Sarno
Località via Tostuolo
Date Pre-Roman

Localization Excellent **Investigation** Complete excavation
Category 11 - other buildings
Description Hellenistic Theatre

References GIS Regione: 185IIINE3

SAR003

Town Sarno
Località Foce
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman Villa

References GIS Regione: 185IIINE8

SAV001

Town Saviano
Località San Erasmo
Date Pre-Roman

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description 2 Samnite burials

References Sogliano 1895: 250-1

SAV002

Town Saviano
Località Fabbio
Date Roman pre-79

Localization Good **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Abate 1864

SAV003

Town Saviano
Località De Giulio
Date Roman pre-79

Localization Fair **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Abate 1864

SCA001

Town Scafati
Località Ventotto
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Farmhouse

References Casale 1979: 50, n. 156

SCA002

Town Scafati
Località Ventotto
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Farmhouse

References NSc 1923: 280 ss.; Carrington 1931: 121, n. 35; Day 1932: tav. A, B, C, n. 35; Rostovzev 1957: 34, nota 26, n. 35; Casale 1979: 37, n. 39

SCA003

Town Scafati
Località Iossa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman storage rooms

References NSc 1892: 122; Casale 1979: 50, n. 150

SCA004

Town Scafati
Località Iossa
Date Roman

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Farmhouse

References NSc 1922: 478; Casale 1979: 50, n. 151

SCA005

Town Scafati
Località Iossa
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Farmhouse

References NSc 1928: 375-377; Day 1932: tav. C, n. 43; Rostovzev 1957: 34, nota 26, n. 37; Casale 1979: 49-50, n. 147

SCA006

Town Scafati
Località Baracconi
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Skeleton of a woman with jewels

References Casale 1979: 50, n. 149

SCA007

Town Scafati
Località Masseria Monacelle
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Cella vinaria with dolia

References Casale 1979: 50, n. 148

SCA008

Town Scafati
Località Castagno
Date Roman

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Roman funerary cippi

References Casale 1979: 50, n. 153

SCA009

Town Scafati
Località Castagno
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman farmhouse

References Della Corte 1954: 447; Casale 1979: 50, n. 152

SCA010

Town Scafati
Località via Croce
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Funerary monument

References Casale 1979: 50, n. 155

SCA011

Town Scafati
Località via Croce
Date Roman post-79

Localization Good
Investigation Accidental discovery
Category 03 - burial
Description Late Antique burials

References Casale 1979: 50, n. 154; Pagano 1995: n. 34

SCA012

Town Scafati
Località Petracca
Date Roman pre-79

Localization Good
Investigation Partial excavation
Category 01 - farmhouse
Description Farmhouse

References NSc 1923: 284 ss.; Day 1932: tav. A, B, C, n. 36; Rostovzev 1957: 34, nota 26, n. 36; Casale 1979: 43, n.73

SCA013

Town Scafati
Località via Montegrappa
Date Roman post-79

Localization Excellent
Investigation Accidental discovery
Category 03 - burial
Description Roman burial

References Pagano 1995: n. 35

SCA014

Town Scafati
Località via Melchiade
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 03 - burial
Description Roman burials

References Pagano 1995: n. 36

SCA015

Town Scafati
Località via Macello Vecchio
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 03 - burial
Description 4th-5th c. AD Roman burials

References Pagano 1995: n. 37

SCA016

Town Scafati
Località SS18
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation
Category 08 - road
Description Roman road

References Pagano 1995: n. 38

SCA017

Town Scafati
Località via della Resistenza
Date Roman

Localization Excellent **Investigation** Accidental discovery
Category 02 - residential villa
Description Roman residential villa with bath complex and broonze seal of the 4th c. AD

References Pagano 1995: n. 39

SER001

Town Serino
Località Sorgente Pelosi
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 04 - waterworks
Description Caput aquae of the Serino aqueduct

References

SFC001

Town San Felice a Cancello
Località Castelletto
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse

References GIS Regione: 173IIISO682

SFC002

Town San Felice a Cancello
Località San Marco
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description Late-antique necropolis

References GIS Regione: 173IIISO701

SFC003

Town San Felice a Cancello
Località Palomba
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Roman farmhouse

References

SGC001

Town San Giorgio a Cremano
Località Largo dell'Arso
Date Roman pre-79

Localization Good **Investigation** Reference
Category 01 - farmhouse
Description Roman farmhouse

References GIS Regione: 184IINE0000043

SGCX01

Town San Giorgio a Cremano
Località Villa Vannucchi
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation
Category 07 - column/statue
Description 2nd c. AD statues

References Pagano 1990

SGE001

Town San Gennaro Vesuviano
Località Pagliarone
Date Roman pre-79

Localization Good **Investigation** Reference
Category 01 - farmhouse
Description Brick column and pilaster on a cocciopesto floor

References Aurigemma 1911: 153-154; Cicirelli 1993bis: 248

SGE002

Town San Gennaro Vesuviano
Località Rammafai
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 04 - waterworks
Description Serino aqueduct

References D'Avino 1983: 177; Cicirelli 1993bis: 248

SGE003

Town San Gennaro Vesuviano
Località Rammafai
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description Burial inscription on limestone and 8 led fistulae (the name of the tribe testifies that this area was in the territory of Nola)

References Cicirelli 1993bis: 247-250

SGE005

Town San Gennaro Vesuviano
Località Cupa Miano
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description E-W ploughing furrows

References Cicirelli 2001: 253-259

SGE006

Town San Gennaro Vesuviano
Località Toppa
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 10 - cultivation
Description NW-SE ploughing furrows

References Cicirelli 2001: 253-259

SGEX04

Town San Gennaro Vesuviano
Località piazza Margherita
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Augustan marble entablature (probably part of a funerary monument's pediment)

References Cicirelli 1993bis: 249

SGV001

Town San Giuseppe Vesuviano
Località San Leonardo
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Late Antique necropolis in amphorae

References Pagano 1995: n. 41

SPB001

Town San Paolo Belsito
Località Campostella
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Funerary monument with statues of togati

References Avella 1988: n. 31

SPB002

Town San Paolo Belsito
Località Villa Tiglio
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 01 - farmhouse
Description Late republican villa

References Albore Livadie 1998: 50

SPB003

Town San Paolo Belsito
Località Villa Tiglio
Date Roman

Localization Excellent **Investigation** Partial excavation
Category 04 - waterworks
Description Two branches of the Serino aqueduct, the second of which is dated to the Constantinian restoration

References Albore Livadie 1998: 50

SSV001

Town San Sebastiano al Vesuvio
Località
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Roman farmhouse with post-79 use

References Cerulli Irelli 1965; Pagano 1995: n. 6

SVE001

Town Somma Vesuviana
Località Cupa Fontana
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery

Category 04 - waterworks

Description Water-supply system. Cocciopesto tunnel 2.27 high, 0.95 wide, 10 m long, followed by at least other 15 m with in the volcanic deposit, with terracotta pipes on the sides (each 48 cm long, 12 cm diameter). 4 m high x 3 m diam well between the two parts.

References D'Avino 1998: 8-12

SVE002

Town Somma Vesuviana
Località Palmentiello
Date Roman post-79

Localization Excellent **Investigation** Field survey

Category 01 - farmhouse

Description Opus incertum walls and Roman pottery

References

SVE003

Town Somma Vesuviana
Località Palmentiello
Date Roman pre-79

Localization Excellent **Investigation** Field survey

Category 01 - farmhouse

Description Roman criptoporticus, dolia, bricks, mill

References

SVE004

Town Somma Vesuviana
Località Palmentiello
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Many dolia and bricks used in a medieval fortified farmhouse. Roman pre-79 potsherds have been found nearby

References

SVE005

Town Somma Vesuviana
Località Cancherone
Date Pre-Roman

Localization Excellent **Investigation** Accidental discovery
Category 05 - inscription
Description Oscan cippus

References

SVE006

Town Somma Vesuviana
Località Pacchitella
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Cella vinaria and criptoporticus

References

SVE007

Town Somma Vesuviana
Località Pacchitella
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Black-glazed pottery, bricks, and dolia fragments

References

SVE008

Town Somma Vesuviana
Località Torretta Scozia
Date Roman

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Fragments of tegulae and dolia, traces of Roman walls

References

SVE009

Town Somma Vesuviana
Località Cavone
Date Roman pre-79

Localization Good **Investigation** Field survey
Category 02 - residential villa
Description Several potsherds and a decorated handle of a bronza vase

References

SVE010

Town Somma Vesuviana
Località Cavone
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Roman farmhouse

References D'Avino 1991

SVE011

Town Somma Vesuviana
Località
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description 2 walls in opus incertum, fragments of dolia and bricks, cella vinaria, Oscan brick-stamp, olive mill, torcular

References D'Avino 1994

SVE012

Town Somma Vesuviana
Località Traianello
Date Roman pre-79

Localization Excellent **Investigation** Field survey
Category 01 - farmhouse
Description Wall in opus latericium, pavement and drainage channell of a torcular

References

SVE013

Town Somma Vesuviana
Località Menolara
Date Roman

Localization Excellent **Investigation** Field survey

Category 01 - farmhouse

Description Dolia and brick fragments used in a Medieval farmhouse, the cellar is built using the standing Roman walls

References

SVE014

Town Somma Vesuviana
Località Starza della Regina
Date Roman post-79

Localization Excellent **Investigation** Field survey

Category 02 - residential villa

Description So-called Augustus' villa

References GIS Regione: 184ISE169

SVE015

Town Somma Vesuviana
Località de Siervo
Date Roman post-79

Localization Good **Investigation** Accidental discovery

Category 03 - burial

Description Burial of woman with jewels dated to the end of the 4th-beginning of the 5th c. AD

References D'Avino 1988; Pagano 1995: n. 44

SVE016

Town Somma Vesuviana
Località Santa Maria del Pozzo
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman farmhouse

References Pagano 1995: n. 45

SVE017

Town Somma Vesuviana
Località Castello d'Alagno
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman farmhouse dated to the 4th-5th c. AD

References Russo 1987; Pagano 1995: n. 46

SVE018

Town Somma Vesuviana
Località S. Maria a Castello
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 03 - burial
Description Necropolis in amphorae of the 4th-5th c. AD

References Pagano 1995: n. 47

SVE019

Town Somma Vesuviana
Località piazza Carmine
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 02 - residential villa
Description Semicircular structure, two burials, and 2nd-3rd century pottery

References Russo 1984; Russo 1994; Pagano 1995: n. 48

SVE020

Town Somma Vesuviana
Località Masseria Montesanto
Date Roman pre-79

Localization Good **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Abate 1862; D'Avino 1993: 5

SVE021

Town Somma Vesuviana
Località Masseria Sant'Anna
Date Roman pre-79

Localization Good **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Abate 1862; D'Avino 1993: 5

SVE022

Town Somma Vesuviana
Località Santa Maria del Pozzo
Date Roman pre-79

Localization Fair **Investigation** Reference
Category 04 - waterworks
Description Serino aqueduct

References Lettieri 1803; Abate 1862

SVE023

Town Somma Vesuviana
Località Masseria Paglietta
Date Pre-Roman

Localization Good **Investigation** Reference
Category 03 - burial
Description Pre-roman burial

References Russo 1984

SVE024

Town Somma Vesuviana
Località Mercato Vecchio
Date Roman

Localization Poor **Investigation** Reference
Category 03 - burial
Description Roman necropolis

References Russo 1984

SVE025

Town Somma Vesuviana
Località via Marigliano
Date Roman

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Roman burials

References Russo 1984

SVE026

Town Somma Vesuviana
Località Piazza Carmine
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 08 - road
Description Miliarium (AD 383-393)

References D'Avino 1985

SVE027

Town Somma Vesuviana
Località via Turati
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 05 - inscription
Description Honorary inscription of Lucius Publilius Probatus (AD 260 ca.)

References D'Avino 1986: 2-3

SVE028

Town Somma Vesuviana
Località via Castello
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery
Category 03 - burial
Description Burials in amphorae of the 3rd-4th c. AD

References Russo 1984; D'Avino 1992

SVE029

Town Somma Vesuviana
Località Raia al Cavone
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery
Category 04 - waterworks
Description Water channel (part of the aqueduct?)

References D'Avino 1991

SVE030

Town Somma Vesuviana
Località Rione Trieste
Date Pre-Roman

Localization Poor **Investigation** Reference
Category 03 - burial
Description Chamber tomb

References Russo 1984

SVE031

Town Somma Vesuviana
Località Cupa Santa Patrizia
Date Roman post-79

Localization Excellent **Investigation** Accidental discovery

Category 02 - residential villa

Description Mosaic pavement of a residential villa (min. 3x4 m)

References D'Avino 1998: 17-8

SVE032

Town Somma Vesuviana
Località piazza del Carmine
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery

Category 02 - residential villa

Description Two mosaic floors of a pre-79 residential villa. In the same area many 1st c. AD pottery has been found. A coin of Domitian and scarse late antique pottery testify to a later frequentation of the area.

References Russo 1994

SVE033

Town Somma Vesuviana
Località via Collegiata
Date Roman pre-79

Localization Excellent **Investigation** Accidental discovery

Category 03 - burial

Description Funerary inscription of L. Cantinius Rufus (Claudian period)

References CIL X, 8163; De Petra 1878; D'Avino 1986

SVT001

Town San Vitaliano
Località Ponte delle Tavole
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse

References

TAN001

Town Torre Annunziata
Località Madonna del Principio
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Post-79 necropolis

References NSc 1922: 480; Casale 1979: 41, n. 61; Pagano 1995: n. 20

TAN002

Town Torre Annunziata
Località Madonna del Principio
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 37, n. 38

TAN003

Town Torre Annunziata
Località Madonna del Principio
Date Roman

Localization Good **Investigation** Accidental discovery
Category 04 - waterworks
Description Water conduit

References Casale 1979: 51-2, n. 157

TAN004

Town Torre Annunziata
Località Santa Teresa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 07 - column/statue
Description Roman statue

References Casale 1979: 47, n. 123

TAN005

Town Torre Annunziata
Località Santa Teresa
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 12 - baths
Description Bath complex of Marcus Crassus Frugus

References Liberatore 1834; Della Corte 1954: 29-30; D'Arms 1970: 214-215; Malandrino 1977: 41 ss., fig. 9, n. 1; Casale 1979: 47, n. 120; Pagano

---

TAN006

Town Torre Annunziata
Località Santa Teresa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Malandrino 1977: 48, fig. 9, n. 2; Casale 1979: 46-47, n. 118

TAN007

Town Torre Annunziata
Località Santa Teresa
Date Roman

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Opus incertum wall and double column

References Malandrino 1977: 53-54, fig. 9, n. 4; Casale 1979: 49, n. 141

TAN008

Town Torre Annunziata
Località Santa Teresa
Date Roman pre-79

Localization Good **Investigation** Rescue excavation
Category 02 - residential villa
Description Villa of C. Siculus

References Della Corte 1954: 450; Malandrino 1977: 51-52, fig. 9, n. 3; Casale 1979: 47, n. 119

TAN009

Town Torre Annunziata
Località Oplontis
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 02 - residential villa
Description Villa of Poppea

References De Franciscis 1973; Malandrino 1977: 63 ss., fig. 13, n. 13; Casale 1979: 31, n. 9

TAN010

Town Torre Annunziata
Località via Murat
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Malandrino 1977: 58, fig. 13, n. 6; Casale 1979: 48-49, n. 138

TAN011

Town Torre Annunziata
Località via Murat
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Opus reticulatum wall

References Malandrino 1977: 58, fig. 13, n. 7; Casale 1979: 49, n. 139

TAN012

Town Torre Annunziata
Località via Murat
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Opus reticulatum wall with frescoes

References Malandrino 1977: 59, fig. 13, n. 9; Casale 1979: 46, n. 113

TAN013

Town Torre Annunziata
Località via Murat
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Malandrino 1977: 59-60, fig. 13, n. 12; Casale 1979: 46, n. 114

TAN014

Town Torre Annunziata
Località via Murat
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 02 - residential villa
Description Walls with 3rd style decoration

References Malandrino 1977: 59, fig. 13, n. 14; Casale 1979: 46, n. 115

TAN015

Town Torre Annunziata
Località via Murat
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Walls of a criptoporticus

References Malandrino 1977: 59, fig. 13, n. 8; Casale 1979: 49, n. 140

TAN016

Town Torre Annunziata
Località via Murat
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Villa of L. Crassius Tertius

References Malandrino 1977: 81 ss., fig. 13, n. 14; Casale 1979: 46, n. 116

TAN017

Town Torre Annunziata
Località via Murat
Date Pre-Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Walls of the Samnite period

References Elia 1959; Malandrino 1977: 59, fig. 13, n. 10; Casale 1979: 46, n. 117

TAN018

Town Torre Annunziata
Località Torretta di Siena
Date Roman

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman ruins

References Casale 1979: 46, n. 112

TAN019

Town Torre Annunziata
Località Torretta di Siena
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Opus incertum walls

References Malandrino 1977: 61, fig. 9, n. 5; Casale 1979: 46, n. 111

TAN020

Town Torre Annunziata
Località Torretta di Siena
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 03 - burial
Description Funerary monument of the Ancaruleni

References Casale 1979: 40, n. 60

TAU001

Town Taurano
Località Taurano
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 03 - burial
Description Roman necropolis

References GIS Regione: 185-1

TAU002

Town Taurano
Località Palazzo del Cavaliere
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 02 - residential villa
Description Roman villa

References GIS Regione: 185IVSE79

TAU003

Town Taurano
Località Palombaio
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 02 - residential villa
Description Roman villa

References GIS Regione: 185IVSE80

TAU004

Town Taurano
Località Monte Donico
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 02 - residential villa
Description Roman villa

References GIS Regione: 185IVSE78

TER001

Town Terzigno
Località Avini
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Amphorae and dolia

References Casale 1979: 51, n. 161

TER002

Town Terzigno
Località Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 01 - farmhouse
Description Farmhouse in cava Ranieri

References Casale 1979: 48, n. 133

TER003

Town Terzigno
Località Boccia al Mauro
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Walls and Roman agricultural tools

References Casale 1979: 39, n. 53; Cicirelli 1993: 570

TER004

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls

References Cicirelli 1993: 570

TER005

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 08 - road
Description E-W pre-79 Roman road

References Cicirelli 1989: 249

TER006

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 03 - burial
Description “A cappuccina” burial of a child

References Cicirelli 1993: 233

TER007

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Excellent **Investigation** Partial excavation
Category 02 - residential villa
Description Cava Ranieri Villa 2

References Menotti 1983: 336-7; Menotti 1987: 166-8 ; Cicirelli 1989: 250-3; Cicirelli 1991; Cicirelli 1993 ; CIcirelli 1993; Cicirelli 2000

TER008

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 10 - cultivation
Description NE-SW ploughing forrows

References Cicirelli 1993: 230

TER009

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 04 - waterworks
Description Cistern

References Menotti 1983; Cicirelli 1993

TER010

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Augustan dump

References Cicirelli 1993: 570

TER011

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 01 - farmhouse
Description Cava Ranieri, Villa 6

References Cicirelli 1993; Cicirelli 1995 ; Cicirelli 1997; Cicirelli 1998; Cicirelli AISCOM; Cicirelli 2000

TER012

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 04 - waterworks
Description U-shaped Roman cistern

References Menotti 1983: 337; Cicirelli 1993: 570

TER013

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 08 - road
Description E-W field road

References Menotti 1983: 337; Cicirelli 1993: 570

TER014

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 01 - farmhouse
Description Cava Ranieri Villa 1

References Menotti 1983: 334-336; Cicirelli 1989: 17-31; Cicirelli 1993: 570-571; Cicirelli 2000: 71-73

TER015

Town Terzigno
Località Boccia al Mauro, Cava Ranieri
Date Roman pre-79

Localization Excellent **Investigation** Rescue excavation
Category 10 - cultivation
Description NW-SE ploughing forrows

References Cicirelli 1994: 230

TGR001

Town Torre del Greco
Località Cupa Vecchia Falanga
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman farmhouse

References Formicola 1990: 174, n. 22

TGR002

Town Torre del Greco
Località Cupa Vecchia Falanga
Date Roman pre-79

Localization Fair **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman farmhouse

References Scatozza Höricht 1985: n. 6; Formicola 1990: 174, n. 21

TGR003

Town Torre del Greco
Località Rospo
Date Roman pre-79

Localization Good **Investigation** Field survey
Category 09 - pottery
Description Roman pottery (terra sigillata italica, thin-walled pottery)

References Formicola 1990: 173-4, n. 20

TGR004

Town Torre del Greco
Località Camaldoli della Torre
Date Roman pre-79

Localization Good **Investigation** Field survey
Category 01 - farmhouse
Description Opus retuculatum, cisterns, pavements with mosaics

References Scatozza Höricht 1985: 164, n. 9; Formicola 1990: 173, n. 19

TGR005

Town Torre del Greco
Località Lamaria
Date Roman pre-79

Localization Fair **Investigation** Reference
Category 02 - residential villa
Description Roman relief with Orpheus, Hermes, and Euridike

References Formicola 1990: 171, n. 18

TGR006

Town Torre del Greco
Località Curtoli
Date Roman post-79

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description 5 Roman burials

References Scatozza Höricht 1985: n. 16; Formicola 1990: 171, n. 16; Pagano 1995: n. 14

TGR007

Town Torre del Greco
Località via Cappuccini
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Opus reticulatum wall

References Formicola 1990: 171, n. 17

TGR008

Town Torre del Greco
Località Santa Maria del Popolo
Date Roman pre-79

Localization Fair **Investigation** Reference
Category 02 - residential villa
Description Roman walls with frescoes

References Formicola 1990: 165, n. 3

TGR009

Town Torre del Greco
Località Santa Maria del Popolo
Date Roman pre-79

Localization Fair **Investigation** Accidental discovery

Category 09 - pottery

Description Roman pottery (Italic terra sigillata, thin-walled pottery, loom weights)

References Formicola 1990: 165, n. 4

TGR010

Town Torre del Greco
Località Calastro
Date Roman pre-79

Localization Fair **Investigation** Accidental discovery

Category 03 - burial

Description Roman burials

References Formicola 1990: 165, n. 5

TGR011

Town Torre del Greco
Località Calastro
Date Roman pre-79

Localization Good **Investigation** Partial excavation

Category 02 - residential villa

Description Roman residential villa

References Scatozza Höricht 1985: 161, n. 7; Formicola 1990: 164, n. 1

TGR012

Town Torre del Greco
Località Calastro
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Opus reticulatum walls

References Formicola 1990: 164, n. 2

TGR013

Town Torre del Greco
Località Ciaravolo
Date Roman

Localization Good **Investigation** Reference
Category 02 - residential villa
Description Roman residential villa

References Formicola 1990: 168, n. 7

TGR014

Town Torre del Greco
Località Contrada Sora
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 02 - residential villa
Description Roman residential villa with statues and bath complex

References Scatozza Höricht 1985: 152-161; Formicola 1990: 165-7, n. 6; Pagano 1991

TGR015

Town Torre del Greco
Località Contrada Sora
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Opus reticulatum walls and human bones

References Formicola 1990: 168, n. 8

TGR016

Town Torre del Greco
Località Contrada Sora
Date Roman pre-79

Localization Good **Investigation** Partial excavation
Category 12 - baths
Description Roman bath complex

References Formicola 1990: 168-170, n. 9-10; Pagano 1995: 35, n. 17

TGR017

Town Torre del Greco
Località Contrada Sora
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Roman walls and part of the piers

References Formicola 1990: 170, n. 11

TGR018

Town Torre del Greco
Località Contrada Sora
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 04 - waterworks
Description Roman aqueduct

References Formicola 1990: 170, n. 12

TGR019

Town Torre del Greco
Località Torre Bassano
Date Roman pre-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Opus reticulatum wall

References Formicola 1990: 171, n. 13

TGR020

Town Torre del Greco
Località Torre Bassano
Date Pre-Roman

Localization Fair **Investigation** Accidental discovery
Category 03 - burial
Description Protohistorical burial

References Scatozza Höricht 1985: n. 17; Formicola 1990: 171, n. 14

TGR021

Town Torre del Greco
Località Torre Bassano
Date Roman pre-79

Localization Good
Investigation Accidental discovery
Category 09 - pottery
Description Roman pottery

References Formicola 1990: 171, n. 15

TGR022

Town Torre del Greco
Località Calastro
Date Roman pre-79

Localization Fair
Investigation Accidental discovery
Category 03 - burial
Description Roman burial of a child

References Scatozza Höricht 1985: 165, n. 15; Formicola 1990: 165, n. 3; Pagano 1995: n. 13

TGR023

Town Torre del Greco
Località Villa Sora
Date Roman post-79

Localization Poor
Investigation Partial excavation
Category 01 - farmhouse
Description Roman farmhouse (4th-6th c. AD)

References Pagano 1991; Pagano 1995: n. 16

TGR024

Town Torre del Greco
Località Villa Sora
Date Roman post-79

Localization Poor **Investigation** Accidental discovery

Category 10 - cultivation

Description Roman inscription of a wood sacred to Jupiter (end of the 2nd - 3rd c. AD)

References Pagano 1991: 184-5

TGR025

Town Torre del Greco
Località via Cavallerizzi
Date Roman post-79

Localization Fair **Investigation** Accidental discovery

Category 03 - burial

Description Roman burials in African amphorae (4th-5th c. AD)

References Pagano 1995: n. 15

TRC001

Town Trecase
Località Soluneno
Date Roman post-79

Localization Good **Investigation** Accidental discovery

Category 01 - farmhouse

Description 3rd c. AD building

References Casale 1979: 48, n. 135; Pagano 1995: n. 51

TRC002

Town Trecase
Località Casella
Date Roman

Localization Good **Investigation** Accidental discovery
Category 01 - farmhouse
Description Roman dolia

References Casale 1979: 46, n. 109

TRC003

Town Trecase
Località Villa Manzo
Date Roman post-79

Localization Good **Investigation** Accidental discovery
Category 11 - other buildings
Description Post-79 walls

References Sogliano 1901: 23; Sogliano 1915: 499; Cerulli Irelli 1975: 296; Casale 1979: 49, n. 143; Pagano 1995: n. 19

TRC004

Town Trecase
Località Villa Manzo
Date Roman

Localization Good **Investigation** Accidental discovery
Category 08 - road
Description Roman road

References Casale 1979: 48, n. 137

TRC005

Town Trecase
Località Villa Manzo
Date Roman

Localization Good **Investigation** Accidental discovery
Category 09 - pottery
Description Roman mortaria

References Casale 1979: 46, n. 110

TUF001

Town Tufino
Località Schiava
Date Roman pre-79

Localization Excellent **Investigation** Complete excavation
Category 02 - residential villa
Description 2nd c. BC residential villa

References

VOL001

Town Volla
Località via Filichito
Date Roman post-79

Localization Good **Investigation** Rescue excavation
Category 08 - road
Description NE-SW Roman paved road

References De Caro 2008: 122; GIS Regione: 184ISE3

VOL002

Town Volla
Località via Filichito
Date Roman post-79

Localization Excellent **Investigation** Rescue excavation
Category 03 - burial
Description 3 post-472 burials

References GIS Regione: 184ISE3

VRI001

Town Villaricca
Località via Circumvallazione
Date Roman pre-79

Localization Fair **Investigation** Rescue excavation
Category 01 - farmhouse
Description Roman farmhouse

References GIS Regione: 184IVNE1

Bibliography

Abate, F. (1862), *Primi studi sull'acquedotto Claudio. Rapporto al signor sindaco di Napoli*, (Napoli: Stamperia dell'Iride).

Albore Livadie, C., G. Mastrolorenzo, and G. Vecchio (1998), 'Eruzioni pliniane del Somma-Vesuvio e siti archeologici dell'area nolana', in Guzzo, P.G. and R. Peroni (eds.), *Archeologia e Vulcanologia in Campania. Atti del Convegno, Pompei 21 dicembre 1996* (Napoli: Arte tipografica), 39-86.

Andreae, B. (1975), 'Rekonstruktion des grossen Oecus der Villa des P. Fannius Synistor in Boscoreale', *Neue Forschungen in Pompeji* (Recklinghausen: 71-83.

Aurigemma, S. (1911), 'S. Gennaro di Palma. Ruderi di un edifizio romano', *Notizie degli Scavi di Antichità*, s. V, vol. VIII, fasc. 3 153-54.

Barnabei, F. (1901), *La Villa Pompeiana di P. Fannio Sinistore scoperta presso Boscoreale*, (Roma: Accademia dei Lincei).

Blanckenhagen, P.H. v., Ch. Alexander, and G. Papadopulos (1962), *The paintings from Boscotrecase*, (Mitteilungen des Deutschen Archäologischen Instituts, Römische Abteilung. Ergänzungsheft, 6; Heidelberg: Kerle).

Carrington, R.C. (1931), 'Studies in the Campanian "villae rusticae"', *Journal of Roman Studies*, 21 110-30.

Casale, A. and A. Bianco (1979), 'Primo contributo alla topografia del suburbio pompeiano', *Pompei 79* (Suppl. Antiqua, 4, Roma: Buffetti), 27-56.

Cerulli Irelli, G. (1965), 'S. Sebastiano al Vesuvio - Villa rustica romana', *Notizie degli Scavi di Antichità*, s.VIII, vol.XIX, Suppl. 161-78.

Cerulli Irelli, G. (1975), 'Intorno al problema della rinascita di Pompei', in Andreae, B. and H. Kyrieleis (eds.), *Neue Forschungen in Pompeji und den anderen vom Vesuvausbruch 79 n. Chr. verschütteten Städten* (Recklinghausen: Bongers), 291-98.

Cicirelli, C. 'Il complesso di pitture e pavimenti di II stile dalla villa 6 di Terzigno', *Atti XV International Congress of Classical Archaeology, Amsterdam 12-17 July 1998* (

Cicirelli, C. (1989), 'Comune di Ottaviano. Via S. Domenico', *Rivista di Studi Pompeiani*, III 253.

Cicirelli, C. (1989), 'Comune di Terzigno. Località Boccia al Mauro, proprietà Cava Ranieri', *Rivista di Studi Pompeiani*, III

Cicirelli, C. (1989), 'Le ville romane di Terzigno', (Torre del Greco: 17-31.

Cicirelli, C. (1991), 'Comune di Ottaviano. Rinvenimenti nelle località Boscariello (Zabatta) e Strocchioni (Toppa)', *Rivista di Studi Pompeiani*, V 211-14.

Cicirelli, C. (1991), 'Comune di Terzigno. Località Boccia al Mauro, proprietà Cava Ranieri', *Rivista di Studi Pompeiani*, V 208-11.

Cicirelli, C. (1993), 'Comune di Terzigno. Località Boccia al Mauro, Cava Ranieri', *Rivista di Studi Pompeiani*, VI 228-31.

Cicirelli, C. (1993), 'Indagini archeologiche a Terzigno', *Ercolano 1738-1988. 250 anni di ricerca archeologica, Atti Convegno Internazionale Ravello-Ercolano-Napoli-Pompei 1988* (Roma: 570.

Cicirelli, C. (1993), 'Ottaviano. Località Boscariello', *Rivista di Studi Pompeiani*, VI 239-41.

Cicirelli, C. (1993), 'Ottaviano. Località Raggi', *Rivista di Studi Pompeiani*, VI 241-47.

Cicirelli, C. (1993), 'S. Gennaro Vesuviano', *Rivista di Studi Pompeiani*, VI 248.

Cicirelli, C. (1995), 'Comune di Ottaviano - Località Bosco De Siervo', *Rivista di Studi Pompeiani*, VII 185-88.

Cicirelli, C. (1995), 'Comune di Terzigno. Località Boccia al Mauro', *Rivista di Studi Pompeiani*, VII 183-85.

Cicirelli, C. (1997), 'Comune di Terzigno. Località Boccia al Mauro', *Rivista di Studi Pompeiani*, VIII 175-79.

Cicirelli, C. (1998), 'Comune di Ottaviano - Località Raggi', *Rivista di Studi Pompeiani*, IX 241-43.

Cicirelli, C. (1999), 'Mosaico inedito da una villa romana scoperta ad Ottaviano', *AISCOM. Atti del V Colloquio dell'Associazione Italiana per lo studio e la conservazione del mosaico, Roma 3-6 novembre 1997* (Ravenna: 345-50.

Cicirelli, C. (2000), 'La villa 1 di Terzigno', *Casali di ieri casali di oggi* (Napoli: 71-73.

Cicirelli, C. (2000), 'La villa 2 di Terzigno', *Casali di ieri casali di oggi* (Napoli: 75-77.

Cicirelli, C. (2000), 'La villa 6 di Terzigno', *Casali di ieri casali di oggi* (Napoli: 79-83.

Cicirelli, C. (2001), 'Indagini archeologiche nei comuni di S. Gennaro Vesuviano e Ottaviano', *Rivista di Studi Pompeiani*, XII-XIII 253-59.

Cola, S. (1915), *S. Giuseppe Vesuviano nella storia. Il Vesuvio e le sue eruzioni. Ricordi storici di Ottaviano, S. Gennarello e Terzigno*, (Napoli:).

Conticello de' Spagnolis, M. (1994), *Il pons Sarni di Scafati e la via Nuceria-Pompeios*, (Monografie della Soprintendenza Archeologica di Pompei, 8; Roma: Erma di Bretschneider).

D'Arms, J. (1970), *Romans on the Bay of Naples: a social and cultural study of the villas and their owners from 150 B.C. to A.D. 400*, (Cambridge (MA): Harvard University Press).

D'Ascoli, F. (1985), *Ottaviano: Terra di Augusto*, (Napoli:).

D'Avino, M. (1983), *Campania nobilissima*, (Napoli:).

D'Avino, R. (1985), 'Resti di colonne romane in Somma', *Summana*, 5 2-9.

D'Avino, R. (1986), 'Iscrizioni romane da Somma', *Summana*, 7 2-8.

D'Avino, R. (1987), 'Residui di statuaria romana in Somma', *Summana*, 10 2-5.

D'Avino, R. (1988), 'Corredo funerario di una donna romana rinvenuto in una tomba in proprietà De Siervo', *Summana*, 14 2-5.

D'Avino, R. (1991), 'Insediamento romano all'alveo Cavone', *Summana*, 22 2-6.

D'Avino, R. (1992), 'Necropoli in via S. Maria delle Grazie a Castello', *Summana*, 24 2-4.

D'Avino, R. (1993), 'L'acquedotto augusteo campano e i pozzi-spiraglio nel territorio di Somma', *Summana*, 29 2-6.

D'Avino, R. (1994), 'Scheda: macina olearia', *Summana*, 32 2-5.

D'Avino, R. (1995), 'Villa romana rustica a S. Maria del Pozzo', *Summana*, 34 2-4.

D'Avino, R. (1996), *Il castello mediceo di Ottaviano: breve raccolta di notizie storiche e descrittive*, (Ottaviano (NA):).

D'Avino, R. (1998), *Presenze Romane a Somma*, (Somma Vesuviana (NA): Summana).

Day, F. (1932), 'Agriculture in the life of Pompeii', *Yale Classical Studies*, 3 165-208.

De Caro, S. (1983), *Pompeii, Herculaneum, Stabiae*, 1 325.

De Caro, S. and D. Giampaola (2008), 'La circolazione stradale a Neapolis e nel suo territorio', in Mertens, D. (ed.), *Stadtverkehr in der antiken Welt* (Palilia, 18, Wiesbaden: Ludwig Rechert Verlag), 107-24.

De Franciscis, A. (1966), 'L'attività archeologica nelle province di Napoli e Caserta', *Filosofia e scienze in Magna Grecia. Atti del quinto convegno di studi sulla Magna Grecia, Taranto 10-14 ottobre 1965* (Napoli: Arte Tipografica), 173-91.

De Franciscis, A. (1973), 'La villa romana di Oplontis', *Parola del Passato*, 153 453-66.

De Franciscis, A. (1974), 'Un monumento sepolcrale ed altre antichità a S. Anastasia (Napoli)', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, n.s. XLIX 225-31.

De Simone, A. and S.C. Nappo (eds.) (2000), *Mitis Sarni opes. Nuova indagine archeologica in località Murecine*, Napoli: Denaro)

De Stefano, P. and V. Carsana (eds.) (1987), *Archeologia e trasformazione urbana, Notiziario 12. Programma straordinario di edilizia residenziale per la città di Napoli*, Napoli: Arti Grafiche Boccia)

de' Spagnolis, M. (2002), *La villa N. Popidi Narcissi Maioris in Scafati, suburbio orientale di Pompei*, (Studia Archaeologica, 119; Roma: Erma di Bretschneider).

Della Corte, M. (1913), 'Sui monumenti scoperti fuori la Porta del Vesuvio: brevi note di epigrafia Pomeian', *Memorie dell'Accademia di archeologia, lettere e belle arti di Napoli*, 2 181-200.

Della Corte, M. (1921), 'Villa rustica, esplorata dal sig. Ferruccio De Prisco nel fondo D'Acunzo, posto immediatamente a mezzogiorno del piazzale della stazione ferroviaria di Boscoreale (Ferrovie dello Stato), l'anno 1903', *Notizie degli Scavi di Antichità*, 436-42.

Della Corte, M. (1922), 'Pompei - Scavi eseguiti da privati nel territorio di Pompei (secondo rapporto)', *Notizie degli Scavi di Antichità*, 459-78.

Della Corte, M. (1929), 'Boscoreale - Parziale scavo della Villa rustica M. Livi Marcelli', *Notizie degli Scavi di Antichità*, 178-88.

Della Corte, M. (1929), 'Boscotrecase - Cella vinaria di una villa rustica', *Notizie degli Scavi di Antichità*, 189-90.

Della Corte, M. (1929), 'Castello di Palma in Campania - Bolli figulini', *Notizie degli Scavi di Antichità*, 204.

Della Corte, M. (1929), 'Domicella - Ruderi di una Villa rustica romana', *Notizie degli Scavi di Antichità*, 199-203.

Della Corte, M. (1929), 'Lauro di Nola - Bollo figulino', *Notizie degli Scavi di Antichità*, 205-6.

Della Corte, M. (1932), 'Santa Anastasia', *Notizie degli Scavi di Antichità*, 308-9.

Della Corte, M. (1954), *Case ed abitanti di Pompei*, (Pompei:).

Ebanista, C. (2003), 'Dinamiche insediative nel territorio di Cimitile tra tarda antichità e Medioevo', in Brandenburg, H. and L. Ermini Pani (eds.), *Cimitile e Paolino di Nola: la tomba di S. Felice e il centro di pellegrinaggio: trent'anni di ricerche. Atti della giornata tematica dei Seminari di archeologia cristiana, Ecole française de Rome, 9 marzo 2000* (Città del Vaticano: Pontificio istituto di archeologia cristiana), 43-86.

Ebanista, C. (2005), 'Il ruolo del santuario martiriale di Cimitile nella trasformazione del tessuto urbano di Nola', in Vitolo, G. (ed.), *Le città campane fra tarda antichità e alto medioevo* (Salerno: Laveglia), 313-77.

Elia, O. (1959), *Relazione agli scavi di Oplontis*, (Torre Annunziata:).

Fergola, L. (1987), 'Comune di Boscoreale. Via Casone Grotta, proprietà Risi-Di Prisco', *Rivista di Studi Pompeiani*, 1 163-66.

Fergola, L. (1988), 'Comune di Boscoreale. Via Casone Grotta, proprietà Risi Di Prisco', *Rivista di Studi Pompeiani*, 2 216.

Formicola, F., et al. (1990), 'Archeologia, geologia e vulcanologia nel territorio di Torre del Greco: tre discipline a confronto', in Albore Livadie, C. and F. Widemann (eds.), *Volcanologie et Archéologie* (Pact, 25, Strasbourg: Rixensart), 125-81.

Fusco, G.M. (1863), *Sulla greca iscrizione posta in Napoli al lottatore Marco Aurelio Artemidoro*, (Napoli: Stamperia del Fibreno).

Giampaola, D. (2010), 'Il paesaggio costiero di Neapolis tra Greci e Bizantini', *Napoli, la città e il mare* (Napoli: Electa), 17-26.

Giglioli, G.Q. (1922), 'Ponticelli (Napoli) - Necropoli del III secolo av. Cr. in località Purgatorio', *Notizie degli Scavi di Antichità*, 257-86.

Golser, C., M. Pagano, and F. Russo (1990), 'Evidenze archeologiche sommerse a Torre del Greco e loro implicazioni sull'andamento della linea di costa vesuviana del 79 d.C.', in Albore Livadie, C. and F. Widemann (eds.), *Volcanologie et Archéologie* (Pact, 25, Strasbourg: Rixensart), 183-95.

Guzzo, P.G. (ed.) (2001), *In Stabiano: cultura e archeologia da Stabiae, la città e il territorio tra l'età arcaica e l'età romana: catalogo della mostra, Castellammare di Stabia, Palazzetto del mare, 4 novembre 2000-31 gennaio 2001*, Castellammare di Stabia: Longobardi)

Guzzo, P.G. (2005), 'Introduzione a Moregine', in Scarano Ussani, V. (ed.), *Moregine. Suburbio 'portuale' di Pompei* (Napoli: Loffredo), 11-22.

Lettieri, P. (1803), 'Discorso circa l'antica pianta et ampliatione della città di Napoli et de l'itinerario del acqua che anticamente flueva et dentro et fora la pred. Città per aquedocti mirabili', in Giustiniani, L. (ed.), *Dizionario geografico-ragionato del Regno di Napoli, 6* (Napoli: Vincenzo Manfredi), 382-411.

Liberatore, R. (1834), 'Delle nuove e antiche terme di Torre Annunziata', *Annali Civili del Regno di Napoli*, 12

Maiuri, A. (1931), *La Villa dei Misteri*, (Napoli:).

Maiuri, A. (1938), *Passeggiate campane*, (Milano:).

Malandrino, C. (1977), *Oplontis*, (Napoli:).

Menotti, E.M. (1983), 'Notiziario 1980-1983. Ottaviano - Indagini, rinvenimenti e ricerche sul territorio', *Pompeii Herculaneum Stabiae*, I 333.

Menotti, E.M. (1983), 'Terzigno. Indagini, rinvenimenti e ricerche sul territorio comunale di Terzigno, località Boccia al Mauro, proprietà Cava Ranieri', *Pompeii Herculaneum Stabiae*, I 334-37.

Menotti, E.M. (1987), 'Comune di Terzigno, loc. Boccia al Mauro, proprietà Cava Ranieri', *Rivista di Studi Pompeiani*, I 166-68.

Miniero, P. (1987), 'Stabiae. Indagini, rinvenimenti e ricerche nell'ager Stabianus', *Rivista di Studi Pompeiani*, I 177-90.

Pagano, M. (1988), 'Pollena Trocchia. Rinvenimento di strutture romane del II secolo d.C.', *Rivista di Studi Pompeiani*, II 244-45.

Pagano, M. (1990), 'S. Giorgio a Cremano (Napoli)', *Bollettino di archeologia*, 3-4 123-25.

Pagano, M. (1991), 'La villa romana di contrada Sora a Torre del Greco', *Cronache Ercolanesi*, 21 149-86.

Pagano, M. (1991), 'Pollena Trocchia. Scavo in località Masseria De Carolis e ricognizioni nel territorio comunale', *Rivista di Studi Pompeiani*, V 231-36.

Pagano, M. (1993), 'Un lucus di Giove alle radici del Vesuvio', *Les bois sacrés. Actes du colloque international de Naples* (Collection du Centre Jean Bérard, 10, Napoli: Centre Jean Bérard), 53-55.

Pagano, M. (1995), 'L'area vesuviana dopo l'eruzione del 79 d.C.', *Rivista di Studi Pompeiani*, VII 35-44.

Parma, A. and A. Gifuni (1988), 'Prime indagini su una necropoli tardo-romana in via Rosanea a Sant'Anastasia', *I Convegno dei Gruppi Archeologici dell'Italia meridionale: Prata Sannita 25-27 aprile 1986* (Prata Sannita: Gruppi Archeologici dell'Italia Meridionale), 151-73.

Pasqui, A. (1897), 'La villa pompeiana della Pisanella presso Boscoreale', *Monumenti Antichi dei Lincei*, VII 397-554.

Pisapia, M.S. (1981), 'L'area ercolanese dopo l'eruzione del 79: evidenze archeologiche. La necropoli di Via Doglie ad Ercolano', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, 56 63-74.

Rossi, C. (1983), 'Notiziario 1980-1983. Ottaviano', *Pompeii Herculaneum Stabiae*, I 333-34.

Rostovzev, M.I. (1957), *The social and economic history of the Roman Empire*, (Oxford: Oxford University Press).

Ruggiero, M. (1888), *Degli scavi di antichità nelle provincie di terraferma dell' antico regno di Napoli dal 1743 al 1876*, (Napoli: Vincenzo Morano).

Russo, D. (1984), 'Usi funerari e necropoli romane a Somma', *Summana*, 2 29-30.

Russo, D. (1985), 'L'opera laterizia romana sul Monte Somma', *Summana*, 4 11-13.

Russo, D. (1986), 'Bollo laterizio degli "ARRI" a Somma', *Summana*, 8 24-26.

Russo, D. (1987), 'Un rinvenimento archeologico sulla statale 268', *Summana*, 11 13-15.

Russo, D. (1988), 'Su alcuni frammenti con scene erotiche da Somma', *Summana*, 13 19-22.

Russo, D. (1989), 'I pesi da telaio recuperati sul versante settentrionale del Somma', *Summana*, 15 9-14.

Russo, D. (1990), 'Ceramica sigillata chiara', *Summana*, 24-25.

Russo, D. (1991), 'Una moneta di Caligola - Una lucerna già vista - Una lucerna erotica della collezione freudiana - Due monete romane da Somma: un quadrante e un denario', *Summana*, 21 9-11,16.

Russo, D. (1994), 'Sito archeologico di piazza Carmine - S. Angelo', *Summana*, 30 14-18.

Sakai, T. (1992), 'A note on the listing of villae rusticae in the vicinity of Pompeii', *Opuscula Pompeiana*, 2 35-47.

Sampaolo, V. (1991), 'Nola', *Bollettino di archeologia*, 11-12 162-68.

Saviano, L. (1988), *Storia di Ottaviano*, (I; Napoli:).

Scatozza Höricht, L. (1985), 'Ville nel territorio ercolanese', *Cronache Ercolanesi*, 15 131-65.

Sogliano, A. (1886), 'Boscotrecase', *Notizie degli Scavi di Antichità*, 131-32.

Sogliano, A. (1895), 'Saviano - Tombe antiche scoperte nella frazione comunale di s. Erasmo nel territorio nolano', *Notizie degli Scavi di Antichità*, 250-51.

Sogliano, A. (1898), 'Boscoreale - Avanzi di una villa romana in piazza Mercato', *Notizie degli Scavi di Antichità*, 419-22.

Sogliano, A. (1899), 'Boscotrecase - Fabbriche antiche scoperte in contrada "Setari"', *Notizie degli Scavi di Antichità*, 297-99.

Sogliano, A. (1901), 'Pompei - Relazione degli scavi fatti durante il mese di gennaio 1901', *Notizie degli Scavi di Antichità*, 21-23.

Sogliano, A. (1915), 'La rinascita di Pompei', *Rendiconti della Accademia di archeologia, lettere e belle arti, Napoli*, 24 483-514.

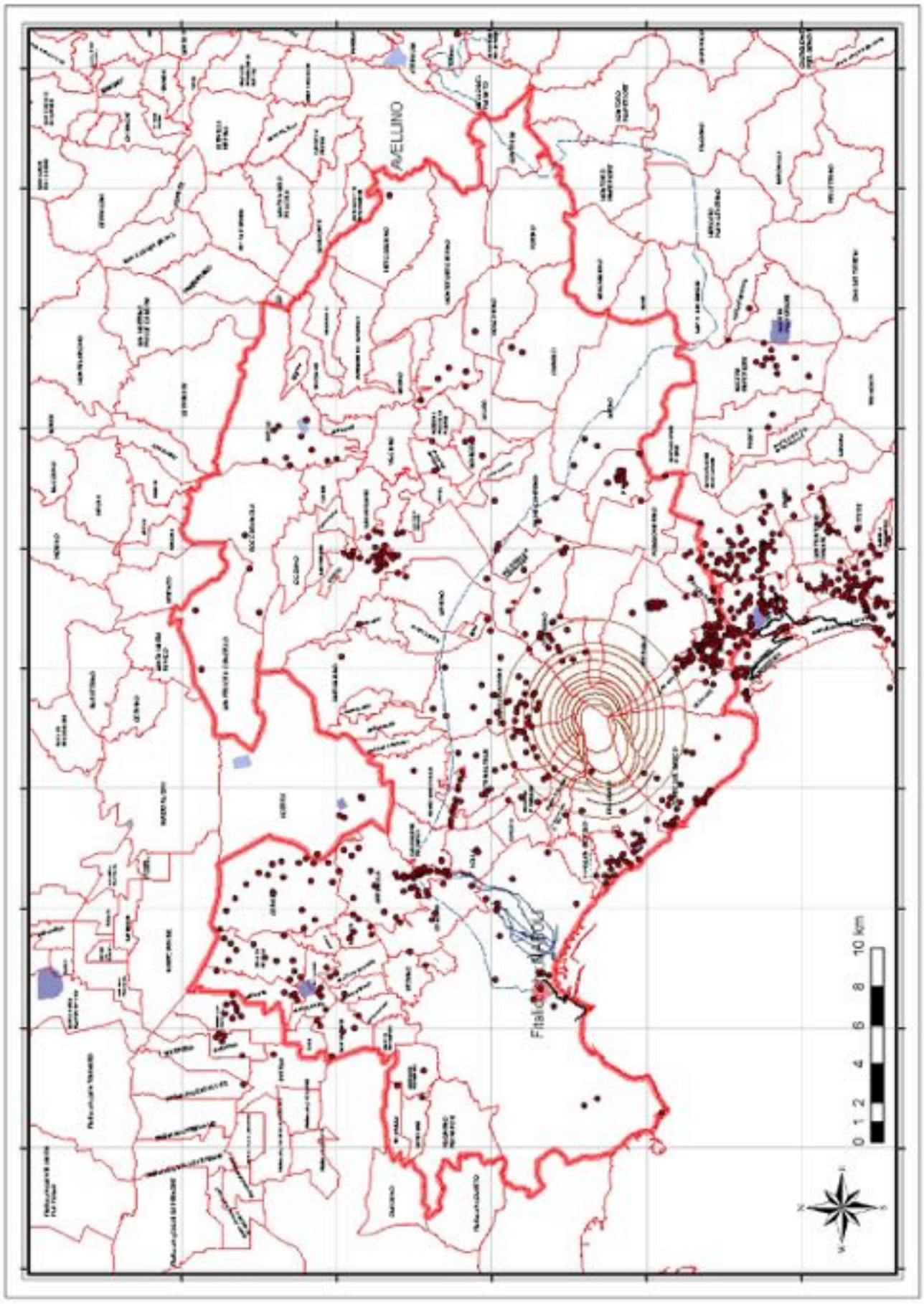
Stefani, G. (1994), *Pompei, vecchi scavi sconosciuti: la villa rinvenuta dal marchese Giovanni Imperiali in località Civita (1907-1908)*, (Monografie della Soprintendenza Archeologica di Pompei, 9; Roma: Erma di Bretschneider).

Stefani, G. (ed.) (2002), *Uomo e ambiente nel territorio vesuviano. Guida all'Antiquarium di Boscoreale*, Pompei: Marius)

Van der Poel, H. (1981), *Corpus topographicum Pompeianum V. Cartography*, (Roma: University of Texas at Austin).

Varone, A. (1988), 'Nuceria romana e medioevale nel Codice Diplomatico Cavese: note di topografia e storia', *Rivista di Studi Pompeiani*, II 103-18.

Zevi, F. (1982), 'L'attività archeologica nelle province di Napoli e Caserta', *Megale Hellas, nome e immagine. Atti del ventunesimo convegno di studi sulla Magna Grecia, Taranto 2-5 ottobre 1981* (Napoli: Arte Tipografica), 325-58.

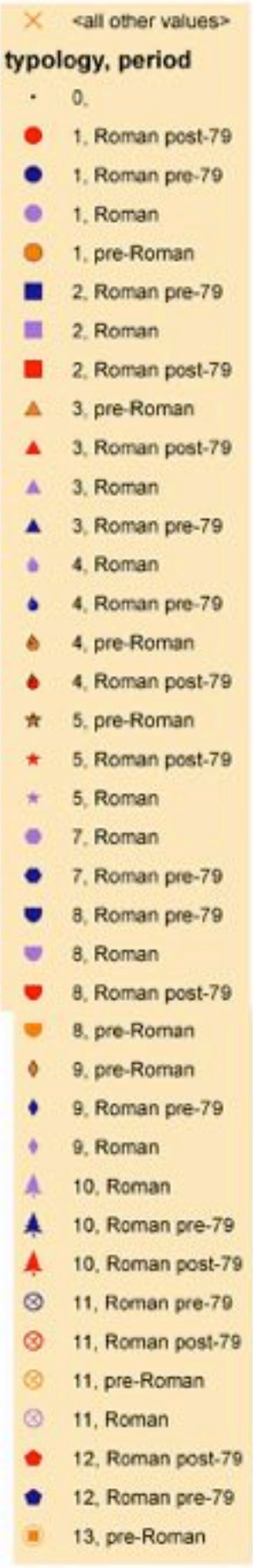


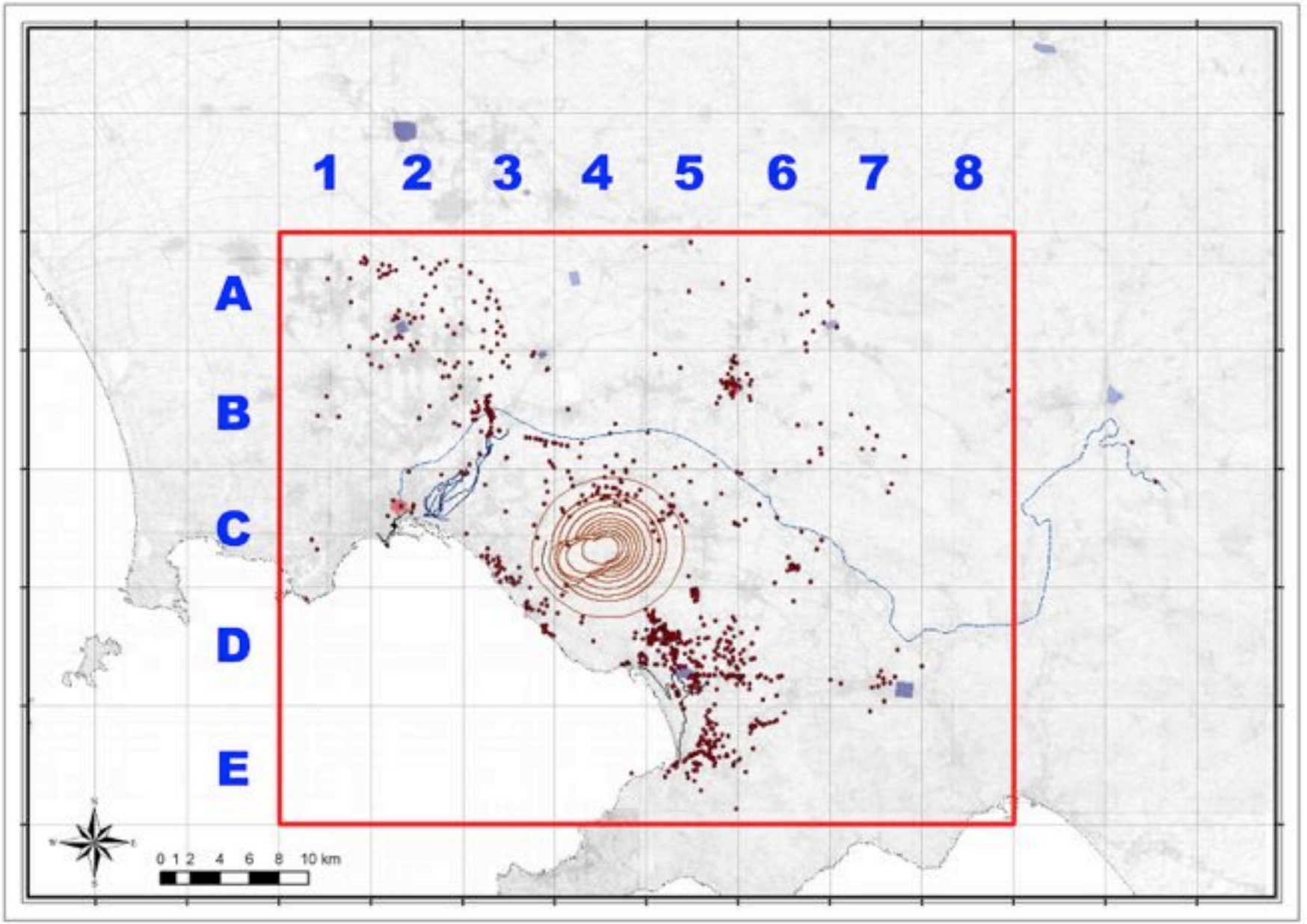
Present day town boundaries.

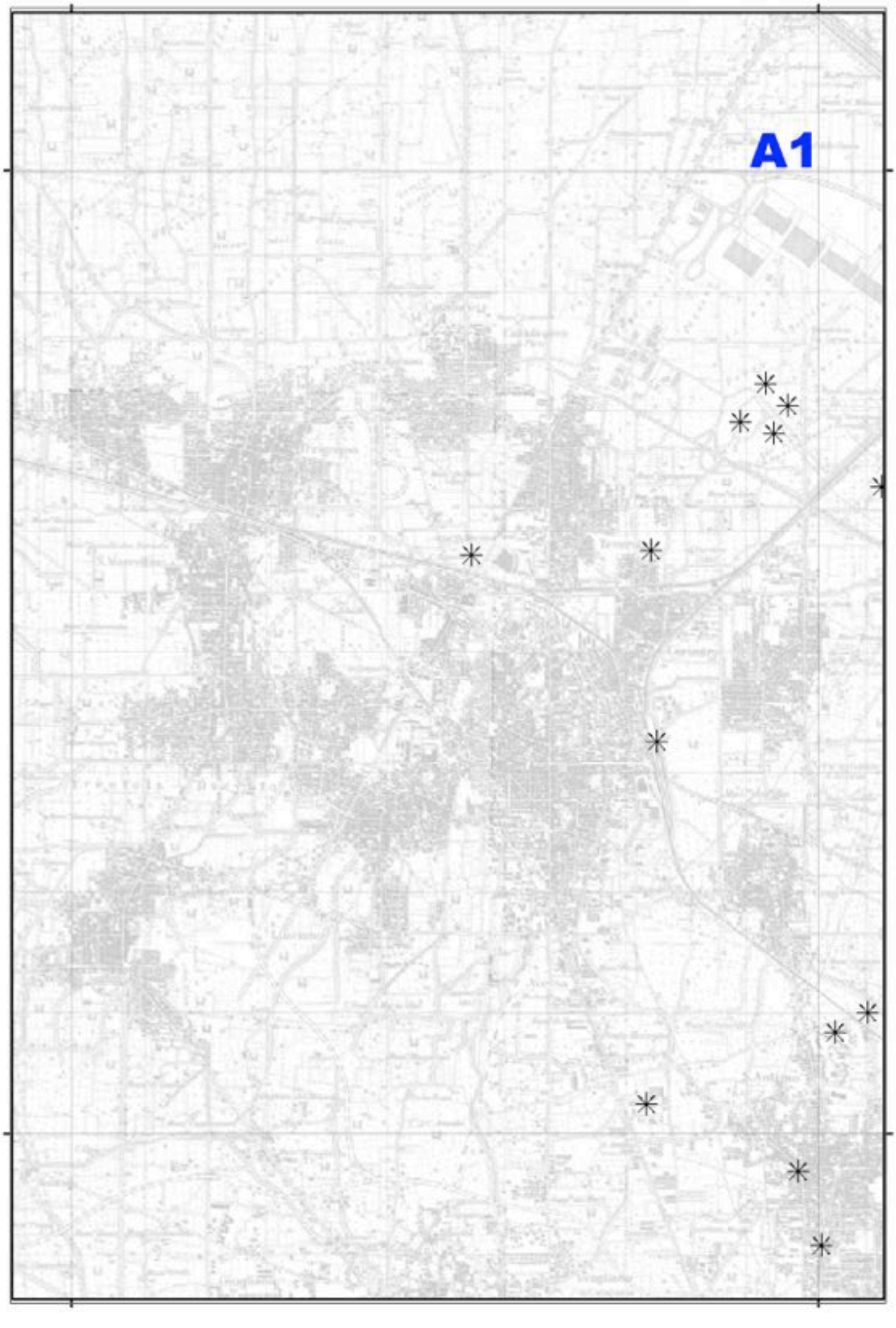
Legend

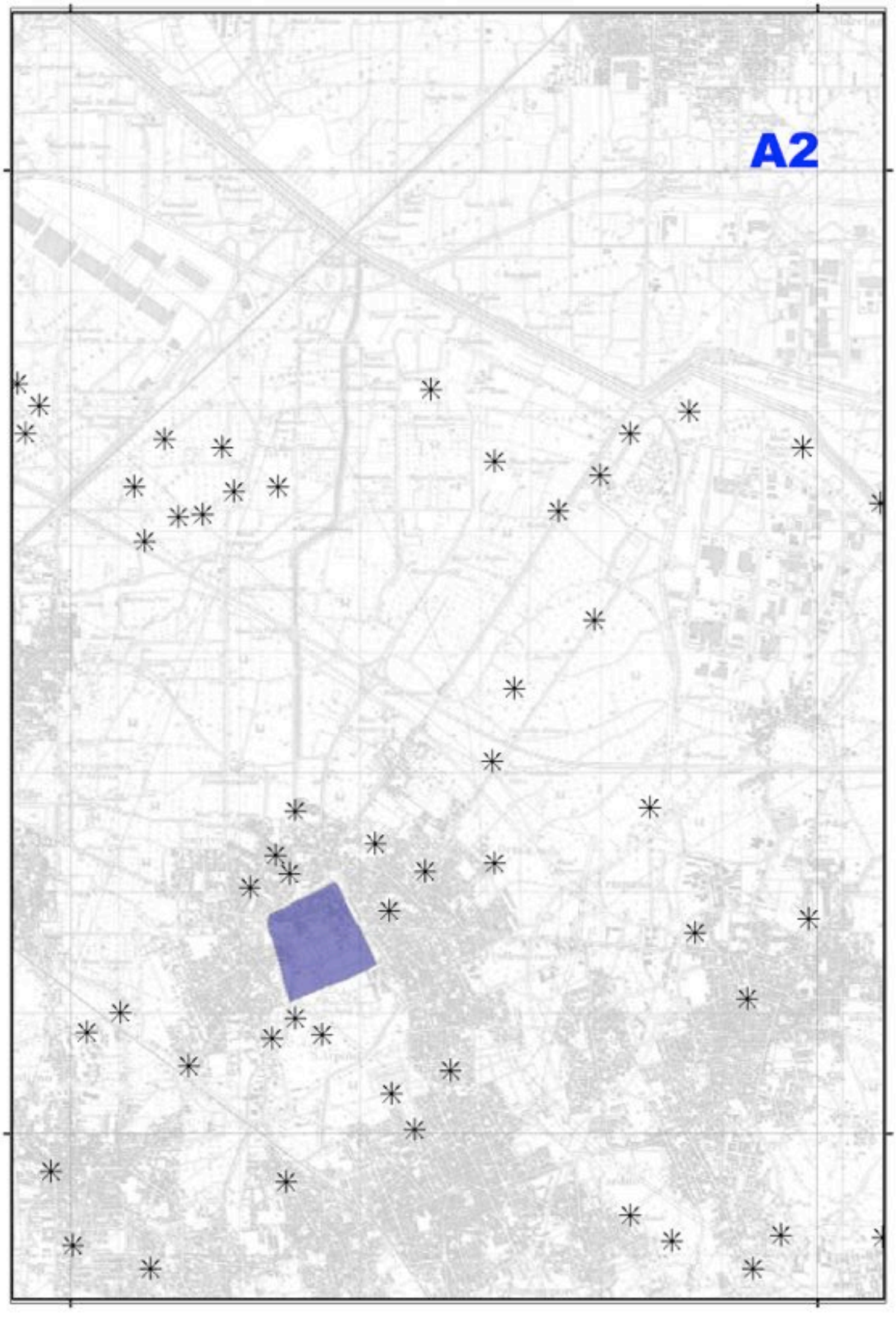
Periods
Orange: pre-Roman
Blue: Roman pre-79
Red: Roman post-79
Purple: Roman (generic)

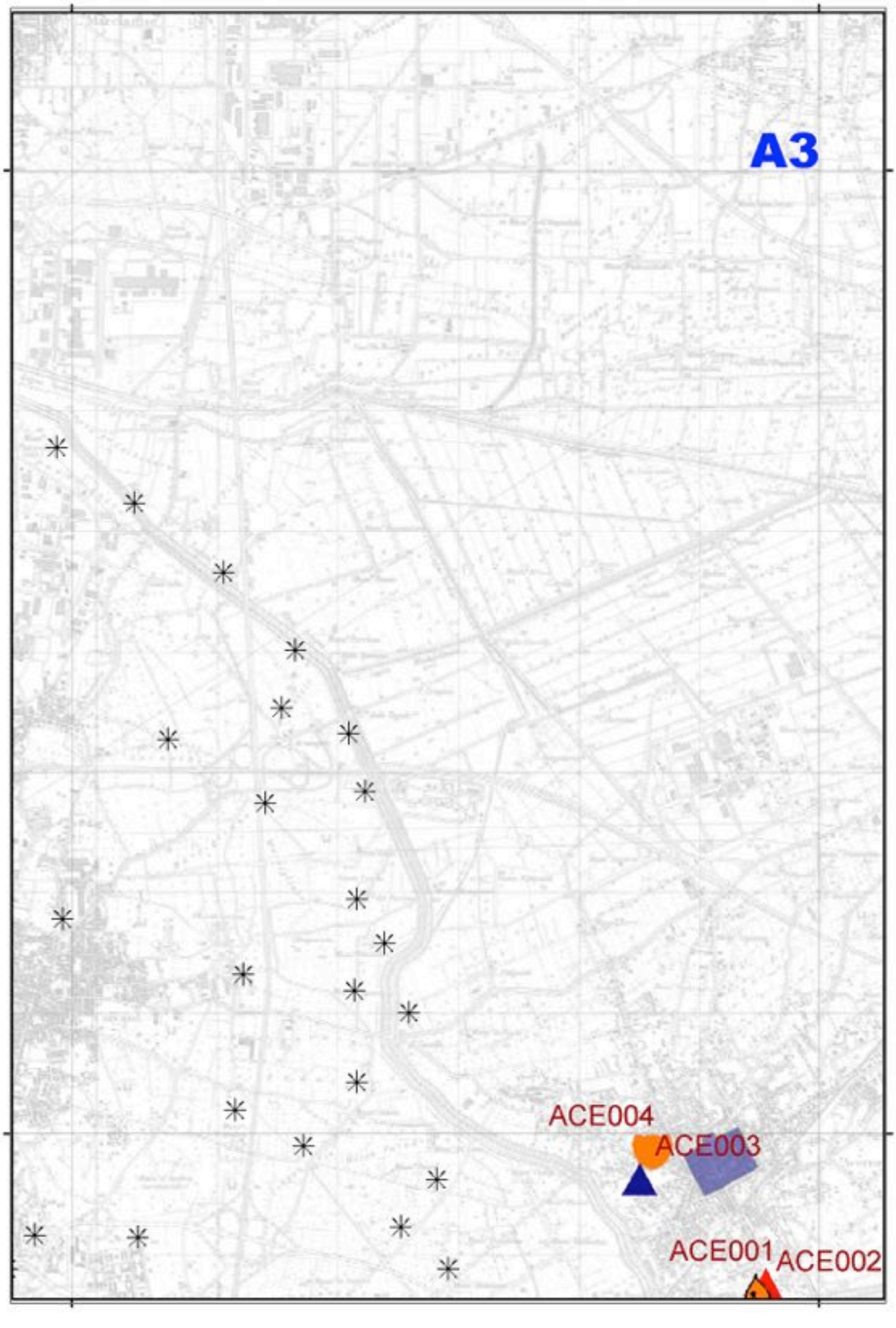
Typology
1, circle: farmhouse
2, square: residential villa
3, triangle: burial
4, drop: waterworks
5, star: inscription
6, cylinder: altar
7, hexagon: column/statue
8, shield: road
9, diamond: pottery
10, tree: cultivation
11, crossed circle: other buildings
12, pentagon: baths
13, square in circle: quarry

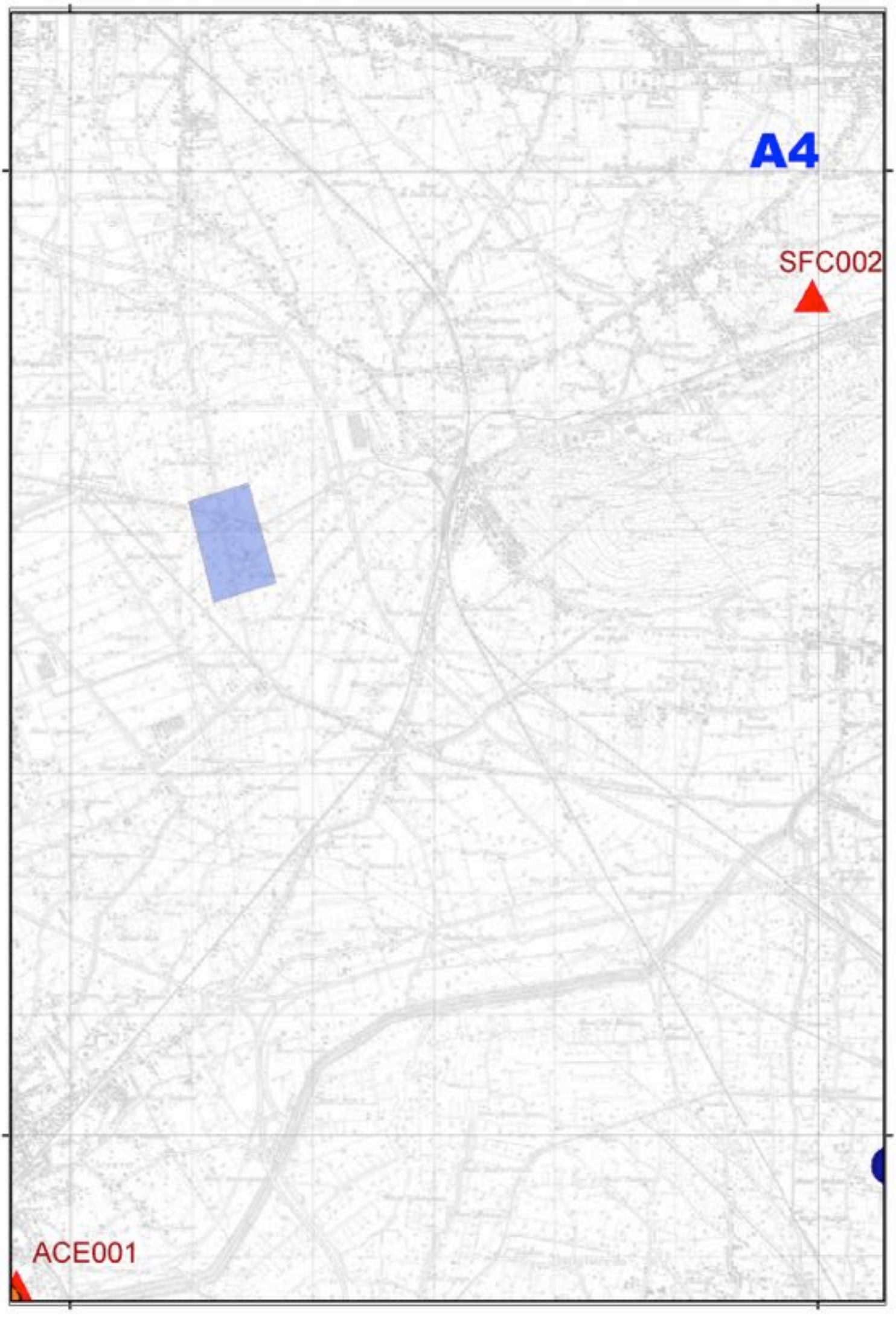


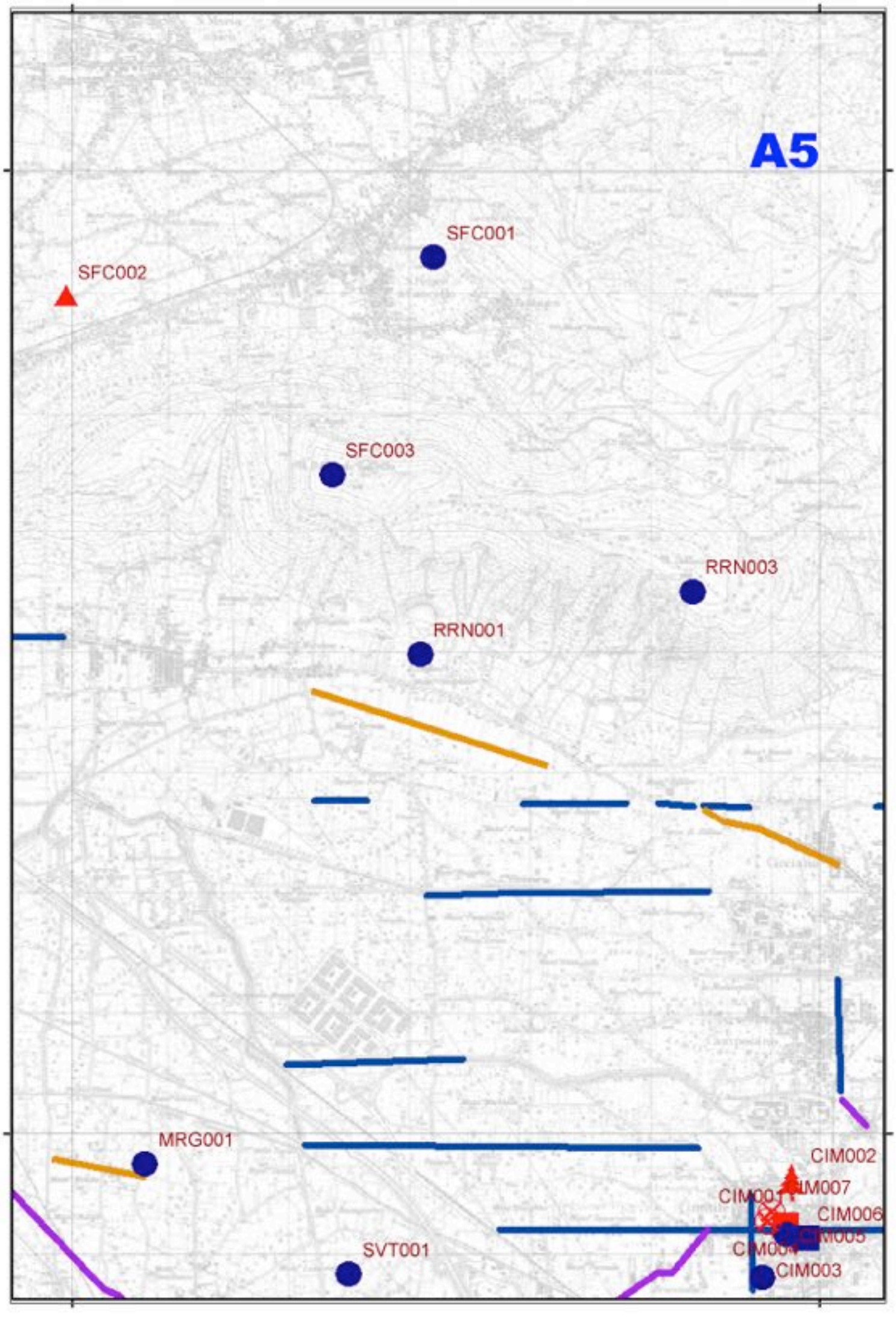

1
2
3
4
5
6
7
8
A
B
C
D
E
0 1 2 4 6 8 10 km

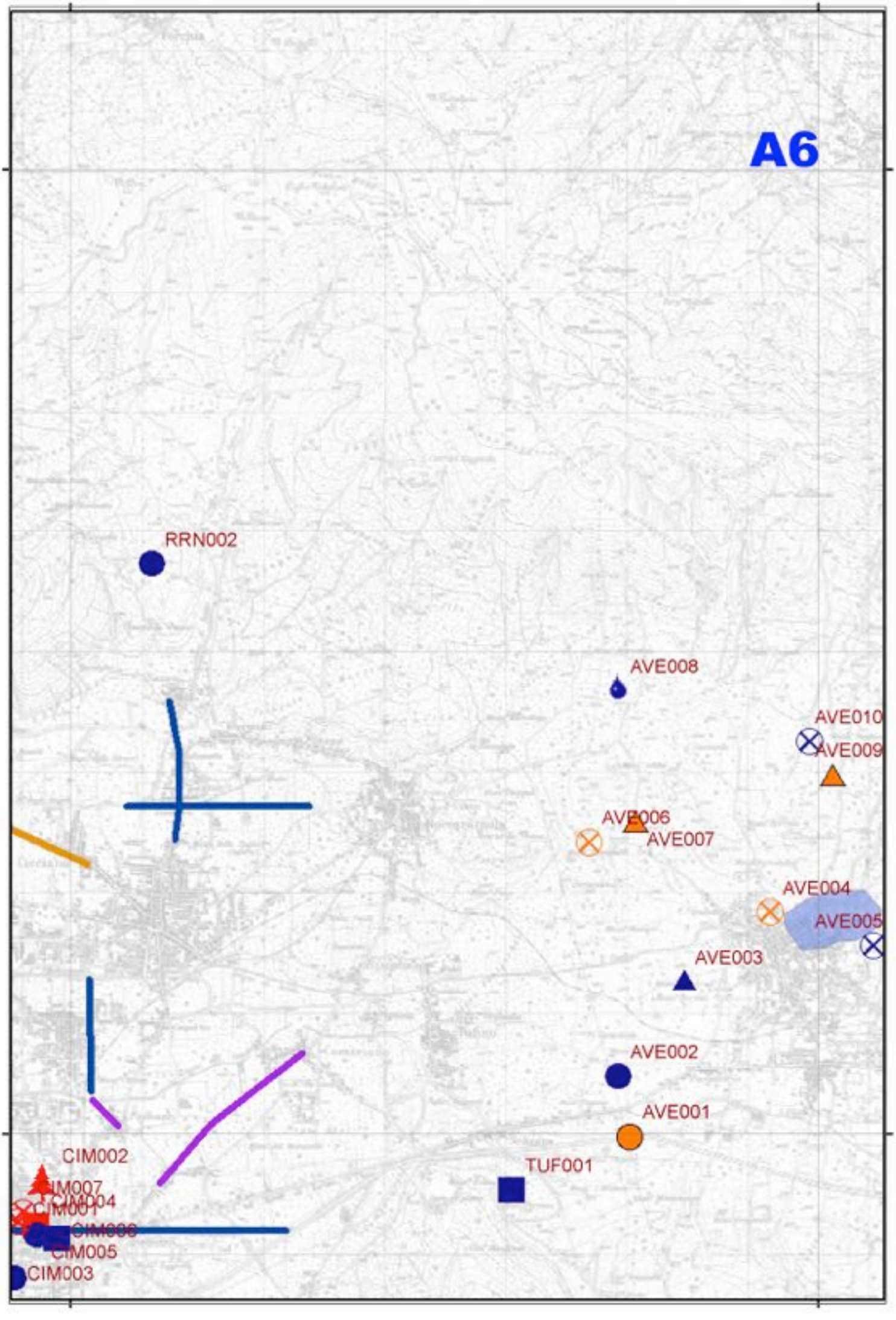

A1

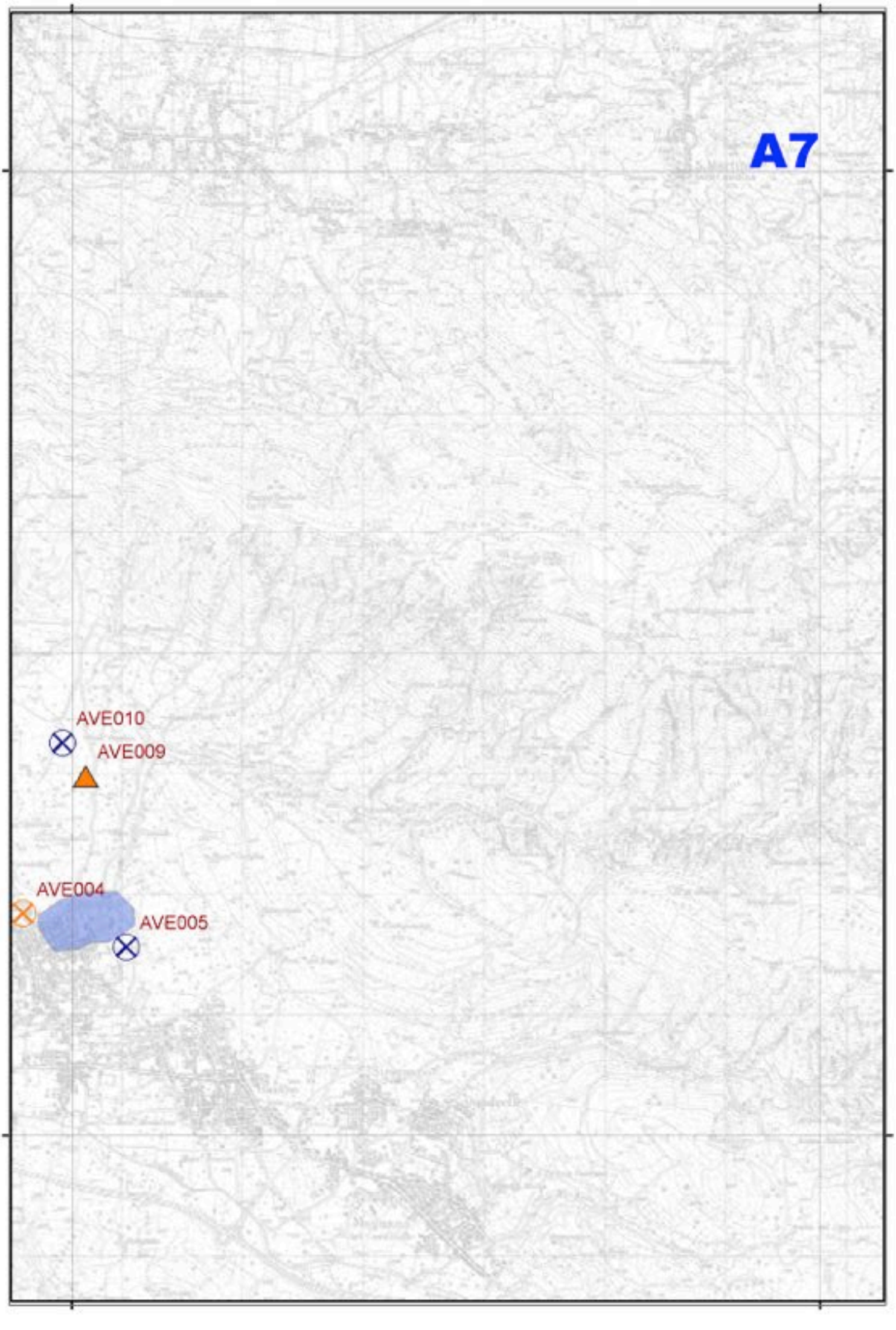

A2


A3
ACE004
ACE003
ACE001
ACE002

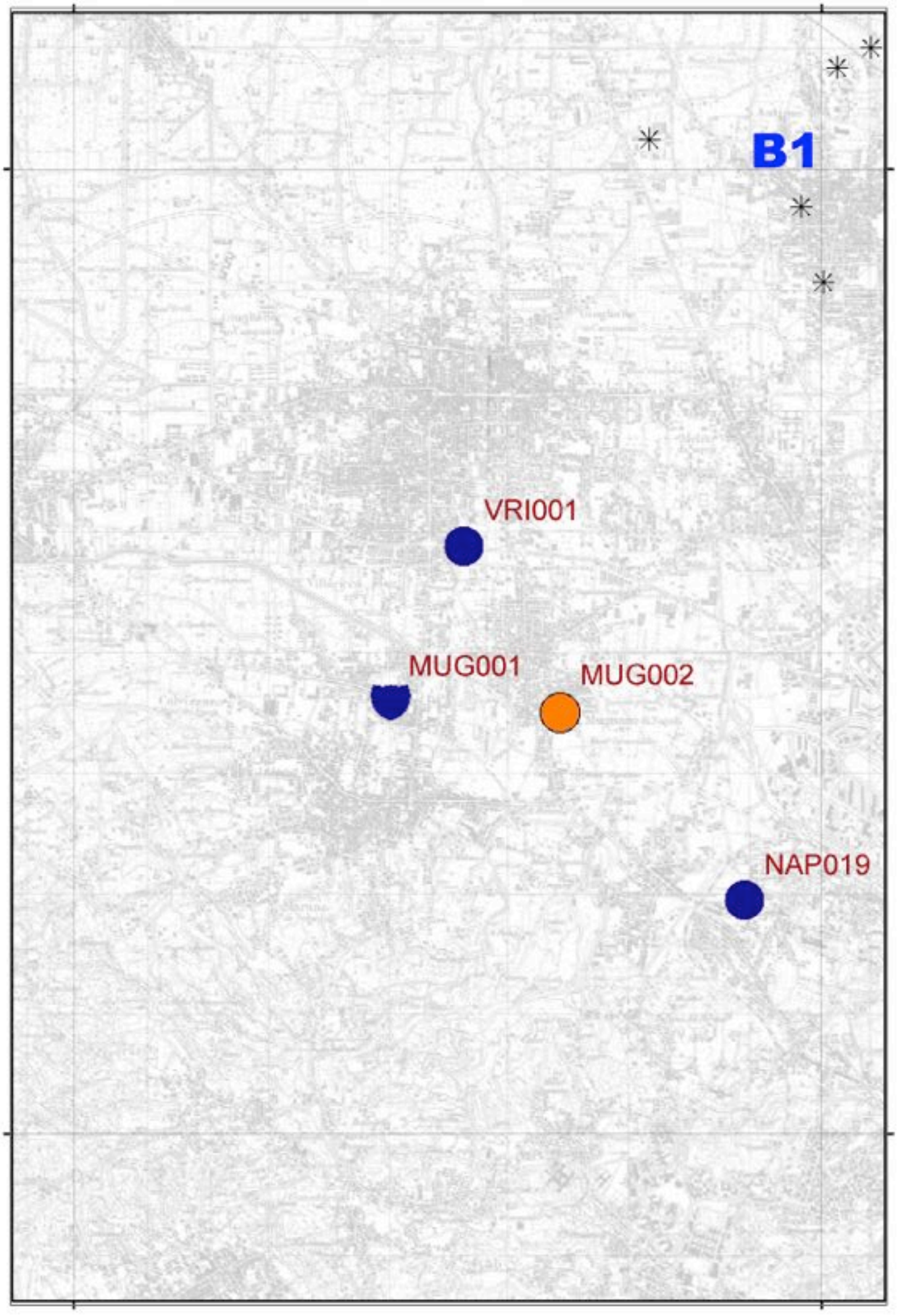

A4
SFC002
ACE001

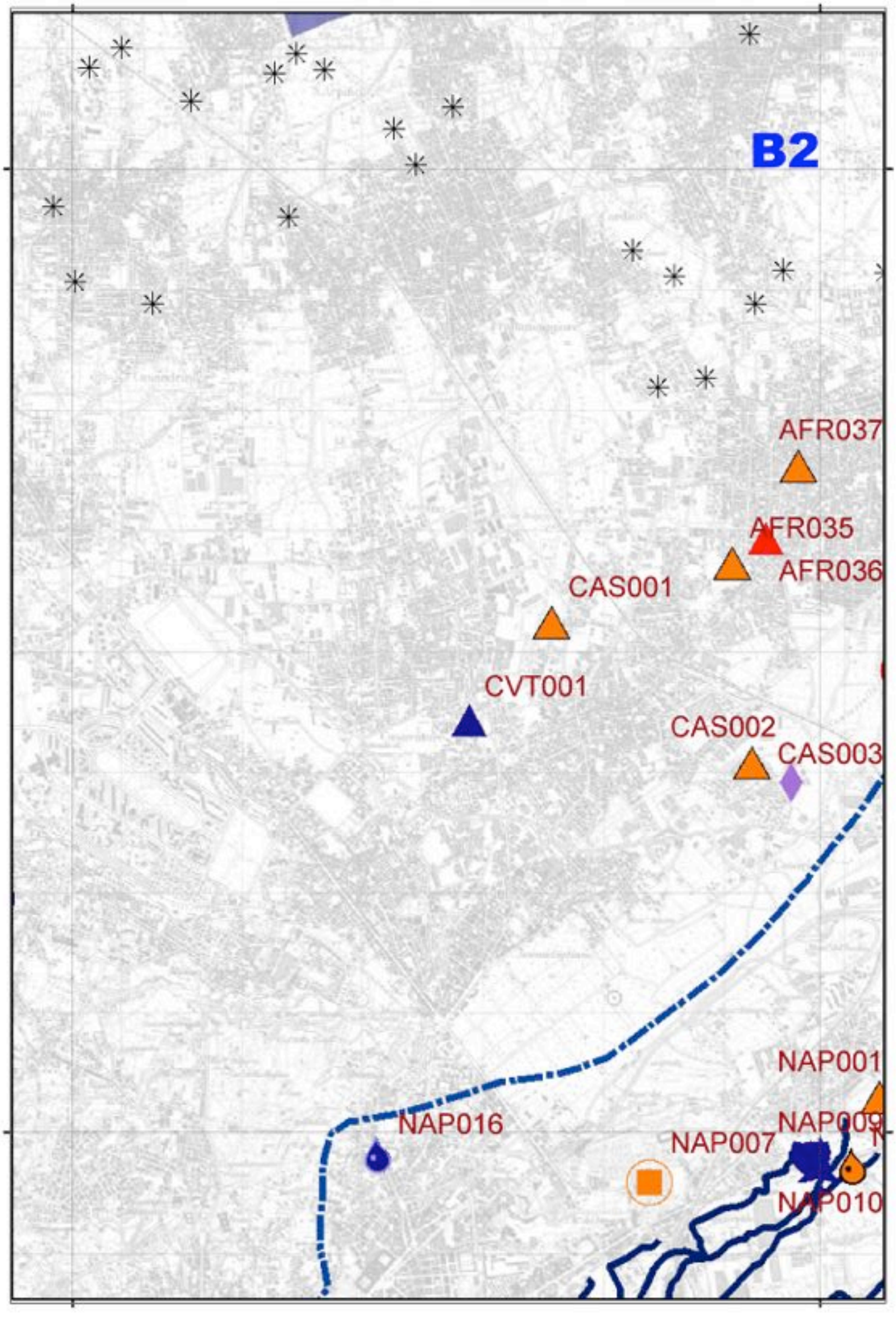

A5
SFC001
SFC002
SFC003
RRN003
RRN001
MRG001
CIM002
CIM007
CIM001
CIM006
CIM005
CIM004
CIM003
SVT001

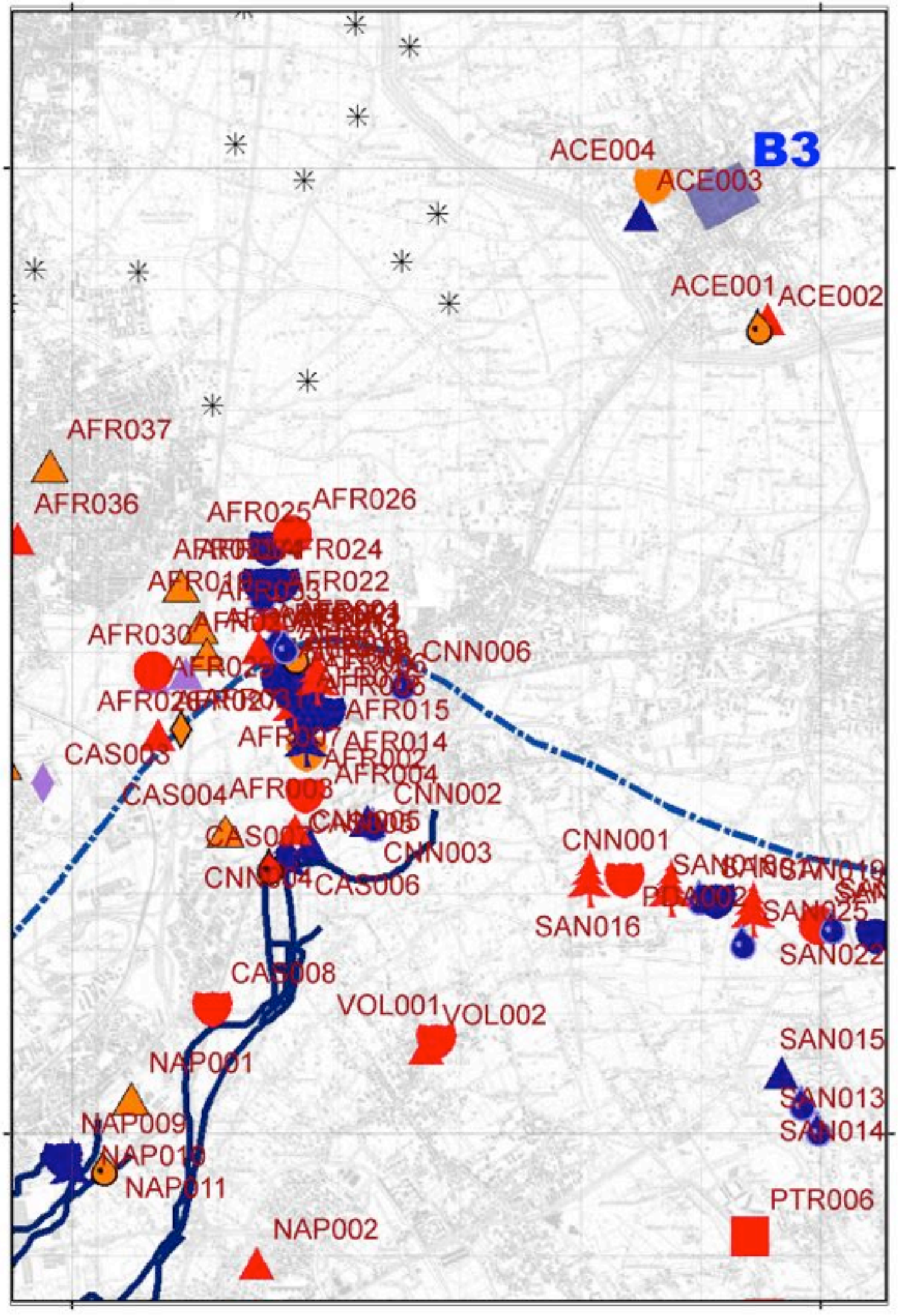

A6
RRN002
AVE008
AVE010
AVE009
AVE006
AVE007
AVE004
AVE005
AVE003
AVE002
AVE001
TUF001
CIM002
CIM007
CIM004
CIM001
CIM006
CIM005
CIM003

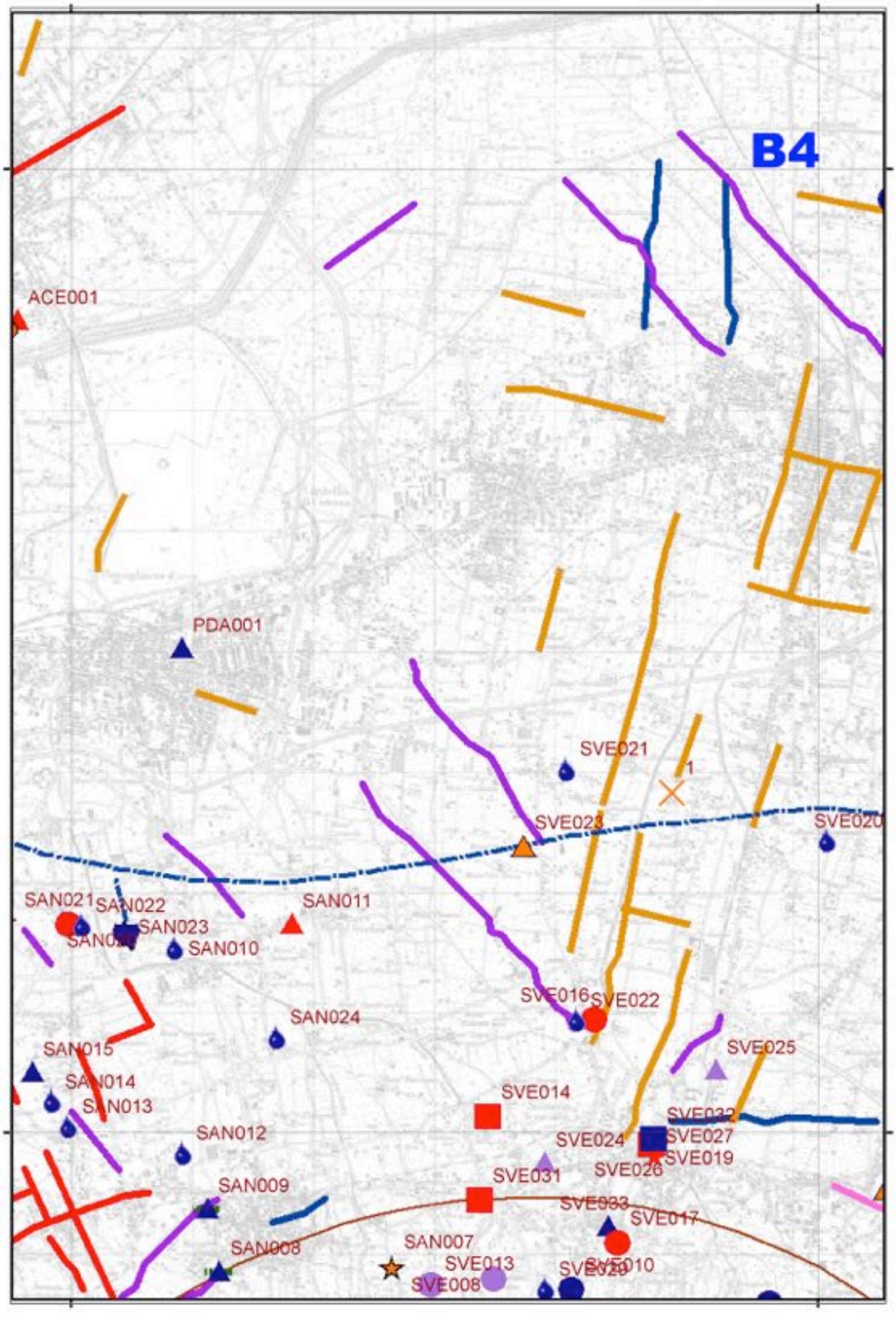

A7
AVE010
AVE009
AVE004
AVE005

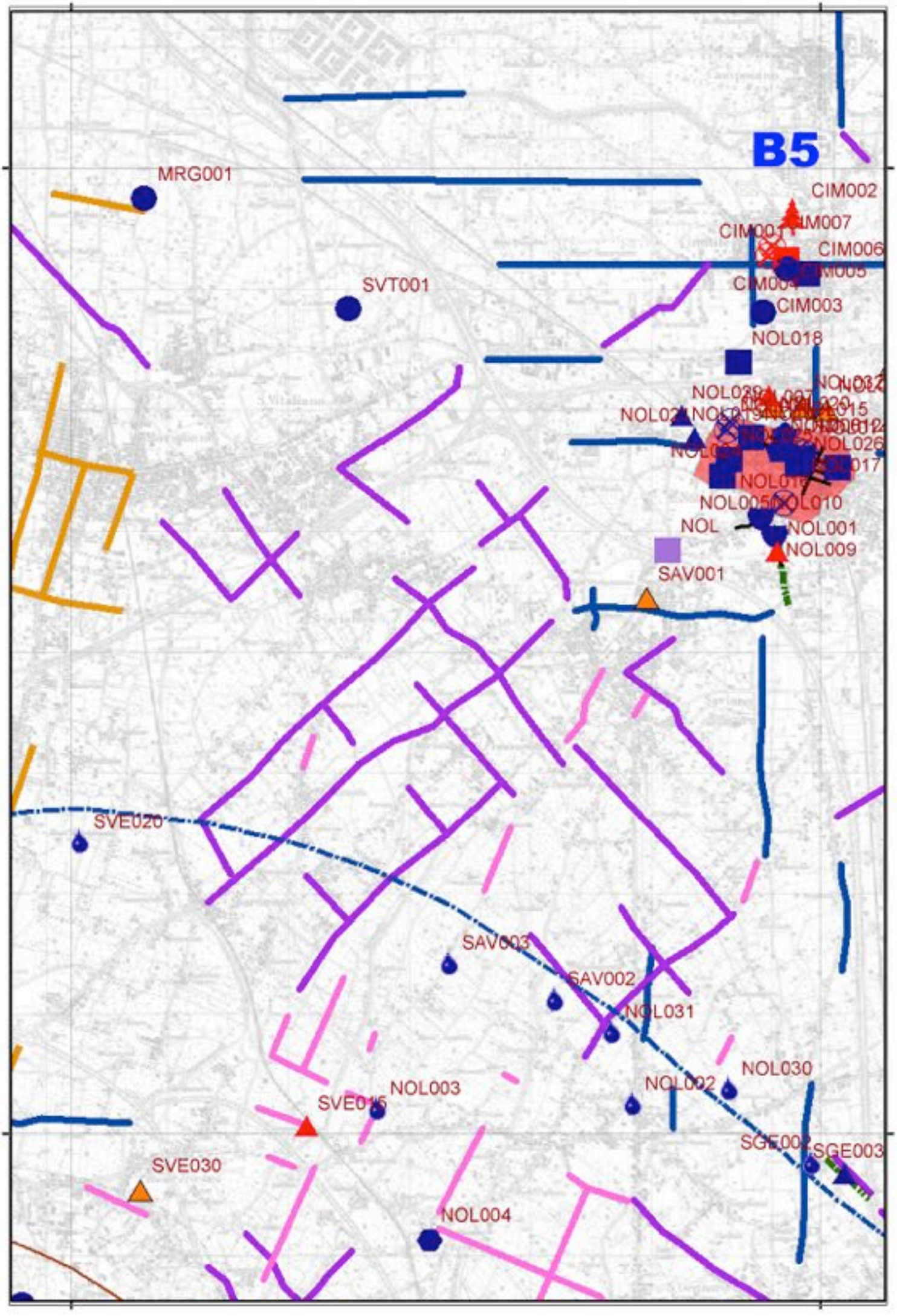
A8

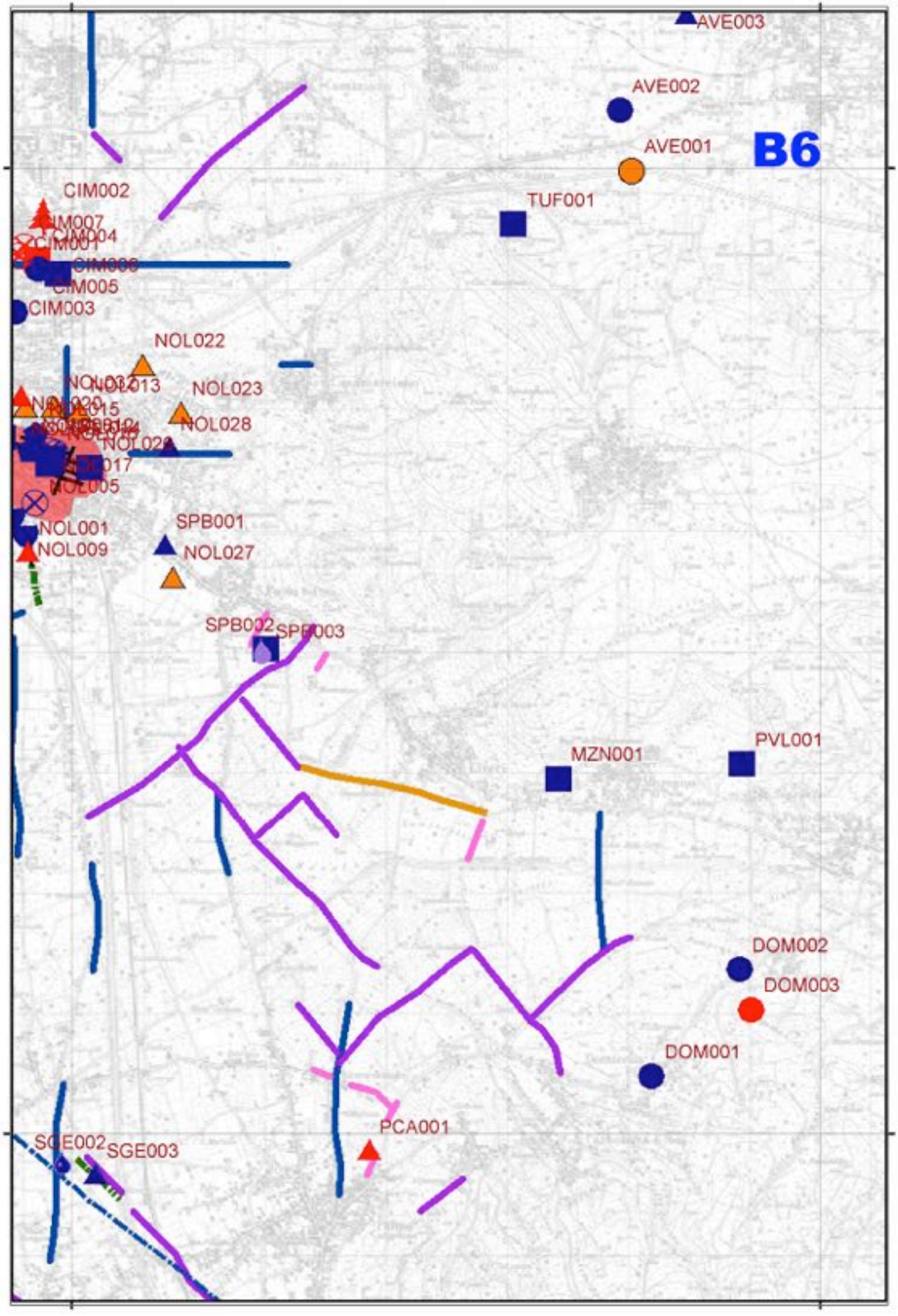

B1
VRI001
MUG001
MUG002
NAP019

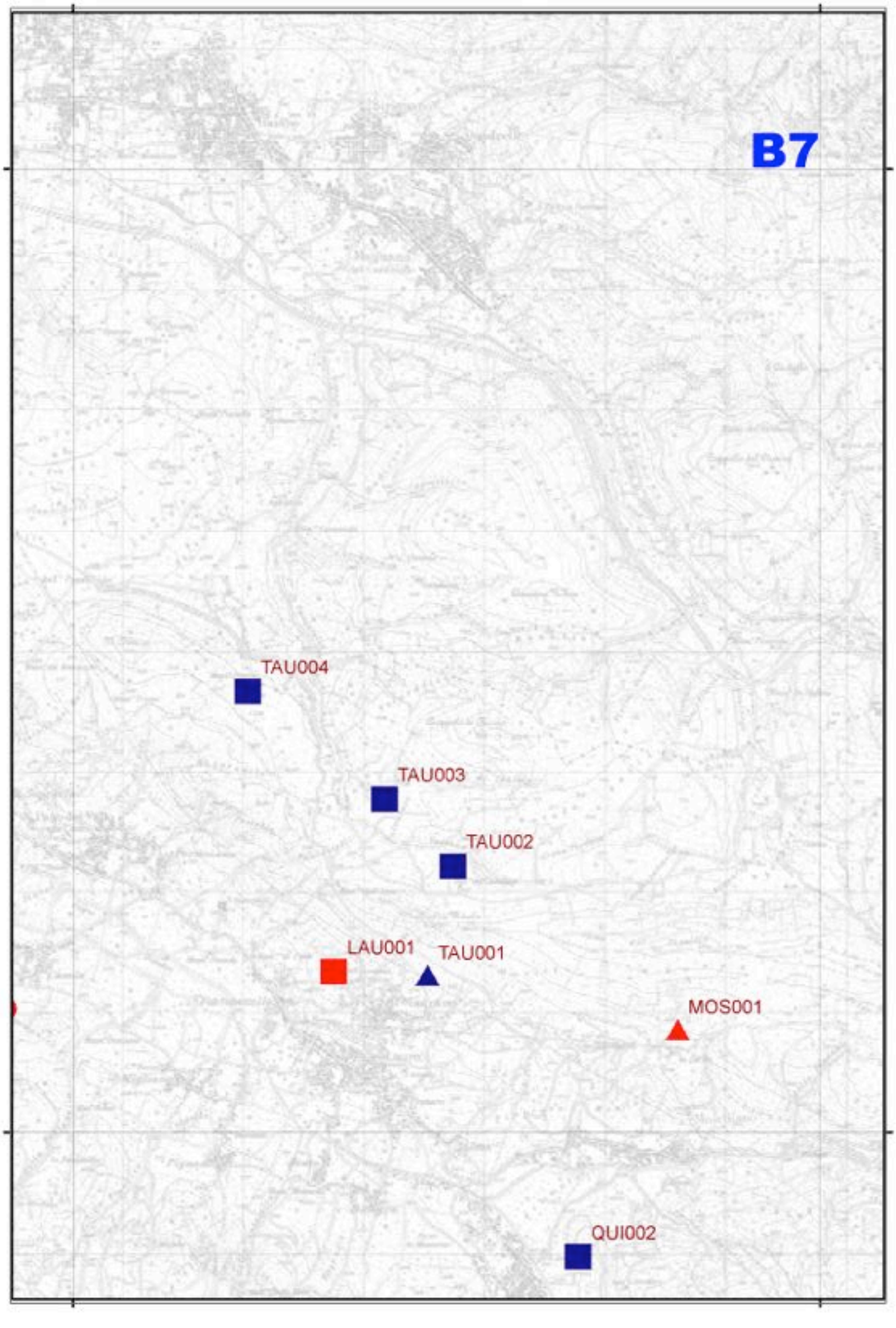

B2
AFR037
AFR035
AFR036
CAS001
CVT001
CAS002
CAS003
NAP001
NAP016
NAP007
NAP010

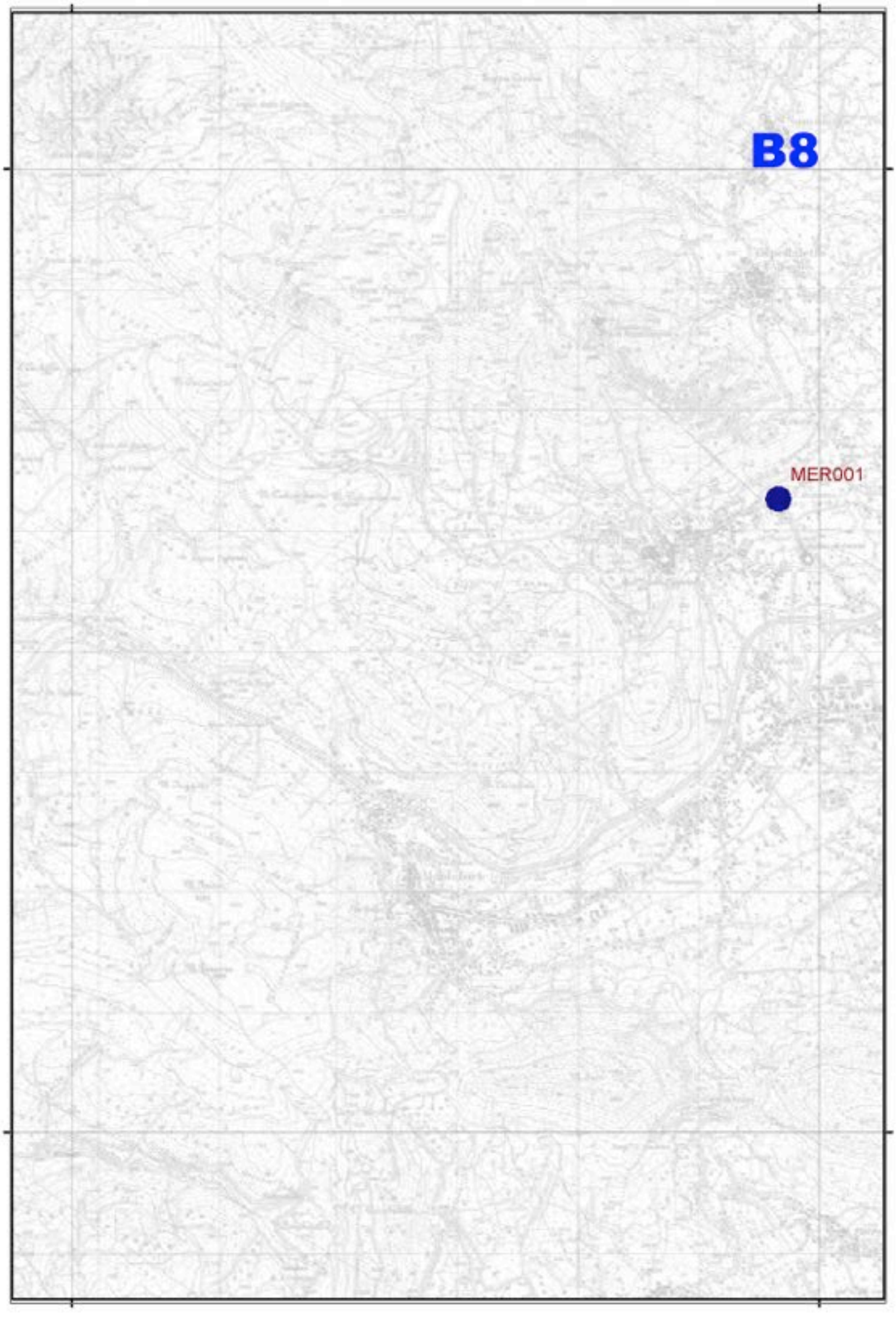

B3
ACE004
ACE003
ACE001
ACE002
AFR037
AFR036
AFR025
AFR026
AFR024
AFR022
AFR030
CNN006
AFR015
AFR014
CAS003
AFR002
AFR004
CAS004
CNN002
CNN003
CAS006
CNN001
SAN016
SAN025
SAN022
CAS008
VOL001
VOL002
SAN015
NAP001
SAN013
SAN014
NAP009
NAP010
NAP011
PTR006
NAP002

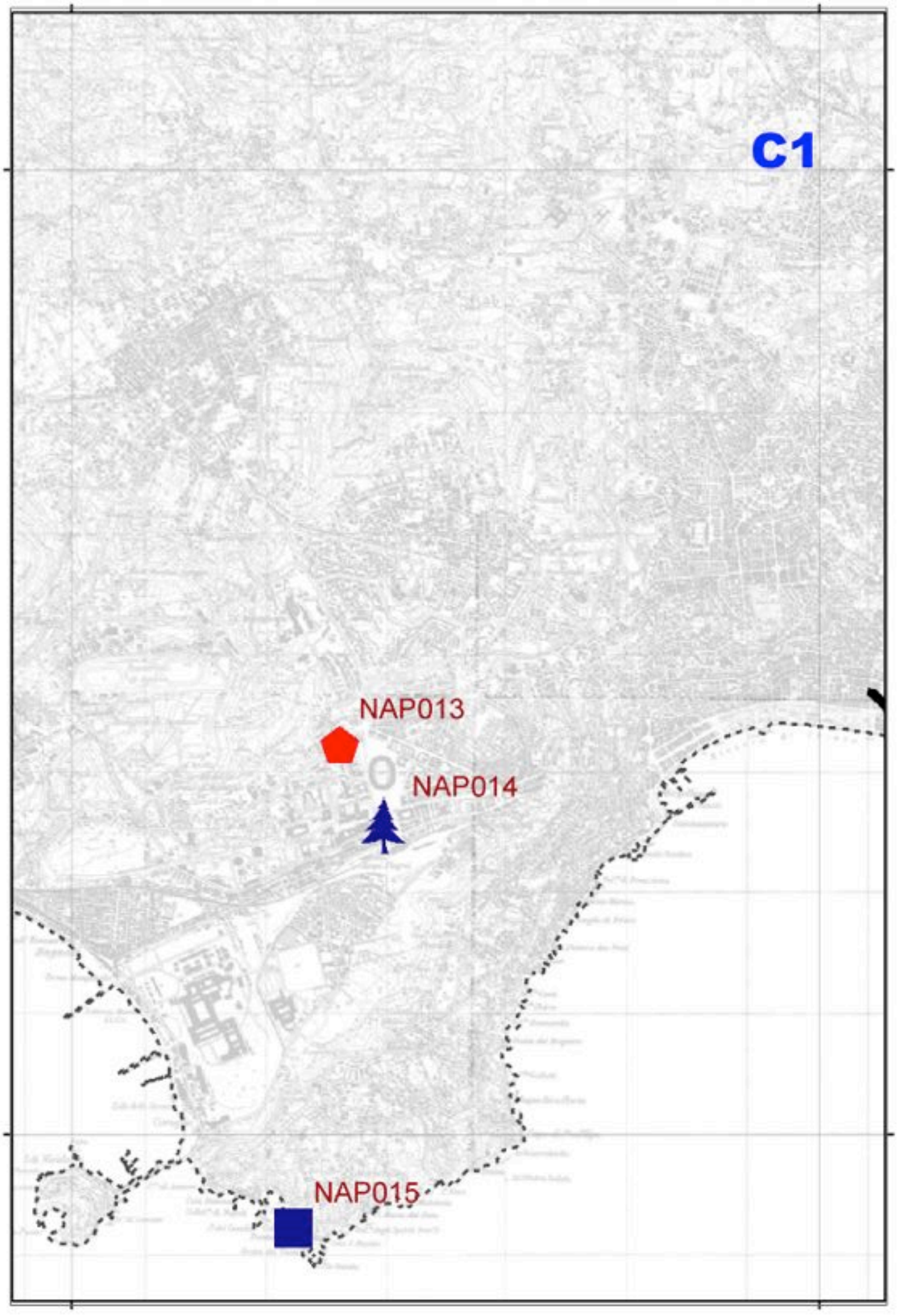

B4
ACE001
PDA001
SVE021
1
SVE023
SVE020
SAN021
SAN022
SAN023
SAN011
SAN010
SVE016
SVE022
SAN024
SVE025
SAN015
SAN014
SAN013
SVE014
SVE032
SAN012
SVE024
SVE027
SVE019
SVE026
SVE031
SAN009
SVE033
SVE017
SAN008
SAN007
SVE013
SVE010
SVE008

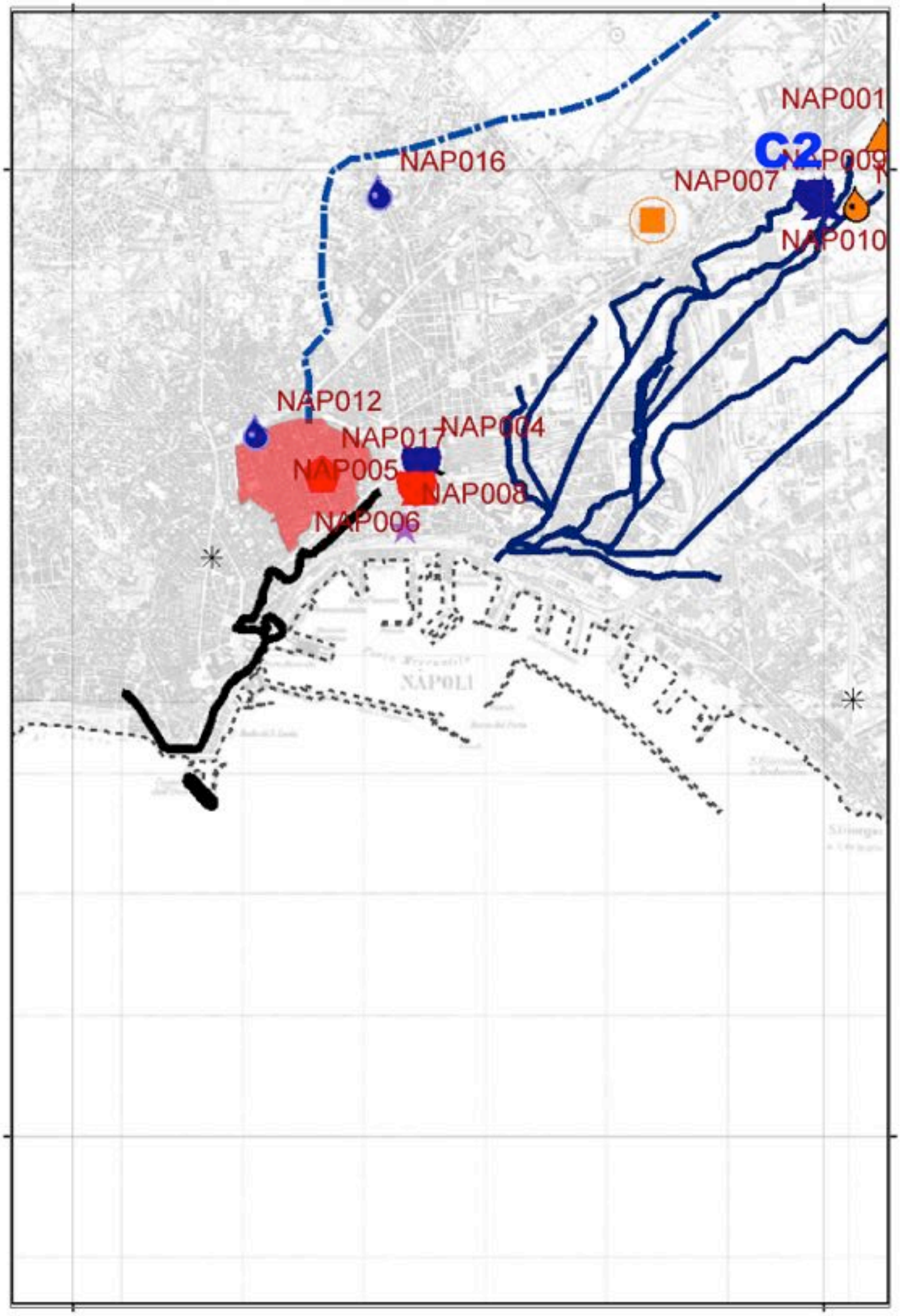

B5
MRG001
SVT001
CIM002
CIM007
CIM001
CIM006
CIM005
CIM004
CIM003
NOL018
NOL029
NOL027
NOL015
NOL026
NOL017
NOL005
NOL010
NOL
NOL001
NOL009
SAV001
SVE020
SAV003
SAV002
NOL031
NOL030
NOL002
NOL003
SVE015
SGE002
SGE003
SVE030
NOL004

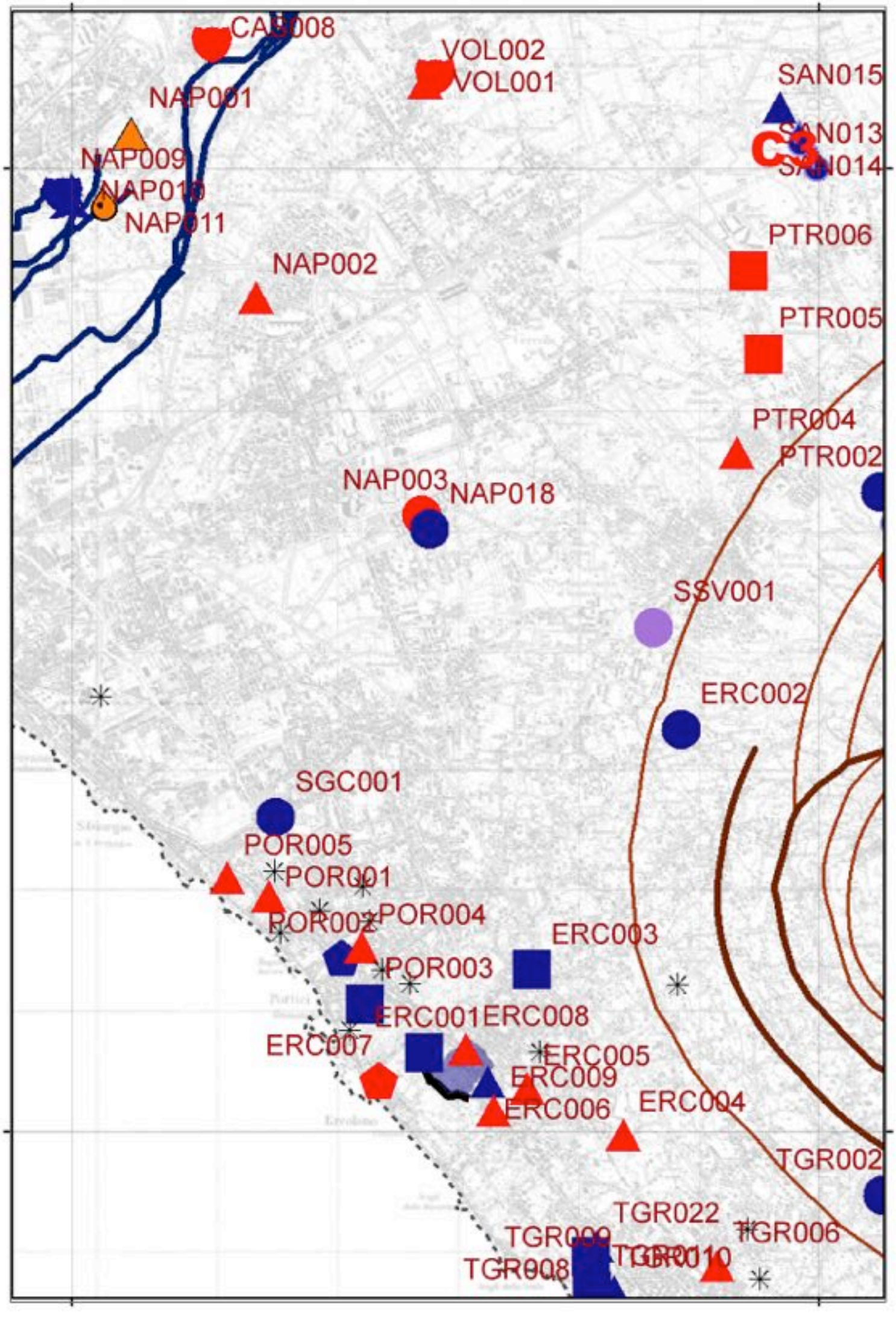

AVE003
AVE002
AVE001
B6
TUF001
CIM002
CIM007
CIM004
CIM001
CIM006
CIM005
CIM003
NOL022
NOL013
NOL023
NOL028
NOL017
NOL005
NOL001
NOL009
SPB001
NOL027
SPB002
SPB003
MZN001
PVL001
DOM002
DOM003
DOM001
PCA001
SGE002
SGE003

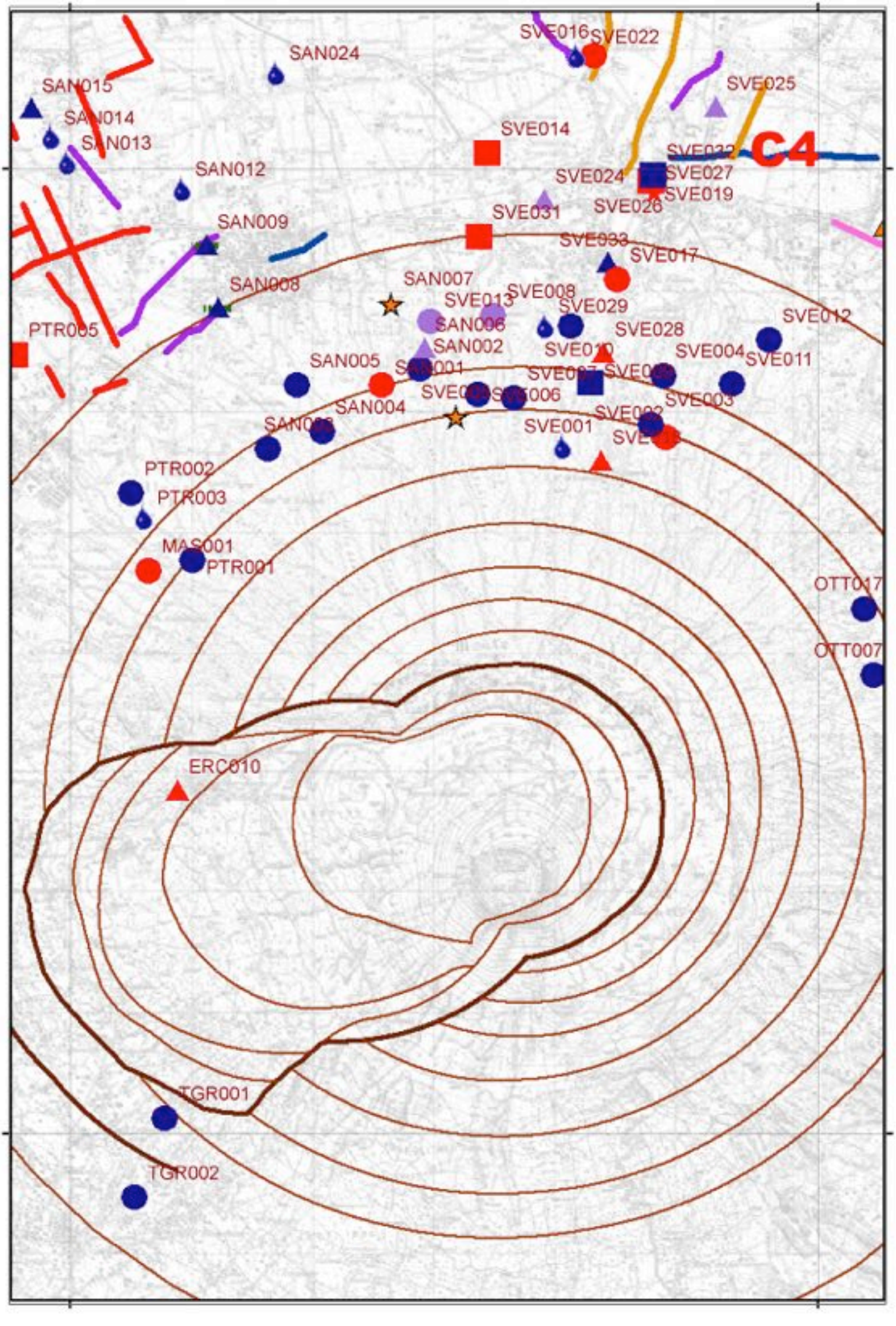

B7
TAU004
TAU003
TAU002
LAU001
TAU001
MOS001
QUI002

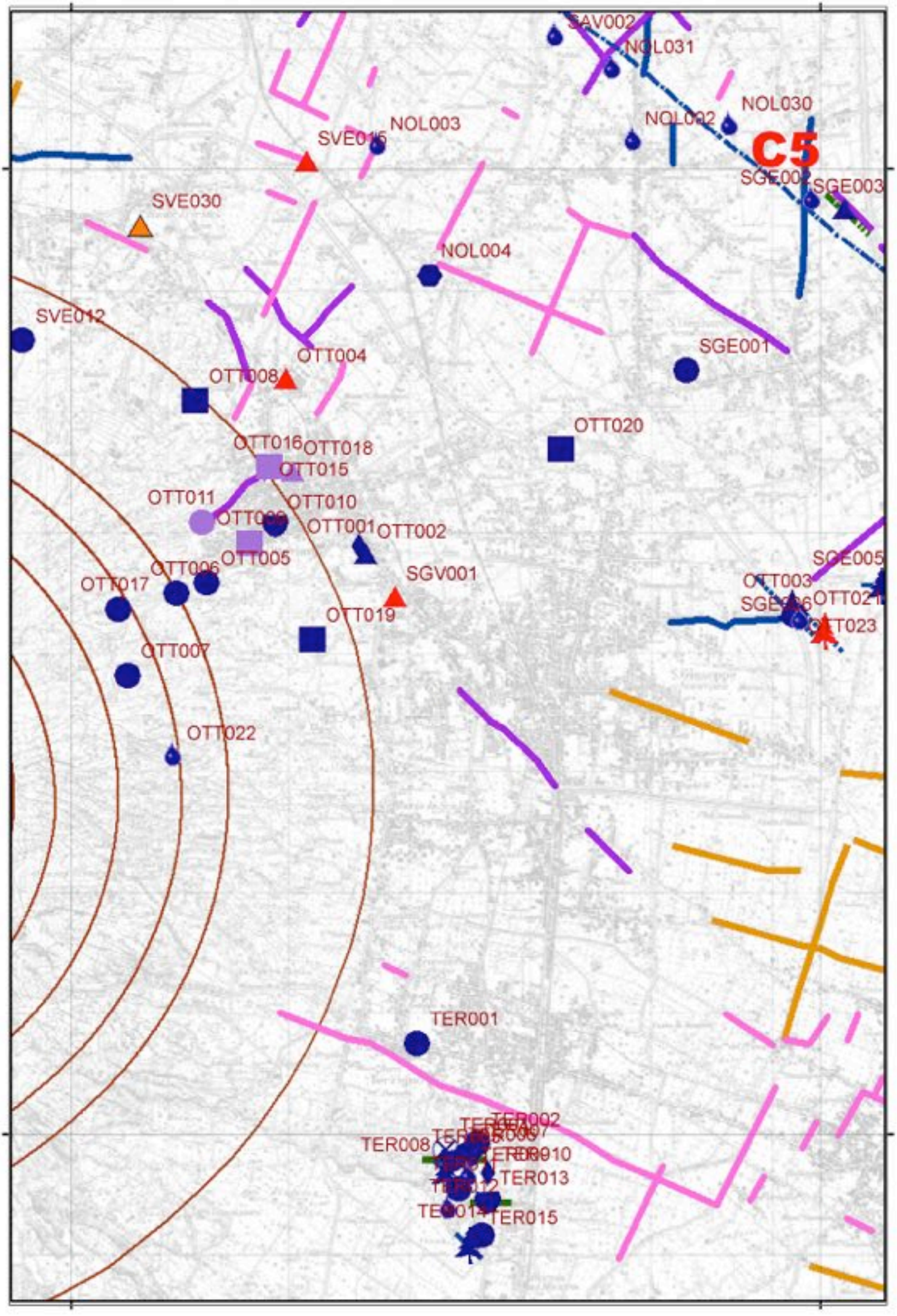

B8
MER001

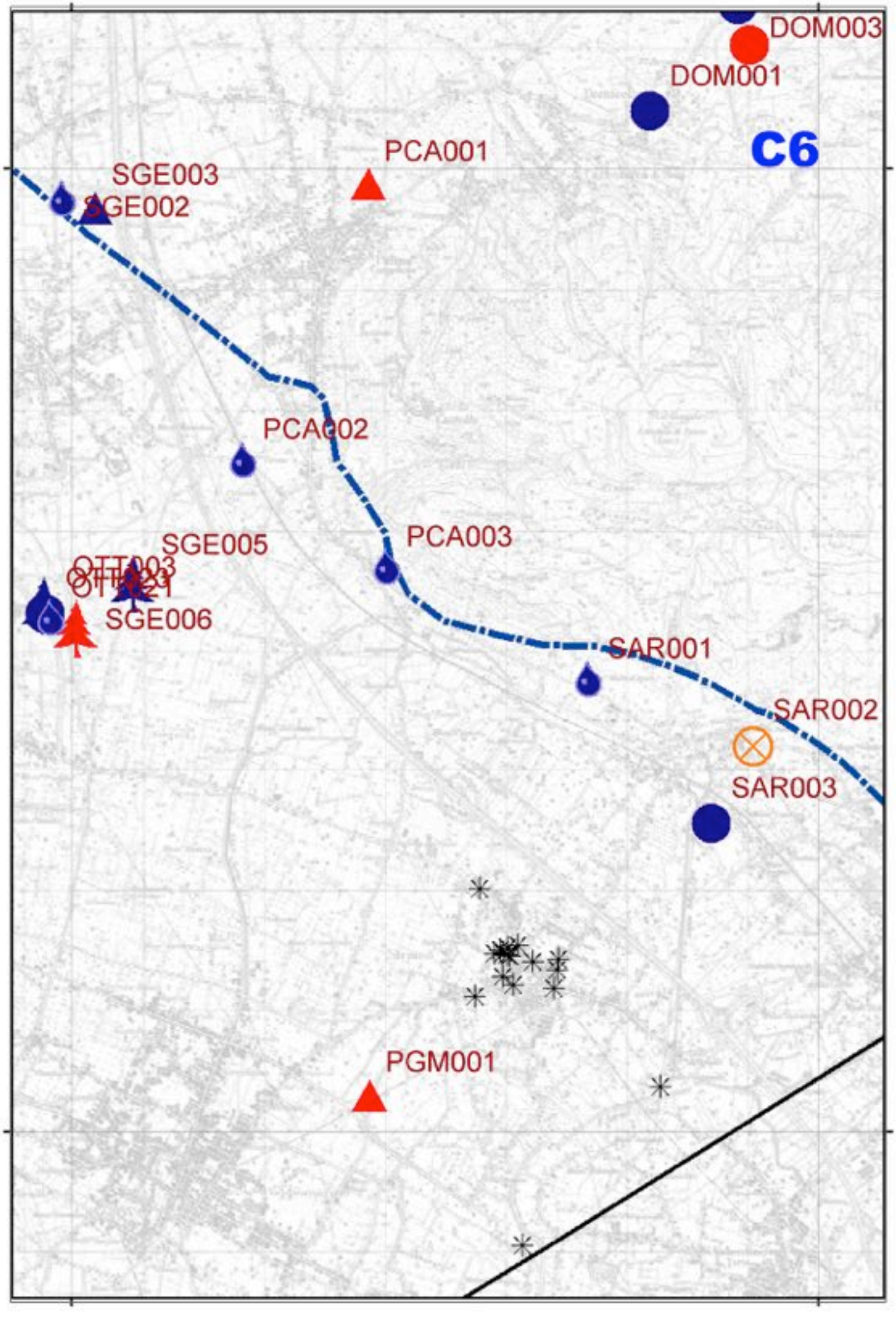

C1
NAP013
NAP014
NAP015

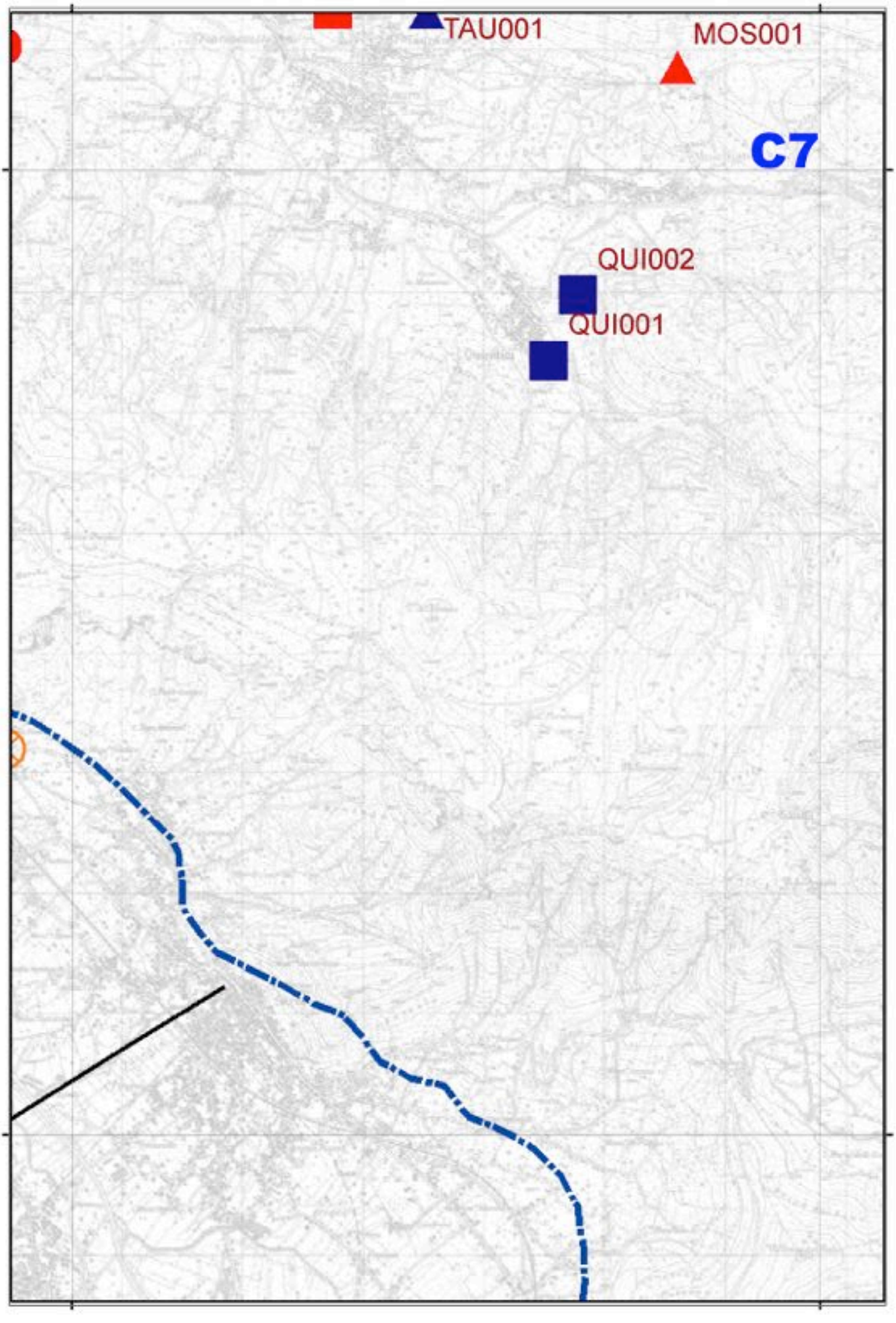

NAP001
C2
NAP016
NAP007
NAP010
NAP012
NAP017
NAP004
NAP005
NAP008
NAP006


CAS008
VOL002
VOL001
NAP001
SAN015
SAN013
SAN014
NAP009
NAP010
NAP011
PTR006
NAP002
PTR005
PTR004
PTR002
NAP003
NAP018
SSV001
ERC002
SGC001
POR005
POR001
POR002
POR004
ERC003
POR003
ERC001
ERC008
ERC007
ERC005
ERC009
ERC006
ERC004
TGR002
TGR022
TGR006
TGR009
TGR008

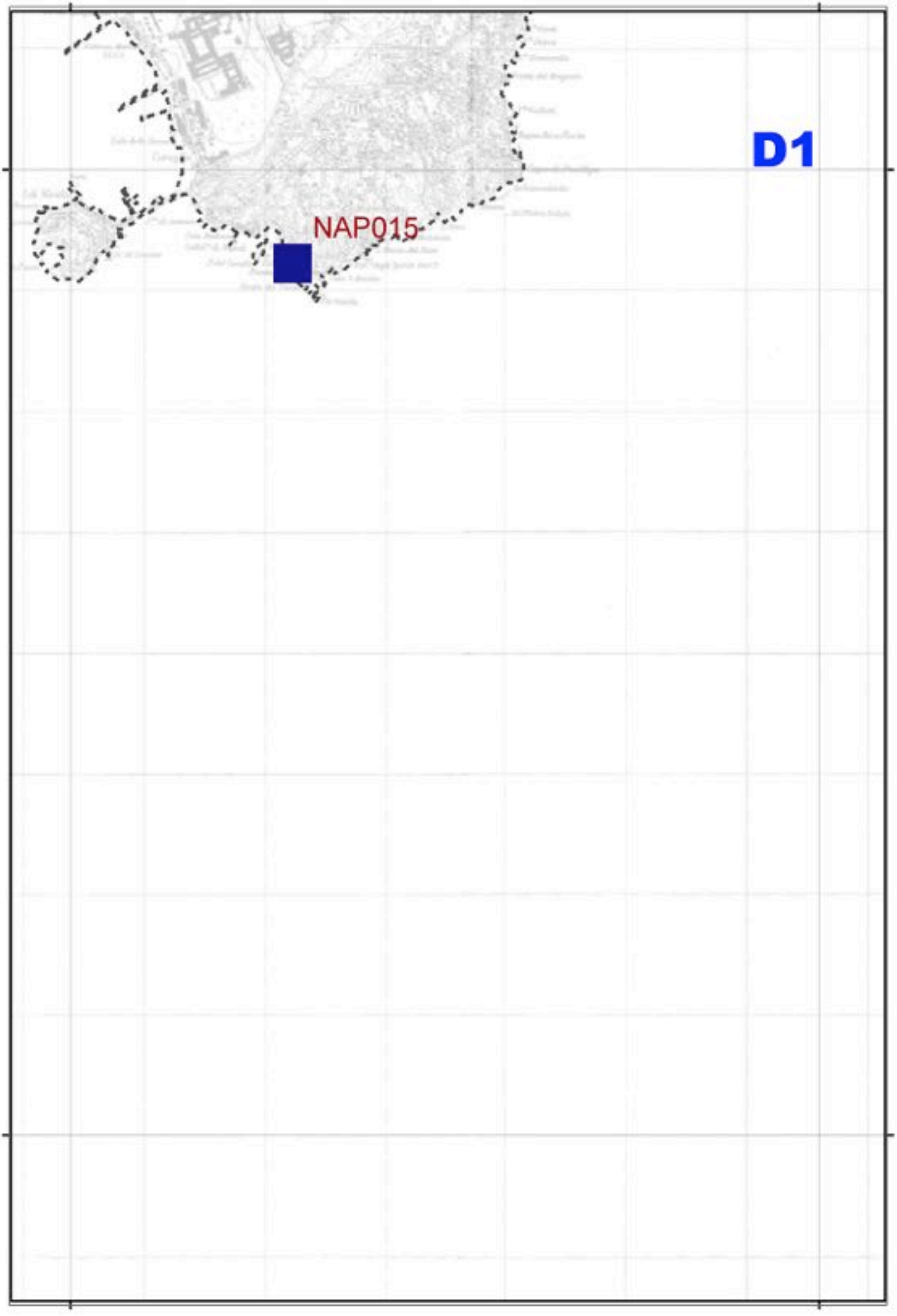

SVE016
SVE022
SAN024
SAN015
SVE025
SAN014
SAN013
SVE014
C4
SVE032
SAN012
SVE024
SVE027
SVE019
SVE026
SVE031
SAN009
SVE033
SVE017
SAN007
SAN008
SVE008
SVE013
SVE029
SVE012
PTR005
SAN006
SVE028
SAN002
SVE010
SVE004
SAN005
SVE011
SAN001
SVE007
SVE003
SAN004
SVE001
PTR002
PTR003
MAS001
PTR001
OTT017
OTT007
ERC010
TGR001
TGR002

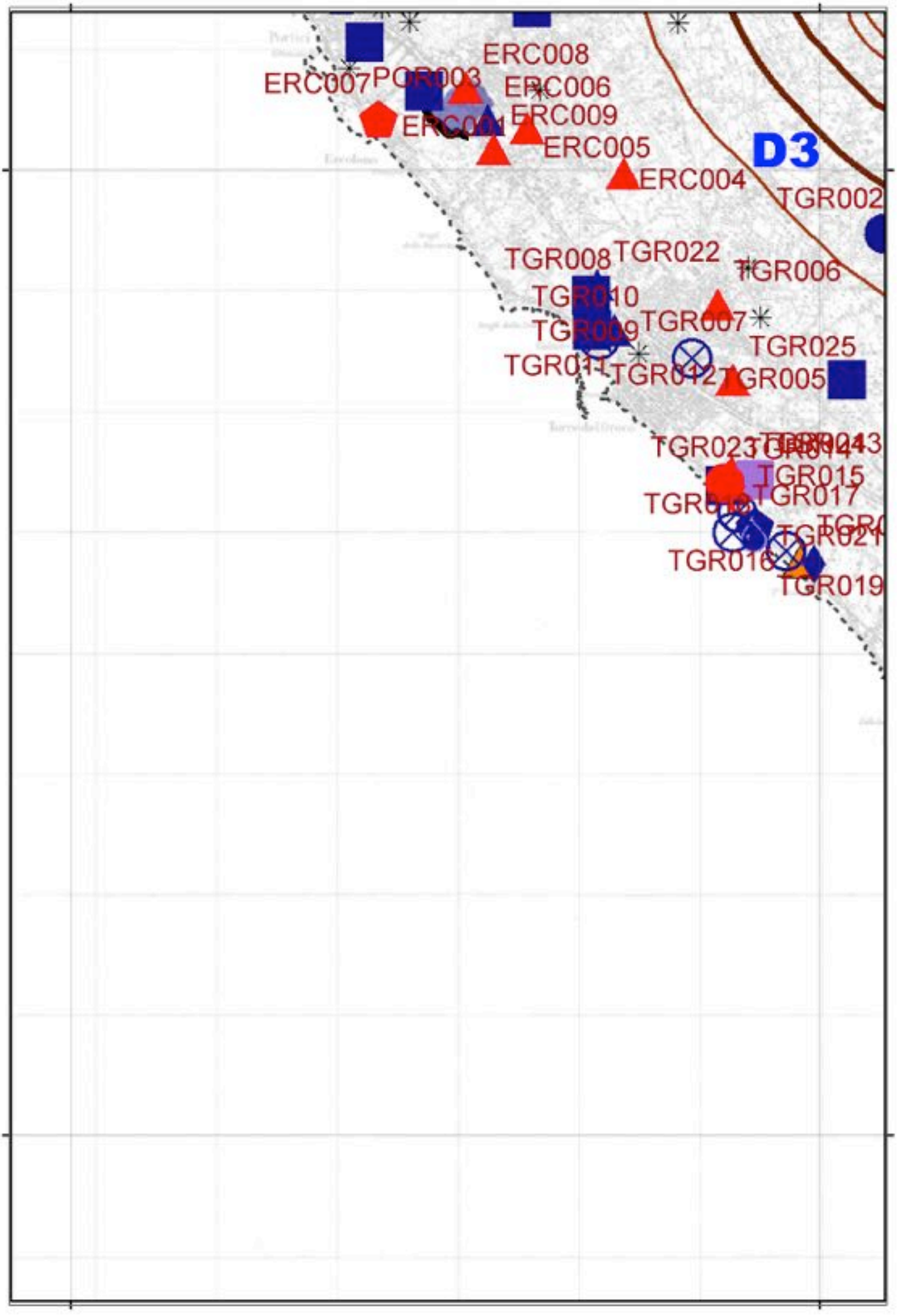

SAV002
NOL031
NOL030
NOL002
C5
NOL003
SVE015
SGE002
SGE003
SVE030
NOL004
SVE012
SGE001
OTT004
OTT008
OTT020
OTT016
OTT018
OTT015
OTT011
OTT010
OTT001
OTT002
OTT005
SGE005
OTT006
SGV001
OTT003
OTT017
OTT021
OTT019
OTT023
OTT007
OTT022
TER001
TER002
TER008
TER010
TER013
TER015

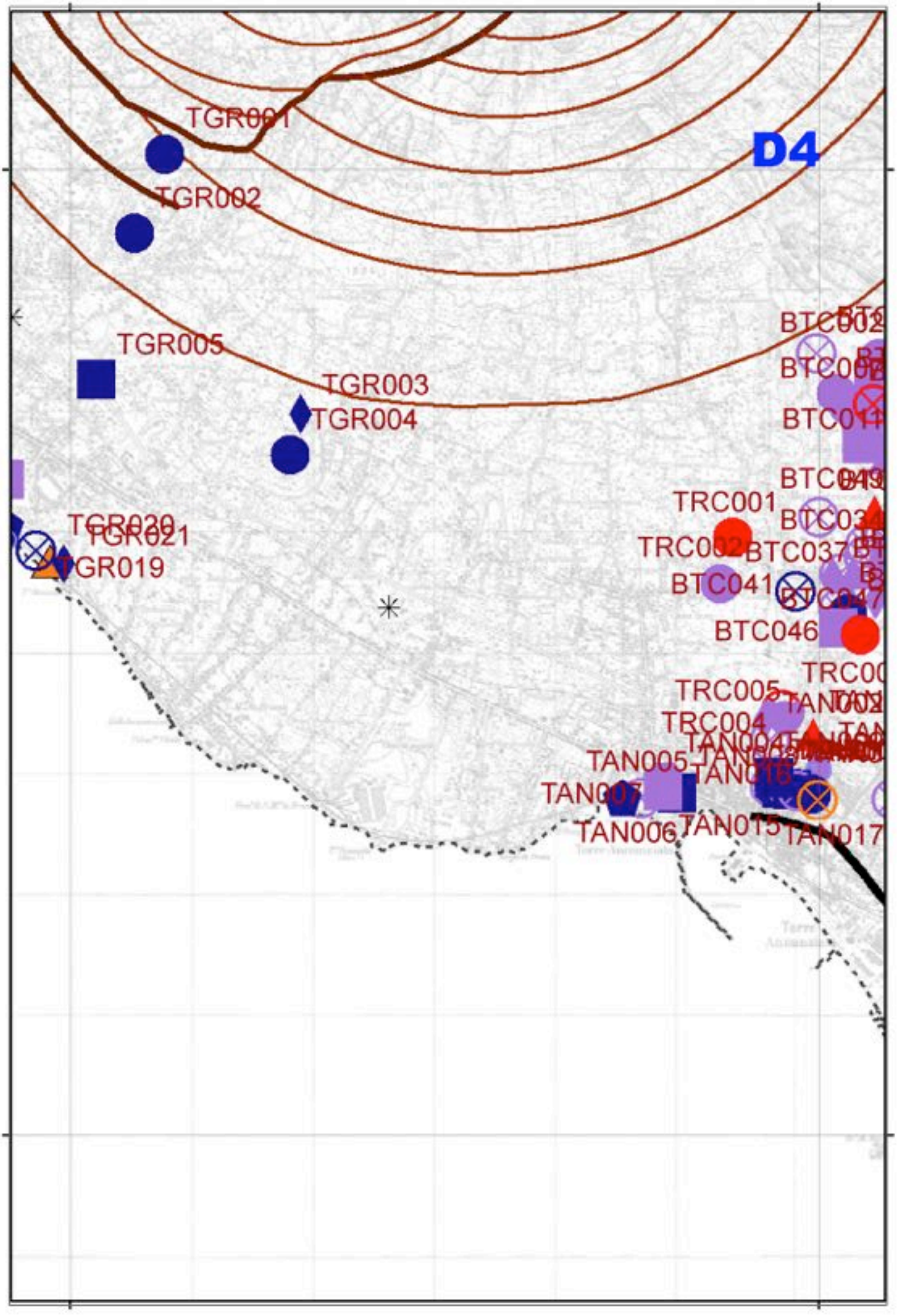

DOM003
DOM001
C6
PCA001
SGE003
SGE002
PCA002
PCA003
SGE005
SGE006
SAR001
SAR002
SAR003
PGM001

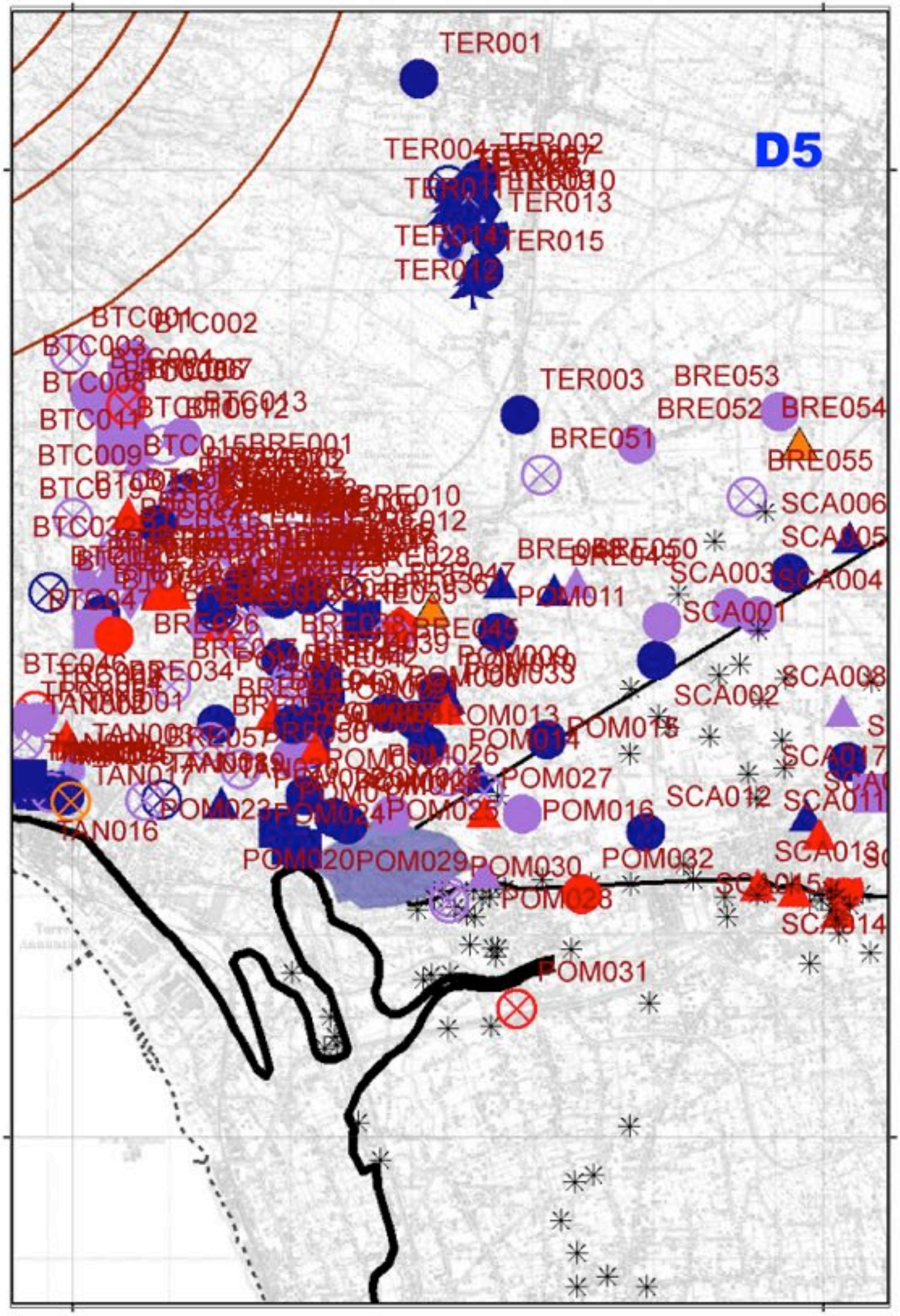

TAU001
MOS001
C7
QUI002
QUI001

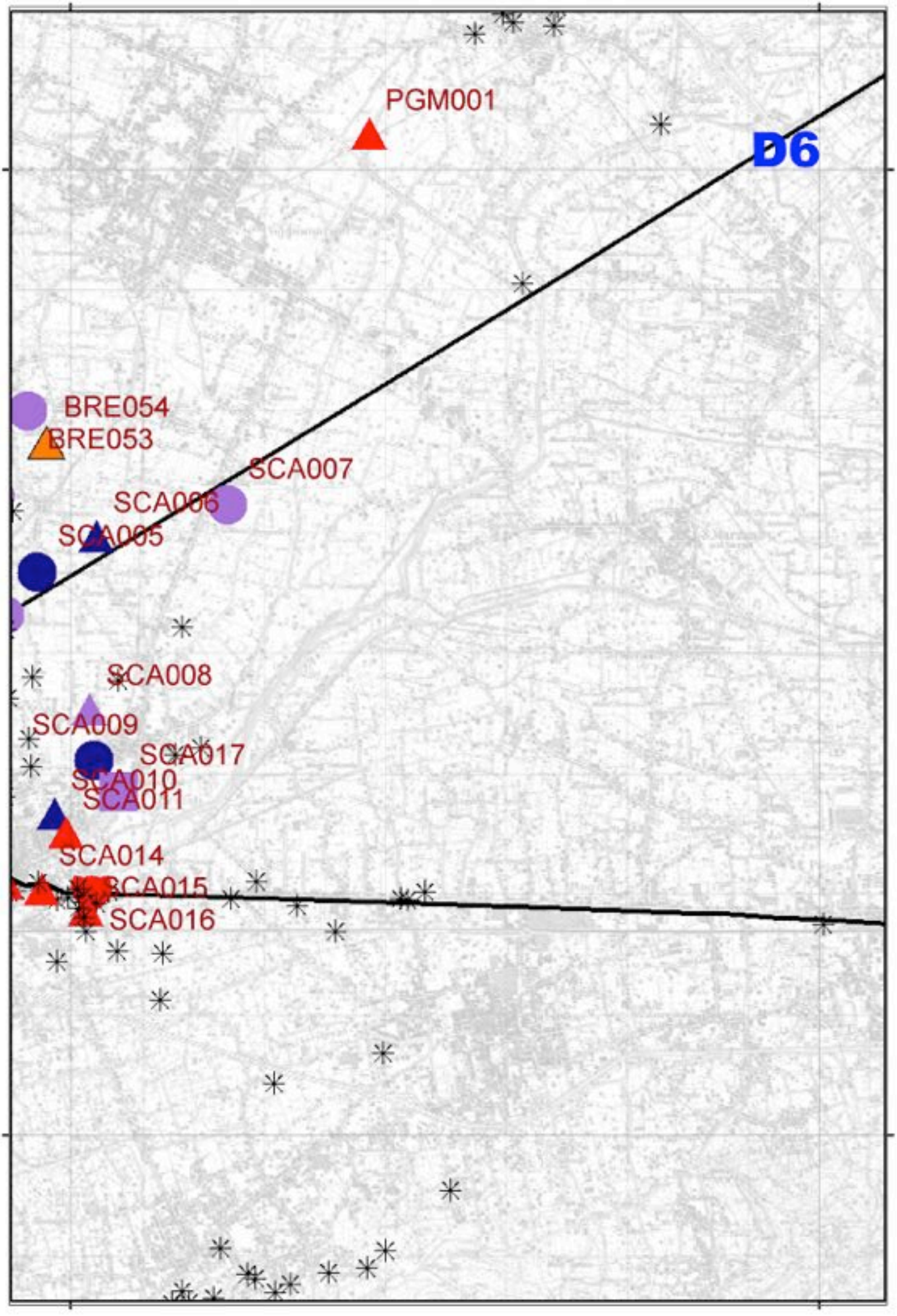
C8

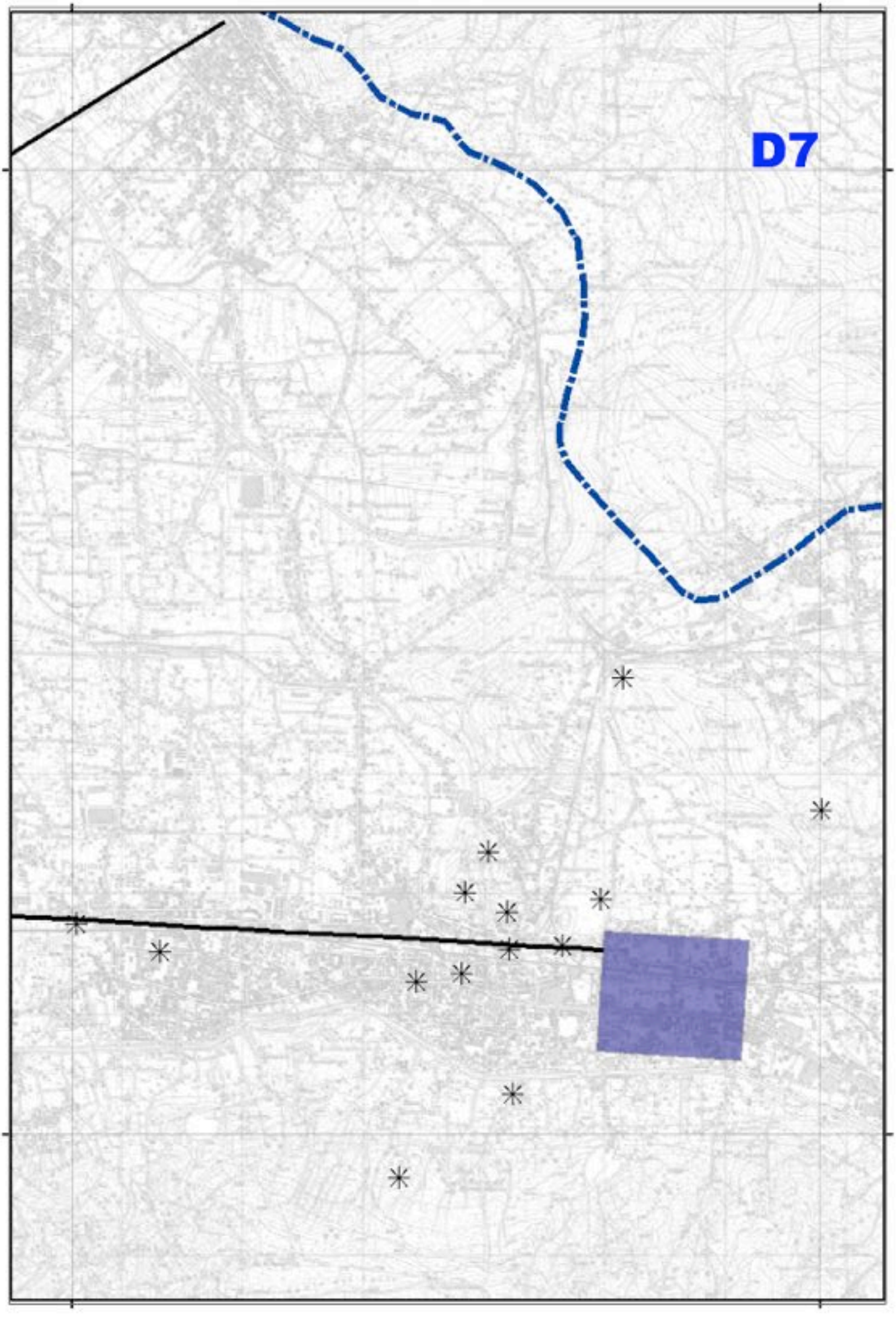

D1
NAP015

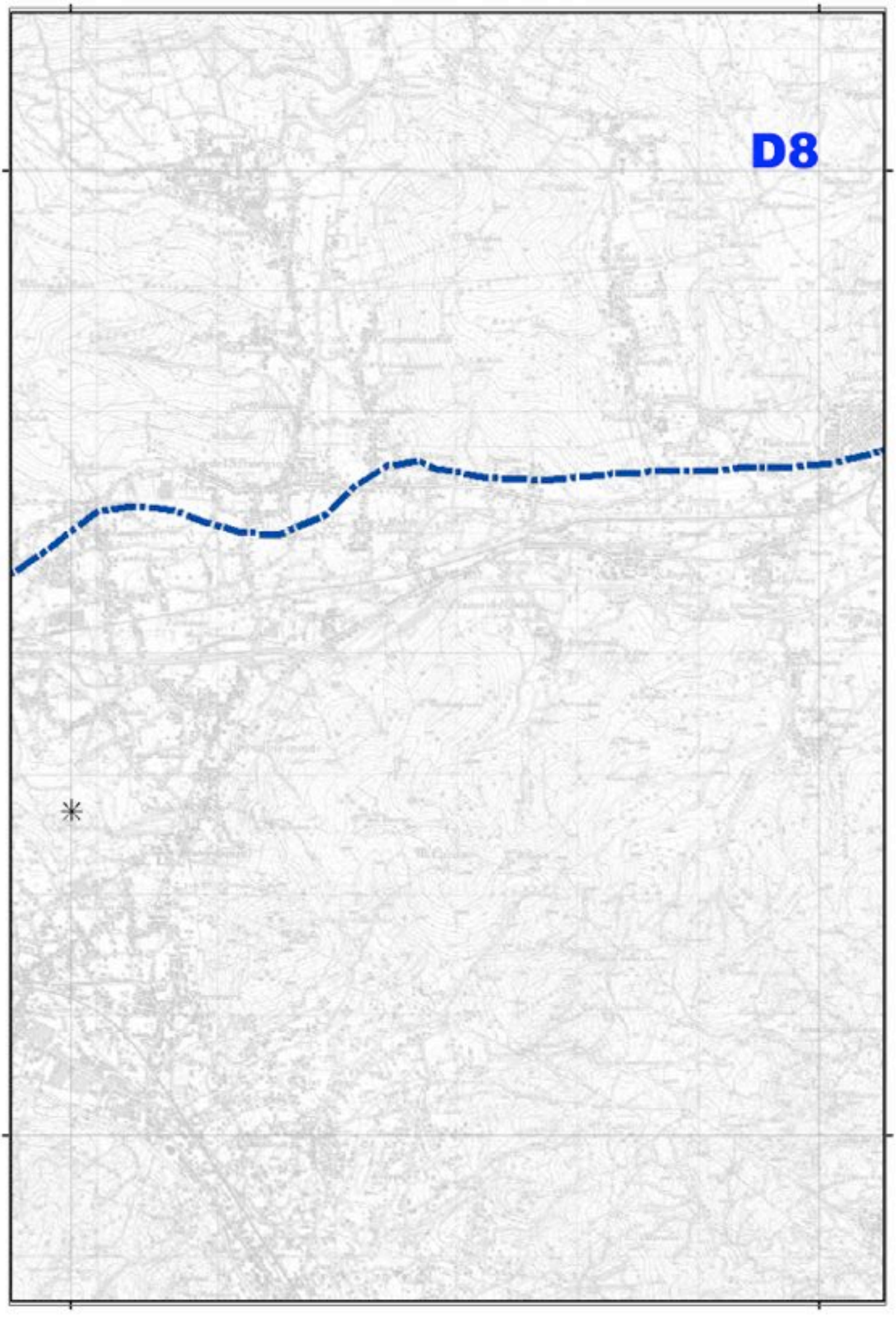

ERC008
ERC007
ERC006
ERC009
ERC005
D3
ERC004
TGR002
TGR008
TGR022
TGR006
TGR010
TGR007
TGR009
TGR025
TGR005
TGR015
TGR017
TGR021
TGR019

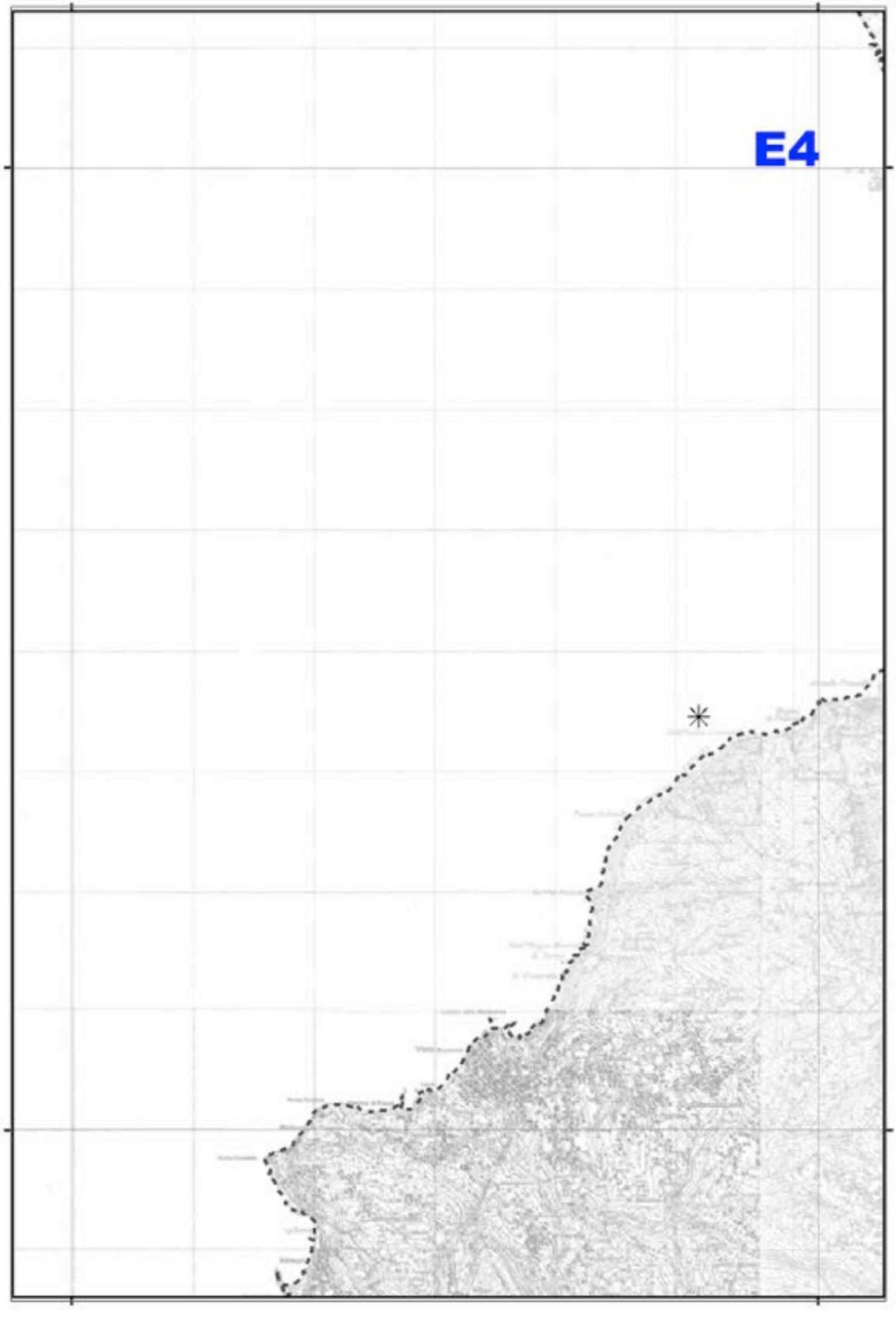

D4
TGR001
TGR002
TGR005
TGR003
TGR004
TGR020
TGR021
TGR019
BTC002
BTC011
TRC001
BTC037
BTC041
BTC046
TRC005
TRC004
TAN005
TAN007
TAN006
TAN015
TAN017

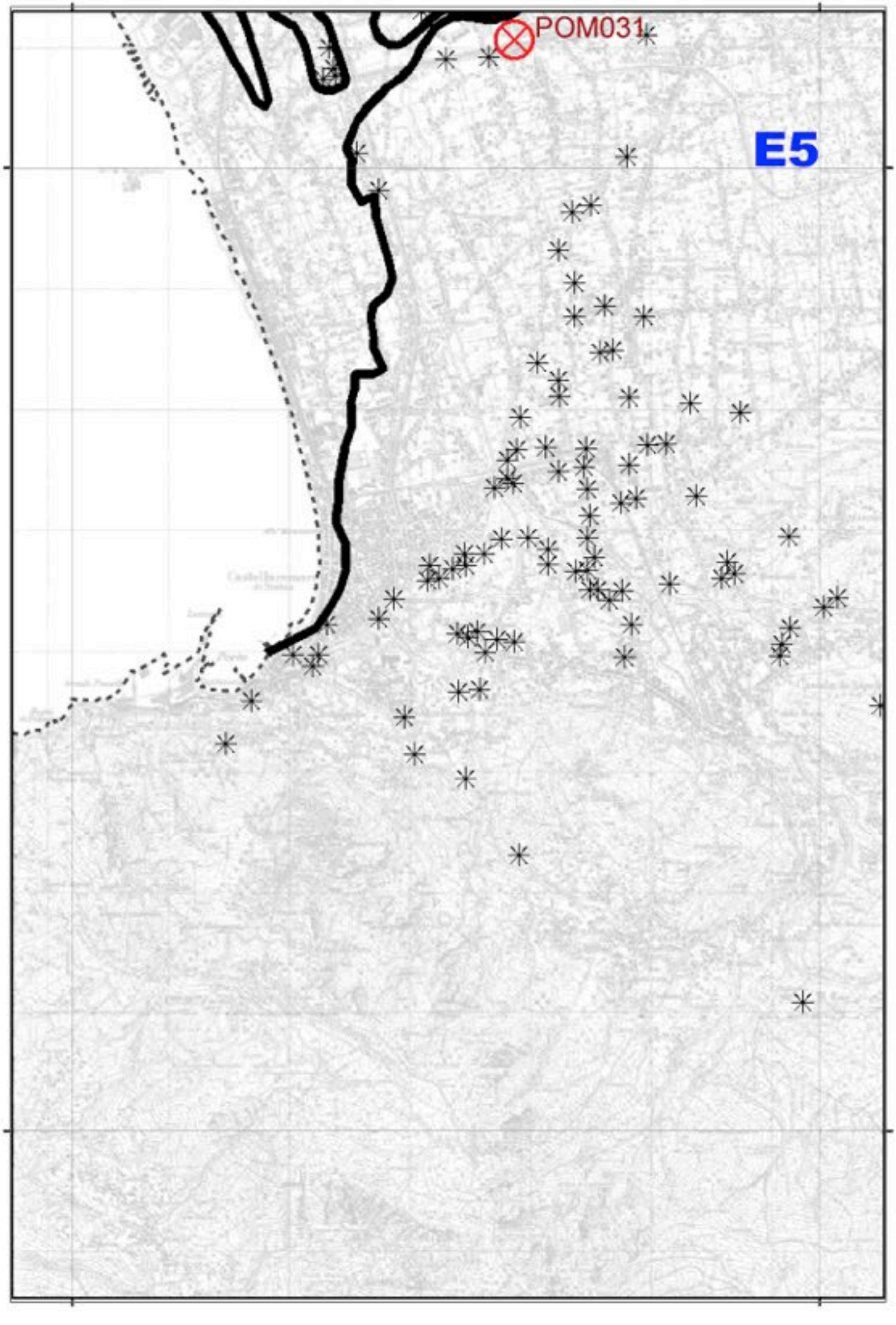

D5
TER001
TER002
TER003
TER004
TER010
TER011
TER012
TER013
TER014
TER015
BTC001
BTC002
BTC003
BTC004
BTC005
BTC006
BTC007
BTC008
BTC009
BTC010
BTC011
BTC012
BTC013
BTC014
BTC015
BTC019
BTC020
BTC021
BTC022
BTC023
BTC024
BTC025
BTC026
BTC027
BTC028
BTC029
BTC030
BTC031
BTC032
BTC033
BTC034
BTC035
BTC036
BTC037
BTC038
BTC039
BTC040
BTC041
BTC042
BTC043
BTC044
BTC045
BTC046
BTC047
BRE001
BRE002
BRE003
BRE004
BRE005
BRE006
BRE007
BRE008
BRE009
BRE010
BRE011
BRE012
BRE013
BRE014
BRE015
BRE016
BRE017
BRE018
BRE019
BRE020
BRE021
BRE022
BRE023
BRE024
BRE025
BRE026
BRE027
BRE028
BRE029
BRE030
BRE031
BRE032
BRE033
BRE034
BRE035
BRE036
BRE037
BRE038
BRE039
BRE040
BRE041
BRE042
BRE043
BRE044
BRE045
BRE046
BRE047
BRE048
BRE049
BRE050
BRE051
BRE052
BRE053
BRE054
BRE055
BRE056
BRE057
TAN001
TAN002
TAN003
TAN004
TAN005
TAN006
TAN007
TAN008
TAN009
TAN010
TAN011
TAN012
TAN013
TAN014
TAN015
TAN016
TAN017
POM001
POM002
POM003
POM004
POM005
POM006
POM007
POM008
POM009
POM010
POM011
POM012
POM013
POM014
POM015
POM016
POM017
POM018
POM019
POM020
POM021
POM022
POM023
POM024
POM025
POM026
POM027
POM028
POM029
POM030
POM031
POM032
POM033
SCA001
SCA002
SCA003
SCA004
SCA005
SCA006
SCA007
SCA008
SCA009
SCA010
SCA011
SCA012
SCA013
SCA014
SCA015
SCA016
SCA017
SCA018

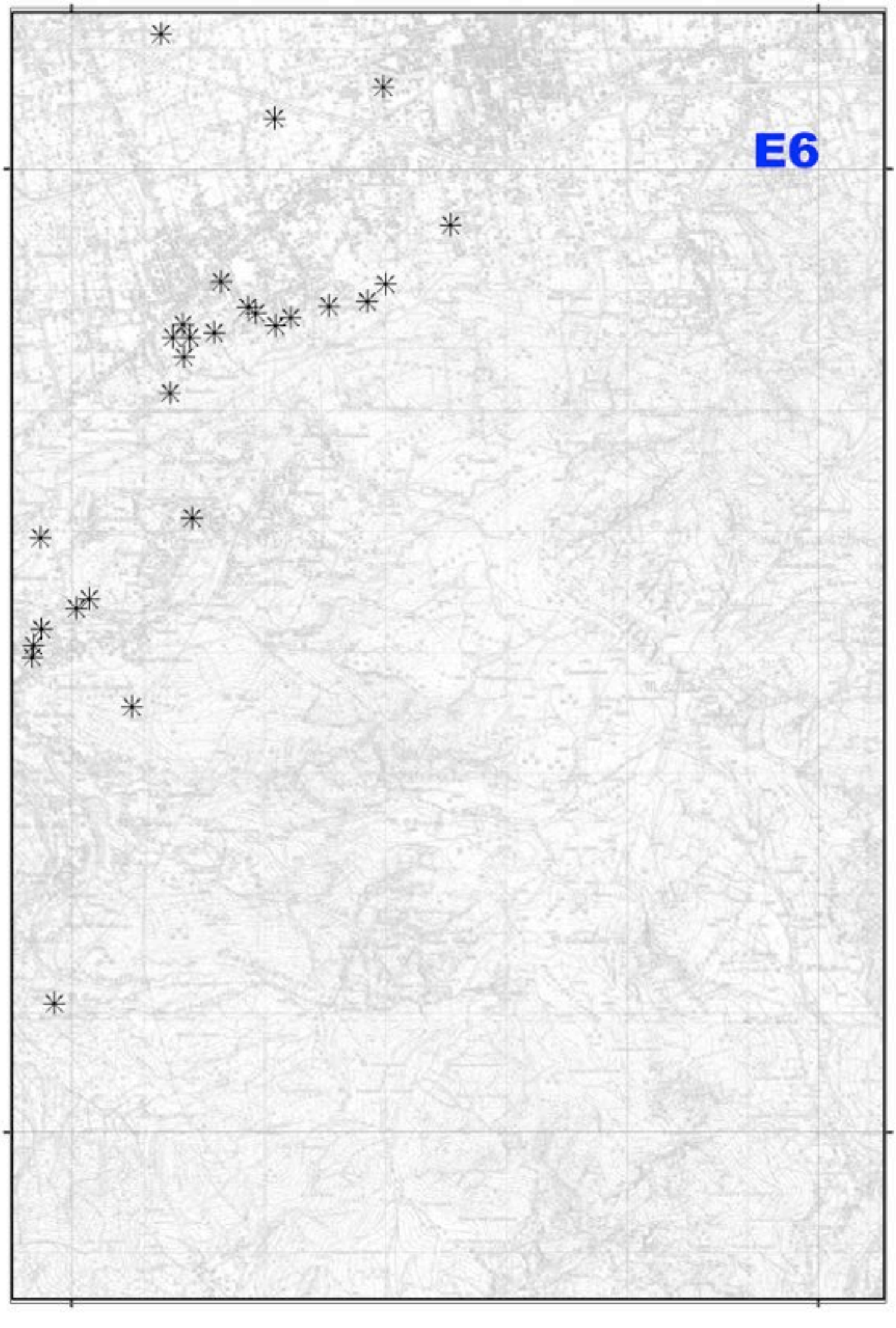

PGM001
D6
BRE054
BRE053
SCA007
SCA006
SCA005
SCA008
SCA009
SCA017
SCA010
SCA011
SCA014
SCA015
SCA016

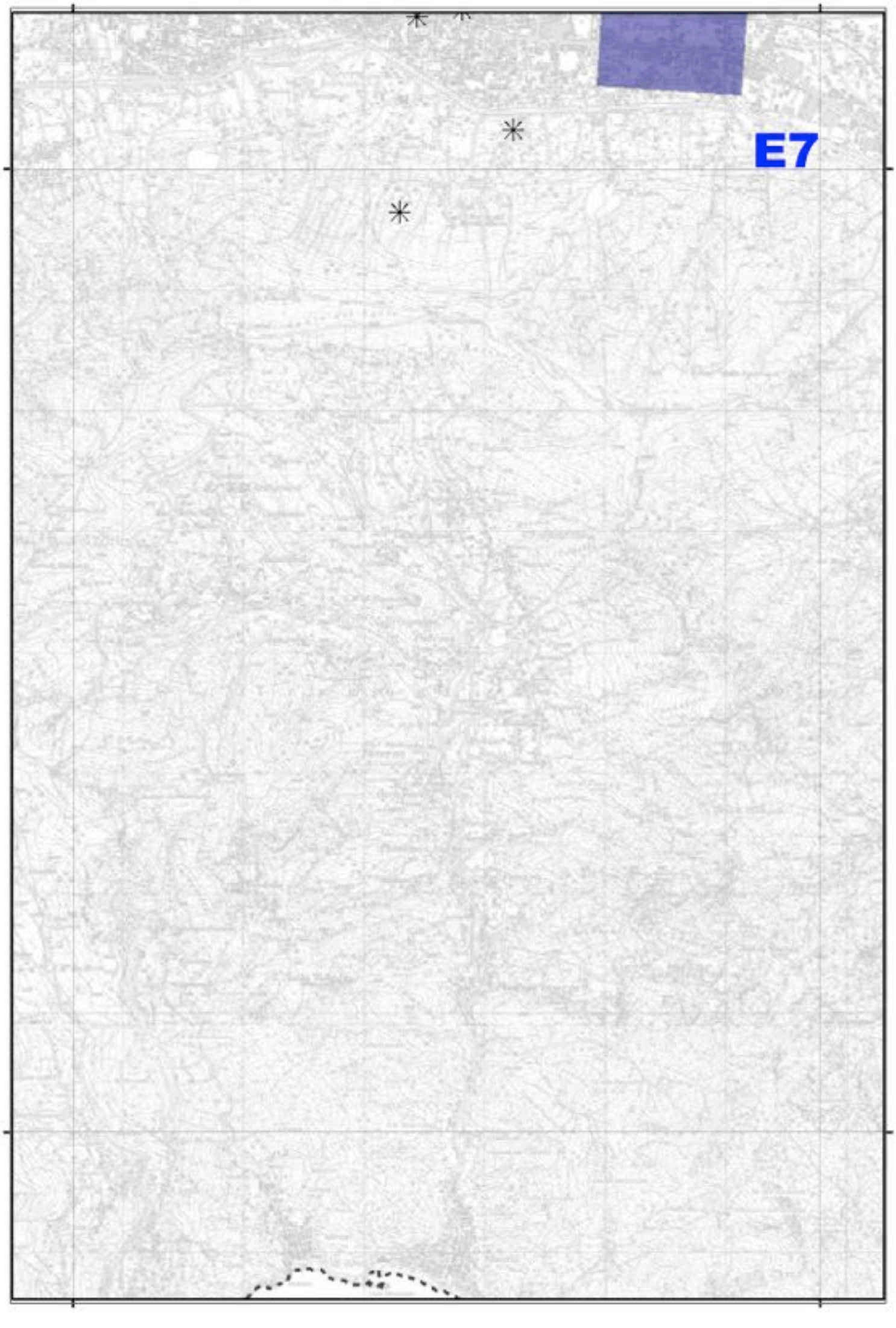

D7

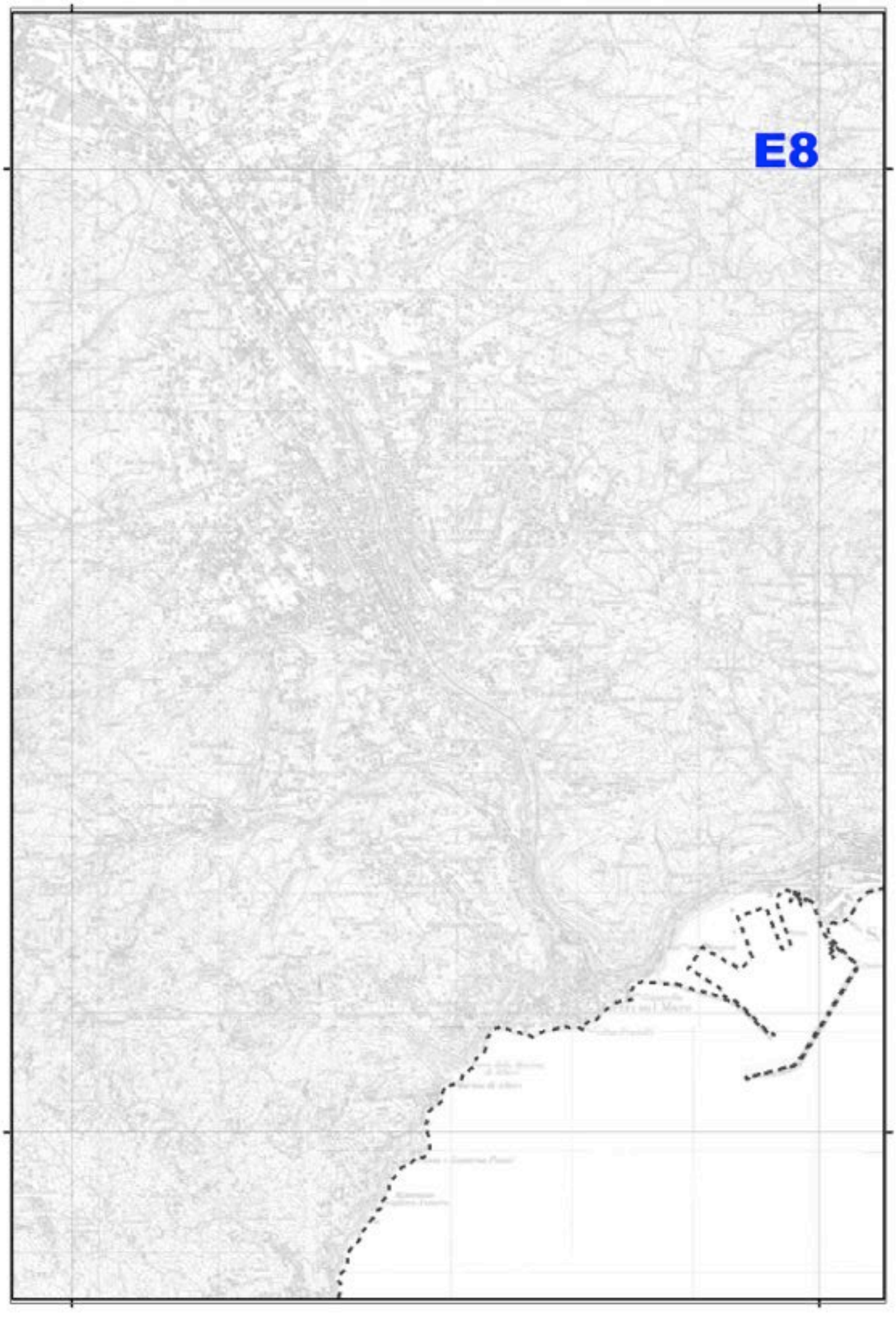

D8

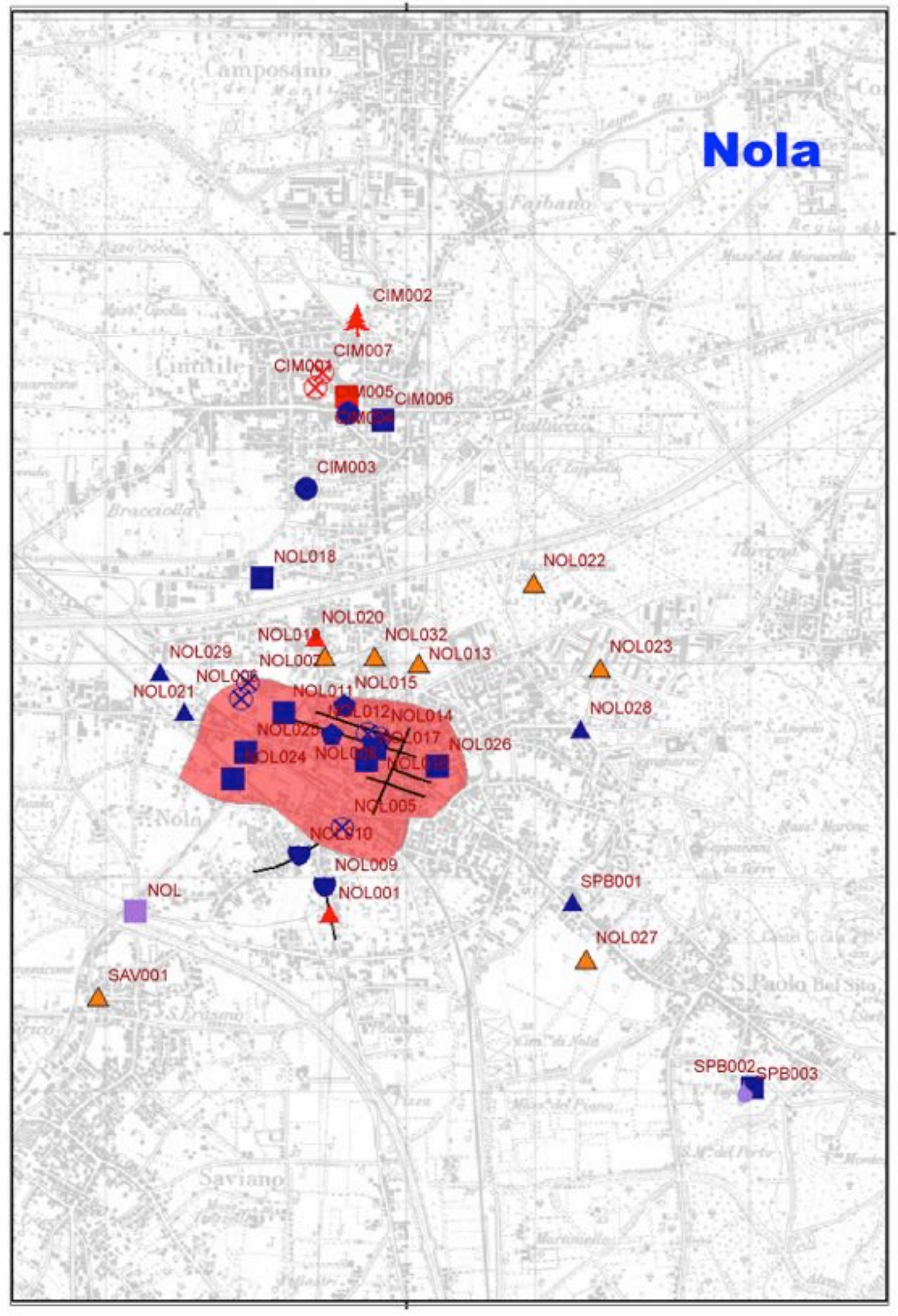

E4

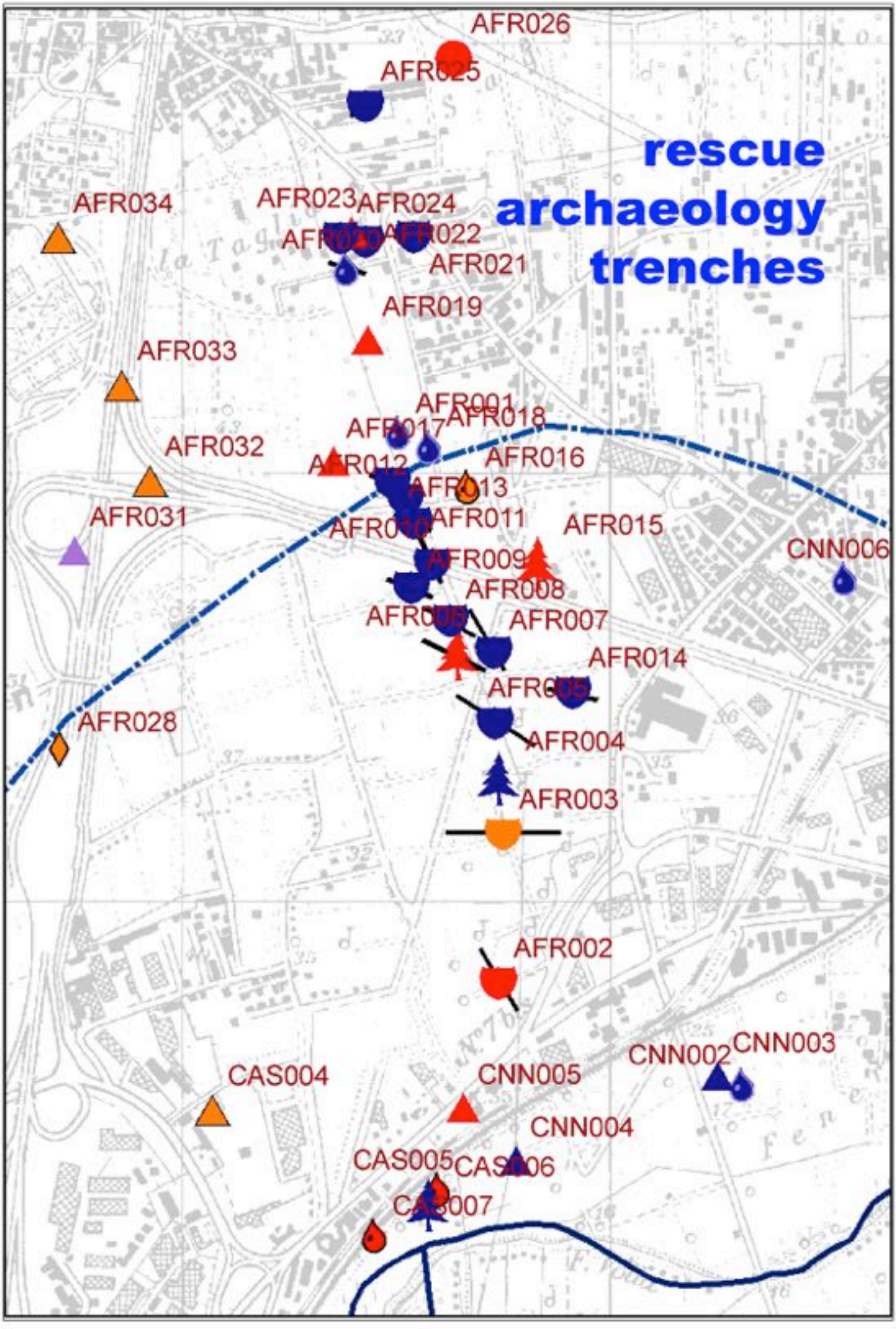

POM031
E5

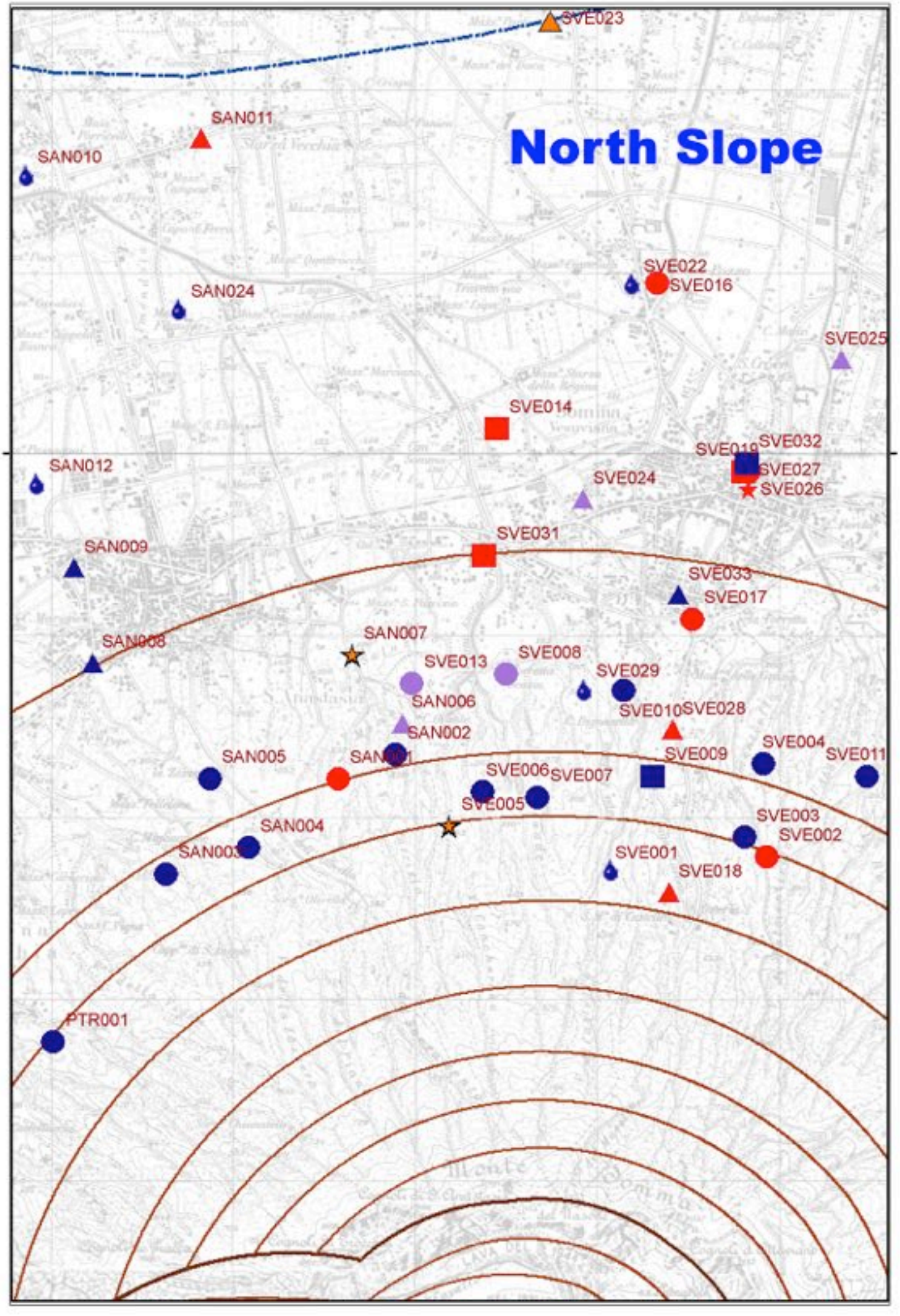

E6

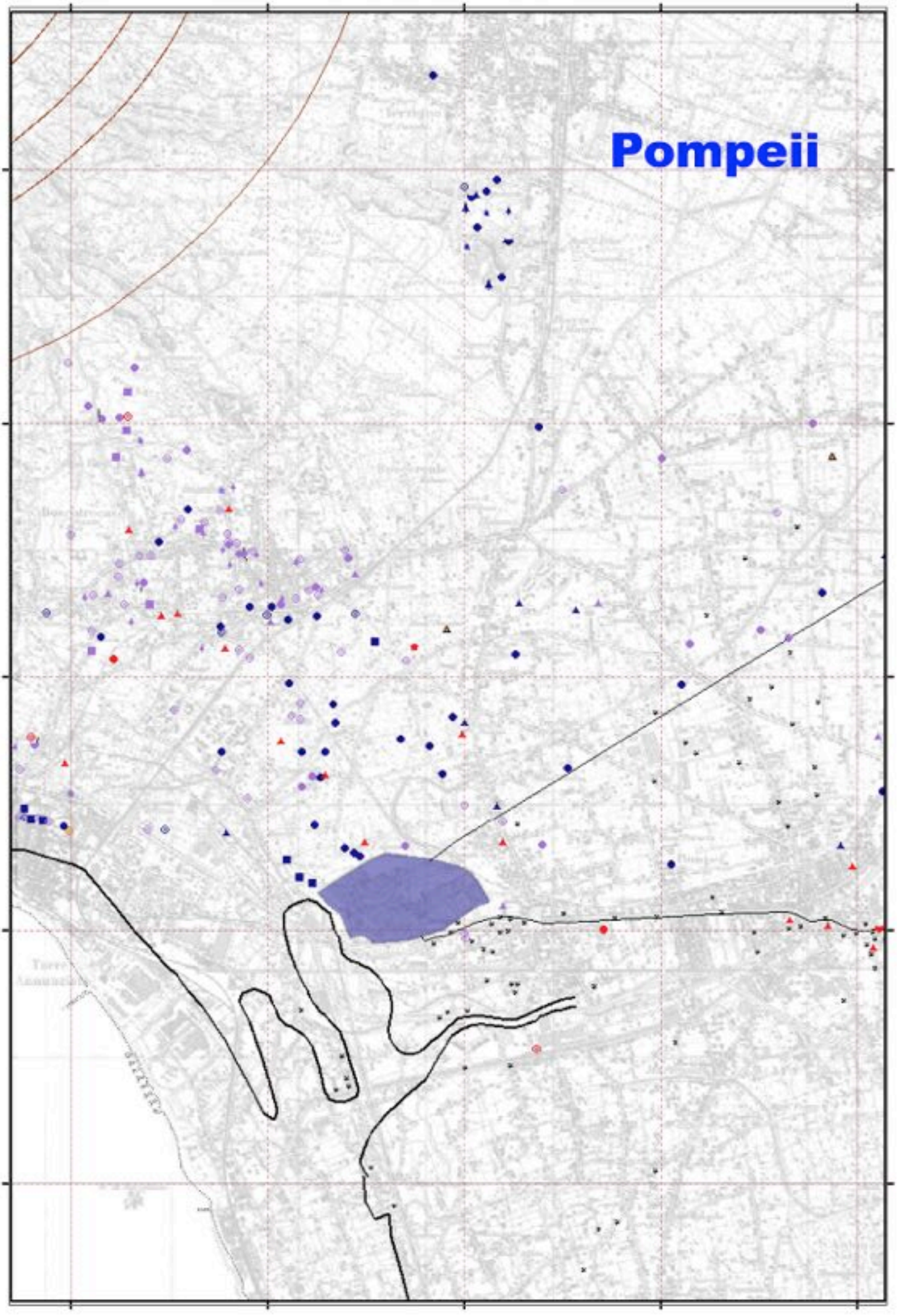

E7

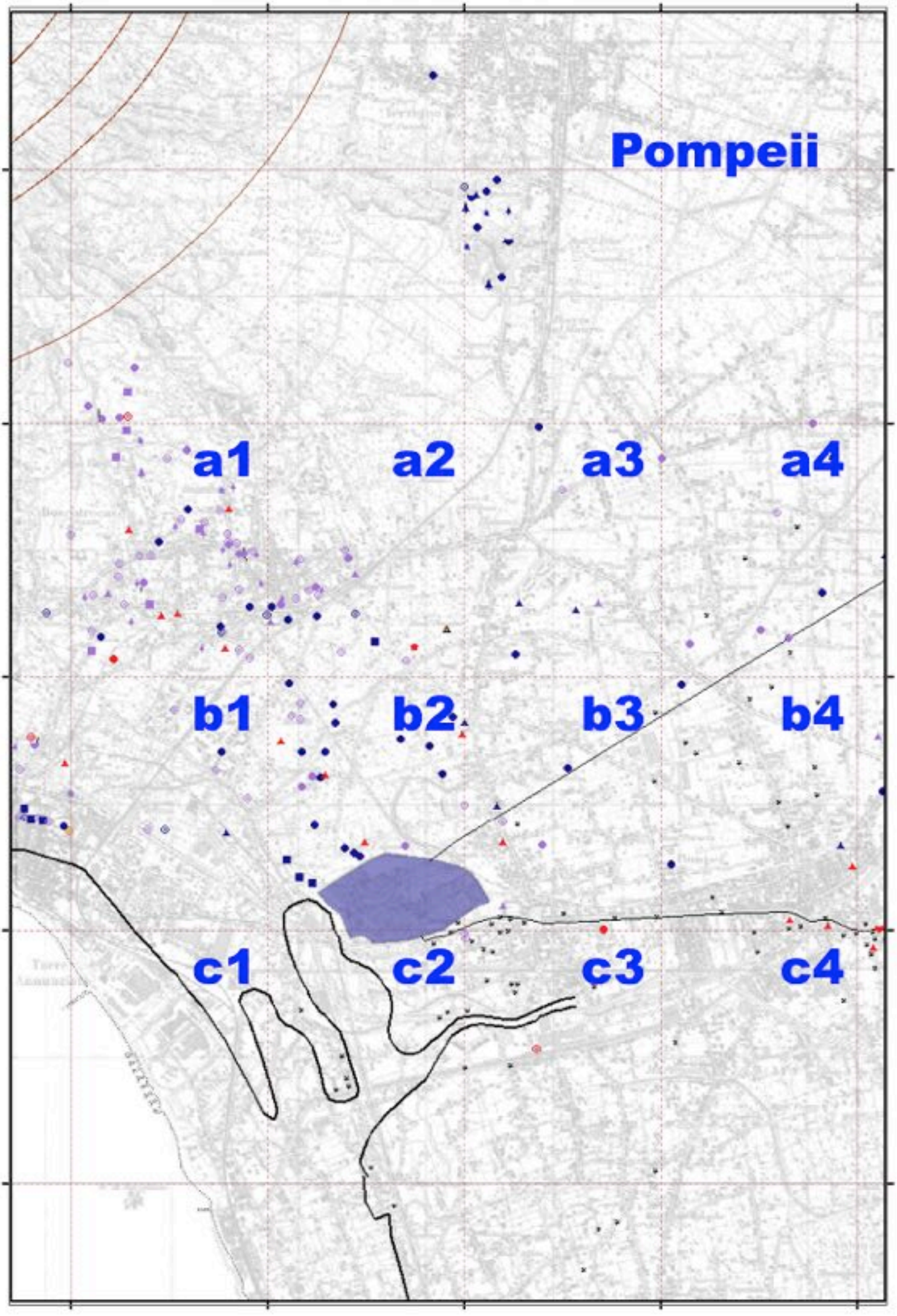

E8

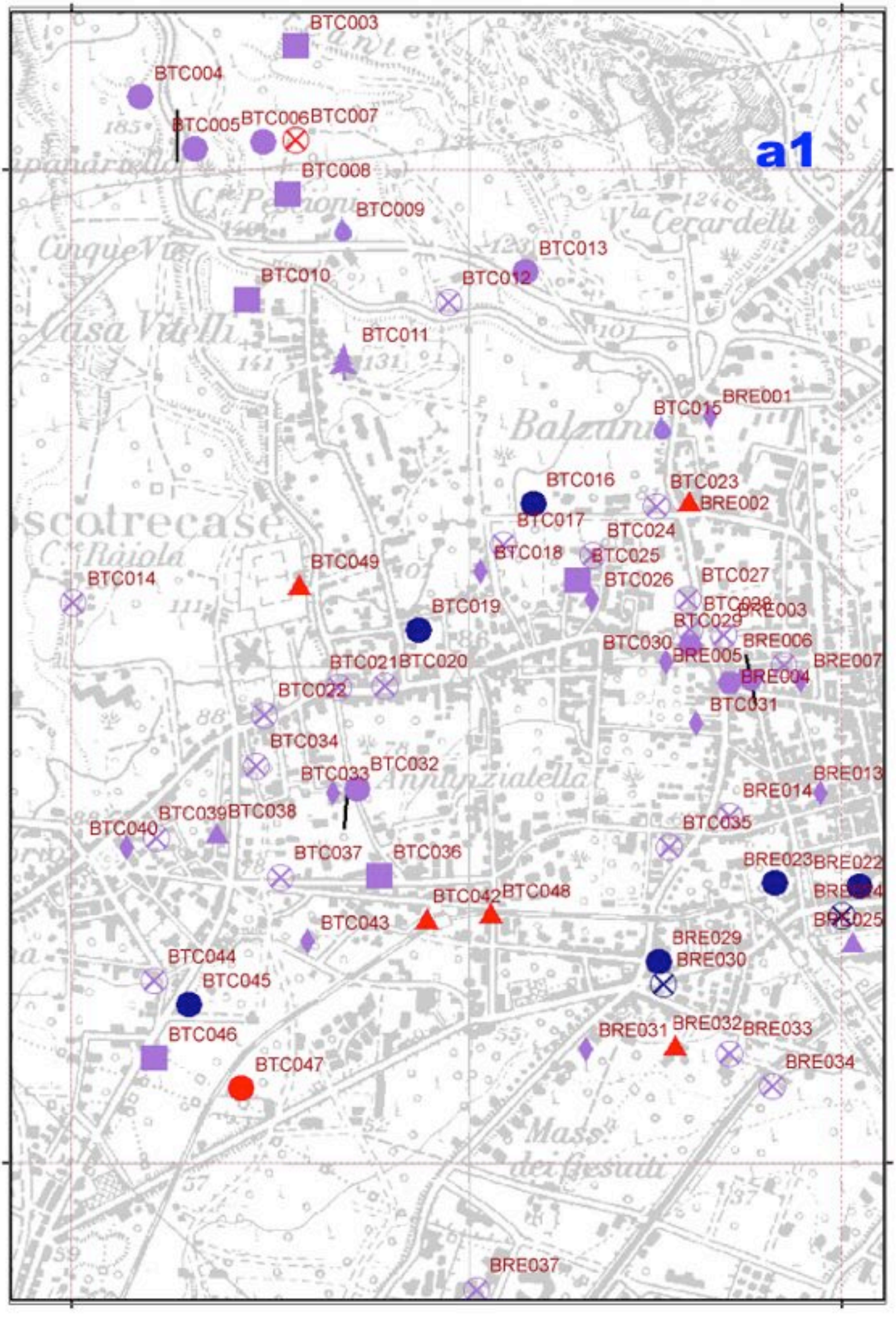

Nola
CIM002
CIM007
CIM005
CIM006
CIM003
NOL018
NOL022
NOL020
NOL032
NOL013
NOL023
NOL029
NOL021
NOL015
NOL028
NOL026
NOL005
NOL009
NOL001
NOL
SPB001
NOL027
SAV001
SPB002
SPB003

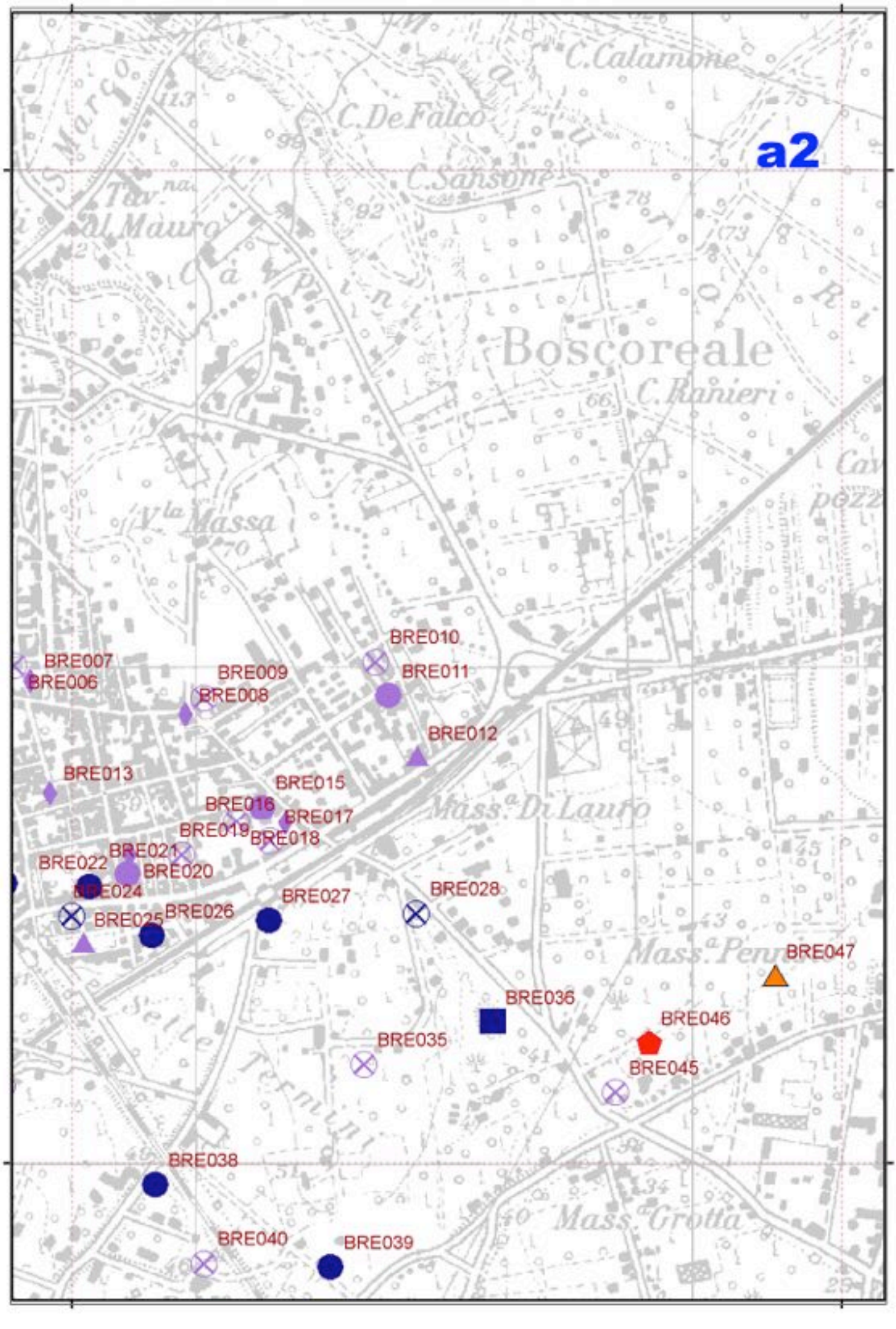

rescue
archaeology
trenches
AFR026
AFR025
AFR034
AFR023
AFR024
AFR022
AFR021
AFR019
AFR033
AFR001
AFR018
AFR017
AFR032
AFR012
AFR016
AFR013
AFR031
AFR011
AFR015
CNN006
AFR009
AFR008
AFR007
AFR014
AFR028
AFR004
AFR003
AFR002
CNN003
CNN002
CAS004
CNN005
CNN004
CAS005
CAS007

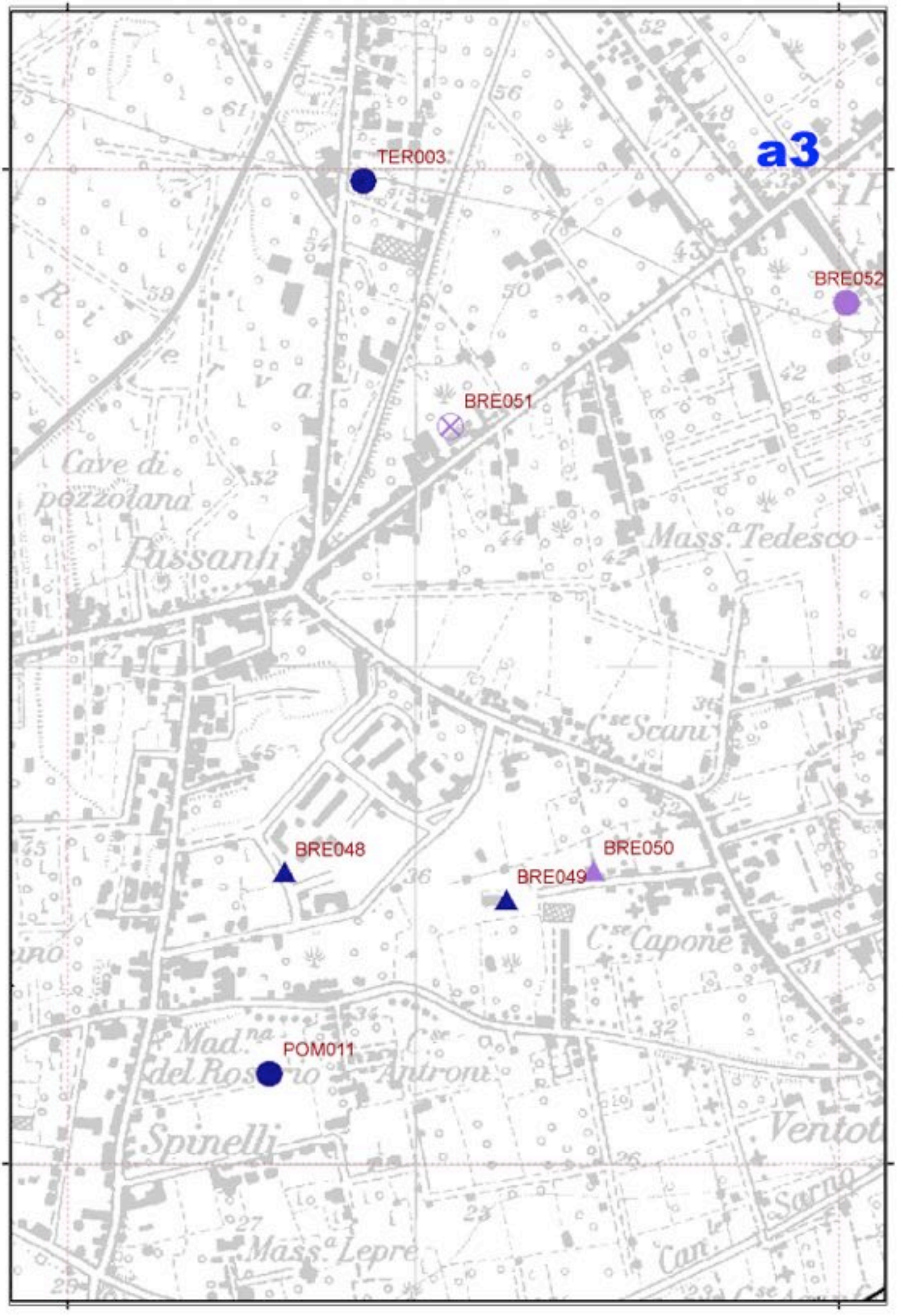

North Slope
SVE023
SAN011
SAN010
SAN024
SVE022
SVE016
SVE025
SVE014
SVE019
SVE032
SVE027
SVE026
SAN012
SVE024
SVE031
SAN009
SVE033
SVE017
SAN008
SAN007
SVE013
SVE008
SVE029
SAN006
SVE010
SVE028
SAN002
SAN005
SAN001
SVE009
SVE004
SVE011
SVE006
SVE007
SVE005
SAN004
SVE003
SVE002
SAN003
SVE001
SVE018
PTR001

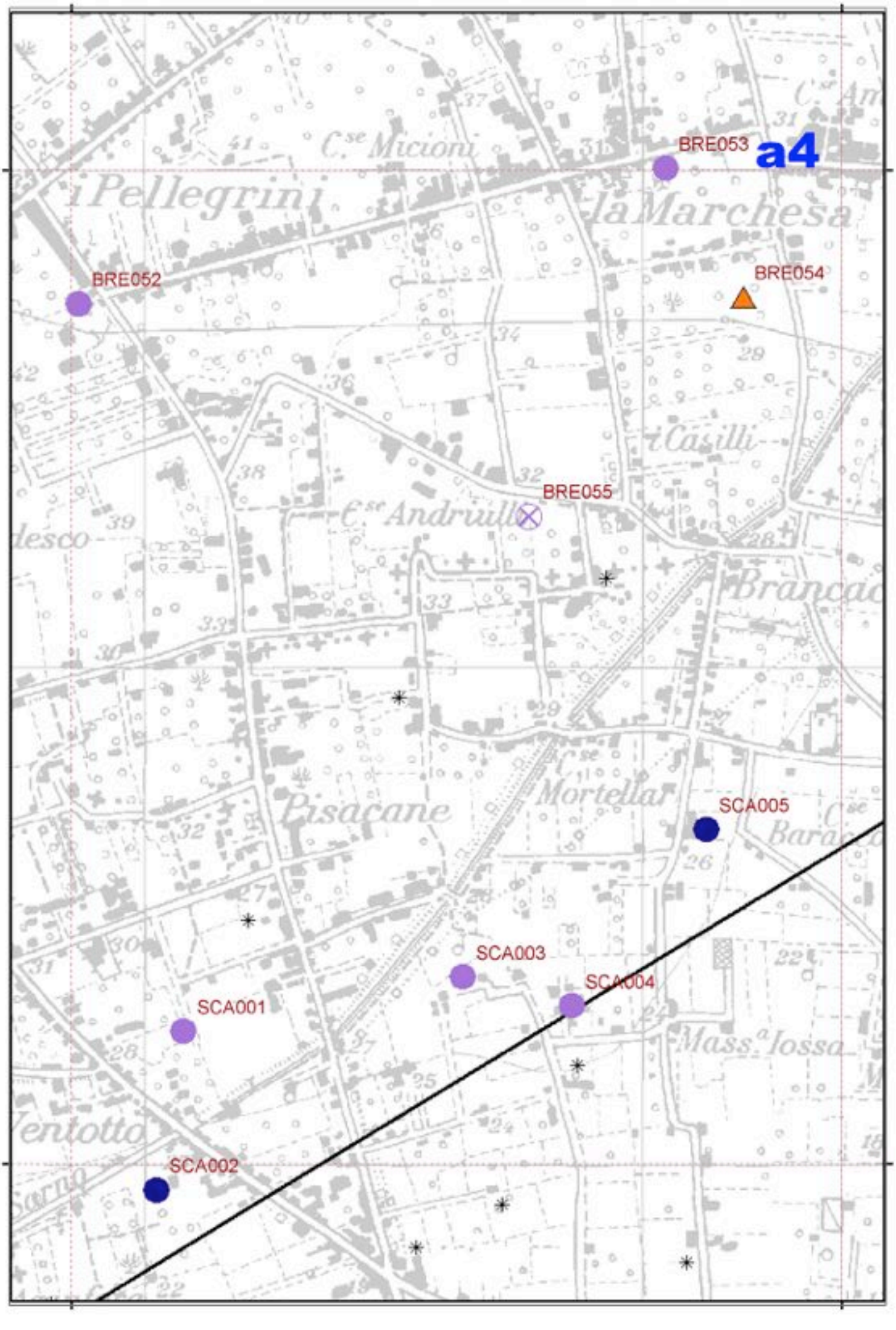

Pompeii

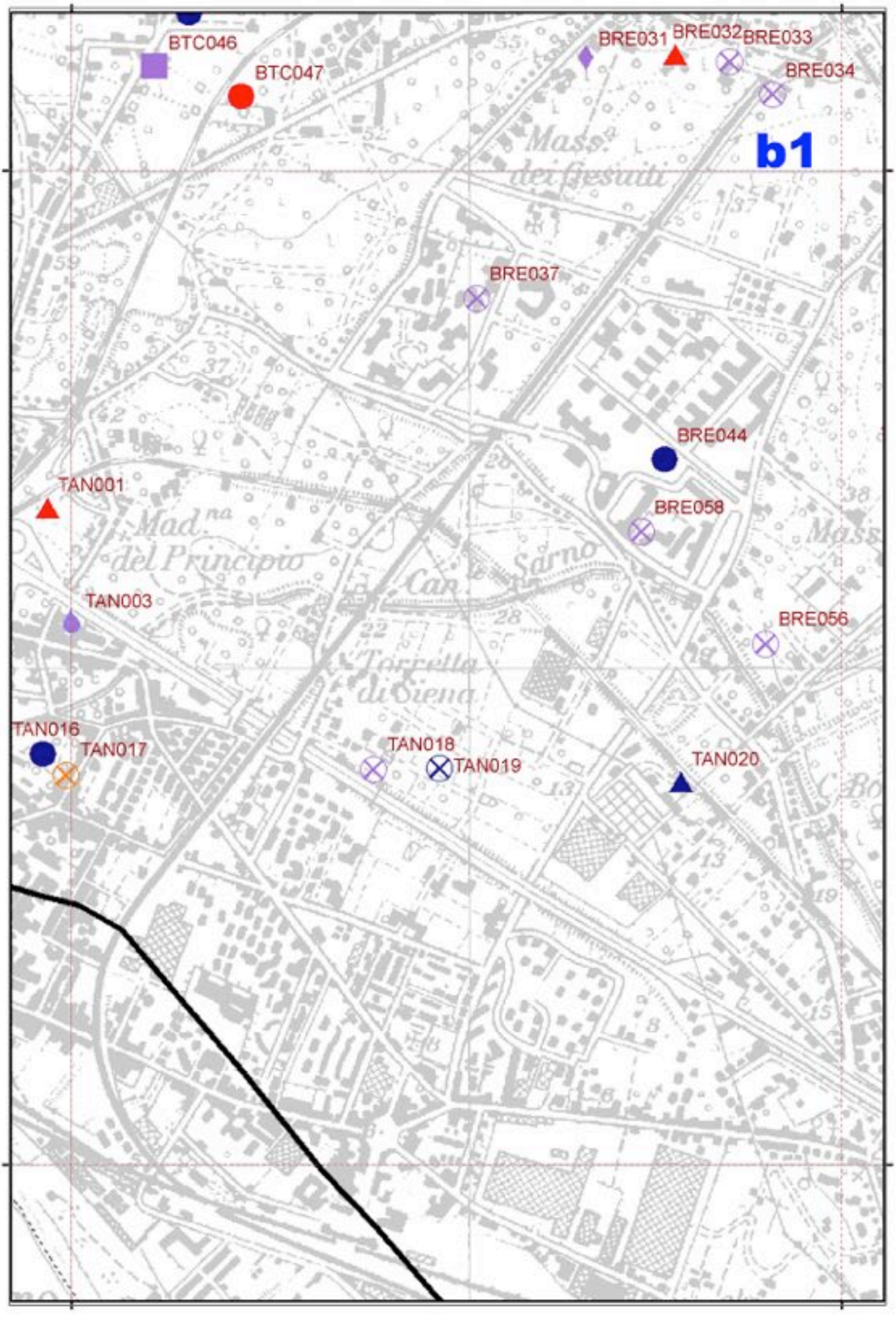

Pompeii
a1
a2
a3
a4
b1
b2
b3
b4
c1
c2
c3
c4

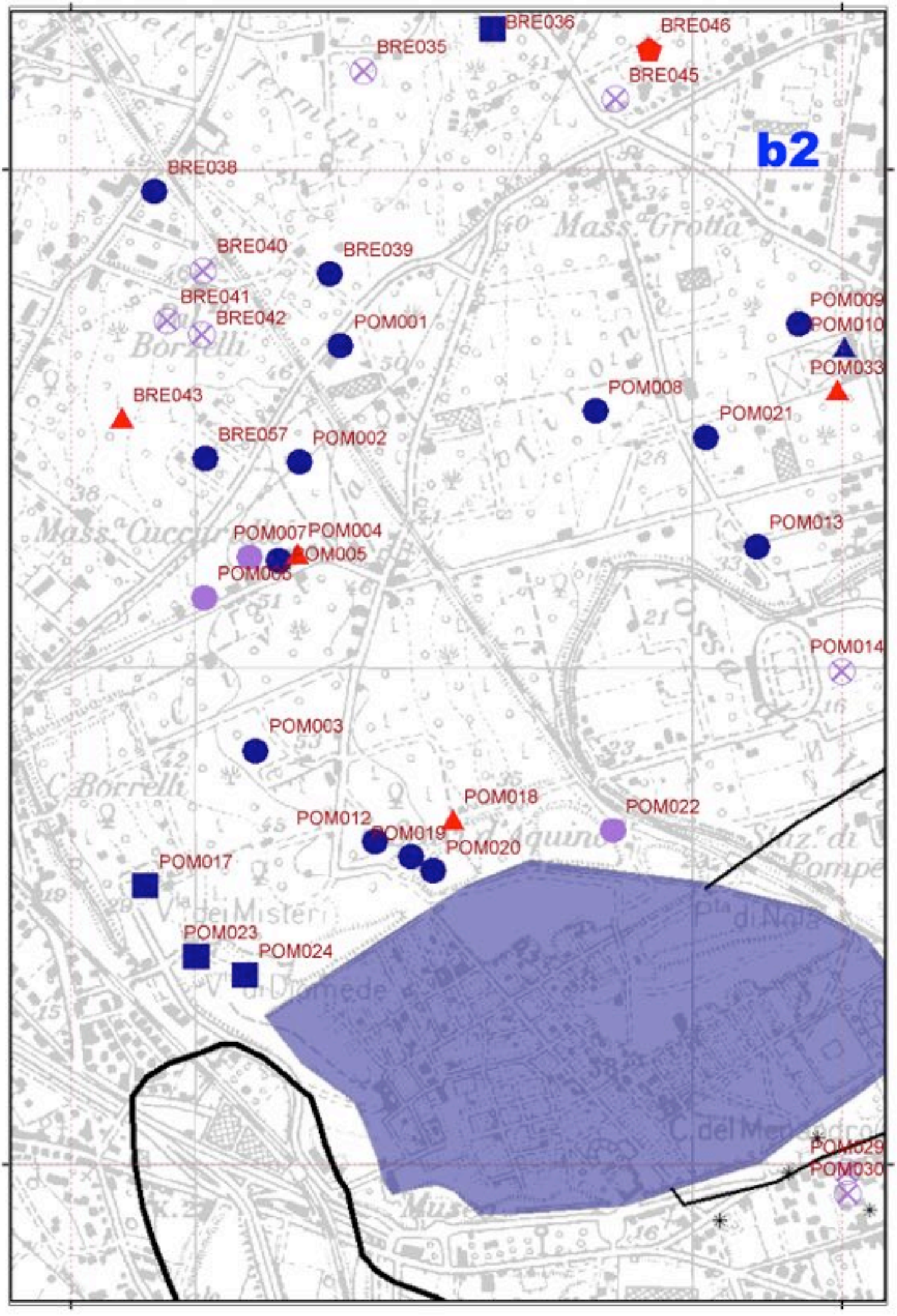

BTC003
BTC004
BTC005
BTC006
BTC007
BTC008
BTC009
BTC010
BTC011
BTC012
BTC013
BTC014
BTC015
BTC016
BTC017
BTC018
BTC019
BTC020
BTC021
BTC022
BTC023
BTC024
BTC025
BTC026
BTC027
BTC028
BTC029
BTC030
BTC031
BTC032
BTC033
BTC034
BTC035
BTC036
BTC037
BTC038
BTC039
BTC040
BTC042
BTC043
BTC044
BTC045
BTC046
BTC047
BTC048
BTC049
BRE001
BRE002
BRE003
BRE004
BRE005
BRE006
BRE007
BRE013
BRE014
BRE022
BRE023
BRE025
BRE029
BRE030
BRE031
BRE032
BRE033
BRE034
BRE037
a1

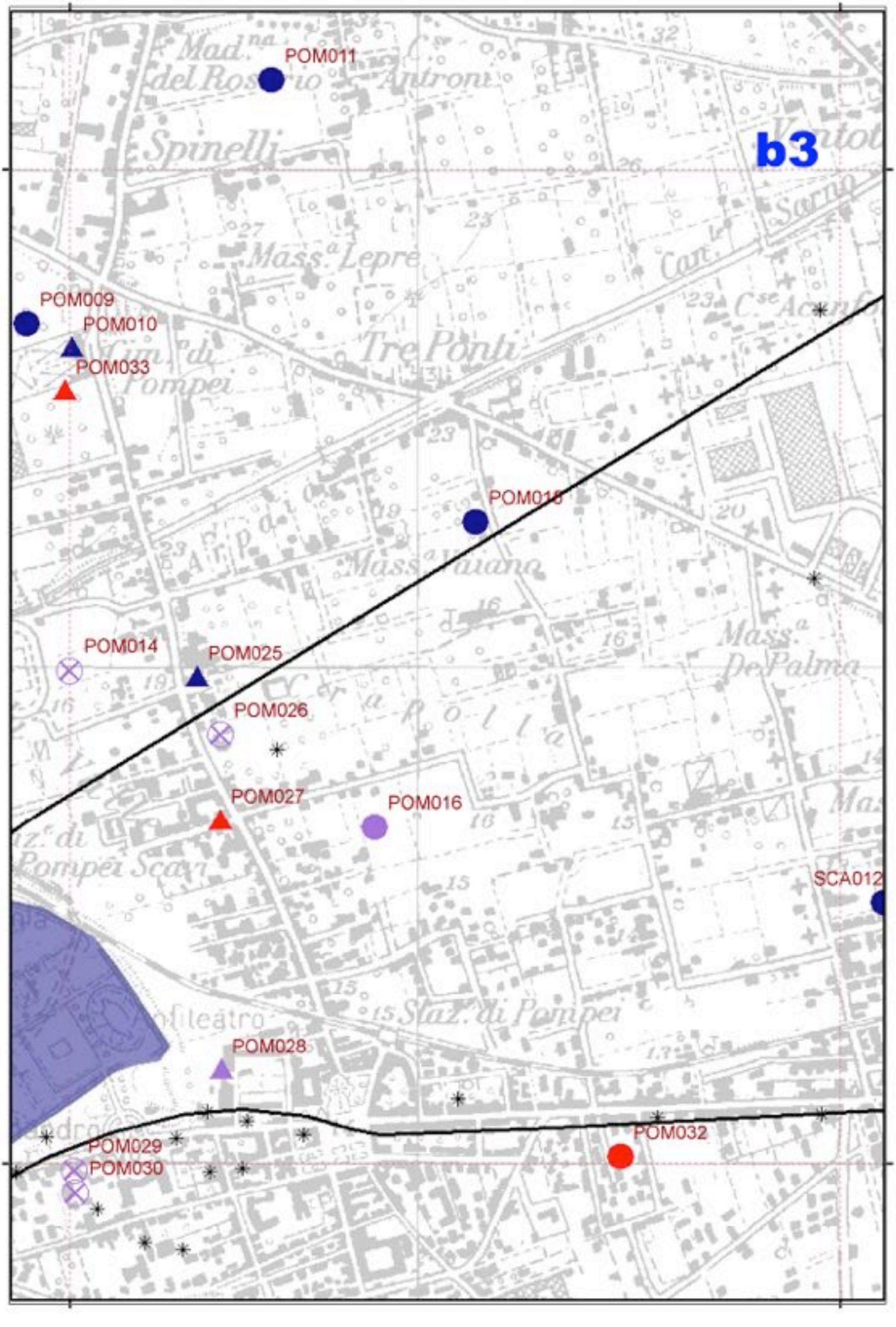

a2
C.Calamone
C.De Falco
C.Sansone
Boscoreale
C.Ranieri
V.la Massa
Mass.a Di Lauro
Mass.a Penta
Mass.a Grotta
BRE006
BRE007
BRE008
BRE009
BRE010
BRE011
BRE012
BRE013
BRE015
BRE016
BRE017
BRE018
BRE019
BRE020
BRE021
BRE022
BRE024
BRE025
BRE026
BRE027
BRE028
BRE035
BRE036
BRE038
BRE039
BRE040
BRE045
BRE046
BRE047

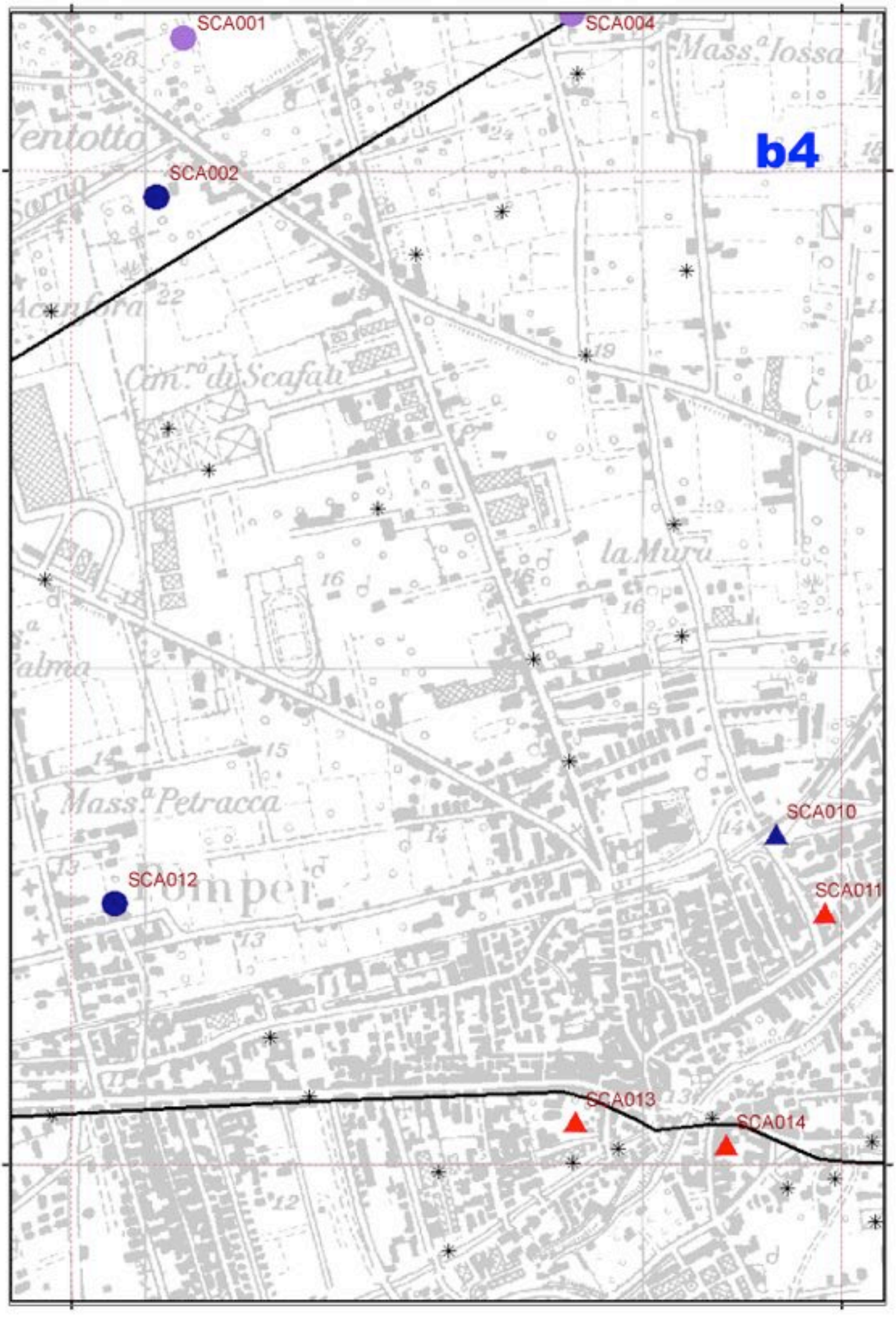

a3
TER003
BRE052
BRE051
BRE048
BRE050
BRE049
POM011
Cave di pozzolana
Passanti
Mass.a Tedesco
C.se Scani
C.se Capone
Mad.na del Rosario
Antrone
Spinelli
Mass.a Lepre

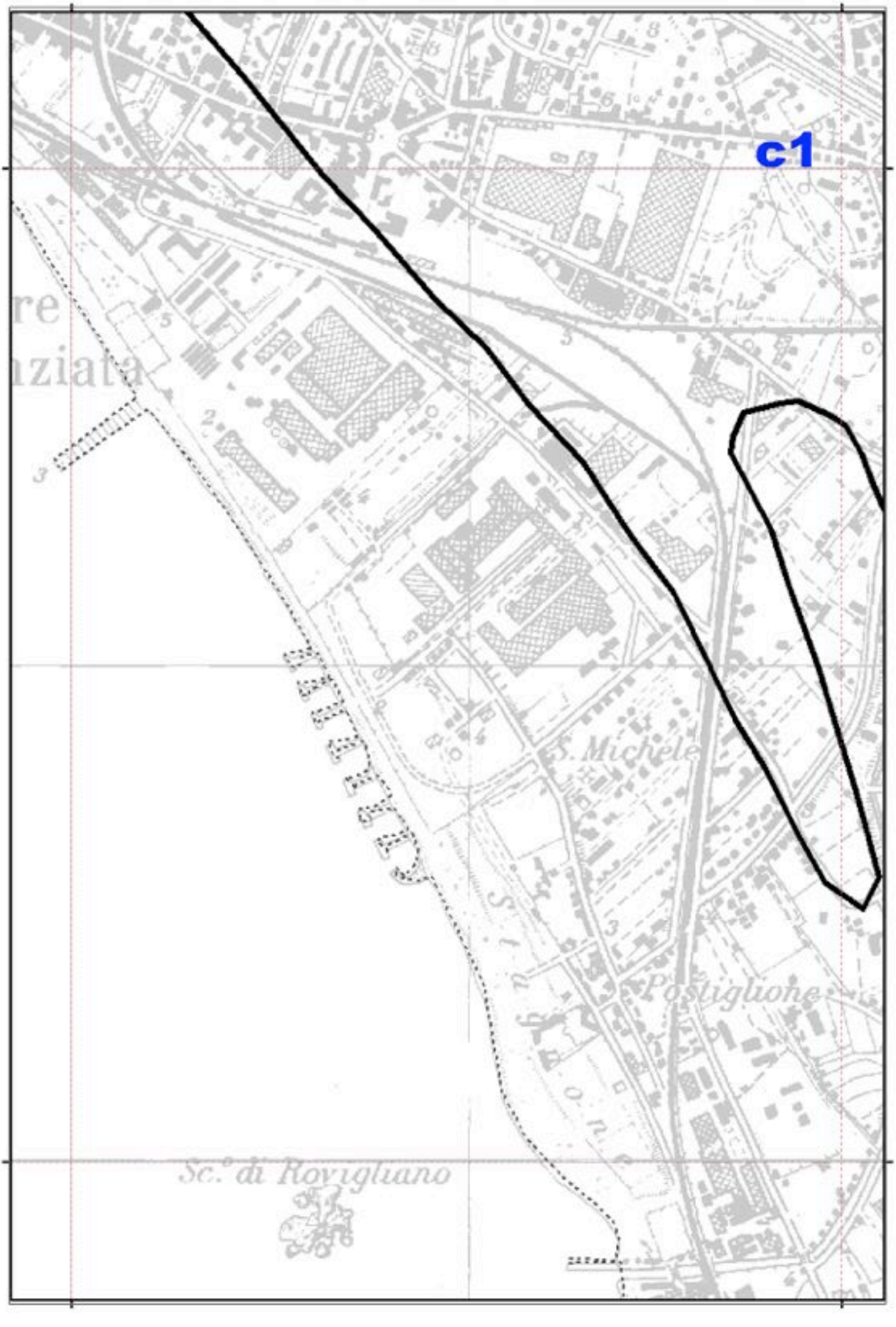

BRE053
a4
BRE052
BRE054
BRE055
SCA005
SCA003
SCA004
SCA001
SCA002
C.se Micioni
i Pellegrini
la Marchesa
i Casilli
C.se Andriulli
Pisaçane
C.se Mortellar
Mass.a Iossa

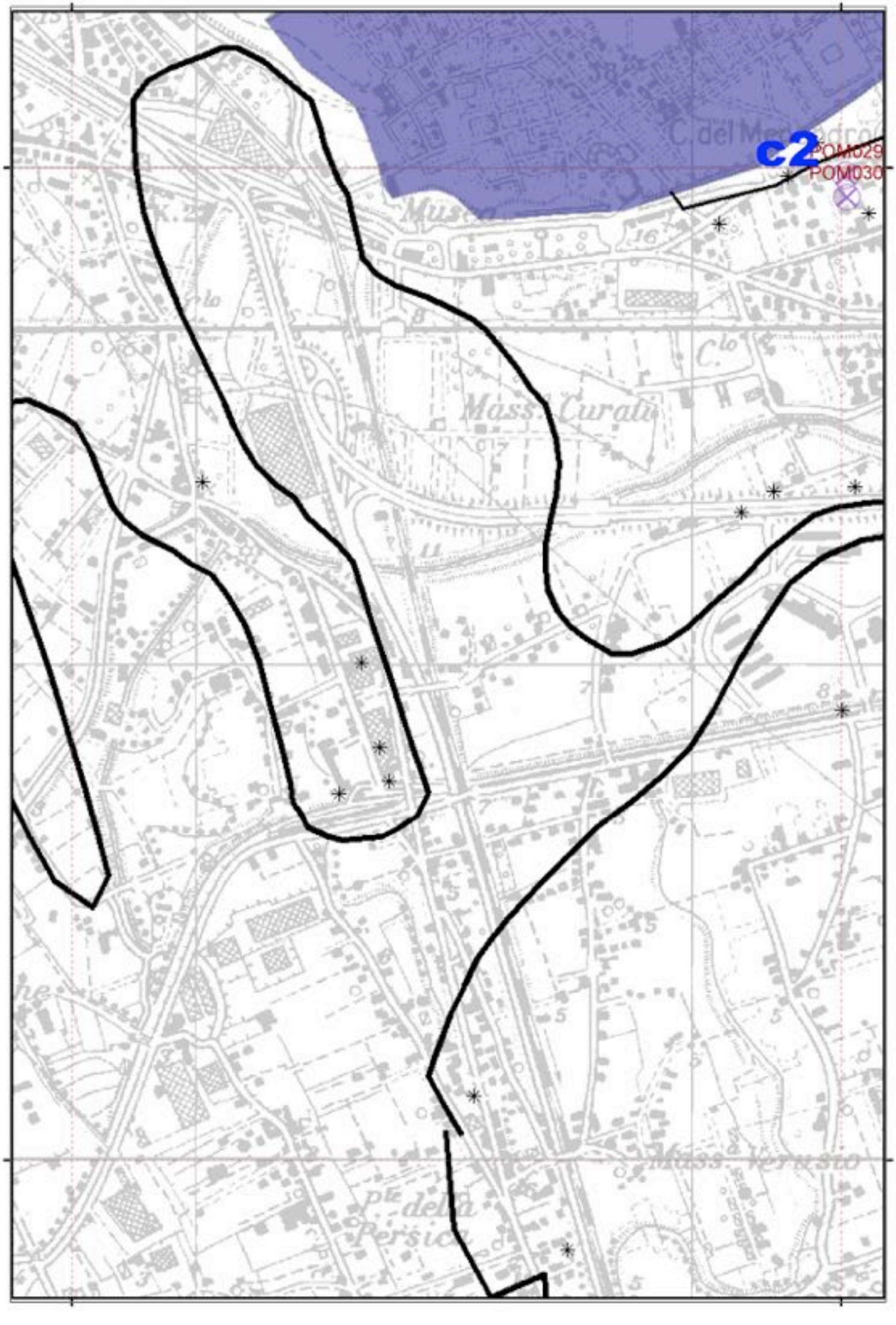

BTC046
BTC047
BRE031
BRE032
BRE033
BRE034
b1
BRE037
BRE044
TAN001
BRE058
TAN003
BRE056
TAN016
TAN017
TAN018
TAN019
TAN020

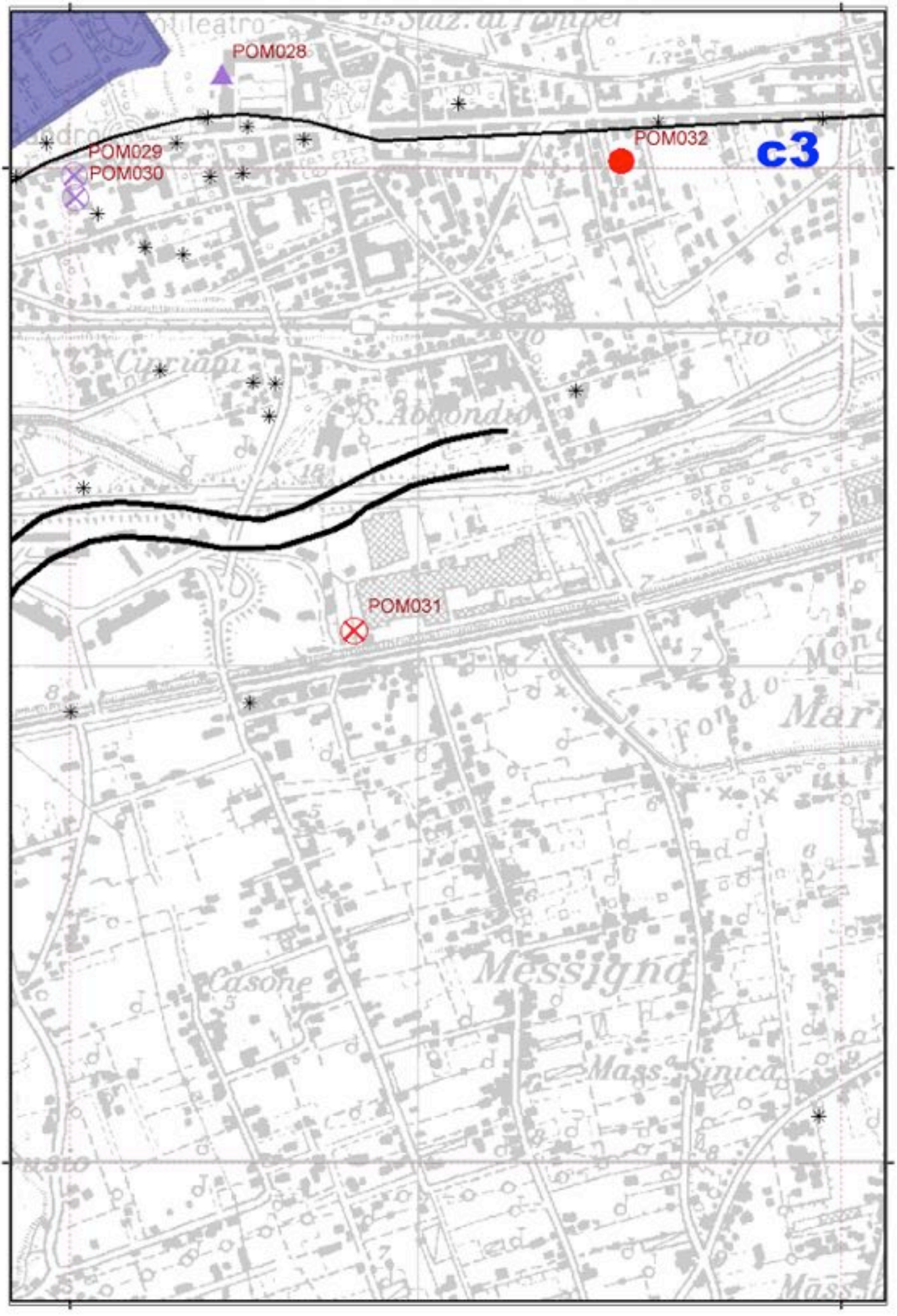

b2
BRE036
BRE046
BRE035
BRE045
BRE038
BRE040
BRE039
BRE041
BRE042
POM001
POM009
POM010
POM033
BRE043
POM008
POM021
BRE057
POM002
POM013
POM007
POM004
POM005
POM006
POM014
POM003
POM018
POM022
POM012
POM019
POM020
POM017
POM023
POM024
POM029
POM030

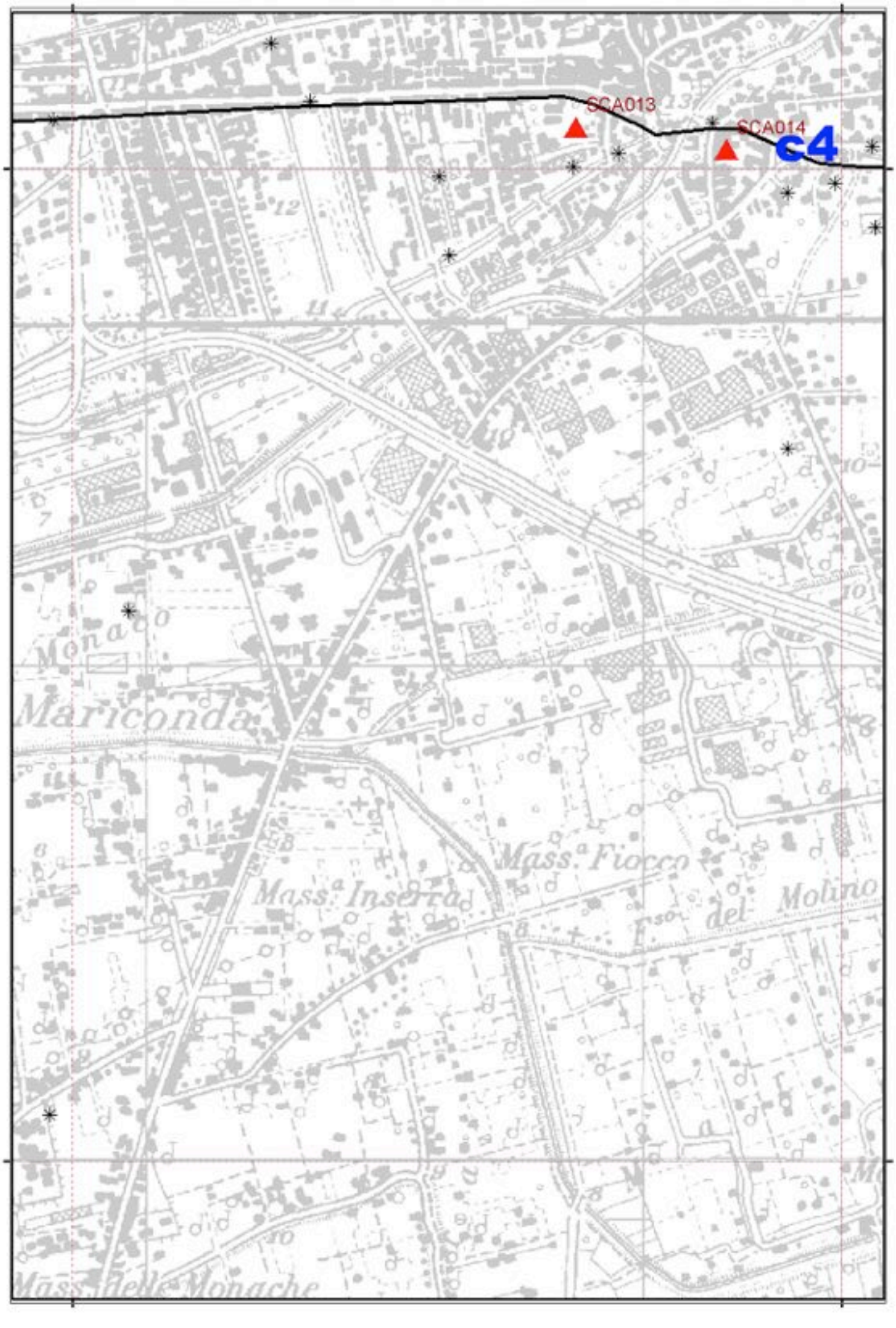

b3
POM011
POM009
POM010
POM033
POM018
POM014
POM025
POM026
POM027
POM016
SCA012
POM028
POM029
POM030
POM032


SCA001
SCA004
b4
SCA002
SCA010
SCA012
SCA011
SCA013
SCA014


c1
S. Michele
Postiglione
Sc.° di Rovigliano


c2
POM029
POM030


POM028
POM029
POM030
POM032
c3
POM031
Messigno
Casone


SCA013
SCA014
c4
Maricondà
Mass.a Insera
Mass.a Fiocco
F.so del Molino
Mass.a delle Monache