THE SOCIAL AND ECONOMIC IMPACT OF ARTIFICIAL LIGHT AT POMPEII

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Abstract

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The evidence presented in this thesis is used to test the hypothesis that a reliable and affordable supply of light fuel and lighting equipment was a major constituent in Roman urban living. Archaeological evidence and ancient literary sources are utilised in order to explore the social and economic activities which consumed artificial light, and evaluate how these nocturnal acts influenced and modified human interactions with each other, and with the physical environment. The consumption of artificial light from c. 300 BCE to 79 CE is investigated, and its influence on the socio-cultural aspects of human activity and the role it played in the daily lives of the inhabitants of ancient Pompeii are evaluated.

The burial of Pompeii in 79 CE by the eruption of Mount Vesuvius resulted in a unique assemblage of lighting equipment, abandoned in many structures as the inhabitants fled. Through the analysis of the Pompeii 79 CE material, I have modelled light fuel consumption for the entire city, and the results demonstrate that large quantities of olive oil were consumed in the provision of artificial light. A clear chronological increase in the development and growth for the use of artificial light at Pompeii is demonstrated.

In this thesis I demonstrate that the night was not a time of inactivity at Pompeii, but thrived with human action, facilitated by artificial light. Well-lit households offered an environment of warmth, security, comfort, and pleasure, and the consumption of artificial light may have been seen as a visual expression of wealth and status. The commercial landscape of the city thrived after the sun had set, and increasing the hours for trade and exchange, through artificial light, resulted in a nocturnal economy which contributed to the wealth and prosperity of this ancient city.

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Chapter 1: Introduction and Theoretical Framework

1.1: Introduction

After-dark activities are structured by access to, and the use of, artificial light. It changes the lives of people, effecting behaviour and perceptions of objects and space. Eckardt (2011: 192) suggests that during the Roman period the use of oil lamps was closely related to a Mediterranean urban lifestyle. This thesis will test the hypothesis that a reliable and affordable supply of fuel and lighting equipment was a major constituent in Roman urban living; exploring the social and economic activities which required artificial light, and assessing how these nocturnal actions influenced and modified human interactions with each other and with the physical environment. The cultural choice to use potential food products, such as olive oil and animal fats, as light fuel suggests a desire or necessity to extend the day. Lighting, both natural and artificial, shapes architectural proportions, decoration, and the organisation and use of space. The uniquely human activity of consuming artificial light has received little attention in studies of pre-industrial societies. The Roman period witnessed significant levels of urbanisation and economic growth, consuming artificial light on a scale never seen before; this thesis will focus on the use of artificial light in ancient Pompeii, using archaeological evidence from the city as a case study of a Roman urban centre in the Mediterranean.

Recent debates (e.g. Hingley and Willis, 2007) have emphasized a need in Roman archaeology to move beyond the physical attributes of objects to address questions of social and economic practice. Previous research on lighting equipment, particularly that from the Roman period, has generally focussed on studies of their typologies and aspects of their trade and exchange: the primary function of illuminating a dark space for human activity has largely been ignored. The research questions addressed in this thesis will advance the study of Roman lighting devices and equipment beyond the production of catalogues and typologies, and improve our understanding of the impact that the consumption of artificial light had on human lives at Pompeii.

The oil lamp, both ceramic and metal, was an item commonly used in the Classical Greek and Roman worlds (c. 500 BCE to 500 CE), and has its origins in the ancient Near East or Archaic Greece (Forbes, 1958: 139). Their use gradually spread west throughout the Mediterranean, and later to north-eastern and north-western Europe. Lamps of Hellenistic Greek and Italian design and origin have been recovered from 1st century CE contexts in Panticapanion (modern Kertch, Crimea), the capital of the Bosporan kingdom (Zhuravlev, 2002a: 1-12) and, with the Roman conquest of Britain in 43 CE, the arrival of oil lamps brought a completely new form of material culture to this north-west province (Eckardt, 2011: 182). However, their presence in large quantities at the majority of Roman-period Mediterranean sites suggests that the use of artificial light was extensive in these areas.

The abundant and uniquely preserved archaeological remains from the Roman city of Pompeii provide an unparalleled and exceptional opportunity to investigate nocturnal social interactions and economic activities; as will be discussed these after dark activities had major economic (both urban and agrarian) and social implications.

1.2: Research questions

This thesis is concerned with the following research questions:

- Why did the inhabitants of ancient Pompeii require artificial light? What were ancient Pompeians 'doing' after dark, and were these activities different to those undertaken during the day?

- What commercial and domestic activities required artificial light, and why?

- Were nocturnal activities different to those which took place during the day?

- How were commercial activities organised in regards to access to light?

- Were there technological developments in lighting devices over time?

- How much fuel was required to illuminate Pompeii – a house, a city block, the whole city?

- Did the use of artificial light have any social consequences?

- Did the use of artificial light have any economic consequences?

1.3: Aim and objectives

Through addressing these research questions this thesis aims to assess the social and economic significance for the consumption of artificial light at Pompeii; and to test the hypothesis that a reliable and affordable supply of fuel and lighting equipment was a major constituent in Roman Mediterranean urban living. A set of objectives were developed to provide a framework in order to address these research questions:

1. To assess the underlying socio-cultural reasoning for lengthening the day;
2. to assess the development and growth of the urban consumption of artificial light at Pompeii (from c. 300 BCE to 79 CE);
3. to assess the scale and extent for household consumption of artificial light in 79 CE;
4. to assess the extent to which nocturnal commercial activity contributed to urban economic and structural growth;
5. to estimate the scale of olive oil consumption for lamp fuel at Pompeii.

This thesis will analyse the extensive archaeological remains of lighting devices and associated equipment found at Pompeii, and consider these data within the social and economic context of their use, and the structural environment. In doing so, the results presented will contribute to our understanding of urban nocturnal social and economic activities at Pompeii and, by inference, the wider Roman world. The outcome(s) of this thesis will highlight the significance for the consumption of artificial light, and explore how a gradual increase in its use, over time, contributed to the city's economic success, and influenced its physical, social, and cultural character.

1.4: Thesis structure

This introductory chapter presents the theoretical framework from which the thesis research questions arose, and a background to this research, leading to a discussion of the thesis aim and objectives.

Chapter 2 will place the issues to be addressed within a wider research context, along with an in-depth examination of past approaches, and an overview of the extensive number of studies of lighting equipment, their strengths and limitations.

Chapter 3 will be a discourse on the nature and sources of the data used in this research, and provide a brief overview of the methodologies to be applied in their analyses. The primary source of evidence is the extensive archaeological remains at Pompeii: the large quantities of lighting equipment recovered from well-preserved structural remains. The analyses of these data are complex, and an understanding of the processes of deposition, post-deposition, and their rediscovery and recovery, is essential for any consideration of the material remains of life in this ancient city. The second key sources of evidence to be considered are the ancient written sources. Information from these sources will be analysed in an attempt to identify the underlying socio-cultural reasoning for lengthening the day (Objective 1), specifically, the range of activities which would have required artificial light.

Chapters 4, 5, 6, and 7 will present the analyses of the data to address the thesis aim and objectives outlined above. At the beginning of each analytical chapter will be an explanation of the methodologies to be applied in the analysis of the data, the underlying assumptions for these and why they are considered appropriate. In Chapter 4 I will focus on the development and growth of the consumption of artificial light at Pompeii, from c. 300 BCE to c. 70 CE (Objective 2). In Chapter 5, I will analyse lighting equipment found in domestic contexts at the time of the eruption of Mount Vesuvius in 79 CE, to assess the extent and scale for the use of artificial lighting in Pompeian households, and compare levels of its consumption between properties (Objective 3). In Chapter 6 I will consider aspects of the nocturnal economy, with the aim of identifying which commercial activities required artificial light, and the impact that extending the day by artificial methods had on economic activity (Objective 4). In Chapter 7 I will present a model in order to estimate the scale of light fuel (predominantly olive oil) consumption at Pompeii; at household, insula, and city levels (Objective 5).

In Chapter 8 I will provide a discussion of the results of the analyses undertaken in Chapters 4, 5, 6, and 7, which in turn will lead to an assessment of the underlying socio-cultural reasoning for lengthening the day (Objective 1), and how this may inform on the social and economic impact for the consumption of artificial light at Pompeii.

1.5: Background to the research

1.5.1: Extending the day: a desire or necessity?

Even today, the majority of human activity takes place during daylight hours. The ability of humans to control their natural environment and produce heat and light safely is one of the defining aspects of humanity. This was even more apparent in pre-modern societies, before humans developed techniques to manipulate natural resources (predominantly fossil fuels) to ensure artificial light and heat were regular constituents in their daily lives. Artificial light in the ancient world was only accessible to those who could afford the luxury, and thus, evidence of its use and scale of its consumption may also serve as a proxy for measuring relative wealth and/or status.

All human lives, ancient and modern, essentially revolve around natural temporal indicators, at the most basic level, day and night, the rising and setting of the sun (see **Figure 1.1** for annual daylight hours in Roman Italy), followed by the lunar month, and, finally, the solar year (in this case of this thesis, following the Julian calendar of 365.25 days) (Rosen, 2004: 3). During the summer months, the length of daylight is as much as

15 hours, but during the winter reduces to as few as 9 hours. The solar year, due to the Earth's axial tilt, brings about the four clearly recognisable seasons (at least in temperate and sub-polar regions): spring, summer, autumn and winter, which are marked by the sun at points of equinox and solstice (Rosen, 2004: 3). The four seasons provide a broad temporal framework for human existence; changes in climate and temperature, and the quantities of sunlight, play essential roles in the provision of food through cultivation and animal husbandry, and the availability of wild resources. This broad temporal framework ensures(d) that both modern and ancient humans experience(d) certain aspects of time in very similar ways, while acknowledging that some personal, social, and cultural understandings of time are unique and individual (Gosden, 2004: 31; Rosen, 2004: 2). Fundamentally, the majority and extent of human activity is dependant of the number of hours of daylight during the day: if one wants or needs to engage with the 'world', and not be restricted by the hours of darkness, then some form of artificial light is essential.

Figure 1.1. Annual daylight hours in Roman Italy by month. Source: Gaisma (2014).

The hearth has been the central focus of nocturnal domestic life since humans were first able to control fire, the use of which offers increased levels of comfort and luxury (heat and light) and security (e.g. protection from wild animals) (Forbes, 1958: 119). For most of prehistory, small groups of people would gather around the domestic hearth in single-room structures, or caves, resulting in close familial and social interactions; with oral tales of the day recited, and dangers of the night (whether real or imagined) kept at bay by light and heat from a living flame. Communal gatherings for larger communities would also have focused around larger bonfires, but still essentially (communal) hearths, enabling individuals and groups to engage with each other to celebrate special events (e.g. festivals for harvests), and at times of stress and conflict. To benefit from the heat and light generated from these hearths, individuals had to be relatively close to the flame, and fires had to be positioned with surrounding space for people to gather, with good ventilation, and controlled in order not to spread and damage the structures in which they were housed.

With the emergence of proto-urban and urban centres around the Mediterranean, particularly in Greece and parts of Italy during the first millennium BCE, domestic living arrangements began to change, with structures having multiple rooms, constructed with materials (masonry) which kept households cool in warmer months, and warmer in the autumn and winter; these structures were more resilient if living flames got out of control. During the first millennium BCE there was increased use of apparatus specifically intended for the use of artificial light: torches, and brackets for holding them, stone, metal, and ceramic oil lamps, and lampstands. These types of lighting equipment were generally only for use in wealthier households (e.g. for use in Greek *symposia*, and burial in the tombs of wealthy Etruscans) and in ritual contexts (Foxhall, 2007: 85-95), by those who could afford to burn foodstuffs for light, such as fruits (specifically, oil from the olive) and animal fats (Kimpe et al., 2001). The wealthy were essentially able to overcome the natural world, and go about their daily lives through the consumption of artificial light, at times of the day when activity for the many was restricted by darkness.

The use of lighting devices in the Roman world was certainly not a ‘new’ development. However, the Roman period brought about significant technological developments in many areas and as the archaeological record suggests, especially for urban centres around the Mediterranean, artificial light was a feature in daily life. By examining the abundant quantities of lighting devices recovered from stratified deposits at Pompeii, it may be possible to identify physical manifestations of any technological developments which would have improved their function in providing light; any manufacturing techniques which would have made their production more efficient and profitable; any stylistic and decorative changes; and/or diversity in the materials used in their manufacture (e.g. metal devices).

The presence of very large quantities of lighting devices suggests continued and large scale production and supply. To make a lighting device required raw materials to form the vessel, either clay or metals, a high temperature kiln or furnace (which required large quantities of fuel (wood/charcoal)) to manipulate the raw material into the required shape; presumably a structure to house the kiln/furnace and space to undertake the work; and a major input of human energy. In addition, the fuel for burning to produce light, predominantly olive oil, had to be purchased regularly, and was perhaps the most expensive component in the provision of artificial light. However, in order to assess the economic consequences for this, one must first assess how much fuel was required.

The emergence of the Roman Empire at the end of the 1st century BCE, and the rise of Augustus, coincided with the substantial growth of urban living in many areas of the Mediterranean. These centres often had populations of many thousands of individuals, living in ‘new’ structural and social environments with the majority of the inhabitants’ subsistence not directly reliant on agricultural work and life in the countryside. While Roman urban centres essentially followed the same format as Greek cities, their number and size were substantially different. At the height of the Roman Empire there were over 431 cities in Italy with populations of around 2-3000; Empire wide, there were some 2000 cities (Jongman, 2007: 501).

Archaeological excavations at Roman urban centres have recovered many tens of thousands of pieces of lighting equipment, the majority of which were ceramic oil lamps, but also metal lamps, lanterns, and associated equipment (e.g. lampstands and hanging chains) have been found. The consumption of artificial light during the Roman period was substantial, and took place in a wide range of contexts, with all levels of society experiencing the night in different ways than the majority of past societies. The human experience of domestic life, leisure, religious practice, and commerce, could continue once the sun had set, but this was possible only through consuming artificial light. Artificial light changed the daily lives and experiences of those living and visiting Roman urban centres: the night was not a time of inactivity, or a restricted and dangerous 'place' due to the lack of sunlight, but a vibrant environment for social and economic activity, with many commercial premises (e.g. shops and bars) open for business and providing a lit space(s) for human action and interaction outside the boundaries of their own homes.

This urban consumption of artificial light consequently had a dramatic impact on the agrarian economy, with large quantities of olive oil used as light fuel, rather than for food (or products for hygiene, perfumes, and medicine). It is difficult to assess whether a relative general increase in the wealth and prosperity, for all levels of Roman society, resulted in greater demand and consumption of artificial light, and, subsequently, olive oil. Alternatively, the increased use of artificial light may have been a result of the dramatic expansion of olive production during the Roman period, possibly resulting in over-supply of olive oil, driving down prices so that the burning of this commodity for light fuel was not considered extravagant. There would have been a financial cost in the provision of artificial light, so its use suggests it was needed or desired to engage in a wide range of activities after the sun had set. These issues will be considered as part of this thesis.

1.5.2: Time and the 'Roman' day

Time, in the modern, Western, sense, is something that is fixed around 24 hours of equal length (60 minutes), forming single days, weeks, months and years (Gosden, 2004: 29). The measurement of time in antiquity was perceived as one of the marks of civilised society, where people had some control over the natural world; a clear differentiation between humans and animals (Hannah, 2009: 121).

Once the lack of sunlight inhibited activity at the beginning and end of the day, and the subsequent drop in temperature, humans had to find alternative sources of heat and light. Prior to the wide-scale use of fossil fuels, these came from organic resources. In the case of light fuel in the Mediterranean during the Roman period, fuel for lighting was predominantly olive oil. Other vegetable oils, including castor and rapeseed, as well as animal fats, were also used, but on a much smaller scale (Neuberger, 1930: 242; Forbes, 1958: 120; Kimpe et al., 2001: 87-95; Eckardt, 2011: 182-183).

The consumption of artificial light in the Roman world was directly related to the number of daylight hours, which changed continuously throughout the year, and, therefore, ultimately, was tied to the four seasons. The number of daylight hours have significant influence on the 'what', 'when' and 'where' of human activities, or, as Laurence (2007: 154) notes, there is always a temporal aspect of social action. The Roman day was divided into two, the day (between the rising and setting of the sun) and night (the dark hours). Both day was divided into 12 hours, but the length of these hours varied throughout the year depending on the amount of daylight hours. Daylight hour lengths were as few as 44 minutes at midwinter to as many as 76 minutes at midsummer (Balsdon, 1969: 17-18). As will be explored in more detail in Chapters 2 (Section 2.4.1 – Daily routines, activities and time) and 3 (Section 3.3.1 Daily life) some aspects of Roman daily life were structured according to the time of the day, for example, set times for dining and visiting the baths. Artificial light was, and is, not essential for human survival, but its consumption in the Western world, from at least the Ancient Greek period until the present day, has become an essential part of daily life, especially in domestic and urban contexts.

1.5.3: Nocturnal urban living at Pompeii

The catastrophic eruption of Mount Vesuvius in 79 CE buried large swathes of land in the Bay of Naples, including the now famous urban centres of Pompeii and Herculaneum. These two urban centres have been a focus of scholarly research since the 18th century and provide a unique set of remains for the study of the urban fabric of Roman cities. Even more unusual are the large archaeological deposits of artefacts recovered which represent the entire range of material culture, often preserved *in situ*, in use during the final phase of occupation immediately prior to the eruption. Houses in Pompeii and Herculaneum are probably at the forefront of people's minds when thinking about Roman households; the standing remains, architecture and wall paintings are some of the best preserved from the Roman world, and warrant their place in any study of domestic life in Roman Italy in the 1st century CE.

The importance of these very large artefact assemblages from these sites should not under-estimated. Eckardt's (2002) comprehensive analysis of c. 2000 pieces of lighting equipment from Roman Britain included almost all known examples from the province at the time of the study; the fact that 250 lighting devices were found in just ten properties at Pompeii (to be considered in Chapter 5 of this thesis) highlights the significance of the Vesuvian sites in Roman archaeology (Berry, 2007: 294).

Pompeian households and domestic daily life have been the subject of scholarly research for almost 250 years (Foss, 2007: 28-42), but little or no attention has been paid to what exactly urban life was like for the inhabitants of this Roman city once the sun had set. Ancient written sources do offer limited glimpses of life after dark, and some of these will be considered alongside the archaeological evidence. The arrival of the night would have certainly restricted social and economic interactions in Roman towns (Ellis, 2007: 286), but to what extent was this the case in domestic and commercial contexts at Pompeii?

The fact that artificial light was consumed in ancient Pompeii is without question however, it is import to consider how this affected social relations within the city, especially as it enables one to engage in activities and with other individuals or groups once the sun has set. Did this mean that many occupants of the city had an improved social life, or time for leisure activities, because it was possible to 'do' other things after completing the day's work? Were people interacting in very different situations and environments?

Lighting devices were recovered from a wide range of contexts where the daily lives of the inhabitants were played out, highlighting the range of activities which would have taken place after dark, such as bathing, religious practice, the buying and selling of goods and services, and particularly domestic activities. The presence of lighting devices in many Pompeian households suggests that a wide range of domestic activities may have been nocturnal, and dining and entertaining was certainly something which took place after dark.

Most lighting devices were portable, and would have been used for movement within the home during the night, and also allowing different parts of the house to be illuminated without the need to light the entire house. However, the majority of lamps were relatively small (and could be held in one hand) but wouldn't have been particularly practical for longer journeys outside of the house. Carrying around a vessel containing combustible liquid fuel (olive oil) with a burning wick would have been dangerous if the holder moved at more than a slow and steady pace. For movement around the ancient city (e.g. for leisure or to purchase food or drink) lanterns and/or torches would have proved much more stable and would have allowed individuals to walk at a brisk pace with less fear of setting fire to oneself.

In a domestic setting, especially for a large dinner party, much of the food preparation must have taken place during the daylight hours, as would have the consumption of most meals in many households. However, if one considers a dinner party (taking place from the evening and continuing into the night) hosted by wealthy individuals for special occasions, which may have had many courses required to be ready at different but certain times, perhaps only partial preparation was undertaken by natural light (either during the day and maybe in the early evening) with the finishing touches applied to the food under artificial light.

The production of most items in the ancient world would almost certainly have taken place during daylight hours. While the brightness of sunlight varies throughout the day and is dependent on localised weather conditions and structural environments, the reliable and cost-free supply of natural light was the most desirable source of illumination. The ability to manipulate raw materials to produce a multitude of consumable goods would have required good visibility for long periods of time. The use of artificial light, especially devices burning olive oil which produced large quantities of smoke and soot, would not have provided a suitable environment for craft production.

This requirement for good visibility (in spaces for craft production) contrasts with that for structural environments which served as premises for retail (whether exclusively for retail or workshops where products made were also available to purchase). Relatively low levels of lighting would have been required for retailers to open their premises for trade and for customers to view items on display. Goods could have been brought close together on shop counters or tables, with a small number of lighting devices nearby to enable viewing. The preparation of food, especially on a relatively large scale, would have required a well-lit environment for preparation and cooking. These spaces would have needed good ventilation to allow for smoke from cook fires to dissipate. While food and drink retailers were open during the day and into the night, it was likely that most food preparation took place during the day, given the potential hazards that reduced levels of lighting would have exacerbated, such has cuts from knives or burns from cook fires.

The standardisation and large scale production of lighting devices (see Chapter 6) from the end of the 1st century BCE onwards highlights the wide spread and extensive consumption of artificial light at Pompeii, which in turn enabled ancient Pompeians to continue their daily lives once the sun had set and, perhaps, engage in certain activities more than ever before (e.g. entertainment or dining both inside and outside of the home and at times of the day previously considered inaccessible?)

1.6: Data and methodology

The oil lamp is the primary source of evidence for the use of artificial light in the ancient world. It is intended the results of these analyses will help to expand critical socio-cultural or socio-economic studies of ancient lighting, and attempt to reconstruct nocturnal activities at Pompeii. The large quantities of lighting equipment at Pompeii provide the majority of the data which I will analyse to address the research questions of this thesis. Lighting equipment were manufactured in a variety of materials, predominantly in clay, but also in bronze, iron, and sometimes even gold. These items were not technologically complex (Neuberger, 1930: 237). Essentially, they consisted of: a closed container for fuel (with a hole for refuelling); a protruding nozzle where a wick was placed to draw fuel to the flame (some lamps have multiple nozzles); and often a handle (**Figure 1.2**). Lighting devices would have been available for most budgets serving all levels of society (Bouras and Parani, 2008: 5), with the sometimes highly elaborate ceramic and metal oil lamps being clear indicators of wealth and [illegible]mining lighting devices in the context of their use and in relation to material remains found in association, one may begin to propose the function of a space and then compare with other areas (and artefact assemblages) which have no or few lighting devices. Fuel was perhaps the most important component in the provision of artificial light, and this study will assess, through fuel burn experiments and modelling, the quantities of light fuel required to illuminate ancient Pompeii.

Figure 1.2: An example of a common Roman ceramic oil lamp; the primary source of evidence for artificial light in the Roman world. Image: author.

The extensive use of lighting devices and associated equipment in domestic, commercial, and religious contexts at Pompeii led to the development of this thesis. The abundant archaeological evidence from over 250 years of investigations in the city provides a unique data set to analyse, using quantitative, qualitative, and theoretical modelling approaches alongside ancient written sources (for context) to achieve the thesis aim and objectives and answer the research questions outlined at the beginning of this chapter.

Chapter 2: Research Context

2.1: Introduction

This chapter provides a review of previous research on the provision of artificial light in the ancient world, the majority of which had little focus on socio-cultural and socio-economic implications for its use. This dearth has provided the inspiration for this thesis. While this thesis focuses primarily on the period of c. 300 BCE to 79 CE at Pompeii, I will commence with a brief outline of some of the aspects for the consumption of artificial light from its earliest prehistoric origins in Europe and the Mediterranean region, followed by a more detailed discussion of the ancient and Hellenistic Greek worlds (from c. mid- 8th century BCE to the 3rd BCE), the Roman period, and through to the Late Antique period (up to the end of the 6th century CE). These works were important in developing the research questions of this thesis as they provide an overview of ancient lighting in the millennium previous to the time frame of this study, and some aspects of post-Roman lighting practices.

This chapter is arranged followed three main themes:

- Light and dark from prehistory to the Late Antique period (Section 2.2);
- Lighting devices, associated equipment, and light fuel (Section 2.3);
- Daily life: day and night, time, and artificial light use in context (Section 2.4).

2.2: Light and dark from prehistory to the Late Antique period

The ability of early humans to control their natural environment and produce heat and light safely is one of the defining aspects of humanity (Neuberger, 1930: 233; Forbes, 1958: 119-193). The lack of sunlight in the early hours of the morning and at the end of the day, and the subsequent drop in temperature, severely inhibited human activity. In order to populate these dark hours, humans had to find alternative sources of heat and light.

Oswald (1997: 87-94) suggests that during the Iron Age, in Britain, the doorways in the majority of roundhouses were orientated to the east or south-east, with natural light entering through these apertures, and also through an open hole in the apex of the roof (which was also to allow smoke from hearths to escape). The central hearth was the primary light source within Iron Age roundhouses, and the focus of the household (Parker Pearson and Sharples, 1999: 17).

Prior to the development of electric lighting, the natural flame, formed from the combustion of plant and animal products, was the primary source of artificial light: predominantly hearths and torches. In addition to the production of heat, the resulting flame emits light, providing an environment for the continuation of human activities and social interaction.

In this thesis, the term ‘lighting device’ refers specifically to an object produced intentionally to provide artificial light, which held the light fuel and facilitated a controlled burn through the use of a wick. These items were predominantly ceramic and metal oil lamps, lanterns, and also items which do not survive well in the archaeological records, such as candles. The term ‘lighting equipment’ refers to all items for producing artificial light, including lighting devices, but also items which facilitated their use and positioning, such as lampstands, chains and hooks for hanging, lamp fillers, wicks, and pins for their adjustment, and brackets for placing torches or lanterns.

A number of 20th-century authors have considered prehistoric artificial lighting within broader studies on ancient technology (e.g. Neuberger, 1930; Forbes, 1958; Hodges, 1970). These studies provide excellent overviews of the origins and early uses of fire, in hearths, for heat and artificial light. The earliest development of lighting devices and equipment (e.g. torches and fire baskets), through to the use of oil lamps and candles in the Greek and Roman periods, resulted in thousands of years of continued use of these items without significant technological advancement in their design and use. The main focus of many of these studies were the lighting devices and equipment themselves, their manufacture, decoration, and origins (e.g. Conticello De' Spagnolis and De Carolis, 1988), rather than their intended use or the socio-cultural and/or socio-economic implications for the consumption of artificial light.

The lack of specific socio-cultural studies for the use of artificial light has recently begun to be addressed, for example, for ancient Greece (see Foxhall, 2007; Parisinou, 2000); Roman Britain (Eckardt, 2002; 2011), and for the Late Antique period in the Eastern Mediterranean (see Ellis, 1997; 2007). The results of this thesis will build on previous research with analysis of the consumption of artificial light in ancient Pompeii, filling a lacuna on studies of nocturnal activities. Through this thesis I aim to enhance our understanding of human nocturnal activity during the Roman period, by analysing the archaeological evidence for artificial light within the social and economic context of ancient Pompeii.

2.2.1: Artificial light in prehistory

Primitive lighting devices, such as lit splinters of pine wood which would smoulder to provide a controlled light source, have been used from the Upper Palaeolithic period until the Late Antique, and even later in the Baltic regions (Neuberger, 1930: 234-235). The use of wood splinters developed into the torch, where thin strips of wood were bundled together and doused with resin or pitch, to provide a more controlled and longer-lasting burn (Neuberger, 1930: 234-235). These bundles were either hung in torch-holders, or burned in pans, as mentioned by Homer (*Odyssey*, XVIII, 307).

Lighting devices were produced as early as the Upper Palaeolithic period (c. 40,000 to 10, 000 years BP), with vessels cut from soft stone, such as sandstone or chalk (**Figure 2.1**), and wicks made from reed, moss or twisted hair were used to facilitate a steady flame (Forbes, 1958: 123). An early lamp was found in the entrance to a cave at La Mouthe, Dordogne, France, and dates to around 18,000 to 10, 000 years BP. The vessel was formed in sandstone and was fuelled with animal fat. Some prehistoric stone vessels, which have previously identified as containers for mixing pigments for cave paintings, may also have functioned as lamps, or indeed, their primary function may have been for artificial light (Forbes, 1958: 123). The act of painting images in caves (often in areas far away from access to natural light) certainly required some form of artificial light, and portability was essential.

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Figure 2.1. Prehistoric lamp from Lascaux, France. Image: Haviland (2000: 261).

By the Neolithic period, one sees an increased use of artificial light through the presence of increased quantities of lighting devices in the archaeological record, with certain populations burning animal fats and vegetable oils as lamp fuel, and using hemp and flax for wicks (Forbes, 1958: 123). Several early examples of stone and early pottery lamps were used by Neolithic miners at Grimes Graves and Cissbury (Clark and Piggott, 1933: 166-183).

2.2.2: Egypt and Bronze Age and Archaic Greece

The evidence for lamp use in pharonic Egypt is limited, and Neuberger (1930: 236) suggests that there are no hieroglyph depictions of oil lamps, but there are some showing the use of torches and candles in funeral processions. In later periods in Egypt, Herodotus (*Hist.* II, 62) discusses a 'Festival of Lamps', where everybody burned lights in open areas and around their houses.

Early Greek lamps were commonly made of stone (**Figure 2.2**), but were essentially in the same form as later ceramic and metal lamps (Forbes, 1958: 124). Examples of such stone lamps have been found in Crete, dating to c. 1550 – 1400 BCE (e.g. **Q3959**, in maroon-coloured limestone), and in the archaic period (Q3960), from the Temple of Artemis at Ephesus, dating to c. 625 – 575 BCE (Bailey, 1996: 118).

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Figure 2.2. *Archaic Greek stone lamp from Crete*. Image*:* Bailey 1996, **Q3961**, 118-9.

2.2.3: Classical and Hellenistic Greek periods

Ceramic oil lamps were produced on a large scale during this period, both wheel- and mould-made products. The majority were simple open- and closed-form wheel- and mould-made vessels (but predominantly open-form with either a shallow open spout, or a closed bridged-spout for the wick (e.g. Cretan and Athenian products in Bailey 1975, 21 – 64). Given that the majority of these lamps were manufactured in pottery workshops engaged in producing a wide range of domestic ceramic wares, many had glazed and slipped surfaces (Bailey 1975, 6-7). Between the 3rd and 1st centuries BCE, in the Vesuvian region (see Types 8 and 9, Chapter 4, Section 4. 3. 1, this thesis), many ceramic oil lamps were produced in Campanian Black Gloss ware which was the most popular type of fine tableware pottery at the time (Morel, 1981). In Italy, by the 2nd century BCE, mould-made lamps were being produced which were certainly the precursors to the later volute and picture lamps – the dominant types during the Roman period. For example, Bailey's (1975) **Q711** and **Q712** forms are present in 2nd and early 1st century BCE deposits at both Cosa (Fitch and Goldman's (1994) raised-dot types, e.g. no. 234, p.59) and Pompeii (see Types 10 and 11, Chapter 4, Section 4. 3. 1). The simple undecorated closed-form wheel-made lamps with deep bodies (e.g. Bailey 1975, 316 **Q678**) were common domestic items and were also present in 2nd and 1st century BCE deposits at Cosa (Fitch, 1994: 35-36) and Pompeii (see Types 7 and 13, Chapter 4, Section 4. 4. 3. 1). The use of oil lamps was certainly wide-spread and most households would have had access to artificial light. However, the consumption of large quantities of artificial light was most likely only for the wealthy, with many households' only using lamps when absolutely necessary, or for short periods (Fitch and Goldman 1994, 9; Foxhall 2007, 92-3). By the early 1st century CE, some lighting devices still portrayed signs of Hellenistic styles and forms (Bailey 1975, 2-15).

2.2.4: Illuminating the Roman world

By the late 1st century BCE, the production and use of lighting equipment was extensive and widespread throughout the Roman Mediterranean world. Roman lighting equipment was manufactured in a wide range of materials, with some diversity in form and decoration, ranging from hand-formed open lamps in coarse ceramic (**Figure 2.3**), to elaborate lamps in bronze (**Figure 2.4,** (Conticello De' Spagnolis and De Carolis, 1988), and even gold (**Figure 2.5**, De Caro (1996: 113)). The 'common' Roman ceramic oil lamp (e.g. **Figures 1.2** (Ch. 1) and **2.6** (below)) was by far the most popular lighting device used in the Roman Mediterranean world. Common ceramic lamps were cheap domestic goods, produced in large quantities generally in small-scale workshops throughout the Empire. This wide range of lighting equipment was produced to suit most budgets, and the abundance of olive oil for light fuel, ensured that artificial light, even in relatively large quantities, was available to most levels of society (Bouras and Parani, 2008: 5). This contrasts sharply with earlier societies where the consumption of significant quantities of artificial light was predominantly by the wealthy (Foxhall, 2007: 92-93).

Figure 2.3. Coarse, hand-formed ceramic lamp, **260-57-12592**, Casa del Chirurgo, Insula VI. 1, Pompeii. Image: author.

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Figure 2.4. Bronze lamp. Image: Conticello De Spagnolis & De Carolis 1988: Tav. 1.1 inv. N. 12631; n.3.

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Figure 2.5. Gold lamp from the Temple of Venus, Pompeii. Image: De Caro 1996, 113.

Figure 2.6. Ceramic oil lamp from Insula VI.1, Pompeii. Image: author.

Lamps were generally portable items, often hung from brackets on chains, placed upon lampstands, or sometimes within niches and in household shrines (e.g. Boyce, 1937; Bailey, 1975; 1980; 1988; 1996). This portability allowed great flexibility for the illumination of designated spaces. However, the movement of lit devices was also a potential fire hazard (Eckardt, 2011: 183). There were some semi-permanent lighting fixtures, such as the very large bronze lampstand (which could accommodate four lamps) found in the Casa di Pansa, Pompeii (**Figure 2.7**, (Roberts, 2013: 230)), and the large six-lamp *polykandela* found in the Late Antique dining room at the House of the Bronzes in Sardis (Ellis, 2007: 292). Such items were predominantly used indoors, with lanterns (e.g. Q3942, Bailey, 1996: 111), and torches utilized for outdoor spaces (Bouras and Parani, 2008: 5).

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Figure 2.7. Bronze lampstand from the Casa di Pansa, Pompeii. Image: Roberts 2013, 230.

2.3: Lighting devices, associated equipment, and light fuel

2.3.1: Lighting equipment: production, trade and exchange

Numerous excavations in Greece, particularly Athens (e.g. Perlzweig, 1961) and Corinth (Slane, 1990), have resulted in many thousands of ceramic oil lamps, many with makers' marks stamped on their bases, identifying producers in both regions (see Karivieri, 1996). Lamp makers Eutyches and Leonteus are thought to have been mass producers of ceramic oil lamps, manufacturing large quantities in Athens during the 3rd and well into the later 4th century CE (Karivieri, 1996: 10). Distribution of Athenian lamps during the 3rd and 4th centuries CE was primarily in the Eastern Mediterranean. By the 5th century CE, lamps from North Africa and Asia Minor began to dominate many aspects of domestic material culture in this region, and beyond (Karivieri, 1996: 255-256). Studies of lamp manufacturers, and the distribution of their products, based on makers' marks stamped on to vessels, enabled Karivieri (1996) to assess the impact and extent of the Athenian lamp industry.

Studies by Karivieri (1996) and Harris (1980) were significant in progressing lighting equipment research beyond typological and art historical approaches. Harris (1980: 126-145) investigated the organisation of the ceramic oil lamp industry through the systematic analysis of material from various excavations and museum collections, placing the industry within the broader economic and social history of the Roman world. Harris recognised that ceramic oil lamps are abundant on many Roman archaeological sites, and selected *Firmalampen*, a particular type of lamp with a makers' mark stamped on the base, to assess the extent of the geographical distribution of these products, providing evidence for trade and exchange of lighting equipment. While Harris highlights that some types of lamp did have a wide geographical distribution, he also suggests that many (of these types) were in fact local products 'copying' common styles and that production was directly related to the market (1980: 127-8). While Harris' research looked at lamps stamped with makers' marks and their distribution, this will not be possible in regards to the lighting devices considered in this thesis. Makers' marks only became a common feature at the end of the 1st century CE, and only a very few lamps at Pompeii are marked, and predominantly only with impress dots or a single letter, rather than a name. Harris also notes the close relationship between pottery and lamp production, and this is again noted in the Pompeian material (see Chapter 4). Lamps were not difficult to make, and Harris comments that the raw materials required were available in all regions of the Empire and production did not require highly skilled individuals (1980: 134). He suggests that ceramic lighting devices were generally not transported over long distances, and that local needs and demands were mostly satisfied by local producers (1980: 144). This also seems to be the case at Pompeii as few lamps fragments had makers' marks, and analysis of their clays (fabrics) (using low power microscopy) presented in Chapter 4 suggests that almost all were manufactured locally. Harris comments on the potential of the large bodies of data in excavation reports and museum collections, acknowledging the need for full quantification and interpretations that go beyond the physical characteristics of the material itself (1980: 126-145).

Cerulli Irelli's (1977: 53-72) report on the excavations of a small workshop at Pompeii contained a pottery kiln which was still in use at the time of the CE 79 eruption of Vesuvius (**Figures 2.8a** &**b**). A number of complete ceramic oil lamps (e.g. **Figure 2.9)** were found in association with clay lamp moulds (**Figure 2.10**) within the workshop; the decorated discus on many lamps found matched those of the lamp moulds (Cerulli Irelli, 1977: 53-72), providing clear evidence for methods of production and offering the potential to map products from this workshop throughout Pompeii and the wider region (note: this will not form part of this study). The work of Cerulli Irelli in classifying and cataloguing the ceramic oil lamps from the pottery kiln workshop, while limited chronologically to the time immediately prior to 79 CE, provides a unique and important glimpse into the production techniques and range of lamps produced in the final quarter of the 1st century CE at Pompeii.

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(a) **(b)**

Figures 2.8a & **b.** Lamp kiln at Regio I, Insula 20.Images: Cerulli Irelli 1977: Tav. XXVII 6 and 5.

Images removed for copyright reasons

Figures 2.9. Gruppo G lamp n. 32. Image: Cerulli Irelli 1977: Tav. XXXVII, 26.

Figure 2.10. Matrice V, Gruppo G. Image: Cerulli Irelli 1977: Tav. XXXVII, 27.

A second pottery kiln has been identified at Pompeii, where ceramic oil lamps were also produced; this was located on the *Via delle Tombe*, outside the Herculaneum

Gatein the north-west corner of the city. However, there are no published records of its excavation (Peña and McCallum, 2009). The location of this production site close to the many tombs along this busy route into Pompeii was, perhaps, no coincidence; lamps were often used as part of religious and ritual practice, sometimes as grave goods within the grave itself, or as part of the burial ceremony and/or commemoration.

Analysis of lamps with maker's marks (e.g. Harris 1980 and Karivieri 1996), and their distribution, have shown that this class of material culture has potential beyond purely typological studies. Production, trade and exchange of these goods were important aspects of the ancient economy. Oil lamps were valuable enough to transport throughout the Empire, even though there may well have been local production sites offering similar products (Harris 1980). Even though ceramic oil lamps were relatively cheap, the fuel required for light was not (Foxhall, 2007: 92-93). The ability to purchase and consume fuel for light was, perhaps, the most significant economic factor when considering the use of artificial light in the ancient world.

2.3.2: Lighting equipment: accessories, portability, and positioning

In addition to the lighting devices themselves, a wide range of accessories, such as lampstands, hooks, and chains, were available to improve utility, and the human experience of consuming artificial light. The use of lighting equipment (e.g. hanging chains and lampstands) increases the options for the positioning of lighting devices themselves, allowing different rooms and spaces to be adapted for use once the sun had set, facilitating changes in room function on a daily and seasonal basis. Forbes (1958: 163) suggests that every Greek and Roman house used oil lamps, and that these were positioned throughout a structure in niches, on lampstands, and hung from ceilings by chains or from brackets on walls. Bailey's (1996) *A Catalogue of Lamps in the British Museum: Vol. IV, Lamps of Metal and Stone, and Lampstands*, provides an invaluable resource of the study of a wide range of lighting equipment. Lampstands were available in a range of heights, and generally manufactured in metal, predominatly bronze (**Figure 2.11**), but also in silver (e.g. **Q3917**, Bailey 1996). Taller lampstands would have stood directly on to the floor, with shorter ones intended to be placed upon furniture or in niches. There were also lampstands which were height-adjustable, such as the silver lampstand (**Figure 2.12**) which had a telescoped height of 533mm and extends to a height of 902mm (**Q3917** Bailey, 1996: 103). Some elaborate and valuable relatively tall lampstands were intended to be portable, produced to be easily transported over long distances, or packed-away for storage in a small space (e.g. a bronze exampe from the House of Neptune and Amphitrite, Herculaneum, where four pieces which fit together to form a lampstand 1.36 mts in height, **Figure 2.13**).

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Figure 2.11. Lampstands. Image: Bailey 1996, **Q3896-8,** Plate 114.

Figure 2.12. Height-adjustable silver lampstand. Image: Bailey 1996, **Q3917**, Plate 132.

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Figure 2.13. Lampstand, in four sections. Image: Roberts 2013, 120.

While the wick was a key component of oil lamps, there is very little evidence for types of materials used to produce them. Most evidence suggests that they were made from the fibrous parts of plants, and therefore tend not to survive in the archaeological record. Neuberger (1930: 242-243) proposes that a wide range of materials were used as wicks, such as papyrus, flax, hemp, pith from rushes, part of the castor-oil plant, and other plant-based products.

Accessories for lighting equipment are not as prominent in Roman archaeological assemblages as lighting devices themselves, and this is mainly due to their manufacture in metal, which does not break and enter the archaeological record in the same way as ceramic products. The most important function of accessories was to provide efficiency, flexibility, and portability when consuming artificial light. The combination of lighting devices, associated equipment, architectural design and decoration, allow for potentially continuous (if desired) change in spatial and temporal use of structures on a daily and seasonal basis.

2.3.3: Previous studies of Roman lighting

As previously noted, large quantities of lighting devices (and smaller quantities of associated equipment) have been recovered from excavations at Roman period sites in the Mediterranean region. Oil lamps were often aesthetically attractive, and sometimes decorated with mythological and erotic discus scenes. These characteristics have resulted in a well-studied artefact class, with numerous expertly illustrated catalogues from sites the length and breadth of the Roman Empire, and detailed publications of museum collections.

The classification criteria for ceramic oil lamps was established initially by Loeschcke (1919) in a major study of the material from legionary camp at Vindonissa, Switzerland. The criteria were based on the following physical features: the shape of the lamp, nozzle, shoulder (where rim joins body), base, handle (if present), surface treatment (e.g. slip or glaze), decoration (generally in relief from a mould), and the colour and mineral inclusions of the clay (Loeschcke, 1919). Deneauve (1969) expanded on Loeschcke's typologies in an analysis of ceramic oil lamps from Carthage, organising the assemblage into a broad chronological sequence. Typological criteria were established by Loeschcke and later, Deneauve, formed the basis for lamp classification and chronology for the majority of reports and catalogues which have followed, including material from some major ancient urban centres, such as the Athenian Agora (Howland, 1958; Perlzweig, 1961), Carthage (Deneauve, 1969; Chapman, 1984), Corinth (Slane, 1990), Delos (Bruneau, 1965), and Terre Cuite de la Mauretaine Tingitane (Ponsich, 1961). The majority of these publications focus almost entirely on the aesthetic and art historical characteristics of lighting devices, resulting in large, well-illustrated catalogues. However, the authors have rarely addressed the social and economic aspects for the actual use of artificial light, or considered the items within the architectural environments where they would have been use.

D. M. Bailey's (1975; 1980; 1988; 1996) four-volume catalogue of lamps held at the British Museum is without doubt the most comprehensive study of the lighting devices and equipment from the Greek and Roman worlds. The British Museum's collection of over 4000 lighting devices and accessories derives from many Italian and Roman provincial sites. While some of these have secure provenance, the majority come from regions, or from personal collections obtained by the Museum, where archaeological contexts are not known. Bailey's catalogue(s) provides detailed descriptions of each item, complimented by accurate line-drawings and photographs, presenting the wide diversity in form, decoration, and material of manufacture, for the lamps held at the British Museum. In Volume I, Bailey (1975) focusses on the Greek, Hellenistic, and Early Roman ceramic oil lamps, providing approximate date ranges for each type and their distribution. This range of lighting devices (Volume I) were the precursors to those produced and consumed during the Roman Imperial period; their essential forms did not change but, there was a general shift in production methods around the end of the first century BCE, with most ceramic oil lamps formed in a mould rather than on a potters' wheel (Robins, 1939: 55). The use of a mould to shape a lamp led to the introduction of decorated discuses (Robins, 1939: 56); this method enabled the mass-production of these sometimes elaborate items by relatively unskilled labour.

In Volume II, Bailey (1980) develops his own typologies for Roman Italian ceramic lamps, with chronologies based on archaeological material. However, many of his data originate from excavations conducted in the 19th and early- to mid- 20th centuries so caution must be taken when considering the date of their original use. In Volume III (1988), Bailey presents lamps recovered from Roman provincial sites from the length and breadth of the Empire, and in Volume IV (1996), presenting lighting devices manufactured in metal and stone, and also a wide range of accessories, such as lampstands and hanging-chains.

Eckardt's (2002) research is one of the few studies of lighting devices and equipment (from Roman Britain) which considers the social aspects for their use, rather than the aesthetic characteristics of the objects themselves. Prior to the Roman invasion of Britain in 43 CE, Iron Age life revolved around the length of the day and the seasons.

Nocturnal activity was concentrated around the hearth, the central focus of the home, where people gathered for heat, and to cook, with the added benefit of light emitting from the flames and enabling social interaction. Iron Age Britons used torches, made from wood, other plant remains, and possibly textiles, wrapped or bound together, and soaked in an organic liquid (either animal fats or vegetable oils). These would have been hung on walls or wooden posts, providing an additional, and portable, light source to the fire(s) in the hearth (Eckardt, 2011: 181).

Eckardt's study (2002) analysed over 2000 oil lamps and candlesticks recovered from Romano-British contexts, the majority were found at urban or military sites: this seems a very small number for the entire history of the Roman occupation of Britain in contrast to Mediterranean sites. For example, the excavation of seven properties at Insula VI, 1, Pompeii (AAPP) has resulted in an assemblage of c. 550 ceramic oil lamps and lamp fragments (Appendix 1). Eckardt's research (2002) addressed specific aspects such as identity, social diversity, and the complex cultural and economic implications that consuming artificial light may indicate. Eckardt (2002; 2011) suggests that the Romano-British home must have been a dark place when compared to modern structures with their 'blanket' lighting provided by the electric light bulb. However, one must consider the fact that the human eye can adjust quickly to relatively low-levels of light, and that even very few light sources may significantly enhance the human nocturnal experience, facilitating a multitude of activities not generally possible once the sun has set. A Roman house illuminated by oil lamps and candles must have had a significant visual impact for its occupants and visitors, changing and enhancing their experience(s) and perception of space, decoration, and domestic objects (Eckardt, 2002; 2011).

2.3.4: The study of artificial light at the Vesuvian sites

To date, publication of more than individual and artistically interesting lighting devices and equipment from Pompeii and Herculaneum have been limited to a few excavation reports and specific catalogues. These include: material from the Casa di Giulio Polibio (Castiglione Morelli, 1983); Insula V, Regio VI (Romanazzi, 1984); bronze lamps (Valenza Mele, 1977; Mele, 1983; Conticello De' Spagnolis and De Carolis, 1988);

ceramic lamps held at the National Archaeological Museum, Naples (Bisi Ingrassia, 1977; Pavolini, 1977). All of these publications only consider material from the 79 CE eruption level deposits at Pompeii and Herculaneum, and are limited in their potential to provide information on the development, growth, and extent for the use of artificial light in the city. These lacunae will be addressed in this thesis.

Essentially, lighting devices and equipment from the Vesuvian sites have received little attention from scholars beyond their classification and study of their art historical features. A major contribution to the study of household artefacts from Pompeii and Herculaneum was *Quaderni di Cultura Materiale: L'Instrumentum Domesticum di Ercolano e Pompei* (Carandini, 1977a). The publication considered a wide-range of material within a framework of the production and consumption of domestic objects within Campania, and emphasized the importance of the region as a major producer of consumable goods during the Roman period (Carandini, 1977b: 7-8). Three papers considered lighting devices: the first, concerns the classification and cataloguing of over 5000 ceramic oil lamps held at the National Archaeological Museum of Naples (Pavolini, 1977: 33-52). Pavolini (1977: 33-52) catalogued only complete vessels, with little discussion of the original intended use, or archaeological context. The second, a study by Bisi Ingrassia (1977: 73-104) classified and presented ceramic oil lamps recovered from excavations at Herculaneum, organising the material into eleven broad types. All types were from 79 CE eruption level deposits, and while there was some attempt to provide a very tentative chronological sequence, this was based solely on their typologies, rather than securely dated stratigraphic sequences. The third study was Cerulli Irelli's (1977) report on the excavations conducted in 1959 of lamp workshop and kiln in Regio I, Insula 20, which, as discussed above, presented evidence for the production of lighting devices at Pompeii. This important paper provides a rare glimpse of the one of the mechanisms behind the provision of artificial light to an ancient city. Castiglione Morelli's later paper (1983: 213-258) presents evidence from excavations of the 79 CE eruption level deposits in the *Casa di Giulio Polibio*, *Pompeii*, where a total of 73 lamps were recovered, mostly ceramic, but there were also the remains of a single bronze lamp. Again, there is little discussion of the primary function of the oil lamps that would have provided artificial light in domestic structures in the last quarter of the 1st century CE.

Despite over 250 years of archaeological excavations at Pompeii, there are only two publications of lighting equipment from excavations below the floor surfaces of the 79 CE levels. The first, by Romanazzi (1984), presents the material from the excavations conducted by Bonghi Jovino (1984) at Regio VI, Insula V. The publication of Bonghi Jovino's investigations remains one of the few from the Vesuvian sites which present material from fully stratified sub-floor excavations, providing a full catalogue of the artefacts recovered. The stratigraphic phases identified during excavation, and the accurate recording of artefacts recovered, allows Bonghi Jovino to present chronological sequences for a number of artefact classes, including a large section devoted to the general ceramics assemblage (which includes a small number of ceramic oil lamps)(Romanazzi, 1984: 234-248). Romanazzi highlights the problem in attributing very fragmentary remains to established typologies, and classifies the material by adapting established criteria.

The second publication resulted from excavations in the area known as Porta Nola (Etani, 2010), and while presenting an extensive catalogue of ceramic oil lamps, the report only presents complete, or almost complete lamps. The absence of (probably) significant numbers of smaller, broken, fragments, and little in regards to a robust quantification of all material, is unfortunate. Many of the items included in the excavation report were recovered from refuse deposits which had been dumped in the defensive ditch outside the city walls. This has resulted in a finds assemblage from a ditch which was used for dumping of the city's waste for many years, and it is difficult to identify any chronological sequence(s) in the material culture which may inform on developmental changes in lighting technology, and/or changes in the quantities of lighting devices used over time.

2.3.5: Olive oil as light fuel

The consumption of vegetable and animal food products for the provision of artificial light is something that is not essential for human survival. The decision to burn food for light fuel light may suggest a surplus of these resources, and technological sophistication in the manipulation of these to produce and provide a controlled burn and a steady flame.

The dominant fuel for artificial light during the Greek and Roman periods was olive oil. However, other vegetable oils, such as castor and rapeseed, and animal fats were also used, either as additives or as the main fuel source (Neuberger, 1930: 242). Oil lamps consumed relatively large quantities of oil, and produced large amounts of smoke (due to the low-level of oxygen supply in the lamp), to produce relatively low levels of lighting. Herodotus (*Histories*, II, 62) tells of adding salt to light fuel, probably to reduce flickering of the flame (Goncalves, 2009: 3: 9-10).

Foxhall (2007: 92) suggests that artificial light in the ancient world may be considered as a commodity, and the use of olive oil as light fuel constituted a large proportion of ancient Greek household olive consumption (see **Table 2.1**). However, in the case of ancient Greece, artificial light was generally consumed in ritual contexts and on a larger scale in the homes of the wealthy (e.g. for *symposia*). Foxhall's study of olive oil consumption by wealthy households in ancient Greece (2007: 85-95) divides domestic consumption in to three main categories: food, lighting, and personal hygiene and adornment (e.g. perfumes). Olive oil was an expensive commodity, and its consumption (as food and light fuel) at special occasions and in ritual contexts was socially significant (Foxhall, 2007: 93). Foxhall (2007: 93) estimates that in order to illuminate a symposium 10 oil lamps would have been required, and would have consumed around 0.5 litre of oil during the entire event. The burning of this valuable foodstuff for light was a visual form of conspicuous consumption for the wealthy Greek elite (Foxhall, 2007: 92-93).

Olive oil for food	25-35 kg per person per year (modern: 50 kg person/year)	100-200 kg per household per year
Olive oil for bathing (including perfumed oil)	1.5 L person/year (women) 5-10 L person/year (men) (modern: 25ml oil washes one six-year old girl)	10-20 kg per household per year
Olive oil for lighting	0.5 L oil per symposium 100 ml for 2 lamps for 2 evenings (modern: 1 lamp burns 7 hours, 50 ml oil)	90-110 kg oil per household per year

Total household olive oil consumption: 200-330 kg oil per household per year

Table 2.1. Summary of estimated levels of domestic consumption of olive oil in wealthy Athenian households (Foxhall 2007, 86, Table 4.1).

For Roman Britain, Eckardt (Eckardt, 2011: 182) argues that the burning of foodstuffs for light in oil lamps could be seen as an overt adoption of a very 'Roman', and, particularly urban, form of material culture. Although the cost of Roman lighting equipment was relatively inexpensive (a graffito from Pompeii (*CIL* IV. 5380) has the cost of a single lamp as 1 *as*), the procurement of fuel (olive oil or animal fats), and its continued supply, required significant financial investment, especially for those provinces a great distance from any centres of olive production (Eckardt, 2011: 182). The decision to burn food to provide artificial light was significant, and suggests a desire or need to extend the day, for work, or to participate in 'Roman' leisure activities, such as reading and writing, or Roman-style dining. This phenomenon highlights the social desire to adopt aspects of Roman urban living in Britain, and suggests that the burning of food to provide artificial light must have been financially viable, at least for the elite.

While there are very many published studies on the production and consumption of olive oil during the Greek and Roman periods (e.g. Mattingly, 1988a; 1988b; DeSena, 2005; Foxhall, 2007; Bowman and Wilson, 2013b; Marzano, 2013), few have considered the vitally important aspect of light fuel (for exceptions, see Mattingly 1988b and Foxhall, 2007). Foxhall (2007) and Eckardt (2002) acknowledge that the supply and affordability of olive oil was a key component of consuming artificial light. There is abundant evidence for the supply of amphora-borne commodities (e.g. oil, wine, and preserved fish products) to most urban and military sites throughout the Empire, but their presence, quantities and vessel volumes (at least those which carried olive oil) have never been studied in relation to the consumption of olive oil as lamp fuel. In Chapter 7 of this thesis, I will redress this gap in knowledge by modelling the quantities of olive oil used for light fuel for a variety of contexts at Pompeii, concluding with broad estimates for the scale of consumption for the entire city.

2.4: Daily life: day and night, time, and artificial light use in context

This section provides an overview of previous research on aspects of daily life and temporality in the ancient world and focuses on the possible roles of artificial light in social, religious, and economic contexts. The author draws upon material predominantly from the Roman period but also from the Late Antique to early Medieval periods (where artificial light use will be considered by the author as analogous to the Roman period), and will explore a wide range of activities and environments where artificial light played an important role.

Sorochan (2002: 111) asks "What could be more ordinary and habitual for a person of the Greco-Roman world than light, dispensing darkness?". The consumption of artificial light was an important expression of the socio-economic status of ancient Greek, Roman, and Late Antique households, and an important component in the practice of rituals in religious worship (e.g. Ellis, 1997; 2000; 2007; Bouras and Parani, 2008; Eckardt, 2002; 2011).

2.4.1: Daily routines, activities and time

The ancient sources provide valuable information for any study of the Roman period, and provide insights in the types, duration, and timings, of nocturnal activities, and how the supply of artificial light may have impacted and influenced social and economic relations. Balsdon (1969) and Laurence (2007) provide excellent reviews of the ancient sources regarding the timings of daily activities. The changes in temperature and variation in the number of daylight hours (see **Figure 1.1**) throughout the year resulted in seasonal variations in daily life (Balsdon, 1969: 19). These variations may have influenced how and when certain areas within a house were used, and may also have changed the functions of space at different times of the year. Evidence from the ancient literary sources for timings of human action in the Roman world have been summarised by Balsdon, 1969: 17-55, and Laurence, 2007: 154–166; these sources suggest that the majority of activities took place during daylight hours. For example, the *paterfamilias*' day would have begun with the *salutatio* at dawn (Horace*, Ep.* 2. 1. 104; Martial*, Ep.* 3. 36, 10. 70), followed by a trip to the *forum* with his clients to conduct the business of the day; a visit to the baths during the afternoon and early evening, with the day ending with dinner lasting the remaining 2-3 hours of the day (Laurence, 2007: 161, Fig. 9.3). However, extreme caution must be taken when using this type of ancient evidence for the study of daily routines at Pompeii, as the majority of texts focus on the wealthiest and most influential in Rome, with discussions of the daily routine of the male elite.

While the studies by Balsdon (1969) and Laurence (2007) have significantly enhanced the understanding of daily life in the ancient Roman world, this thesis offers the potential to further explore the practicalities of some of the difference kinds of activities taking place in ancient Pompeii based on both ancient sources and archaeological evidence. Domestic (Chapter 5) and commercial (Chapter 6) nocturnal activities taking place within a range structural environments will be examined alongside the artefactual remains of lighting devices. In order to identify when certain activities which took place, some theoretical consideration must be made regarding the practicalities of undertaken certain tasks during the day and how these may be restricted or enhanced at night using artificial light. For example, did commercial activities take place in workshops only during the day? The need for good and constant levels of light for craft production is essential. Also, what about household craft production and repair, such as weaving and textile work? Again, good and constant levels of light would have been required, so perhaps these tasks were only undertaken during the and in spaces with abundant natural light.

Eating and drinking were important activities, both practically (as everyone needs food and drink to survive) and for entertaining, where the illumination of the dining space, both naturally and artificially, played a significant role in providing the required ambience whilst displaying to the diners the wealth and status of their host (Ellis, 2007: 294-295). Given that an aristocratic dinner party was expected to last well into the night, artificial light would have been required for these social interactions, especially during the winter months. However, one must consider the many tasks which must be undertaken before food and drink would have been served. Food preparation often involves sharp knives and high temperatures, both of which require careful attention otherwise there is the possibility of injury. Also, one would need to 'see' the food to ensure it was fresh (both at the point of purchase and during preparation).

Ellis' (1997) study of Late Antique dining practices may be used as an analogy for the Roman period. He highlights that the provision of illumination at dinner parties was often lavish and extensive (for the elite, at least), and was a way for entertainers to express their wealth and status by controlling the natural elements. An affordable and reliable supply of fuel and lighting equipment enabled a wide range of society to participate in leisure and commercial activity once the sun had set.

Figure 2.14 shows St. John the Evangelist at study with the aid of a lamp placed upon a lampstand. Part of the engraving on the left side of the Proiecta silver casket (**Figure 2.15)**, shows a group of women at their toilette, possibly preparing a bride for a wedding ceremony using candles illuminating their activity (Bouras and Parani, 2008: 20).

Image removed for copyright reasons

Figure 2.14. St. John the Evangelist at study. Image: Bouras and Parani 2008: 20.

Image removed for copyright reasons

Figure 2.15. Women at their toilette, possibly preparing a bride for a wedding ceremony, with lamps illuminating their activity. Image: Bouras and Parani 2008: 20.

Sorochans' (2002: 111-119) study on the use of artificial light by peoples of the early Byzantine Empire highlights the changes in material culture in Late Antiquity, which continued in to the early Medieval periods. The material culture of the Late Antique period generally had its origins in the Greco-Roman world, and this is evident in lighting equipment from the Eastern Empire from this period. Ceramic oil lamps were heavily influenced by Italian designs until the 3rd century CE, when local products in the provinces became cruder in form and decoration, and the clays used were of lower quality, with less refined firing. Sorochan (2002: 111) highlights that even though the objects themselves were generally less refined, there was mass production of lighting equipment, and extensive consumption of artificial light by all levels of the population in domestic, commercial, and ritual contexts. Lighting devices were hung outside properties, placed in niches in walls, or on the ground near entrances, and in tombs. During the late Roman period we see the provision of large quantities of specialised lighting equipment to provide multiple flames, such as *lampada*, *candelabra* and *polykandela*, used to illuminate large, public buildings (including churches), cathedrals and mausolea (Bouras and Parani, 2008: 11). By the 7th century CE, candles and glass lamps had replaced Roman-style ceramic and bronze oil lamps in the eastern Mediterranean (Sorochan, 2002: 115).

2.4.2: Religion and ritual

The use of artificial light as an integral component of ritual ceremonies is well attested in the ancient world (Parisinou, 2000), and the provision of a 'living' flame in cult practices, alongside the burning of incense (Zaitsev, 2002b: 61-62) and the use of musical instruments, were important constituents for the experience of ceremonial participants to engage with the event with all their senses. Domestic and public shrines often had lit lamps placed within them, serving as both a ritual provision of light, and also a practical location (for illumination) for a lamp in front of a house of at roadside shrines (Boyce 1937; Forbes 1959). In addition to their use in ritual situations, oil lamps were sometimes adorned with religious images and iconography, not merely decorative, but possessing symbolic meaning(s) to their users and were more than a simple allegiance to certain deities (Tinh and Jentel, 1993; Bouras and Parani, 2008: 1).

As well as picture lamps (with decorated scenes on their discuses), lamps of bronze and clay, were fashioned in various forms representing human body parts, such as human feet, animals (e.g. ducks and swans), shells (e.g. snails), plants (e.g. pine cones), and face-masks (Conticello De' Spagnolis and De Carolis, 1986; Conticello De' Spagnolis and De Carolis, 1988; Mele, 1983). Bullhead lamps, theatrical mask, Negroid head, and fish-shaped lamps were popular between the 2nd century BCE and 2nd century CE throughout the Roman world (Chrzanarski, 2002: 13-36). Bullhead lamps, representing the Egyptian god Apis, originated in Greece, Asia Minor, and Egypt, but were later produced in large quantities in Italy, and on the northern shores of the Black Sea (Chrzanarski, 2002: 13). Multi-nozzled lamps, originally thought to have had their origins in Egypt (Zhuravlev, 2002b: 2), were used mainly in domestic contexts, but have also been found in shrines and temples.

Many ceramic oil lamps produced in Roman Italy had discuses decorated with images representing a wide variety of scenes from daily life, including erotic imagery, animal and floral images, gladiators (and gladiatorial contests), and deities and mythological scenes (see Bailey, 1975; 1980; 1988; 1996; Cringus and Stefanescu, 2008). Pagan imagery was popular as discus decoration throughout the Roman period, with specific deities prominent in certain parts of the Empire (e.g. Serapis and Isis in Egypt (Tinh and Jentel, 1993)). From the 3rd century CE, one sees a gradual shift in the imagery used to decorate lighting equipment, from a predominately pagan iconography, to lamps with overtly Christian symbols (Paleani, 1993: 105-107).

Zaitsev (Zaitsev, 2002a: 44) suggests that the use of artificial light in funeral traditions in the ancient world had two main functions: the first, was to provide light in dark burial chambers during funeral ceremonies; the second was more abstract in providing a 'living' fire to illuminate the journey to the afterlife for the departed. Lamps and candelabra have been recovered from excavations of burial grounds at Ust'-Alma Necropolis (Ukraine), a Late Scythian settlement in use between the 2nd century BCE to the mid- 3rd century CE (2002a: 41); graves excavated at this site contained large numbers, and a wide variety of, grave goods, including red slipped vessels and other pottery, glass and bronze vessels, weapons, and metal dress ornaments. Only a small number of graves contained lighting equipment (crypts 449, 634, 703, 716, and 735), some of which had picture discs (from tombs 430, 510, and 533 (510 and 533 being graves of children)) (Zaitsev, 2002a: 44). A large proportion of these lamps were decorated with a wide range mythical imagery, including Pegasus, eagles, Medusa, and the bull, suggesting that these particular types of decorated lamps had special meaning for the departed, and, importantly, for the living acting out ritual performances during funeral ceremonies. The use of oil lamps was not common practice in this region, even so, their presence in certain burials suggest that the provision of artificial light to aid dead souls through the darkness of the 'other world' was important (Zaitsev, 2002a; 2002b; Zhuravlev, 2002a).

The use of lamps, torches, and lanterns at funerals was common practice in the Late Antique period, especially in ceremonies for high-statues individuals, particularly during processions to the burial location and both outside and inside the burial chamber or tomb (Bouras and Parani, 2008: 22). **Figures 2.16a and b** show a 4th century CE fresco depicting the entrance to a burial chamber illuminated with candles (after Bouras and Parani, 2008: 22, Figs. 21-22). Eusebius comments on the magnificent golden lighting devices surrounding the bier of Constantine I (cited in Bouras and Parani, 2008: 22). At very high-status funerals the extensive use of lights was a significant display to emphasize the importance of the departed individual. The body was illuminated when on display for mourning before the funeral ceremony, and, during the procession of important civic and religious leaders escorted the body bearing torches and candles (Bouras and Parani, 2008: 22).

Images removed for copyright reasons

Figures 2.16a and b. Candles on candlesticks at the entrance to a burial chamber, Silistra, Bulgaria, c. 4th century CE. Image: Bouras and Parani 2008, 22.

Lighting devices in tombs were used in different ways, for example, **Figure 2.17** shows the use of a hanging lamp by a worker excavating the ground for the Catacombs of Saints Peter and Marcellinus (Bouras and Parani, 2008: 8). One also sees a range of lampstands and candlesticks illuminating a funerary portrait of Proculus (Bouras and Parani, 2008: 9) from the 5th century CE catacomb of San Gennaro in Naples (**Figure 2.18**).

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Figure 2.17. Fresco depicting an excavator at work with hanging lamp for light, in the Catacomb of Saints Peter and Marcellinus, probably end of 3rd to early 4th centuries CE. Image: Bouras and Parani 2008, 8.

Image removed for copyright reasons

Figure 2.18. Funerary portrait of Proculus from the 5th century CE catacomb of San Gennaro in Naples. Image: Bouras and Parani 2008, 9.

In the Catacomba di Commodilla (Cosentino and Ricciardi, 1993) one sees numerous lamps and other vessels (such as a broken small coarse pottery cup modified for use as a lighting device (1993: 31-33)) mortared into the walls to provide permanent fixtures for lights for the 'living', when the tombs were re-opened and prepared for the next burial ceremony. However, these lighting devices may have also continued to burn after the tombs were closed to provide certain levels of (perceived) comfort for the departed.

During the Late Antique period the role of artificial light in religious ceremonies, and in places of worship, became more important (Bouras and Parani, 2008: 1-2). The illumination of very large buildings, such as the Constantantian basilica and the Hagia Sophia in Constantinople, required vast quantities of light fuel (Bouras and Parani, 2008: 29-36). For example, the Constantinian basilica of St. John of the Lateran had an extensive lighting system (Bouras and Parani, 2008: 29), and Constantine donated seven large agricultural estates purely to provide revenues for the supply of fuel for lighting. The estates provided an income of 4390 solidi, where 5 solidi would provide a soldier with food for a year, and 1 solidus could purchase 20-25 quarts of olive oil (Liber Pontificalis, ed. Duchesne, 1:173, (cited in Bouras and Parani, 2008: 29). This highlights the vast resources which were needed to provide artificial light on such a large scale.

Although we see social and religious changes taking place in the East at the end of the Roman period and into the Early Byzantine, particularly the gradual change from pagan to Christian religious practice, the form and function of lighting equipment does not seem to reflect this until at least until the 4th century CE (Bouras and Parani, 2008: 15). Between the 4th and 7th centuries CE, the only change is decorative (rather than technological) with the symbolic and mythological scenes represented on lamps reflecting a Christian culture through iconography, such as the dolphin, dove, and Chi-Rho (Bouras and Parani, 2008: 15-17).

Many lighting devices from the Roman period exhibited religious and ritual overtones, with images of various deities and mythological scenes on some lamp discuses, and numerous lamps produced in forms with a direct religious meaning. These may be have been important to individuals and family groups, for example, when present in burials or used in household shrines, but may also have been used in temples or at religious ceremonies. In the Late Antique period there was explicit use of artificial light in religious ceremonies and in public religious buildings. However, it is difficult to assess the importance of lamps with religious and mythological scenes in the domestic setting.

2.4.3: Public lighting

The lighting of public areas, such as urban streets, and public spaces and buildings, was a source of civic pride to those towns and cities where this was provided, such as at Antioch and Edessa in Syria, Caesarea in Asia Minor, and Constantinople (Bouras and Parani, 2008: 1). The ability of a city's administration to extend the day through the provision of artificial light, therefore increasing social and commercial interactions, must have heightened a sense of civic pride, and provided additional levels of security for the inhabitants and visitors (Forbes, 1958: 166). Ammianus Marcelinus *(Rer. Gest.,* XIV.1.9) writes that the ancient city of Antioch was illuminated during the night to the same level as during the day, and Libanius (314-393 CE) and S. Jerome (345-420 CE) comment that the streets of this large city were illuminated at night, using oil lamps hung outside shops; Basil the Great (in 371 CE) talks of the streets of Caesarea, in Cappadocia, being lit using the same methods (cited in Neuberger, 1930: 245).

In public ceremonies, the use of artificial light, such as firebrands, lamps, torches, basins, and candles, and the burning of incense, were important components (Neuberger, 1930: 245). For example, the *Adventus* ceremony, which celebrates the arrival to a major city of very important individual (such as bishops, holy men, or even the Emperor), the procession was accompanied by individuals bearing lights (Bouras and Parani, 2008: 21).

Shopkeepers in cities such as Antioch, Constantinople, and Edessa were required to keep their lamps lit outside their premises at night in order to provide illumination of the city streets (Bouras and Parani, 2008: 20). However, one cannot be sure who paid for this service, whether it was the urban administrators as part of their civic duties or, the owners of the commercial properties in order to increase the potential for income at night and to entice customers after-dark. An examination of the evidence for a nocturnal economy at Pompeii will be undertaken in Chapter 6.

2.5: Summary

One of the most striking aspects of lighting devices and equipment from the Upper Palaeolithic, and through to Late Antiquity and into the Early Middle Ages, was the overall lack of significant technical developments (Hodges, 1970: 203). There are strong similarities between the stone oil lamps from prehistoric cave sites in Southern France and Roman period ceramic and metal oil lamps: essentially, open or covered bowls for fuel with a space or nozzle for a wick. If more artificial light was required, then more wicks and/or oil lamps were needed. However, there were some minor technological developments during the Roman period, such as the introduction of an air-hole, larger lighting devices, and the use of chains, hooks and lampstands to enhance the functionality and portability of lighting equipment.

The onset of the night maybe have brought about anxiety and feelings of fear, given that darkness is often associated with evil, justifying users embodying lighting equipment with images of gods and a living flame emitting protective properties (Bouras and Parani, 2008: 1). The belief that light was required to provide the dead with a familiar and safe environment, and also to illuminate their way to the next world was a popular feature in funerary practices in the ancient world (Bouras and Parani, 2008: 23). The consumption of artificial light in religious and ritual contexts was socially significant.

While there was a lack of significant technological development of lighting equipment, the Roman period witnessed a dramatic increase in the consumption of artificial light, as is evident in the many tens of thousands of lighting devices recovered from archaeological excavations throughout the Empire. Lighting devices and equipment form the major source of evidence for any study of the use of artificial light in the ancient world, but there are limitations when using the published literature. The main problem is that much of the previous research has focussed largely on the classification and cataloguing of material. Their use in comparative studies is limited, with few studies providing methodologically robust quantification (only presenting a selection of 'interesting' and complete lighting devices). Few studies have analysed lighting equipment for its functional capacity, which was their manufacturers' and consumers' original and primary intention.

Ellis' (1997; 2007) has considered elite consumption of artificial light, particularly for Late Antique dining (1997) and Late Roman housing (2007). He (2007: 285-286) highlighted the important distinction between day and night in the ancient world. Once the sun had set, a wide-range of human activity was severely restricted. This is not the case in the modern world, where street lighting and a ready supply of electricity (at least for the Western world) allows for continued activity at any time of the day or night (Ellis, 2007: 285-286). Ellis suggests that the 'time of day' in an aristocratic Roman house was important for its use and function (2007: 286). He posits the concept that artificial light and day was gender specific, with male-led activities illuminated artificially, e.g. receiving clients very early in the morning, and dining at home, later in the evening, with the lady of the house in control during the daylight hours (2007: 86). In reality, a gender specific temporality in any archaeological context is almost impossible to identify.

Eckardt (2011, 180) states that "light and heat are fundamental human needs, and that public perception still strongly associates the concept of bright and warm rooms decorated with wall-paintings and mosaics with the Roman period, projecting a sense of comfort and civilised living back into the past". This thesis will explore these aspects to consider nocturnal life in ancient Pompeii from a social and economic perspective.

Chapter 3: The Nature of the Data

3.1: Introduction: archaeological evidence and ancient written sources

The aim of scholars who attempt to integrate both archaeological and historical evidence to enhance our understanding of the past is to identify the human actions presented in the texts (whether from the focus of the prose or information from the background narratives) which have been embedded in the physical remains in use at the time of writing. In antiquity, these remains were then broken, discarded, and subsequently buried; later recovered through archaeological excavation and contextually analysed in order to recover 'embedded' evidence to provide information of life in the past.

In order to address the questions outlined in Chapter 1 and achieve the thesis aim and objectives, this study will examine both archaeological (Section 3.2) and historical evidence (Section 3.3). The archaeological evidence will provide the quantitative and qualitative physical dataset (i.e. the artefactual and architectural remains at Pompeii), which will be used to address questions of chronological changes in the use of artificial light, the social and economic impact of its consumption, and spatial patterns on micro and macro scales (e.g. within households and across Pompeii). Analysis of the ancient written sources will contribute to the general social, cultural, and economic contextual framework for the use of artificial light analysed in this thesis, specifically, to provide indications for which aspects of daily life would have required artificial light, why it was desired, for how long, and where it was consumed.

3.2: The archaeological evidence

The Vesuvian sites are unique, not solely for being 'frozen in time', but also for the well preserved pre- 79 CE layers (the layers of archaeological deposits below the floor surfaces of the city in 79 CE). Artefacts from Pompeii may be divided into two main groups; the first, material from sub-floor surface stratified deposits from recently excavated areas of the city, and the second, material from primary deposits preserved *in situ* from the final phase of occupation immediately prior to the eruption of Vesuvius in 79 CE.

3.2.1: Archaeological evidence: sub-floor assemblages (pre- 79 CE deposits)

Recent decades have witnessed numerous archaeological excavations at Pompeii below the 79 CE floor surfaces, in areas which were previously cleared of volcanic debris (e.g. at Insula V (Bonghi Jovino, 1984); Porta Capua (Etani, 2010); Insula's VIII.7 and I. 1, the Pompeii Archaeological Research Project: Porta Stabia (University of Cincinnati); Region VIII, the Via Consolare Project (San Francisco State University); Regio I, (University of Reading and the British School at Rome); and Insula VI. 1, the Anglo-American Project in Pompeii (AAPP)(Anderson and Robinson, forthcoming). The majority of these projects have to date not been published in their entirety. These often large-scale excavations have resulted in very large artefact and bioarchaeological assemblages. The majority of the recovered artefact assemblages were from secondary archaeological deposits, with material generally consisting of the refuse of human living. This refuse was probably originally disposed of outside of the city walls, and often collected and brought back to some areas to be re-used and re-deposited as levelling rubble and for construction trench fills for new structures, structural repairs, and re-developments of existing structures (Peña, 2007: 12-13 and 318-318; Dicus, 2014: 56-69). The material remains from this type of deposit are often very fragmentary, with few complete items present, and it is often difficult to ascertain if the location of their recovery within and around excavated structures, relates to their place of use when they were complete objects, being used for their intended function. Analysis of this type of archaeological evidence requires different methodologies to the material recovered from primary deposits caused by the catastrophic volcanic eruption in 79 CE.

With specific regard to this thesis, the main source of evidence to achieve Objective 2 (Chapter 4) and a part of Objective 6 (Chapter 6, sections 6.2.1 and 6.2.2) derives from archaeological investigations conducted by the AAPP at Insula VI. 1, where an entire insula was examined including standing remains and wall decoration, along with extensive 79 CE sub-floor surface excavations. Insula VI. 1 is located in the north-west corner of the city immediately inside the Herculaneum gate, and fronting one of the main routes into and through Pompeii: the Via Consolare (**Figure 3.1**).

Figure 3.1. Plan of Insula VI.1, Pompeii. Image courtesy of Dr. Rick Jones and Dr. Damian Robinson, Anglo-American Project in Pompeii.

The insula was one of the earliest areas of Pompeii to be cleared of the 79 CE volcanic debris beginning in the 1760's (Fiorelli, 1860). The natural elements, tourists, and even bombs dropped by Allied Forces in 1943 have left the area in a dilapidated state. At the time of the 79 CE eruption the properties forming the insula had a range of functions including two houses, an inn, bars, a shrine, and a well and fountain (Bon et al., 1997; Jones and Robinson, 2005; 2007). The Casa delle Vestali, one of the largest houses in Pompeii (Jones and Robinson, 2005), occupied a large proportion of the northern area, with the smaller Casa del Chirurgo located immediately to the south (**Figure 3.1**). The Casa del Chirurgo has been a prominent feature of scholarly research on the development of the architecture of the Roman house (e.g. Maiuri, 1930; Wallace-Hadrill, 1994).

Investigations were undertaken throughout the extent of Insula VI. 1, with all standing remains recorded and analysed, and all floor areas without solid surfaces (such as mosaics) excavated down to natural levels. High-levels of recovery of artefacts and environmental remains were one of the main aims of the AAPP, with all excavated soil sieved through a 5mm mesh, and samples were taken from all contexts for flotation and sorting. All artefacts were cleaned (where appropriate) and bulk recorded, immediately after excavation and sorted in to specific artefact classes (e.g. pottery, ceramic oil lamps, plaster, ceramic building material, glass, metal objects, animal bone, and botanical remains). Recording and analysis of pottery and of lighting equipment (all of which comprised ceramic oil lamps), was carried out following methodologies typical of pottery studies (e.g. Orton et al., 1993: 166-181; Tyers, 1996: 204-205). All pottery was initially sorted in to broad ware classes (amphorae, finewares, coarsewares etc.) and weighed. The ceramic material was then further divided into functional categories (transportation, food preparation, storage, presenting and consuming) and quantified using estimate vessel equivalents (EVEs). EVEs are based on the sum of the proportion of rim of each vessel and vessel type preserved (McKenzie-Clark, 2012: 121-122). This method of quantification was applied to all ceramic classes, and some of the resulting data (oil lamps, amphorae and finewares) will be used in the analyses to address Objective 2 in Chapter 4.

One of the domestic structures from the investigations at Inslua VI. a, the Casa del Chirurgo, will be considered in detail in Chapter 4, where structural changes at the property, over time, will be analysed and compared with an assemblage of lighting devices recovered during archaeological excavations. Over 540 kgs of pottery and ceramic oil lamps were recovered. Through the analysis of this material (McKenzie-Clark, 2012; Griffiths et al., forthcoming), quantification by estimated vessel equivalents (EVEs) resulted in totals of 51 ceramic oil lamps, 89 *amphorae,* and 101 ceramic finewares (black and red slipped table wares), from the Casa del Chirurgo (Appendix 1). These quantities will form the basis of the analysis to be undertaken in Chapter 4.

To date, a total of 558 lamps and lamp fragments (Appendices 1 and 2) have been recovered from excavations of stratified deposits at seven properties at Insula VI. 1 (the Inn, Triclinium, Casa del Chirurgo, Shrine, the Bars of Acisculus and Phoebus, and the Well and Fountain). These will be analysed to identify and assess the chronological changes in the quantities of lighting devices consumed in and around this Pompeian neighbourhood (Chapters 4 and 6, this thesis). Quantification (by estimated vessel equivalents (EVEs)) of the remains of ceramic oil lamps resulted in 159 (EVEs), from approximately 400 years of human activity at the insula. This data will also be analysed to address any changes in the methods of production for lighting devices over time, and to assess if these changes had any economic significance (Chapter 6, Section 6.2.1).

It is worth noting here that all of the lighting equipment assemblage from Insula VI. 1 consisted only of ceramic vessels, in contrast to material from the eruption level primary deposits considered in Chapter 5, where metal lamps formed 15.6% of the assemblage. This phenomenon raises interesting questions regarding the recycling of metal objects, and the deposition and post-depositional processes of how these items entered (or did not) the archaeological record.

3.2.2: Archaeological evidence: the 79 CE eruption level assemblages

The number and range of well-preserved structures at Pompeii, alongside the many tens of thousands of artefacts recovered from the volcanic debris, often in the original place of use, provides a unique dataset to address a multitude of questions regarding urban daily life in this part of Italy in the first century CE. This dataset is perhaps the only one from the entire Roman world which could be used to achieve Objectives 3, 4, and 5, of this thesis.

While Pompeii has been extensively excavated over the past 250 years, systematic studies of artefact assemblages to answer questions of social and economic activity are limited (Berry, 1997; Coarelli, 2002; Allison, 2004a; 2006b). The majority of the excavations have focussed on clearing the volcanic debris from the site, deposited as a result of the eruption of Mount Vesuvius in 79 CE, with extensive studies of the architectural remains (e.g. Raper, 1977; Jongman, 1988; Laurence, 1994; Ling, 1997; Mac Mahon, 2005; Moeller, 1976; Robinson, 1997; Robinson, 2005; Tsujimura, 1990; Wallace-Hadrill, 1994; Zanker, 1998). Artefacts numbering in their tens of thousands have been recovered from these deposits (where excavations were taken down to the floor surfaces of structures at the time of eruption), often preserved *in situ* in the rooms and properties where they would have been used at the time of the disaster. Only a small proportion of the artefacts recovered have been recorded with any detailed accuracy and subsequently published. While there are many issues regarding artefact assemblages from the eruption levels at Pompeii (for example, recovery and looting, either immediately following the 79 CE eruption and/or following the re-discovery of the city and 'modern' investigations; excavation and retention decisions, recording strategies, and publication choices have all played a significant role in the formation of these archaeological assemblages (for further discussion: Allison (2004a)). Even so, the importance of this evidence should not be underestimated, and there is significant research potential to answer questions of socio-cultural aspects of the Roman world providing these issues are explicitly considered and acknowledged during any analysis. Crucially, recent research by Allison (2004a&b; 2006a&b) has collated and analysed evidence from written records and the physical remains of the excavations of 30 houses in the city (conducted during the 19th and early 20th centuries). This was the first systematic analysis of domestic Pompeian artefact assemblages (or any 'group' of assemblages) where an understanding of their functional context was the primary objective. This approach allows for comparative contextual studies where aspects of human activities, such as domestic consumption, may be addressed in a systematic way.

A total of 242 lighting devices and 20 lampstands were recovered from 10 of the 30 properties whose artefact assemblages and their specific use context were considered by Allison (2004a; 2006b). The lighting equipment, from these ten properties will be further analysed in Chapter 5. In order to undertake a contextual study of household consumption of artificial light at Pompeii, the number of potential flames per household (at the 10 properties) will be assessed (as some of the vessels have multiple nozzles), and measured against total ground floor surface area of each property, in order to provide an estimated value for artificial light consumption: the number of potential light flames per square metre of house ground floor surface area. These values will then be further utilised to assess the scale of the burning of olive oil for artificial light in Pompeian households, with the values derived from analysis and extrapolated to provide estimates for light fuel consumption for a single house, an insula, and for all clearly residential structures observed within the city.

In addition to the data for domestic artificial light, archaeological evidence from 79 CE deposits in commercial structures (e.g. Spano 1919) and bathing establishments (e.g. Gell, 1837) will be analysed to assess the extent of the nocturnal economy (Chapter 6). Furthermore, these data will be analysed in order to estimate light fuel consumption, and extrapolated across all observed examples of commercial structures (e.g. shops, workshops, bars etc.) and bath houses at Pompeii (Chapter 7).

Kaiser has identified 15 permanent religious structures at Pompeii (Kaiser, 2011: 124). To date, the only published evidence for lighting devices from religious structures comes from the Temple of Isis (Mau, 1899: 162-176), and caution must be taken when inferring artificial light consumption for the other sacred buildings at Pompeii from a single dataset. A total of 61 lighting devices were recovered from this temple, and this dataset will be used to propose light fuel consumption estimates for all observed religious structures, with the aim of estimating the scale of artificial light consumption in the act of public ritual practice at Pompeii (Chapters 6 and 7). Note: one must be extremely cautious when using a single dataset to estimate fuel consumption at 15 structures, however, this is the only data available, and it may prove useful to provide broad approximations.

It is worth noting here some of the issues regarding the presence and/or absence of lighting devices in the 79 CE deposits at Pompeii. Many lighting devices must have been removed by people fleeing the city during the eruption, and this has certainly had a significant impact on the quantities of material recovered. While these problems of deposition and recovery have influenced the nature of artefact assemblages at the site, there is significant research potential for addressing multi-faceted questions of the daily lives of the inhabitants of ancient Pompeii.

Even though the issues raised above regarding the formation of Pompeian artefact assemblages are valid, the fact remains that the artefacts recorded were present in each household, and provide absolute minimum numbers for comparative studies; almost certainly more would have been present within each house/establishment during occupation. Find spots may also not be as accurate as one would like. The lighting devices and other domestic artefacts presented by Allison (2004a&b; 2006a&b) may be regarded as probably the most robust dataset of domestic items found *in situ* for scholarly enquiry into the daily lives of the inhabitants of Pompeii in the years immediately prior to its destruction. In addition to the print publications of Allison's research at Pompeii, details of the houses and their recorded contents are available as online companions: www.stoa.org/projects/ph/home (2004b) and www.le.ac.uk/archaeology/menander/ (2006a), providing free and open access to these extremely valuable resources. These works are essential for any study of domestic life at Pompeii in the years immediately prior to the destruction of the town in 79 CE. If, as Berry states (2007: 299), one considers each household assemblage as 'groups' of domestic artefacts, then through analyses we can start to make informed assumptions for a whole range of social, economic and religious activities for the inhabitants and visitors to these houses.

3.3: Ancient written sources

While the archaeological evidence provides the main body of data in this thesis, one must not ignore the written sources. However, any reading of an ancient literary source must be interpreted with the acknowledgement that the authors were often Roman, male, urban, and members of the educated elite, whose views and opinions were formed in a very narrow social contexts, and whose intended audience was like-minded, educated and highly-literate, with similar social and cultural backgrounds (i.e. aristocratic and wealthy). Bowman and Wilson (2009, 10-11) note some of the problems when attempting to use different strands of evidence, especially in any endeavour of providing context from the written sources to the realities of often scant and fragmentary archaeological evidence. Allison (2001: 181) emphasises that one must ask questions for the material remains using robust material culture approaches to the archaeological evidence. The results of these questions should then be tested for against the ancient written sources for 'consistencies and inconsistencies' rather than for context. In order to investigate aspects of Roman social history the examination of the ancient written sources alone does not provide adequate information for many aspects of Roman daily life and the physical environments where it was played out (Allison 2001, 182). Allison (2001, 182), in her analysis of studies of domestic space, highlights how evidence is compromised when analysing and interpreting archaeological remains through the use of written sources which are completely unrelated. However, this type of approach does have great potential, as Bowman and Wilson note (2009, 10-11), and a number of ancient sources will be utilised in this thesis with specific regards to daily activities and time, and the structural environment where these activities took place.

Ancient prose often mention physical objects used in daily life, such as oil lamps, the physical remains of which are sometimes found in archaeological contexts. Furthermore, scenes of human action are often described, and, occasionally, the times of the day, events (e.g. dinner parties), and their locations (occasionally with descriptions of the structures and spaces where they took place). These glimpses of life through written evidence can aid analyses and readings of archaeological remains. However, great caution must be taken when relating the physical and often very fragmentary remains of ancient objects directly to events and observations presented in the ancient texts.

Inscriptions and *graffiti* often provide valuable information on such things as dates and range of important events, such as harvests, festivals, and political elections (e.g. Tuck, 2008: 25-34), and many aspects of daily life (for Pompeii, see Cooley and Cooley, 2004).

3.3.1: Daily life

Domestic activities, commerce, religion and entertainment were all major features of daily life for all levels of Roman society, and provided structured spatial and temporal spheres for human interactions. Shops, workshops, baths, bakeries, restaurants, and bars would have been open and trading as and when there was need, during the day, and into the night. Bakers would begin their day before dawn, ready to sell their products to the waking population (*Mart.* 12. 57), and bars and restaurants would be open during the morning (often with a break in the middle of the day, especially during the summer), and trading throughout the day and late into the night (see Laurence, 2007: 158 and 166, Fig. 9.2). The provision of education may also have been undertaken by lamp light, at least in part, and Juvenal comments that lamps burned by schoolboys would blacken marble busts of Horace and Virgil (*Sat.* VII, 222).

Martial (*Ep.* 4.8; 3.36) remarks that a 'typical' day (of an aristocrat) begins with clients paying their respects and presenting petitions to their patrons (the *salutatio*) during the first and second hours. However, it was likely that the staff of a household began their preparations of this in the dark hours before dawn. Martial (*Ep.* 4.8) goes on to suggest that the fourth and fifth hours were given over to the business of the day, with the sixth hour set-aside for rest, and the seventh used to conclude the days' work. The day ends with the eighth hour for leisure, with the ninth being a time for dinner. However, he also comments (*Ep.* 10.70) that business may be undertaken at other times, and friends may be received during the evenings, and that sometimes he ventures to the baths at the tenth hour. While Martial's daily life may certainly not be considered the norm for most of the population of Roman Italy, his writings do highlight at fairly rigid chronological structure for many daily activities, but with flexibility as and when required. The words of Martial also highlight that the majority of his daily activities, specifically, the business of the day, took place during daylight hours, with time for leisure and dining at the end of the day.

In Martial's letter to Sparsus (*Ep.* 12.57), he comments on his suffering when in town, where he is woken by the noise of the urban population, and longs for the quiet of his country house. He exclaims to his friend that he (Sparsus) is not bothered by such noise of the city because he lives in a more desirable part of Rome, and hints that the wealthy may sleep by day as no daylight may enter Sparsus' house unless expressly permitted. This last comment suggests that Rome's wealthy elite could essentially ignore the natural world and sleep at a time of their own choosing, even during the daylight hours, and continue their daily lives well in to the night. Martial's comments ring true with Cassiodorus (*Letters* I. 46. 2), where he notes that it was a mark of a civilised society if one could distinguish humans from animals (e.g. through night time activity illuminated artificially), and separate oneself from the natural world. The ability of Martial's friend to sleep during the daylight hours, and, most likely, embark on other activities in to the night, through the provision of artificial light, may indicate that this was indeed the case, but maybe only for the wealthy.

Dining

The Roman elite, for the most part, dined within the home (see Laurence, 2007: 160 for discussion), either on their own or at friends and business associates. While Martial hints at structured times for certain tasks of the day, with dinner taking place during the ninth hour (*Ep.* 4.8), Ammianus Marcellinus (*Re. Ge.* 23.6.77) notes a distinction of the eating habits and times for dining between the urban dwellers of the Empire and barbarians. If one examines Petronius' character Trimalchio, one may tentatively gain insights in to what it was like to attend a wealthy Roman dinner party, albeit with many aspects wildly exaggerated (*The Satyricon*). As guests entered Trimalchio's dining room, they noticed a pair of oil lamps hanging from the ceiling to illuminate the entranceway, and also to pour light on to two wall mounted tablets, the first, inscribed with '*on December thirtieth and thirty first, our Gaius dines out*', the second with a painting of the moon's phases and seven planets, with the days which were considered lucky and unlucky highlighted (Petronius, *Sat.* 30). Another dinner guest later comments, through a drunken haze, that the lamps in the dining room seemed to burn double as the room was spinning around (Petronius, *Sat.* 64). Later, Trimalchio's guests are taken to another dining room where his wife, Fortunata, had some of her own possessions on display, which included a small bronze lamp with the image of a fisherman (Petronius, *Sat.* 73). As Trimalchio's party continued through the night until dawn, illuminated by artificial light, with dinners were alerted to the dawn by a crowing cockerel, and the host ordering diners to extinguish the flames of the lamps by pouring their wine on to them (Petronius, *Sat.* 74).

Sleeping

As one third of human existence is spent sleeping – the timing and physical organisation of sleep is important in the arrangements of Roman housing. *Cubicula* were generally small rooms arranged around atria and peristyles, most often defined as a place to sleep (i.e. bedrooms) but also functioned as spaces for more utilitarian household activities, e.g. storage etc. Varro places *cubiculum* as rooms around *atria* (Varro *ling.* 5, 162) but Nissinen (2009, 96) highlights that Varro is referring to ancient and not contemporary (to himself) households. However, in reality, it is difficult to identify rooms for sleeping based purely on their location. For confirmation, evidence for a bed must be sought.

Propertius' statement in *Eliges* (II, 15):

"O happy me! O night that shone for me! And O you darling bed made blessed by my delight! How many words we exchanged with the lamp beside us, and how much we wrestled when the light was put out! For now she fought me with her breasts bared and sometimes she covered herself with her tunic and teased me with delay."

The mention of a lamp by Propertius certainly provides evidence of a need for light, presumably because it was bed-time after the sun had set, in preparation for sleep or 'other' activities which required a degree of privacy (but not necessarily in a bedroom) brought about darkness once the light was extinguished.

Commerce and leisure

Many shops and workshops opened early in the morning, most likely at dawn, and were open for business in the evening, may be until the eleventh hour (Petronius, *Sat.* 12). Workers in bakeries lit their ovens and prepared bread for the day before the sun had risen (Martial *Ep.* 12. 57). The inhabitants of Roman urban centres would certainly have demanded their daily bread as soon as the sun had risen, or before, with staff of the elite sent out to buy bread and general produce to prepare the first meal of the day (and others), with other individuals purchasing and eating the products on their way to work. Shops and bars for food and drink were open by the fourth hour, and many of these would have been open throughout the day and into the night (Amm. Marc. *Re. Ge.* 14.6.25); these retailers would have provided food and drink for much of the urban population, and were places where one could spend time after a long day of labour. Some of the lower classes may have spent the whole of the night drinking, to then sleep away the daylight hours in shady arcades (Amm. Marc. *Re. Ge.* 14.6.25).

In a scene at an inn, Eumolpus and Bargates are speaking privately, when a crier arrives carrying a burning torch, and announces a reward for information on one named Giton, who recently strayed from the baths (Petronius, *Sat*. 79). Here Petronius highlights two important aspects of night time; the first, the movement of people throughout the city illuminated by torches (of which there is little evidence for at Pompeii); and the second, that bathing establishments were indeed open for business after the sun had set.

Petronius (*Sat.* 79) writes that Gaton extricates a group from an unfamiliar part of the city, and notes the lack of a torch to guide their way, and that it was unlikely that they would meet anyone in the quiet of the night with a light. This passage by Petronius hints that many urban centres were not provisioned with artificial light to illuminate a city's streets, and that moving around after dark may have been dangerous. The group, on entering the market–place in the evening, it may not have been the best time to make a purchase, as the low levels of light may have been used to hide the quality of the goods on sale (Petronius. *Sat*. 12). This text suggests that many businesses were trading even as the sun set. The burning of lamps indoors for such long periods to illuminate the interiors of brothels during the day and night, would produce spaces full of lamp smoke and the aroma of burning oil. The ancient sources testify that brothels were dirty and smelly places, with the soot from oil lamps blackening people's faces (Horace*, Sat.* I, 2, 30; Petronius*, Sat.* 22).

Bathing

According to a number of ancient sources (e.g. Vitruvius 5. 10; Juvenal *Sat.* l II. 205) there were set times for attending the baths, from midday until the early evening. However, Martial suggests waiting to attend until at least the eighth hour, as before this the baths would be too hot, and he even attended bathing establishments from the tenth hour, if his business of the day had taken more time than expected (*Ep.* 10. 48. 3; 10. 70). Attending the baths in the Roman world was for more than just bathing and toilet activities. Seneca describes some of the many activities which took place there including exercise, massages, and the taking of refreshment, while commenting on the harsh sounds that these many actions created (*Ep.* 86: 4-8). Eating and drinking were common in Roman baths (Martial *Ep.* 12.19; Seneca. *Ep.* 122.6), and a graffito from the Suburban Baths in Herculaneum records a meal in the baths consumed by two slaves while a second records the bill for food and drink bough in the baths (*CIL* 4.10677, 4.10678). However, while these records highlight that food and drinks were consumed within bathing establishments, Fagan suggests that the items were unlikely to have been prepared at the bath house (Fagan, 1999: 33-34). A trip to the baths was also thought to be an important part of a healthy lifestyle, with different bathing sequences recommended for various ailments as part of a medical regime (e.g. Celsus *Med.* 1. 4. 3).

Access to light, both natural and artificial, would have played a significant role in the design, and construction of bathing establishments. Seneca (*Ep.* 86.10) comments that baths built in the Republican period were naturally dark places and presumably would have required a great deal of artificial light. This contrasts with his comments on the bright Imperial establishments with large windows allowing bathers access to abundant sunlight. This shift in the desires of bathers for large quantities of sunlight, presumably so that they could add a depth of colour to their skin, is evident at Pompeii (Seneca *Ep.* 86.10). The long-lived bathing establishments (e.g. the Forum Baths) were dark places with few windows, while later baths - those where major architectural changes were taking place, such as the Sarno Baths, and the under-construction Central Baths, had very large windows allowing natural light to flood in.

There is some evidence for temporal separation for bathing for men and women, and peoples of different class (e.g. slaves, freedmen). The wealthy elite may well have attended the baths earlier in the day than the lower classes, whom most likely had to work predominantly during the daylight hours (e.g. Laurence 2007: 162-3). An inscription from a bathing establishment in Portugal notes that men bathed in the afternoon and early evening but that women bathed in the morning and early afternoon (*CIL* 2.5181), and in the 3rd century CE Christian women were told to bath at the 10th hour so as not to bathe with men (Didascalia 3.1.9). However, it is difficult to be certain if this was indeed the case in Rome. As Laurence notes (2007, 162-6), the contents of ancient texts regarding daily routines of the lower classes and of women are limited.

3.3.2: Architecture and the organisation of space

Architectural design and decoration, and the organisation and use of space, impacted on the consumption of artificial light in the ancient world. According to Vitruvius (I, IV, 1), the planning for the location of a city must first consider the site to be 'very healthy', and coastal towns should not be positioned to look south or west, due to the excessive heat caused by direct sunlight. This was mainly due to temperature rather than access to light, and structures containing consumable items such as wine, grain, fruit, or *papyri*, must be located away from the harshness of direct sunlight to prolong preservation.

Vitruvius also states that when planning the construction of a building, access to natural light should be one of the main considerations (I, II, 7). Bedrooms and libraries should be orientated towards the east; baths and winter quarters towards the west (to maximise access to natural light during the winter), and picture galleries towards the north where a consistent and steady light was required (I, II, 7). Roof-openings (in winter residences) should be positioned high to ensure maximum natural light for the dining rooms below (VI, III, 2). While one cannot be sure that specific rooms in Roman houses had specific functions, as Vitruvius hints (VI, IV, 1), the positioning of rooms in relation to the sun was based on their functional requirements for heat and light. The reasoning for orientation of apertures for natural light was based on the season, and the time of day, when certain rooms or structures were used. For example, Vitruvius (V, X, 1) suggests that bath houses should face towards the southwest or south, and washbowls must be placed under windows, to maximise the amount of daylight, because bathing took place between midday and the evening.

Other ancient sources highlight the importance of location, environment, orientation and season (e.g. Pliny the Younger, *Ep.* 5.6). Columella (*Res. Rust.* 1, 6, 1) advocates that the organisation of space in a villa should be dependent on the seasons for example, *cubicula* used during the winter months should be orientated towards the south-east to maximise the amount of sunlight at the winter solstice. In his letter to Gallus (*Ep.* 2.17) Pliny goes into great detail when describing a range of rooms in a villa with much emphasis on location to take advantage of views (for example, to the sea), with a parlour having openings or windows to every side. Another room is described as having a window to take in light from the rising sun, and a second window to watch the sun set. A dining room is positioned to receive bright sunlight and Pliny notes that this would also improve the temperature during the winter. He notes a circular apartment had windows around its entire circuit to allow sunlight as it follows it course during the day. In this space was a library and it is presumed that this room (with abundant natural light) would have been a place used extensively throughout the day (*Ep.* 2.17).

Columella (*Res. Rust.* 1, 6, 1-2) comments that winter bedrooms face the sunrise at winter solstice, and that summer bedrooms should face toward the midday sun at the time of the equinox. For dining rooms, summer dining rooms should look toward the rising sun of the winter. Baths should face the setting sun of summer (1, 6, 2) in order to be naturally illuminated from midday up to the evening. Promenades should be exposed towards the midday sun at the equinox, so as to receive both maximum sun in winter and minimum during the summer (for shade). Cubicles for unfettered slaves should maximise for the midday sun at the equinox (Columella *Res. Rust.* 1, 6, 3), and for those in chains. an underground prison should only receive light through narrow windows built high so that they could not be reached from the ground.

While access to natural light was certainly important, a place of quiet and darkness to retire to was also considered essential by Pliny (*Ep.* 2.17). Pliny describes rooms for sleeping where the noise of the sea and the weather could not be heard, nor the sounds of servants going about their duties, and that lightening would not be seen (in a storm) nor the light of the day, except when the windows were open (to Gallus, *Ep.* 2.17; to Apollinaris, *Ep.* 5.6). Even though in his letter to Apollinaris he describes such a quiet room, one notes that it was located next to a room used for daily entertainment of friends; such events would have certainly resulted in much noise but maybe the location of a 'quiet space' close to a potentially 'noisy space' was a necessity to conduct meetings which required a high degree of privacy.

According to Vitruvius (VI, IV, 2) and Columella (*Res. Rust.* 1, 6, 1) the orientation of dining rooms was thought to be of particular importance, and spaces that were used predominantly during the summer months should be orientated towards the south to maximise access to sunlight from midday. Columella states that winter dining rooms should be orientated towards the sunset at the equinox. Vitruvius suggests that winter dining rooms and bathrooms should face southwest to maximise the evening light; with the pleasing view of the setting sun being an additional benefit (VI, IV, 1). During spring and autumn, dining rooms should face towards the east to ensure that during the day the sun's path would ensure the room/s would be at the desired temperature at the conventional time for dining. In the summer time, dining rooms should face north in order to keep the room cool, so that, as Vitruvius states 'the rooms are both healthy and agreeable' (VI, IV, 2). Columella and Vitruvius both comment that certain rooms (e.g. *cubicula* and dining rooms) were orientated dependent on function, the season and time of day when they were used, requiring different amounts of light and heat at different times of the year. Some wealthy villa owners certainly had multiple bedrooms which they used at different times of the year (e.g Pliny. *Epist.* 2, 17), while Augustus (Suetonius, *Aug.* 72, 1) continued to use the same bedroom for over 40 years.

Varro uses the term *caecum* (blind) in his description of a sleeping-room because not all bedrooms have the amount of light that they should (Varro *ling.* 9, 58). Many small rooms in Pompeian houses would have been very dark, with little or no access to natural light (see Chapter 5, below). Therefore, the use of artificial light within these spaces would have been important and impacted on their use, especially after dark.

It is clear that the function of certain rooms within a house were interchangeable and dependent of the season. However, certain spaces required a constant and a steady light, such galleries with paintings, rooms for craft production (such as embroidery), and painters' studios (where stable lighting is essential when working with coloured pigments) (Vitruvius VI, IV, 2). With regards to decoration, whether in plaster (such as stucco) or paintings directly on to walls, Vitruvius considers their aspects in relation to the use of oil lamps and fires (VII, III, 4 and VII, IV, 4)**.** If plaster mouldings were to be used in rooms which would have needed a fire, for heating, and numerous oil lamps, for light, the mouldings should be flat, rather than intricate, so soot may be easily wiped away. Stucco could be applied and polished in order to reflect more light (*Vitruvius* VII, III, 9). In winter dining rooms, Vitruvius (VII, IV, 4) suggests that wall paintings and cornice work should not be of intricate design, and walls should be predominantly painted black because the smoke and soot from fires and oil lamps would spoil the decorations.

While Vitruvius provides valuable information regarding the construction of structures, their orientation with regards to natural light, and the use of artificial light, and its pros and cons, his writings generally describe an 'idealised' building. The topography of a construction site, access to natural resources, the location of the construction site within an urban centre and the proximity of other structures and roads, were heavily influential on how and where they were built. Therefore, the construction of Roman buildings should always be primarily considered in relation to their local environment, rather than attempting 'force' their architecture into Vitruvius' 'idealised' criteria for structures. In addition, Vitruvius was only one individual, writing at a particular point in time, and, in the case of Pompeii, construction within the city began as early as the 6th century BCE (Coarelli, 2002: 13-26), with renovations and modifications to structures continuing throughout the entire history of the city, and still taking place at the time of the eruption in 79 CE (Anderson, 2011: 74-87).

3.4: Summary

While archaeological evidence will form the majority of data analysed in this thesis, specifically, lighting devices and associated equipment, along with the extensive structural remains at Pompeii, ancient textual sources will also be examined, with the aim of providing additional narrative with regards to daily life during the Roman period. While the archaeological remains provide physical, spatial, and temporal framework for after dark activities at Pompeii, textual evidence will feed in to the discussion and provide a human input from those who lived in the past. What the ancient written sources show is that temporality in daily human actions was important in the Roman world, and that light and dark and the seasons had a constant impact. In particular, room orientation, access to natural light, and decoration, were prominent in the minds of the ancients when designing and building their homes.

Chapter 4: Domesticating the Night: Architectural Development and the Growth of the Consumption of Artificial Light

4.1: Introduction: a case study of the Casa del Chirurgo, Insula VI. 1, Pompeii

The aim of this chapter is to assess whether there was development and growth for the consumption of artificial light, over time, and if this was reflected in the structural changes undertaken at the Casa del Chirurgo over the c. 300 years of its occupation. In addition, the results will contribute to the argument for changes in lighting practices alongside broader social, economic, and political contexts during this period.

In order to address the aim of this chapter a methodology (see Section 4.2, below) will be adopted where the relative proportions of lighting equipment (ceramic oil lamps) from stratified deposits will be compared to fine table wares (red slip and black gloss pottery) and transport amphorae. It is assumed that any increase or decrease of lighting devices over time reflects artificial light consumption at the property and the immediate neighbourhood. Any changes will be compared to the chronological structural changes at the Casa del Chirurgo and how these may have influenced the use of artificial light and the levels of lighting (both natural and artificial) in certain areas of the house. The primary source of evidence are the ceramic oil lamps recovered, which have undergone a thorough examination by the author: details of the clay composition of each vessel (fabric) and a full description of each lamp is provided in the catalogue of artefacts from the Casa del Chirurgo in Appendix 1. As part of this examination (and of ceramic oil lamps from other areas of Insula VI. 1), a lamp type series has been developed which enables enhanced quantification based on estimated vessel equivalents. This type series is provided below (Section 4.3.1).

The primary source of evidence for this case study derives from archaeological investigations at the Casa del Chirurgo, Insula VI. 1, conducted by the Anglo-American Project in Pompeii (see Chapter 3 for discussion). Co-ordinated and consistent recording procedures, materials analyses and function classifications were used for all artefact classes and environmental remains from the AAPP's excavations, undertaken by established specialists over a period of ten years (including Hilary Cool, John Dore, Robyn Veal, Jane Richardson, Jaye Mckenzie-Clark, and Gary Forster, and David Griffiths). Some of these raw datasets will be used in the comparative components of this thesis, specifically, the fine table ware pottery (data provided by Jaye McKenzie-Clark) and amphorae (Gary Forster).The recording and analysis of the ceramic oil lamps was undertaken by the author. In addition to the analyses of artefact and environmental evidence, examination of the structural remains and sub-surface stratigraphic sequences have identified numerous phases of construction and re-development; identifying social, religious, and economic activity, and functional changes at the Insula throughout the entire history of the site, c. 300 BCE to 79 CE (see Bon & Jones (eds.) 1997 and Jones and Robinson 2007 for examples). The physical remains of the Casa del Chirurgo, the results of the archaeological excavations, and the artefactual evidence found, form the primary data set for this case study (below).

To date, the Casa del Chirurgo (VI. 1. 9-10) is the most intensely investigated structure from excavations at Insula VI. 1 (**Figure 3.1**, Chapter 3), and due to the detailed examination of artefacts from the property, provides an excellent opportunity to examine the use of artificial light in relation to the structural changes at the house throughout its entire history.

4.2: Methodology

All bulk pottery and ceramic oil lamps (**Figure 4.1)** were sorted by type and then each functional class was further divided into diagnostic and undiagnostic material. At this stage each diagnostic sherd/vessel was drawn (at a 1:1 scale) or photographed; detail of vessel form, surface treatment, fabric composition, and the diameter and the percentage of each rim were also recorded. The recording of pottery and ceramic oil lamps in this manner allows for robust quantification, resulting in estimated vessel equivalents (EVEs) for each pottery class and ceramic oil lamp types by phase (**Figure 4.2**), enabling diachronic and intra- and inter-site comparisons, both qualitative and quantitative, of the material culture. The lamp assemblage will be considered regarding the context of its deposition/re-deposition, for example, as part a levelling layer or from a pit (see **Table 4.1**). This characterisation process resulted in a large pottery and ceramic oil lamp dataset which could then be used quantitatively as evidence for the amount of supply and consumption of goods (such as fine tablewares and the commodities transported in amphorae), and, the main focus of this study, artificial light, at Insula VI. 1.

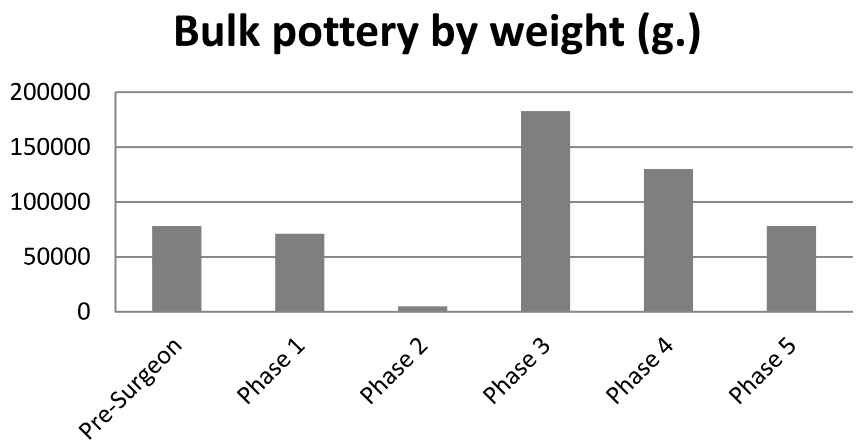


Figure 4.1. Bulk pottery by phase, Casa del Chirurgo (*N* = 545kgs).

4.3: Ceramic oil lamps

A total of 19 lamp Types (based on form and fabric attributes) were identified in the assemblage for Insula VI. 1 (Section 4.3.1, below) representing 28 fabric classes (see Appendix 1). A full catalogue of ceramic oil lamps recovered (to date) from areas within Insula VI .1 in addition to the Casa del Chirurgo is provided in Appendix 2 (Triclinium, the Inn, the Shrine, the Bar of Acisculus, the Bar of Phoebus, and the Well/Fountain area). Adopting a range of broad types rather than those designated by, for example, Bailey (1975; 1980; 1988; 1996, and Deneauve (1969), allows a significantly greater number vessel fragments (sometimes very small) to be used for analysis. Traditional typologies are based on a greater number of attributes such as rim form and nozzle, size, handle etc.; the methodology adopted in this study for assigning lamp fragments to 'types' allows for only a single observable characteristic (e.g. shoulder form (in the case of Types 1 to 6, Loeschcke Shoulder Forms (LSF)) to be used and therefore an increased number of lamp remains become usable components for analytical study.

The 19 types were based broadly on the material relating to their method of manufacture and ceramic tradition: bucchero; Black Gloss; coarseware - thick-walled and wheel-made, and coarseware - thick-walled and mould-made; very coarse, open hand-formed; fine thick-walled and mould-made, and fine thin-walled mould-made (predominantly slipped (**Table 4.2**). The fabrics were examined using a low power microscope (X20 magnification) and recorded following the methodology used for classifying Roman pottery outlined in *The National Roman Fabric Reference Collection: A Handbook* (Tomber and Dore, 1998: 5-8*)*. There was great similarity in many of the fabrics used in the manufacture of the ceramic oil lamps in this assemblage, the majority of which were probably produced locally and/or regionally (based on the presence of black volcanic inclusions in the clay matrices); it is likely that further petrographic analyses of the 28 fabric types may well result in fewer fabric types. Sixteen Types and twenty-five fabric classes were represented in the Casa del Chirurgo ceramic oil lamp assemblage (see Section 4.3.1, Figures 4.2-4.19, and Appendix 1).

The ceramic oil lamps were recovered from a variety of different types of deposits (contexts). **Table 4.1** presents the type of deposit and the occurrence (where a diagnostic fragment of ceramic oil lamp had been assigned a unique accession number, *N* = 141). The majority derive from levelling layers (49) and fills (35) related to the construction and redevelopment of the house. A single lamp fragment was found as part of an earth floor. A total of 13 were recovered from layers related to the garden area and a single occurrence from an unspecified deposit. The remainder were recovered from cess pit fills (3), cistern fills (18), pit fills (16), and post-hole fills (5). All of these deposits were either secondary or tertiary, where items were part of hard-core in the construction and redevelopment of the property, as levelling layers or to fill voids allowing building work to take place over earlier structural remains. No primary deposits were identified and the majority of the ceramic oil lamp assemblage was very fragmentary. While the finds from these deposits and their locations do not add to any spatial analysis for lamp use within the Casa del Chirurgo, the chronological sequence of deposits containing datable archaeological remains (e.g. coins, pottery, glass, and lamps) provides evidence for general patterns of consumption in the house and its immediate environs throughout the history of occupation.

Context/Deposit Types	Occurrence
Cess pit fills	3
Cistern fills	18
Pit fills	16
Construction/cut/trench fills	35
Post-hole fills	5
Earth floor	1
Levelling/rubble/sub-floor surface layers	49
Garden layers	13
Deposit	1
Total occurrences	**141**

Table 4.1. Context types and occurrence of ceramic oil lamps, Casa del Chirurgo.

4.3.1: AAPP ceramic oil lamp types

Type 1

Circular, mould-made and thin-walled; slipped. Diameter range c. 60 – 110mm. LSF I, IIa & IIb. The range of fabrics closely resembles those used to produce fine, thin-walled vessels (cups, beakers, bowls etc. both slipped and unslipped). Some items are most likely local or regional products due to presence of black vitreous inclusions. Fabric Types: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 22, 24, 26.

Figure 4.2. Type 1 example.

Type 2

Circular, mould-made and thin-walled; slipped. Diameter range c. 60 – 140mm. Fine fabric with sparse subvisible inclusions. LSF IIIa & IIIb. The range of fabrics closely resembles those used to produce fine, thin-walled vessels (cups, beakers, bowls etc. both slipped and unslipped). Some are most likely local or regional products due to presence of black vitreous inclusions. Fabric Types: 1, 2, 4, 5, 6, 7, 8, 11, 13, 14, 16, 17, 18, 21, 28.

Figure 4.3. Type 2 example.

Type 3

Circular, mould-made and thin-walled; slipped. Diameter range c. 50 – 120mm. Fine fabric with sparse subvisible inclusions. LSF IVa & IVb. The range of fabrics closely resembles those used to produce fine, thin-walled vessels (cups, beakers, bowls etc. both slipped and unslipped). Some are most likely local or regional products due to presence of black vitreous inclusions. Fabric Types: 1, 2, 3, 4, 5, 7, 8, 14, 17.

Figure 4.4. Type 3 example.

Type 4

Circular, mould-made and thin-walled; slipped. Diameter range c. 50 – 120mm. Fine fabric with sparse subvisible inclusions. LSF V, VIa & VIb. The range of fabrics closely resembles those used to produce fine, thin-walled vessels (cups, beakers, bowls etc. both slipped and unslipped). Some are most likely local or regional products due to presence of black vitreous inclusions. Fabric Types: 1, 2, 3, 4, 5, 6, 10, 11.

Figure 4.5. Type 4 example.

Type 5

Circular, mould-made and thin-walled; slipped. Diameter range c. 60 – 120mm. Fine fabric with sparse subvisible inclusions. LSF VIIa & VIIb. The range of fabrics closely resembles those used to produce fine, thin-walled vessels (cups, beakers, bowls etc. both slipped and unslipped). Some are most likely local or regional products due to presence of black vitreous inclusions. Fabric Types: 1, 2, 3, 4, 5, 6, 7, 14, 24.

Figure 4.6. Type 5 example.

Type 6

Circular, mould-made and thin-walled; slipped. Diameter range c. 34 – 120mm. Fine fabric with sparse subvisible inclusions. LSF VIIIa & VIIIb. The range of fabrics closely resembles those used to produce fine, thin-walled vessels (cups, beakers, bowls etc. both slipped and unslipped). Some are most likely local or regional products due to presence of black vitreous inclusions. Fabric Types: 1-6, 8, 14, 24.

Figure 4.7. Type 6 example.

Type 7

Coarse fabric with common inclusions, ovoid, mould-made and thick-walled. Coarse fabrics with common inclusions. Most lamps are likely local products due to the presence of black vitreous inclusions. Fabric Types: n/a.

Figure 4.8. Type 7 example.

Type 8

Black Gloss, globular, wheel-made and thick-walled. Diameter range c. 60 – 80mm. A range of Campanian products: Campana A (fine, hard, well-sorted. Munsell: 5YR 5/6), Campana B (fine, hard, well-sorted. Munsell: 10YR 7/4), and Campana C (fine, hard, well-sorted. Munsell 5Y 7/1). All of the Black Gloss lamps' fabrics and surface decoration (i.e. black glaze) are identical to the wide range of tablewares produced between the 5th and 1st centuries BCE in the Campanian region. Fabric Types: 19, 21.

Figure 4.9. Type 8 example.

Type 9

Black Gloss, wheel-made and thick-walled; all 'other' non-globular forms. Diameter range c. 30 – 64mm. A range of Campanian products: Campana A (fine, hard, well-sorted. Munsell: 5YR 5/6), Campana B (fine, hard, well-sorted. Munsell: 10YR 7/4), and Campana C (fine, hard, well-sorted. Munsell 5Y 7/1). Fabric Types: 19, 20, 21.

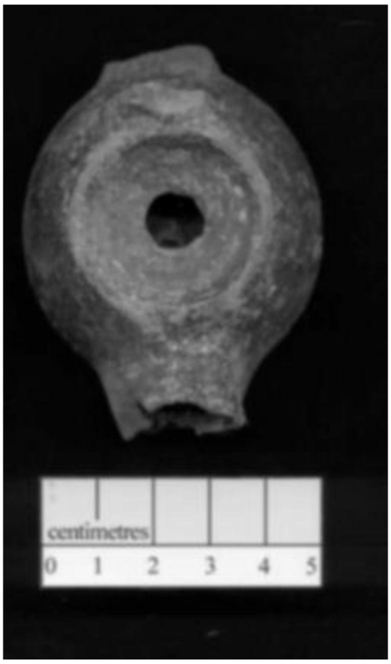


Figure 4.10. Type 9 example.

Type 10

Mould-made and thick-walled, circular with rounded-shoulder and small raised point decoration (c. 0-2mm). Diameter range c. 68 – 110mm. Fine to coarse fabric with common inclusions. Fabric Types: 4, 17, 24, 26.

Figure 4.11. Type 10 example.

Type 11

Mould-made and thick-walled, circular with rounded-shoulder and small raised point decoration (c. 2mm>). Diameter range c. 40 – 120mm. Diameter range c. 40 – 120mm. Fine to coarse fabric with common inclusions. Fabric Types: 4, 5, 7, 8, 10, 24.

Figure 4.12. Type 11 example.

Type 12

Square or rectangular, mould-made and thick-walled. Fine fabric with sparse subvisible inclusions. Some are most likely local or regional products due to presence of black vitreous inclusions. Fabric Types: 1, 5, 8, 10, 11, 16, 24, 25.

Figure 4.13. Type 12 example.

Type 13

Circular, wheel-made and thick-walled; low-quality manufacture. Diameter range c. 30 – 80mm. Very coarse fabric with abundant inclusions. The fabric is the same as local and regionally produced coarseware cooking and storage vessels. Fabric Types: 1, 2, 3, 4, 14, 17, 22, 25, 26.

Figure 4.14. Type 13 example.

Type 14

Circular or ovoid, mould-made and thick-walled; low-quality manufacture. Diameter range c. 38 – 48mm. Coarse fabrics with common inclusions. Most are likely local products due to the presence of black vitreous inclusions. Fabric Types: 3, 5, 8.

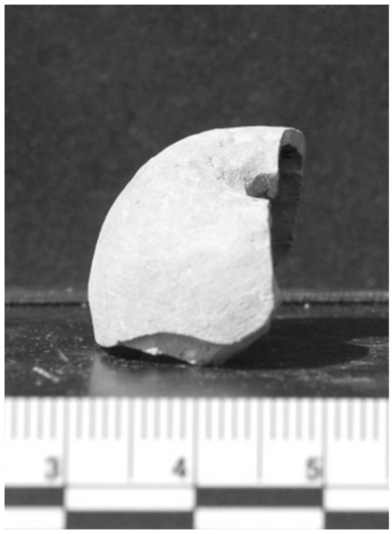


Figure 4.15. Type 14 example.

Type 15

Crude, hand-formed and thick-walled, open form; very low-quality manufacture. Diameter c. 70mm. Very coarse fabric with abundant inclusions. The fabric is the same as local and regionally produced coarseware cooking and storage vessels. Fabric Type: 27.

Figure 4.16. Type 15 example.

Type 16

Bucchero, mould-made and generally highly decorated with burnished surface. Diameter range. C. 40 – 70mm. Fine to coarse soft grey to grey-brown fabric with common inclusions. Fabric Types: 15, 17.

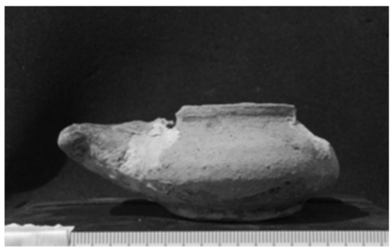


Figure 4.17. Type 16 example.

Type 17

Mould-made and thick-walled. Diameter range c. 60 – 80mm. Fine to coarse fabric with common inclusions. Fabric Types: 1, 2, 4, 5, 6, 7, 17, 24.

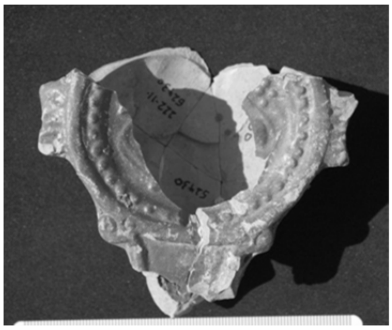


Figure 4.18. Type 17 example.

Type 19

Opposite-facing two-nozzled lamp with elongated ovoid body. Diameter c. 80mm. A multi-nozzled version of Types 1 to 6. Fine fabric with sparse subvisible inclusions. Fabric Type: 24.

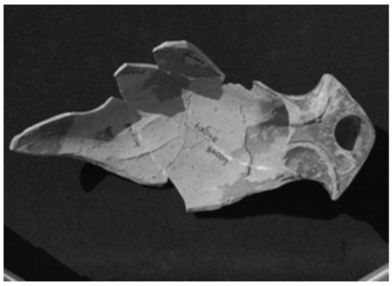


Figure 4.19. Type 19 example.

Type 21

Large (up to 200mm diameter) with prominent crescent lug and linear and raised-point decoration; unslipped. Hard, fine grey fabric with common inclusions. Fabric Type: 21.

No image.

Ceramic Tradition	**AAPP Types**	**Production Date Range**
Bucchero	16	7th to 5th centuries BCE
Black Gloss	8 and 9	3rd to 1st centuries BCE
Coarseware, thick-walled and wheel-made (unslipped)	7, 13	Up to end 1st century BCE
Coarseware, thick-walled and mould-made	10, 11, 14	c. 150 to 75 BCE
Very coarse, open and hand-formed	15	Unknown
Fine, thick-walled and mould-made (generally slipped)	12 and 17	c. 150/100 BCE onwards
Fine, thin-walled and mould-made (generally slipped)	1 to 6, 19 and 21	c. 25 BCE onwards

Table 4.2. Ceramic tradition by AAPP Type and production date range.

4.4: Amphorae

A catalogue of the amphorae recovered from the Casa del Chirurgo is provided in Appendix 1. While it was not always possible to identify with absolute certainty the original contents of each amphora vessel (e.g. wine, olive oil, fish-based products), the assemblage did represent a broad range of commodities (**Table 4.3**) from multiple sources (Appendix 1). Only 9 olive oil or olive oil/other amphorae were represented in an assemblage of 89 vessels (by EVEs). While there is no clear pattern for olive oil supply at the Casa del Chirurgo, the overall assemblage does highlight general patterns in the supply of amphora borne commodities throughout the entire history of occupation at the site. The inclusion of amphora vessels in this case study is predominantly for the use in comparative studies as relative proportions (alongside ceramic oil lamps and fine ceramic Black Gloss and Red Slip tablewares, Appendix 1) to show chronological changes in the consumption of artificial light which may reflect a past reality rather than solely large artefact assemblages.

Phase	Wine	Wine (predominantly)	Olive oil	Olive oil/other	Fish-based products	Uncertain	Total
Pre-Chirurgo Activity	10	1		1			**12**
1	4	5		2	1	1	**13**
3	11	4	1	2	1	2	**21**
4	14	8		2	1	1	**26**
5	8	5		2		2	**17**
Total	**47**	**23**	**1**	**9**	**3**	**6**	**89**

Table 4.3. Amphorae and their commodities, Casa del Chirurgo.

In addition to the changes in quantities of *amphorae* at the Casa del Chirurgo, there were chronological variations on the origins of the commodities which they carried (Appendix 1, *amphorae*). During the pre-Chirurgo activity, 11 (EVEs) were of Italian origin while only 1 was imported (from Spain). During Phase 1, Italian products continue to dominate, with 9, but joined also with 1 each from Spain and Crete, and 2 of North African origin. In Phase 3 Italian products form the greatest number of vessels in the assemblage (with 13), with a single vessel from Spain, 2 from Crete, and 3 from North Africa. A similar pattern was continued during Phase 4 with 20 vessels of Italian origin, 1 from Spain, and 2 each from Crete and North Africa (a single vessel had an unknown origin). In the final years of occupation at the insula (Phase 5) Italian products still dominate (with 12), with other commodities from Crete (2) and North Africa (1). A single vessel had an unknown origin.

As one can see in **Table 4.3** and discussed above, Italian commodities were by far the largest group of products consumed in this neighbourhood of Pompeii. Wine was certainly the dominant product (in all phases) transported to the city in *amphorae,* with a steady supply of other products, including olive oil. If the city had not been destroyed by the eruption in 79 CE, one may have seen a greater increase in Spanish olive oil (in Dressel 20 *amphorae)* and North African products (including olive oil) over the following centuries, as production in these regions increased dramatically.

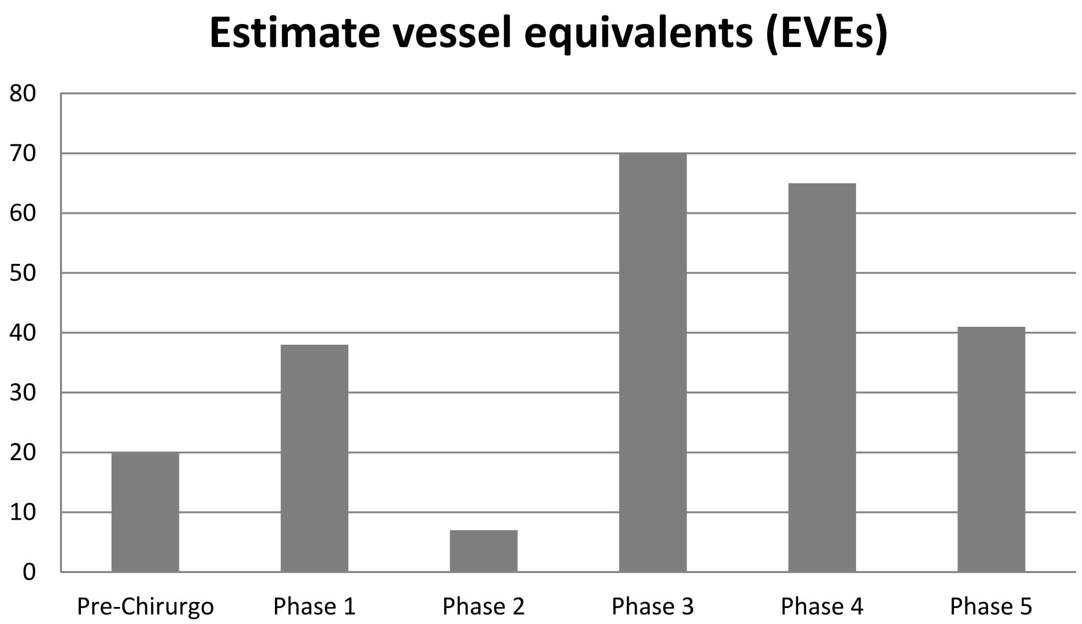


Figure 4.20. Total estimated vessel equivalents (EVEs) for amphorae, finewares, and ceramic oil lamps by phase, Casa del Chirurgo (*N* = 241).

Phase	Chronology	Lamps	Amphorae	Finewares	Total
Pre-Chirurgo Activity	c.300 - 150 BCE	1	12	7	20
1	c. 150 - 100 BCE	4	13	21	38
2	c. 100 - 25 BCE	0	0	7	7
3	c. 25 BCE - CE 15/25	23	21	26	70
4	c. CE 15/25 - CE 62	13	26	26	65
5	c. CE 62 - CE 79	10	17	14	41
Total		**51**	**89**	**101**	**241**

Table 4.4. Lamps, amphorae, and finewares by EVEs, Casa del Chirurgo (*N* = 241*).*

In order to identify chronological changes in the levels of the consumption of artificial light, quantification of material recovered, by estimated vessel equivalents (EVEs), resulted in 51 ceramic oil lamps, 89 *amphorae,* and 101 ceramic finewares (black and red slipped table wares), from the Casa del Chirurgo (**Table 4.4**).

4.5: Casa del Chirurgo: analysis of the archaeological and structural evidence

4.5.1: The structure and excavations

The property runs the full width of the insula between the Via Consolare and the Vicolo di Narciso (Chapter 3, **Figure 3.1**). In its final phase, a small commercial property formed the south-west corner of the property (VI. 1. 12), and opened directly on to the Via Consolare. The property takes its name from the assemblage of 40 medical instruments recovered during excavations of the structure in the 18th century. The Casa del Chirurgo has featured heavily in Pompeian research and studies of the Roman house, with many scholars commenting on the perceived early construction of the house in the 4th century BCE (Maiuri, 1930: 381-395; Wallace-Hadrill, 1997: 219-240). However, recent archaeological evidence now confirms a second-century BCE date for its construction (Anderson and Robinson, forthcoming). For many, this house represents a physical manifestation of the ‘archetypal’ Roman *atrium* house; its floor plan symbolic of the ‘logical’ according to *Vitruvius* in his *de Architectura.* Most of these interpretations have been based the assumption that the large stone blocks which form the façade of the house, represent a construction style from the fourth/third century BCE, with little supporting archaeological stratigraphic evidence. New evidence from intensive and extensive investigations of the subsurface stratigraphy and associated ceramic, glass, and coin remains, provide reliable chronological evidence for multiple phases of occupation of the property, from the earliest construction the house around 200 BCE, until its destruction in 79 CE (Anderson and Robinson, forthcoming).

Clearance of 79 CE volcanic debris from the insula took place during the 18th and 19th centuries. Due to the lack of systematic recording of the material removed from these deposits, it was impossible to reconstruct the *in situ* artefact assemblages from the final years of occupation of the Casa del Chirurgo. Therefore, this case study considers evidence from more traditional archaeological deposits, those below the floor surfaces in place at the time of the eruption.

4.5.2: The pre-Chirurgo phase, c. 300 BCE - c.150 BCE

At some point during the 3rd century BCE the area now known as Insula VI. 1 was levelled and upper and lower terraces were formed in preparation for occupation. Approximately 1metre (m) of soil was removed from the lower terrace and some evidence for a structure was identified. Evidence of this early structure was found below Room 23 of the final phases of the Casa del Chirurgo (**Figure 4.21**), with remains of a toilet (with amphorae used as soak-away), or cistern, and a large section of an *impluvium* (**Figure 4.22**). It was likely that this early structure was a domestic property, as the *impluvium* suggests the presence of an atrium.

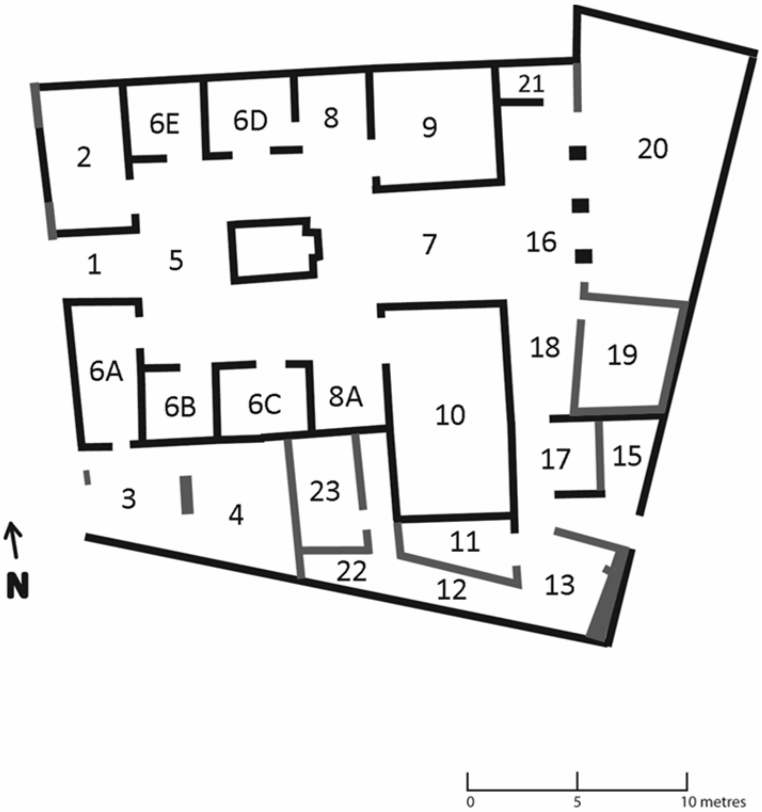


Figure 4.21. Plan of the Casa del Chirurgo in its final phase (with room numbers referred to in the text). Image: AAPP archive.

Figure 4.22. Pre-Chirurgo archaeological remains. Image: AAPP archive.

A single ceramic oil lamp was found in the deposits dating to this early period (c. 300 – c. 150 BCE), forming 5% of the assemblage when compared to *amphorae* at 60% and ceramic finewares at 35% (**Figure 4.23**). Of the 12 *amphorae* recovered from this pre-Chirurgo phase, 10 were almost complete Greco-Italic *amphora* (see **Figure 4.24**, a large deposit in pit 261.059),which date between the 4th and 2nd centuries BCE, and were deposited in a single event (along with soil, lava stones, plaster and other ceramics) to completely fill a latrine or cesspit (Context 261.059). While one can say little at this stage about the consumption of artificial light, the presence of lighting equipment clearly highlights that it was a feature in or around the insula during the 3rd and 2nd centuries BCE.

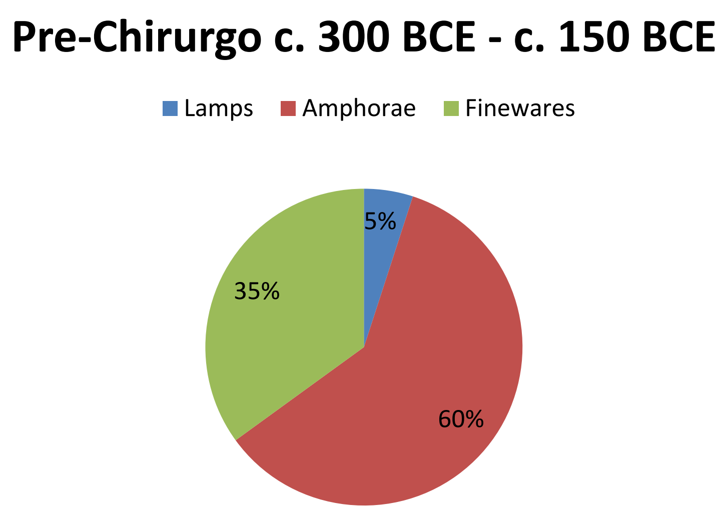


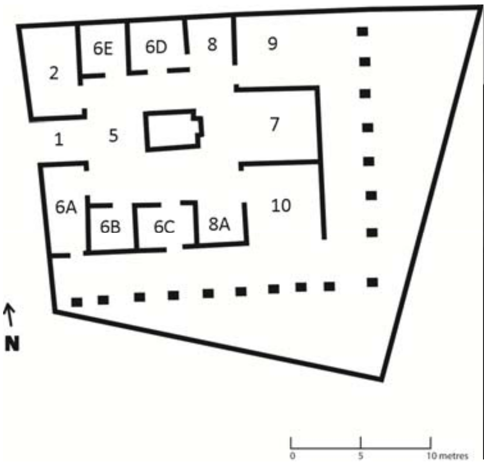
Figure 4.23. Relative proportions of Pre-Chirurgo ceramic oil lamps, amphorae, and finewares (*N* = 20 EVEs).

Figure 4.24. Greco-Italic *amphorae,* Context 261.059. Image: AAPP archive.

4.5.3: Phase 1, the Casa del Chirurgo, c. 150 BCE – c. 100 BCE

Recent discoveries during the investigations by the AAPP can now be dated to around the 2nd century BCE (Anderson and Robinson, forthcoming), and provide a date for the first phase of construction of the extant Casa del Chirurgo. These discoveries comprise the original core of this house and indicate that it was laid out in Sarno stone ashlar around a central atrium with an *impluvium* and *opus africanum* masonry (**Figures 4.25a** and **b**). A portico ran the entire lengths of the eastern and southern sides, with open spaces, and beaten earth floors, outside the house structure. These discoveries show a layout that is in direct contrast to the well-known and much discussed archetypal inward-looking *atrium* house, with some principal rooms opening outwards on to the open spaces beneath colonnaded porticoes (**Figures 4.25a** and **b**).

Rooms 6A and 6C had doorways opening on to the southern portico, the entire southern side of the large *triclinium* (room 10) was fully open, and the small *triclinium* in the north-east corner of the house (room 9) was fully open on to the eastern portico (**Figure 4.25a** and **Figure 4.26**).



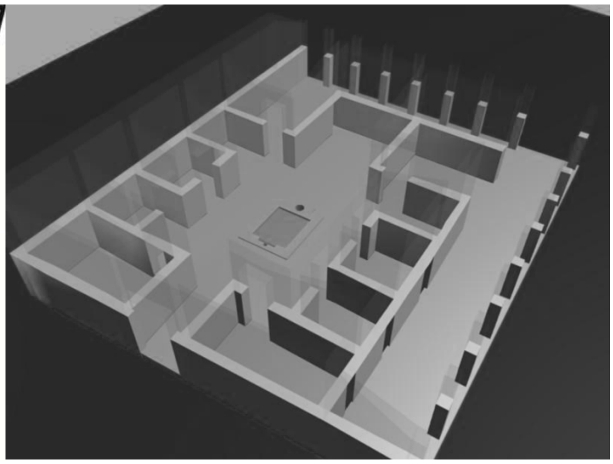


Figure 4.25a **Figure 4.25b**

Figures 4.25a and **b.** Phase 1 plan (a), and 3D reconstruction (b), Casa del Chirurgo. Image: P. Murgatroyd.

These rooms looking out onto the open eastern and southern colonnades must have been flooded with natural light during the day, with the rest of the house being naturally illuminated through a central *compluvium* in the roof of the *atrium*. The location of the house at the highest point of Pompeii ensured that the occupants had fine views over the rest of the city towards Monte Fiato to the south and east, and towards the coast and sea to the west.

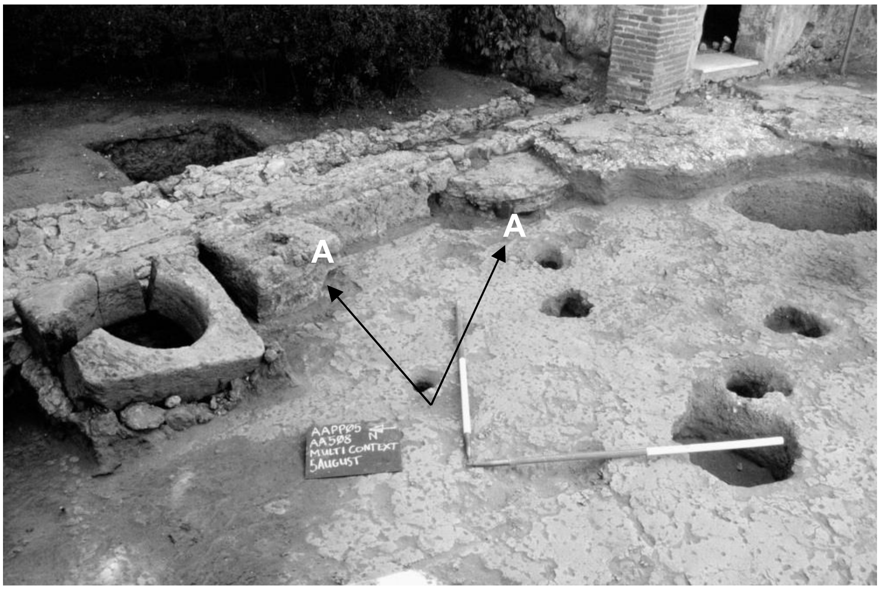


Figure 4.26. The northern portion of the eastern colonnade (A - column bases), as seen from room 16. Image: AAPP archive.

During Phase I there were still very few lamps. Remains of only four lamps (EVEs) were recorded, which formed 11% of the artefact group (lamps, *amphorae*, and ceramic finewares), with *amphorae* and ceramic finewares forming 34% and 55% respectively (**Figure 4.27**).

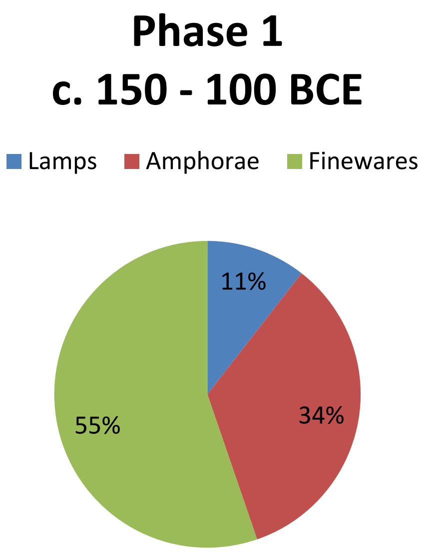


Figure 4.27. Phase 1, relative proportions ceramic oil lamps, *amphorae*, and finewares (N = 38 EVEs).

These percentages suggests that artificial light did not play a significant role in domestic life in the second-half of the 2nd century BCE in this neighbourhood at Pompeii, although, as one can see in **Figures 4.25a** and **b**, the Casa del Chirurgo would have been lit extensively by natural light for much of the day because much of the house was open to the elements. The orientation of the open, colonnaded eastern and southern aspects of the house ensured that the inhabitants could utilise the maximum amount of sunlight available, and these open spaces could have been used even at the very end of the day. Without artificial light, the open nature of the house in this period (with much of the insula still not fully developed) also suggests relatively open spaces within the neighbourhood and the wider city. The open nature of the house (e.g. the outward looking plan with colonnades to the east and south) also tentatively suggests this neighbourhood was a reasonably safe and secure place to live, where access to certain areas of the Casa del Chirurgo, i.e. the open colonnades, could have been relatively easy.

4.5.4: Phase 2 (A and B), c. 100 BCE – c. 25 BCE

At the beginning of Phase 2, around 100 BCE, the first major structural changes to this house took place. Changes were made in two distinct periods (A and B), both between c. 100 – 25 BCE. The first, Phase 2A, constituted the construction of a masonry wall following the north wall east-west and extending this wall to the *Vicolo di Narciso* (**Figure 4.28**). The construction of this new wall also enabled the owners of the adjacent Casa delle Vestali to create extra rooms at the rear of their property, which was also undergoing renovations at this time. One of the new rooms in the Casa delle Vestali had a high window for natural light which overlooked the garden of the Casa del Chirurgo. Some form of understanding or formal/legal agreement must have been reached between the owner/occupiers of both houses, prior to window being put in place with the construction of the north-eastern extension of the Casa del Chirurgo's northern boundary, creating new rooms in the Casa delle Vestali.

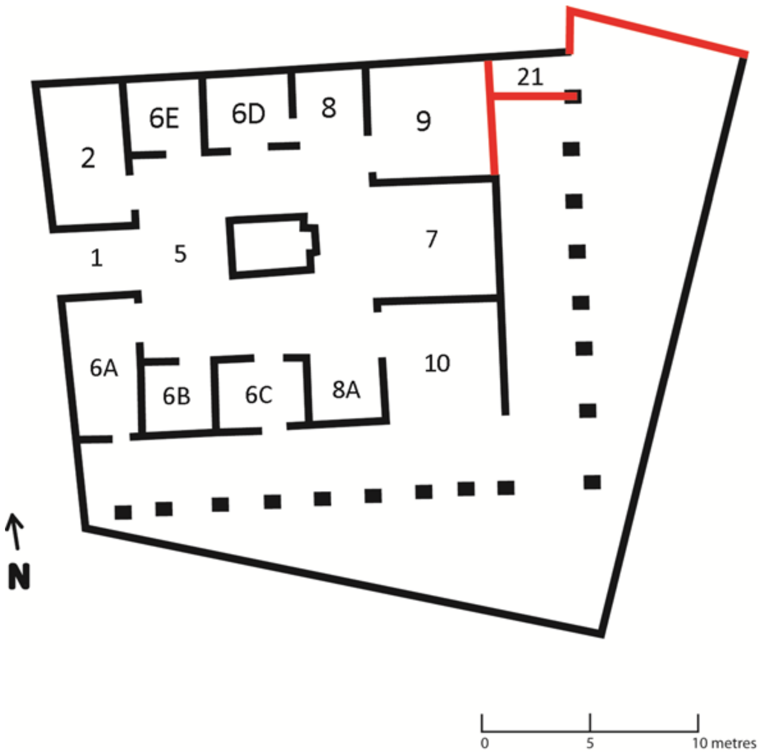


Figure 4.28. Phase 2A structural changes, c. 100 – c.25 BCE. Image: P. Murgatroyd.

The open eastern side of room 9 was blocked, and additional walls constructed in this northern end of the eastern colonnade to form room 21. A large window was inserted at the southern-quarter of the eastern wall of the small *triclinium* (room 9), which overlooked the covered portico and provided abundant natural light to the room (**Figure 4.29**).

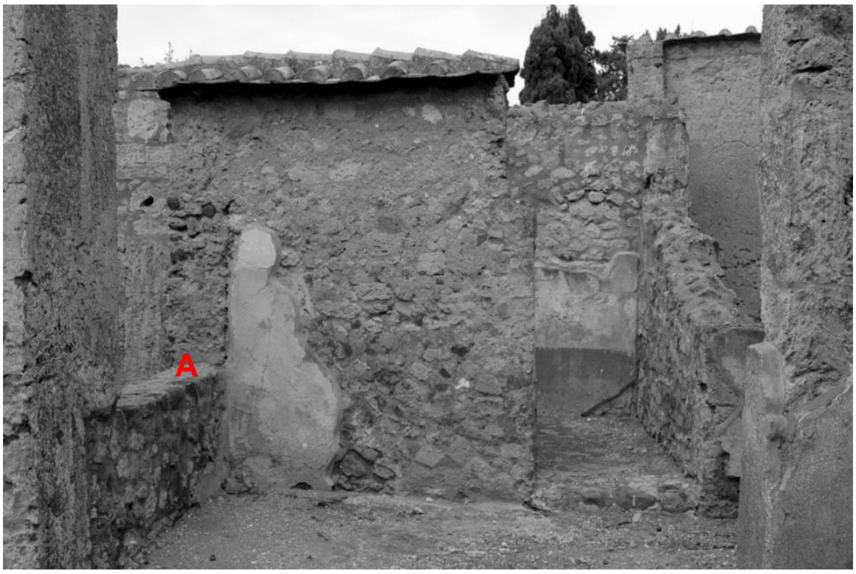


Figure 4.29. Room 21 (rear) and the small *triclinium* (room 9), left, with window (A) overlooking the portico. Image: AAPP archive.

During Phase 2B, the previous eastern boundary, which was probably a fence, was redefined as a masonry wall running the entire length (north-south) of the plot (**Figure 4.30**). This phase also saw new and further divisions of space in the south east corner. The large *triclinium* (room 10) was substantially enlarged, but was completely closed-off from the southern portico, and therefore access to natural light was severely restricted. Additional masonry walls were built in the south east corner to create the beginnings of a suite of rooms for service (e.g. the later, main kitchen for the house). These major changes modified the nature of the house, specifically with regards to its layout. The redevelopments required the removal of parts of both the southern and eastern colonnades, and the orientation of both the small and large *triclinia* (rooms 9 and 10) changed from outward to inward looking (**Figure 4.30**).

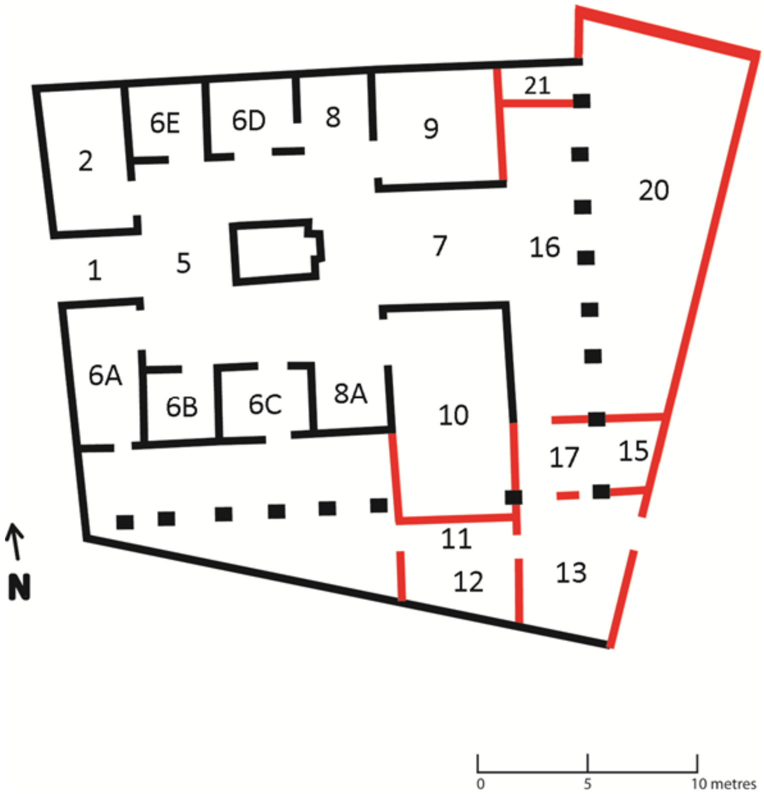


Figure 4.30. Phase 2B structural changes, c. 100 BCE – c.25 BCE. Image: P. Murgatroyd.

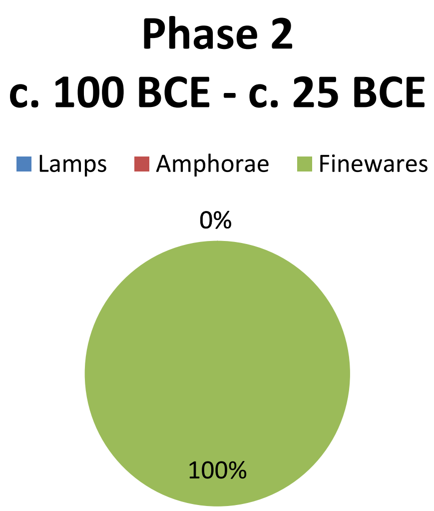


Figure 4.31. Phase 2, relative proportions of ceramic oil lamps, *amphorae*, and finewares (N = 7 EVEs).

The bulk pottery assemblage from this phase weighed only 4.9kg (see **Figure 4.1**), and there were no ceramic oil lamps or *amphorae* present. The overall lack of artefacts suggests that the structural changes made did not require large-scale levelling or the use of material remains to fill construction trenches. Also, most floor surfaces were paved during this time, which would have prevented large quantities of material remains entering the archaeological record. It is therefore impossible to make any conclusions regarding the consumption of artificial light during Phase 2, based solely on the artefact assemblage (**Figure 4.31**). However, the structural changes which took place did reduce the amounts of natural light to the inside of the house, with much of the south-east corner of the structure, previously part of the colonnaded garden area, given over to additional rooms (**Figure 4.30**).

4.5.5: Phase 3, c. 25 BCE – c.15/25 CE

This phase witnessed extensive structural modifications to many areas of this house (**Figure 4.32**). Alterations in the north-west corner took place to separate room 2 from the house to create a small workshop. The floor level of rooms 3 and 4 in the south-west corner were lowered significantly and doorways from rooms 6A, B, and C were blocked to create a separate shop. Upper floor rooms were created above rooms 2 and 3 (and possibly over part of the western rooms of the service suite), with access through a separate door and stairway between room 3 and the main house.

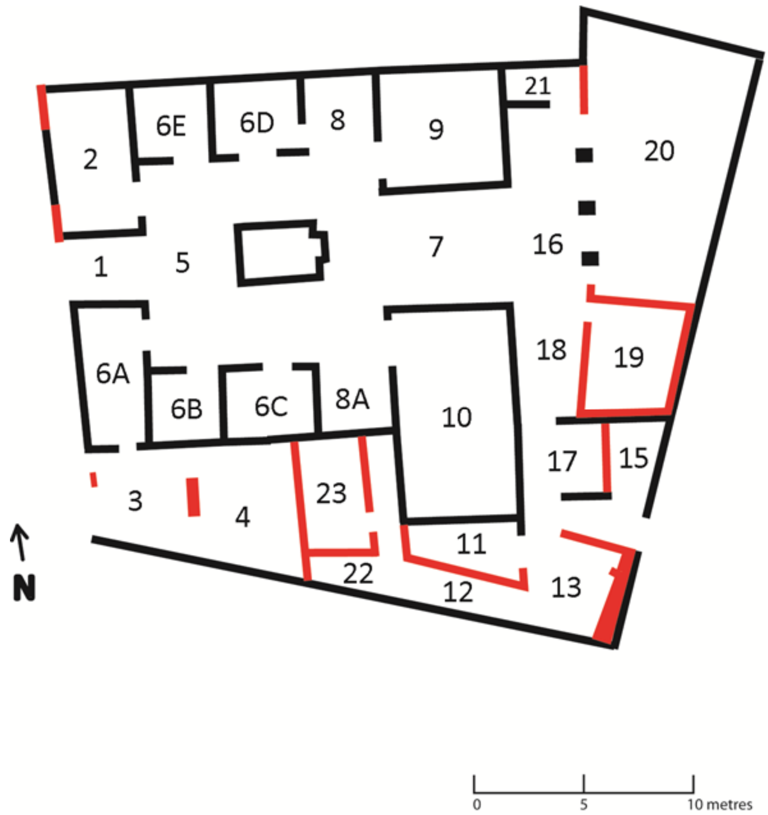


Figure 4.32. Phase 3 structural changes, c. 25 BCE – c. 15/25 CE. Image: P. Murgatroyd.

A range of new rooms were created in the southern and south-eastern parts of the house to form a service suite (**Figure 4.32**), with access from the atrium through a corridor (room 8a) and with a separate entrance at the rear of the house (presumably to enable staff to enter the house away from the main living areas), and access from this area to the newly created formal garden in the north-east corner. The creation of these rooms required the complete removal of the southern colonnade. The lack of windows in the walls of these service rooms must have made these areas within the house relatively dark, even during the day. The very small room 22 was left unroofed to create a light well for the service corridors, rooms 8a and 12. A new formal *oecus*, elaborately decorated and with a vaulted ceiling, was created (room 19) at the rear of the house and this had a large window overlooking the formal garden (**Figure 4.33**). Some of the eastern colonnade was retained as part of the formal garden and *oecus* area. The *tablinum* (room 7) was modified with a wooden partition inserted at its eastern end (**Figure 4.32**), enabling the occupants of the house to close-off the garden area during winter months, but also to open-up the main living areas as and when required, and allow these darker parts of the property to be flooded with natural light from the garden.

Figure 4.33. View over the garden from the window in room 19, Case del Chirurgo. Image: author.

Excavations of deposits from this phase generated the largest artefact assemblage from the entire history of the house. Over 182kgs of pottery were recovered (**Figure 4.1**), comprising 23 lamps, 21 *amphorae*, and 26 fineware vessels (by EVEs)(**Table 4.4**). The increase in the absolute numbers of artefacts recovered compared to the previous phases (**Table 4.4**) was substantial, but it is the significant rise in the relative proportion of lighting devices (33% compared to *amphorae* (30%)and ceramic finewares (37%)) that provides clear evidence for a dramatic increase in the consumption of artificial light during this time (**Figure 4.34**).

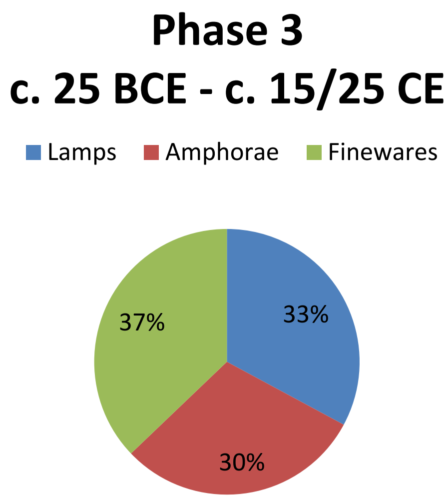


Figure 4.34. Phase 3, relative proportions of ceramic oil lamps, *amphorae*, and finewares (N = 70 EVEs).

This apparent substantial increase in the consumption of artificial light directly coincides with the major structural changes to the house. The structural changes substantially reduced the amount of natural light to many areas of house, with some parts intentionally constructed (e.g. the southern service rooms) without any access to sunlight (**Figure 4.35**). This evidence suggests that by the late 1st century BCE the use of, and fashion for, oil lamps had become an integral part of 'everyday' life, at least in this part of Pompeii, even influencing the architectural design of structures, providing the opportunity to create rooms without much access to natural light, which could have only been used through the provision of artificial light. The changes to the Casa del Chirurgo came at a time when the intensification of urbanisation in Pompeii, and in the wider Roman world, was taking place at a dramatic rate (e.g. Jones and Robinson, 2007).

Figure 4.35. Phase 3, 3D reconstruction of the Casa del Chirurgo. Image: P. Murgatroyd.

4.5.6: Phase 4, c. 25/40 CE to c. 62/3 CE

The main structural changes during this phase were the provision of additional upper floors above the shop/workshop (room 2) in the north-west corner of the house, and above the eastern service rooms. Some of the rooms around the *atrium* also received new stone thresholds and most of the house seems to have been redecorated in the contemporary Fourth Style.

Archaeological excavations of features from this phase resulted in a large artefact assemblage, with over 130kgs of pottery (**Figure 4.1**) which included 13 lamps, 26 *amphorae*, and 26 fineware vessels (by EVEs)(**Table 4.4**). While the same number (by EVEs) of *amphorae* and ceramic finewares were recovered, the absolute number of lamps is reduced from 23 to 13, which, as a relative proportion comprises a reduction from 33% to 20% of the assemblage (**Figure 4.36**). However, this may not necessarily have resulted in a reduction in the consumption of artificial light. The relative percentage of *amphorae* increases from 30% to 40% (**Figure 4.36**). As many of these vessels would have transported olive oil to Pompeii, this may suggest an increased and continued supply of light fuel.

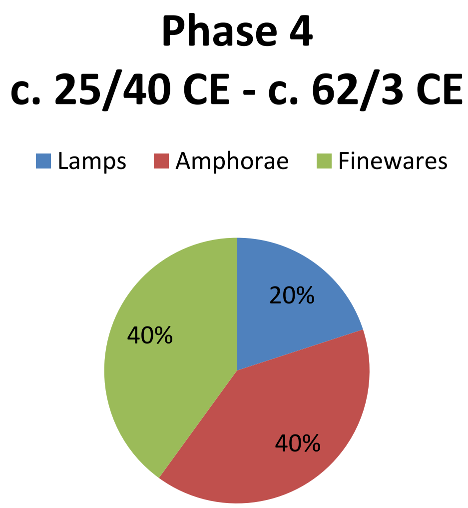


Figure 4.36. Phase 4, relative proportions of ceramic oil lamps, *amphorae*, and finewares (*N* = 65 EVEs).

There were relatively few structural changes to the ground floor rooms, and the addition of upper floor rooms would have further diminished the amount of natural light to the lower floors. After the productive 'boom' of the Augustan period, and once properties were well-furnished with lighting equipment, the demand for lamps may have diminished. While ceramic lamps were certainly broken on a, probably, regular basis, they would only need to be replaced individually. In order to provision a structure with artificial light, a regular supply of fuel was the primary requirement. The evidence from this phase tentatively suggests that this was the case: similar levels of lighting were provided as oil lamps could be re-fuelled and re-used many times as long as care was taken not to damage them. Therefore, fewer lamps did not necessarily result in less artificial light being consumed over time, as the number of *amphorae* suggests there was a constant supply of olive oil for lamp fuel (**Figure 4.36**and **Table 4.4**).

4.5.7: Phase 5, c. 62/63 CE to c. 79 CE

A major earthquake in the Vesuvian region, c. 62/63 CE (Coarelli 2002, 22), reportedly caused extensive damage throughout the city, and to the properties at Insula VI. 1 (including the Casa del Chirurgo) did not escape its ravages (Jones and Robinson 2007: 401). There was evidence for major damage to the Casa del Chirurgo, and the subsequent repairs in the final years before the eruption. Large post-holes were found in the atrium, where substantial posts had been used to support the roof (**Figure 4.37**), and there was also extensive damage to walls in the southern part of the house.

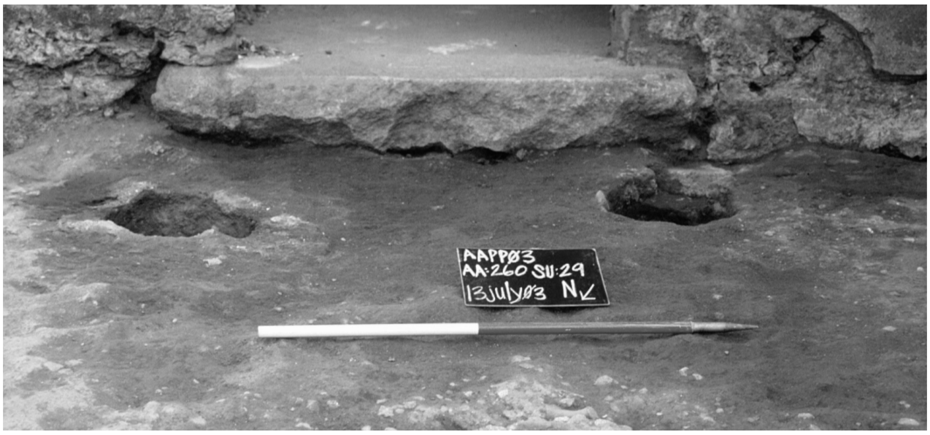


Figure 4.37. Post-holes in the floor of the *atrium,* Phase 5. Image: AAPP archive.

The mosaic floor of the *tablinum* (room 7) was damaged by debris and construction materials being dragged across the floor. A large lime-slaking tank was dug into the floor of room 6A for use in the preparing of construction materials (e.g. mortar and plaster). It was not completely clear whether the owners/occupiers had completed their repairs and/or if the house was fully occupied at the time of the eruption in 79 CE.

Excavations of features from Phase 5 produced an artefact assemblage of 78 kgs of pottery (**Figure 4.1**), which included 10 lamps, 17 *amphorae*, and 14 fineware vessels (by EVEs)(**Table 4.4**). While the assemblage from this phase was smaller than those in either Phases 3 or 4, there was little change in the relative proportions of lamps, *amphorae,* and ceramic finewares at 24%, 42% and 34% respectively (**Figure 4.38**). This suggests that while there must have been significant disruption in the urban fabric and infrastructure at Pompeii, the consumption of artificial light continued, as a relative proportion of household consumption, as it had for the previous 100 years or so.

Due to the early clearance of volcanic debris from Insula VI. 1 in the 18th and 19th centuries, and the poor excavation records from those programs of works, there was no artefactual evidence from the very final years of occupation leading up to 79 CE, in contrast to some parts of the city, where household assemblages were discovered in situ (see Chapter 5).

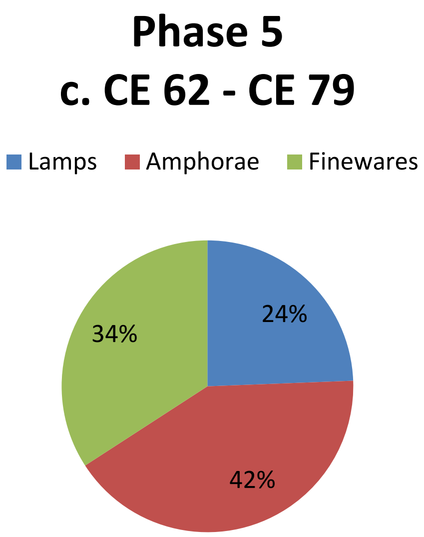


Figure 4.38. Phase 5, relative proportions of ceramic oil lamps, *amphorae*, and ceramic finewares (*N* = 41 EVEs).

4.8: Discussion

The construction of this house in c. 200 BCE resulted in a property which took advantage of its location at a highest point of the city, and had open colonnades to the south and east, to enjoy the fine views towards the sea and mountains. The construction and its occupation was at a time when the city was not as densely populated as it was in 79 CE. It was not until c. 100 BCE that the house underwent major renovations, with the addition of boundary outer-wall to the east (Phase 2b, **Figure 4.30**). Analysis of artefacts from this next phase is limited due to the very small sample size (**Figure 4.31**).

Around the beginning of the last quarter of the 1st century BCE, however, this property underwent extensive structural and functional changes (Phase 3, **Figures 32 & 35**). It became more inward-looking, with the southern colonnade completely removed, and the space to the south re-arranged to provide a service area and a separate commercial property. A 'domestic' room on the western side of the atrium was separated from the rest of the house to form a workshop. At this time, upper floor space at the house was portioned-off to provide for a first-floor residential apartment with separate access. These significant architectural developments severely restricted the amount of natural light into the house. During this phase we see a dramatic increase in the consumption of artificial light, with absolute increases in both lighting equipment and in fuel, transported in *amphorae*, with increases in relative proportions of lamps compared to *amphorae* and fine wares (**Figure 4.34**). The increased demand for artificial light during this phase directly corresponds to the reduction in access to natural light brought about by the structural developments at the house.

During the 1st century CE, though, we see a gradual reduction in the consumption of lighting equipment, but not necessarily artificial light. The relative proportion of lamps compared to amphorae (40%) (for lamp fuel) reduced from 33% in Phase 3 to 20% in Phase 4. In the following 50 years or so there were limited architectural changes beyond re-plastering and re-painting, with little or no evident domestic habitation at the house following the earthquake c. 62/63 CE. This resulted in a significant reduction in the number of objects present in the archaeological record from this time.

The structure developments and changes in the quantities of artificial light use at the house, over time, would have also corresponded with changes in the use of space within the property. During Phase 2 (a & b) the house continued to have access to large quantities of natural light along the southern and eastern porticos and in the *atrium.* From the end of the 1st century BCE until 79 CE (Phases 3 to 5) the house was very much changed and the only spaces with high levels of natural light were the *atrium* and garden area. Spatial analysis of artificial light use was not possible due the deposition processes of how the lighting device fragments entered the archaeological record (see above). However, the use of space within the house must have changed, for example, the south-eastern suite of rooms, which the excavators have identified as areas for food preparation and servants quarters, had very little access to natural light (only a small light well in the roof). This space must have been relatively dark even during the day, and once the sun had set artificial light would have been essential in order to use this area.

As will be discussed in Chapter 5, rooms at the rear of Pompeian houses which opened onto gardens were often the focus of activity during the evening and into the night (due to the presence of large quantities of lighting devices in some of these spaces). Perhaps room 19, which has a large window overlooking the garden, and was highly decorated, may have been the focus of nocturnal activity at the Casa del Chirurgo.

The shape of the *atrium* did not change and natural light continued to flood into this space throughout the entire history of the house. This space was perhaps the focus of much activity during the daytime; it may have been a place of reception for clients of the *paterfamilias,* and for conducting business during the morning (see Chapter 3 for discussion). As discussed by Allison (2004a: 146-8), cloth production often took place in the *atria* of Pompeian houses (where loom emplacements would have been located) and was an activity which was highly visible. There is strong evidence for this in the Casa del Chirurgo, where Cool comments on the fact that 38 lead loomweights were found in the courtyard of the house when it was cleared of the 79 CE volcanic debris on the 19th January 1771 (Fiorelli, 1860: 248 cited in Cool forthcoming). Cool has also analysed large quantities of cloth production implements (e.g. tools and loomweights) associated with the mid- 1st century CE developments at the house. While there were certainly practical reasons for this craft to take place in *atria* (e.g. access to natural light), (Cool, forthcoming) suggests that the acts weaving and cloth production in these spaces was to partly as an expression of the traditional values of the matron of the household by producing clothes for her family. For example, Livia (the wife of Augustus) projecting her public persona as matron of the house making her husband's clothes and teaching their daughter and grand-daughter how to weave and spin (Suetonius, *The Twelve Caesars* II.63, II.73).

The decision to convert a domestic room (room 2) to a workshop late in the 1st century BCE was a significant development at the house. The conversion of space to commercial use within a house was not uncommon, but the choice of this particular room may have been based on a number of factors: it was easily separated from the rest of the house; it opened onto one of the main thoroughfares of the city; and, the instillation of a wooden panelled door which could open to almost the full width of the room would have resulted in a very well naturally illuminated space. This suggests that whatever industrial activity took place in this room (most likely metalworking – see Anderson and Robinson, *forthcoming*) was undertaken during the day.

4.7: Conclusion

By using various categories of evidence (e.g. lighting equipment, fine tableware pottery, amphorae, stratigraphic and architectural evidence) the above analyses have identified chronological changes in the consumption of artificial light at the Casa del Chirurgo and in its neighbourhood. Analysis of the lighting devices alongside the structural remains has also provided hints at what activities may have taken place in certain spaces within the house, and when. The functional changes of some areas of the property, from domestic to commercial, created additional income potential for the owners, taking advantage of the wider socio-political stability and economic prosperity during the Augustan period. The intensification of urbanisation throughout the Roman world during this time coinciding with an economic boom, as witnessed by the dramatic increase in consumer goods from archaeological deposits and an increase in monumental architecture in Pompeii (Ling 2007, 119-128; Zanker 1998). This intensification of urbanisation was witnessed at Insula VI. 1 (Jones & Robinson 2007), with the structural changes to the Casa del Chirurgo being one example. This prompted the occupants to restrict the views in to the property, providing increased security and privacy, but consequently restricting their access to natural light and external views. This resulted in a dramatic increase in the demand and consumption of artificial light in the neighbourhood of the Casa del Chirurgo.

The research presented here demonstrates that access to light was an important consideration for the inhabitants of Casa del Chirurgo, and while one cannot say for certain that the ceramics analysed (including lamps, amphorae, and fine wares) were actually used by the occupants of the house, given the nature of archaeological deposition, they were probably consumed by populations in very close proximity. The general consumption patterns evident in the assemblage have demonstrated that changes in the consumption of artificial light correspond directly with the structural developments of the Casa del Chirurgo, the city of Pompeii, and the wider Roman world.

Chapter 5: Household Consumption of Artificial Light in 79 CE

5.1: Introduction

This chapter comprises a case-study that will focus on the consumption of artificial light in c. 79 CE in a sample of ten properties at Pompeii, by quantifying and then comparing the total number of potential flames per household divided by the total ground floor surface area of each house (**Table 5.1**). All properties in this sample are *atrium* houses, at least at their core, but often with peristyle gardens. Their main entrances opening on to a front hall (*atrium*) with a central water feature (*impluvium*) positioned beneath a roof with a central opening (*compluvium*), with rooms generally to all four sides. The open-roofed *atria* and peristyle gardens were the main sources of light within Pompeian houses (Wallace-Hadrill 1994, 82-3). It must also be stated here that rooms in Pompeian houses were often not as open and well-lit spaces as they appear in the surviving remains today. Most rooms had doors, shutters, curtains (e.g. Casa del Fabbro, below), and/or wooden partitions (e.g. Casa del Tramezzo di Legno at Herculaneum (Wallace-Hadrill 1994, 83, Figure 4.12). These features would have altered the amounts of natural light available, and the illumination of spaces through artificial light. By changing the shape of space, and directing natural and artificial light to specific areas within houses (using doors, shutters, partitions, and curtains), the inhabitants of these houses could focus nocturnal human activities and social interactions in specific lit areas as and when required, making the most of natural and artificial lighting conditions.

5.2: Pompeian households

Full descriptions for each house included in this sample, their floor plans, and their full artefact catalogues, can be found in Allison's research on Pompeian households (2004a & b), with additional detailed contextual analysis of the finds from the properties at the Insula of the Menander (House I 10, 8, Casa del Fabbro, Casa degli Amanti, and the Casa del Menandro) in Allison (2006a & b).

The primary source of evidence for any study of artificial light at Pompeii are the abundant lighting devices (lamps and lanterns) and associated equipment (such as chains, hooks, and lampstands) recovered from the volcanic deposits of the 79 CE eruption. The criteria for quantifying and comparing the consumption of artificial light at Pompeian households are based on an assessment of the potential number of flames of all the lighting devices found within a property. The potential numbers are then divided by the ground floor surface area (m^2) of that house, to provide a value of the potential number of flames per m^2 for all the houses in the sample (**Table 5.1**). There is a great deal of evidence for upper floors at many Pompeian houses, and these spaces would have significantly increased the floor surface area measurements. However, due to the fact that most only survive as fragmentary remains, it is very difficult to identify just how much 'extra' living space would have been provided. Therefore, only ground floor surface areas (including garden areas) will be used in this study. Lighting devices from the ten Pompeian houses will be considered alongside the architectural features of each property, such as access to natural light (windows and doors etc.), room orientation, and colour and type of decoration. These devices are then plotted spatially within the houses where the archaeological records allow (**Figures 5.1** to **5.8**). In section 5.3, there will be a house-by-house discussion, presented by house size (by ground floor surface area in M^2). The chapter will conclude (section 5.4) with a discussion and comparison on the consumption of artificial light in these Pompeian households in 79 CE.

House	Location	Floor surface area (m^2)	No. of lighting devices	Potential flames	Flames per M^2
Casa della Ara Massima	VI 16, 15	200	30	31	0.16
House I 10, 8	I 10, 8	265	10	12	0.05
Casa del Principe di Napoli	VI 15, 8	270	6	6	0.02
Casa dei Ceii	I 6, 15	300	14	14	0.05
Casa del Fabbro	I 10, 7	320	17	19	0.06
Casa degli Amanti	I 10, 11	520	10	10	0.02
Casa dell'Efebo	I 7, 10-12	650	35	57	0.09
House VIII 5,9	VIII 5,9	650	41	41	0.06
Casa di Julius Polybius	IX 13, 1-3	700	31	31	0.04
Casa del Menandro	I 10, 4	1800	48	50	0.03
Total			**242**	**271**	

Table 5.1. Lighting equipment from 10 Pompeian houses and ground-floor areas of these houses (79 CE deposits).

5.3: Analysis

5.3.1: Casa della Ara Massima

The Casa della Ara Massima (**Figure 5.1**) is located at VI 16, 15, and has a ground-floor area of approximately 200 m^2. Thirty lighting devices (27 ceramic and 3 bronze) were found at the house, with a potential for 31 flames; an average 0.16 artificial flames per m^2. This house is unique in this dataset, as it does not have a garden area. While there were no breaches in the walls of the property, excavators stated that the upper levels of the volcanic deposit may have been disturbed, suggesting at least some post-eruption investigations.

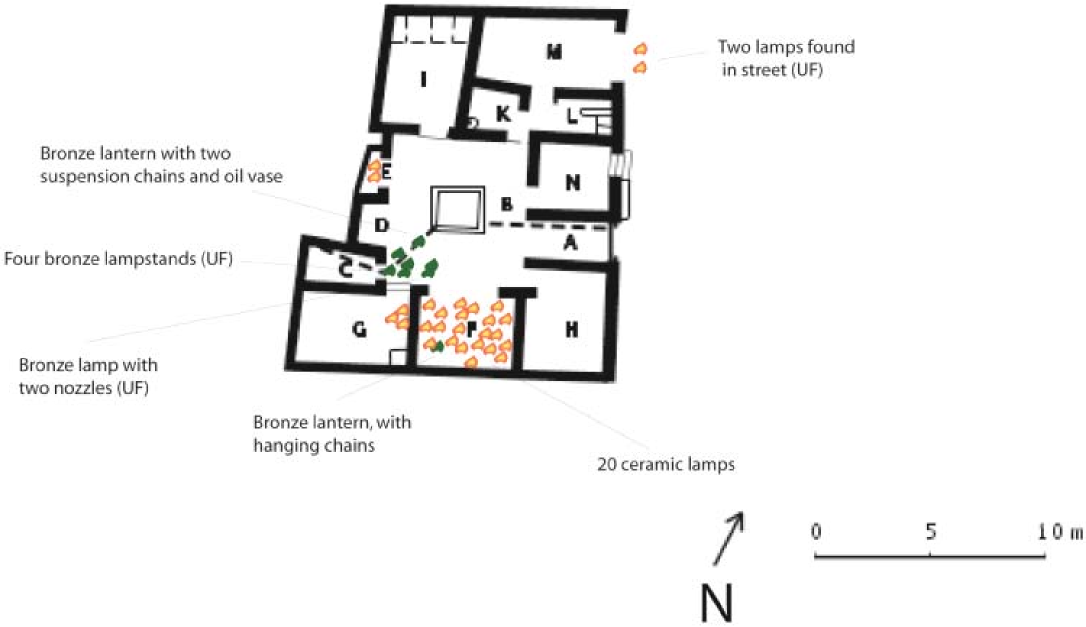


Figure 5.1. Spatial distribution of lighting equipment at Casa della Ara Massima (adapted from Allison 2004: Casa della Ara Massima plan).

The Casa della Ara Massima was seemingly the most brightly artificially lit house within this case study, but it is also the smallest. The number of lighting devices (which included two lanterns, the highest number of this type of lighting device in this sample), their high-status nature (bronze and ceramic, some with multiple nozzles and in elaborate forms), and the relatively large number of lampstands (only the Casa di Julius Polybius and Casa del Menandro had more, with five each (**Table 5.1**)), suggests that artificial light was consumed in large quantities. The four lampstands found in this property were all less than 0.2 m in height, suggesting they would have been placed upon furniture, rather than free standing. This evidence for artificial light suggests that for the inhabitants of the Casa della Ara Massima, after dark activities played an important part of their daily lives. Whether this was because they spent much of their time away from the house during daylight hours, or that they were great entertainers, once the sun had set, it is impossible to say.

The concentration of lighting devices in room F (20 ceramic oil lamps and 1 bronze lantern) warrants further analysis. This room has been described as both a *tablinum*

(Stemmer, 1992: 23) and a *triclinium* (Sogliano, 1908: 74). It was not clear what the function of the room was in the final years prior to the eruption (Allison 2006b). The presence of two iron feet with ivory decoration suggests the presence of furniture in this room, possibly a couch for dining or a bed for sleeping. However, the large collection of utilitarian items including 20 glass, 2 ceramic, and 2 bronze vessels, in addition to the 21 lighting devices; bronze discs possibly from a barrel; five guardispogli, possibly from a chest; a set of bronze scales with plates; a set of bronze tweezers; an amber figurine; an amulet; a bone hairpin; a gold earring and 103 glass beads from a necklace suggests it was a place of storage at the time of the eruption and may have been used as such for a number of years prior to this given the quantities of domestic items. Stemmer (1992, 42) states the decorated south wall was repaired after the earthquake in AD 62/3 to a lower standard than the existing elaborate Fourth Style, suggesting a change in function of the room to domestic storage. Therefore, the presence of a large quantity of lighting devices in room F does not necessarily suggest that this space was used extensively after dark. Nevertheless, the quantity of lighting devices in the Casa della Ara Massima suggests extensive activity in the house once the sun had set.

5.3.2: House I 10,8

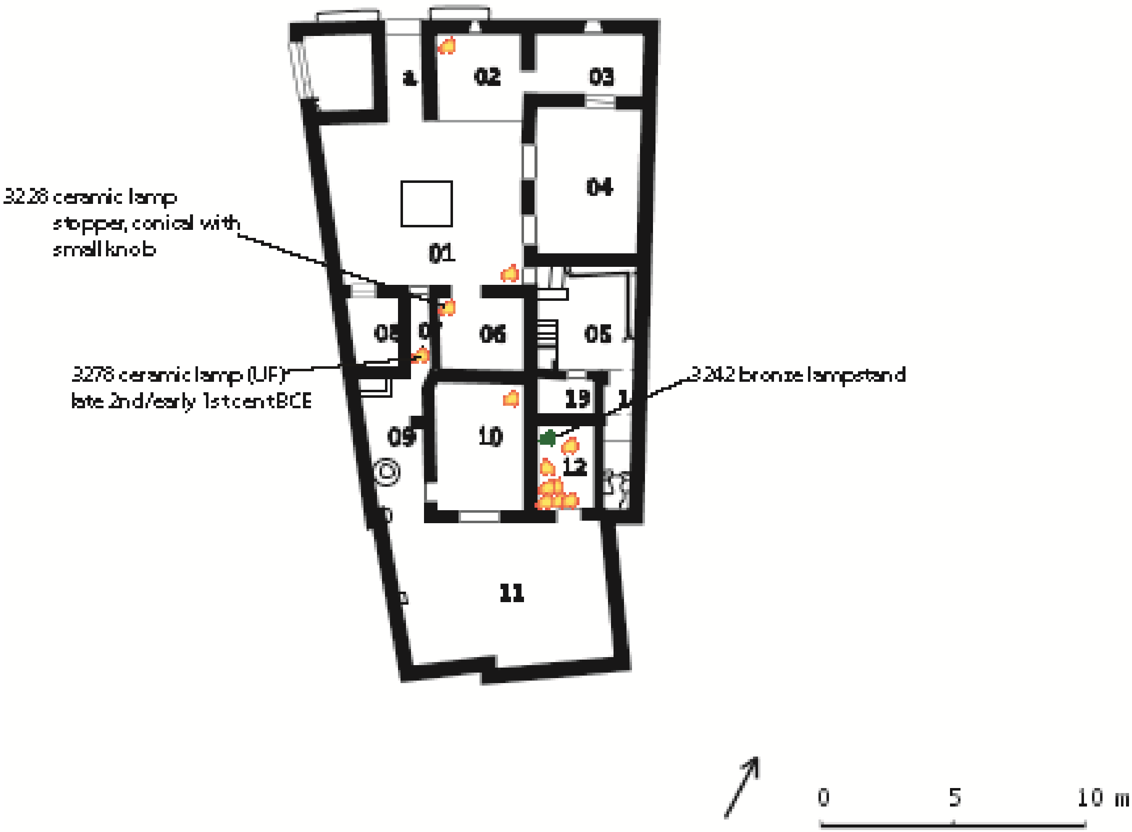


Figure 5.2. Spatial distribution of lighting equipment at House I 10,8 (adapted from Allison 2004: House I 10,8 plan).

House I 10, 8 (**Figure 5.2**), in the Insula del Menandro (I 10), has a ground floor surface area of approximately 265 m^2. Ten ceramic lighting devices were recovered, with a potential for 12 flames; an average 0.05 flames per m^2 (**Table 5.1**). The house had a front hall and rear garden, with rooms predominantly on its eastern side. There was evidence for heavy post-eruption disturbance with numerous wall breaches. While this house had significantly fewer lighting devices than the Casa della Ara Massima, the property was well furnished with natural light, flooding in through numerous windows (both internal and external). The possible utilitarian/industrial function of the some of the northern rooms (rooms 2, 3 and 4)(Ling 1997, 171-2), and the presence of numerous windows suggests that the majority of the activity here was undertaken during the day; whatever those activities may have been, they required large quantities of natural light. The main residential area of the property was located towards the rear (southern) half, and this was where the majority of the lighting devices were found (room 12). Impressions of wooden shelving on the undecorated walls suggest it was used for domestic storage. Elia (1934, 316) comments that this room may have originally been a *cubicula* connected to the *triclinium* (room 10) but was later used for storage, especially in the final years prior to the eruption. The very wide range of material had a diverse range of functions (see Allison 2006a for full list) including ceramic and bronze kitchen items; toilet items and jewellery; tools and a fishhook, and six ceramic oil lamps and a bronze lampstand.

While room 12 had the greatest concentration of lighting devices within this house, the room was most likely used for storage at the time of the eruption, and their presence does not necessarily indicate that this space was used extensively after dark (but may have been used in the large room 10 next door). However, rooms in other houses that open onto garden other houses also had concentrations of lighting devices (e.g. Casa di Julius Polybius, Casa del Fabbro, and the Casa del Menandro, below) which may indicate that these rooms and the spaces they opened onto were often in use after dark. The consumption of artificial light within this property was focused in the residential areas of the house towards the rear, implying that the industrial/commercial spaces in the front of the property were used predominantly during the day.

5.3.3: Casa del Principe di Napoli

Figure 5.3 Spatial distribution of lighting equipment at Casa del Principe di Napoli (adapted from Allison 2004: Casa del Principe di Napoli plan).

The Casa del Principe di Napoli (**Figure 5.3**) is located at VI 15, 8, and has a ground floor surface area of approximately 270 m^2. Six lighting devices (3 ceramic and 3 bronze) were found at the property, with a potential for 6 flames; an average of 0.02 artificial flames per m^2 (**Table 5.1**). The structure was excavated between 1896 and 1898, and the evidence for recovered artefacts is somewhat limited due to the relatively poor levels of recording.

While there was evidence for post-eruption disturbance at the property, a large number of relatively high-status objects were found, mainly furnished in bronze. Of the eight pieces of lighting equipment (six lamps and two lampstands), only three (of the lamps) were ceramic. Even though the lighting device assemblage from the Casa del Principe di Napoli was one of the smallest in this dataset, the relative proportion of the more valuable bronze items (over 50%), suggests that the wealth and status of the occupants of this fairly small '*atrium'* house was relatively high.

The relatively few recorded lighting devices from this house, especially those in ceramic, rather than indicating very low-levels of artificial light at the house was likely due to the poor recording at the time of excavation at the end of the 19th century. The house was naturally well lit during daylight hours, with room e opening fully on to the atrium and room f with a window opening on to garden n. The southern rooms had relatively large openings on to ambulatory I and, in turn, garden n. Even though only six lighting devices were found in this house, there was a concentration of three bronze lamps in room k in the south-east corner of the property, a room which opens onto an open space (ambulatory I) which in turn opens onto the garden area (n). This is a similar pattern already noted (above) in House I 10, 8 (room 12) and Casa della Ara Massima (room F). The relatively elaborate bronze lighting equipment found in a house of this size is interesting and may indicate that the consumption of artificial light, and how it was provisioned, was important to the occupants of this property.

There was also a small concentration of lighting devices (two lampstands and a ceramic oil lamp) in room a, a small undecorated room located in the north-east corner off of the atrium and next to the main entranceway, and had a staircase leading to the upper floors. A small collection of domestic items (ceramic and glass vessels and a lead weight) and five bronze coins were also recovered from this room. Artificial light would have been important in using this room after dark, as it was located next to the main entranceway and with a staircase to the upper floors – an area of potentially increased human activity, and may have been kept in this room for use upstairs.

5.3.4: Casa dei Ceii

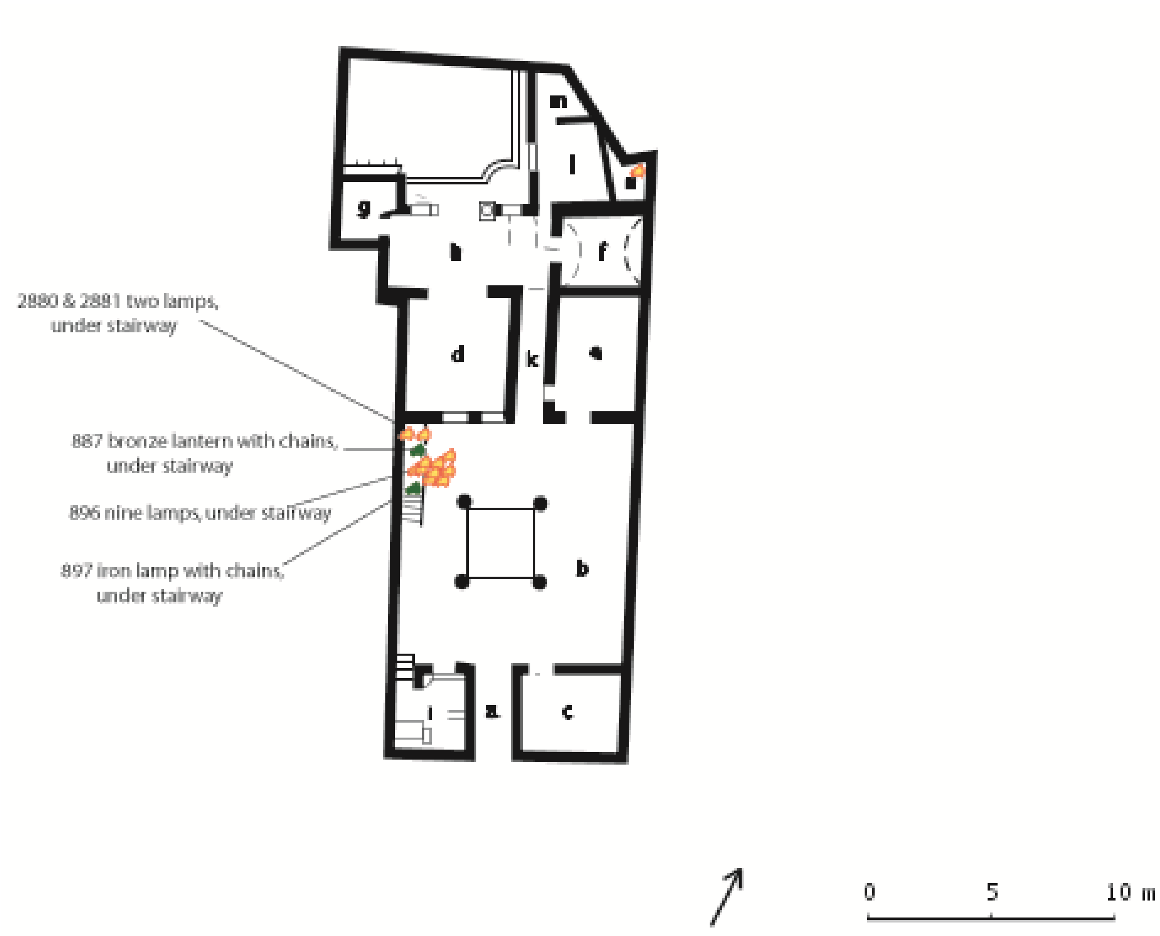


Figure 5.4. Spatial distribution of lighting equipment at Casa dei Ceii (adapted from Allison 2004: Casa dei Ceii plan).

The Casa dei Ceii (**Figure 5.4**) is located at I 6, 15, and has a ground-floor area approximately of c. 300m^2. Fourteen lighting devices (12 ceramic, 1 bronze and 1 iron) were found, with a potential for 14 flames; an average of 0.05 artificial flames per m^2 (**Table 5.1**). Due to the disturbed nature of the artefact assemblage from this house, spatial analysis for the use of artificial light within the property was not possible. The house was excavated between May 1913 and August 1914, and the excavators suggest heavy post-eruption disturbance in antiquity evident through the domestic artefact assemblage and its distribution. Nevertheless ten fragments of a ceramic lamp were found in room n, with the remaining 13 complete lighting devices found under the stairway in the northwest corner of the front hall. It was likely that the ancient looters never found the latter lamps due to their location and the previous excavators were not interested in the fragmentary remains found in room n.

The fact that 13 out of the 14 lighting devices were in storage (whether packed away in haste at the time of the eruption, for long-term storage during the spring and summer, for the times when the property was not occupied, or as spares), and the lack of lighting devices in the remainder of the house suggests that the Casa dei Ceii may actually have been relatively well furnished with lighting devices at the time of the eruption. Other domestic properties of similar ground-floor areas (such as the Casa del Fabbro and House I 10, 8, **Table 5.1**) had 0.06 and 0.05 flames per m^2 respectively. While there was abundant evidence for post-eruption looting, the inhabitants may well have fled the property with many of their more valuable and portable possessions, possibly including many lamps and lanterns.

5.3.5: Casa del Fabbro

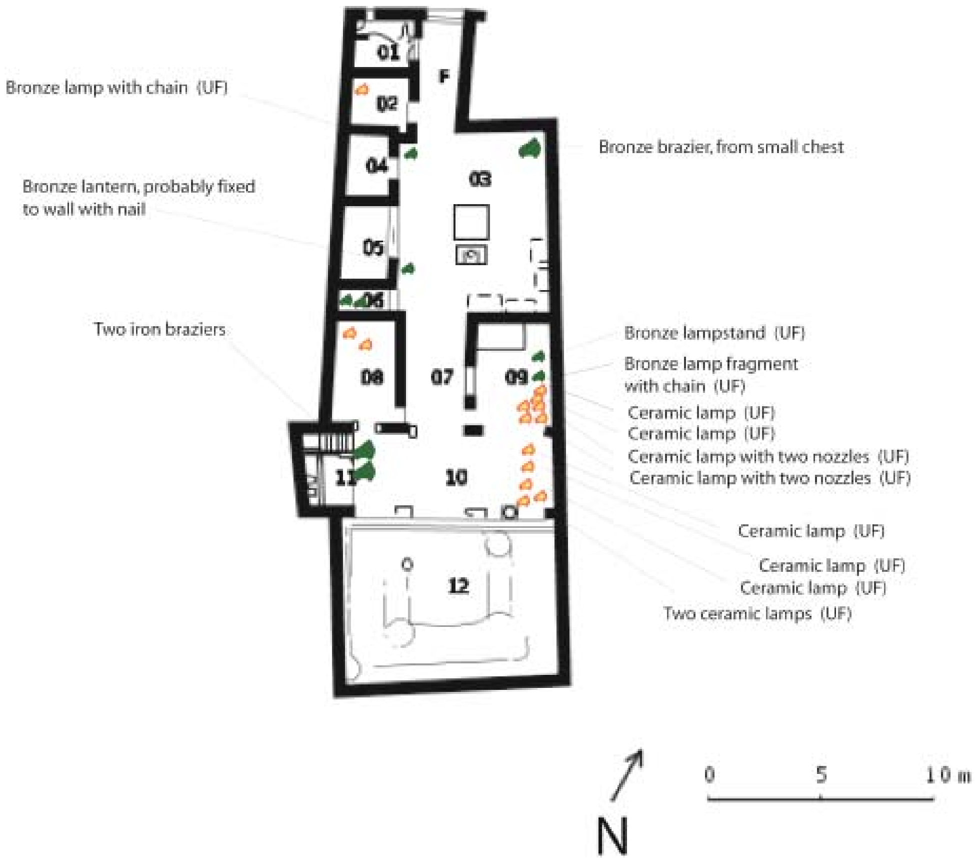


Figure 5.5. Spatial distribution of lighting equipment at Casa del Fabbro (adapted from Allison 2004: Casa del Fabbro plan).

Casa del Fabbro (**Figure 5.5**) is located at I 10, 7, west of the Casa del Menandro, and has a ground floor surface area of approximately 320 m^2. Seventeen lighting devices (12 ceramic and 5 bronze) were found, with a potential for 19 flames, and an average of 0.06 flames per m^2 (**Table 5.1**). The house has an unusual layout, and is entered from the street to the north (entranceway F), opening on to front hall 3, with a suite of rooms (1, 2, 4, 5, and 6) on the western side. Open, and immediately south of, front hall 3, was a wide corridor (room 7), with large rooms (8 and 9) to the east and west, leading to a large covered space (ambulatory 10), opening on to garden 12 (**Figure 5.5**).

In its latest phase, Ling (1997, 154) suggests that room 9 was used as a *triclinium* for dining and/or entertaining, with, possibly, a ritual function indicated by the presence of a domestic *lararium* in a niche. The remains of two human individuals were also found in this room, who presumably died while sheltering from the devastating effects of the eruption. The black painted walls, the presence of numerous lighting devices, the niche, the window in the north wall, and the almost completely open southern end of this room, suggest that this space (room 9), along with ambulatory 10 and garden 12, was used regularly during the evenings and into the night, taking maximum advantage of the setting sun for natural light. Once the sun had set, lighting devices would be lit and, in the colder months, a heavy curtain (Allison 2006, 342) could be pulled across the southern opening to provide additional shelter and privacy. The presence of a bed and other items of furniture (and fragments/furniture fittings), along with eight bronze vessels suggests this room was used for dining and entertaining on a regular basis after dark illuminated by artificial light. This suite of rooms (room 9, ambulatory 10, and garden 12) seems to have been the main focus of the household once the sun had set.

The occupants of this house appear to have consumed relatively high levels of artificial light when compared to others in the sample. They also possessed the highest number of bronze lighting devices (with five), even greater than the much larger Casa di Julius Polybius and Casa del Menandro (with three and four respectively).

5.3.6: Casa degli Amanti

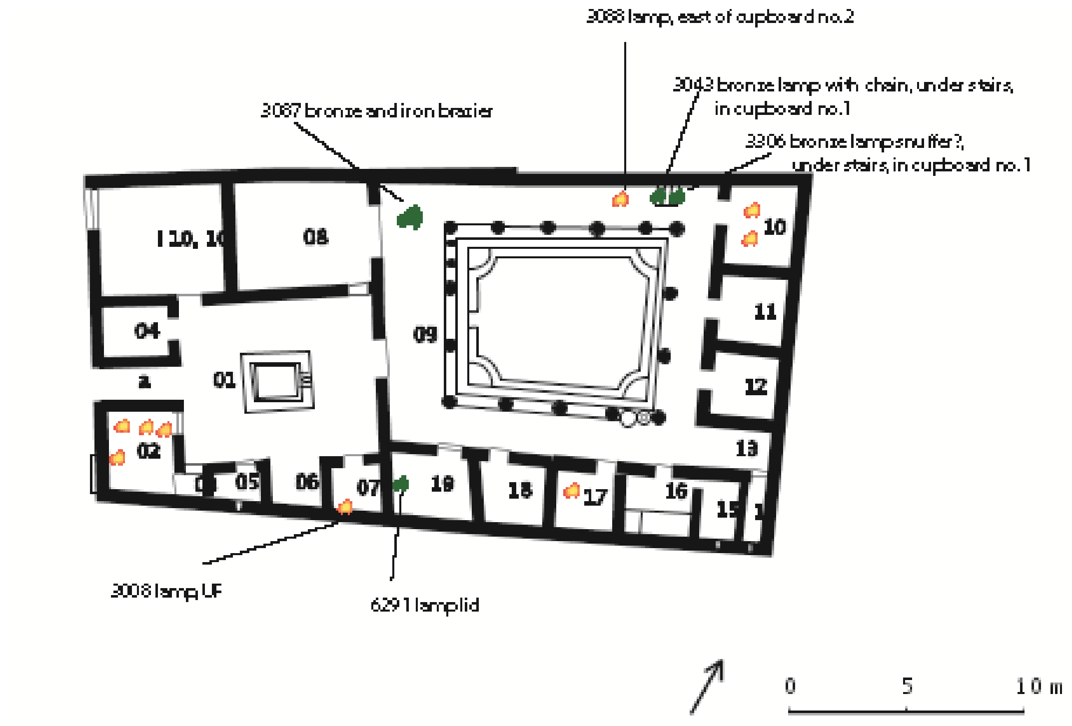


Figure 5.6. Spatial distribution of lighting equipment at Casa degli Amanti (adapted from Allison 2004: Casa degli Amanti plan).

The Casa degli Amanti (**Figure 5.6**) is located at I 10, 11, in the southwest corner of the Insula of the Menander, and has a ground floor surface area of approximately 520 m^2. Ten lighting devices were found (9 ceramic and 1 bronze), with a potential for 10 flames; an average of 0.02 artificial flames per m^2 (**Table 5.1**). The house had rooms on the upper floors above both the front-half of the house (the west), and the portico in the rear (the eastern peristyle garden).

The only entranceway into the property was from the west, and the house has a front hall and rear garden layout. There was heavy post-eruption disturbance at the property, which resulted in relatively few items of lighting equipment being found in a house of this size. Room 2 was located immediately adjacent to the entranceway and had a stairway leading to the upper floors. Four ceramic oil lamps were found in this room along with two ceramic vessels and a small altar (Allison 2006, 359). Allison

(2006, 233 & 359) notes that these four lamps are the only group from the insula (I 10) whose decorative images have a 'theme' with three have the same discus motif (the figure of a seated cross-legged male naked above the waist with a wing over the right shoulder with the left hand holding an object, possibly a staff or a banner, and the fourth is similar (a winged sphinx standing on two crossed branches). When considered alongside the altar found close by, then the lamps may have been used are part of a ritual ceremony within the house. The collection of lamps in a room next to the main entranceway with a stairway leading to upper floors is similar to those in the Casa del Principe di Napoli (above).

Garden 9

A range of artefacts were recovered from two wooden cupboards found underneath the stairway located at the northeast end of the northern ambulatory of the peristyle (garden 9). In cupboard no. 1, in addition to the lighting devices (a bronze lamp with chain and a bronze lamp snuffer) were a range of ceramic vessels including three jugs, two abbeveratoi, a small pot and an *amphoretta*; bronze items included a cone, tweezers, fitting, a forma di pasticceria, two coins; other finds included an iron hammer and a bone spindle. In cupboard no. 2 were two wooden pommels, one glass and one alabaster plate. Two *amphora* bases containing coloured earth and a ceramic oil lamp were found nearby. To the northwest end of the ambulatory was a small chest containing a wide range of domestic artefacts in storage; a bronze brazier was found close by.

Room 10

Room 10 is located in the northeast corner of garden 9 and close to the stairway mentioned above. The room was painted in the Fourth Style with a black socle zone, a red central area with central *aedicula*, with a white area above. The floor was of cocciopesto with a circle of *tesserae* in the centre. The room has a doorway in the west wall which opens onto the garden, and also a small internal window which would have allowed natural light into this space. Two ceramic oil lamps were recovered and a bronze stud. Two iron rods were also found. Allison notes that the iron rods were similar to some found in rooms 15 and 18 in the Casa del Menandro and may have been parts of a couch. This room was likely to have been a *cubiculum* (Ling 1997, 202). The decoration, lighting devices and possible remains of couches suggests that the function of this room was for dining, leisure, and/or for sleeping – which compare closely with similarly positioned, decorated and furnished rooms in the House I 10,8 (room 12), Casa del Principe di Napoli (room k), Casa del Fabbro (room 9), Casa di Julius Polybius (room EE), and the area in the southeast corner of the peristyle in the Casa del Menandro (rooms 21 and 22).

The Casa degli Amanti had the second lowest levels of artificial illumination in the sample, with 0.02 flames per m^2 (**Table 5.1**). Extensive post-eruption disturbance is evidenced in this house (23 wall breaches were recorded at the property) which suggests that many household objects had been removed. A single bronze lamp was recovered, but no lanterns or lampstands were present. The extensive upper-floor rooms would have had much more access to natural light than those below; the upper-floor above most parts of the house (and subsequent high roofs above the atrium and peristyle) must have made the ground-floor of this property a relatively dark place, even during the day.

5.3.7: Casa dell'Efebo

The Casa dell'Efebo (**Figure 5.7**) is located at I 7, 10-12, and has a ground floor surface area of approximately 650 m^2. Thirty-five ceramic lighting devices were found, with a potential for 57 flames; an average of 0.09 flames per m^2 (**Table 5.1**). Thirty-four of the thirty-five lighting devices were found in storage within rooms 13 and 14. It is therefore likely that the inhabitants of this house had stored many of their household goods prior to their escape from the city during the eruption (but some may have been spares). When in use, these lighting devices must have been well distributed throughout the house, but it is impossible to say how often these items were brought out for use, or where they may have been placed. Lighting equipment was generally highly-portable, and easy to put into, and take out of, storage at a moment's notice.

Figure 5.7. Spatial distribution of lighting equipment at Casa dell'Efebo (adapted from Allison 2004: Casa dell'Efebo plan).

There is uncertainty in the 'state' of occupation of this house at the time of the eruption. The excavators noted post-eruption disturbance and numerous artefacts on the street immediately outside. There were notable concentrations of material, of varying functions, in rooms 13 and 14 (utilitarian, luxury items, and the majority of the lighting devices); religious and luxury items in room 15 (such as a bronze altar, and a bronze statue of Efebo), while furniture had been removed from room 10. It has been suggested that this house was largely unoccupied at the time of the eruption (Allison, 2004b): the garden area was no longer functioning as an entertainment space but was used for the storage and preparation of building materials. Rooms 13, 14, 15, and 17 were used for the storage of salvaged materials and kitchen was not in use in 79 CE. While this evidence suggests abandonment, or, at least, a significantly reduced household, the rooms in the house and the masonry couch in the garden were decorated in a stylistically late Fourth Style, indicating possible occupation until close to the time of the eruption. The presence of a relatively large number of household items, some luxurious, suggests upheaval in occupation, but not necessarily abandonment. The material in storage may have been packed away by the occupants immediately prior to the eruption, resulting in a distorted distribution of artefacts throughout the house. However, even if the level of occupation at the house was reduced, the high-status of the occupants is reflected through a relatively high number of lighting equipment, the recently decorated areas in the house, and the presence of other valuable items (such as the bronze statue of an Efebo). While there were no bronze lighting devices, a number of the ceramic lamps were particularly impressive: two in the form of ships; two with ten nozzles, and one with five; one lamp in the form of a bearded man, and one of human feet. The lamp in the form of a bearded man was manufactured in clay with a lead-glazed surface, which was unusual for ceramic products. The lighting devices were evidently high-status (even if they were all ceramic). The two lamps in the form of ships may have floated on the water in the *impluvium*, with the reflections of the flame creating an ambient space.

The Casa dell'Efebo was a large house and was particularly well furnished for artificial light. It had the second-highest levels of artificial illumination in all of the houses in this sample (**Figure 5.1**). It seems that by the final stages of the eruption most household objects had been put into storage. Thirty-four of the thirty-five lighting devices were found in rooms 13 and 14, and other luxury items were found stored in room 15. The presence of obsidian panels (a very unusual elite decorative feature at Pompeii (Powers 2011, 10-32)), inserted in to the east wall of front hall A^{II}, also highlights the high-status of the inhabitants of this house, and the importance they placed on artificial and natural light. Obsidian and glass decorative panels have only been identified at three properties other than the Casa dell'Efebo; the Casa delFrutteto (I 9, 5); the Casa dello Specchio (IX 7, 18-19); and the Casa degli Amorini Dorati (VI 16, 7.38) (Powers 2011, 17). The panel in the Casa dell'Efebo is positioned at a point in the house where it would have maximized the reflective properties of the glass. Whilst Powers (2011, 19) suggests that the main functions of these glass panels were as decorative mirrors, for personal use, or for providing a decorative feature reflecting natural light during daylight hours, I posit that they could have been placed within walls to reflect the artificial light of a nearby lamp or lantern. The position of the panel near entranceway 11, in close proximity to the doorways into rooms 9 and 10, within front hall A^{II} (with its *impluvium*), suggests use after-dark, as lamps were often hung beside doorways and in these positions to maximize distribution of artificial light (see the Casa del Fabbro (**Figure 5.5**), where a lamp with hanging chain in the north west corner, and the bronze lantern, which may have been hung from a nail in the wall in the south west corner of front hall 3). Whilst it was not possible to analyse the spatial distribution of lighting devices within the house, due to their location in storage, the Casa dell'Efebo would have been brightly lit in antiquity, and its occupants would have paid particular attention to the provision of artificial illumination for their property, probably on a regular basis. The elaborate lamps, and exotic obsidian panel, highlight that after-dark activities played an important role in the daily lives of the house occupants, and this was likely an important expression of their wealth and status.

5.3.8: House VIII 5, 9

House VIII 5, 9 (**Figure 5.8**) is located at VIII 5, 9, and has a ground floor surface area of approximately 650 m^2. Forty-one ceramic lighting devices were found, with a potential for 41 flames; an average of 0.06 flames per m^2 (**Table 5.1**). While the owners of this property consumed relatively high levels of artificial light, based on the number of flames per m^2, **Figure 5.8** may be misleading due to an unusual collection of ceramic lighting devices found in room f. Two wooden chests were found in this room, one of which contained red earth, the other 37 ceramic cups with red and black glaze. A further 53 ceramic vessels (also with red and black glaze) were also found in this room, alongside 37 unused ceramic lamps (with single nozzles, and with varying dimensions ranging between c.79 – 130mm in diameter).These latter vessels and lamps had probably also been stored in a wooden box which had not survived. Whether these lamps (and the ceramic vessels) were for use within this house is uncertain, but other hoardings of utilitarian items are also witnessed at other properties throughout Pompeii, such as in the Casa dell'Efebo as discussed above. The presence of 37 ceramic lamps from a chest in room f does not necessarily point to their use in this house, as they were all unused. The fact that the lamps had not yet been used tentatively suggests that they were placed here for storage before being taken elsewhere for retail.

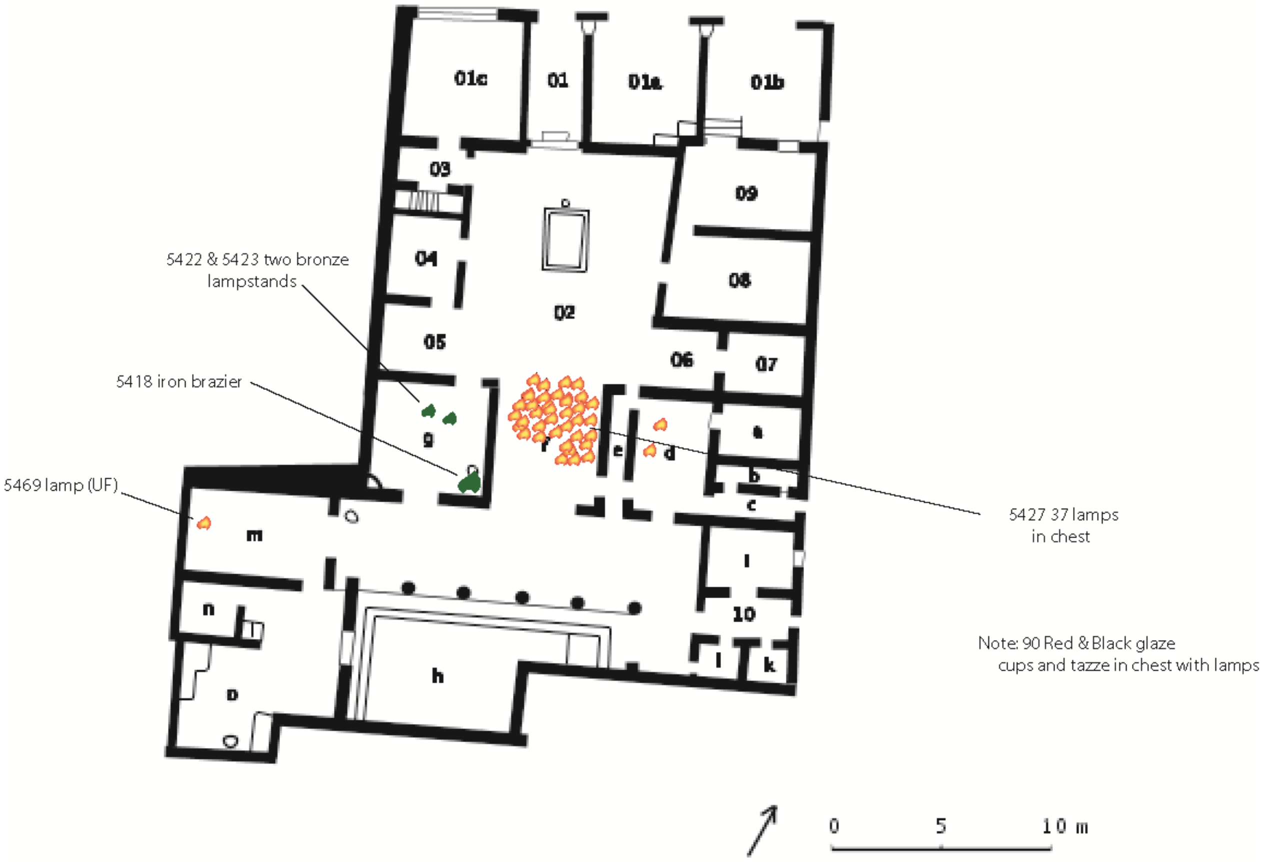


Figure 5.8. Spatial distribution of lighting equipment at House VIII 5, 9 (adapted from Allison 2004: House VIII 5,9 plan).

5.3.9: Casa di Julius Polybius

Figure 5.9. Spatial distribution of lighting equipment at Casa di Julius Polybius (adapted from Allison 2004: Casa di Julius Polybius plan).

The Casa di Julius Polybius (**Figure 5.9**) is located at IX 13, 1-3, on the north side of the Via dell'Abbondanza, and has a ground floor surface area of approximately 700 m^2. Thirty-one lighting devices (28 ceramic and 3 bronze) were found, with a potential for 31 flames; an average of 0.04 flames per m^2 (**Table 5.1**). The southern part of the house had two relatively distinct and separate functions: the west was possibly more commercial in nature; the east with a residential focus. Even though the house was very large, and had at one time been an elaborate property, it was not what one would consider elite accommodation as large parts of the house were given over to commercial activity. The lighting devices in the rooms around front hall O were well-distributed, with a few in the rooms in the western half around room N. The western 'commercial' area of the house, while having fewer lighting devices than the eastern area, has a number of internal windows and apertures which open onto other rooms within the property. This suggest that some spaces in this part of the house were not sufficiently naturally lit for whatever commercial enterprises were undertaken there, but that extra natural light was 'borrowed' from other rooms with more access to natural light, and that this indirect light was required for whatever tasks were undertaken.

The rear part of the house included a large garden area (CC) and covered portico, with rooms opening onto it at both the north and south sides, and seems to have been the main residential area (it was also likely that there were living quarters on the upper floors), and had a concentration of high-status domestic objects, found in room EE. This room had the greatest quantity of lighting devices within the house. The room opened onto the garden area, its walls and high vaulted ceiling were decorated with black and red wall paintings, and it had an ornate *cocciopesto* floor; this room was the most elaborate in the entire house. The numerous household artefacts found in room EE suggest that at the time of the eruption these may have been placed here for temporary storage. The presence of high-status lighting devices (particularly bronze lamps and lampstands) alongside a range of other objects which may be considered of similar status and including at least three beds/couched with bronze and bone decoration and a bronze seat or stool; possibly a cupboard or chest which may have contained the (at least) eight ceramic vessels; at least fifteen bronze vessels for storage and pouring/presentation; two bronze shell-shaped *forma di pasticceria*; three bronze plates and two cups; a bronze statuette of a puppy and a bronze statue of a male standing 1.3mts in height possibly holding a candelabra. This collection of predominantly bronze material, much of which may have been used for dining, within a room overlooking a large garden area (CC) and decorated with dark painted walls, all provide evidence for relatively high-status dining within this space. It is hypothesized here that many of the lighting devices stored here were intended for use in this room, or, at least, in very close proximity. The remains of beds/couches and numerous bronze lamps and lampstands suggest this was indeed a space for leisure and/or dining. Room (EE) was south facing and almost fully open onto the garden, taking advantage of sunlight for as long as possible during the day. This room, its orientation, location, and contents (see **Figure 5.10**, below), was similar to that in other houses with rooms opening onto garden areas (e.g. Casa del Fabbro, room 9, above, and Casa del Menandro, rooms 21 and 22, below).

Image removed for copyright reasons

Figure 5.10. Casa di Julius Polybius, room EE during excavation. Image: Pompeii photo archive neg. D14453, Ministero per i Beni e le Attività Culturali - Soprintendenza archeologica di Pompei, 1975 (ID: ph10_13)

Room M had the second greatest concentration of lighting devices with four ceramic lamps. This room was used for domestic storage, to which the presence of two cupboards and a masonry recess used for storage attests. The finds from this room were predominantly utilitarian and included numerous ceramic vessels (at least one jar and one jug) and many lids, a glass cup, some glass counters and a bronze ring.

Given the portable nature of lighting devices and lampstands, they were likely used extensively in the garden area, and in the rooms FF/II, GG, and HH to the north and AA, BB, UU, TT to the south, which opened onto it (and, indeed, anywhere within the house). The dark painted decoration on the walls in room EE and the high vaulted ceiling, suggests regular use of lamps; the dark paint minimizing the visual effects of sooting from the burning flames of lighting devices (*Vitruvius* VII, IV, 4). The rooms immediately to the east (FF, II and GG) were elaborately decorated with large areas painted in white and light coloured architectural features, such as plaster cornices and mouldings. Room HH, in the north east corner of the garden area, was decorated with black painted walls. The orientation of room HH, and its dark wall decoration, suggests a similar function to that of room EE. The elaborately decorated, in pale colours, rooms FF, II, and GG, were probably for use during daylight hours as spaces for occupation and shade during the summer months, with rooms EE and HH (with dark painted walls) used once the sun had set, or during the winter months, with their shorter days; this was where most of the lighting equipment was located. Whilst lighting devices are highly portable, there does seem to be a focus of such equipment in the rooms decorated with dark paint in this house (see also House I 10,8, room 12 (**Figure 5.2)**, and Casa del Fabbro, room 9 (**Figure 5.5**)), and in garden spaces and rooms which opened on to them.

5.3.10: Casa del Menandro

Figure 5.11. Spatial distribution of lighting equipment at Casa del Menandro (adapted from Allison 2004: Casa del Menandro plan).

The Casa del Menandro (**Figure 5.11**) is located at I 10, 4, and has a ground floor surface area of approximately 1800 m^2. Forty-eight lighting devices (44 ceramic and 4 bronze) were found, with a potential for 50 flames; an average of 0.03 flames per m^2 (**Table 5.1**). The Casa del Menandro is one of the largest houses in Pompeii. The house was excavated between November 1926 and June 1932, and the excavators took particular care in their recording of material and positions within the house. The artefact assemblage from the Casa del Menandro may be considered of one of the best representations of an *in situ* collection of material culture from any Roman household, and an extremely valuable resource in the study of the occupants of elite houses in the Vesuvian region, especially the daily lives of wealthy Pompeians at the time of the eruption in 79 CE.

The Casa del Menandro was by far the largest house in this study (**Table 5.1**), but had the second lowest levels of artificial illumination at 0.03 flames per m^2. However, it did have the most lighting devices, with 48 recorded. As in the Casa di Julius Polybius, there were distinct zones of activity within the house. The front hall (*atrium*) was particularly well-furnished with lighting devices, and was probably one of the main residential areas within the house. Rooms 1 and 2 were located either side of the main entranceway a and had similar concentrations of lighting devices as similarly position rooms in other houses (e.g. Casa del Principe di Napoli and Casa degli Amanti). Room 1 had two lamps and a small collection of other artefacts representing mixed domestic use (a broken bronze *casseruola*); a bronze handle and two rods; an iron lock and key; a bone pin and needle; and glass beads and counters. Room 2 had a stairway to the upper floors which ran along three of the walls, below these were three niches. There were a limited range of finds including 16 ceramic dishes (which had presumably been stored in one of the niches) and 3 locks. The three lamps recovered from this room were thought to have come from the upper floor based on their position within the volcanic deposits. These lamps highlight that this space was a place of regular activity giving access to the upper floors, both during the day and at night (as in the Casa del Principe and Casa degli Amanti). The narrow range of finds suggests it was a space to move through and for some domestic storage. Room 8 (*tablinum*) was a large space which opened on to both the front hall and peristyle, and could have been closed-off from either with large with a large partition or screen (Ling 1997, 49-50).

Eastern suite of rooms

Rooms along the eastern side of the north-south axis of corridor L were for occupation by part of the household engaged in commercial/industrial/agricultural activities, with tools and equipment forming a large part of the artefact assemblage (Allison 2006a). This suite of rooms was not well furnished or decorated with wall paintings, but there were quantities of lighting equipment, some of which may be considered as high-status (such as a bronze lamp and lampstand in room 43, a bronze lampstand on the threshold between room 40 and hall 41), and three lamps in a niche in hall 41. The three lamps in the niche in hall 41 may were likely part of a household shrine and used as part of a religious ceremony.

Rear and garden rooms

The other main areas with concentrations of lighting devices were along the southern side of garden area c, with multiple devices found in the alcove (room 22) and room 21 (**Figure 5.11**). The presence of these lighting devices and of an iron brazier in room 24, and a bronze brazier in the northern ambulatory close to the entrance to room 8 and front hall b beyond, suggest the garden area was regularly used after dark in the days prior to the eruption. The concentration of lighting devices in the open alcove space (room 22) indicates that lighting devices, which had likely been distributed in other areas of the garden, were put away in haste during the eruption. Room 21 was almost certainly a place for domestic storage, as the presence of two shelves on three of the walls attests. In addition to the lighting devices, the range of finds from this room suggests a mixed domestic function and include a small selection of ceramic, bronze, and glass vessels; parts of a lock from a box; and a lead weight. Room 22 was a small curved space located along the southern ambulatory of the garden and opening onto it. The space was highly decorated in the Fourth Style with a landscape of Diana and Actaeon. Six ceramic oil lamps were found in this room and only a very few other items (a ceramic plate and a lid), highlighting that this space, and most likely this whole southern garden area (given the presence of the many lighting devices in room 21 and the iron brazier in room 24) was used extensively after dark.

While the Casa del Menandro was a very large elite house, not all areas were in use at the time of the eruption. The entire bath suite in the south-west corner contained very few finds, when the volcanic debris was cleared, and no lighting equipment (**Figure 5.11**). The rooms and courtyard in the south-east corner of the property were also bereft of lighting devices, as were the suite of rooms (including room 19, a very large dining/entertaining space) along the eastern side of the peristyle garden area. The lighting devices found in the lower-floor rooms, beneath the bath suite were likely to have been semi-permanent features (along with the three braziers). The extremely valuable collection of silver artefacts (Painter, 2002) found in this room suggests secure storage, and maybe members of the household staff would have resided here as guards for the precious items stored within. Natural light and ventilation for these rooms was provided through light-wells which opened at floor level in the garden area (Ling 1997, 95); there was an iron brazier in room A for heating, and lighting devices were present in all of these rooms (A, B, C, and D). These rooms were probably only occupied on a semi-permanent basis.

The remains of ten people were found at the western end of the east-west axis of corridor L: this desperate group of people was using lamps and lanterns to aid their attempts to escape the house during the catastrophic events in 79 CE. At least one bronze lantern (possibly two), and a number of ceramic lamps were found next to the remains of these individuals, clearly highlighting the value of lighting equipment at this dark and dangerous time, and also how the unique deposition process of the eruption of Vesuvius directly influenced on the formation of household artefact assemblages, especially for lighting devices.

5.4: Discussion

On the basis of these densities of lighting equipment, the Casa della Ara Massima was the most brightly lit house within this case study, and was the only property without a garden area, therefore, reducing the amount of living space within the floor-surface area. The house also showed very little evidence for post-eruption disturbance (with no wall breaches), which may have influenced the number of lighting devices found. The Casa dei Ceii and the Casa del Fabbro were of similar size (300 m^2 and 320 m^2) and had similar levels of artificial light, at 0.05 and 0.06 flames per m^2, respectively. The lighting devices from the Casa del Fabbro were well distributed throughout the house, but there was a concentration towards the rear in the garden rooms 9 and 10, and the kitchen area (room 11), highlighting a particular focus for the use of these rooms opening on to an outside space after dark.

The Casa dell'Efebo was particularly well furnished with lighting devices (the number of lamp flames per m^2 was the second highest in this sample) and had the second-highest potential levels of artificial illumination (**Figure 5.7**). While it was not possible to analyse the spatial distribution of lighting devices throughout the Casa dell'Efebo, the house would have been brightly lit in antiquity, and its occupants would have paid particular attention to illuminating their property, most likely on a regular basis. The elaborate lamps and exotic obsidian panel highlight that nocturnal activities were important in their daily lives, and was likely an overt expression of their wealth and status.

While the Casa di Julius Polybius was a very large elite house, by the time of the eruption, it seems to have been in a state of flux, in regards to function, and undergoing repairs and restoration following the earthquake of AD62/3, with some areas being used for commercial activities. The mixed-use of residential and commercial activity in the house may explain the relatively low figure of 0.04 potential flames per m^2, when compared with the other properties in this sample. The lack of lighting devices in commercial areas shows that these probably took place during the day. There seems to have been a strict division been commerce and domestic life, with work stopping at sunset, and staff either leaving for their own accommodation elsewhere, or retiring to the residential areas within the house where artificial lights were more numerous.

While the Casa del Menandro was the largest property within this sample, it had the third lowest potential levels of artificial illumination with 0.03 flames per m^2. This low figure is mainly due to the floor area for this house including a large part that was non-residential, such as the market garden in the south-west corner (garden 50), and the stables in the south-east corner (29 to 34). The bath suite (rooms 45 to 48) was completely out of use, and the rooms along the eastern side of garden c seem to have gone out of use by the time of the eruption. No lighting devices were found in the latter location. The bath suite, market garden and stables form almost a one third of the floor-surface area of the house, and if one uses only the residential parts of the house for calculating household consumption of artificial light, there would have been 0.04 flames per m^2, rather than 0.03 flames per m^2. The rooms surrounding the front hall seem to have been well illuminated, but some lighting devices probably come from upper-floor rooms above this part of the house, where possibly sleeping quarters were located. There was a concentration of lighting devices in the rooms along the eastern boundary of the property, most likely the living quarters of staff or slaves. Most of these rooms were not decorated, but had access to natural light through windows or doorways facing the street. The staff and slaves residing here were engaged in some forms of industrial activities, and horticulture and/or local agriculture (suggested by the presence of a range of agricultural tools found here). Whatever activities were taking place in the rooms along the eastern edge, especially those to the north of the house, they required high levels of natural light. The presence of lighting devices, some even high status (two bronze lampstands and a bronze lamp), suggests a continued need for artificial light for the staff and slaves to continue their tasks once the sun had set. If the house was largely unoccupied by the owners and their families, then the remaining occupants were consuming high levels of artificial light for their own personal benefit (something they may not have been able to do when the house was fully occupied).

Front Halls

Within households there seems to have been some temporo-spatial use of certain spaces for different aspects of social action. Six out of the seven households, where spatial analysis for lighting devices was possible to a high level, had lighting devices in rooms near the main entrance to the house (Casa della Ara Massima (two lamps were recovered immediately outside one of the two entranceways into the property), House I 10, 8, Casa del Principe di Napoli, Casa del Fabbro, Casa degli Amanti, and the Casa del Menandro). The main entranceways into these houses would have been subject to heavy foot traffic, and having lighting devices located in the rooms close to these areas would have enabled access to artificial light upon entering or leaving the property. In addition, these rooms may also have functioned as places for household staff or slaves to inhabit (both during the day and night) to welcome visitors and as security to restrict access to the house. A rapid access to artificial light would have been essential during the night for both of these situations.

However, front halls (*atria*) in the Pompeian households in this study tended not have been used much after dark. Only the Casa della Ara Massima and the Casa del Menandro (in both the front hall of the main residence (room b) and the smaller hall (room 41) in the eastern suite of rooms) have more than a single lighting device. Front halls in *atrium* houses at Pompeii had access to quite high-levels of natural light through the aperture in the roof in the centre of the room (*compluvium*), and it may be suggested that only certain household activities took place in these spaces and only during daylight hours. Front halls were public spaces and as noted by Martial (4.8; 3.36) (see Chapter 3, Section 3.3.1), the *paterfamilias* would receive his clients early in the morning, with the front hall (and rooms off of these) being a place of reception. As discussed in Chapter 4, the front halls of Pompeian houses were often used for weaving and sowing (Allison, 2004a: 146-148). A well-lit space was necessary for these types of household crafts, but front halls were also used in part for display of elaborate decoration and high status goods. The presence of large number of lighting devices in the front hall of the Casa della Ara Massima may have been due to the absence of a garden area, with this space being used as such with the elaborately decorated large room (F) opening onto it (similar to other rooms which open onto garden areas or porticos, which are discussed below).

Some *atria* (e.g. the Casa di Julius Polybius and House I 10, 8), and the rooms surrounding them, were used for commercial activity. In the Casa di Julius Polybius, front hall C and hall N, and their surrounding rooms, were used in such ways; maximising their access to natural light by the addition of two external windows (front hall C) and numerous internal windows (and a light-well in room Nk). The front-western portion of this house had very few lighting devices, suggesting that once the work of the day was finished in these spaces the occupants relocated to the residential areas of the property in the eastern and northern parts. In House I 10, 8, room 2 was fully open onto the front hall and had an external window; room 3 was accessed through a door way from room 2 and had an external window and an internal aperture into room 4; and room 4 had two large windows into the front hall. Most of the lighting devices were found in the rooms towards the rear of this house.

Cubicula

The label *cubicula* has often been assumed to refer to bedrooms, but there are issues in assigning room function based on such terminology (Allison 2007, 271). In this thesis the author will use the label *cubicula* to describe small closed rooms located around front halls and peristyles. While some may well have function as bedrooms (see Nissinen 2009, 85) these rooms most likely had a wide range of functions and were both decorated and undecorated (Allison 2007, 271-2). Very few *cubicula* within the houses in this study had lighting devices (e.g. Casa della Ara Massima, room E; Casa del Fabbro, room 2; Casa degli Amanti, rooms 7, 17, and 19; Casa di Julius Polybius, rooms M, P, S, Y, and W, and the Casa del Menandro, rooms 35, 37 and 43 - all of which are located in the eastern suite of rooms while no lighting devices were found in *cubicula* around the front hall (b) in the main part of the house). There may have been a number of reasons for the lack of lighting devices in these rooms. Even if some of these spaces were indeed bedrooms (see Nissinen 2009, 85-107 for full discussion), artificial light was certainly not necessary to aid ones sleep. The *cubicula* which had other functions may have also only been used during the day, given their locations in well and naturally illuminated front halls and peristyles. If, as one assumes, the occupants of Pompeian houses went to their sleeping quarters after dark, then perhaps a lighting device was only necessary to help guide their way. The general small size of *cubicula,* and often with poor ventilation, would have resulted in the space becoming filled with lamp smoke and soot in a relatively short period of time. However, Propertius (*Eliges* II, 15) wrote of a lamp beside the bed where he and his partner lie and talk, with more leisurely activities taking place between the two once the light is extinguished, therefore, lamps were certainly used in bedrooms.

It is beyond the scope of this thesis to explore fully the function of *cubicula*. The presence of lighting devices within only a few of these rooms is interesting, but it is difficult to provide any definitive answers for this. Perhaps their size and lack of ventilation was the main reason for their absence. While Columella (1, 6, 1) suggests that winter *cubicula* in rural villas should be orientated towards the south-east to maximise sunlight during the winter months, this was certainly not always possible due to the dense concentration of buildings within an urban setting.

Garden rooms for dining, leisure and entertainment

In all of the houses in this sample, where spatial analysis was possible, there were concentrations of lighting devices towards the rear garden areas of the properties (House I 10, 8, Casa del Principe di Napoli, Casa del Fabbro, Casa degli Amanti, Casa di Julius Polybius, and the Casa del Menandro). While the Casa della Ara Massima does not have a garden, room F would have provided a space similar to those discussed in this section, opening onto the front hall. These concentrations suggest that after dark activities within these structures were primarily a social time, for family and friends, within the most private domestic areas, well away from the more 'public' areas of the front hall. Martial (4.8) comments that the ninth hour was the time for dinner and it does seem that the dining and entertaining rooms which opened onto garden areas were places with a particular focus for night-time activity. In Petronius' description of *Trimalchio's* dinner party there are numerous mentions of an artificially illuminated dining room (*Satyricon* 30; 64; 73; 74), and it is clear that the meal was taking place after dark and continued through the night until dawn (*Satyricon* 74).

These dining and entertaining rooms are often located in the most private areas of the house, generally opening on to garden areas (e.g. room 12, House I 10, 8; room 9, Casa del Fabbro) or covered porticoes/surrounding garden areas (e.g. room EE, Casa di Julius Polybius and rooms 21 and 22, Casa del Menandro). The decoration of these rooms seems to confirm Vitruvius' comments on winter dining rooms: painted walls in these rooms were generally in black or dark red, and faced south to take advantage of as much natural light as possible. The concentrations of lighting devices close to outside spaces suggests that these were a focus of more leisured nocturnal activity, rather than domestic maintenance kind, at least in the final days before the eruption. These areas were open-roofed and would have been naturally brighter spaces than *atria* (front halls) and the rooms surrounding them. As the sun set and the evening drew darker these spaces continued to be used facilitated by the artificial light from lamps and lanterns.

5.5: Conclusions

The analyses carried out in this chapter suggest that the greatest quantity for the consumption of artificial light, at a household level, was around 0.09 flames per m^2. Even in the very large houses at Pompeii, only parts (although, probably sometimes substantial areas) were illuminated with lighting devices, distributed as and when required to produce light. All of the households in this sample had numerous lighting devices, highlighting widespread consumption of artificial light, and indicating that the night was not a time of darkness and inactivity. An affordable supply of lighting devices and fuel meant that the times of the day which had previously been periods of inactivity, due to the lack of sunlight, were now utilised and enjoyed (if one could afford it). Lamps and lanterns became particularly important to the individuals fleeing the city during the final stages of the eruption in 79 CE, and to those who stayed behind (such as the ten people who died in corridor L, the Casa del Menandro), when vast quantities of ash emanating from the volcano meant it was dark even during the day.

Also, valuable objects, such as bronze lamps and lampstands, were likely to have been removed from many households during this final catastrophe. The problems of inaccurate recording of finds during excavations at Pompeii has also influenced our understandings of the quantities of lighting devices (and other artefacts) left *in situ*. Even when these issues are considered, the sheer wealth of data provides a multitude of opportunities for comparative contextual studies. One must also acknowledge that the inclusion of upper floors in this study would have certainly increased the amount of calculated living space within a household (but most were destroyed during the eruption). Much of the living accommodation may have been located on upper floors, but these areas may have also been separate dwellings entirely (possibly for rent), and it is clear that some lighting devices considered in this chapter would have been used in these rooms.

Many ancient sources comment that room orientation and their intended functions (mostly in rural villas) were heavily influenced by the season and the amounts of natural light available (e.g. Pliny the Younger, *Ep.* 5.6 and Columella (1, 6, 1). This would have been difficult in a densely packed urban environment, such as Pompeii, where space was at a premium and room orientation was often irrelevant as houses had multiple storeys and high walls restricting views. Surrounding structures would have severely restricted natural light within households, especially early in the morning and evenings. The use of artificial light made room orientation for natural light almost irrelevant, and would have facilitated after dark activities anywhere within a house. However, there does seem to be distinct areas within households where activities were separated dependent on the time of the day and access to natural light. It is proposed here that time was separated into public and private, as were some areas within Pompeian households, with, perhaps, gender and class divisions. The business of the day was conducted in the morning by the *paterfamilias* and his clients in the front hall and adjacent areas, with perhaps the matron and other females of the households undertaking cloth production and other activities once the front hall had been vacated (by the senior males and visitors) for the day. Front halls were also used as purely commercial spaces, for example, in the Casa di Julius Polybius (see above), where good lighting conditions were utilised. Private (i.e. family, close friends and associates) activities would then move towards the more 'private' space at the rear of the house during the evening and continue into the night with the provision of artificial light.

The portable nature of Roman lighting equipment within a house brought about increased levels of comfort, warmth and security for its inhabitants, although, staff and slaves within these households were unlikely to have felt the benefits in the same way. Instead, artificial light may have extended their working days, perhaps with domestic chores beginning before dawn, preparing the household ready for when the masters awoke, and continuing their tasks once the sun had set and the family had retired (e.g. cleaning-up after a late night dinner). Darkness may have formed a psychological barrier within Pompeian households, restricting social interaction to certain areas, and at certain times of the day and year. The amount of sunlight varies significantly from season to season, from as few as 9 hours per day in the winter months to as much 15 hours during the summer. The consumption of artificial light would also have seen great seasonal variations, with wealthier Pompeians keen to show that the length of the day did not really matter, to them, and that they could overcome the natural world to continue their daily lives even when the sun had set.

Chapter 6: Commercialisation of the Night at Pompeii

6.1: Introduction and methodology

The ancient economy is a subject with a long history of lively debate for scholars of the classical world (e.g. Finley, 1985; Mattingly and Salmon, 2001; Bowman and Wilson, 2009; 2011; 2013b). The dynamic nature of the ancient city provided opportunities for large numbers, and a wide variety of, financial transactions, acting as *foci* for local, regional and long-distance trade and the exchange of goods and services. While there have been great strides made in our understanding of the complexities of the ancient economy, the concept of a 'nocturnal economy' has not previously been considered. The physical act of consuming artificial light instantly has commercial ramifications through the production and supply of light fuel and lighting devices. In addition, the use of artificial light had the potential to increase the income of commercial enterprises without the need for structural expansion (through extended trading hours). This would have been especially important during winter months when the number of daylight hours were at their lowest (as few as 9 hours per day).

This chapter is organised by three main themes, each of which would have significantly influenced the nocturnal economy at Pompeii and beyond. The first theme (Section 6.2) examines the production of lighting devices and associated equipment. The ceramic oil lamps from Insula VI. 1 (dating between c. 300 BCE to c. 70 CE) examined by the author will be analysed quantitatively to identify changes over time in the numbers of vessels produced and consumed in the neighbourhood. They will also be considered according to their method of manufacture and any technological changes in their composition. In concluding this section, high-status lighting devices (e.g. metal devices and lampstands) from the 79 CE eruption levels deposits will be assessed to asses if it is possible to identify relative wealth and status between households, based on the relative proportions of metal and ceramic lighting devices.

The second theme (Section 6.3) explores a variety of contexts at Pompeii where the use of artificial light would have had clear commercial implications, whether directly involved in trade and exchange after dark, e.g. shops and bars, or, indirectly, through the economic consequences of its consumption, for example, in domestic and religious environments. The concept of a nocturnal economy at Pompeii derives from the presence of lighting equipment recovered from various structures (e.g. house, shops, and bath houses) in the city, identified through the archaeological excavation of the volcanic deposits dating to the eruption of Mount Vesuvius in 79 CE. A range of commercial contexts are explored with a discussion of the archaeological evidence for lighting equipment, alongside other evidence, such as epigraphic and historical, relevant to function of these structures as part of the Pompeian economy. The concept of a nocturnal economy relates not solely to commercial enterprises open and trading after dark, but also includes the consumption of light fuel and lighting equipment in residential contexts (structures whose primary function was not residential, such as shops and workshops, where employees/slaves may also have resided).

The third theme (Section 6.4) explores the many events (based on evidence originally derived from ancient written sources) which regularly took place in the city which would have significantly, if temporarily, increased the population, almost certainly resulting in increased business for the many commercial enterprises throughout Pompeii. This chapter will conclude (Section 6.5) with a discussion of how all of these themes combined to form a vibrant aspect of the urban economy by extending the day.

6.2: Lighting equipment

6.2.1: The production of lighting devices and associated equipment

The production and trade of everyday objects has received much attention in studies of the Roman economy (e.g. Mac Mahon and Price, 2005). Roman lighting equipment was manufactured in a range of materials including ceramic, metals (bronze, iron, and even gold), stone, and even glass (Bailey, 1975; 1980; 1988; 1996); the majority were manufactured in clay. As noted in Chapter 2, Section 2.3.1, the majority of ceramic oil lamps in Roman Mediterranean urban centres were produced close to their intended markets, There is evidence for the production of ceramic oil lamps at Pompeii with the presence of at least two workshops (see Chapter 2, Section 2.3.1). In the first instance ceramic lamps and lamp moulds were recovered from a small workshop at I 20, 3. The second workshop, at II 3, 9, was a small workshop just outside the Porta Ercolano (Cerulli Irelli, 1977: 53-72; Peña and McCallum, 2009: 57-79). The presence of large quantities of ceramic oil lamps from most excavations at Pompeii suggest that these were the predominant type (by material) of lighting devices used in this ancient city.

Evidence from the secure stratified deposits during excavations at Insula VI. 1 (AAPP) recovered a total of 477 occurrences (accessioned ceramic oil lamp fragments) representing 159 estimated vessel equivalents (EVEs) from seven structures with domestic, commercial, and religious functions. Five phases of human activity had been identified (Anderson and Robinson, forthcoming), spanning almost 400 years (**Table 6.1**). All of the lighting devices recovered from Insula VI. I were manufactured in clay; there was no evidence for metal devices, or any associated metal equipment.

Date-range	No. of Lamps (EVEs)
c. 300 - 100 BCE	7
c. 100 - 25 BCE	47
c. 25 BCE – 25 CE	62
c. 25 – 79 CE	43
Total	**159**

Table 6.1. The ceramic oil lamps from Insula VI.1 (Appendices 1 and 2).

There were relatively few traces across the entire insula for structures dating from the third to first-half of second centuries BCE (a few un-mortared walls constructed upon compacted earth surfaces) (Jones and Robinson, 2007: 389-390). The major structural developments took place from the early to mid-second century BCE, with much remodelling and redecoration taking place throughout the entire history of the insula until its destruction in 79 CE (Jones and Robinson, 2007: 389-406).

Only seven lamps (by EVEs) were recovered from deposits dating between 300 – 100 BCE (**Table 6.1**). However, after this period, there was a dramatic increase in the number of lamps (47 EVEs) present in deposits dating between 100 – 25 BCE. Over the next50 years or so (c. 25 BCE – 25CE), the quantities of lamps increased substantially to 62 (EVEs). This growth in the number of ceramic oil lamps in circulation coincides with a period of dramatic increase in wealth and prosperity at Pompeii, and also with a time of increased structural development and intensification of occupation at Insula VI. 1. In the deposits dating from c. 25 CE until the eruption of Mount Vesuvius in 79 CE, 43 (EVEs) ceramic oil lamps were recovered. This decrease in the quantity of lamps does not necessarily indicate that less artificial light was consumed during this period and may be due to a number of factors. One possible explanation may be the fact that once a lamp was produced it had a potentially long use-life; therefore, following a surge in production between c. 25 BCE and 25 CE, fewer new lighting devices may have been required, with existing ones fuelled by continuing supplies of olive oil. A second explanation is that there were fewer major structural changes during this period, resulting in less need for large quantities of rubble for use as levelling layers and construction fills (i.e. waste deposits including such items as broken bricks and roof tiles, and large quantities of pottery and other rubbish produced by the inhabitants of the city).

6.2.2: Ceramic oil lamps; specialization and productive efficiency

Analysis of the 477 occurrences (159 EVEs) ceramic oil lamps from Insula VI. 1 revealed chronological changes in their physical composition without significant change in their forms or how they would have functioned. The main change was the shift from predominantly wheel-made, thick-bodied lamps (with c. 4-5mm wall thickness), towards fine, mould-made lamps with thin-bodies (with approximately c. 1-2 mm wall thickness)(**Figure 6.1a, b** and **c**). This change also brought about a general increase in the size and fuel capacity of the ceramic oil lamps. For example, the coarse, thick-walled lamp **320-61-60062** (**Figure 6.1a**), has a fuel capacity of c. 15ml, enough to burn for approximately one hour, and the thin-walled lamp **323-63-14695** (**Figure 6.1b**), has a fuel capacity of c. 30ml, which could have burned for approximately two hours before refuelling. In addition, the thick-walled lamp (above) weighs 66g (with its handle missing), and the thin-walled lamp weighs 64g; by using the same quantity of clay a lamp with twice the fuel capacity had been produced, which could have provided artificial light for double the amount of time before requiring refuelling.

Figure 6.1a. **Figure 6.1b.**

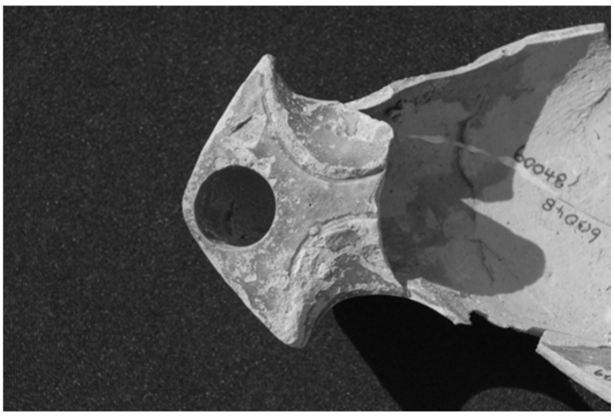


Figure 6.1c

Figures 6.1a, b and **c**: **a**) thick-walled lamp (**320-61-60062**), **b**) thin-walled lamp (**323-63-14695**), and **c**) broken thin-walled ceramic oil lamp, Insula VI.1, Pompeii. Images: author.

While seemingly a small change, this modification in production methods would have had commercial implications for the producers of ceramic oil lamps. During the third and second centuries BCE, all lamps found at the insula where wheel-made and thick-bodied, however, the sample of only 7 vessels is small. Production of mould-made thin-walled lamps began in the first century BCE, and within a relatively short time, formed 47% of the assemblage. Around the time of Augustus (27 BCE – 14 CE), there was an increase in the absolute quantities of lamps used within the neighbourhood of Insula VI. 1, with mould-made thin-walled vessels forming 62% of all lighting devices. This shift to predominantly thin-walled lighting devices continued from around 25 CE until the destruction of the city in 79CE; during this final period of activity at Pompeii thin-walled lamps formed 84% of the total assemblage (**Figure 6.2**).

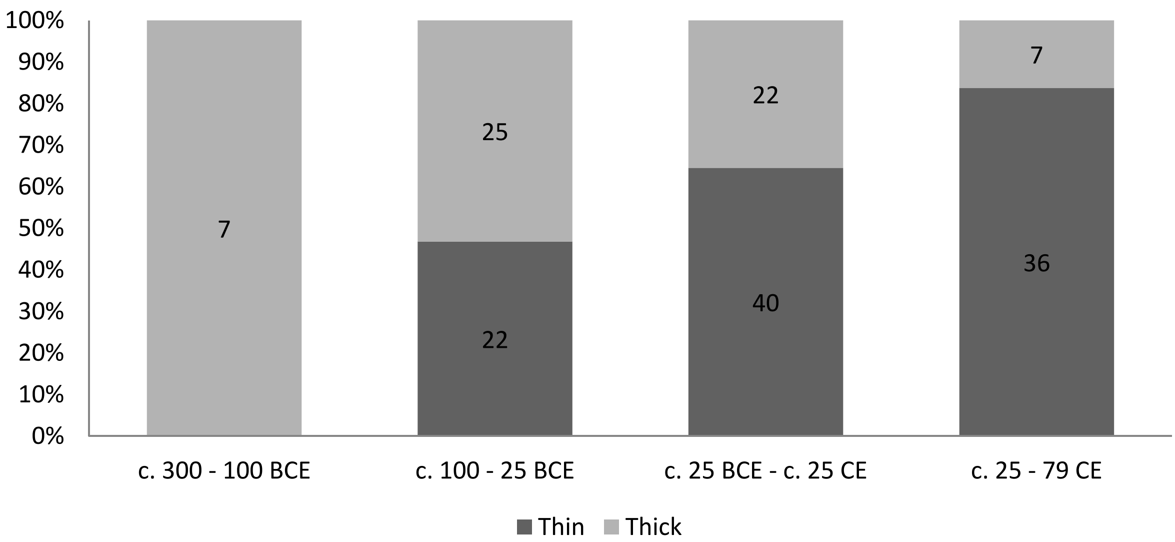


Figure 6.2. Relative proportions of thick-walled and thin-walled ceramic oil lamps from Insula VI. 1 (n = 159).

During the first century BCE (probably around the second and third quarters) the ceramic oil lamps from Insula VI. 1 showed a change in their production methods and composition. The earlier thick-bodied lamps were predominantly wheel-made, some of which were highly decorated glazed and slipped devices, but the majority were coarse undecorated vessels with rough surfaces (e.g. **Figure 6.1a**). As is evident in **Figure 6.2**, once this change had occurred, it was not reversed.

Even though there were changes in manufacturing techniques, the clays and additional temper (inclusions) used to produce ceramic oil lamps were essentially the same as those used before (see Appendices 1 and 2). The clays were from local sources and the mineral inclusions (also locally sourced) added as part of the production process (and those present naturally within the clays) were homogenous in the majority of the lamp fabric types identified in Chapter 4. However, in order to produce very thin-walled vessels, the mineral inclusions present were ground much finer than those in earlier coarse thick-walled vessels (otherwise they may have protruded through the vessel surface and produced a much less refined object which would have been difficult to coat with a slip for decoration). The fabric composition of the majority of the ceramic oil lamps recovered from Insula VI. 1 were very similar to other locally produced pottery (this observation is based on the authors own research on the pottery assemblage from the Casa del Chirurgo (Griffiths *et al. forthcoming*)), especially the coarsewares and the thin-walled tablewares. The thin-walled drinking cups, beakers, and bowls recovered from the insula share many of the characteristics of the thin-walled ceramic oil lamps such as fabric composition and often with a decorative slip.

Alongside the substantial increase in the quantities of ceramic oil lamp produced during the final quarter of the first century BCE (**Table 6.1**) and into the first century CE, the shift from thick-walled to thin-walled shows a focus on efficiency in their production; both of these factors had the potential to substantially increase profits for the producers of ceramic lighting devices. The presence of thick-walled lamps in later deposits was likely due to their very robust nature, and, as such, they were likely in use for long periods of time because they were not easily broken. Additionally, the presence of thick-walled lamps does not necessarily suggest that they were manufactured during these later periods, and, one sees a clear pattern with a gradual reduction in their relative proportion of the lighting device assemblage from the last quarter of first century BCE onwards (**Figure 6.2**). The majority of the thin-walled mould-made lamps were decorated with an applied 'slipped' and 'glossy' surface in red or red/brown, often with a decorative central discus (**Figure 6.3**). These items were produced in significant quantities from the second-half of the first century BCE onwards throughout the Roman world, when the production of thick-bodied lamps comes to an abrupt end.

Figure 6.3. Ceramic oil lamp with decorated discus (**263-27-13107**, Insula VI. 1, Pompeii). Image: author.

The commercial implications of changing production methods for ceramic oil lamp producers were significant, for this shift in manufacturing process, which may be perceived as small, would have significantly reduced production costs. Firstly, once a lamp mould was produced, fine and decorated lamps could be mass produced with relatively unskilled labour. Secondly, because the body of the lamp was now very thin (often less than 1mm), less clay (a commodity) was required. Thirdly, a thin-bodied ceramic vessel requires much less firing time in a kiln, therefore, improving productivity and reducing the quantities of fuel required for the kiln. The raw materials and sources of power required for the production of ceramic oil lamps, in the forms of human energy and kiln fuel (predominantly wood and charcoal) (Wilson 2012, 137-151), but also (possibly) olive press cakes (pith), formed the majority of the costs associated with the manufacturing process. A more efficient use of the raw materials, workers, and fuel, in the production of ceramic oil lamps, would have resulted in greater profits for producers. This shift in the manufacturing process may have been driven with the aim of ensuring the workshop was more efficient, but because it also coincides with a significant increase in the quantities of the lighting devices in use at Pompeii, it may also have been to facilitate the increased demands during a period of economic growth and increased prosperity.

As noted in Chapter 2, Section 2. 3. 1, the marking of ceramic oil lamps by producers did not begin in earnest until the later part of the first century CE. This is supported by evidence from Insula VI. 1, where only 11 examples were identified from 477 lamp fragments (**Table 6.2** and Appendix 1 for details). All were either impressed dots (e.g. Acc. No. 24520) or lines (Acc. No. 50460), or single letter (e.g. M (Acc. No. 23474) or P (Acc. No. 40987)) – none had a makers' name common on later *Firmalampen* which may indicate that most lamps recovered from Insula VI. 1 were locally produced).

Property	**Occurrence**	**Stamped**
Triclinium	146	0
The Inn	37	4
Casa del Chirurgo	141	5
The Shrine	67	1
Bar of Acisculus	10	0
Bar of Phoebus	20	1
The Well/Fountain	56	0
Total	**477**	**11**

Table 6.2. The number of examples of ceramic oil lamps with maker's marks from eight properties at Insula VI. 1.

6.2.3: High-status objects, metal lighting equipment

This section will discuss the use of metal lighting equipment (e.g. lamps, lanterns, and lampstands) from domestic contexts used in the years immediately prior to, and including, 79 CE, as a means to understanding their production and distribution. Given that no metal lighting devices were recovered from excavations of sub-floor archaeological deposits at Insula VI. 1, it is impossible (from the evidence utilised in this thesis) to address the chronological development and growth for the use of these metal objects. These objects were considered high-status due to fact that their cost was certainly significantly higher than the more common ceramic oil lamps. While there is evidence from workshops in Pompeii where metal objects were produced (Pirson, 2007: 466), there are no specific indications for the manufacture of metal lighting equipment anywhere within the city. However, objects recovered from a workshop outside the Porta Vesuvio in the 19th century included an under-life-size statue of an *ephebe* that had been adapted for use as a lampstand and was undergoing repair (Pirson, 2007: 467).

In contrast to the ceramic material recovered from the 79 CE contexts considered in **Figure 6.4**, there were no metal lighting devices or associated equipment recovered from excavations of any period in any part of Insula VI. 1. However, this absence of metal lighting equipment does not necessarily indicate that there were no metal pieces used in the neighbourhood of Insula VI. 1 during the almost four hundred years of activity, but was probably the result of the extensive recycling of metal items during the Roman period, resulting in very few pieces entering the archaeological record. Collection of damaged and broken metal objects for recycling was common in the ancient world, and these items were significantly more robust and not easily damaged, broken and discarded, to enter the archaeological record in the same way as ceramic items; these factors certainly played important roles in the formation of artefact assemblages at Pompeii. In addition, the removal of valuable personal objects as people fled the city, especially lighting devices to guide their way through the dark city during the eruption, had a significant impact on the quantity of high-status metal objects in the archaeological record.

If one examines the lighting equipment from the 10 Pompeian households considered in Chapter 5, where all archaeological deposits date to the eruption in 79 CE, it is clear that there was diversity in the use of metal lighting equipment when compared to those in ceramic. The overall assemblage (from the 10 properties, consisted of 262 items (including lamps, lanterns, lampstands, and hanging chains/hooks). Metal lighting equipment formed 15.6% (41 items) of the overall assemblage (**Figure 6.4**). This phenomenon broadly corresponds with the relative proportions of ceramic and metal tablewares (e.g. serving and tableware vessels) from the same 10 households (**Figure 6.5**). For example, the properties with high proportions of ceramic lighting equipment (e.g. House I 10, 8 and Casa di Julius Polybius) also had similar proportions of ceramic tablewares. In addition, those properties with high proportions of metal lighting equipment (e.g. Casa del Principe di Napoli and Casa del Fabbro) also have very similar proportions of metal tablewares (**Figure 6.5**). It does seem that the relative proportions of domestic items in metal or ceramic may have been a general indicator of wealth and status for ancient Pompeians.

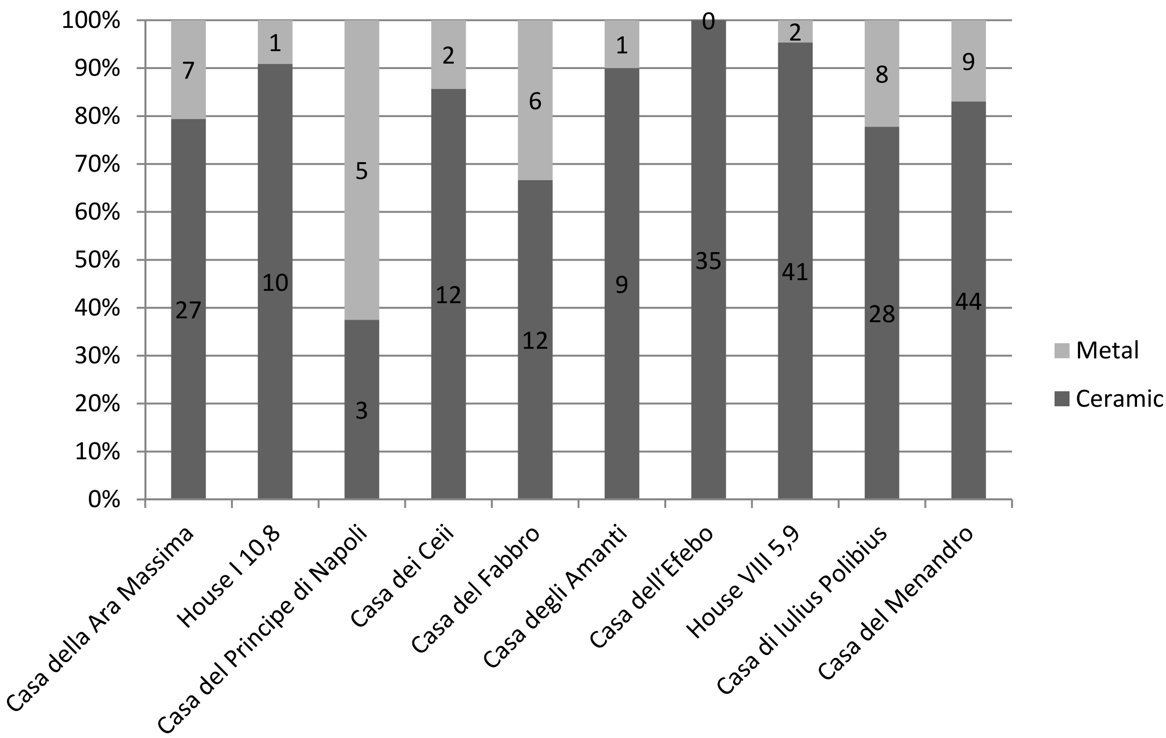


Figure 6.4. Relative proportions of ceramic and metal lighting equipment from 10 Pompeian Households (n = 262).

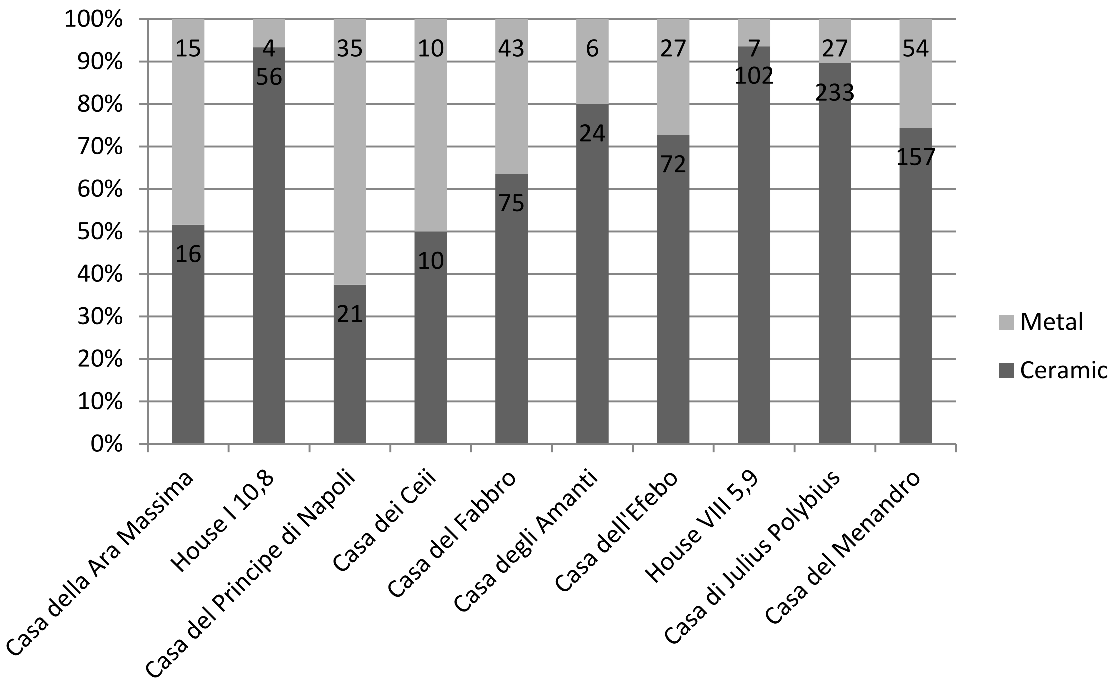


Figure 6.5. Relative proportions of ceramic and metal tablewares from 10 Pompeian Households (n = 994).

Lampstands were an important addition to the suite of lighting equipment, providing flexibility and portability to spaces which were required to be lit artificially, such as places close to walls decorated with elaborate paintings; small lampstands upon furniture for intimate gatherings; tall lampstands to provide light at eye-level. Height-adjustable lampstands which would have provided even greater spatial flexibility (see Chapter 2, **Figure 2.12**). These items could be particularly elaborate, and, in addition to facilitating flexibility in lighting conditions, illuminated lampstands were themselves exhibited as valuable objects (as were other domestic metal items) and used to express the wealth and status of their owners.

6.3: The nocturnal economy: implications for the consumption of artificial light

6.3.1: Residential consumption of artificial light

As discussed in Chapter 5, many Pompeian houses contained numerous lighting devices (lamps and lanterns) and related equipment (e.g. hanging chains and lampstands) (Allison, 2004a; Allison, 2006b). Large quantities of lighting equipment from these domestic structures highlight the importance of Pompeii as an archaeological resource due significant numbers of artefacts recovered. If one considers Eckardt's (2002) analysis of some 2000 known lighting devices from across Roman Britain covering some 300 years, then the importance of the Vesuvian sites in the study of Roman urban daily life in the1st century CE is significant. The quantity of lighting devices and equipment found within Pompeian households implies that residential consumption was not an insignificant part of the urban economy. In addition to the structures with a clear domestic functions, there were many premises whose primary purpose was commercial (e.g. for hospitality, such as inns and bars; workshops and shops for the production and sale of goods; structures for hygiene and leisure (bath houses and brothels)); many of these structures would have also provided homes for those employees and/or slaves who worked there.

If one employs a basic statistical approach, irrespective of house size, number of rooms, or perceived status of the owners, then an average of 24.2 lighting devices per household (based on the 10 Pompeian households examined in Chapter 5) may be proposed. If one then extrapolates this average across the 546 observed residential structures within the city (Kaiser 2011, 124), then an estimated 13213 lighting devices may have been present within these premises at the time of the eruption (it must be noted here that, to date, there still remains approximately one-third of the ancient city of Pompeii buried beneath the volcanic debris of the 79 CE eruption). However, as discussed in Chapter 5, there were certainly different levels in the consumption of artificial light between Pompeian households, and, if one is to produce more robust estimates for the number of lighting devices in primarily domestic structures, a more refined approach must be adopted. This will be undertaken in Chapter 7, and will form part of the overall model for city-wide light fuel consumption.

6.3.2: Commercial consumption of artificial light

One of the defining features of imperial Roman urbanism was the quantity and variety of permanent commercial structures for the production and retail of goods and services. These permanent structures were a significant change from Greek and early Roman commerce, which generally took place in the *agora* or *forum*. The shift in the location of where commercial activities were undertaken, changed the urban landscape, and the way that social interactions and commercial transactions were practiced, and the where and when that they took place (DeLaine, 2005: 29). However, *fora* were still important spaces for commerce.

The practicalities of commerce taking place by artificial light must be considered. While only a small number of lighting devices would have been required to illuminate a commercial retail space sufficiently to facilitate the sale of goods (e.g. food and drink), the preparation of items for sale would require greater levels of light. For example, the preparation of food on a large scale (i.e. for more people than a domestic household), required lots of ingredients and preparation using sharp implements and high temperatures (see also Chapter 3). Also, manufactured goods, such as pottery and metal household items would have been made during daylight hours, where careful attention must have been paid to produce the required items to a required standard and so as not to injure oneself during these processes.

One must also consider the movement of people throughout Pompei once the sun had set. While many lighting devices did have handles, these items were not particularly practical for moving more than a short distance. Light fuel could spill with only a small movement and if it came into contact with the naked flame (such as that of the lamp) then the individual carrying the vessel may suffer serious injury. While there was no evidence for organised street lighting at Pompeii, lanterns and torches must have been the lighting source of choice when moving around the city at night.

Numerous lighting devices have been found *in situ* in the many commercial properties at Pompeii (Spano, 1919), suggesting that the use of artificial light helped facilitate trade and exchange once the sun had set. While these business premises were primarily commercial, many would have also functioned as residences for staff and/or slaves and their families (Pirson, 2007: 457). Many of these structures had mezzanines and upper floors for storage and living quarters (Spano, 1919: 4). The separation of work and living space at ancient Pompeii was often fluid, with commercial premises providing approximately 40% of the housing units in the city (Pirson, 2007: 468). As the urban centre of Pompeii became more densely populated, with construction of all types of structures intensified throughout its entire history, and many living units became smaller(Pirson, 2007: 469). By the first century CE, many domestic dwellings began to incorporate commercial activities, sometimes within the house itself, often converting rooms which fronted on to the street into shops and workshops (e.g. Casa del Chirurgo, Insula VI. 1, (Jones and Robinson, 2007: 401).

As Spano (1919: 4) and Pirson (2007: 468) suggest, small commercial structures also provided living space for staff/slaves and their families, therefore, the presence of lighting equipment does not necessarily indicate that the enterprise was open and trading after dark. However, there was extensive evidence for the positioning of lamps and lanterns upon shop and bar counters near to the street, and also hanging outside, indicating that some commercial premises were trading after the sun had set (Spano, 1919: 4-5). Shop fronts and doorways were often fully closed when the premises were shut for business, and during these times access to natural light and ventilation was often through small windows above a doorway.

Taverns and Inns

Visitors to Pompeii were serviced with a range of accommodation options, some offering food and drink, shelter for their animals, for overnight or longer stays (DeFelice, 2007: 474-486). DeFelice (2007: 483) has identified c. 145 hospitality structures at Pompeii, with possibly a further 47. Evidence from epigraphic, historical and archaeological sources suggests that taverns in the Roman world were popular places at night. A *graffito* by a group of late night drinkers at a tavern in Pompeii, the *seribibiuniversi*, notes their support for a political candidate (*CIL* IV, 581).

The presence of masonry bar counters is a clear indication of a retail establishment for serving food and drink, and these establishments were located in almost all parts of Pompeii (Ellis, 2004: 376). These retail premises were abundant and distributed primarily along the main thoroughfares at Pompeii, suggesting a significant and constant demand for their goods and services. One may safely assume that inns would have been used at night, consuming artificial light, given their role in providing accommodation, food, and drink.

Retail and Industry

By the first century CE, Pompeii had witnessed dramatic changes in the urban economic landscape, with many commercial structures converting from small-scale industry and production, to retail (e.g. Jones and Robinson, 2007: 400). McGinn (2002: 10-11) notes literary sources commenting that brothels were identified by lamps hanging outside their doors, and that they probably used more lamps than other structures, even during the day. While it is difficult when using early excavation records to identify exactly which objects came from which structure at Pompeii, their quantities, and their position, one may conclude that many *tabernae* had sufficient lighting equipment to illuminate not only the internal space, but also to showcase goods for sale to passers-by during the dark hours (Spano, 1919: 7-10).

Spano's (1919: 21-23) assessment of the lighting devices from retail units (shops and bars) at Pompeii led to his hypothesis (based on numbers of devices from excavations in the early part of the 20th century) that the 95 premises along two stretches of road (between the Porta Marina and the Forum, and from the Forum part-way along the via dell'Abbondanza) (**Figure 6.6**), would have each had a lamp hanging outside (to indicate that they were open for business), and one lamp positioned inside to illuminate the inner space. He suggests that many of these lamps had multiple nozzles, and posits that there were at least 285 potential flames to illuminate the 95 shops examined. He goes on to extrapolate these estimates for 132 shops along 576 metres of the Via della Fortuna and the Via di Nola (396 estimated flames), and 170 shops (510 estimated flames) along 700 metres of the Via Stabian (Spano, 1919: 22-23). It is difficult to assess if Spano's estimates are accurate, based on the archaeological evidence, as excavation records from this time are sporadic in their accuracy and consistency. Spano comments that many shops near the Forum contained multiple lamps, often more than two or three, and up to four, eight, and as many as 12 (Spano, 1919: 8-9). One problem in using this data to provide broader estimates is that Spano only comments on the structures where lighting devices were found, and not the ones devoid of these items.

Image removed for copyright reasons

Figure 6.6. Plan of south-west Pompeii, from the Porta Marina to via dell'Abbondanza.

If one considers that only four lamps (with five potential flames) were recovered from four clearly commercial structures at the Insula of the Menander (not including the bar, which was part of House I 10.2-3), then these quantities would provide an average of 1.2 light flames per structure; much lower than Spano's estimates of three flames. Although the sample from the Insula of the Menander is very small, and lighting devices were only found in two of the four premises, Units I 10.5-6 and I 10.13, which had three and one respectively (Allison 2006).

While one may never be able to be truly accurate when assessing the quantities of lighting devices and the number of potential flames from commercial premises at Pompeii, perhaps an estimate of an average of 2 flames per structure (a figure between the 1.2 light flames from the Insula of the Menander, and the 3 flames proposed by Spano (1919: 20-23), would be a sufficient comprise; this figure will be utilised in Chapter 7 to estimate and compare city-wide light fuel consumption at Pompeii. If these estimates are even moderately accurate, then these busy thoroughfares, with their very many shops and bars, would have been brightly lit during the dark hours, and, presumably, busy with customers and browsers even after the sun had set.

Public Baths

The Roman bathing experience was considered an essential component of civilized life (Koloski-Ostrow, 2007: 224). Vitruvius comments (V. 10. 11) that main time of day for bathing was in the late afternoon and in to the evening. Balsdon (1969, 28-9) suggests that baths were open for business from the sixth hour until the eleventh (approximately 7 ½ hours at midsummer and 4 ½ hours at midwinter). At Pompeii, there were at least four sets of public baths, paid for, maintained, and run by the city's officials; the Forum Baths, the Stabian Baths, the Central Baths, and the Suburban Baths (Koloski-Ostrow, 2007: 224-256). In addition, there were at least three other privately owned public bath suites; the Palaestra/Sarno Baths, the Praedia of Julia Felix, and the Republican Baths (Koloski-Ostrow, 2007: 224). Bathing establishments were a ubiquitous part of urban centres and were one of the defining features of Roman civilized living. While individual establishments may have differed in architectural design, the general format was broadly similar: a sequence of rooms which included a vestibule, *frigidarium, apodyterium, tepidarium, and caldarium,* often surrounding a *palaestra* (Koloski-Ostrow, 2007: 228). The architectural design of bath complexes was focussed on keeping the various rooms, necessary for the various acts of bathing, at the required and constant temperature. The inconsistences of natural light, and its effects on temperature, necessitated that it was intentionally restricted in most areas of the bath suite. This resulted in many areas being dark even during the day, requiring consistent and controlled levels of artificial light.

In the *apodyterium* and *tepidarium* of the Forum Baths at Pompeii, there was evidence for glass window panels set in bronze frames, which could pivot to open and close to regulate temperature. There was also a light-well in the south wall of the *apodyterium* (**Figure 6.7**), below which was a niche for a lamp, which is still blackened by soot from the flame (Mau, 1899: 198). A vaulted *caldarium* was entered through corridor E; this small room had windows in the *scala* to the south, and also a niche for a lamp (Mau, 1899: 199-200) . At the southern end of the *tepidarium* there was a large light-well, angled at approximately 45 degrees to direct sunlight into the main area of activity in this space. Directly below the light-well stands a large brazier, where burning coals would have provided a subtle glow in addition to heating the room. This room was highly decorated and there were many individual niches set into all four walls, separated by architectural ceramics in the form of Atlantes, used to hold up the cornice above (Mau, 1899: 199). These niches have often been described as 'lockers' for bathers' personal belongings, but Spano (1919: 31) notes that many were for the placing of lamps, with some having (now missing) sliding convex glass panes to protect the flame from the damp environment.

Figure 6.7. The apodyterium at the Forum Baths. Image: author.

On entering the Forum Baths, and in order to move between the suites of rooms and the *palaestra*, one had to use the many long and narrow corridors, which had very little access to natural light, and must have been lit artificially (even during the day). Some 500 lamps were reportedly found in Corridor e (Gell, 1837: 94); while this large quantity would have been more than sufficient to illuminate this dark space, many were probably placed there for storage around or at the time of the eruption. While it is difficult to be accurate regarding the total number of lamps recovered from the Forum Baths, one may suggest at least 1000 (see Gell, 1837:94 who suggests 1328 lamps, but also (Niccolini and Niccolini, 1890: 3) and (Nielsen, 1990: 136) who suggest a figure of around 1500) - certainly more than necessary to illuminate the whole building complex; such a large number of lighting devices would have required significant quantities of olive oil for fuel. Irrespective of how accurate the quantities of the lighting devices found here, their presence in such numbers potentially provides a valuable insight into the significant quantities of lamps in use at Pompeii.

It is even more difficult to identify how many lighting devices may have been present in other bathing establishments and Whitmore (2013: 212) notes that 28 lamps and one candelabrum were recovered from the Stabian Baths, which seems a very low number. The Stabian Baths complex formed most of a city block (Insula VII. 1. 8), with the earliest evidence for a bathing establishment on the site dating to the second century BCE (Koloski-Ostrow, 2007: 227).Originally, the water for the baths came from a deep well near to the vicolo del Lupanare, but was later supplied directly by the aqueduct as the enterprise expanded (Koloski-Ostrow, 2007: 229). In their final arrangement, the Stabian Baths were similar in layout to the Forum Baths; a suite of bathing rooms with an associated *palaestra*. A range of shops and bars surrounded the establishment, as close to the Forum and Central Baths, highlighting the close relationships between the service-industry, commerce, and bathing at Pompeii.

A visit to the baths at Pompeii offered a wide range of activities to facilitate the demands of bathers. In addition to the physical practice of personal hygiene, there were opportunities for other activities, both for leisure and commerce, such as eating and drinking, engaging with prostitutes, social interaction with friends and associates, and dealing the matters of business. Bathing establishments often supplied a range of activities and services directly to their customers such as libraries, restaurants, theatres and shaded walkways (Koloski-Ostrow, 2007: 255). The large quantity of lighting devices found at the Forum Baths clearly indicate that artificial light played an important role in Roman bathing practices.

The costs for the construction of a bathing establishment would have been significant, and DeLaine (1997: 219-220) notes that the Baths of Caracalla in Rome would have required 120 million sesterces, with the Baths of Neptune in Ostia costing over 2 million sesterces. In order for the continued operation of bathing establishments, significant and continuous financial outlay was required for resources: wood, charcoal and olive pith to fuel the furnace (see Wilson, 2012: 149-151); a constant and reliable water supply; staff for running the establishment; large quantities of lighting devices; and vast quantities of olive oil for bathing (and for light fuel)(Fagan 1999: 160-4).

The presence of lighting devices in such large quantities suggests that these bath suites consumed artificial light on a grand scale. While there was evidence for relatively large quantities of lighting devices at the Forum and Stabian Baths, it is unknown how many were recovered from the three observed privately owned establishments (the Palaestra/Sarno Baths, the Praedia of Julia Felix, and the Republican Baths). However, at the time of the eruption at Pompeii one may assume that large quantities of light were also being consumed at the private establishments.

6.4: Factors for temporary increases in population: markets, games, festivals, theatrical performance, and religious worship

Even though there was a structural change in the locations where many economic transactions took place during the Roman period (i.e. an increase in the numbers of permanent commercial structures), the use of *fora* and other open spaces for commerce continued to play important roles in the urban economy. Markets were held on a regular basis, with epigraphic evidence from Pompeii suggesting they were held weekly, with stall holders moving between places on set days (Cooley and Cooley, 2004: 159-160).

Roman towns and cities offered a wide range of entertainment options to their inhabitants and visitors including gladiatorial shows and games, theatres, and those of a more personal nature, such as bathing and a visit to the brothel (Cooley and Cooley, 2004: 44-82; Parslow, 2007: 212-223). Games and festivals played an important role in the socio-economic lives of the inhabitants of Pompeii, attested by the construction of permanent, and often large, public buildings: the amphitheatre, two theatres (Parslow, 2007: 212-223) the Great Palaestra (next to the amphitheatre), and the gladiatorial barracks and training school at the Quadriportico dei Teatri in the so-called Theatre

District (Parslow, 2007: 217), and the numerous temples (Coarelli, 2002: 74-109; Small, 2007: 184-211). Epigraphic evidence suggests games took place throughout the year on at least 49 days (**Figure 6.8**), with April, May, and November having at least 10, 12, and 11 respectively (Cooley and Cooley, 2004: 51, Fig. 4.1). If one considers that the amphitheatre had a seating capacity for around 24,000 people (Cooley and Cooley, 2004: 46), more than adequate to accommodate all of the inhabitants of Pompeii and visitors from other towns and the surrounding countryside (Parslow, 2007: 215), then the population of the city would have increased significantly on at least 49 days of the year. Games' schedules were driven by local factors, and generally organized around dates for agricultural events (e.g. sowing, ploughing, harvest), political elections and religious celebrations (Tuck, 2008: 25-26).

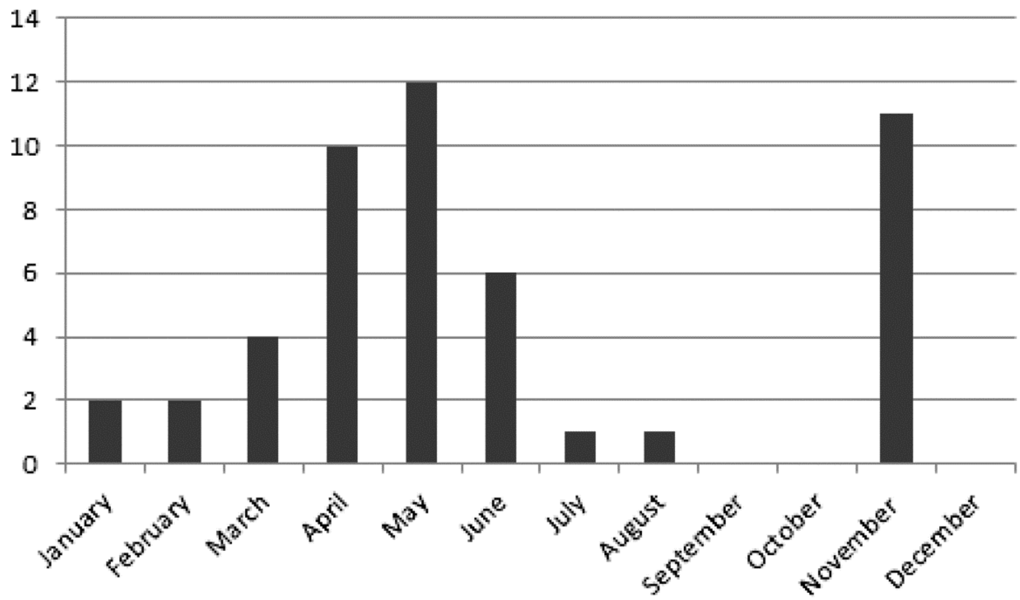


Figure 6.8. No of days of games at Pompeii (after Cooley and Cooley, 2004: 159-160).

Pompeii was furnished with two permanent theatres, the Teatro Piccolo and the Teatro Grande. The Teatro Grande had its origins in the second century BCE, and was the first permanent auditorium at Pompeii (Parslow, 2007: 212). The Teatro Piccolo was constructed sometime in the 70s BCE following the arrival of Sullan colonists; an inscription in bronze (now gone) commemorates the award of the construction contract by prominent colonists (Cooley and Cooley, 2004: 20 & 68; Parslow, 2007: 213-214). Parslow highlights the importance of Pompeii as a Campanian centre for entertainment and spectacle, with three large permanent structures for performance by the middle of the first century BCE (2007: 176); few other towns in the region had such extensive facilities. These structures (the amphitheatre, the Teatro Grande, and Teatro Piccolo) could accommodate large numbers of spectators, c. 24,000, c. 3000, and c. 1000 respectively (De Albentiis, 2002: 176; Cooley and Cooley, 2004: 42). The significant financial investment required for their construction, maintenance, and running of these large capacity structures suggests that grand events were held on a regular basis, and were also of significant economic benefits to those hosting the games, and to the business community within the city.

The Roman festival combined the modern concepts of festivals, religious events, feasts, and holidays (Kleijwegt, 2006: 345). Many festivals were fixed to particular days (45 regular festivals during the Republican period), with others decided annually with some flexibility in their timings. In addition, the Senate voted for 'special' festivals on an annual basis, such as a thanksgiving or Triumph. By the second century CE, Marcus Aurelius had limited the number of festival days to 135, but this was still an average of 10 days per month (Kleijwegt, 2006: 345).

Kaiser (2011, 124) identified 15 temples/sanctuaries at Pompeii, but there are very limited records of how many lighting devices were found within them during excavation. One may hypothesize that artificial light was a factor within these structures and spaces, either through the 'every day' practical functions of the places (e.g. priests/priestesses living and maintaining the structures and ceremonial equipment), and during religious ceremonies themselves on a regular basis as part of the annual calendar of religious events and celebrations. For example, at the Temple of Isis, 58 ceramic oil lamps were found in a storeroom in room 5 (Mau, 1899: 175), and two bronze candlesticks (possibly lampstands) and a bronze lamp (with two nozzles) were found in a box in the *cella*. The Temple of Isis may well have consumed greater quantities of artificial light than other places of worship at Pompeii, given that night and day, dark and light, were significant components of in the Isis and Osiris myth (Mau, 1899: 162). Due to the lack of archaeological evidence for lighting devices from other religious buildings at Pompeii, it is difficult to provide an estimate how much light fuel was consumed by other religious orders, if any at all.

6.5: Discussion

The evidence presented in Section 6.2 suggests that there was a significant increase in the production of ceramic oil lamps between c. 25 BCE and c. 25 CE, to satisfy the demand for the consumption of artificial light at Pompeii. Lighting equipment added to the repertoire of ceramic goods produced by potters, and those involved in their manufacture utilized similar manufacturing techniques, and fired the items in the same kilns as other ceramic products. In addition, there was a dramatic shift in production techniques which would have made significant efficiency improvements, both in time and the quantities of natural resources (e.g. clay and kiln fuel) required in the production of lighting equipment.

By the time of the eruption, an average of 15.6% of lighting equipment in domestic settings was metal; substantially more expensive than ceramic products, these high-status objects would certainly have been an expression of wealth and status. At the time of the eruption of Vesuvius in 79 CE, most households in Pompeii were consuming artificial light on a significant scale. Domestic activity was not restricted to houses of the traditional atrium type and its variations, as most other structures in Pompeii would also have provided some residential function for their owners, workers, and/or slaves.

Prior to Pompeii’s destruction it would appear from the above discussion that a nocturnal economy had developed within the city, with affordable and reliable supplies of lighting equipment and fuel enabling commercial enterprises to extend the working day without the need for structural expansion. Artificial light enabled businesses to maximise trading hours on days when the population of the city would significantly increase, e.g. for festivals, games, markets, electoral events, and, one may hypothesize, that on such days the buying and selling of goods and services was boosted and continued into the night. Many visitors to the city would require overnight accommodation and food and drink; patronising bars, restaurants, public baths, shops and workshops, even after the sun had set.

The public baths at Pompeii would appear to have been large consumers of artificial light. The main time of day for bathing was in the late afternoon and in to the evening and the presence of large quantities of lamps in the Forum Baths supports this; one may hypothesize that the surrounding commercial premises may have been open and trading well in to the night, to take advantage of the human traffic to and from the baths. If one considers that Pompeii had a minimum of nine bathing establishments in 79 CE, with varying capacities capable of facilitating large numbers of baths, then the potential opportunities for after dark commercial activities, directly or indirectly related to the business of cleanliness and hygiene, may have been significant. Light, both natural and artificial, would have been tightly controlled in bath houses to facilitate controlled temperatures in different rooms. At least one had its origins in the second century BCE (the Stabian Baths), with others built, repaired and upgraded up until the destruction of the city. Koloski-Ostrow (2007: 224) suggests that four establishments (Stabian, Forum, Central and Suburban) were publicly owned, and that the local government invested significant funds for their construction and operation.

6.6: Conclusion

The consumption of artificial light would have played an important part in the economy of Pompeii, and provided increased opportunities for trade and exchange once the sun had set. The commercialisation of the night was only possible through the reliable and affordable supply of lighting equipment and, more importantly, olive oil for light fuel. Once established, the nocturnal economy, in addition to the social and cultural changes brought about by artificial light, played an important role in the Roman urban living and the wider ancient economy.

While many of the main themes of a Pompeian nocturnal economy have been outlined in this chapter, probably the most important ingredient for artificial light has not been considered in detail: the use olive oil for light fuel. Given that light fuel was as absolute necessity in the provision of artificial light, Chapter 7 will be devoted to this vital component.

Chapter 7: Urban Light Fuel Consumption at Pompeii

7.1: Introduction

It is widely accepted that agricultural production in the Roman period witnessed unparalleled growth and expansion, and was certainly the major component of the ancient economy (Bowman and Wilson, 2013a; Marzano, 2013). The cultivation of olives, their trade, exchange, transportation, and consumption (as fruits and oils), played an important role in many aspects of daily life in the Mediterranean; the scale of their consumption dramatically increased during the Roman period (Mattingly 1988a & b). In addition to its consumption as food, olive oil was used extensively for light fuel, and as a key ingredient for many personal hygiene products (such as perfumes and oils). In Diocletian's Price Edict in 309 CE the maximum price of 40 *denarii* per *sextarius* (approximately 0.546 litres) for 'fresh' olive oil was proposed, and 24 *denarii* for 'second quality'. However, in relation to the fuel consumption models below which are based on lighting in 79 CE, prices of all commodities (and the value of *denarii*) were certainly different from those over 200 years later. However, one may tentatively use Diocletian's prices for olive oil to provide hypothesised costs which may be useful when exploring the scale of light fuel consumption at Pompeii (below).

The consumption of olive oil was substantial, but its importance in providing artificial light for Roman urban living and as part of the economy has largely been ignored. (Mattingly, 1988b: 159) comments that the consumption of olive oil (per capita) in the ancient world has been underestimated, and this is especially the case when considering its use as light fuel. This chapter provides a quantitative model for the consumption of artificial light at Pompeii, in order to assess the scale of olive oil consumption for light fuel for the entire city.

Section 7.2, below, presents a discussion on how much artificial light may have been required on a daily, seasonal, and annual basis, and the underlying assumptions (of the author) on which the proposed figures are derived. The basis for estimating light fuel consumption derives from a single lighting device (see Section 7.3.1 for experiment design).

Light fuel consumption models will be produced based on broad estimates from this single lamp and extrapolated from quantified lighting device assemblages from 79 CE archaeological deposits, with known provenance, from a range of contexts (e.g. domestic, commercial, and religious) throughout the city.

Following these sections will be a number of case studies for light fuel consumption: for a single lamp; a household; a bath house; a temple; an entire *insula*; and finally, for the whole city. Each case study will begin with an explanation of the methodology used to produce the light fuel consumption figures proposed in the models. While these models are somewhat tentative, and based on general assumptions and hypotheses (such as how much artificial light was actually required on a daily and seasonal basis), there was sufficient evidence from secure archaeological deposits to provide broad indications for the scale of light fuel consumption for this Roman city.

7.2: Day and night: how much artificial light?

The amount of sunlight changes constantly, with very small changes taking place on a daily basis, leading to large seasonal and annual differences in the quantity of daylight hours; from as few as 9 hours in the winter months, up to 15 hours at the height of summer (see **Figure 1.1**, Chapter 1). Therefore, the demands for artificial light certainly varied on a seasonal basis. In order to produce this model for city-wide light fuel consumption, annual changes in consumption patterns must be considered when proposing estimates for artificial light use.

If one considers the number of daylight hours presented in Chapter 1 (**Figure 1.1**) then an annual average of 12 hours of natural light per day (the sum of the monthly average divided by 12 months) may be proposed. Therefore, one proposes that the requirements for light (both natural and artificial) to facilitate human activity, would have been at least an average of 12 hours per day throughout the year. It is hypothesized that during months where natural light was available for less than 12 hours per day, artificial light was required to make up the shortfall; for example, up to 3 hours in the winter, with very limited artificial light required in the summer months (however, as discussed in Chapters 5 and 6, artificial light was consumed in certain contexts as required, even during the day. It may also be noted here that the average daily requirements for artificial light for commercial premises may have been significantly greater than for domestic contexts. If one considers the often dual-function of many commercial premises, then artificial light may have been required perhaps for an average of one hour per day to facilitate commercial needs, and an additional one hour for the occupants residential needs, e.g. activities such as eating, and socialising once the business of the day was concluded.

Table 7.1 presents the quantities of artificial light required on a month by month basis and the estimated monthly requirements for artificial light. It is clear that more artificial light was needed in the winter months. When these quantities are considered on an annual basis, then artificial light was required for an average of approximately 0.9 hours (54 minutes) per day. For ease in producing the light fuel consumption models which follow, this figure is rounded-up to one hour per day.

Jan	9	3
Feb	10	2
Mar	11.5	0.5
Apr	12.5	0
May	14	0
Jun	15	0
July	15	0
Aug	14	0
Sept	12.5	0
Oct	11.5	0.5
Nov	10	2
Dec	9	3
Average	**12**	**0.9**

Table 7.1. Average daylight hours by month (column 2), and estimated monthly requirements for artificial light (column 3).

7.3: Modelling light fuel consumption

7.3.1: Experiment design

The unit of measurement for illuminance is the lux, and one lux equals one lumen per square metre of illuminated area. One lumen equals one candela (luminous intensity) into one steradian. The illuminance of a common candle is approximately equal to one candela. A Roman oil lamp with a single nozzle would have emitted very similar levels of illuminance as a common candle (Hughes and Gale, 2007: 271-274).

While the evidence for lighting equipment is abundant throughout the Roman Mediterranean world, one of the most important components for producing artificial light, the wick, is extremely rare in the archaeological record. Forbes (1966, 120-1) comments that a wick (which could be made from a range plants) with an appropriate weave through which a suitably liquid fuel (vegetable oil or animal fat) could flow at a sufficient rate to continuously supply a burning flame. (Goncalves, 2009: 3: 12) used both cotton and flax wicks in their experiments for the 3D reconstruction ancient lighting, with no variation in levels of emitted lighting noted. The wick used in the experiment for this fuel consumption study was 100% cotton, selected based on its ready availability as it is commonly supplied with reconstructed Roman ceramic lamps. The absorption rate of the wick controls the burn-rate; a too tight weave restricts fuel flow leading to an extinguished flame; a highly-absorbent wick burning fuel too rapidly may result in the fabric of the wick also burning quickly requiring more manual manipulation (feeding the wick through the nozzle) and constant replacement. The weave of the selected wick allowed sufficient fuel to produce a steady flame with little manipulation. A ‘common’ lamp (with 30ml of olive oil for light fuel) burn-event of c. 2 hours required no wick manipulation.

A reproduction oil lamp was used in this experiment (**Figure 7.1**). The lamp was made of clay, with an external slip (as applied to most lamps found at Pompeii in first century CE contexts). The lamp was filled with olive oil to a level where the fuel-hole (**Figure 7.1**) would allow a continued air supply in to the lamp reservoir. The lamp had a fuel capacity of approximately 30ml, similar to most ‘common’ ceramic oil lamps at

Pompeii. A superior quality Extra Virgin olive oil was used[1], which had been produced using only mechanical processes, to which no additives or preservatives had been added.

30ml of oil was added to the lamp, and the wick was placed so one end rested in the base of the reservoir (submerged in the olive oil), with the other protruding approximately 10mm from the nozzle. The wick was allowed to rest in the olive oil for 10 minutes in order for the fuel to soak through to the nozzle-end. The wick was then lit and allowed to burn until the fuel expired. The experiment was carried out on three occasions for reliability and consistency of the results (**Table 7.2**). Following each burn event, the nozzle-end of the wick was trimmed of burnt residue to provide a clean and steady flame (i.e. so the flame would not flicker) for the next event. The average time for a burn-event before refuelling was approximately two hours, or 15ml per hour (**Table 7.2**). Therefore, a single burn-event, i.e. the time required before refuelling, of two hours (at a rate of 15ml per hour) was recorded for a 'common' ceramic lamp with a single nozzle.

Figure 7.1. Lamp and wick used in for light fuel consumption experiments. Image: author.

[1] Extra Virgin Olive Oil produced solely by mechanical means and contained no additives or preservatives. Produced in Spain at Finca Valdezarza by L & S. L, San Martin de Montalban, Toledo, Spain.

Burn Event	Fuel	Time (minutes)
1	30ml	117
2	30ml	124
3	30ml	122

Table 7.2. Three burn event experiments for light fuel consumption.

7.3.2: Case study: a single lamp

The archaeological evidence from Pompeii provides a robust dataset to produce a model of light fuel consumption for an entire Roman city. In order to do so, one must begin at the most basic level by using one oil lamp with a single flame. If one hypothesizes that the annual average requirements for artificial light was one hour per day (as proposed above), with a burn-rate of 15ml per hour, then a 'common' single-nozzled lamp would have consumed c. 5.5 litres of light fuel over a year:

One lamp at 15ml per hour, for one hour per day x 365 days = 5.475 litres per annum

However, lamps with multiple nozzles (providing they were all lit) would have consumed fuel at a rate of 15ml per hour per nozzle. Therefore, a lamp with two nozzles will consume fuel at a rate of 30ml per hour, or 60ml for a two-hour 'burn event' (for a 30ml capacity lamp).

Where possible, the number of nozzles, rather than the number of lamps, has been used to estimate fuel consumption in the following case studies explored below, presented in tables and figures as 'potential number of flames' (the term 'potential' is used because lighting devices with multiple nozzles could still have functioned if only one nozzle was used).

7.3.3: Case study: the Casa del Fabbro

The Casa del Fabbro was selected as a case study for household light fuel consumption at Pompei in 79CE; it was a medium-sized house located at insula I 10 (Chapter 5, Section 5.3.5, **Figure 5.5**), and had a ground floor surface area of approximately 320 m^2. It was very well excavated and recorded, as was the entire insula, and there exists a comprehensive catalogue of artefacts recovered (Allison, 2006a; Allison, 2006b). A total of 17 lighting devices were recovered, with 19 potential flames. If one applies the light fuel consumption formula devised above (a rate of 15ml per hour), and assume that all of the lighting devices and potential flames burned for an average of one hour per day, 0.285 litres of olive oil for light fuel was consumed per day, or some 104 litres per year. However, it was unlikely that all of the devices would have been required on a daily basis, therefore, if the model is adapted to hypothesize that an average of 25% and 50% potential flames of the lighting devices were lit for an average of one hour per day throughout the year, then 26 litres and 52 litres of light fuel, respectively, would have been consumed at the Casa del Fabbro on an annual basis.

Even though the sample of Pompeian households examined in Chapter 5 of this thesis was relatively small (only 10 of the 546 residential structures observed by Kaiser 2011, 124), when one considers the quantities for light fuel consumption presented here for the Casa del Fabbro, and extrapolated across 546 residences, one begins to gain an impression of the very large quantities of olive oil used to illuminate domestic spaces at Pompeii. It must be noted, however, that one cannot directly apply the light fuel consumption estimates from the Casa del Fabbro to all houses in Pompeii. As discussed in Chapter 5, the quantities of lighting devices varied between households were not necessarily related directly to house size. Even so, by utilising a range of house sizes and levels of fuel consumption, it has been possible to estimate household light fuel consumption across the entire city, which will be presented below.

7.3.4: Case study: commercial structures (the Via Marina/Via dell' Abbondanza and Insula I 10)

As explored in Chapter 6, the evidence for lighting equipment, and, anecdotally, their position(s) within structures, suggests that commercial premises in Pompeii were being used after the sun had set, for both trade and accommodation. These commercial structures were also used as residences, most likely to house those who worked there (staff and/or slaves, and their dependants). In addition, some structures whose primary functions were residential, also had areas which were used for production and commerce (e.g. Chapter 5, House I 10, 8 and the Casa di Julius Polybius). Therefore, the 910 observed examples of commercial structures at Pompeii (Kaiser 2011, 124) should also fall in to the residential category. For clarity, this will be considered as a separate category purely for ease of estimating scale of consumption and presenting data.

While Spano (1919, 21-3) proposed an average of three potential flames per commercial property (based on 285 lighting devices found at 95 commercial premises along the Via Marina and Via dell' Abbondanza), an estimated quantity of two potential flames will be used to produce this model for fuel consumption in commercial premises (**Table 7.8**). This figure was arrived at due to the lack of detail of exactly which, and how many, commercial properties actually contained lighting devices. Studies of artefact assemblages from the 79 CE deposits in commercial structures at Pompeii have been few, and a thorough re-examination of the site records is much needed. Subsequently, an estimate of two potential flames per commercial premises is proposed in this thesis, a combination of the figure derived from Spano's three per structure, and more reliable archaeological evidence from the five commercial units at Insula of the Menander, which had an average 1.25 potential flames (**Table 7.5, below**).

Therefore, 910 commercial premises across the city had a potential of 1820 flames; if all the potential flames from lighting devices were in use (consuming light fuel at a rate of 15ml per hour) for an average of one hour per day throughout the year, this would have resulted in the consumption of 27.3 litres of light fuel per day, or 9964 litres per year. If an average of 25% or 50% of lighting devices were used throughout the year, 2491 litres and 4982 litres (respectively) of light fuel would have been consumed on an annual basis. However, one must consider that the average daily requirements for artificial light in commercial settings may have been different to those of structures which had uniquely domestic functions. In addition, with many commercial structures providing living space for employees and/or slaves, the demands for artificial light may have been significantly greater. An average daily requirement for artificial light of two hours is therefore proposed, which would have resulted in annual light fuel consumption (per flame) at twice the amount than in domestic contexts.

Considering the 910 commercial structures as a dataset, each with an average of two potential lamp flames burning for an average of two hours per day, in total, combined, they would have consumed 54.6 litres of light fuel per day (if all lighting devices were lit), or 19929 litres over a year. If an average of 25% or 50% of the potential flames from the lighting devices were used throughout the year, then 4982 litres and 9964 litres of light fuel would have been consumed on an annual basis.

7.3.5: Case study: Insula I 10, a Pompeian neighbourhood

The excavations of Insula I 10 (the Insula of the Menander) have probably produced the most detailed and reliable recording and analysis of urban structures and their material remains, from contexts dating to the time of the eruption, from the whole of Pompeii (e.g. Ling, 1997; Allison, 2006b). The insula consisted of both domestic and commercial structures (**Figure 7.2**): three small-sized houses (House I 10.1, House I 10.2-3 (part of which, Room 2, was functioning as a retail space at the time of the eruption, and House I 10.18); two medium-sized houses (Casa del Fabbro and House I 10.8); one large house (Casa degli Amanti); one very large house (Casa del Menandro), and four commercial units (I 10.5 and I 10.6 were connected to form one structure).

A total of 97 lighting devices, with the potential for 109 flames, were recovered from Insula I 10 (**Table 7.3**). Household light fuel consumption for the insula, based on 105 potential flames burning for one hour per day, would have been around 1.57 litres, or some 574.88 litres per year. If one adapts the model and hypothesize that an average of 25% or 50% of the potential flames of lighting devices were used for one hour per day, per year, then 143.72 and 287.44 litres of light fuel would have been consumed in the households at this Insula.

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Figure 7.2. Plan of Insula I 10, Pompeii.

Property	Potential no. of flames	Per hour	Per day	100%	50%	25%
Casa del Fabbro (I 10, 7)	19	0.285	0.285	104.025	52.01	26.01
Casa del Menandro (I 10, 4)	55	0.825	0.825	301.125	150.56	75.28
Casa degli Amanti (I 10, 11)	10	0.15	0.15	54.75	27.38	13.69
House I 10, 1	3	0.045	0.045	16.425	8.21	4.11
House I 10, 2/3	3	0.045	0.045	16.425	8.21	4.11
House I 10, 8	12	0.18	0.18	65.7	32.85	16.43
House I 10, 18	3	0.045	0.045	16.425	8.21	4.11
Unit I 10, 6/5	4	0.06	0.12	43.8	21.90	10.95
Unit I 10, 9	0	0	0	0	0	0
Unit I 10, 12	0	0	0	0	0	0
Unit I 10, 13	1	0.015	0.03	10.95	10.95	10.95
Total	**110**	**1.65**	**1.725**	**629.25**	**320.29**	**165.62**

Table 7.3. Estimated light fuel consumption (litres) for Insula I 10.

Consumption of artificial light in the commercial structures at the insula was on a much smaller scale, but this is because they constituted less than 5% of the floor-surface area of the city block (**Figure 7.2**). Only four lighting devices were recovered from the commercial structures: three (one with two nozzles) from Unit I 10 6/5, and one from Unit I 10, 13. If all of the potential flames (five) burned for an average of two hours per day (one hour for commerce and one hour for domestic activity), they would have consumed 0.15 litres per day, or 54.75 litres of light fuel per year. If 25% or 50% of the four potential flames from Unit I 10, 6/5 burned for two hours per day per year, then 10.95 and 21.9 litres of light fuel would have been consumed. Note: the single lamp flame from Unit I 10, 13 was not included in the 25% and 50% potential flame figures (**Table 7.3**) because a single flame cannot be halved or quartered.

While there was some correlation between the size of a property and the consumption of light fuel between the households at Insula I 10, a larger house did not necessarily result in greater quantities of light fuel consumption per m^2 of floor surface area (**Figures 7.3**and **7.4**). The Casa del Fabbro provided evidence for the consumption of almost twice the quantity of light fuel (over 104 litres per year when 100% of potential flames were lit) than the larger Casa degli Amanti (whose floor surface area was 200m^2). House I 10.8 has evidence for the consumption of 65.7 litres per year, over 10 litres per year more the Amanti, even though it was half the size. However, the largest house, the Casa del Menandro at around 1800 m^2, has evidence for the consumption over 300 litres of light fuel per year; this house was over three times the size of the Casa degli Amanti (54.75 litres per year) and almost six times the size of the Casa del Fabbro (which had the second-highest level of light fuel consumption at the insula, with an estimated 104 litres per year). Therefore, as discussed in Chapter 5, domestic levels of artificial light varied on a house-by-house basis, most likely dependant on the inhabitants' requirements for after dark activities, and, also, if they could afford it.

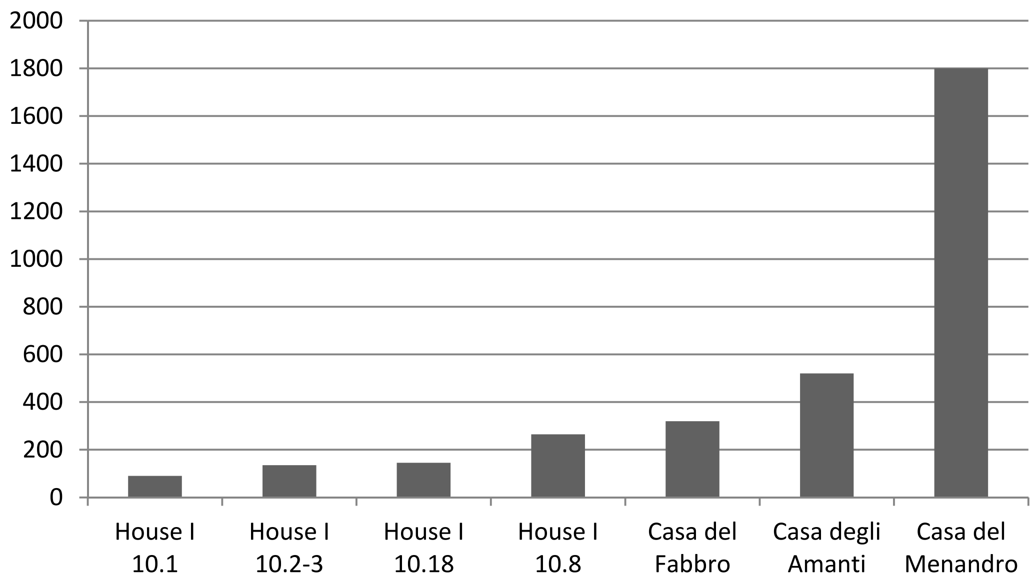

Figure 7.3. Floor-surface area (m^2) of houses at Insula I 10.

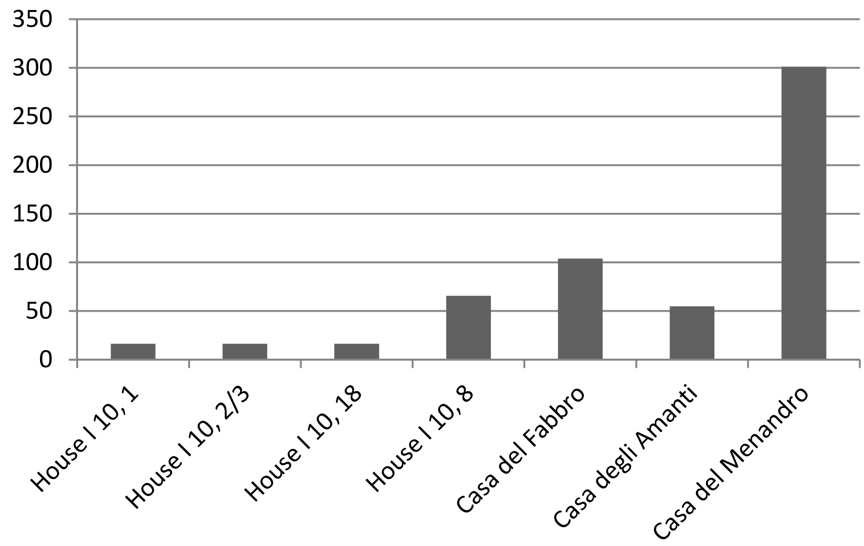

Figure 7.4. Annual household consumption of light fuel (litres) at Insula I 10.

If one now considers all of the lighting devices and potential lit flames from Insula I 10, it is possible to produce estimates for the scale of light fuel consumption for an entire neighbourhood (**Table 7.3**). 97 lighting devices were recovered from 11 structures (domestic and commercial), with the potential for 110 light flames. Using the formula outlined above, the combined fuel consumption for the entire insula would have been 629.25 litres per year (**Table 7.3)** if all of the potential flames were used as prescribed above. If 25% or 50% of the potential flames were lit for one hour per day per year (with the one from Unit I 10, 13 burning for two hours per day throughout the year), then light fuel consumption would have been 165.62 and 320.29 litres, respectively.

7.3.6: Case study: Temple of Isis

The only robust evidence for lighting equipment in religious structures in the city comes from the Temple of Isis. A total of 59 lighting devices were recovered, with potentially 60 flames (the bronze lamp had two nozzles; there are no details whether any of the ceramic devices had multiple nozzles, so it has been assumed they each had one). Kaiser (2011, 124) observed 15 permanent religious structures at Pompeii, and many of these would have used artificial light for a variety of reasons, e.g. as part of religious practices or if some space was also used for a residence. Given that many ceremonies which took place in the worship of Isis required artificial light, even during periods of the year when there was abundant daylight, it is difficult to estimate the daily light fuel consumption at the temple.

In producing this model, it has been assumed that the average annual consumption of artificial light in temples would have been two hours per day, however, it may have been significantly greater. If all the potential flames were lit at the Temple of Isis, then light fuel consumption would have been 1.8 litres per day, or 657 litres annually. If 25% or 50% were used, then daily light fuel consumption would have been 164.25 and 328.5 litres, respectively.

Due to the lack of published lighting device assemblages from other ritual buildings, it has been assumed (in this thesis) that all of the 15 permanent religious structures at Pompeii would have required similar quantities of light as the Temple of Isis. Based on the figure of 60 potential flames all burning for an average of two hours per day, then light fuel consumption for each of the 15 religious structures (a total of 900 potential flames) would have been 27 litres per day, or 9855 litres per year. The use of artificial light in the act of religious practice at Pompeii would have required significant financial outlay for lighting equipment and light fuel (for example, the contents of over 131 Dressel 20 *amphorae* per year for the entire city).

7.3.7: Case study: the Forum Baths

As discussed in Chapter 6, public bathing establishments were substantial structures that may well have consumed artificial light on a grand scale. If one proposes that the 1328 lamps reportedly found in the Forum Baths, for example, were lit for an average of one hour per day, then this enterprise alone would have consumed approximately 19.92 litres of light fuel per day, or 7270.80 litres per year (or, approximately 97 Dressel 20 amphorae). It was conceivable that light fuel consumption at the Forum Baths would have been significantly greater, as most bath houses were generally dark spaces requiring large quantities of artificial light, even during daylight hours. Therefore, the annual daily average of one or two hours per day, suggested for domestic and commercial contexts other use contexts, may not be sufficient. The requirements that the suites of rooms in bath houses must be kept at constant and specific temperatures to facilitate the Roman bathing experience, necessitated the use of artificial light for the majority of the time that they were open for business, rather than only after the sun had set. As discussed above, this would have required large quantities of light fuel throughout the year, and the consumption of artificial light was not, for the most part, seasonally affected by the changes in the hours of natural light. Therefore, for the case of this model, the annual estimated average figure of 1 or 2 hours of artificial light consumption proposed for domestic, religious, and commercial enterprises, was not suitable for bath houses. For the purpose of this study, it was hypothesized that baths at Pompeii were open for approximately six (modern) hours per day, and consuming at least some artificial light for all of that time. This hypothesis dramatically increases the quantities of light fuel required in order for bathing establishments to provide their services. The daily and annual light fuel consumption figure of 19.92 litres per day, and 7270.80 litres per day, proposed above for the Forum Baths, increases dramatically to 119.52 and 43624.80 litres respectively; a substantial amount of olive oil (approximately 582 Dressel 20 *amphorae* per year). It was unlikely that all of the lighting devices would be required all of the time, as vessels would be damaged and broken probably at a greater rate than in other use contexts, due to the moisture making the items slippery when being refuelled and/or moved around the building, and many would have been in storage. Therefore, if 25% and 50% of the lighting devices were in use for six hours per day, then 10906.20 and 21812.40 litres of light fuel may have been consumed annually; a not unsubstantial quantity and probably more realistic than the previously proposed 43624.80 litres per year for 100% of the potential flames.

While 1328 lamps were recovered from the Forum Baths evidence for lighting devices from other bathing enterprises was scant, and caution must be taken when using quantities from a single source to estimate those present in other baths at Pompeii. At least three large public bath houses were in operation at the time of the eruption in 79 CE (Forum, Stabian, and Sarno Baths), with a fourth (the Central Baths), and largest, under construction (see Chapter 5). If one hypothesizes that the Stabian and Sarno Baths would have required similar quantities of lighting devices as the Forum Baths, then these three substantial urban businesses would have consumed huge quantities of olive oil for light fuel. However, the 1328 lamps found at the Forum Baths is a significant amount, and there may have been circumstances specific to that establishment (for example, a delivery of a large quantity of lamps may have been made immediately prior to the eruption). Therefore, a figure of 500lighting devices is proposed each for the Stabian and Sarno Baths in order to produce the model for light fuel consumption for all bathing establishments within the city. If all of the proposed 2328 lighting devices were lit for six hours per day, every day of the year, then 209.5 litres of light fuel would have been consumed every day, and 76467.5 litres over the year. If only 25% and 50% of the lighting devices were in use (as discussed above), then 19116.9 and 38233.75 litres of olive oil would have been required annually.

In addition to the public baths, the three privately owned establishments (Palaestra/Sarno, Praedia of Julia Felix, and the Republican Baths) must also be integrated in to this model. Archaeological evidence for lighting devices from these is lacking, and, as such, a tentative estimate of 500 lighting devices for each of these structures is proposed. Based on the figures for the public baths already discusses, figures for 25% and 50% of lighting devices in use at any one time are suggested, resulting in estimates for light fuel consumption at rates of approximately 33.75 and 67.50 litres per day, or 12318.75 and 24637.50 litres, respectively.

If the three public and three private bathing establishments are considered together, and if 50% of the potential light flames were lit for six hours per day, then approximately 62871.25 litres of light fuel would have been consumed. If only 25% were used, then 31435.6 litres of olive oil would have been consumed for artificial light. These figures are significant, and would have required approximately 838 (50%) and 419 (25%) Dressel 20 *amphorae* full of olive oil every year to illuminate the act of bathing at Pompeii.

7.4: Modelling light fuel consumption at Pompeii in 79 CE

In order to produce a model for light fuel consumption for the entire city, one must first establish estimates for how many lighting devices may have been in use at any one time, how long they may have burned, and seasonal variations. Rather than producing estimates for light fuel consumption based on population size (with the various proposed numbers of people living in Pompeii ranging from between 10 to 20000), it was decided to base this model on the actual physical evidence for the consumption of artificial light (lighting devices and associated equipment), alongside the structures where they would have been used, and their context, e.g. domestic, commercial, or religious.

The destruction of the city by the eruption of Mount Vesuvius in 79 CE provides a unique opportunity to attempt this, given the sheer number of well-preserved structures in large swathes of the city (over 1600 excavated to date, **Table 7.7**); over two-thirds of the total area within the city walls has been cleared of volcanic debris, and there have been many tens of thousands of objects found. Fuel consumption estimates for a single lighting device, at household and *insula* levels, and also for other use contexts (a temple and public baths) will now be extrapolated to provide a city-wide estimate for light fuel consumption in 79 CE.

Lighting devices have been recovered from many structures within the city with a wide range of functions: domestic, commercial, religious and leisure/hygiene (public baths). While it was only possible to present lighting device assemblages from a small proportion of the approximately 1600 excavated structures at Pompeii, there was enough data here, when considered alongside the structural evidence, to extrapolate these data across the city to produce reasonable estimates for the scale of light fuel consumption for Pompeii in 79 CE.

Some of the case studies presented earlier in this chapter were based on relatively small datasets, with few structural examples having well recorded and published artefact assemblages; the evidence from Pompeian households, in particular, was more substantial and robust (see Chapter 5). In addition, there was certainly diversity in the levels of domestic consumption of artificial light between households which reflects the needs of the occupants and/or their economic status. Pompeian domestic structures are the most intensively studied group of Roman houses from anywhere in the Empire, so when integrating the evidence for household artificial light consumption presented in Chapter 5, there was an opportunity for a sophisticated model for light fuel consumption in the city.

7.4.1: Domestic consumption

Wallace-Hadrill's (1994) sample for his study of houses and society at Pompeii and Herculaneum, was 234 domestic residences, ranging in floor-surface areas from c. 10 m^2 (for households residing in shops/workshops/bars etc.) to the largest houses in the city, between 2000-3000 m^2 (**Table 7.4**). In addition to these clearly domestic structures, Kaiser has identified 910 commercial structures. For this study, all of these premises are considered as having some residential function in addition to their business roles. By using Wallace-Hadrill's (1994, 79-80) sample (number of houses, their floor-surface areas, and the percentile of his whole group of 234 houses), one may apply his relative proportions of houses by floor-surface areas (**Table 7.4**) to Kaiser's observed residential units (**Table 7.5**). The 82 households in Wallace-Hadrill's study (1994, 79), with floor-surface areas ranging between 10 to 99 m^2, are not included as a percentile of clearly domestic structures in **Table 7.4**, as these units were residences within structures whose primary function was commercial.

If one then applies the percentiles for number of domestic properties within each size range developed by Wallace-Hadrill (1994), to the total number of residential units observed by Kaiser, a more robust figure for the absolute number of houses by floor-surface areas for all residential units in the city may be proposed (**Table 7.5**). The data for lighting devices from the 10 Pompeian houses considered in Chapter 5 was then applied to the 546 residences by size range, and was utilised to produce estimates for the total number of lighting devices for the whole group of observed households (the average number of potential light flames per m^2 for each property by size-range (e.g. 100 – 199m^2, 200 – 299m^2 etc.) and is presented in **Table 7.6**).

House size sq. m	WH no. of Houses	Ave. area sq. m	Percentage of group (WH)	Adapted (this thesis) percentage of group
10-99	82	38	35	0
100-199	50	145	21	32.9
200-299	31	240	13	20.4
300-399	19	337	8	12.5
400-499	19	435	8	12.5
500-599	11	527	5	7.2
600-699	7	665	3	4.6
700-799	2	775	1	1.3
800-899	2	825	1	1.3
900-999	0	0	0	0
1000-1499	6	1152	3	4.0
1500-1999	3	1677	1	2.0
2000-2999	2	2658	1	1.0
Total	**234**	**N/A**	**100**	**100**

Table 7.4. Percentile of houses by floor-surface area from Wallace-Hadrill (1994).

House size sq. m	Percentage of houses by size (WH)	No. of structures (Kaiser)
100-199	32.9	181
200-299	20.4	111
300-399	12.5	68
400-499	12.5	68
500-599	7.2	39
600-699	4.6	25
700-799	1.3	7
800-899	1.3	7
900-999	0.0	0
1000-1499	4.0	22
1500-1999	2.0	11
2000-2999	1.3	7
	100.0	**546**

Table 7.5. Number of observed residential structures by floor-surface area m^2.

House size sq. m	Ave. area (m^2)	No. of structures	Ave. no. of potential flames per m^2	Potential no. of flames
100-199	145	181	0.013	341.185
200-299	240	111	0.07	1864.8
300-399	337	68	0.07	1604.12
400-499	435	68	0.05	1479
500-599	527	39	0.05	1027.65
600-699	665	25	0.05	831.25
700-799	775	7	0.03	162.75
800-899	825	7	0.03	173.25
900-999	0	0	0.03	0
1000-1499	1152	22	0.03	760.32
1500-1999	1677	11	0.03	553.41
2000-2999	2658	7	0.03	558.18
Total		**546**		**9356**

Table 7.6. Observed residential structures by estimated size range (floor-surface area) and their potential number of light flames.

Once the number of houses by floor-surface area had been established, the next stage was to produce estimates for the average potential number of flames per m^2 for each house in each size category. While none of the lighting device assemblage presented in Chapter 5, **Table 5.1,** derived from any dwelling with a floor-surface area of less than 200 m^2, or from any of the 7 very large houses with between 2000 and 2999 m^2, they did provide a representative sample for the majority of house size ranges at Pompeii. Estimated potential lamp flames per m^2 for houses not represented in **Table 5.1,** Chapter 5**,** are based on estimates from a house with the next closest floor-surface area (e.g. estimates for houses with over 2000 m^2 floor-surface area was based on evidence from the Casa del Menandro (c. 1800m^2 floor-surface area). As discussed above, the range of dwellings with a size of between 10 and 99 m^2 will be included in the estimates for the 910 commercial structures (**Tables 7.8** and **7.9**). Due to the absence of representative lighting device assemblages from households with a size between 100 and 199 m^2, an estimate of two lamps (each with single nozzles) was used (this may be a relatively low estimate for the number of lamp flames per m^2, but it was based on the assumed lower social status of the inhabitants of these smaller properties (this is a major assumption and the author acknowledges that this certainly may not have been the case). The small group of properties have more in common with 'commercial' dwellings (in regards to light fuel consumption) rather than the purpose built houses with floor-surface areas of 200 m^2 and more.

While some of the figures presented here, namely those from structures in size ranges up to 199 m^2, and above 2000 m^2, were not based directly on archaeological evidence, one believes that they provide a very close approximation for the quantities of lighting devices which may have been present, and are therefore appropriate for use in this model, when considered alongside with more accurate data from households with representative lighting device assemblages.

7.5: Results

Table 7.7 presents the total number of properties by architectural category observed by Kaiser (2011, 124). The categories highlighted in yellow, and the total number of observed examples at Pompeii formed the basis of this city-wide model of light fuel consumption. **Table 7.8** presents estimates for light fuel consumption for the use contexts explored in this study, which formed a large proportion of the urban fabric of Pompeii: commercial, residential, public baths, and religious structures. The daily and annual estimates for light fuel consumption are based on 100% of the lighting devices burning for periods stated. However, it was unlikely that all lighting devices would have been lit all of the time, or that large areas of each structure, especially residencies, would need illumination at the same time. The portability of lighting devices and equipment ensured that certain spaces within structures could have been very well illuminated, with other spaces left dark when not in use. Therefore, the overall total of 206757 litres of olive oil for light fuel is likely an over estimation. Certain factors relating to contrasting use in each of the contexts explored would most definitely have influenced light fuel consumption. There was likely a requirement that there were a number of spare lighting devices in storage, ready to replace broken ones, as and when required. Fewer devices were needed during the summer months, and for long periods when days were long, artificial light may not have been required at all (except in certain contexts, e.g. bath houses). As the sun began to set, a few lighting devices may have been lit, the quantity gradually increasing as the evening became darker.

Architectural Category	Examples of Buildings	Number of Observed Examples at Pompeii
Administrative	basilica, senate-house (*curia*)	9
Commercial	bar/restaurant (*coupon, popina, thermopolium, brothel* (*lupinar*), shop (*taberna*)	910
Entertainment	theatre, amphitheatre, odeum, quadriporticus attached to theatre	4
Health-related	bath, gymnasium (*palaestra*), latrine accessible from street	26
Production	bakery, forge, kiln, workshop	150
Religious	temple, sanctuary	15
Residential	elite house (*domus*), non-elite house	546

Table 7.7. Number of observed buildings at Pompeii by category (*after* Kaiser 2011, 124, table 8.4); categories explored in this study are highlighted in yellow.

The figures presented in **Table 7.8** may be further refined, with, perhaps, only an average of between 25% to 50% of lighting devices required at any one time (**Table 7.9**). This would have resulted in the consumption of light fuel of between 141.61 and 283.23 litres per day, or 51689.47 to 103378.95 litres annually. In order to supply these estimated quantities of light fuel, 1.88 to 3.77 Dressel 20 *amphorae* (containing olive oil) would have needed to be transported to the city per day, or 689 to 1378 over a year.

Property Type	Number of Observed Examples at Pompeii	Estimated Potential Number of Flames	Burn rate per hour (L)	Burn-time (hrs)	Daily	Annual
Commercial/dwelling	910	1820	0.015	2	54.6	19929
Residential	546	9356	0.015	1	140.3	51224.1
Baths	5	3828	0.015	6	344.5	125749.8
Religious	15	900	0.015	2	27.0	9855
					566.5	**206757.9**

Table 7.8. Estimated city-wide consumption of light fuel (in litres) for known observed properties at Pompeii (100% lighting devices in use).

Property Type	Daily 25 - 50% of lighting Devices	Annual 25-50% of lighting devices
Commercial/dwelling	13.65 - 27.30	4982.25 - 9964.50
Residential	35.08 - 70.17	12806.02 - 25612.05
Baths	83.13 - 172.26	31437.45 - 62874.90
Religious	6.75 - 13.50	2463.75 - 4927.50
Range	**141.61 - 283.23**	**51689.47 - 103378.95**

Table 7.9. Light fuel consumption based on a daily and annual average use of 25 to 50% of lighting devices.

7.6: Discussion

Modelling light fuel consumption for an entire city began with a solitary lamp with a single flame for light. Such a small and seemingly insignificant object has led to estimates of between 51,689 and 103,378 litres of olive oil consumed for light fuel at Pompeii over a year. If one uses Diocletian's prices for olive oil at the beginning of the 4th century CE of 24 *denarii* (for second quality) and 40 *denarii* (for best quality) per *sextarius* (or 0.546 litres), then the cost of illuminating this ancient city would have been between 2,272,043 and 4,544,087 *denarii* per year for second quality olive oil, and 3,786,739 and 7,573,479 *denarii* for best quality. However, these figures may only be used very tentatively, as the value of the *denari* was debased over the centuries and the market demands, and the production and supply levels to late 1st century CE Pompeii would have been significantly different to those in the 4th century CE. However, these are very significant sums, and very large amounts of money would have been spent the provision of light fuel.

The recovery of these artefacts within a range of contexts, often *in situ* from the time of the eruption, has enabled a detailed study of light fuel consumption for residential, commercial, bathing, and religious contexts within the city. However, it must be restated that the lamps recovered at Pompeii were only a small proportion of those which would have been in use in 79 CE, as many would have been removed to aid the refugees fleeing the city during the disruption of the eruption, and are therefore not represented in the archaeological record.

The wealth of archaeological evidence at Pompeii for lighting devices in domestic contexts has allowed for accurate estimates based on light fuel consumption at 10 properties: this data has provided the basis for estimating light fuel consumption in domestic settings for the entire city. The evidence for residential units (where structures were originally intended for domestic use) was more robust, with regards to quantification, than from commercial, and other, structures; most of which also probably a secondary functions as dwellings.

In order to model light fuel consumption for a single house, the Casa del Fabbro was chosen as a case study. Nineteen potential light flames were identified at this medium-sized house, which may have required between 26 and 52 litres of light fuel per year. While the Casa del Fabbro may not have been considered a 'typical' Pompeian house (if there was such a thing), the combined data from the ten households analysed in Chapter 5 provided sufficient and accurate data for lighting equipment which could be applied to all residential properties (546 in this case) to produce estimates for the potential number of flames per m2, which was then extrapolated for across a broad size-range of residences.

Domestic consumption of artificial light at Pompeii was extensive. While Kaiser (2011, 124) suggests that there were 564 observed examples of clearly residential properties (i.e. houses) (**Table 7.7**), which includes elite and non-elite houses, one must also consider the fluid nature of habitation in the ancient world, and recognize that many of Pompeii's inhabitants also resided in many of the 910 commercial, 150 production, and 15 religious structures.

The estimated requirements for artificial light at commercial premises were based on their (probable) dual function as both business and residences. The fuel consumption model was adjusted thus, with an average of one hour (over a year) of lighting device use allocated to nocturnal trading, and a second hour allocated to illuminating living space and activities once the premises had closed for the day. The 910 commercial structures observed would have consumed between 4982 and 9963 litres of light fuel per year, based on an average of 25% and 50% lighting device use. Even though the commercial structures were the largest functional category in this study (by quantity, rather than floor-surface area), light fuel consumption was only 10% of the total considered in the city-wide model.

Producing a model for an entire city block (Insula I 10), consisting of mixed use structures, has provided an insight in to the scale of artificial light consumption, and, therefore, light fuel consumption at a neighbourhood level. The 11 domestic and commercial structures which formed the insula were all consuming artificial light in various quantities. As is evident in **Table 7.9,** residential properties were consuming much greater quantities of light fuel than commercial structures. However, there was no clear correlation between house size (based on floor-surface area (m^2) and the amounts of artificial light consumed. The inhabitants of the neighbourhood (Insula I 10) consumed light fuel at an estimated rate of between 165 and 629 litres of per year. However, simply using the fuel consumption model from Insula I 10, and multiplying the results by the number of observed *insulae* at Pompeii, would, I believe, have lost a level of accuracy provided by using quantities of observed structures at Pompeii, their average number of lighting devices by house-size range, and those recovered from structures with other functions.

The evidence suggests that public and private bathing establishments at Pompeii consumed very large quantities of olive oil as fuel for lighting. Given the requirements for constant, if different, temperatures in rooms for the various constituents involved in the Roman act of bathing, natural light was kept to a minimum in many parts of the structures. However, restricting natural light resulted in many areas of the structures being poorly lit, even during the day. By using artificial light, temperatures could be controlled to a much greater extent, but this also resulted in a much greater demand for lighting devices and light fuel than in other structures, as is evidenced through the 1328 lighting devices found at the Forum Baths. The five bathing establishments modelled in this study would have consumed between 31437 and 62874 litres of light fuel annually; approximately 61% of the total for all the contexts considered (which were approximately 89% of the observed structures at Pompeii, see **Table 7.7**.

Modelling light fuel consumption at religious structures at Pompeii was more difficult than for domestic and commercial buildings, due to the lack of archaeological evidence for lighting devices found in these contexts. The only reliable published excavation of a religious building at Pompeii (from the 79 CE eruption level deposits) was that of the Temple of Isis (see Mau 1899, 162-176). The quantity of lighting devices found at the temple (and their potential number of flames), was directly extrapolated to the other 15 observed religious structures at Pompeii, to produce an estimate for light fuel consumption of between 2463.75 and 4927.50 litres per year. A wide variety of deities were worshipped at the many religious structures at Pompeii, and at the small household and roadside shrines. The participants of the ceremonies which took place at these structures would have certainly used artificial light in different ways and varying quantities as part of their religious practice.

Approximately 1660 structures of various categories have been observed at Pompeii (**Table 7.7**), and in producing this city-wide model, archaeological evidence has enabled four important areas of human activity to be analysed in relation to artificial light consumed, and, therefore, the quantities of olive oil required for light fuel. 1476 structures were included in this model, some 89% of the total. Of these, bathing establishments consumed by far the greatest quantities of light fuel, at approximately 61% of the total. Second to this were the 546 residential structures (33% of those observed), with 25% of the total light fuel consumed in these contexts whose primary function was domestic. Commercial/dwelling structures formed 55% of the observed structures, and because of their dual function this resulted in hypothesised requirements of an average of two hours of artificial light per day across a year; 10% of the light fuel for the city was consumed within these structures. Finally, the 15 religious structures formed 1% of the observed buildings at Pompeii, consuming 5% of the city's requirements for light fuel.

7.7: Conclusion

While these fuel consumption estimates are modelled using quantified archaeological evidence for lighting devices, the model is greatly dependent on broad assumptions for the daily averages of how much artificial light was actually required. There may certainly have been stark differences in light fuel consumption in the contexts examined, for example, an average of six hours of artificial light throughout the year required to illuminate bathing establishments may be a gross over estimate, as the attendants at these premises would certainly have adjusted lighting conditions depending on how many customers were present. Commercial premises may have consumed greater quantities, as the estimate for the number of potential flames was perhaps too low, and the hypothesised requirements of an average of two hours burn time may also have been too low, as many places of business (e.g. bars and brothels) would have traded well in to the night. An additional factor, which would have had an impact in producing this model, was that approximately one-third of the city is still buried beneath volcanic debris from the eruption of Mount Vesuvius in 79 CE. Given this fact, it was considered too simplistic to increase the range of figures proposed by a factor of one third, as there are too many uncertainties regarding the quantity and nature of the buried structures and evidence for lighting devices. However, there is more of the city buried beneath these volcanic deposits, and artificial light was certainly consumed within the very many structures buried in antiquity.

Chapter 8: Discussion and Conclusions

8.1: Discussion

In this chapter I will provide a discussion of the research undertaken and I will address the objectives of this thesis (see Chapter 1, Section 1.3). This will be followed by my conclusions, where I will answer the research questions proposed in Chapter 1 (Section 1.2), and conclude with an assessment of the social and economic significance of the consumption of artificial light at Pompeii, and whether the hypothesis that a reliable and affordable supply of fuel and lighting equipment were major constituents in Roman Mediterranean urban living.

8.2: Revisiting the thesis objectives

While heat and food are essential for human survival, artificial light is not. The burning of natural resources for heat and light has been practiced since the earliest humans learned to control fire. By the end of the first millennium BCE, in the Roman Mediterranean regions, artificial light was being consumed on a large scale, in contexts not previously illuminated on a regular basis, and by many whose ancestors' daily lives would have been severely restricted once the sun had set. While artificial light is not essential for human survival, the evidence from Pompeii suggests a desire for it, and its consumption gradually increased over 400 years of activity, as demonstrated through the evidence presented in Chapter 4. The archaeological evidence from Pompeii has provided an opportunity to chart the development and growth for the use of artificial light, over time, and to explore the social and economic impact for its use.

8.2.1: The development and growth of the urban consumption of artificial light at Pompeii, from c. 300 BCE to 79 CE

During the 400 years or so prior to the eruption of Mount Vesuvius in 79 CE, the consumption of artificial light increased dramatically in the neighbourhood of Insula VI. 1. This coincided with an intensification of urban development and occupation within the city walls. The evidence from the Casa del Chirurgo (presented in Chapter 4) highlights clear chronological patterns in the consumption of artificial light in the neighbourhood of Insula VI. 1, from the earliest phases of human activity in this area, around 300 BCE, until the final decade before 79 CE. The absolute quantities of lighting devices (**Table 4.4),** fineware pottery, and amphora borne commodities (including abundant supplies of olive oil, much of which was used as light fuel), all consistently increased until around 15/25 CE. The relative proportion of lighting devices when compared to fineware pottery and amphorae, gradually increase from 5% in the pre-Chirurgo phase (c. 300 – 150 BCE), to a maximum of 33% during Phase 3 (c. 25 BCE – c. 15/25 CE), levelling off to 20% (Phase 4) and 24% (Phase 5) during the final 50 years of occupation. The absolute quantities in the bulk ceramics assemblage (**Figure 4.1**) from this final 50 years of activity at the site (including the ceramic oil lamps, finewares, and amphorae analysed) gradually reduced during Phases 4 and 5. However, this reduction does not necessarily indicate a decrease in the quantities of material culture in use during this time, but was most likely due to the fewer structural redevelopments at the house, and subsequent lack of need for waste products (such as discarded ceramics) used levelling layers and construction fills.

Importantly, no metal lighting equipment was recovered from the excavations at Insula VI. 1. This contrasts sharply to material recovered from the 79 CE eruption level archaeological deposits (Chapters 5 and 6), where an average of 15.6% of the lighting equipment was manufactured in metal (**Figure 6.4**). If, hypothetically, the ceramic lighting devices from Phases 4 and 5 at the Casa del Chirurgo represented 84.4% of all lighting equipment in use during these times, with the remaining metal lamps (not present in the archaeological record) forming the remaining 15.6%, then the relative proportions of lamps would have been slightly more at, around 23% and 28%.

Following the construction of the Casa del Chirurgo in c. 200 BCE, the property underwent numerous renovations and structural developments. The original layout had covered porticoes opening to the south and east sides, making the most of the natural light with these spaces illuminated for the maximum amount of time as the sun set, with the inhabitants enjoying spectacular views across the city towards Monte Fiato to the south, and across the sea to the south and east. However, the intensification of occupation at Insula VI. 1, and throughout the city, was continuous, with demands on space for ever more buildings, and additional storeys, were great. The occupants of the Casa del Chirurgo had to adapt, both by modifying their physical environment (the house) and through the use of ever more lighting devices burning greater quantities of fuel. Multi-storied properties to the south and east would have probably restricted much of the view from the covered porticoes, and as the population of city increased, the relative lack of security offered by an open-sided house, was not sufficient to ensure the levels of safety and comfort required by its inhabitants. In the years between the end of the first century BCE and the first quarter of the first century CE, the property was very different to that originally imagined at the time of its construction a hundred years before. The southern and eastern covered porticoes had given way to extra rooms, with the house becoming more inward looking, and access to natural light was severely restricted. However, this reduction in the quantity of light available, especially during the evening, was remedied by an increased use of lighting devices. Even during the day, many parts of the house would have been relatively dark places (e.g. **Figures 4.32**, Chapter 4), and would have required some artificial light even when it was light outside.

The evidence for all of the lighting devices analysed from Insula VI. 1 (**Table 6.1**, Chapter 6) provides further support for the development and growth for the consumption of artificial light in the neighbourhood. Of the 159 (by EVEs) ceramic oil lamps recovered from seven structures within the insula, the majority, 39%, came from deposits dating to between c. 25 BCE and 25 CE. During the final phase of occupation at the insula, the absolute quantity of oil lamps reduced to 27% of the whole lighting device assemblage. These quantities incorporated lighting devices from the Casa del Chirurgo where, as one sees in **Table 6.1**, the greatest quantities of ceramic oil lamps (33%) also come from deposits dating between c. 25 BCE and 25 CE. There is clear correspondence between the quantities of lighting devices solely from the Casa del Chirurgo (**Table 4.4**) and from the seven structures as a whole (**Table 6.1**). This suggests that there was continued growth in the consumption of artificial light at Insula VI. 1 from c. 300 BCE until at least c. 25 CE.

Analysis of all of the ceramic oil lamps analysed from the insula demonstrates a clear change in production methods from predominantly wheel- and mould-made thick-bodied ceramic devices, to thin-walled items which were produced in large quantities. This change in production methods which would have had an economic benefit for the producers (**Figure 6.2**, Chapter 6). While the comparison of the relative proportions of thick- and thin-walled ceramic oil lamps found at the insula (**Figure 6.2**) may be simplistic, the results do show a radical and continued shift in methods used in the production of these objects. This development in technology would have had a significant economic impact, with much less clay (a valued commodity) required to form each lamp, and less kiln fuel needed to fire the items, as thinner vessels require less time in the kiln. This shift may have been a conscious efficiency drive, by the producers, and would have presumably resulted in increased profits for the production of the lamps. The change in production method may also have been the result of increased demand for lighting devices, therefore, encouraging producers to manufacture more lighting devices from smaller quantities of clay and kiln fuel. This may well have been the case, but it was also as likely that increased demand was only one driver for production efficiency (to supply market demands for artificial light), with an opportunity for increased profit from the same quantities of raw materials, is another likely factor.

This shift from thick- to thin-walled mould began around 100 BCE, but the major changes most likely took place between c. 25 BCE and c. 25 CE. During the latter periods, and corresponding to the dramatic growth in thin-walled, mould-made lamps, one sees the introduction and growth in the presence of imagery on the discus of many ceramic oil lamps. The forming of lamps in moulds allowed manufacturers to produce highly decorated lamps on a large scale, with a wide range of images presented on discuses, often with very elaborate designs. These designs may have made these lamps more desirable. However, many images had religious connotations, and may have been used in specific contexts relating to the worship of whichever deities were represented on the vessels.

An important aspect of the development and growth for the consumption of artificial light at Pompeii was significantly absent from the sub-floor archaeological deposits at Insula VI. 1: the more luxurious and expensive metal lighting devices and associated equipment. No pieces of metal lighting equipment were recovered from any archaeological deposit at Insula VI. 1. Therefore, sub-floor assemblages examined in this thesis provide no chronological evidence for the introduction and/or expansion for the use of metal lighting equipment at Pompeii. What was clear, based on the archaeological assemblages from the volcanic deposits of 79 CE, was that metal lighting devices and equipment were used extensively throughout the city at this time, and formed 15.6% of the overall assemblage (see **Figure 6.4**, Chapter 6). Metal lighting items (e.g. **Figures 2.4** and **2.5**) were more valuable than those manufactured in ceramic, often elaborate, and may have been placed on lampstands, or hung from chains and hooks. In addition, the use of lighting equipment in the form of metal lampstands, hooks, and chains, increases the portability of lighting devices (metal and ceramic) within and around a structure. Lampstands were often very elaborate pieces of furniture (see **Figures 2.7, 2.11, 2.12,** and **2.13**, Chapter 2), and when examined alongside metal and ceramic lighting devices themselves, may have been considered as an expression of wealth and status.

8.2.2: The scale and extent for household consumption of artificial light in 79 CE

The analysis of lighting equipment from 10 Pompeian households undertaken in Chapter 5 provides evidence for the scale and extent of the consumption of artificial light in the years immediately prior to the eruption in 79 CE. While lighting devices were present in all but one (House I 6, 8-9) of the 30 Pompeian households analysed by Allison's (2004; 2006), only archaeological assemblages from 10 properties in her sample were considered to be sufficiently representative to be analysed in detail. Lighting equipment and structural data from these properties were analysed and the data combined and extrapolated across households from Wallace-Hadrill's (1994) study of *Houses and Society in Pompeii and Herculaneum,* providing broad estimates for the scale of household consumption at Pompeii (Chapter 7).

Analysis of artefact assemblages from the 10 Pompeian households resulted in an average estimate of around 0.09 light flames for every m^2 of floor surface area (Table 5.1, Chapter 5). However, there were clearly different levels of consumption of artificial light between households, but there was no clear correlation between house size and the quantities of artificial light consumed (**Figure 5.11**). Larger houses (by ground floor surface area) did not necessarily consume more artificial light, and the greatest consumers (based on potential number of flames per m^2) were the inhabitants of the smallest house in this sample, the Casa della Ara Massima. This evidence highlights the need to consider the inhabitants of households as individual 'groups' of people, with their own socio-economic needs and desires, who may have experienced the night in many different ways. For example, the inhabitants of the Casa della Ara Massima may have spent much of the day away from home going about their business, only to return late in the evening. Their desire for artificial light to extend the day provided increased opportunities for interactions with family and friends, once the sun had set.

In the largest houses, i.e. the Casa di Julius Polybius and the Casa del Menandro, it was likely that not all rooms would have been in use at one time. In the case of the Casa di Julius Polybius, a large part of the house was given over to commercial activity, which seemingly had little need for artificial light (based on the absence of lighting devices from these areas, **Chapter 5**, Section 5.3.9). In the Casa del Menandro, a large, and elaborately decorated and well-furnished house, it was also likely that not all rooms were required for after dark activities, even for the grandest dinner party. The portability of lighting devices would have facilitated certain rooms to be illuminated and used once the sun had set; this flexibility reduced the need for all rooms to have their own lamps or lanterns, and ensured that light fuel was only consumed in areas as and when required.

Kaiser (2011, 124) identified 546 observed examples of clearly domestic structures at Pompeii, and, through the analysis undertaken in Chapter 7, an estimated total of 9356 potential light flames is proposed for the whole sample. In addition to these 546 structures, I suggest that the 910 commercial structures observed within the city, would also have had a residential function. I hypothesized that each of these 910 properties would have been furnished with at least two lighting devices, and taken as a group, this would have resulted in at least 1820 potential light flames.

In conclusion, the archaeological evidence suggests that all structures which had some residential function were probably consuming artificial light to illuminate the domestic aspects of the lives of the occupants. The 546 residential structures at Pompeii were consuming artificial light on a large scale, potentially as much as 51,224 litres of light fuel every year. For those who could afford it, their daily lives were not restricted by the lack of sunlight, and they would have been able to continue interacting in domestic settings through the consumption of artificial light. Most households consumed artificial light in different quantities, using a range of lighting devices and equipment, dependant on what they could afford, and/or were willing to spend on the illumination of their homes. The consumption of artificial light was certainly an expression of wealth and status, with the inhabitants of the city able to witness the glow of lamps emanating out of windows, open doorways, and out through the *compluvia* and the open space of peristyles, without being able to view the owners' families and guests inside.

8.2.3: The extent to which nocturnal commercial activity contributed to urban economic and structural growth

With regards to nocturnal economic activity, many, if not most, commercial structures were consuming artificial light. However, it is difficult to conclude which premises were actually open for business once the sun had set, or if the lighting devices recorded in these structures (of which few assemblages have been published) were solely for personal use. Spano's (1919) research identified that many shops, workshops, and bars at Pompeii, had been found to contain multiple lighting devices when they were excavated, often still in position on counters by the front of premises, or hanging on the wall outside. The position of lighting devices to illuminate the outside and shop fronts, so that the goods and services within could be seen, purchased, and consumed, suggests that many of these commercial enterprises were indeed open for business after dark. The ability to continue trading once the sun had set was facilitated by the access to artificial light, and heavily dependent on the cost of illuminating their premises being less than the extra income generated.

As discussed above, artificial light was consumed on a large scale at Pompeii and, most likely, in all domestic environments. Artificial illumination in domestic contexts must also be considered as part of the nocturnal economy, with households consuming lighting devices and equipment, and as a combined group of structures, significant quantities of olive oil for light fuel.

The periodic events which took place at Pompeii, such as markets, games, and festivals, would have drawn large numbers of people to the city, temporarily, but significantly, increasing the population. Epigraphic evidence from the city suggests games would have taken place on at least 49 days of the year. Events such as religious and harvest festivals, games, and theatre performances, influenced the number of occasions when people from the surrounding villages and countryside were attracted to Pompeii. These temporary visitors would require accommodation, food, drink, bathing, goods and services, and entertainment, with revelry taking place late in to the night.

During the first century CE, Roman urban centres were transformed by a dramatic expansion of permanent commercial structures (see Section 6.3.2, Chapter 6), suggesting that the demand for goods and services was almost constant, and that the supply of these was not completely reliant on periodic and temporary markets. However, the latter certainly continued to take place. The quantities of shops, workshops, and bars, at Pompeii, were many, and, combined, formed a major part of the urban landscape. In addition, during the first century CE, many households converted domestic space to areas with a commercial function, altering rooms which fronted on to the street in to space which could generate income. Demand for commercial space within the city was certainly high. The many commercial enterprises were serviced by large numbers of wage-workers and slaves, many of whom would have also resided there, along with their families. In addition to this increase in permanent commercial structures, there was a general increase in the intensification of urbanisation, with more properties crammed within the city walls, and the addition of upper floors to many structures (for extra space within the home or for rental as separate apartments). This evidence suggests that during the first century CE Pompeii was a very densely populated city. The intensification of the urban environment resulted in many residences being relatively small (e.g. back rooms in commercial premises and apartments occupying upper floors), and were possibly occupied with small family units or unrelated individuals lodging within the city. The large number of food and drink retail units at Pompeii suggests that many of the city's residents might have regularly eaten out. This phenomenon may suggest that many of the smaller residential units may have lacked cooking facilities or, perhaps, that it was not economical to purchase fuel and ingredients to cook for oneself. The provision of affordable food and drink along Pompeii's streets increased human activity in these areas, both during the day and after dark. These areas were probably very busy after dark; the majority of wage-workers and slaves were likely engaged with their employment during daylight hours, and the night was a time to rest, relax, eat and drink, and partake in the many options for entertainment offered in the city. One may have been able to safely wander around the city at night because it was a place of bustling, and illuminated, activity. An illuminated Pompeii may have enabled poorer social groups to enjoy leisure time, to explore the town, 'window' shop, eat and drink, and engage socially with other inhabitants and visitors. Without artificial light flooding out of shops and bars on to the streets of Pompeii, most of the activities of urban poor would have been severely restricted, and many would have stayed at home, with limited options for social interaction and leisure, sleeping until daybreak.

The nocturnal economy at Pompeii had many facets. The production and sale of the lighting devices and equipment themselves was clearly an economic activity, with their sale generating income for many involved as part of the *chaîne opératoire* of their manufacture. The suppliers of raw materials, such as clay and metals to form the items, the workshops and workforce necessary for the production, the kilns and furnaces for firing, the fuel required for heat, and the traders and retailers of the finished products, were all participants of a nocturnal economy. Perhaps the most important component required for the provision of artificial light was the production and supply of olive oil for light fuel. This will be discussed below.

8.2.4: The scale of olive oil consumption for lamp fuel at Pompeii

While the data presented in **Table 7.9** is based on very small proportion of structures within the city, the proposed estimates for the quantities of olive oil consumed for light fuel are substantial. For the area of the city which has been cleared of volcanic debris, with some 1660 structures identified, I estimate that very large quantities of olive oil were consumed as light fuel, possibly between 51689 and 103378 litres per year (see Chapter 7). If one considers that in early Imperial Italy there were some 431 cities (urban centres with populations of between 2000 and 3000 inhabitants), plus the mega-city that was Rome (Jongman, 2007: 501), then the consumption of light fuel was potentially enormous. The use of artificial light in Roman Italy would have consumed a large proportion of all the olive oil produced and supplied to urban centres. While it is difficult to estimate what proportion of the olive oil supplied to Pompeii was actually used for light fuel, one may start to make broad estimates for the scale of consumption based on archaeological evidence (the number of lighting devices and the potential number of flames) present in specific contexts. The data from Pompeii is ideally suited for this type of study, and the estimates presented in **Table 7.9** highlight the potentially large volumes of light fuel consumed at the city.

8.3: Revisiting the research questions

8.3.1: Why did the inhabitants of ancient Pompeii require artificial light? What were ancient Pompeians 'doing' after dark, and were these activities different to those undertaken during the day?

While it is difficult to understand the desires and needs of ancient Pompeians, the analyses undertaken in this thesis have explored a variety of social and economic contexts within the city which may have required artificial light. Artificial light facilitated human agency at times and in spaces where it was previously restricted, or experienced in less favourable conditions due to the lack of natural light. Juvenal (VII,

222) comments on schoolboys being educated by lamplight, as marble busts of Horace and Virgil were blackened by soot from burning flames.

In addition to the practical advantages that illuminating a dark space for nocturnal activity, artificial light may have also been used to enhance the experience of certain situations. To Propertius (*Eliges* II, 15), its use had personal and emotional connotations when spending time with a loved one, and the illuminated environment obviously featured heavily in his memory of the situation at the time of writing. It is, perhaps, the case, that private conversations held by lamp light, and the letting-go of certain inhibitions once a light was extinguished, and the possibilities of passion that may ensue, that some human actions and emotions are driving, in part, by light and dark.

As demonstrated in this thesis, the consumption of artificial light at Pompeii certainly took place in most contexts, and on a large scale in domestic, commercial, and leisure environments. Analysis of the evidence suggests that by the time of the eruption in 79 CE, artificial light played an important role in daily life within the city. While a great deal of archaeological evidence has been presented, the thoughts and opinions of the ancient habitants of this ancient city are absent. The reading of some ancient literary sources provides an opportunity to make enquiry into the role of artificial light through the thoughts and opinions of authors from the period, many of which have been discussed throughout this thesis (e.g. Chapter 3).

8.3.2: What commercial and domestic activities required artificial light, and why? How were commercial activities organised in regards to access to light? Were nocturnal activities different to those which took place during the day?

It was likely that there were certain commercial, domestic and religious activities which only took place during the day (e.g. productive), while others were suited to both day and night (e.g. retail of goods and services).

Commercial enterprises could have only conducted their business during the dark hours through the consumption of artificial light and, as concluded in Chapter 6, the financial outlay for the provision of artificial light must certainly have been outweighed by the income generated. It was possible that the commercial enterprises primarily engaged with retail (e.g. inns, taverns, and shops) and in the provision of leisure and hygiene activities (e.g. brothels and baths) were the most likely establishments open and trading after dark (and therefore consuming artificial light). Productive activities would have required high levels of lighting so that tools, such as sharp knives for food preparation, heavy and sharp tools for metalworking and other crafts, may be used safely and high temperature installations such as braziers, cook-fires, furnaces and kilns. Other industries, such as cloth production, would have required good eyesight and manual dexterity, and high levels of lighting in order to undertake complex tasks such as weaving, spinning and sowing.

Some commercial enterprises would have consumed disproportionate quantities of artificial light, specifically, brothels and bathing establishments. While bath houses are easily identified and discussed in Chapter 6, brothels are not as visible in the archaeological record. However, many ancient writers commented on the presence and use of brothels and noted the use of artificial light to illuminate their interiors. Privacy would have presumably been desired by consumers, and it was likely that 'service' rooms did not have much access to natural light, requiring lighting devices even during the day (if the brothel was open and trading). The doors and facades of brothels were identified by hanging laurel branches and lamps outside, even during the daylight hours.

Bathing establishments consumed artificial light on a large scale, even during the day, and the evidence presented in Chapters 6 and 7 highlights the great quantities of lighting devices and lamp fuel required to illuminate these structures. The act of bathing was fundamental to a civilised Roman, with all urban centres being furnished with bathing establishments. While bathing certainly took place from midday, many areas of the suites were required to be at a constant temperature, therefore, natural light was often tightly controlled. Artificial light was essential in order to control temperature, as well as illumination.

The activities which took place within Pompeian households may also have had a spatio-temporal element. There were many areas within households where clusters of lighting devices were found, suggesting that these spaces may have been brightly illuminated and used for different activities than areas which were naturally well-lit. In some of the houses examined in Chapter 5 there were distinct areas given over to commerce through some sort of household 'industry' (e.g. House I 10, 8, rooms 2, 3 and 4, and Casa di Julius Polybius, the western side of the southern half of the ground floor of the house). These commercial areas had very few lighting devices, but lots of access to natural light through external and internal windows, *compluvia*, and a light well. This evidence suggests that where there were household industrial activities taking place, these must have been during daylight hours.

Spaces and rooms close to entranceways seem to have been well illuminated (e.g. the Casa della Ara Massima, Casa degli Amanti, and the Casa del Menandro), most likely for the very practical reasons of providing light for people entering and leaving a property. However, this position of lighting devices close to the main entranceways, may have been to project light out into the street, and a way of the owners' to express their ability to ignore nature and continue with their daily lives without the need for sunlight.

Front halls tended to have very few lighting devices, and the evidence suggests that these spaces were used during the day when sunlight would enter through *compluvia.* Perhaps, as Martial comments (4.8; 3.36), the *paterfamilias* would receive clients during the morning, with the space later being used for household crafts by the matron (and other female members of the household) utilising the naturally well-illuminated space while also displaying their class and status in this very public part of the house (see Section 4.8, Chapter 4 and Section 5.4, Chapter 5).

Cubicula, small rooms immediately off front halls were not particularly well furnished with lighting devices. These rooms had a variety of functions, and the lack of lighting devices in *cubicula* considered in the thesis does little to aid one's interpretation of what they were used for and when. However, the lack of lighting devices may be due to their small size and lack of ventilation as the burning flames of lamps and lanterns would have emitted large amounts of smoke making the space uncomfortable very quickly.

The concentration of lighting devices towards the rear of some properties, often in rooms which opened directly on to gardens (e.g. room 12, House I 10, 8, and room 9, Casa del Fabbro) and covered porticoes (e.g. room EE, Casa di Julius Polybius and rooms 21 and 22, Casa del Menandro), suggests that the night (at home) was generally for family, friends, or business associates. These spaces were positioned away from the entranceways of the house and the more formal and 'public' front halls. The collections of lighting devices within rooms which probably had the most access to natural light, suggests that these were used as the sun set, with activities continuing in to the night, and illuminated artificially.

As highlighted in Chapter 6, worshippers at the Temple of Isis made use of lighting devices. While it was difficult to assess how much, if at all, artificial light played a role in the practices of other religious orders at Pompeii, light and dark were fundamental aspects of the Egyptian myth of Isis and Osiris. Osiris, the sun-god, was killed by his brother, Set, the ruler of darkness. Isis resurrected Osiris to conceive a son, Horus, also known as Harpocrates, the fresh sun of the new day (Mau, 1899: 162). The worship of many Egyptian divinities was practised every day, often more than once. The first service of the day for worship of Isis began was the 'opening of the temple', which took place in the early hours before the sun had risen. The temple doors were opened, but a white curtain was hung across the doorway to hide from view the interior of the temple. At the appropriate moment, the curtain was drawn to expose the representation of the goddess to worshippers (Mau, 1899: 170-171). Mau (1899: 175) notes that excavators found 58 lighting devices in a storeroom and suggests that that some aspects in the worship of Isis certainly took place at night.

8.3.4: Were there technological developments in lighting devices over time?

There was little technological development which would have impacted their function or the quantities of light emitted, of lighting devices during the period considered in this thesis (c. 300 BCE to 79 CE). Present in the 79 CE household assemblages were a range of lighting equipment which would have enhanced the flexibility in the provision of artificial light such as hanging chains and hooks, and lampstands of various heights. These items allowed for lighting devices to be placed at different heights and in large spaces where there was no shelving or surface at the required level, or hung on walls close to doorways.

The only way to increase the levels of lighting was through more lighting devices. However, there were significant technological developments in the production of lighting devices. In Chapter 6 the changes in the methods of production for ceramic oil lamps is discussed at length. The shift from predominantly wheel-made to almost exclusively mould-made from the end of the 1st century BCE onwards was significant. These mould-made lamps were mass produced, and required less clay in their manufacture (due to their very thin bodies) and less time in the kilns (which would have required less fuel because firing time was reduced). This change suggests that the production of ceramic oil lamps became specialised and that large quantities were being consumed within Pompeii.

8.3.5: How much fuel was required to illuminate Pompeii – a house, a city block, the whole city?

As explored in Chapter 7, significant quantities of light fuel were required to illuminate the ancient city of Pompeii. A model was produced for the Casa del Fabbro (Section 7. 3. 3, Chapter 7) which provides an example of the possible levels of household consumption of light fuel. If all of the lighting devices would have been used for one hour per day, then 104 litres of olive oil would have been consumed on an annual basis. However, it was very unlikely that all of the lighting devices present would have been required all of the time. Therefore, the model was refined on the basis that if an annual average of 25% and 50% of the lighting devices were used, 26 and 52 litres of olive oil, respectively, would have been consumed.

In order to estimate how much light fuel was required to illuminate an entire city block, Insula I, 10 was selected as a case study (Section 7.3.5, Chapter 7). Again, a range of quantities was proposed based on 25%, 50%, and 100% of the lighting devices in use throughout the year. Quantities of 165 (25%), 320 (50%), and 629 litres (100%) were proposed.

As a result of the range of light fuel consumption models proposed in Chapter 7, quantities for the entire city's consumption have been estimated. The figures are based on 25% and 50% of lighting devices in use throughout the year (for various periods – some use contexts required more artificial light, e.g. baths). The combined models generated results of between 51689 and 103379 litres of olive oil being consumed for artificial light at Pompeii per year. It must be emphasized again here that large areas of the city remain unexcavated, and the actual light fuel consumption for Pompeii may have been significantly greater.

8.3.6: Did the use of artificial light have social and economic consequences?

The use of artificial light in ancient Pompeii had significant social consequences. There is a fundamental human desire to gather around a flame, where the promise of heat and light offer comfort and safety. The amounts of light, natural and artificial influenced what people did, when, and where. By being able to continue one's activities once the sun has set greatly increases the time for human interactions during the months when there is reduced sunlight. Evenings and night times within households were times of leisure and entertainment, with the day extended by lamp light, and areas within the house set aside specifically for the gathering of family, friends, and associates once the sun had set. The ability, for those who could afford it, to overcome nature and continue with their daily lives was significant.

The individuals who could not afford high levels of artificial light now had many more possibilities for nocturnal human interactions. The city streets must have been populated even during the dark hours, and through artificial illuminated many had increased nocturnal opportunities for entertainment and leisure.

Did an extended day allow those of the working and/slave classes time for leisure because the day did not end with the setting of the sun? This may have been so, and the fact that certain social groups within the city could now engage with those of the wider city outside the realm of work may have been seen as a significant social benefit to those individuals. However, a day extended by artificial light had the potential to greatly lengthen the day for working/slave class, which may have a detrimental social benefit to some.

An affordable supply of artificial light encouraged and enabled a vibrant nocturnal economy at Pompeii. The ability to continue commercial activity once the sun had set provided opportunities to increase income without the need for structural expansion. By extending business hours, many enterprises could take advantage of a large urban population, and the temporary increases in the number of people visiting the city on market and games' days. However, it is impossible to assess exactly how much of the city's commercial activity took place after dark. Nevertheless, the presence of large quantities of lighting devices in almost all environments of human action in the city, suggests that the night was not a time of inactivity, but a time when social and economic interactions took place. Nocturnal activities in private residences also contributed to urban economic growth, through the consumption of goods involved in the provision of artificial light: lighting equipment and fuel. The extra dimension of a nocturnal economy at Pompeii was a major component for urban growth and the economic success of this city during the Roman period.

In the case of olive oil, one may posit that the growth in the consumption of artificial light, when considered within a framework of a general increase in wealth and prosperity, was perhaps one of the driving factors for the extensive expansion and dramatic increase in the scale of olive production throughout the Empire. Alternatively, the increase in agricultural surpluses of olive crops, especially following 'bumper' harvests, may have driven prices down, creating a situation where the burning of foodstuffs for light was an affordable luxury for many socio-economic groups; extending the day for social and economic activities, and increasing opportunities for leisure by increasing the light hours during the day. It was likely that both these hypotheses were correct, in part, as market-orientated urban economies would have been fluid. The scale of agricultural production was dependent on environmental conditions, with abundant and poor harvests, as well as consumer demand, influencing commodity prices. The consumption of olives for light fuel had significant economic implications, both in the agrarian and non-agrarian urban environments, and must be taken in to account in any study of the consumption of this staple crop during the Roman period. The dramatic expansion of olive production during this time would have significantly influenced many peoples' lives, such as agricultural workers, to individuals and organisations and involved in the processing and transportation of produce, and the many thousands of retailers in urban centres throughout the Mediterranean (Mattingly, 1988a: 50-51).

8.4: Conclusions

The consumption of artificial light was a major constituent in urban living at Pompeii. The night was not a time of inactivity, but flourished with human action, illuminated by a reliable and affordable supply of lighting equipment and fuel. Artificial light was socially and economically significant, and played an important role in the lives of those inhabiting of this now famous ancient city; from the humble slave preparing a house before dawn, to the wealthy home owner entertaining friends and associates late at night bathed in lamp light.   The glow of artificial light from windows, doors, *peristyle* and *compluvia*, witnessed by those outside well-lit houses, may have been seen as a visual expression of wealth and status, and a power over nature, projecting an environment of warmth, security, comfort, and pleasure.

The commercial landscape of the city thrived after the sun had set, with the nocturnal economy, through the household consumption of lighting devices and light fuel, and the buying and selling of goods and services, facilitated by extending the business day with artificial light. This urban, nocturnal economy was a major component of the wider agrarian production of the olive - an extremely important staple crop which generated huge wealth for landowners, with many tens of thousands of individuals engaged in its production, trade, transportation, and retail.

If one considers the Roman oil lamp as an individual item illuminating a small space, it may be viewed as humble and relatively insignificant. However, if one considers many hundreds of thousands of lighting devices burning through the night throughout the Roman Empire, then its social and economic impact was hugely significant.

8.5: Applications and future research

The methodologies utilised in this thesis are suitable for analysis of artificial light consumption at other sites throughout the Roman world. There would then be the potential for inter-site comparisons, especially for urban centres in different parts of the Empire, but also for sites with contrasting social and economic functions (for example rural villas and temples). While the majority of archaeological sites do not have the unique preservation of structural remains with *in situ* material culture witnessed at Pompeii, the comparison of robustly quantified lighting device assemblages with other material classes has the potential to aid our understanding of how people in different areas of the Roman world engaged with the night, and how much artificial light, and therefore light fuel, was consumed.

In addition to the macro-scale Empire-wide socio-economic questions the study of artificial light consumption may address, there is significant potential for the micro-scale, especially in the reconstruction of past built environments using 3D modelling. While this thesis addressed some aspects of decoration within structures and their access to natural light, the rapidly developing techniques in digital 3D modelling (such as the accurate reconstruction of levels of lighting (both natural and artificial), shade and colour) offer significant insights into how people in the past would have visually experienced the built environment.

Introduction to Appendices

The raw data from the AAPP excavations at Insula VI. 1, Pompeii, analysed in Chapters 4 and 6, are provided below. Appendix 1 is a catalogue of the material (ceramic oil lamps, amphorae, and fine tableware pottery) from the Casa del Chirurgo, analysed in Chapter 4. Also provided (prior to the catalogue of ceramic oil lamps) are full descriptions of lamp fabrics recovered from Insula VI. 1 (this includes material from properties other than the Casa del Chirurgo – see Appendix 2). Where decoration has been identified on the ceramic oil lamps, including any figurative or possible iconographic imagery, it has been noted in the vessel description. However, lamps with imagery were few and very fragmentary, and it was beyond the scope of this thesis to undertake further analyses of these to explore any 'meanings' attached to these and possible relationships with lamp use and after dark activities.

Abbreviations used in the catalogue:

LSF	=	Loeschcke Shoulder Forms
osf	=	Outer surface
isf	=	Inner surface

Fabric inclusion frequency: a = abundant, c = common, s = sparse, vs = very sparse (based on Tomber and Dore's inclusion frequencies (1998: 7, Fig. 2).

Context Code: context numbers allocated by the AAPP for excavated archaeological deposits and full descriptions of these, and well as a full discussion on the archaeology of the Casa del Chirurgo, will be available in the Anderson and Robinson (forthcoming) volume *House of the Surgeon, Pompeii: Excavations in the Casa del Chirurgo (VI. 1, 9-10,23).*

The amphorae from the Casa del Chirurgo were identified, classified and catalogued by Gary Forster (Griffiths, Forster and McKenzie-Clark forthcoming). An AAPP Form and Fabric code is provided, which were allocated by Forster as part of his analyses. Where possible, and following standard practice in Roman amphora studies, a Peacock and Williams' (1986) classification is provided (along with additional concordance if available). Vessel origin and their proposed original contents are provided and based upon those presented by Peacock and Williams and Roman Amphorae: a digital resource, University of Southampton, available online through the Archaeology Data Service (http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/).

The fine tableware pottery (red slip and black gloss wares) were identified, classified and catalogued by Jaye McKenzie-Clark, and based on her methodology outlined in Vesuvian Sigillata at Pompeii (2012). A full catalogue of the material from the Casa del Chirurgo which has been used in this thesis will be providing in the forthcoming volume An Urban Community at Pompeii. Research on Insula VI.1 by the Anglo-American Project in Pompeii: the House of the Surgeon Ceramics (Griffiths *et al., forthcoming*).

Appendix 1: AAPP ceramic oil lamp fabrics

1 Pale brown; hard, smooth, smooth fracture, fine; sparse to common, ill-sorted, rounded small inclusions: c: white (lime), c: mica (silver) s: quartz, vs: black (vitreous?), vs: brown-red iron-rich. **Munsell:** 10YR 6/2 light brownish gray.

2 Pale brown-green; hard, smooth, irregular fracture, fine-coarse; common, well-sorted, rounded, fine inclusions: c: lime, s: brown-red iron-rich, s: quartz. **Munsell:** 2.5YR 7/3 pale yellow.

3 Orange-brown; hard, smooth, irregular fracture, fine-coarse; abundant, well-sorted, rounded, fine and large inclusions: a: lime, c: quartz, s: red-brown, s: black, s: mica (gold). **Munsell:** 5YR 5/6 yellowish red.

4 Very pale brown; hard, smooth, irregular fracture, fine; sparse, ill-sorted, rounded and subrounded, fine inclusions: s: lime, s: red-brown iron-rich, s: black, s: mica (gold). **Munsell:** 7.5YR 7/4 pink.

5 Pale brown; hard, smooth, irregular fracture, fine; abundant, well-sorted, rounded, fine inclusions: a: mica (gold and silver), c: lime, c: quartz, s: red-brown iron-rich, s: black (very fine). **Munsell:** 7.5YR 7/4 pink to 10YR 7/4 very pale brown.

6 Pale brown; hard, smooth, irregular fracture, fine (sandy); sparse, ill-sorted, rounded, fine inclusions: s: quartz, s: lime, vs: red-brown iron-rich. **Munsell:** 10YR 7/3 very pale brown.

7 Pale brown; hard, smooth, smooth fracture, fine (sandy); abundant, well-sorted, rounded, very fine inclusions: a: lime, a: black (very fine), s: mica (gold and silver), vs: red iron-rich. **Munsell:** 10YR 7/3 very pale brown - 6/3 pale brown.

8 Pale brown; hard, smooth, irregular fracture, fine (sandy); abundant, well-sorted, rounded, very fine inclusions: a: black (very fine), s-c: red iron-rich, s: lime, vs: mica (gold and silver). **Munsell:** 10YR 6/4 light yellowish brown.

9 Very pale brown; hard, smooth, smooth fracture, fine (sandy); sparse, ill-sorted, subrounded, fine inclusions: s: quartz. **Munsell:** 10YR 7/3 very pale brown.

10 Pale brown; hard, smooth, irregular fracture, fine; abundant, well-sorted, subrounded, fine and medium inclusions: a: lime, a: quartz, a: black (very fine, s: mica (gold and silver), s: red iron-rich. **Munsell:** 10YR 7/3 very pale brown.

11 Dark brown-grey; hard, rough, irregular fracture, fine to coarse; abundant, well- sorted, rounded and subrounded fine to medium inclusions: a: quartz (90%), c: lime, c: black (very fine), s: mica (gold and silver), s: red iron-rich. **Munsell:** 10YR 5/2 grayish brown to 5/3 brown.

12 Brown to grey-green; hard, rough, irregular fracture, fine to coarse; abundant, ill-sorted, rounded fine and medium inclusions: a: quartz (fine), c: lime, c: black/grey, c: mica (gold and silver, some large fragments), c: brown-red iron-rich (some medium). **Munsell:** 2.5Y 6/2 light brownish gray.

13 Pale brown-grey; hard, smooth, smooth fracture, fine; abundant, well-sorted, rounded, very fine (subvisible) inclusions: a: black (very fine), a: quartz (very fine) c: lime (very fine), c: red, c: mica (gold and silver, very fine). **Munsell:** 2.5Y 6/2 light brownish gray to 6/3 light yellowish brown.

14 Grey-brown; hard, rough, irregular fracture, fine to coarse; abundant, well-sorted, rounded and subrounded, fine and medium inclusions: a: quartz, c: lime, c: black, s: orange, s: mica (silver). **Munsell:** 10YR 5/2 grayish brown.

15 Bucchero; grey-brown; hard, smooth, irregular fracture, fine; abundant, well-sorted, rounded, fine inclusions: a: quartz, a: lime, a: mica (gold and silver), s: brown-red iron-rich. **Munsell:** 10YR 5/2 grayish brown.

16 Pale brown; hard, rough, irregular fracture, coarse; abundant, well-sorted, rounded, subrounded, and angular, fine inclusions: a: lime, a: quartz; a: black (very fine), a: mica (gold and silver), s: red-orange. **Munsell:** 10YR 6/4 light yellowish brown.

17 Orange-brown; hard, smooth, irregular fracture, fine; common, ill-sorted, rounded and angular medium and large inclusions: c: black, c: lime, c: quartz, s: red-orange clay pellets, s: mica (silver). **Munsell:** 7.5YR 6/6 reddish yellow. Fine matrix but with larger inclusions

18 Grey; very hard (over fired), rough, irregular fracture, fine; abundant well-sorted, rounded and subrounded, medium to large inclusions: a: black (medium to large), a: quartz, c: lime, c; mica (gold and silver). **Munsell:** GLEY 1 4/ dark gray.

19 Campana A; orange; hard, rough, smooth fracture, fine to coarse; abundant, well-sorted, rounded (fine) and angular (medium) inclusions: a: quartz, a: mica (gold and silver), c: lime (medium, angular), c: black. **Munsell:** 5YR 5/6 yellowish red.

20 Campana B; pale brown; hard, rough, irregular fracture, fine to coarse (sandy); abundant, well-sorted, rounded and subrounded, fine and medium inclusions: a: black, a: quartz, a: mica (gold and silver, some large), c: lime. **Munsell:** 10YR 6/4 light yellowish brown.

21 Campana C; pale grey; hard, smooth, irregular fracture, fine; abundant (90%+), well-sorted, rounded fine (subvisible) inclusions: a: black, a: quartz, a: lime. **Munsell:** 5Y 7/2 light gray.

22 Pale brown; hard, rough, irregular fracture, coarse; abundant, well-sorted, subrounded inclusions: c: quartz, c: black, c: red- brown iron-rich, c: lime, c: mica (gold and silver). **Munsell:** 10YR 7/4 very pale brown to 7/6 yellow.

23 **Same as LA18**

24 Orange-brown; hard, smooth, irregular fracture, fine; abundant, well-sorted, rounded and subrounded, fine (submicroscopic) inclusions: a: lime, a: mica (gold and silver, some medium, subrounded), a: quartz; c: black (very fine). **Munsell:** 5YR 6/6 reddish yellow.

25 Pale brown; hard, rough, irregular fracture, coarse; common, ill-sorted, rounded fine and medium inclusions: c: lime, c: quartz, c: black, c: brown and red-orange iron-rich, vs: mica (silver). **Munsell:** 7.5YR 7/4 pink.

26 Pale brown-orange; soft, rough, smooth fracture, coarse; abundant, well-sorted, subrounded and angular, fine and medium inclusions: a: lime, a: quartz, c: black-grey, s: red-brown iron-rich, s: mica (gold and silver). **Munsell:** 7.5YR 6/6 reddish yellow.

27 Grey-brown; soft, rough, irregular fracture, coarse; abundant, well-sorted, rounded, fine, medium and large inclusions: a: quartz, c: black (vitreous, some large), c: grey pellets, s: lime, s: mica (silver). **Munsell:** 2.5Y 5/2 grayish brown.

28 Red-brown; hard, smooth, irregular fracture, fine; abundant, well-sorted, subrounded, fine inclusions**:** a: lime, a: quartz, a: mica (gold and silver), vs: black. **Munsell.** 5YR 5/6 yellowish red. **African?**

29 Pale brown; soft, rough, irregular fracture, coarse; abundant, well-sorted, subrounded and angular, fine and medium inclusions: a: lime, a: quartz, c: black, c: red-orange iron- rich, c: mica (gold and silver, some medium, angular). **Munsell:** 10YR 6/4 light yellowish brown.

30 Grey-brown; hard, smooth, irregular fracture, fine; abundant, well-sorted, subrounded, fine inclusion: a: quartz, c: lime, s: black, s: mica (gold and silver), s: red-brown iron-rich. **Munsell:** 10YR 4/2 dark grayish brown.

Ceramic oil lamps, amphorae, red slip and black gloss tablewares from the Casa del Chirurgo

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
9739	Wheel-made, 2 fragments forming approximately half of a black gloss lamp, fuel hole in centre of discus. Black gloss osf and isf.		8	19	60	25	200.106	Construction fill	Pre-Chirurgo Activity
11178	Three-quarter lamp fragment with partial nozzle. Fine, raised point decoration on shoulder and body. Central fuel-hole in discus. Evidence of handle (missing). Base ring. Lime rich fabric?? Red slip osf.		10	26	68	50	261.043	Pit fill	1
11800	Rim and body; ovule raised-point decoration on shoulder, central fuel hole in discus. Air-hole on rim between nozzle and discus. Red-orange slip osf and isf.		11	8	65	22.5	261.043	Pit fill	1
11807	Rim. Black gloss osf and isf.		9	21	44	20	261.043	Pit fill	1
9924	Corner fragment of square mould-made lamp, central		12	8	0	25	261.045	Pit fill	1

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
	fuel hole. Thick, red slip.								
12592	Coarse, open-form hand-made lamp. Powdery surface with remains of slip (HUE 2.5Y light olive brown) osf.		15	27	70	25	260.057	Cut fill	3
12593	Body and rim fragment. Black gloss 'metallic' finish osf and isf.		9	20			260.057	Cut fill	3
9872	Black gloss body fragment.		9	20			262.004	Earth floor	3
13066	Rim and shoulder fragment. Red-orange slip osf and isf.	I a	1	4	90	12.5	262.028	Loose sub-floor surface	3
13072	Rim and discus fragment. Brown slip osf.	II a	1	2	80	2.5	262.028	Loose sub-floor surface	3
12095	Coarse, wheel-made, almost complete lamp. Evidence of nozzle and handle (both missing), and raised base. Carinated lower-body. Body diam. 52mm; base diam. 31.5mm. No surface treatment.		13	25	37	100	265.022	Cut fill	3
10309	Base and body fragment with raised point decoration. Raised base-ring, handle (missing), partial spout/neck of nozzle. Red slip osf and isf. Base-ring diam. 39mm		11	4	70	0	265.085	Cut fill	3
10310	Body fragment with raised base-ring. Closely spaced, large raised-point decoration. Orange slip osf.		11	5	70	25	265.085	Cut fill	3
10311	Large lamp fragment. Body, rim, handle (missing), and lug on left-hand side. Fine, closely-spaced raised point decoration on rim and body. Raised base-ring. Red slip osf and isf.		10	3	75	52.5	265.085	Cut fill	3
10312	Body, rim, shoulder, discus (with central fuel-hole), nozzle and lug of left side of rim. Close-spaced, large raised point decoration on top of shoulder/rim. Dark brown slip osf and isf.		11	7	70	50	265.085	Cut fill	3

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
10355	Body and base with small, raised-point decoration. Orange slip osf.		10	26	0	0	265.085	Cut fill	3
10613	Campana A Black gloss base and body and nozzle fragment. Possible makers mark (unidentifiable) on base. Black gloss on osf and isf.		9	19	0	0	265.085	Cut fill	3
10616	Body, shoulder, rim, discus (with fuel-hole and figurative decoration). Air-hole between discus and rim/nozzle. Shoulder and body with closely-spaced, fine, raised-point decoration. Red-orange slip osf and isf		10	3	80	15	265.085	Cut fill	3
10621	Coarse, wheel-made complete lamp. Burning to nozzle, complete handle joins rim and base. Central fuel-hole. Raised-based. Carinated lower-body. Diam. 47.5mm, base diam. 32mm. Rough surface, orange-red slip osf, heavily eroded.		13	25	36	100	265.085	Cut fill	3
12470	Rim (with ovoid decoration) and body. Handle (broken). Brown-yellow slip osf and isf.	VIII b	6	1	74	15	277.01	Cut fill	3
12197	Rim, discus (with bird image) with semi-volute. Brown slip osf and isf.	III a	2	1	78	30	277.013	Levelling layer	3
12256	Rim. Brown slip osf.	III a	2	14	72	20	277.019	Levelling layer	3
12180	Rim. Brown slip osf.	I	1	6	68	22.5	277.03	Cut fill	3
12776	Rim with semi-volute. Orange-brown slip osf and isf.	IV	3	14	70	12.5	277.034	Cut fill	3
12777	Rim, shoulder, body and discus (with central fuel-hole). Handle (broken) sits high on rim. Red slip osf.		17	4	78	16	277.034	Cut fill	3
12778	Body, rim, discus and partial nozzle. Handle (missing). Fuel-hole in central discus and air-hole between discus and rim. Body diam. 66mm. Red-brown slip osf and isf.		11	2	66	100	277.034	Cut fill	3
12779	Rim, body and discus. Central fuel-hole. Handle (broken) sits high on rim. Red slip osf.		11	4	70	25	277.034	Cut fill	3
12507	L. 125mm, W. 75.2, H. 31.8		11	5	67.7	100	277.065	Cut fill	3

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
12508	Body, rim, discus and flared nozzle. 'Fish-tail' lug on left of body, central fuel-hole in discus, air-hole between rim and discus. Debased - ill-defined raised point decoration. Orange-brown slip osf and isf.		11	5	72	22.5	277.065	Cut fill	3
12156	Rim (with small raised-point decoration) and body. Orange slip osf.		10	17	110	17.5	277.08	Post-hole fill	3
12157	Rim with deep discus and central fuel-hole. Brown slip osf and isf.	III a	2	1	58	50	277.08	Post-hole fill	3
12158	Rim and deep discus, partial lug. Orange-red slip osf and isf.	VII b	5	3	92	30	277.08	Post-hole fill	3
13345	Rim and discus (with shell decoration). Brown-orange slip osf and isf.		1	4	76	10	277.085	Pit fill	3
21591	Rim and decorated discus. Pale brown slip osf.	II a/b	1	7	70	12.5	507.176	Pit fill	3
21592	Rim and discus. Brown slip osf.	VI b	4	6	80	8	507.176	Pit fill	3
21196	Rim and discus (with shell decoration). Brown slip osf and isf.	IV b	3	4	90	15	508.028	Garden layer/deposit	3
20364	Rim, shoulder and discus (with decoration). Ovoid decoration between rim and discus. Volute. Decoration between nozzle and rim. Orange slip osf and isf.	II a	1	22	70	15	508.036	Garden layer/deposit	3
21283	Shoulder, rim and discus (with shell decoration). Red-orange slip osf and isf.	VII b	5	24	100	7.5	508.036	Garden layer/deposit	3
23710	Rim and shoulder (with heart-shaped decoration. Red-orange slip osf and isf.	VIII b	6	8	70	2.5	508.036	Garden layer/deposit	3
23393	Body fragment with raised-point decoration. 'Fish-tail' lug with incised decoration. Brown-red slip osf and isf.		11	24	80	10	508.051	Garden layer/deposit	3

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
20427	Rim, shoulder and discus (with central fuel-hole). Brown slip osf and isf.	II b	1	2	70	15	508.052	Pit fill	3
20429	Rim, shoulder and discus. Brown slip osf.	VIII b	6	2	80	5	508.052	Pit fill	3
20430	Shoulder, rim and discus (with roulette decoration). Orange slip osf and isf.	III a	2	28	70	2.5	508.052	Pit fill	3
20601	Rim, shoulder and discus. Pale brown slip osf.	VI b	4	6	120	5	508.054	Garden layer/deposit	3
21334	Bucchero lamp fragment decorated with incised grooves and grapes? Black burnished osf.		16	15	0	2.5	508.057	Garden layer/deposit	3
21353	Rim and discus. Dark brown slip osf.	II b	1	11	60	5	508.057	Garden layer/deposit	3
21355	Shoulder (with ovule decoration), rim and discus. Black-dark brown slip osf and isf.	VIII b	6	6	100	10	508.057	Garden layer/deposit	3
21356	Rim, shoulder and discus. Brown slip osf.	III b	2	6	66	10	508.057	Garden layer/deposit	3
15286	Rim and handle fragment. Smooth, no slip.	IV b	4	5	70	20	508.073	Garden layer/deposit	3
23474	Large, thick-bodied square to ovoid. Coarsely made. Lug to left side and partial nozzle. Raised base-ring with makers' mark (M). Red-orange slip osf and isf.		12	24	70	75	508.075	Garden layer/deposit	3
23476	Thick-bodied rim and lug (with incised decoration). Quite coarsely manufactured. Red slip osf.		12	24	64	17.5	508.075	Garden layer/deposit	3
23412	Rim with deep discus fragment. Pale brown slip osf.	III a	2	7	86	12.5	508.08	Post-hole fill	3

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
23415	Shoulder and body. Red-orange slip osf.	I	1	4	60	15	508.08	Post-hole fill	3
24438	Rim. Red-orange slip osf and isf.	IV	3	5	62	13	606.013	Trench fill	3
30631	Rim and decorated (unidentifiable) discus. Handle (missing). Orange-brown slip osf.		17	24	80	11	613.024	Levelling layer	3
30632	Square-rectangular Bucchero fragment. Black slip and burnished osf.		16	15	0	0	613.024	Levelling layer	3
30633	Rim, body and discus fragments (x13). Central fuel-hole and floral decoration on discus. Orange slip osf and isf.		1	24	70	47.5	613.024	Levelling layer	3
30665	Rim, discus (with central fuel-hole) and nozzle. Soapy osf, heavily eroded.		17	2	78	17.5	613.024	Levelling layer	3
30666	Rim and nozzle with volute. Red-orange slip osf and isf.	III	2	5	70	12	613.024	Levelling layer	3
30667	Rim and body. Pale brown slip osf and isf.	I	1	26	74	15	613.024	Levelling layer	3
30668	Rim and body. Pale brown slip osf.	I	1	1	72	12.5	613.024	Levelling layer	3
30673	Rim. Mid-brown slip osf and isf.		1	5	70	7.5	613.024	Levelling layer	3
24519	Coarse, wheel-made, half-lamp with full profile. Discus with fuel-hole, handle (missing). Carinated lower-body, diam. 52.5mm, raised base diam. 29.5mm. Rough surface, no slip.		13	25	38	100	614.006	Cut fill	3
24520	Lamp with elongated, slightly round-ended nozzle; wide channel from discus to nozzle. Raised base-ring with makers mark on base (five dots). Red slip osf and isf.		17	24	62	100	614.006	Cut fill	3
24521	Complete lamp; flared flat-noised nozzle, single lug on left side, complete handle. Large, raised-point decoration on shoulder and body, raised base ring. Red slip osf.		11	24	65	100	614.006	Cut fill	3
24522	Rim (with decorated 'fish tail' lug) and decorated discus (unidentifiable) with central fuel hole. Pale brown-green slip osf.		17	2	70	25	614.006	Cut fill	3

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
24523	Black gloss rim, discus and nozzle. Dot decoration between rim and nozzle. Black gloss osf.		9	19	64	17.5	614.006	Cut fill	3
24525	Rim and handle with raised-point decoration. Red-orange slip osf and isf.		11	5	80	12.5	614.006	Cut fill	3
24526	Black gloss rim and nozzle. Black gloss osf and isf.		9	21	50	15	614.006	Cut fill	3
24527	Sub-rounded lamp; rim, body and handle (broken). Red slip osf and isf.		17	24	80	12.5	614.006	Cut fill	3
9918	Rim and shoulder with raised-point decoration. Red slip osf (heavily eroded).		10				261.038	Rubble layer	4
12463	Rim (with ovoid decoration) and body. Brown slip osf.	VIII b	6	14	80	13	277.02	Cut fill	4
13752	Rim. Orange-brown slip osf.	III a	2	4	90	16	277.047	Construction fill	4
13999	Rim with rilling and one semi-volute, decoration on discus (unidentifiable). Red-brown slip osf.	III a	2	8	70	25	507.032	Rubble layer	4
15274	Rim, shoulder, discus and volute fragment. Brown-red slip osf and isf.	II a	1	17	60	22.5	507.072	Levelling layer	4
15275	Rim, shoulder and discus fragment. Mid-brown slip osf.	VI a	4	2	80	12.5	507.072	Levelling layer	4
20204	Rim, shoulder (with semi-volute) and discus (with roulette decoration). Brown slip osf and isf.	VII b	5	1	70	12.5	507.072	Levelling layer	4
20251	Rim, shoulder and discus. Brown-red slip osf and isf.	I	1	17	60	10	507.08	Levelling layer	4
20253	Thick-bodied shoulder and body fragment (4-5mm). Red slip osf and isf.	II a	1	4	86	10	507.08	Levelling layer	4
20087	Body and shoulder with volute. Orange slip osf and isf.	III a	2	4	72	15	507.081	Pit fill	4
20089	Shoulder (with raised rilling) and discus. Dark brown-grey slip osf and isf.	VIII a	6	1	80	20	507.081	Pit fill	4
20110	Shoulder and body. Handle (missing). Brown slip osf and isf.	II a	1	1	70	13.5	507.09	Levelling layer	4
21058	Rim and discus. Dark brown slip osf and isf.	II a	1	14	70	2.5	507.09	Levelling layer	4

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
20144	Shoulder, rim, discus and base. Pale brown-orange slip osf.	III	2	16	80	22.5	507.111	Pit fill	4
20716	Rim and shoulder. Handle (missing). Pale brown slip osf and isf.	VI	4	4	98	37.5	507.164	Pit fill	4
20727	Shoulder, rim and discus. Red-brown slip osf and isf.	I	1	17	100	17.5	507.164	Pit fill	4
20669	Rim. Orange slip osf.	III a	2	4	72	10	512.551	Cess pit fill	4
23488	Rim and discus. Pale brown slip osf and isf.	I	1	2	80	14	512.551	Cess pit fill	4
23492	Rim and shoulder (with ovule decoration). Pale brown-orange slip osf and isf.	VIII	6	5	70	7.5	512.551	Cess pit fill	4
25057	Rim and shoulder. Dark brown slip osf and isf.	VIII b	6	1	90	13	607.252	Pit fill	4
25260	Rim and body fragments with large, crescent-shaped lug (L. 46mm); linear and dot decoration. Soapy, no slip.		21	30	192	10	612.017	Levelling layer	4
25263	Rim and body. 'Fish tail' lug with incised decoration. Mid-brown slip osf.		12	25	70	12.5	612.017	Levelling layer	4
21726	Black gloss, open lamp with arrow-shaped nozzle. Black gloss osf and isf.		9	21	64	25	612.023	Levelling layer	4
21729	Rim and discus (with roulette decoration between). Pale brown slip osf and isf.	I	1	6	90	10	612.023	Levelling layer	4
21731	Rim, body and volute nozzle fragments (x11). Pale brown slip osf and isf.	I	1	7	74	50	612.023	Levelling layer	4
21799	Rim (with volute), body and base. Pale brown slip osf and isf.	I	1	2	66	32.5	612.023	Levelling layer	4
21802	Rim with rectangular lug (with incised decoration). Brown-orange slip osf.		12	10	70	17.5	612.023	Levelling layer	4
21803	Body with flared nozzle and volute. Incised linear decoration radiating from discus centre. Brown-orange slip osf and isf.	III	2	13	82	12.5	612.023	Levelling layer	4
21940	Thick-bodied red slipped lamp. Small discus with central		12	24	40	30	612.023	Levelling layer	4

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
	fuel-hole; leaf motif at one point from discus, raised-point decoration on body. Possibly rectangular or square lamp. Red-orange slip osf.								
21941	Black gloss globular lamp. Base diam. 50mm, 15%. Black gloss osf and isf.		8	21	0	1	612.023	Levelling layer	4
25990	Black gloss base and body fragments. Slightly coarse black gloss slip osf and isf.		9	21	0	0	612.023	Levelling layer	4
30077	Rim and shoulder (with raised-point decoration). Pale orange slip osf and isf.		12	24	40	40	612.023	Levelling layer	4
30297	Rim and discus (with roulette decoration). Red-brown slip osf and isf.		4	11	70	5	612.023	Levelling layer	4
24397	Rim and lug with garland decoration. Orange slip osf.		12	24	70	12.5	612.031	Construction fill	4
30427	Rim and shoulder (with raised-point decoration). Red-orange slip osf and isf.		12	24	50	25	612.047	Construction fill	4
30428	Black gloss rim and body with narrow elongated rounded nozzle. Black gloss osf and isf.		8	19	80	5	612.053	Construction fill	4
30433	Rim with 'fish tail' lug (with incised decoration). Mid-brown slip osf.		17	2	80	12.5	612.053	Construction fill	4
30228	Body fragment with rectangular 'fish tail' lug. Soapy osf, no slip.		17	7	70	15	613.024	Levelling layer	4
30229	Rim and body. Red-brown slip osf.	I	1	8	76	15	613.024	Levelling layer	4
10121	Rim and body fragment. Brown slip osf.		1		80		262.009	Levelling layer	5
10122	Rim. Orange-brown slip osf.	I	1		90		262.009	Levelling layer	5
10123	Rim. Red slip osf and isf.	III a	2		90		262.009	Levelling layer	5
10168	Coarse, deep-bodied lamp with carination on lower-body. Red-brown slip osf and isf.		13	1	60	17.5	262.009	Levelling layer	5
10175	Rim. Dark brown slip osf.	III a	2		100		262.009	Levelling layer	5

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
10201	Rim. Red-orange slip osf and isf.	III a	2		60		262.014	Levelling layer	5
10269	Rim and discus with ovoid decoration. Red slip osf.	III	2	17	100	7.5	263.002	Deposit	5
13106	Half-lamp. Rim, discus (with shell decoration), handle, body, raised base-ring, volute and elongated nozzle. Pale orange-brown slip osf and isf. SV as 263-28-12879	II b	1	7	72	50	263.027	Cistern fill	5
13107	Almost complete lamp. Discus decorated with two fishes and weighing-scales. Red slip osf. SV as 263-27 13108 and 263-28-10499, 12845, 12856.	III a	2	5	70	100	263.027	Cistern fill	5
13109	Shoulder and discus fragment with volute. Red-brown slip osf and isf.	III b	2	2	80	5	263.027	Cistern fill	5
13115	Three rim fragments. Dark brown slip osf and isf. Heavy erosion, 'greenish' surface due to post-deposition.	II a	1	2	80	22.5	263.027	Cistern fill	5
10478	Mould-made, almost complete discus and shoulder fragment. Figure on discus (possibly human or human/animal with head-dress??) and goat eating fruit from small tree with dog curled-up beneath, two further goats grazing. Orange-red slip osf and isf.	VII a	5	24	85	60	263.028	Cistern fill	5
10489	Rim, discus (with central fuel-hole), volute, and nozzle. Channel (with air-hole) from nozzle to discus. Figurative decoration on discus (possibly a bird?). Red-brown slip osf and isf.	I	1	13	75	22.5	263.028	Cistern fill	5
10490	Rim, shoulder (with semi-volute) and decorated discus fragment. Red slip osf.	II b	1	17	70	12.5	263.028	Cistern fill	5
10493	Rim and shoulder with semi-volute. Red-brown slip osf and isf.	II b	1	4	72	20	263.028	Cistern fill	5
10497	Rim and discus (with radiating grooves from centre). Red slip osf.	I	1	24	70	5	263.028	Cistern fill	5
10500	Rim and shoulder with volute. Brown slip osf.	II a	1	2	90	12.5	263.028	Cistern fill	5
10501	Shoulder, body and discus fragment. Brown slip osf and	II a	1	1	80	37.5	263.028	Cistern fill	5

Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Context Description	Phase/Period
	isf, heavily eroded. Includes Acc. No's 10520, 12861, 12884, 12885.								
12855	Rim, shoulder, discus (with shell decoration) and body fragments. Handle (missing). Dark brown slip osf and isf.	I	1	18	66	42.5	263.028	Cistern fill	5
12857	Rim, shoulder (with ovoid decoration) and partial discus. Red slip osf.	VIII a	6	4	90	25	263.028	Cistern fill	5
12858	Partial rim, body, shoulder; discus with radiating lines from centre, base with central fuel-hole, and handle. Possible stamp on base. Handle (broken) sits high on shoulder. Brown slip osf.	I	1	7	65	20	263.028	Cistern fill	5
12860	Rim, shoulder and body fragment. Pale brown-green slip osf.	III a	2	21	70	22.5	263.028	Cistern fill	5
12877	Rim and flared nozzle with semi-volute. Brown-red slip osf.	II b	1	14	70	15	263.028	Cistern fill	5
12878	Rim, discus and nozzle with volute. Red-orange slip osf, heavily eroded.	I	1	5	70	15	263.028	Cistern fill	5
12880	Mould-made. Handle, rim, shoulder, discus with image (unidentifiable), central fuel-hole, base-ring with possible makers stamp. Rough, red-orange slip, heavily eroded.	VI b	4	5	64	42.5	263.028	Cistern fill	5
10785	Rim, discus, volute. Air-hole (not pierced through) between rim and nozzle. Brown slip osf and isf.	III b	2	2	80	15	265.004	Levelling layer	5
10786	Rim, shoulder and discus. Brown slip osf and isf.	VI b	4	1	80	35	265.004	Levelling layer	5
10787	Rim and body. Brown-red slip osf and isf.	VI b	4	6	80	5	265.004	Levelling layer	5
10788	Rim, shoulder and discus. Red-brown slip osf.	III b	2	6	75	15	265.004	Levelling layer	5
10790	Rim, shoulder and discus. Brown-red slip osf and isf.	IV a	3	8	60	15	265.004	Levelling layer	5
12356	Rim, shoulder, nozzle and discus (with decoration). Dark red slip osf.	IV a	3	3	70	17.5	265.004	Levelling layer	5
12359	Rim and shoulder. Brown slip osf.	VIII b	6	1	100	2.5	265.004	Levelling layer	5

Amphorae

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
9592	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
9593	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
9601	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
9657	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
9669	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
13165	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
14301	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
13151	Wine	AM/AM/001.20	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
13166	Wine	AM/AM/001.20	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
13810	Wine	AM/AM/001.20	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.059	Pre-Chirurgo Activity
13471	Olive oil/wine/other	AM/AM/014.10	C.AM.019	Spain	Class 15	**Haltern 70**, Camulodunum 185A, Schöne-Mau VII	1	507.034	Pre-Chirurgo Activity
24464	Wine (predominantly)	AM/AM/002.10	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	608.038	Pre-Chirurgo Activity

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
9599	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.035	1
9655	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.035	1
13898	Wine	AM/AM/001.10	C.AM.002	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	261.043	1
11987	Wine (predominantly)	AM/AM/002.00	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	261.043	1
11998	Wine (predominantly)	AM/AM/002.10	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	261.043	1
12002	Wine	AM/AM/002.10	C.AM.007	Campania?	Class 3-6 (a-c,	**Dressel 1A**-Ostia XX;	1	261.043	1

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
	(predominantly)			Italy	Pascual)	**1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)			
11986	Olive oil/fish sauce?	AM/AM/004.00	C.AM.017	North Africa	Class 32 (1-3)	**Neo-Punic**, Mañá C	1	261.043	1
9988	Wine (predominantly)	AM/AM/002.00	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	261.047	1
9989	Uncertain	AM/AM/004.10	C.AM.017	North Africa	Class 32 (1-3)	**Neo-Punic**, Mañá C	1	261.047	1
10987	Wine	AM/AM/001.10	C.AM.024	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	262.024	1
13904	Fish-based products	AM/AM/015.10	C.AM.034	Spain	Class 16 (a-e)	**Dressel 7-11**, Beltran 1, Paunier 435	1	262.024	1
12251	Wine (predominantly)	AM/AM/002.10	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum	1	277.036	1

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
						181, Callender 1; **1C, Pascual**)			
13760	Olive oil/wine?	AM/AM/010.10	C.AM.012	Crete	N/A	Cretoise 4, Merangou**AC4**	1	277.047	1
9347	Wine (predominantly)	AM/AM/002.10	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	184.097	3
9755	Wine	AM/AM/009.20	C.AM.027	Crete	Class 39	Cretoise 2, Benghazi ER1, Merangou**AC2**?	1	200.057	3
9695	Olive oil	AM/AM/016.10	C.AM.010	North Africa	Class 37 (a)	**Tripolitanian II**, Ostia II	1	200.057	3
9696	Uncertain	AM/AM/999.30	C.AM.999	Unknown	N/A	**Misc: unclear/unknown**	1	200.057	3
9873	Wine	AM/AM/001.10	C.AM.025	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	262.004	3
13008	Wine	AM/AM/001.10	C.AM.002	Campania? Italy	Class 2	**Greco-Italic**, Republicaine,	1	262.028	3

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
						Lamboglia 4			
13010	Wine	AM/AM/001.10	C.AM.001	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	262.028	3
10677	Wine	AM/AM/003.30	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	265.085	3
10679	Wine	AM/AM/003.30	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	265.085	3
10678	Olive oil/fish sauce?	AM/AM/004.10	C.AM.017	North Africa	Class 32 (1-3)	**Neo-Punic**, Mañá C	1	265.085	3
10385	Wine	AM/AM/009.10	C.AM.022	Crete	Class 39	Cretoise 2, Benghazi ER1, Merangou**AC2**?	1	265.085	3
10378	Fish-based products	AM/AM/015.40	C.AM.019	Spain	Class 16 (a-e)	**Dressel 7-11**, Beltran 1, Paunier 435	1	265.085	3

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
10314	Uncertain	AM/AM/999.30	C.AM.999	Unknown	N/A	**Misc: unclear/unknown**	1	265.085	3
12235	Olive oil/fish sauce?	AM/AM/004.20	C.AM.018	North Africa	Class 32 (1-3)	**Neo-Punic**, Mañá C	1	277.03	3
12702	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	277.034	3
12703	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	277.034	3
32013	Wine (predominantly)	AM/AM/002.10	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	610.054	3
30656	Wine (predominantly)	AM/AM/002.20	C.AM.001	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia	1	613.024	3

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
						XX,Camulodunum 181, Callender 1; **1C, Pascual**)			
32147	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	613.025	3
24473	Wine	AM/AM/001.10	C.AM.002?	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	614.006	3
24479	Wine (predominantly)	AM/AM/002.20?	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	614.006	3
13839	Wine	AM/AM/003.20	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	261.04	4

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
13225	Wine	AM/AM/001.10	C.AM.039	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	275.01	4
12565	Wine	AM/AM/003.20	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	277.025	4
12566	Wine	AM/AM/003.20	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	277.025	4
12560	Wine	AM/AM/001.10	C.AM.016	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	277.064	4
12560	Wine	AM/AM/001.10	C.AM.037	Campania? Italy	Class 2	**Greco-Italic**, Republicaine, Lamboglia 4	1	277.064	4
13989	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI,	1	505.005	4

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
						Camulodunum 182-3, Callender 2, Benghazi ER4			
13990	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	505.005	4
20344	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	507.08	4
20354	Fish-based products	AM/AM/005.10	C.AM.010	Spain	Class 18/19	**Beltran IIA/B**, Dressel 38, A-Ostia LXIII, Camolodunum 186C, Callender 6; B-Ostia LVIII	1	507.08	4
20083	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3,	1	507.081	4

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
						Callender 2, Benghazi ER4			
20084	Wine	AM/AM/009.10	C.AM.009	Crete	Class 39	Cretoise 2, Benghazi ER1, Merangou**AC2**?	1	507.081	4
21238	Wine (predominantly)	AM/AM/002.20	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	508.04	4
21482	Wine (predominantly)	AM/AM/002.10	C.AM.045	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	512.559	4
21484	Wine (predominantly)	AM/AM/002.20	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	512.559	4
24121	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI,	1	607.236	4

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
						Camulodunum 182-3, Callender 2, Benghazi ER4			
21835	Wine (predominantly)	AM/AM/002.10	C.AM.001?	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	612.023	4
25996	Wine (predominantly)	AM/AM/002.10	C.AM.999	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	612.023	4
21827	Wine (predominantly)	AM/AM/002.20	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	612.023	4
21983	Wine (predominantly)	AM/AM/002.20	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum	1	612.023	4

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
						181, Callender 1; **1C, Pascual**)			
21831	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	612.023	4
25679	Olive oil/fish sauce?	AM/AM/004.10	C.AM.017	North Africa	Class 32 (1-3)	**Neo-Punic**, Mañá C	1	612.023	4
21836	Olive oil/fish sauce?	AM/AM/004.20	C.AM.017	North Africa	Class 32 (1-3)	**Neo-Punic**, Mañá C	1	612.023	4
12580	Wine	AM/AM/009.10	C.AM.007	Crete	Class 39	Cretoise 2, Benghazi ER1, Merangou**AC2**?	1	612.023	4
21837	Uncertain	AM/AM/999.30	C.AM.007	Unknown	N/A	**Misc: unclear/unknown**	1	612.023	4
30503	Wine (predominantly)	AM/AM/002.20	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum181, Callender 1; **1C, Pascual**)	1	612.053	4

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
11105	Wine (predominantly)	AM/AM/002.10	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	260.015	5
9889	Wine (predominantly)	AM/AM/002.10	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	262.014	5
13333	Wine (predominantly)	AM/AM/002.00	C.AM.007	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	262.028	5
10509	Wine (predominantly)	AM/AM/002.10	C.AM.008	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	262.028	5
10519	Wine	AM/AM/003.10	C.AM.007	Campania?	Class 10	**Dressel 2-4**, Graeco-	1	263.028	5

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
				Italy		Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4			
10805	Wine	AM/AM/003.10	C.AM.006	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	263.028	5
13331	Wine	AM/AM/003.10	C.AM.006	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	263.028	5
13334	Wine	AM/AM/003.10	C.AM.001	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	263.028	5
13651	Olive oil/fish sauce?	AM/AM/004.10	C.AM.035	North Africa	Class 32 (1-3)	**Neo-Punic**, Mañá C	1	263.028	5

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
13654	Wine	AM/AM/009.10	C.AM.013	Crete	Class 39	Cretoise 2, Benghazi ER1, Merangou**AC2**?	1	263.028	5
10506	Olive oil/wine?	AM/AM/010.10	C.AM.012	Crete	N/A	Cretoise 4, Merangou**AC4**	1	263.028	5
10511	Uncertain	AM/AM/999.30	C.AM.007	Unknown	N/A	**Misc: unclear/unknown**	1	263.028	5
10851	Wine (predominantly)	AM/AM/002.10	C.AM.028	Campania? Italy	Class 3-6 (a-c, Pascual)	**Dressel 1A**-Ostia XX; **1B**-Ostia XX,Camulodunum 181, Callender 1; **1C, Pascual**)	1	265.003	5
10772	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	265.004	5
10775	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	265.004	5

Accession No.	Commodity	AAPP Form	AAPP Fabric	Origin	Peacock and Williams Class	Other concordance	EVE	Context Code	Phase/Period
11010	Wine	AM/AM/003.10	C.AM.007	Campania? Italy	Class 10	**Dressel 2-4**, Graeco-Roman, Koan, Ostia LI, Camulodunum 182-3, Callender 2, Benghazi ER4	1	265.004	5
11001	Uncertain	AM/AM/999.30	C.AM.999	Unknown	N/A	**Misc: unclear/unknown**	1	265.004	5

Red Slip Tablewares

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
261.8026	rim, body	plate	180	10.5	261.043	1
261.8141	rim	bowl	200	30.5	261.043	1
261.8142	base	cup	60		261.043	1
261.9986	handle	handle			261.047	1
607.30573	base	cup	50		607.295	1
607.32063	rim	cup	100	7	607.314	1
612.25557	rim	dish	105	8	612.027	1
612.25558	rim	dish	160	4	612.027	1

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
612.25083,25556	rim	plate	300	14	612.046	1
508.20407	rim	platter	400	6	508.052	2
508.20409	rim	dish	160	17	508.052	2
508.20412	rim	cup	140	7	508.052	2
508.20416	rim	cup	110	8	508.052	2
508.20411,20419	rim	bowl	300	5	508.052	2
508.20418,23422	rim	cup	80	14	508.052	2
200.9719	base	plate	100		200.013	3
200.9759	rim	plate	290	2	200.057	3
200.9732	rim	cup	30	15	200.1	3
262.13051	base	cup			262.028	3
262.13052	rim	cup	100	4	262.028	3
262.13053	rim	cup	100	3	262.028	3
265.12087	base	plate	100		265.022	3
265.10836,10373	rim, handle	miscellaneous	150	15	265.022	3
265.10277	rim	miscellaneous	150	7	265.085	3
265.10278	rim	flagon	100	17	265.085	3
265.10279	body	body			265.085	3
265.1028					265.085	3
265.10281					265.085	3

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
265.10283					265.085	3
265.10286					265.085	3
265.10288					265.085	3
265.10289	handle	handle			265.085	3
265.1029	rim	flagon	45	100	265.085	3
265.10364	wall				265.085	3
265.10365	rim	plate	165	8	265.085	3
265.10366	base	flagon			265.085	3
265.10367	wall				265.085	3
265.1037	wall				265.085	3
265.10371	wall				265.085	3
265.10372	wall				265.085	3
265.10625	rim	cup	80	11	265.085	3
265.10628	rim	plate	190	7	265.085	3
265.10629	handle	handle			265.085	3
265.10368,10627	rim	dish	180	34	265.085	3
277.12552	rim		150	4	277.009	3
277.12285	rim		100	25	277.034	3
277.12513	base				277.065	3
508.21209					508.028	3

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
508.21210,21211	rim	plate	200	12	508.028	3
508.21302	body	?			508.036	3
508.23276	rim	plate	280	9	508.044	3
508.23277	base	flagon	80		508.044	3
508.23384	rim	cup	90	5	508.051	3
508.20609	base	cup			508.054	3
508.21349	rim	cup	100	4	508.057	3
508.2135	rim	cup	120	4	508.057	3
508.21352	base	cup			508.057	3
508.21316	base	plate			508.063	3
508.20616	rim	plate			508.073	3
508.21332	rim	cup	100	5	508.074	3
508.21333	rim	cup	100	16	508.074	3
508.23417	rim	plate	300	3	508.081	3
508.23418	rim	plate	165	7	508.081	3
508.23419	rim	plate	140	5	508.081	3
508.23420,23421	rim	dish	130	14	508.081	3
607.30173	rim	plate	150	5	607.261	3
607.30069	rim	cup	100	14	607.299	3
607.3007	rim	cup	160	4	607.299	3

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
607.32037,32014	rim	bowl	250	4	607.311	3
610.30032	rim	plate	200	4	610.048	3
612.25084	rim	dish	140	5	612.007	3
613.30076	base	platter	120		613.024	3
613.30205	rim	platter	360	3	613.024	3
613.30209	rim	plate	200	8	613.024	3
613.30646,30647,30648,30206	rim	platter	320	20	613.024	3
614.245	base	platter	110		614.006	3
614.24501	rim, handle	inkwell			614.006	3
614.24504	rim	plate	160	3	614.006	3
614.24505	rim	flagon	100	23	614.006	3
614.24508	rim	cup	140	5	614.006	3
614.25535	base	bowl	80		614.006	3
614.25536	base	plate	80		614.006	3
260.9951	entire profile	cup	90	17	260.012	4
261.8098	rim	dish	160	2.5	261.004	4
261.8099	rim	cup	80	6	261.004	4
261.11911,11825	rim	bowl	200	19	261.004	4
261.8137	handle,	handle			261.04	4

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
	body					
277.13343	rim	plate	220	3	277.085	4
507.20193	base	cup			507.072	4
507.20197	rim	plate	200	3	507.072	4
507.20195,20196	body				507.072	4
507.21053	rim	platter	320	28	507.079	4
507.21054	base	platter	130		507.079	4
507.20219	rim	plate	240	4	507.08	4
507.2022	rim	plate	180	5	507.08	4
507.20221	rim	plate	170	13	507.08	4
507.20222	body	beaker?			507.08	4
507.20223	base	bowl	50		507.08	4
507.20224	rim	plate	180	2	507.08	4
507.20226	rim	cup	60	2	507.08	4
507.20229	entire profile	plate	280	25	507.08	4
507.20095	rim	bowl	250	5	507.081	4
507.20070,21095	rim	plate	165	6	507.081	4
507.20115	base	flagon			507.09	4
507.20118	base	cup			507.09	4

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
507.20138	rim	plate	270	4	507.111	4
507.20139					507.111	4
507.20140,21080	rim	cup	170	4	507.111	4
507.20178	rim	cup	120	4	507.115	4
507.21077	rim	plate	150	2	507.115	4
507.21094	rim	cup	110	6	507.164	4
507.2373	base				507.164	4
508.21233	base				508.04	4
607.24132	rim	cup	100	4	607.236	4
607.24142	rim	plate	200	3	607.236	4
607.25515	base	cup	40		607.243	4
610.24706	rim	plate	180	3	610.034	4
612.25158	base	plate?			612.017	4
612.25257	base	platter	110		612.017	4
612.25258	base	plate			612.017	4
612.21767	base	cup			612.023	4
612.21768	rim	plate	200	4	612.023	4
612.21769	rim	plate	160	8	612.023	4
612.21771	rim	plate	180	5	612.023	4
612.21773	rim	plate	180	3	612.023	4

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
612.21774	rim	cup	90	14	612.023	4
612.21779	base	plate			612.023	4
612.21974	rim	flagon	70	25	612.023	4
612.21975	rim	plate	200	6	612.023	4
612.21976	rim	platter	340	3	612.023	4
612.2198	rim	flagon	150	6	612.023	4
612.21981	rim	bowl	240	9	612.023	4
612.24828	rim	flagon	70		612.023	4
612.2483	rim	plate	280	3	612.023	4
612.24831	rim	plate	210	3	612.023	4
612.24834	rim	cup	90	5	612.023	4
612.25684	base	dish	50		612.023	4
612.25685	rim	flagon	40		612.023	4
612.25686	rim	dish	140	7	612.023	4
612.25691					612.023	4
612.25998	rim	plate	250	3	612.023	4
612.30088	base	dish	50		612.023	4
612.3009	rim	flagon	60	7	612.023	4
612.21776,25691	rim	plate?	140	8	612.023	4
612.21973,30087	base	plate			612.023	4

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
612.25683,21772,21778,	entire profile	dish	150	51	612.023	4
2.19733E+14						
612.30089,30360	base	dish	60		612.023	4
612.30361	rim	cup	80	5	612.047	4
612.30437	rim	cup	100	6	612.053	4
612.30438	rim	dish	160	5	612.053	4
260.11118	rim	plate	165	4	260.015	5
260.11119	base	plate	80		260.015	5
260.11120,11116	rim	bowl	280	6	260.015	5
262.13952	rim	dish	200	3	262.006	5
262.13953	rim	dish	280		262.006	5
262.10417	rim	plate	150	3	262.008	5
262.10125	rim	dish	110	5	262.009	5
262.10126	rim	cup	140	7	262.009	5
262.10132	rim	cup	150	5	262.009	5
262.10133	rim	cup	80	9	262.009	5
262.10134, 10130	rim	platter	530	5	262.009	5
263.8105	rim	cup	90	30	263.027	5
263.8106	rim	cup	140	5	263.027	5

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
263.8107	rim	cup	80	29	263.027	5
263.8108	rim	plate	180	20	263.027	5
263.8109	rim	cup	120	7	263.027	5
263.811	base	platter	120		263.027	5
263.8111	body				263.027	5
263.8028,10459,10460,12810	rim, body	cup	80	59	263.027	5
263.10454	rim	cup	70	12	263.028	5
263.10455	base	platter	120		263.028	5
263.10457	rim	cup	50	16	263.028	5
263.10458	rim	plate	150	9	263.028	5
263.10461	base				263.028	5
263.10463	rim	cup	100	7	263.028	5
263.10464	base	cup			263.028	5
263.10465	base	plate			263.028	5
263.10472	rim		100	5	263.028	5
263.12808	base	plate			263.028	5
263.1281	rim		90	25	263.028	5
263.12811	rim	cup	90	15	263.028	5
263.12812	base	cup			263.028	5
263.12813	entire	cup	50	2	263.028	5

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
	profile					
263.12814	base	cup			263.028	5
263.12826	rim	plate	200	14	263.028	5
263.12827	rim		180	3	263.028	5
263.12828	rim		130	4	263.028	5
263.12829	rim		180	36	263.028	5
263.12886	rim	plate	240	10	263.028	5
263.13638	base	cup	60		263.028	5
263.43232	rim		100	7	263.028	5
263.81	rim, body	plate	200	11	263.028	5
263.8101	base	cup	60		263.028	5
263.8102	rim	cup	90	31	263.028	5
263.10459 + 60	rim		150	2	263.028	5
263.12809,10461	base	cup			263.028	5
263.12816,17,21	rim	plate	170	38	263.028	5
263.12824;12825	rim	plate	200	8	263.028	5
263.10265	rim	plate	190	16	263.03	5
263.10266	entire profile	cup	70	10	263.03	5
263.13147	rim	cup	100	5	263.03	5

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
263.13578	base	beaker			263.03	5
263.13587	rim	plate	200	4	263.03	5
263.13580,13142	rim	cup			263.03	5
263.13583,13144	rim	plate	200	8	263.03	5
265.11431	base				265.002	5
265.11432	base				265.002	5
265.11430,11431	base	cup			265.002	5
265.11348	rim	dish	150	5	265.003	5
505.13693	base				505.008	5

Black Gloss Tableware

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
13192					261.059	Pre-Chirurgo Activity
261.13191	rim	bowl	18.5	40	261.059	Pre-Chirurgo Activity
261.12795	rim	plate	330	20	261.059	Pre-Chirurgo Activity
275.13206	rim	cup	160	6	275.092	Pre-Chirurgo Activity

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
275.13221	rim	cup	140	5	275.092	Pre-Chirurgo Activity
275.13195	rim	cup	120	12	275.093	Pre-Chirurgo Activity
275.13201	rim	cup	120	8	275.093	Pre-Chirurgo Activity
275.13204	rim	cup	100	8	275.093	Pre-Chirurgo Activity
275.14951	base	cup	50	10	275.132	Pre-Chirurgo Activity
12421	rim	bowl	300	4	276.042	Pre-Chirurgo Activity
276.12447	rim	dish	160	11	276.045	Pre-Chirurgo Activity
12447					276.045	Pre-Chirurgo Activity
277.13797	base	cup	50	25	277.096	Pre-Chirurgo Activity
505.20011	rim	cup	90	13	505.071	Pre-Chirurgo Activity
505.20012	rim	cup	110	13	505.071	Pre-Chirurgo Activity
505.23719	rim	cup	100	10	505.075	Pre-Chirurgo Activity
505.21575	rim	bowl	160	6	505.094	Pre-Chirurgo Activity
606.30507	rim	votive cup	40	100	606.09	Pre-Chirurgo Activity
606.30506	rim	dish	90	25	606.09	Pre-Chirurgo Activity
608.30557					608.03	Pre-Chirurgo Activity
608.30568	rim	dish?	90	10	608.032	Pre-Chirurgo Activity
9257	rim	?	80	10	183.005	1
9102	body				183.126	1
9409	rim	jug	40	35	184.117	1

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
9302	rim, handle	handle	100	12	184.117	1
9304	rim	jug?	80	14	184.117	1
200.32164	rim	bowl	160	4	200.022	1
200.32165	rim	bowl?	150	13	200.022	1
9747	rim	?			200.112	1
200.3216	rim	plate	250	4	200.123	1
9773	rim	plate	280	8	260.02	1
11133	base				260.081	1
11134	knob		40	50	260.081	1
10906	rim	cup	130	4	260.093	1
11798	entire profile	plate	260	4	261.043	1
11728	rim	plate	350	4	261.043	1
11683	rim	dish?	200	7	261.043	1
11699	rim	plate	250	7	261.043	1
11702	rim	bowl	180	5	261.043	1
11686	rim	plate		2	261.043	1
11682	rim	dish?	150	20	261.043	1
11792	rim	dish?	210	5	261.043	1
11684	rim	plate	250	8	261.043	1

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
11793	rim	plate?	460	3	261.043	1
11732	rim	plate	290	6	261.043	1
11691	rim	plate	240	7	261.043	1
11767	rim	plate	300	4	261.043	1
11707	handle	handle			261.043	1
11786	rim	plate	250	2	261.043	1
11720	rim	dish?	200	4	261.043	1
11685	rim	dish?	20	7	261.043	1
11787	rim	plate	240	6	261.043	1
11794	rim	plate	230	3	261.043	1
11715	rim	dish	140	7	261.043	1
11708	handle	handle			261.043	1
11730	rim	cup	70	10	261.043	1
11739	rim	plate?	160	7	261.043	1
11776	rim	?	110	9	261.043	1
11688	rim	dish?	250	8	261.043	1
11681					261.043	1
11796	rim	plate	370	8	261.043	1
261.11694	rim	plate	350	2	261.043	1
11700	rim	bowl?	150	8	261.043	1

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
11696	body				261.043	1
11694					261.043	1
9940	rim	?			261.045	1
9950	rim	?			261.045	1
9942	rim		250	5	261.045	1
9941	body	oil container?			261.045	1
9936	base	plate			261.045	1
9938	base	dish?			261.045	1
9947	rim	dish?	150	5	261.045	1
9976	base	plate			261.047	1
10916	rim	plate?	130	7	262.018	1
10910	rim	plate	260	4	262.018	1
10928	handle	handle			262.018	1
10922	rim	?	110	6	262.018	1
10948	base	plate			262.024	1
10945	rim	plate	200	12	262.024	1
10947	rim	plate?	180	7	262.024	1
10950	rim	cup?	100	15	262.024	1
10955	rim	cup	170	7	262.024	1

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
11230	base	cup			262.039	1
14944					275.038	1
275.14946	rim	cup	80	10	275.038	1
275.14947	rim	bowl	140	7	275.038	1
10861	rim	cup	100	10	275.057	1
276.12408	base	cup	40	50	276.01	1
12408					276.01	1
12394	rim	plate/cup	150	5	276.015	1
2787					276.02	1
276.13909	rim	cup	100	7	276.02	1
276.13907	rim	cup	110	12	276.02	1
276.130908	rim	cup	150	6	276.02	1
12426	rim	plate	260	4	276.035	1
277.13442		plate	250	2	277.011	1
277.13443	rim	plate	200	4	277.011	1
277.13444	rim	plate	200	7	277.011	1
12260	rim	bowl	170	6	277.019	1
12244	base	?			277.036	1
12245	base	cup			277.036	1
505.20741	rim	bowl	170	15	505.061	1

Accession No (s).	**Description**	**Vessel Type**	**Diam. (mm)**	**Rim %**	**Context Code**	**Phase**
505.20743	rim	bowl	120	11	505.061	1
508.13455	rim	plate	200	5	508.023	1
508.2065	rim	bowl	250	4	508.072	1
608.25608	rim	plate	240	4	608.019	1
608.25611	rim	cup	140	6	608.019	1
608.25607	rim	plate	140	23	608.019	1
608.25609	rim	bowl	140	16	608.019	1
608.2561	rim	bowl	180	8	608.019	1
608.25606	rim	bowl	190	18	608.019	1
608.25613	rim	plate		2	608.019	1
24387					608.031	1
608.24388	rim	plate	260	5	608.031	1
609.24703	rim	?	120	12	609.106	1
609.32001	rim	bowl	240	6	609.106	1
609.24704	rim	bowl	200	3	609.106	1
609.2417	entire	cup/ink well	50	40	609.111	1
612.2556	rim	dish	130	7	612.027	1
508.20463	base	plate	90	27	508.052	2
508.20466	rim	platter	420	7	508.052	2
9267	rim	plate	350	3	184.009	3

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
9265	rim	bowl?	300	2	184.009	3
9330	rim	plate	330	6	184.097	3
9328	rim	jug	70	60	184.097	3
9335	rim	plate	170	6	184.097	3
9329	base	jug?			184.097	3
9333	base	cup?			184.097	3
9297	rim, handle	cup?		15	184.11	3
9277	base	plate?		100	184.115	3
9583	rim	cup	60	12	184.115	3
9707	rim	cup	70	8	200.011	3
9754	rim	cup?	170	8	200.018	3
9688	base	plate			200.057	3
9690	rim	plate			200.057	3
260.12586	rim	plate	200	4	260.057	3
9776	rim	?	30	25	260.094	3
9867	rim	plate	370	3	262.004	3
9869	rim	cup	120	10	262.004	3
262.1306	rim	cup?	80	10	262.028	3
262.13054	rim, handle	cup	90	17	262.028	3
262.1099	rim	cup	150	6	262.164	3

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
10991	body	body			262.164	3
262.1099					262.164	3
12093	rim	dish	190	5	265.022	3
12088	rim	plate	340	4	265.022	3
12089	base	plate			265.022	3
12091	base	plate			265.022	3
10273	rim	plate	250	6	265.085	3
10665	entire profile	dish	100	2	265.085	3
10665	rim	dish	180	15	265.085	3
10670	base	plate			265.085	3
10353	rim	cup	100	4	265.085	3
10667	base	dish?			265.085	3
10665	Rim		170		265.085	3
10668	base	plate			265.085	3
10669	base	plate			265.085	3
10351	rim	dish?	200	6	265.085	3
10350	base	?			265.085	3
1057	Rim		150	6	265.085	3
10658	rim	cup?	150	7	265.085	3

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
10660	rim	cup	90	9	265.085	3
10666	base	plate			265.085	3
12551	base?	?			277.009	3
277.13361	rim	cup	100	27	277.018	3
277.13359	base	flagon	7.5	50	277.018	3
277.13362	rim	plate	150	7	277.018	3
277.12289	rim	plate	280	3	277.034	3
277.12287	base	chalice	60	27	277.034	3
277.12293					277.034	3
277.12292	handle				277.034	3
277.1229	rim	plate	290	6	277.034	3
12524	rim	plate	240	6	277.065	3
277.13378	rim	cup	6.5	16	277.093	3
277.1338	rim	dish	160	7	277.093	3
505.21511	rim		170	8	505.004	3
508.2132	rim	bowl	280	5	508.036	3
508.21321	rim	dish	140	9	508.036	3
508.2132	rim	bowl	240	4	508.036	3
508.23282	rim	bowl	200	4	508.044	3
508.2339	rim	plate	300	5	508.051	3

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
508.23392	base	dish	90	45	508.051	3
508.23391	rim	dish	140	17	508.051	3
508.21342	rim	plate	260	3	508.057	3
508.21345	base	cup	70	8	508.057	3
508.23425					508.08	3
606.24763	rim	plate	170	6	606.043	3
606.24764	rim	plate	180	7	606.043	3
606.30518	rim	cup	80	4	606.075	3
610.30059	base	cup	40	75	610.048	3
613.30628	rim	platter	360	5	613.024	3
613.30658	rim	bowl	200	3	613.024	3
613.30662	base	bowl	90	23	613.024	3
613.32102	base	cup	30	100	613.027	3
613.32103			150	15	613.027	3
613.32112	rim		120	15	613.027	3
614.25539	base	plate	60	100	614.006	3
614.24512	rim	bowl	200	15	614.006	3
614.25541	rim	plate	260	7	614.006	3
614.24513	rim	plate	160	13	614.006	3
614.24515	rim	platter	360	5	614.006	3

Accession No (s).	**Description**	**Vessel Type**	**Diam. (mm)**	**Rim %**	**Context Code**	**Phase**
614.24511					614.006	3
614.24517	rim	plate	160	10	614.006	3
9551	rim	dish/bowl	40	5	184.017	4
10994	base				261.004	4
10993	rim	plate	260	13	261.004	4
10995	rim	plate	300	3	261.004	4
10999	rim	jug	90	5	261.004	4
10022	rim	plate?	220	6	261.038	4
97836	rim	plate	190	4	261.038	4
10031	rim	?			261.038	4
10024	rim	dish	250	4	261.038	4
11243	base	plate			261.04	4
275.14943	rim	cup	70	40	275.002	4
505.20008	rim	bowl	140	7	505.011	4
505.20009	base	cup	50	20	505.011	4
505.20006	rim	bowl	200	8	505.011	4
507.20043	rim	plate	240	14	507.007	4
507.13998	rim	bowl	160	4	507.032	4
512.21471	rim	bowl	260	12	512.559	4
612.21791	rim	bowl	140	10	612.023	4

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
612.24876	base	cup	40	100	612.023	4
612.24877					612.023	4
612.21789	body				612.023	4
612.21947	rim	bowl	160	6	612.023	4
612.21946					612.023	4
612.21948	rim	plate	280	29	612.023	4
612.24799	base	chalice	50	24	612.023	4
612.21781	rim	platter	430	21	612.023	4
612.24798	rim	cup	40	100	612.023	4
612.21949	rim	plate	360	19	612.023	4
612.21944	rim	cup	120	3	612.023	4
612.248	base	plate	60	25	612.023	4
612.21945	rim	dish?	160	7	612.023	4
612.21797	base	plate?	60	100	612.023	4
612.21785	rim	plate	300	4	612.023	4
612.24809					612.023	4
612.24794	rim	plate	280	6	612.023	4
612.21796	base	cup	50	11	612.023	4
612.21783	rim	plate	250	5	612.023	4
612.21792	rim	plate	220	4	612.023	4

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
612.24817	rim	plate	250	5	612.023	4
612.24802	rim	bowl	210	10	612.023	4
612.24803	rim	plate	240	10	612.023	4
612.21795	rim	plate	350	6	612.023	4
612.24874	base	plate	80	35	612.023	4
612.21788	rim	plate	360	5	612.023	4
612.21782	rim	cup	110	34	612.023	4
612.30406	rim	platter	340	5	612.047	4
612.40305	base	plate	80	30	612.047	4
612.30404	base	plate	70	50	612.047	4
612.3045	rim	plate	200	7	612.053	4
612.30451	base	plate/bowl	90	12	612.053	4
612.30446	rim	cup	110	10	612.053	4
613.30727	base	plate	90		612.017	4
262.13954	rim	platter	380	2	262.006	5
10138	rim	plate	320	1	262.009	5
10222	rim	plate	360	2	262.017	5
10225	rim				262.017	5
10229	rim	cup?		15	262.017	5
10217	rim	dish?	330	3	262.017	5

Accession No (s).	Description	Vessel Type	Diam. (mm)	Rim %	Context Code	Phase
505.13698	rim	plate	260	4	505.008	5
505.13695	rim	flagon ?	70	23	505.008	5
505.13699	rim	cup	80	27	505.008	5
505.20016	rim	cup	180	7	505.058	5

Appendix 2: AAPP ceramic oil lamps from the Bar of Acisculus, the Bar of Phoebus, The Inn, The Shrine, Triclinium, and the Well/Fountain

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Bar of Acisculus	15242	Rim fragment.		3	1	72	12.5	145.012	100 - 25/15 BCE
Bar of Acisculus	15320	Mould-made. ¼ body, ½ nozzle with burning. Discus – no decoration.		13	2	30	25	145.013	100 - 25/15 BCE
Bar of Acisculus	15325	Black Gloss fragment. Thick c. 10mm body/nozzle. Evidence of burning. Campana A.		9	19	0	0	145.013	100 - 25/15 BCE
Bar of Acisculus	15326	Rim fragment.		1	3	70	9	145.013	100 - 25/15 BCE
Bar of Acisculus	14140	Rim fragment.	II a	1	5	100	7.5	145.02	100 - 25/15 BCE
Bar of Acisculus	14695	Mould-made, complete lamp; discus with central fuel hole and shell decoration. Burning on nozzle and handle (crudely applied). Debased copy. Channel from nozzle to discus/fuel hole. Rounded nozzle flanked by volutes. Slightly raised base-ring. L: 98mm, H:	III a	2	1	67	100	323.063	100 - 25/15 BCE
Bar of Acisculus	14698	Rim fragment.	III b	2	7	80	5	323.063	100 - 25/15 BCE
Bar of Acisculus	15271	Wheel-made, whole lamp, handle (missing), slightly raised base, no decoration or slip. Central hole in discus. Evidence of burning on nozzle.		13	25	42	100	502.07	100 - 25/15 BCE
Bar of Acisculus	14822	Rim fragment.	VI b	4	1	80	13	323.03	25 - 70 CE
Bar of Acisculus	14824	Rim fragment.	VII b	5	2	70	7.5	323.03	25 - 70 CE
Bar of Phoebus	40987	Base, body and rim. Discus (with fuel-hole), raised base with makers' mark (P? - unidentifiable). S.V incl. 324-56-41113. 4 fragments. Red-brown slip.		6	4	34	7.5	324.055	100 - 25/15 BCE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Bar of Phoebus	44963	Body fragment with raised-point decoration and partial volute. Red slip.		10	4	0	2.5	324.059	100 - 25/15 BCE
Bar of Phoebus	40858	Body and rim (with ovoid decoration). Orange-brown slip on osf and isf.		6	5	120	30	324.014	25 - 70 CE
Bar of Phoebus	40859	Shoulder, rim, discus (deep bowl - c. 12mm) with fuel-hole. Partial volute.		2	5	75	20	324.014	25 - 70 CE
Bar of Phoebus	40875	Rim. Pale brown slip on osf and isf.		1	6	80	12.5	324.014	25 - 70 CE
Bar of Phoebus	40879	Rim. Orange-brown slip.	I	1	1	78	7.5	324.014	25 - 70 CE
Bar of Phoebus	40880	Rim. Red-orange slip on osf and isf.	I	1	9	62	5	324.014	25 - 70 CE
Bar of Phoebus	41026	Body, rim and discus (with Gladiator helmet decoration). Thick body (c. 3mm). Dark red-brown slip osf and isf.		1	1	74	12.5	324.024	25 - 70 CE
Bar of Phoebus	41027	Body fragment. Mid- brown-red slip.		10	4	0	2.5	324.024	25 - 70 CE
Bar of Phoebus	40139	Base and body (with raised-point decoration). Dark red-brown slip on osf and isf.		11	4	40	2.5	500.011	25/15 BCE - 25 CE
Bar of Phoebus	40576	Rim and decorated discus (unidentifiable). Pale brown slip on osf and isf.		5	6	0	2.5	500.013	25/15 BCE - 25 CE
Bar of Phoebus	40724	Shoulder, rim, discus, and base fragments. Sooting on nozzle; remains of side lug, 'shell' decoration on discus with fuel-hole SV as 40725, 40726, 40727. Light Red slip.	I	1	5	62	22	500.013	25/15 BCE - 25 CE
Bar of Phoebus	44964	Nozzle fragment.		0	6	0	2.5	500.013	25/15 BCE - 25 CE
Bar of Phoebus	44965	Nozzle fragment.		0	1	0	2.5	500.013	25/15 BCE - 25 CE
Bar of Phoebus	40722	Rim and body. Orange-brown slip.	I	1	5	88	17.5	500.018	25/15 BCE - 25 CE
Bar of Phoebus	40727	Shoulder, rim and discus. Dark brown slip.	VIII	6	1	0	10	500.018	25/15 BCE - 25 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Bar of Phoebus	40058	Shoulder and rim. Slip (uncertain colour) heavily eroded.	I	1	2	70	15	500.031	25/15 BCE - 25 CE
Bar of Phoebus	40059	Shoulder. Dark brown-red slip.	VIIa	5	5	0	10	500.031	25/15 BCE - 25 CE
Bar of Phoebus	40410	Shoulder (with lug), discus (with fuel-hole) and neck (with decoration). Dark brown slip on osf and isf.	VIIIb	6	6	80	15	500.038	25/15 BCE - 25 CE
Bar of Phoebus	40411	Nozzle fragments with sooting. Dark brown slip. SV. Incl. 500-40-40280.		0	2	0	2.5	500.038	25/15 BCE - 25 CE
The Inn	49873	Black gloss nozzle.		9	20	0	0	123.054	100 - 25/15 BCE
The Inn	49874	Black gloss rim, body and nozzle (elongated).		9	20	60	30	123.054	100 - 25/15 BCE
The Inn	48996	Rim and discus with semi-volute. Mid- brown slip, heavily eroded.	III a	2	5	78	20	126.023	100 - 25/15 BCE
The Inn	50252	Coarse, wheel-made lamp with handle (broken). Soapy, no slip. Sooting on osf.		13	22	60	25	127.039	100 - 25/15 BCE
The Inn	50275	Coarse, wheel-made lamp. Body, rim and handle (broken). Soapy, no slip.		13	3	50	20.75	127.05	100 - 25/15 BCE
The Inn	50263	Fine, mould-made lamp. Rim and shoulder with semi-volutes. Dark brown-red slip on osf and isf.	IV b	3	1	70	7.5	127.051	100 - 25/15 BCE
The Inn	49924	Coarse, wheel-made lamp with handle (broken). Soapy, no slip.		13	3	80	7.5	127.057	100 - 25/15 BCE
The Inn	53617	Fine lamp; raised-point decoration on upper- and lower-body with smooth band between; elongated nozzle (missing), one lug and handle (missing). Raised base ring with possible makers' mark. Discus with fuel-hole. Black-dark brown slip.		10	24	69	100	222.002	100 - 25/15 BCE
The Inn	53207	Discus fragment with relief decoration ('elephant' with heavy strapping and saddle). Red slip on osf.		0	5	0	0	222.003	100 - 25/15 BCE
The Inn	53208	Rim fragment.		17		80	30	222.003	100 - 25/15 BCE
The Inn	53209	Rim with flat, squared lug. Red slip.		17	5	80	22.5	222.003	100 - 25/15 BCE
The Inn	52430	Mould-made circular lamp with elongated neck (mostly		17	24	80	50	222.011	100 - 25/15 BCE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
		missing); semi-volutes (between body and neck); two squared-lugs, discus with circle of raised-points around outer-edge and decorated (unidentifiable) centre. Air-hole between neck and discus, raised-base.							
The Inn	52431	Plain, rounded rim with semi-lug. Red slip on osf and isf.		17	4	80	22.5	222.011	100 - 25/15 BCE
The Inn	52432	Rim. No slip.		17	6	60	22.5	222.011	100 - 25/15 BCE
The Inn	52583	Lamp fragment with raised-point decoration and handle (broken) that sit high on shoulder. Red slip.		11	24	73	50	222.026	100 - 25/15 BCE
The Inn	53396	Rim fragment.		2		80	15	222.042	100 - 25/15 BCE
The Inn	53400	Coarse, wheel-made lamp with carinated body and raised base. No slip.		13	2	56	30	222.042	100 - 25/15 BCE
The Inn	53763	Rim with lug. Brown slip.		17	1	0	2.5	222.048	100 - 25/15 BCE
The Inn	54002	Raised rim (with partial lug) and discus. Red slip.		17	17	80	20	222.061	100 - 25/15 BCE
The Inn	53146	Coarse, wheel-made lamp fragment with flare, pointed nozzle. Rough, no slip.		13	17	40	20	222.167	100 - 25/15 BCE
The Inn	50459	Buccero lamp nozzle, flared with flat end. Slipped/burnished on osf and isf.		16	15	0	0	271.234	100 - 25/15 BCE
The Inn	50460	Raised-base fragment with partial stamp (illegible). Red slip.		0	4	0	2.5	271.234	100 - 25/15 BCE
The Inn	50462	Bucchero lamp nozzle, with flared, flat end. Slipped/burnished.		16	15	0	0	271.234	100 - 25/15 BCE
The Inn	50465	Broken handle fragment. Slipped/burnished.		16	15	0	0	271.234	100 - 25/15 BCE
The Inn	50466	Coarse, wheel-made lamp with raised-base and handle (broken). Rough, no slip.		13	3	50	35	271.234	100 - 25/15 BCE
The Inn	50470	Bucchero lamp fragment with handle. Burnished.		16	15	0	0	271.234	100 - 25/15 BCE
The Inn	50471	Rim. Brown-red slip.		3	5	100	5	271.234	100 - 25/15 BCE
The Inn	51817	Coarse wheel-made lamp with carinated body; raised base and deep discus, flared and pointed nozzle, handle (broken).		13	3	60	100	271.235	100 - 25/15 BCE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
		Rough, no slip.							
The Inn	51818	Almost complete Bucchero lamp. Raised base-ring, protruding rim and flared, flat-ended nozzle. Burnished. Base diam. 44.7mm, length 95.5mm.		16	15	70	100	271.235	100 - 25/15 BCE
The Inn	51820	Coarse, mould-made globular lamp body with fuel-hole. Smooth, no slip.		14	3	38	47.5	271.235	100 - 25/15 BCE
The Inn	60000	Well-fired Bucchero rim and discus. Double-grooved lines on outer-rim. Burnished osf.		16	17	0	5	271.235	100 - 25/15 BCE
The Inn	60001	Bucchero flared and flat-ended nozzle. Burnished.		16	15	0	0	271.235	100 - 25/15 BCE
The Inn	60002	Bucchero base fragment with circular stamp. Burnished.		16	15	40	30	271.235	100 - 25/15 BCE
The Inn	51996	Coarse, wheel-made lamp with carinated body, raised base, flared, pointed nozzle and handle (missing). Rough, no slip.		13	4	58	100	271.243	100 - 25/15 BCE
The Inn	50238	Shoulder and discus (with rectangular fuel-hole). Brown-red slip.	IV a	3	1	120	7.5	127.08	25/15 BCE - 25/35 CE
The Inn	54081	Rim and discus. Red slip.		17	24	70	15	222.003	25/15 BCE - 25/35 CE
The Inn	54058	Shoulder and rim. Red-brown slip.	II b	1	17	60	7.5	222.007	25/15 BCE - 25/35 CE
The Inn	52489	Rim with multiple rilling on inner-shoulder. Grey-green slip.	I	1	1	110	3	222.024	25/15 BCE - 25/35 CE
The Inn	54100	Base fragment with makers' mark. Red slip. Possibly same as 52430.		17	24	0	0	223.004	25/15 BCE - 25/35 CE
The Inn	53663	Shoulder and discus (with fuel-hole and image-unidentifiable) and partial semi-volute. Brown 'glossy' slip on osf and isf.	III b	2	6	110	10	223.005	25/15 BCE - 25/35 CE
The Shrine	60027	Coarse, wheel-made, half-lamp with full profile. Discus with fuel-hole, handle (missing).		13	25	44	50	310.082	100 - 25/15 BCE
The Shrine	60028	Rim and discus fragment with central fuel-hole. No slip.		13	14	38	50	310.09	100 - 25/15 BCE
The Shrine	60029	Almost complete, coarse, wheel-made, carinated lower-body raised base, arrow-shaped nozzle, handle (missing).		13	26	31	100	310.09	100 - 25/15 BCE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
The Shrine	30791	Almost complete lamp (nozzle missing). Plain, slipped decoration, fuel-hole and air-hole in discus, handle sits high on shoulder. Flat base with single groove.	VIII b	6	5	69	100	310.091	100 - 25/15 BCE
The Shrine	30794	Shield fragment from slipped lamp, squared-corner and floral, moulded decoration.		0	4	0	0	310.091	100 - 25/15 BCE
The Shrine	60031	Small rim fragment.	II b	1	1	70	10	310.092	100 - 25/15 BCE
The Shrine	60032	Small rim fragment.	II b	1	1	50	5	310.092	100 - 25/15 BCE
The Shrine	60033	Small rim fragment.	II b	1	1	60	7.5	310.092	100 - 25/15 BCE
The Shrine	32258	Body, rim fragment with complete handle (with two grooves).	V-VI	4	1	72	20	310.106	100 - 25/15 BCE
The Shrine	32261	Shoulder, rim and handle fragment (broken).	VIII b	6	1	60	12.5	310.106	100 - 25/15 BCE
The Shrine	60034	Black gloss lamp with linear incised grooves across rim.		9	21	60	12.5	310.116	100 - 25/15 BCE
The Shrine	60038	Body and rim fragment.	IV b	3	1	78	12.5	310.155	100 - 25/15 BCE
The Shrine	60039	Small shoulder and rim fragment.	VIII b	6	4	100	5	310.164	100 - 25/15 BCE
The Shrine	30760	Body and rim fragment. Ovoid decoration between groove on outer-rim and discus.	I	1	5	80	17.5	310.169	100 - 25/15 BCE
The Shrine	60041	Small shoulder and rim fragment. Linear raised decoration on shoulder. Thick red slip.	VIII b	6	5	100	2.5	310.197	100 - 25/15 BCE
The Shrine	60042	Body and rim fragment. Ovoid decoration between groove on outer-rim and discus.	I	1	5	80	12.5	310.243	100 - 25/15 BCE
The Shrine	60045	Shoulder and rim fragment.	VI b	4	5	82	12.5	320.025	100 - 25/15 BCE
The Shrine	60058	Small shoulder and rim fragment. Shoulder with ovoid decoration.	VIII b	6	5	96	7.5	320.062	100 - 25/15 BCE
The Shrine	60060	Body and rim fragment. Black gloss globular lamp.		8	21	80	17.5	320.076	100 - 25/15 BCE
The Shrine	60074	Almost complete, coarse wheel-made lamp, with carinated lower-body, arrow-shaped nozzle (broken), handle (missing). Vertical sides on inner-rim with flat discus and fuel hole.		13	26	41	100	510.034	100 - 25/15 BCE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
The Shrine	60073	Body, shoulder, rim and discus fragment with flared lug.		12	1	80	15	510.023	200 - 100 BCE
The Shrine	60013	Base with base-ring and makers' mark.	0	0	7	60	25	204.119	25/15 BCE - 25/35 CE
The Shrine	60022	Rim and discus fragment.	IV b	3	2	92	15	310.043	25/15 BCE - 25/35 CE
The Shrine	60023	Rim with discus fragment.	VI b	4	1	76	10	310.044	25/15 BCE - 25/35 CE
The Shrine	60024	Rim with discus fragment.	VI b	4	5	80	2.5	310.044	25/15 BCE - 25/35 CE
The Shrine	60025	Rim fragment with decorated discus.	III b	2	4	76	30	310.051	25/15 BCE - 25/35 CE
The Shrine	60048	Large lamp with twin-nozzles, opposite-facing. Flared nozzle with rounded end, volutes on shoulders.	VII b	19	24	80	25	320.036	25/15 BCE - 25/35 CE
The Shrine	60049	Body and rim fragment, semi-volute.		12	16	80	15	320.05	25/15 BCE - 25/35 CE
The Shrine	60050	Body and rim fragment.	II	1	1	98	10	320.05	25/15 BCE - 25/35 CE
The Shrine	60051	Rim and discus fragment. Rectangular lug and decoration on discus (unidentifiable).		12	11	72	17.5	320.05	25/15 BCE - 25/35 CE
The Shrine	60052	Body, rim and handle (missing) fragment.		12	24	70	22.5	320.05	25/15 BCE - 25/35 CE
The Shrine	60053	Small rim fragment.	V	4	3	80	5	320.05	25/15 BCE - 25/35 CE
The Shrine	60054	Small rim fragment.	I	1	1	74	7.5	320.05	25/15 BCE - 25/35 CE
The Shrine	60062	Almost complete, coarse, wheel-made lamp, carinated lower-body, rounded arrow-shaped nozzle, handle (missing) and raise base.		13	26	33	100	320.061	25/15 BCE - 25/35 CE
The Shrine	60063	Bucchero lamp body and partial lamp fragment.		16	15	0	0	320.061	25/15 BCE - 25/35 CE
The Shrine	60064	Rim and discus fragment. Decoration (unidentifiable) on		2	5	110	10	320.061	25/15 BCE - 25/35

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
		discus and fuel-hole.							CE
The Shrine	60065	Small rim and discus fragment.	VII a	5	7	120	5	320.061	25/15 BCE - 25/35 CE
The Shrine	60066	Small rim fragment.	III	2	6	82	12.5	320.061	25/15 BCE - 25/35 CE
The Shrine	60068	Small lamp fragment, raised-point decoration (c. 2mm).		11	10	0	0	320.061	25/15 BCE - 25/35 CE
The Shrine	60069	Shoulder and rim fragment.	VII	5	5	80	12.5	320.061	25/15 BCE - 25/35 CE
The Shrine	60071	Small body, rim and handle (missing) fragment.		9	21	50	25	510.022	25/15 BCE - 25/35 CE
The Shrine	60004	Rim, base and flare, flat nozzle fragments x3.	VIII b	6	4	80	27.5	203.005	62 - 79 CE
The Shrine	60005	Rim, base and flare, flat nozzle fragments x3.	IV b	3	4	90	10	203.005	62 - 79 CE
The Shrine	60006	Rim, base and flare, flat nozzle fragments x3.	III b	2	11	92	7.5	203.02	62 - 79 CE
The Shrine	60008	Body, rim and discus fragment. Black-dark brown slip.	II b	1	5	72	20	203.055	62 - 79 CE
The Shrine	60012	Shoulder, rim and discus fragment.	VIII b	6	24	80	27.5	204.025	62 - 79 CE
The Shrine	30949	Rim and discus fragment.	VI b	4	10	120	12.5	310.019	62 - 79 CE
The Shrine	30950	Rim and discus fragment.	VIII b	6	14	60	7.5	310.019	62 - 79 CE
The Shrine	60078	Discus with figurative image (unidentifiable).		0	7	0	0	310.037	62 - 79 CE
The Shrine	60017	Shoulder with ovoid decoration, rim and discus fragment.		6	5	60	27.5	310.04	62 - 79 CE
The Shrine	60018	Rim fragment.	II b	1	2	80	5	310.04	62 - 79 CE
The Shrine	60019	Shoulder with heart-shaped decoration, rim and discus with image (unidentifiable).	VIII b	6	6	100	10	310.04	62 - 79 CE
The Shrine	60020	Body and shoulder fragment.	V	4	6	90	15	310.04	62 - 79 CE
The Shrine	60021	Body, rim and nozzle fragment with volute.	III a	2	1	70	15	310.04	62 - 79 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
The Shrine	60026	Rim fragment.		6	5	80	7.5	310.078	62 - 79 CE
The Shrine	60046	Shoulder, rim, discus and nozzle fragment. Discus with off-set fuel-hole and central, vertical, single-stem handle (broken). Elongated, rounded nozzle with semi-volutes.	VIII b	6	4	100	15	320.026	62 - 79 CE
The Shrine	60047	Small rim and discus fragment (with fuel-hole).	VIII b	6	4	90	2.5	320.026	62 - 79 CE
The Shrine	60056	Small fragment with raised decoration.		12	5	0	0	320.026	62 - 79 CE
The Shrine	60070	Small rim and handle (missing) fragment.		9	19	48	20	510.015	62 - 79 CE
The Shrine	60075	Decorated Black gloss lamp fragment.		0	20	0	0	510.043	62 - 79 CE
Triclinium	46389	Nozzle fragment with brown-orange slip.	n/a		1	0	0	270.038	100 - 25/15 BCE
Triclinium	46391	Rim fragment with brown slip.	Iv b	3	2	70	20	270.038	100 - 25/15 BCE
Triclinium	46391	Rim fragment with brown-orange slip.	IIIb	1	1	68	10	270.038	100 - 25/15 BCE
Triclinium	46392	Rim and discus fragment with brown-orange slip.	VIII a	6	2	0	7.5	270.038	100 - 25/15 BCE
Triclinium	48071	Rim fragment with orange-brown slip.	III	17	2	80	15	226.024	200 - 100 BCE
Triclinium	49105	Decorated (unidentifiable) discus fragment.	n/a	0	6	0	0	226.028	200 - 100 BCE
Triclinium	44107	Bucchero base fragment. Black-burnished.		16	15	0	0	168.078	25/15 BCE - 25 CE
Triclinium	44182	Very coarse, mould-make base. Rough, no slip.		14	5	38	100	168.1	25/15 BCE - 25 CE
Triclinium	44258	Bucchero lamp base with handle (broken). Black-burnished.		16	15	0	10	168.115	25/15 BCE - 25 CE
Triclinium	44296	Rim. Mid-brown slip, heavily eroded.	VI	4	1	60	12.5	168.115	25/15 BCE - 25 CE
Triclinium	44300	Rim. Brown-orange slip.	III a	2	17	80	6	168.115	25/15 BCE - 25 CE
Triclinium	44346	Shoulder, rim and deep discus fragment. Brown-orange slip.	III b	2	17	76	37.5	168.122	25/15 BCE - 25 CE
Triclinium	44347	Sub-rounded lamp fragment with decoration on discus. Similar to red square lamp from Surgeon.	III	2	17	70	22.5	168.122	25/15 BCE - 25 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Triclinium	44353	Rim. Brown-orange slip.	VI b	4	1	70	6	168.122	25/15 BCE - 25 CE
Triclinium	49453	Broken handle fragment with orange slip.	n/a	0	1	n/a	0	185.012	25/15 BCE - 25 CE
Triclinium	44943	Rim. Brown-orange slip.	III b	2	5	80	10	185.014	25/15 BCE - 25 CE
Triclinium	49200	Rim and body fragment. No slip, unfinished?	I	1	6	80	36	226.005	25/15 BCE - 25 CE
Triclinium	49206	Rim with semi-volute. Dark red-orange slip osf and isf.	VII a	6	5	120	5	226.005	25/15 BCE - 25 CE
Triclinium	49207	Rim with semi-volute. Dark red-brown slip osf.	III a	2	1	100	5	226.005	25/15 BCE - 25 CE
Triclinium	49211	Fragment with deep discus, fuel-hole and handle (broken). Debased Type 1.	I	1	17	86	60	226.005	25/15 BCE - 25 CE
Triclinium	49124	Rim fragment with brown-red slip.	VIIIb	6	4	0	5	270	25/15 BCE - 25 CE
Triclinium	45650	Rim and discus. Pale brown-orange slip.	VI a	1	5	110	8	270.011	25/15 BCE - 25 CE
Triclinium	45652	Rim. Dark brown slip.	II b	1	1	70	10	270.011	25/15 BCE - 25 CE
Triclinium	45825	Rim. Brown-orange slip.	I	1	17	0	2.5	270.012	25/15 BCE - 25 CE
Triclinium	45828	Rim. Orange-brown slip.	III	2	1	60	10	270.012	25/15 BCE - 25 CE
Triclinium	45841	Shoulder with ovoid decoration, sub-rounded rim and complete handle. Patchy orange slip.	VIII	6	5	0	10	270.012	25/15 BCE - 25 CE
Triclinium	45844	Rim and discus, 3 fragments. Bright orange slip.	III	2	17	76	50	270.012	25/15 BCE - 25 CE
Triclinium	45846	Rim and discus, 4 fragments. Figurative decoration on discus, 1 possibly 2 females. Red-grey slip, slightly 'metallic' flaky finish.	I	1	17	70	55	270.012	25/15 BCE - 25 CE
Triclinium	46127	Rim. Pale brown slip, heavily eroded.	III	2	2	80	5	270.012	25/15 BCE - 25 CE
Triclinium	46126	Rim. Pale brown-orange slip.	III	2	5	80	12.5	270.02	25/15 BCE - 25 CE
Triclinium	46128	Rim. Pale brown slip, heavily eroded.	I	1	5	60	15	270.02	25/15 BCE - 25 CE
Triclinium	46129	Rim. Patch grey-brown slip.	IIa	1	1	0	5	270.02	25/15 BCE - 25 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Triclinium	46245	Rim and discus (with fuel-hole and partial image - unidentifiable). Brown slip.	I	1	9	80	35	270.02	25/15 BCE - 25 CE
Triclinium	46099	Rim and discus. Orange-brown slip.	I	1	5	70	17.5	270.024	25/15 BCE - 25 CE
Triclinium	46100	Discus with Gladiator image, 2 fragments. Dark brown slip.		0	1	0	0	270.024	25/15 BCE - 25 CE
Triclinium	46238	Nozzle with volute. Grey/green-dark brown slip.		0	2	0	0	270.025	25/15 BCE - 25 CE
Triclinium	46240	Rim and discus (with shell decoration). Patchy brown-orange slip.	II b	2	18	80	25	270.025	25/15 BCE - 25 CE
Triclinium	46241	Rim. Patch red-brown slip.	I	1	3	80	7.5	270.025	25/15 BCE - 25 CE
Triclinium	46242	Rim. Patch dark brown slip.	III	2	1	80	15	270.025	25/15 BCE - 25 CE
Triclinium	46244	Rim and discus, 3 fragments. Decorated discus, male figure with cape and hands around neck of a lion/big cat. Orange-brown slip.	II	1	5	70	27.5	270.025	25/15 BCE - 25 CE
Triclinium	46443	Rim. Orange slip.	II b	5	5	58	25	270.026	25/15 BCE - 25 CE
Triclinium	46452	Rim. Brown slip.	II b	6	5	98	10	270.026	25/15 BCE - 25 CE
Triclinium	46456	Rim and decorated (unidentifiable) discus. Dark red slip.	I variant	1	5	70	15	270.026	25/15 BCE - 25 CE
Triclinium	46461	Rim with decorated discus (unidentifiable). Dark brown slip.	I	1	5	80	15	270.026	25/15 BCE - 25 CE
Triclinium	46462	Rim and plain discus and fuel-hole, large nozzle (part), air-hole between discus and nozzle. Patchy mid-brown slip.	I	1	6	94	35	270.026	25/15 BCE - 25 CE
Triclinium	49114	Rim fragment with orange-brown slip.	IIIb	2	5	80	11	270.033	25/15 BCE - 25 CE
Triclinium	49119	Rim and discus fragment. Orange-brown slip osf.	III a		1	0	0	270.033	25/15 BCE - 25 CE
Triclinium	49120	Rim. Red-brown slip osf and isf.	II b	1	1	80	10	270.033	25/15 BCE - 25 CE
Triclinium	49122	Fragment with orange-brown slip.	I	1	1	70	7.5	270.033	25/15 BCE - 25 CE
Triclinium	48169	Body, rim (with lug) and deep dish. Patchy mid-brown slip. Same as 44825.	IV b	4	1	74	32.5	270.034	25/15 BCE - 25 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Triclinium	48171	Coarse, hand-formed lamp. Smooth, no slip.		14	8	48	32.5	270.034	25/15 BCE - 25 CE
Triclinium	48172	Rim and discus. 'Pitted' red-brown slip.	VII a	5	5	80	7.5	270.034	25/15 BCE - 25 CE
Triclinium	48173	Rim and discus. Brown-orange slip on osf and isf.	I	1	5	60	10	270.034	25/15 BCE - 25 CE
Triclinium	48174	Rim with partial nozzle and volute. Patchy brown slip on osf and osf.	IV	3	7	80	5	270.034	25/15 BCE - 25 CE
Triclinium	48175	Rim. Patchy orange-brown slip.	III	2	4	100	13	270.034	25/15 BCE - 25 CE
Triclinium	48176	Rim. Brown-orange slip.	II b	1	1	70	12.5	270.034	25/15 BCE - 25 CE
Triclinium	48178	Rim with ovoid decoration. Patchy brown slip.	III	2	5	72	12.5	270.034	25/15 BCE - 25 CE
Triclinium	48179	Rim and discus. Dark red-brown slip on osf and isf.	VIII b	6	1	90	6	270.034	25/15 BCE - 25 CE
Triclinium	48180	Rim. Brown-orange slip.	II b	1	7	100	7.5	270.034	25/15 BCE - 25 CE
Triclinium	48182	Rim and discus fragment. Brown-orange slip.	III b	2	5	140	3	270.034	25/15 BCE - 25 CE
Triclinium	48183	Rim, discus (with unidentifiable decoration) and handle (1/2 missing). Brown-orange slip.	VII a	5	4	80	15	270.034	25/15 BCE - 25 CE
Triclinium	48186	Rim. Brown-orange slip.	II b	1	5	70	17.5	270.034	25/15 BCE - 25 CE
Triclinium	48189	Rim and discus. Brown-orange slip on osf and isf.	IV b	3	5	60	10	270.034	25/15 BCE - 25 CE
Triclinium	48193	Rim. Dark brown slip.	VII b	5	14	0	7.5	270.034	25/15 BCE - 25 CE
Triclinium	48194	Rim. Orange-brown slip.	II b	1	1	100	5	270.034	25/15 BCE - 25 CE
Triclinium	48195	Rim. Red-brown slip on osf and isf.	III a	2	5	100	6	270.034	25/15 BCE - 25 CE
Triclinium	48196	Rim and discus (with decoration). Brown-orange slip.	VII b	5	5	0	5	270.034	25/15 BCE - 25 CE
Triclinium	48197	Rim. Dark brown slip.	IV a	3	5	80	7.5	270.034	25/15 BCE - 25 CE
Triclinium	51404	Rim with ovoid decoration. Brown-orange slip.	III	2	5	90	15	270.034	25/15 BCE - 25 CE
Triclinium	46342	Rim with partial volute. Bright orange slip.	II b	2	5	70	15	270.036	25/15 BCE - 25 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Triclinium	46344	Rim. Brown-orange slip.	II b	2	14	70	7.5	270.036	25/15 BCE - 25 CE
Triclinium	46345	Rim. Bright orange slip.	III a	2	5	70	10	270.036	25/15 BCE - 25 CE
Triclinium	46443	Rim with complete handle. Bright orange slip.	VII b	2	5	70	12.5	270.036	25/15 BCE - 25 CE
Triclinium	49070	Rim and discus fragment with dark brown slip.	I	1	7	80	7.5	270.044	25/15 BCE - 25 CE
Triclinium	44081	Rim, shoulder (with ovoid decoration) and discus. Brown-orange slip.	VIII b	6	1	120	5	168.045	62/3 - 79 CE
Triclinium	44432	Sub-rounded lamp fragment with decoration on discus. Similar to red square lamp from Surgeon.	III	6	1	76	75	185.008	62/3 - 79 CE
Triclinium	44455	Rim. Brown-orange slip.	VI b	0	1	n/a	0	185.008	62/3 - 79 CE
Triclinium	44501	Rim, shoulder and discus fragment with patchy orange-brown slip.	VIIIa	6	6	80	10	185.008	62/3 - 79 CE
Triclinium	44825	Almost complete lamp with two lugs; central fuel-hole, and air-hole between rim and deep discus. Light, orange slip.	IVb	3	17	66	100	185.008	62/3 - 79 CE
Triclinium	44836	Rim fragment with dark brown-orange slip.	IIIb	2	1	80	10	185.013	62/3 - 79 CE
Triclinium	44826	Rim fragment with deep discus. Dark red-brown slip.	IV a	3	1	78	15	185.13	62/3 - 79 CE
Triclinium	44829	Shoulder and discus fragment with brown-red slip osf and some internal slip on isf.	IVb	3	5	90	15	185.13	62/3 - 79 CE
Triclinium	44831	Shoulder/discus fragment with grey-brown slip.	IIIa	2	11	80	7.5	185.13	62/3 - 79 CE
Triclinium	44833	Rim, shoulder (with ovule decoration) and discus. Red-brown slip on.	VIIIb	6	1	?	10	185.13	62/3 - 79 CE
Triclinium	44834	Rim and discus fragment. Discus with leaping 'big cat' in relief. Patchy, mid- brown slip.	VIIIa	6	1	90	12.5	185.13	62/3 - 79 CE
Triclinium	44835	Rim and discus fragment. Decoration in relief on discus (unidentifiable). Dark red brown slip.	IIIa	2	8	80	10	185.13	62/3 - 79 CE
Triclinium	44838	Shoulder and discus fragment with semi- volute. Brown-orange slip on osf and isf.	IIIa	2	17	80	10	185.13	62/3 - 79 CE
Well/Fountain	41142	Rim fragment with flared lug (with incised decoration). Soapy		1	5	80	17.5	143.024	25 - 70 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
		surface, heavily abraded.							
Well/Fountain	41143	Shoulder and rim. Mid- brown slip.	IIa	1	10	72	17.5	143.024	25 - 70 CE
Well/Fountain	43151	Rim; ill-defined, almost flat, rilling, and thick body (c. 10mm). Debased example. Dark brown slip.	I	1	16	0	5	143.081	25 - 70 CE
Well/Fountain	43152	Rim. Dark brown slip on osf and isf.	I	1	1	60	5	143.081	25 - 70 CE
Well/Fountain	43153	Base, with slightly raised base-ring.		0	5	0	0	143.081	25 - 70 CE
Well/Fountain	43037	Body and rim. Red slip osf.	I	1	3	0	5	206.001	25 - 70 CE
Well/Fountain	43058	Rim with small volute, discus with air-hole. Pale brown slip on osf and isf.	I	1	6	70	15	206.001	25 - 70 CE
Well/Fountain	43061	Body and rim. Pale brown slip on osf and isf.	I	1	6	80	12.5	206.001	25 - 70 CE
Well/Fountain	42880	Body and rim. Orange slip.	I	1	5	72	20	206.002	25 - 70 CE
Well/Fountain	44970	Rim. Red slip on osf and isf.	II b	1	5	60	7.5	143.051	25/10 BCE - 25 CE
Well/Fountain	41849	Shoulder, rim and discus. Red slip.	VIII b	6	5	0	5	143.058	25/10 BCE - 25 CE
Well/Fountain	41850	Rim and discus with small volute. Red slip.	II a	1	5	0	5	143.058	25/10 BCE - 25 CE
Well/Fountain	41853	Rim with deep discus. Black slip on osf and isf.	II a	1	12	0	2.5	143.058	25/10 BCE - 25 CE
Well/Fountain	41212	Shoulder (poorly defined rilling), rim, discus and slightly raised base-ring. SV. 41213. LSF: IIa. Debased example. Black/dark grey-brown slip on osf and isf.	II a	1	13	72	17.5	143.065	25/10 BCE - 25 CE
Well/Fountain	41216	Rim and discus (with shell decoration). Black slip/burnishing.		16	15	0	2.5	143.065	25/10 BCE - 25 CE
Well/Fountain	42806	Body and rim. Dark red-brown slip.	I	1	14	80	12.5	143.074	25/10 BCE - 25 CE
Well/Fountain	44971	Base of large lamp, raised base-ring, and flaring body.		0	11	80	12.5	143.074	25/10 BCE - 25 CE
Well/Fountain	41820	Body, rim (lug with incised decoration) and discus with fuel-hole. Dark brown slip on osf and isf, heavily abraded.	IV variant	2	16	75	32.5	143.075	25/10 BCE - 25 CE

Site	Accession No.	Description	LSF	Type	Fabric	Diam. (mm)	Rim %	Context Code	Phase/Period
Well/Fountain	44973	Body, rim and complete handle. Orange slip.	VIII	6	3	80	15	144.043	25/10 BCE - 25 CE
Well/Fountain	44974	Rim. Red-orange slip.	III	2	5	80	10	144.043	25/10 BCE - 25 CE
Well/Fountain	41458	Rim. Orange-brown slip.	III	2	5	70	10	144.044	25/10 BCE - 25 CE
Well/Fountain	42943	Body and rim. Brown-red slip on osf and isf.	II b	1	5	70	12.5	144.166	25/10 BCE - 25 CE
Well/Fountain	42944	Rim (with large volutes) and discus. Brown-grey slip on osf and isf. Heavily abraded.	III b	2	6	80	15	144.166	25/10 BCE - 25 CE
Well/Fountain	42187	Body and shoulder fragment. Dark brown slip.	VIII	6	4	0	5	205.011	25/10 BCE - 25 CE
Well/Fountain	43095	Rim and discus (with decoration). Dark brown-grey slip.	I	1	12	0	5	206.008	25/10 BCE - 25 CE
Well/Fountain	42488	Body and rim. Red slip on osf and isf.	I	1	6	80	5	207.011	25/10 BCE - 25 CE
Well/Fountain	42494	Two conjoining handle fragments. Floral decoration with 'knob' on rear, hollow point.		0	1	0	0	207.011	25/10 BCE - 25 CE
Well/Fountain	42495	Shoulder and rim. Pale brown slip on osf and isf.	I	1	6	60	10	207.011	25/10 BCE - 25 CE
Well/Fountain	42496	Shoulder and rim with partial volute. Red-brown slip on osf and isf.	VII a	5	5	0	10	207.011	25/10 BCE - 25 CE
Well/Fountain	42497	Body and shoulder. Probably a waster - misshapen rim/shoulder. Dark brown slip on osf and isf.	VI	4	6	60	20	207.011	25/10 BCE - 25 CE
Well/Fountain	42498	Decorative (large swirl) fragment, unknown type, solid cone-shaped. Fragment, solid 'cone' shape. Pale brown slip on osf and isf.		0	9	0	0	207.011	25/10 BCE - 25 CE
Well/Fountain	44977	Shoulder and rim. Red slip on osf and isf.	VII b	5	6	0	7.5	207.011	25/10 BCE - 25 CE
Well/Fountain	42589	Body and rim. Red slip on osf and isf.	II a	1	6	70	7.5	207.016	25/10 BCE - 25 CE
Well/Fountain	41471	Rim and discus. Brown slip on osf and isf.	I	1	6	72	20	144.057	50 - 25/10 BCE
Well/Fountain	42023	Rim. Brown slip.	I	1	2	0	2.5	205.029	50 - 25/10 BCE

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