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‘The Influence of Geography on the Development of early Rome’

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INTRODUCTION

Rome began life as a small settlement of farmers and shepherds on a series of hills overlooking the river Tiber. One reason why this settlement grew to become the capital of a vast empire can be attributed to its geography. Modern views point towards its commercial advantages, especially over its close neighbours and its setting within the wider geographical environment. This includes the location of the Via Salaria (Salt Road) linking Rome with its inland neighbours and giving it control of a very important early commodity. It was also close to the river for trade, and the Tiber Island was the lowest point at which the river could be safely crossed. All this facilitated trade with their Etruscan neighbours to the north and the Greek settlements to the south. There was also trade between the Greeks and Etruscans, and while travelling by sea was faster, it also posed risks such as piracy and weather whereas land transport was slow but safer. Anyone travelling by land from the Greek settlements to Etruria (or vice versa) who didn't want to go far inland would likely travel through Rome. Rome also enjoyed the fertile volcanic soil of its hinterland and ancient sources emphasised that the Romans were traditionally rustic farmers. Ancient discussions from the likes of Cicero and Livy tend to place a higher importance on the strategic location of the city, primarily militarily, but also culturally, for the successful growth of the city.

This investigation will focus primarily on geological and archaeological evidence. This material will be supplemented by literary evidence where that is possible. It is, however, clear that Roman writers possessed little genuine knowledge about the geographical and topographical realities of the earliest inhabitation of the site of Rome, as will be discussed further in chapter 1. For instance, in most accounts of Rome's origins, Romulus, Rome's mythical founder, was said to have founded his city on essentially uninhabited farmland. The investigation will explore the links between the local geography around the site of Rome, and discuss the impact this geography had on the early development of the site and later city. I will begin with an overview of work that has been carried out to date, including those by ancient Greek and Roman writers as well as modern archaeological and historical studies. This thesis will also include an explanation of the wider geography of the region, including the Italian peninsula and how factors such as climate, historic volcanic activity, and rainfall patterns influenced the geomorphological formation of key geographical features such as the River Tiber and the hills of Rome, and will consider how these features in turn influenced the development of the city. The geographical impact of the Tiber, along with the hills and valleys of Rome, will be the main focus of this work, which will also explore the ways in which the

geography has affected how, why, and where the Romans built bridges, roads, aqueducts, and other such works.

Modern works on the impact of geography on the development of early Rome are naturally more focussed on archaeological evidence, as well as geographical and geological data. Some of these works do still cite ancient sources to support their arguments, such as Aldrete's work on the flooding of the Tiber River.¹ While Aldrete's work is comprehensive, it does not constitute an all-encompassing study of the wider impact that geography has had on the development of early Rome. Ammerman is one of many scholars who have focussed on land use changes in the valleys of early Rome, and his archaeological field work on coring and his subsequent written works have been referenced by contemporaries. Numerous scholars have focussed on the hills and topography of Rome, Heiken's work focusses on the seven hills of Rome, while Mignone's centres on the Aventine Hill specifically, and De Rita, a geologist, has written on this aspect of the hills and the wider geological setting. However, none of these scholars has attempted to offer a comprehensive study on the wider geographical impacts of all the different aspects discussed and the interactions between the hills, valleys and rivers, and how these interactions affected the development of the city, and what the Romans did to both alleviate their geographical limitations and exploit the opportunities they presented.

The site on which Rome would be built was formed hundreds of thousands of years ago by tectonic uplift, volcanic activity, and fluvial erosion. Both the geographical history of the region and the place of Rome in the wider geographical context of the Italian peninsula will be the focus of chapter 2. Uplift occurred between over 2 million years ago until just over 1 million years ago, to raise the Italian peninsula above sea level, and the famous hills of Rome themselves, which were the focus of much of the early settlement, were formed by an early period of volcanic activity which began around 700,000 years ago. The hills were formed by a combination of tectonic uplift of hard ignimbrite rock which was covered by a layer of volcanic ash as a result of periods of volcanic activity. The softer ash and sedimentary rock were eroded by surface water runoff, as well as the Tiber River after it shifted course from a more northern route to the path it takes today. The volcanic nature of the soil in the hinterland inland of Rome facilitated subsistence farming and the growing of crops, and the central position along the Italian peninsula (coupled with its location in relation to important early trade routes as has been discussed) saw the city in a favourable location for population and economic growth.

¹ See Aldrete, 2007.

The hills on which Rome was built (which are commonly but mistakenly referred to as the seven hills of Rome) played a significant role in Rome's development, and will be the focus of chapter 3. Their position overlooking the Via Salaria and the Tiber River and island allowed for control of parts of these important trade routes. The Capitoline and Palatine hills, in particular, served as military strongholds from an early time, as may possibly be demonstrated by their prominence in foundation myths and early histories (although this may also be a reflection of what later Roman writers believed about earlier times). The Capitoline hill was a significant centre for religious institutions (it was here that the huge, archaic temple to Jupiter Optimus Maximus was built), and was also the citadel overlooking the city. The Palatine was always firmly established in the Romans' mind as the original site of Rome, as it was on this hill that Romulus was believed to have founded the city. In later times, it was desirable real estate. The eastern slopes were less defensible than those of the Palatine and Capitoline, and the circus valley separated the hill from the rest of the city, and would have physically cut the Aventine off from the city during times of flooding (the Romans saw this hill as outside the city and Pomerium until the time of Claudius), rendering the valley a swampy bog filled with malaria and other such diseases. Although it has long been viewed as something of a plebeian district, Mignone has recently argued that the Aventine was closer in social makeup to the rest of the city, and a more detailed investigation into the social architecture of the area is needed to place this hill into the greater context of the social makeup of Rome.

The valleys of Rome also affected the development of the city, albeit in a different way, and these will be the focus of chapter 4. The valleys were low lying, sometimes boggy areas which were frequently inundated both by flooding from the Tiber as well as localised flooding as a result of runoff from the surrounding hills. These valleys were heavily modified over the centuries in order for them to be permanently habitable by both the raising of the valley floors with the use of debris fill, and the construction of the Cloaca Maxima which drained excess water from the city centre. Some scholars argue they were inhabited from as early as the sixth century BCE, however I find this highly unlikely due to the environmental conditions which would have been present, as will be discussed. A significant part of modern scholarship has focussed on the Forum Valley and this will also be the main focus for this work, as it is from here that much of the best evidence has come.

The Tiber River was also a significant factor in the development of the city. The river itself was an important trade route as has been discussed, and allowed navigable access to both the coast (and therefore foreign ports) and the interior hinterland. However, the river also posed a permanent threat to the people of Rome, with flooding regularly inundating low-lying areas of

the city, rendering them uninhabitable. There are accounts from ancient sources as to the damage flooding caused, including the destruction of buildings and there are some references to loss of life. However further analysis requires environmental data to allow for a fuller picture as well as an understanding of the topography and drainage patterns of the valleys in Rome and how these have changed over time (even during the Archaic period), as will be discussed in chapter 5 of this work.

Chapter 6 will focus on infrastructure in the early city, with the exception of the drainage channels such as the Cloaca Maxima which will be covered in chapter 4. This includes early bridges, roads, aqueducts, and walls, and focusses on how they were impacted by the local geography of the region and in turn, the impact they had on the geography itself. Bridges built over the Tiber had a spatial impact on the city, opening up real estate on the right bank (western side) of the river for settlement, and they also allowed for easier trade access to link with the roads north to Etruria and south to the Greek colonies. These bridges were first made from timber, however the nature of the river environment facilitated a shift towards stone piers as more reliable and stable during flooding events. While early aqueducts were sufficient to link springs within the city to end-water users, by the 4th century BCE the population of Rome required a water supply sourced from outside the city. This presented challenges due to the nature of the geography not being uniform. As a result the majority of the length of an aqueduct was constructed underground via tunnels. Only a small proportion was built on arcades, although these short stretches showcased the greatest in Roman architecture, with arches triumphantly delivering water to the people. The Romans also constructed cisterns at the end of these aqueducts to alleviate supply issues caused by anything from structural issues with infrastructure, to drought, or to water supply being cut off during an attack on the city.

This thesis will cover the different geographical elements which have been discussed as they interact not only with the Roman people but also each other. As this thesis is artificially separating complex geographical processes into individual chapters, there will invariably be a degree of repetition between the chapters. The hills of Rome cannot be discussed without reference to the geography of the valleys or the Tiber, as one directly affects the others, and vice versa. Most modern scholars have focussed on a particular element such as the valleys or hills, or have focussed their work on geology, topography, archaeology, or the Roman people themselves. However none of these scholars has attempted a broad ranging study on how all these elements interacted and how this affected the development of the city of Rome, or the extent to which the Romans themselves modified their environment in response to this. This thesis will draw on evidence from across multiple fields such as history, archaeology,

geography, and geology to gain a fuller picture of the geographical environment of early Rome. It will also be supplemented with ancient sources (where possible) to understand how interactions with the geographical environment affected the early Romans and the development of the city. It is my opinion that the local and wider geographical environment played a predominant role in how the city was developed, from spatial settlement patterns and the need to modify their environment, from the building of bridges and the physical modification of the hillsides to satisfy the growing population, to the raising of valley floors and the construction of drainage canals to alleviate damage caused by flooding.

CHAPTER 1: ANCIENT SOURCES

Ancient discussions of the geography of Rome focus primarily on the strategic benefits of the site. However these Roman sources wrote hundreds of years after Rome's founder supposedly chose the site for his city, and so relied heavily on traditional stories, supplemented with myth and hearsay to fill any gaps in their knowledge. Roman discussions of the nature of the geography were also heavily influenced by Greek thought as will be discussed with regard to Dicaearchus' influence on Cicero's *Republic*. Due to the fact that many of these ancient works have been lost or are fragmentary, this ancient evidence needs to be treated with caution. There is evidence which can be used with more confidence however, although this typically refers to later times when there is more certainty around events. The depictions in these ancient works can bring to our attention information which was not intended to be the focus of these works. For example accounts of even mythical battles can provide information about topographical or geographical features of the site of Rome, and accounts of food shortages can allude to natural disasters or environmental anomalies. For this reason, while this thesis will focus primarily on archaeological, geographical, and geological evidence, it will also use textual evidence. Ancient evidence is used where possible and this can shed light on previously unknown scenarios or ancient viewpoints.

In his work, *Republic*, Cicero presents a lengthy discussion on the site of Rome, which centres primarily on the proximity of the sea.² He does admit, in a letter to his friend Atticus, that he essentially copied ideas in his discussion of Romulus' choice of site from the Greek author Dicaearchus' arguments about the Peloponnesian cities and their association with the coast. Dicaearchus stated that every Peloponnesian city was either built on the coast or had direct access to a sea port, and explained that the Greeks' focus was on the sea as opposed to the Peloponnese.³ Dicaearchus saw close proximity to the sea as an issue as this allowed for the introduction of foreign ideas, which corrupted Greek morals, and Cicero also explains what he perceives to be the grossly negative influence of other cultures on coastal cities. He blames the 'moral decline' of these coastal cities on the 'corrupting influences' of merchants importing foreign merchandise.⁴ With these foreign items (and we can assume seamen, migrants, and travellers) from distant lands came the infiltration of foreign morals.

² Cic. *Rep.* 2.5.

³ Cic. *Att.* 6.2.3.

⁴ Cic. *Rep.* 2.8.

Cicero also states that one of Romulus' reasons for choosing the site of Rome is that the location is far enough inland to be protected from naval raids and invasions as there can be little warning from an invading naval force.⁵ However, a city surrounded by land cannot be attacked by a surprise force as there will invariably be some forewarning, whether it be from the disruption to the forest or from the noise of the army itself, and any force approaching by land can be scouted to ascertain their full intentions. He explains that, due to Romulus' insight, the city was built far enough inland from the mouth of the Tiber River to be protected from unwanted attention of both military and cultural influences of other peoples, yet close enough (due to its proximity to the Tiber River) to have access to these foreign markets at its own control.⁶ Cicero also points out that the Tiber is ideally navigable for both trade via the coast and wider Mediterranean and the hinterland upstream of the city. However, he also vastly exaggerates the navigability of the Tiber describing the river as "smooth and unfailing" and ideal for trade.⁷ While this is not untrue, it does not take into account the river as both perilous and powerful. The Tiber has always been susceptible to highly dangerous and potentially damaging flooding and, as the Romans had no sort of warning system, this often took them by surprise. The river could also become very low at times during the summer, which would have restricted the size and number of ships that could be used on it. But Cicero's account is in any case idealised. He argues that Romulus lived in literate and enlightened times;⁸ in other accounts, Romulus was depicted as a rustic farmer, whose choice of the Palatine for the site of his new city was dictated more by chance: it was here that he was raised.⁹

Another ancient writer who has had a major influence on our understanding of Roman views of the location and site of the city of Rome during this time is Titus Livius, or Livy. Livy's major work was a comprehensive account of the history of Rome itself. This history (of which the majority of the books are only known to us by summaries from later authors) begins with the earliest settlement of the site and includes references to the geography of the area (although these references are likely to have been heavily influenced by popular conceptions in Livy's time around the early history of Rome).

Livy's account in book one provides some evidence for the nature of the site. The story of the exposure of Romulus and Remus, for instance, is set during a flood of the Tiber.¹⁰ The

⁵ Cic. *Rep.* 2.6.

⁶ Cic. *Rep.* 2.10.

⁷ Cic. *Rep.* 2.10.

⁸ Cic. *Rep.* 2.18-19.

⁹ E.g. Livy 1.6.3, 1.7.3.

¹⁰ Livy 1.4.

flood waters evidently reached the foot of the Palatine hill, since it was there that the brothers were suckled by the she-wolf, however this account alludes to standing water which prevented the twins from being placed in faster flowing water which would have carried them further downstream. This story ties in the importance of the river to the history of Rome from very early on, as the flooding of the Tiber played a predominant role in the foundation myth of the city. Later, during Romulus' war with the Sabines, one of the Sabines, Mettius Curtius, was said to have ridden his horse into a swamp in the forum valley.¹¹ This story, which appears to provide evidence for the swampy nature of the valley, needs to be handled with some caution, however, since it is clearly aetiological, as it explains the name of the Lacus Curtius; moreover, there are other stories which offer explanations for the lacus, and these do not presuppose such conditions.¹²

After the story of the abandonment of Romulus and Remus and the early mythological development of the city, there is not as much direct discussion of the geography of the area, especially in relation to the site of the city. In his initial reasoning for the choice of location for the city, Livy only mentions that Romulus and Remus chose the spot where they grew up. He does say that they each chose a hill to occupy and settle (and build fortifications), but at best he paints these as the most defensible positions within the chosen location.¹³ However, much later on, Livy does highlight the geographical advantages of the site in a speech by the statesman Camillus. After the sack of Rome by Gallic invaders in 390 BCE, Livy relates Camillus' speech to the Roman plebs, urging them not to abandon the city, but instead stay and rebuild it.¹⁴ While this is mostly focussed on the religious and emotional ties to the site, Camillus also points out some of the geographical advantages. He references the 'healthful hills', and 'commodious' river and the links this formed for trade (mostly produce as he also references the soils of the plains outside the city) with inland villages, as well as maritime supplies. He also refers to the geographical location of the city in proximity to the coast, stating that it is close enough to the sea for 'convenience' (trade etc.), but far enough away for protection from foreign fleets.¹⁵

This evidence is difficult and needs to be handled with caution; it may reflect later times more than it does early and, when it comes to evidence like Cicero's discussion of Romulus' choice of site, it is also necessary to take ancient ideas and arguments into account. These

¹¹ Livy 7.6.

¹² See Bremmer, 2014, 155-160

¹³ Livy 1.7.

¹⁴ Livy 5.55.

¹⁵ Livy 5.55.

accounts also lend themselves to an overreliance on myths and hearsay to account for explanations and reasoning of events. There is, however, much better evidence, which can be used much more straightforwardly, although this evidence naturally refers to the circumstances of much later times. For example Dio depicts a flood of significant magnitude which struck the city in 55 BCE and which inundated all the lower levels and even many in the higher portions.¹⁶ He also describes houses collapsing due to their construction of bricks becoming soaked, animals perishing, and even people who did not take refuge in higher areas losing their lives. However he does also ascribe this phenomenon as likely caused by some divinity rather than excessive rains or storm surge from the coast.

Conclusion:

In the following study, therefore, the ancient sources will be handled with caution, especially if there is no other primary source information to base the arguments on. The nature of this evidence will also depend on where it is situated within the chronology of the history of Rome. During the late republican period onwards there are documents and even contemporary witnesses which have been drawn upon, making these accounts more reliable. However in the case of earliest Rome there is no such material, and these accounts can rely on hearsay and analogies handed down through generations, and therefore need to be treated with more caution than later accounts. This study will therefore draw upon evidence from work carried out in the disciplines of archaeology, geography, and geology, but it will also include the use of ancient sources where it is possible to determine the nature and value of the evidence. The example from Dio is of significance as it depicts the extent of a flood event and the effect this had on the population where there is no obvious archaeological or geographical evidence of this. There are also instances of ancient source material which is relevant as supporting evidence for which it was not intended to be.

¹⁶ Cass. Dio 39.61.1-3.

CHAPTER 2: THE GEOGRAPHY OF ROME AND ITS ENVIRONS

Introduction:

In order to understand how geography affected the development of early Rome we first need to place the city and its people in their wider geographical context, as the development of Rome was also influenced by external geographical factors. These factors can be both physical, such as the geological construct of the region, and human, such as the interactions between neighbours. The physical geographical influences include factors such as climate, geology, and soil structure, but also Rome's position in regards to natural resources. Human factors such as Rome's interactions with its neighbours also heavily influenced the development of the city. Political and social influence from close neighbours such as the Etruscans, Greeks, and even other Latin people impacted on social, religious, and civic development. The widening sphere of Rome's influence also allowed for greater control of natural resources such as quarries and productive farmland as well as control over important trade routes.

Placing Rome within the wider environment:

The site of Rome is in a very fortuitous area with a favourable combination of geographical features which allowed the local population to flourish. The region which forms modern day Italy was dominated by the interaction between mountains and plains, and the influence the climate and local weather patterns had on this interaction. Only around 20 percent of the total area of modern day Italy is classed as a 'plain' (that being land under 300m above mean sea level, or MSL), and of this land, around 70 percent is found in the Po River catchment.¹⁷ 40 percent of the area is classified as 'mountainous' (above 1000m), and the remaining 40 percent is roughly classified as 'hill'.¹⁸ The distribution of these features has a large influence on the local climatic conditions of the regions which has also led to very distinct cultural differentiations between regions. The Apennine mountain range which runs along the spine of the peninsula has a dramatic effect on the rainfall distribution patterns of the areas on either side of the mountains, driven by a prevailing westerly wind which can cause an orographic rainfall effect on the Apennine Ranges. Orographic rainfall occurs on the windward side of a mountain range (in this case the western slopes of the Apennines). As the moist air rises up the

¹⁷ Cornell, Matthews, 1982, pg. 11.

¹⁸ Cornell, Matthews, 1982, pg. 11.

slopes, this causes cooling and condensation, which lead to higher rainfall on this side of the ranges. This also causes an effect called katabatic wind on the other side of the ranges (in this case the eastern side) which is drier air, which also warms on descent. An example of this weather pattern is in the South Island of New Zealand. The West coast of the Southern Alps can receive annual rainfall amounts of between 4,000 mm and 10,000 mm per year, whereas the plains on the eastern side of the Alps can receive less than 500 mm per year.¹⁹ On the Italian peninsula this effect is shown with parts of the west coast averaging between 1,000 to 1,300 mm of rainfall per year while some eastern regions only receive between 400 to 700 mm per year.²⁰ In general the western coast was far more favourable for settlement than the eastern coast of the peninsula – as the Apennines run closer to the eastern coast of the peninsula the streams are shorter, and combined with a lack of rainfall, generally tend to be either dry river beds, or a raging torrent of water. According to Cicero, Apulia – the area around Bari and Taranto on the South Eastern coast – was the “most sparsely populated part of Italy”.²¹ This area receives only 570 mm – 670 mm of rainfall per year and that, combined with the large limestone plateaus which do not allow for much soil moisture retention, means that it tends to be susceptible to long periods of drought.

As opposed to the eastern coast, the western coast of the peninsula is dominated by larger plains which allow for larger, more navigable rivers. This coast (which includes the area around Rome and Latium) receives significantly more rainfall and is dominated by volcanic hills and mountains running down the flank of the Apennines. These volcanic hills are rich in phosphates and potash, making them some of the most fertile regions in the peninsula, especially the area around Campania.²² This was possibly one of the main factors in the establishment of Greek colonies on the south western coast of the peninsula, along with the abundance of natural harbours which were mostly absent from the eastern coast. The western coast (including the Latium region) was dominated by small alluvial plains close to the coast, and a series of drainage basins in the upper areas closer to the Apennines which were (at least partly) connected by navigable rivers and volcanic lakes such as Lake Albano which was used as irrigation for the local area.

The geography of the area surrounding Rome is dominated by numerous geomorphological interactions which shaped the landscape and geography of the region into what the Romans

¹⁹ Mackintosh, 2001.

²⁰ Costantini. 2013, pg. 24.

²¹ Cic. *Att.* 13.4.

²² Cornell, Matthews, 1982, Pg. 12.

knew and were affected by. The predominant feature of the area from the Apennine Mountains to the west coast of the peninsula has been created by tectonic uplift, and refined by fluvial erosion. The low lying areas and low hill country (only around 20 percent of the peninsula is classified as 'low lying') that make up the majority of the Roman hinterland are predominantly comprised of Pliocene clays (mudstones and sandstones) dating to around 2.3 to 2.6 million years old.²³ This suggests that this area was, at one time, below sea level, before tectonic uplift and interaction between the Eurasian and African plates created the European Alps, and the uplift of the Italian peninsula. Around 700,000 years ago volcanic activity took over as the predominant driving force in geomorphological change, as a series of volcanic eruptions both to the north and south of the region resulted in a covering of volcanic ash. This volcanic activity also created calderas (volcanic crater lakes) between the Apennine Mountains and the Tyrrhenian Sea. The most relevant of these is Lake Albano, 20 km south east of Rome, which (although outside the scope of this investigation) was used to irrigate local crops from as early as 395 BCE. Plutarch also describes an event attributed to 406 BCE where the lake surged over the hills which formed the ring of the caldera into the surrounding countryside, destroying fields and vineyards,²⁴ despite no rain having fallen and no rise in tributary levels.²⁵ This phenomenon was ascribed as an omen connected with the Roman siege of Veii and therefore the historical accuracy needs to be treated with some caution, however there is some geological evidence of a catastrophic overflow of the caldera in 396 BCE.²⁶ Modern scholars have also attributed this possible episode to volcanic gas building up under layers of sediment on the lake floor before being released, which could cause an overflow of the caldera.²⁷

The area around Rome itself was of natural strategic importance. There was a natural ford downstream of Tiber Island, and hence Rome was situated at an important trading crossroad. The area was relatively fertile due to the volcanic nature of the soil, and the hills upon which the first permanent settlements stood offered key defensible features. These hills also had numerous abundant springs which provided a key, fresh water supply to local residents until the population grew too large for local springs alone to supply sufficient quantities of water.²⁸ The geological composition of these hills provided volcanic limestone, or tuff, which was used as the building blocks of early Rome. As Roman influence spread they gained control of other

²³ Rosenstein, 2006, pg. 106.

²⁴ Plut. *Cam.* 3, see also Livy 5.15.1-3.

²⁵ Anzidei, 2009, pg. 3.

²⁶ Anzidei, 2009, pg. 3.

²⁷ Oppenheimer, 2015, pg. 442.

²⁸ Front. *Aq.* 4.2.1.

nearby quarries, especially those around Veii, and with these quarries came building material of greater quality than that found locally within Rome.²⁹ The area around the Forum Boarium was also the site of the ‘great altar’ to Hercules, which, according to myth, was erected in his honour after he slew Cacus, the giant of the Palatine Hill, although the story also goes that Hercules erected it to himself. The rites performed at this altar were performed in the Greek manner, and it is possible that this cult was established by Greek traders who came up the Tiber to the crossroads to the area where the Forum Boarium was eventually established outside the boundary of the city.³⁰ This Greek influence is evidenced by the presence of terracotta statues of Hercules and Minerva located on the Sant’Omobono temple near the Forum Boarium. While these are Roman versions of their Greek counterparts, the scene depicted represents an episode in Greek mythology where Athena (Minerva) introduces Heracles (Hercules) to the Greek Gods on Mount Olympus and is likely to have been created by a Greek craftsman, possibly residing in Rome at the time.³¹

In order fully to understand the impact geography had on the development of the city, we first need to understand the relationship between the people who lived in Latium and their environment. The archaeology of the wider region needs to be taken into account, including the ‘proto-urban’ centres that began to emerge in the 10th century BCE in Latium, Etruria and Samnium among others. These centres were mostly located on singular hilltops and large plateaued areas of thirty to fifty hectares, with some such as Veii in Etruria consisting of a large settlement area of one hundred to two hundred hectares as the large plateaus allowed.³² These are similar to early Rome in some ways, as each hill within Rome consisted of a settlement around 50 hectares. However the major difference in this settlement pattern is that this cluster of hilltops was not settled in isolation, and so the close geographical nature of these settlements meant they would either eventually come into conflict with one another, or join together as a larger civic centre the size of the likes of Veii. These ‘proto-urban’ centres survived on agriculture from the local area, consisting of emmer wheat, barley, peas and beans, cabbage and lettuce, along with farming stock such as pigs and chickens, and this local produce would also have been supplemented by hunting and fishing as well as the gathering of wild produce.³³

²⁹ See chapter 6 for a more comprehensive overview on the nature of these limestone tuff building materials.

³⁰ Livy 1.7.3-15.

³¹ Cornell, 1995, pg. 162.

³² Hopkins, 2016, pg. 21.

³³ Ward, 2003, pg. 34.

Building materials of early Rome:

Archaeological evidence can provide an insight into the type of materials used during the construction of the early city. Wattle and daub would have primarily been used in early dwellings, as can be seen in the photos of Giacomo Boni's excavations (as is discussed in detail in chapter 4 of this thesis). Clay deposits at the base of the valleys also allowed for the manufacture of terracotta tiles which were used in roofing. However it was stone, quarried from the surrounding hills, which quite literally provided the building blocks for the development of the city. The Romans have been building in stone since the early 7th century BCE, mostly using local volcanic stone (tuff) as their main construction element, and the majority of this came from locally quarried rock from the hills within the city. Tuff (which is the geological name for this volcanic material comprised of ash and rock; some English-speaking archaeologists have adopted the name 'tufa', however this can be used to describe a number of sedimentary rocks) is a type of limestone (calcium carbonate) that generally forms around lakes and springs.³⁴ The limestone found within the immediate vicinity of the city was very porous and malleable which make for a convenient basic building material, however because of its porous nature it is very easily eroded and susceptible to weathering, and therefore was superseded by stone from outside the immediate vicinity as soon as resources allowed. This material was used in the podium of the Temple of Jupiter Optimus Maximus located on the Capitoline hill.³⁵ Up until the fourth century BCE all stone used for construction would have been quarried exclusively in Rome itself (the Cappellaccio tuff).³⁶ After the Romans gained control of the territory previously held by the city of Veii in 396 BCE they also gained control of the quarries near the Tiber where Grotta Oscura was quarried.³⁷ This tuff was less susceptible to the elements than Cappellaccio was, and is the main element of the Servian Wall (or at least the surviving section of the Servian Wall on the Esquiline Hill).³⁸ Some Cappellaccio tuff was also used in the construction of the wall, but the evidence suggests this was part of the rampants (agger) situated inside of the wall and acted as a retaining wall for the fill.³⁹ The third major tuff building stone used in this period was *Peperino*. This grey tuff was from the quarries located in the Alban Hills and was used in Rome from the 3rd century BCE (the first instance

³⁴ Lancaster, 2005, pg. 12.

³⁵ Holloway, 1996, pg. 18.

³⁶ Holloway, 1996, pg. 18.

³⁷ Coarelli, 2014, pg. 12.

³⁸ Holloway, 1996, pg. 19.

³⁹ Coarelli, 2014, pg. 16.

of this is thought to be the trophy of Marcus Fulvius Flaccus in the Forum Boarium dating to 264 BCE).⁴⁰

Rome's interactions with its neighbours:

Interactions with its neighbours are an important factor in exploring the relationship between the Rome and the wider geography of the area as these interactions affected the social, economic, and political makeup of Rome, and in some cases, such as the control of particular quarries, this affected the physical appearance of the city. During the 10th to 8th centuries BCE, the existing Latial culture was predominant within the proto-urban settlements in the location of Rome. During the 8th and 7th centuries there is evidence of greater interaction between the local population and their neighbours, both to the north and south. Influence from the south came mainly in the form of contact with the Greek colonies around the Campania region, and the Latin alphabet was probably introduced from the Greek settlement of Cumae.⁴¹ There is also Greek influence within Roman mythology, which Wiseman attributes to the lack of a written language in the early Latin culture.⁴² However he also emphasises that, even though there was no written Latin language at the time, there was still a strong sense of oral tradition which is sometimes marginalised, and indicates an independent Latin identity to some early stories.⁴³ The excavation of tomb sites around Latium also points to this period in time where social classes have started to develop. These social classes are separated economically and can be seen in the contrast in archaeological evidence unearthed in these tombs which point to the development of an aristocracy.⁴⁴ There is also physical evidence of Greek luxury goods in the form of a Corinthian vase within 7th century burials within the Esquiline cemetery.⁴⁵

There were also interactions with the Etruscan people to the north, however how much influence this had on the Romans is difficult to determine. There may have been an influx of Etruscan migrants into the city as the population expanded in the 8th Century, and Cornell points to Etruscan inscriptions found in Rome dating from the regal period which could allude to some form of Etruscan influence.⁴⁶ However it is important to draw a distinction between the idea of Etruscan Rome, where early Rome took a significant portion of its religious and

⁴⁰ Holloway, 1996, pg. 19.

⁴¹ Ward, 2003, pg. 16.

⁴² Wiseman, 1994, pg. 26.

⁴³ Wiseman, 1994, pg. 29.

⁴⁴ Forsythe, 2005, pg. 90.

⁴⁵ Wiseman, 1994, pg. 27.

⁴⁶ Cornell, 1995, pg. 157.

civic practices and institutions directly from Etruscan culture, along with its architecture, and dress, etc., and the fact that there was naturally influence of Etruscan culture within Rome just as there was Latial culture in Etruscan cities. Rome was a cosmopolitan population, with a culture which was open to the movement of people, and in the case of Cornell's inscriptions; these only number four out of many others found during the period, and do not prove residence as they may just as likely have been created by travellers.⁴⁷ Due to their close proximity as neighbours, and the fact that Etruscan and Latial culture were not already entirely dissimilar, the actual influence Etruscan culture had on the development of Rome may have been insignificant. There would naturally have been influence from both sides as a general central Italian culture developed, as neither culture had developed in a vacuum before encountering each other.⁴⁸

The earliest reliable textual evidence of Rome's interactions with its neighbours comes from Polybius' account of a treaty with the Carthaginians dating from the time the first consuls were appointed after the fall of the kings of Rome.⁴⁹ This treaty outlined key geographical areas which could be accessed by the respective parties, and any business which could be carried out in these areas. The burgeoning Roman state also established control over local geographical advantages as they extended their influence along the Tiber during the 4th century BCE. In 396 BCE they gained control of the Etruscan city of Veii, and with this came control of the local materials such as the Grotta Oscura quarry near the Tiber. The control of this region also allowed for more secure trade routes with both the interior and northern areas of the peninsula, via the Tiber as well as inland routes.

After the Romans had gained control of the city of Veii, they also subjugated local Latin tribes in the immediate area in the Latin War of 340 – 338 BCE. These territorial interests of Rome also came into direct conflict with those of their other Italian neighbours, and resulted in conflicts involving the Greek colonies situated in southern Italy. The most notable of these conflicts was the Samnite Wars, occurring between 343 and 290 BCE and involved Rome, their Oscan neighbours, and numerous other Italian tribes. At the end of this extended period of local conflict Roman control had extended south to incorporate the fertile hinterland of Campania, north to the river Arno, and to the eastern coast of the Italian peninsula. In incorporating the regions previously held by the Samnites, Piceni, Etruscans, and other Latins within their sphere of influence, the now Roman Republic had complete control over this area. It was during this

⁴⁷ Cornell, 1995, pg. 157.

⁴⁸ Ward, 2003, pg. 27.

⁴⁹ Polybius 3.22.

period when the network of Roman roads began to be established. Before the Samnite Wars the only routes south for troop movements passed dangerously close to the malarial swampy area of the Pontine Marshes. During the first Samnite War the Romans could not reinforce or resupply troops in their struggle against the Samnites across the marsh, and it was not until 312 BCE that the construction of a new road to Campania began under the censorship of Appius Claudius Caecus that allowed for the continued troop movements of the Romans. This road eventually stretched from Rome, through Capua, to Brindisi on the South-eastern coast. After the Pyrrhic wars which ended in 272 BCE, the Roman Republic also gained control over Magna Graecia in the south from the Greek colonies with whom the war was fought, thus cementing their control over the whole of the Italian peninsula.

Conclusion:

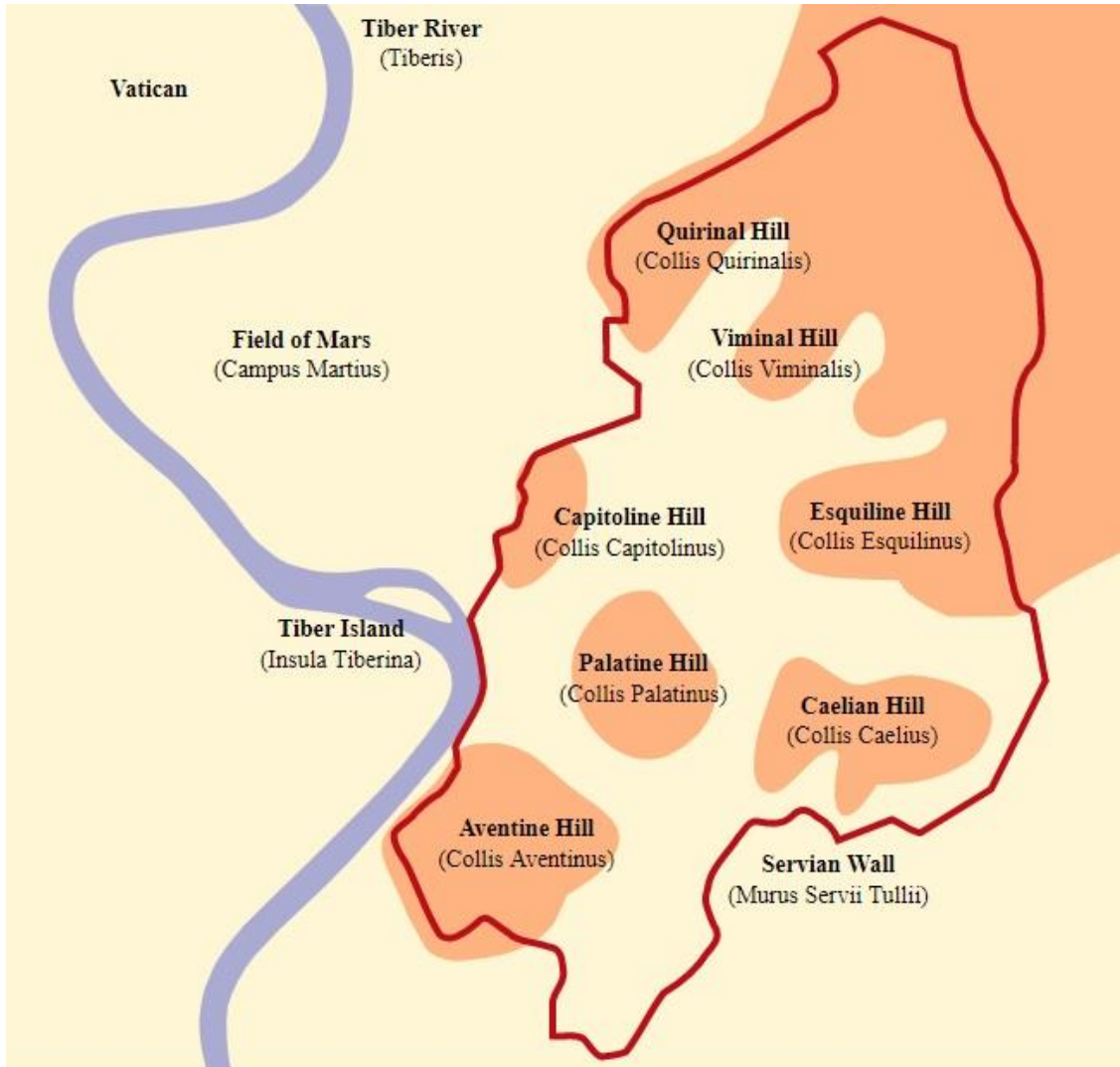
The physical geographical interactions which affected Rome's development can be traced back millions of years; tectonic uplift, periods of volcanic activity, and fluvial erosion all contributed to the formation of the landscape upon which Rome was built, and these complex geographical processes influenced the city's development in almost every way. Fertile hinterland consisting of volcanic plains, and high annual rainfall compared to that of the east coast allowed for an abundant food supply to facilitate population growth. The human influences from Rome's early neighbours are also important in the development of the city. The interaction with neighbours brought new ideas and resources, and Rome's conquest of the Italian peninsula brought greater control over trade and goods. This allowed for greater control over resources in the local area such as the quarries near Veii which produced building material of greater quality than those found more locally. Greater control of trade routes and food supplies also allowed for more security of supply which allowed for economic security and continued population growth in the city. Rome also benefited from its central position within the wider Mediterranean region through both economic trade and the spread of new technology and ideas. The coast of Greece is only around 50 km from the South-eastern coast of the Italian peninsula, the North coast of Africa is less than 600 km from Rome itself, and southern parts of Gaul were also less than 500 km away.

CHAPTER 3: THE HILLS OF ROME

Introduction:

The hills that define the topography of the city of Rome are predominantly made up of volcanic rocks, deposited during the volcanic activity around the Alban hills volcanic system 700,000 – 600,000 years ago. The Alban hills are a semi-circular hill structure with a small caldera located in the centre, merely 20 km south-east of Rome. Before the volcanic activity, the area in and around Rome was fairly new as it was born of the tectonic processes which raised the sea bed almost 1 million years ago. The new clay sedimentary rock which made up most of the bedrock of the region started to erode immediately, as the ancient Tiber River (Paleo Tiber) carved its way through the soft new landforms on its march towards the sea. The presence of particular clays allows us to track how dynamic the course of the river bed has been throughout the last million years, with the original river mouth being located approximately 20 km north of the current delta. The river changed course around 700,000 to 600,000 years ago with the delta moving south towards the village of Anzio after tectonic uplift forced the Tiber further south. This occurred during the initial period of the volcanic processes which would eventually push the river north to its more modern route passing between the Sabatini and Alban volcanic fields. However, along with the Sabatini Volcanoes (located to the north-east of the city), the large and violent volcanic activity ongoing during this period covered the entire region in several hundred metres of volcanic material including ignimbrites and pyroclastic material. After these violent eruptions, the geomorphology of the area was completely changed, with large flat plateaus being formed from the deposition of vast amounts of volcanic material. The Tiber River dissected these plateaus and the process of fluvial erosion led to the lowering of the river bed causing a large alluvial valley dominated by the river. The hills in and around Rome were the product of large ignimbrite deposits which were not as easily eroded as the softer pyroclastic deposits of ash and other soft materials. As the river ran into these harder materials it was forced to change course as water will always take the path of least resistance, causing the meandering of (or bends in) the river course. In the case of the local hills within Rome itself, the major driver of fluvial erosion was not the Tiber (although this would have had an effect, especially during periods of above average flow conditions) but the smaller streams which originated locally and the drivers of these streams, namely localised rainfall and the springs from which they were fed. These streams had the same effect on the local environment as the Tiber had on the wider area, eroding away the softer material as they made their course

towards their eventual confluence with the Tiber. The result of this process was the formation of a series of hills along the banks of the Tiber, and the hills within the immediate vicinity of Rome became known as the seven hills of Rome.



Map of the hills of Rome with 4th century Servian Wall. Orange areas indicate a higher elevation.⁵⁰

The Palatine, in the centre of Rome, was supposedly the original settlement in the city and always held a reverence as Romulus' residence. The Capitoline, defined by its peak (the Arx) as the citadel of Rome, was an important religious location and included the temple of Jupiter Optimus Maximus. The Aventine, located to the south of the valley of the circus was always technically located outside the city proper during the scope of this investigation, however it was inside the walls effectively making it a part of the city from early times. The Esquiline was a larger geographical area which included two other *montes*, or hills. While it had been

⁵⁰ https://upload.wikimedia.org/wikipedia/commons/5/57/Seven_Hills_of_Rome.svg.

occupied for as long as the Palatine, it was not fortified within the city until the time of Servius Tullius (as is discussed in depth in chapter 6 below) as the city naturally expanded onto the plateau to the north-east. Similarly, the Quirinal was settled from an early time and had significant early religious archaeological remains. This hill was also the supposed location of the Sabine settlement within Rome, and was always seen as being different from Rome in some way. The Caelian was the south-eastern most of the hills as is likely to have been a key part of the defences of the early city, and was the only easily defensible location on the south-eastern segment of the wall. The Viminal was the smallest, and often seen as the least important of the hills of Rome. While it was settled from an early period, there have not been any significant religious archaeological finds as there had on the neighbouring Quirinal.

The Palatine:

Roman historical tradition often claims that the Palatine was the original site of Rome, and, according to Livy, was chosen by Romulus as the location on which to found his new city, while his brother Remus chose the Aventine.⁵¹ Livy's account of the foundation myth of Rome also outlines that the infant Romulus and Remus washed up next to the Ficus Ruminalis (the mythical fig tree near where the entrance to the Lupercal was supposed to be) at the base of the Palatine, near the Tiber River.⁵² While there is no proof that anything specifically attributed to Romulus ever existed, there is evidence of an archaic wall dating from the 8th century BCE around the Palatine, which would have been a very clear visual marking of the boundary as well as a defensive structure.⁵³ During periodic excavations on the Palatine in the first half of the twentieth century, archaeologists also uncovered a large number of post holes and ceramics, as well as evidence of wattle and daub building materials, and even infant burials which date to the mid-9th to late 7th centuries BCE located in numerous locations across the Palatine, indicating widespread settlement across the hill during this period.⁵⁴

During the 9th to 7th centuries there is also evidence of permanent settlements on other hills within Rome, with debris from wells and burial remains dating from the 8th century evident as well as sacrificial and votive remains, indicating religious sites were located across the different

⁵¹ Livy 1.6.4.

⁵² Livy 1.4.5.

⁵³ Rea, 2007, pg. 23.

⁵⁴ Hopkins, 2016, pg. 21.

hills.⁵⁵ This indicates that up to at least the 7th century the hills of Rome were supporting, at least somewhat, individual communities. They had individual burial grounds and at least some religious structures, and in some instances had boundary walls clearly delineating the space deemed to be within their settlement. This does not, however, mean they were entirely segregated communities, or had been established by individual tribes who settled the same area. It is more likely they were separate suburbs, separated by the (at the time) uninhabitable valleys between hills, and that any sense of individual community (if there was one this early) was born out of isolation, and the presence of separate burial locations and religious sites was one of convenience. During the 8th century the civic centre of Rome was quickly established in the newly created forum area, and by the 6th and 5th centuries, the majority of religious institutions followed suit with the establishment of large temples in the Forum driven by an increase in public works, and the Palatine began to evolve into a residential neighbourhood dominated by the elite (although it was still an important location for certain religious rites such as those to assure a victory in war).⁵⁶

The Capitoline:

The Capitoline Hill was also central to the development of Roman urban space, as it, like the Palatine, has evidence of settlement before the traditional date of the foundation of Rome. While Livy's account of the settlement of the Palatine is based in myth, there is archaeological evidence of much earlier settlement on the Capitoline dating to as early as the 14th century BCE, and evidence of burials taking place on the Palatine, Capitoline, Aventine, and Esquiline Hills from the 10th century.⁵⁷ There are also remnants of Iron Age huts, as well as seeds and furrows indicating subsistence farming on the tops and slopes of the hills from around the same time.⁵⁸ The Capitoline was also significant as triumphal processions ended on the hill, especially after the dedication of the Temple of Jupiter Optimus Maximus.⁵⁹ It is arguable that the Capitoline was the most important of Rome's hills in the establishment of the city, especially when it came to the defence of the community due to its defensible position.

⁵⁵ Hopkins, 2016, pg. 22.

⁵⁶ Rea, 2007, pg. 24.

⁵⁷ Hopkins, 2016, pg. 21.

⁵⁸ Hopkins, 2016, pg. 21.

⁵⁹ Rea, 2007, pg. 45.

Despite being the smallest of the seven hills of Rome the Capitoline had the best natural defences, consisting of two peaks to which the access was predominantly steep, rock covered slopes. The southern of these two peaks was called the *Capitolium*, and the northern peak was referred to as the *Arx* (or citadel).⁶⁰ Recent excavations on the Capitoline have shed new light on the geographical history of this important location in Rome. No complete contour map has been created to show the hill's natural topography, however modern mapping using data from over 40 coring locations on the hill show that there were only two acres of available space on the *Arx* for building during the regal period, and that the temple of Jupiter was in fact located on what would have been the western side of the *Capitolium* (it has been attributed to the centre of the *Capitolium* as that was where it stood in relation to the topography in later times).⁶¹ The coring work carried out shows that there was a layer of silt and clay approximately 5 metres thick covering the Tufo Lionato rock which forms the main structure of the Capitoline Hill.⁶² These soft sedimentary rocks could not have supported a structure such as the Temple of Jupiter, and so the foundations for this building had to be dug through the layers of sediment, into the tuff below. The sediment excavated from these foundation holes was then used as fill to create an artificial terrace designed to support the western corner of the temple.⁶³ Livy also claims that Tarquinius Priscus built up a level space on the Capitoline with masonry for the Temple of Jupiter of such magnitude as to be prophetic, indicating the extent to which the Romans recognised the importance of the geographical manipulation required for the utilisation of the site.⁶⁴ During the Gallic siege of Rome in 390 BCE the invading forces were said to have almost destroyed the entire city, which was only saved due to the strategic significance of the citadel atop the Capitoline, which the Romans were able to hold after retreating to the hilltop.⁶⁵ The Romans believed if they could hold on to the Capitol the city would not be lost, and according to Livy, they used the geographical features to their advantage by charging down the slopes and routing the Gallic army.⁶⁶ While this evidence is literary, the Gallic invasion in 390 BCE is not disputed, and the obvious geographical advantages do allow for some acceptance of at least the plausibility that this sort of scenario could have happened. According to Livy the Capitoline was also significant in the establishment of the city as, according to legend, Romulus created a sanctuary in the saddle between the *Capitolium* and the *Arx* which was designed to

⁶⁰ Rea, 2007, pg. 47.

⁶¹ Ammerman, 2000, pg. 82.

⁶² Ammerman, 2000, pg. 83.

⁶³ Ammerman, 2000, pg. 83.

⁶⁴ Livy 1.38.7.

⁶⁵ Livy 5.39.9.

⁶⁶ Livy 5.43.3.

increase the city's population by enticing asylum seekers from other areas to settle in the city.⁶⁷ This is the area where the Tabularium (state archives) was located by the 1st century BCE. By the 6th century BCE there is also evidence of permanent tuff stone walls around the top of the Capitoline, indicating the importance to the city the hill had by that time.⁶⁸

The Esquiline:

The Esquiline hill, or *Mons Esquilinus* is the name given to a larger area in which two other hills (*montes*) were also located: the Mons Oppius and Mons Cispus. These two smaller hills were essentially two spurs or outcrops of the same larger table land on the north eastern side of the city. The area was referred to as *Esquiliae* during the period this thesis focuses on, and was only referred to once as the Mons Esquilinus by Cicero (*Rep.* II.11) before the first century. For this work the area will be referred to as the Esquiline hill, with the Oppian and Cispian being differentiated where necessary. The valley between the Oppian and Cispian is referred to as the Subura (although in some instances the Subura extended as far north as the Viminal) indicating that this area was also inhabited from an early period.⁶⁹ The Esquiline was inhabited as early as the 10th century BCE with evidence of ongoing burials, huts, and land cultivation discovered across the hills of the area.⁷⁰ The larger Esquiline was fortified within the 6th Servian Wall, and indicates an expansion of the city to the north east. Livy gives a population of 80,000 citizens living in Rome at the time of Servius Tullius, and states that Servius expanded the city to the north east area of the Esquiline to accommodate the growing population.⁷¹ This area would have lent itself to a natural expansion of the city as the area was a high, flat plateau removed from the natural hazards of the central valleys and lower lying areas to the north-west and south of the city. The large open city boundary would have been harder to defend than the steeper rocky outcrops of the more central hills, however Strabo describes the wall on the north east boundary of the Esquiline as being surrounded by a deep trench 6 stadia in length, with the resulting earth forming a rampart, or agger, on the inner face of the wall which was also flanked with towers.⁷²

⁶⁷ Livy 1.8.5.

⁶⁸ Rea, 2007, pg. 48.

⁶⁹ Richardson Jr., 1992, pg. 373.

⁷⁰ Hopkins, 2016, pg. 20.

⁷¹ Livy 1.44.3.

⁷² Strabo 5.3.7.

The Quirinal:

Like the Esquiline, archaeological finds provide evidence that the Quirinal has been occupied since at least the 10th century BCE, and sacrificial and votive remains indicate that there were also places of religious importance located on the hill as early as the 8th century BCE.⁷³ Tradition states that the Sabines settled here once peace had been established between Romulus and Titus Tatius after the rape of the Sabines. This explanation is fanciful, however the Quirinal did have altars dedicated to Sabine deities, and had its own festivals, indicating that the area was seen as being different from the rest of Rome in some way.⁷⁴ The Quirinal was separated from the Viminal to the south by a valley which gradually rose in height as the two hills joined the larger Esquiline plateau to the north east. This valley was formed by local rainfall runoff and the valley drained into what would eventually become the Cloaca Maxima. The Quirinal was within the Servian walls as discussed above, with the wall running along the steep northern slope before turning south along the more exposed eastern extreme of the city and forming part of the agger of the Esquiline hill.

The Viminal:

The Viminal was one of the smallest of the seven hills and was essentially an outcropping of the larger Esquiline plateau, protruding south west towards the centre of the city. It was separated from the Quirinal to the north by a deep valley which would eventually become the Forum of Trajan, and from the Esquiline (Cispian) to the south by the Subura. The area between the Viminal and the Cispian was classified as the Subura Major, with the remaining area between the Cispian and the Oppian as the Subura Minor.⁷⁵ The Viminal is described as being the least important of the hills as well as the smallest, with no significant religious spaces that we know of.⁷⁶ The apparent Sabine influence of the Quirinal is not apparent, and the Porta Viminalis road which ran along the hill was not a major arterial road of any significance.⁷⁷

⁷³ Hopkins, 2016, pg. 22.

⁷⁴ Richardson Jr., 1992, pg. 326.

⁷⁵ Richardson Jr., 1992, pg. 373.

⁷⁶ Richardson Jr., 1992, pg. 431.

⁷⁷ Richardson Jr., 1992, pg. 431.

The Caelian:

The Caelian Hill is the south eastern most of the hills of Rome, stretching east of the Palatine hill in a long narrow tongue for around 2 kilometres.⁷⁸ Ancient tradition ascribes the name to the Etruscan general Caeles who supposedly settled the immediate area,⁷⁹ and the hill was also said to have originally been called the Querquetulanus after the oak forest that covered the area.⁸⁰ However, again this link is tenuous and the name was more likely attributed to the hill during later antiquity, referencing the Porta Querquetulana in the Servian wall. It is also unclear as to who was responsible for adding the Caelian to the city as numerous ancient sources have ascribed it to Romulus,⁸¹ Tullus Hostilius,⁸² and Tarquinius Priscus⁸³ among others. On the northern and southern slopes of the Caelian, small streams drained run off and directed it towards the basin of the Colosseum. The area immediately to the north (between the Caelian and Esquiline) was called the Subura (not to be confused with the area between the Mons Oppius and Mons Cispus as discussed earlier), indicating that this area was inhabited, which leads me to the conclusion that, unlike the Aventine, the Caelian was accessible even during times of flooding. The Servian wall encompassed both the Caelian and Subura which were both within the Septimontium, and the topography of the hill as the only easily defensible location on the south eastern segment of the wall (and city itself) suggests this would have been an important part of the early city, as even after the construction of a wall this would have acted as somewhat of a stronghold along that vulnerable section.

The Aventine:

While the Aventine had been inhabited to some extent from at least the 10th century BCE and is included as one of the seven hills of Rome, it was not originally inside the Pomerium (the sacred boundary of the city). According to Livy's account of the story, the Aventine was a significant part of the augural contest between Romulus and Remus after Remus chose the hill as his preferred location for a settlement (although in Ennius' version Romulus was on the Aventine).⁸⁴ The highest part of the hill rises up to 46 m above MSL, and also has steep cliffs on its north-west border with the Tiber River. The south-eastern and north-eastern slopes

⁷⁸ Richardson Jr., 1992, pg. 61.

⁷⁹ Dion. Hal. *Ant. Rom.* 2.36.2.

⁸⁰ Tac. *Ann.* 4.65.

⁸¹ Varro *Ling.* 5.46.

⁸² Dion. Hal. *Ant. Rom.* 3.1.5.

⁸³ Tac. *Ann.* 4.65.

⁸⁴ Livy 1.6.4.

however are gentler and the hill is therefore not as defensible as the Palatine and Capitoline, which may account for its lack of permanent early settlement, or use as a citadel.⁸⁵ The neighbourhoods on the Aventine would also have been isolated from the rest of the city during the frequent floods which inundated the Valley of the Circus, and this could also have led to the spread of malaria from mosquitos which bred in the swampy conditions.⁸⁶ Initially the Aventine was one of the four ‘core’ hills on which Rome was settled (the others being the Palatine, Capitoline, and Caelian), and although the hill was the southernmost of Rome’s ‘seven’, the north-eastern slope ran along the valley of the circus and was in close proximity to the important Forum Boarium and Via Salaria. According to Livy’s account, the Aventine was first permanently settled in the late 7th century BCE when Ancus Marcius allowed residents from locally conquered villages to settle on the hill.⁸⁷ He also writes that the hill became part of the state domain in 456 BCE, and thus plebeians were able to acquire land and settle parts of the hill.⁸⁸ It is likely due to this makeup of early settlers that the Aventine is commonly portrayed as a plebeian district, and during the republican period and later the hill’s neighbourhoods also comprised a sizable percentage of the immigrants who flocked to Rome from throughout the empire, which is also likely to have added to the stereotype of the social makeup of the neighbourhoods. Mignone argues that the whole idea of the Aventine as a strictly plebeian neighbourhood is not based on any tangible evidence, and the hill is more likely to have had a similar social makeup as other parts of the city, which would have included a wide ranging social makeup. She argues that a cross-disciplinary approach is needed, with more emphasis on analysing the domestic architecture of Rome, with which I agree.⁸⁹

Conclusion:

The earliest settlements in Rome were on the hilltops with evidence suggesting these have been continuously inhabited since at least the 10th century BCE, and it is the nature of the geography of the location of Rome which was the main driver in this settlement pattern. The first settlements were located on the Capitoline and Palatine hills, and it is likely these were deliberately situated overlooking the crossroads of multiple important trade routes in the area as a means of control. The remaining hills of Rome were settled soon after, before any low

⁸⁵ Mignone, 2016, pg. 3.

⁸⁶ Mignone, 2016, pg. 3.

⁸⁷ Livy 1.33.5.

⁸⁸ Livy 3.31.1.

⁸⁹ Mignone, 2016, pg. 137.

lying areas were permanently inhabited, with the topography of the region being responsible for this. The earliest settled hills were all naturally defensible, with steep sided cliffs to protect them from invaders, and walls around parts of these individual hills would also have helped to reinforce such defensible positions. The hilltops were also protected from natural dangers such as flooding (primarily from the Tiber) and any disease associated with the sometimes marshy valleys between the hills. It is likely the separate hills were extensions of the earlier Capitoline and Palatine settlements, or at least belonged to the same general group of people. It is even possible to view the separate hills as different suburbs, each with limited religious and civic independence born out of necessity as, due to the nature of these hilltop settlements, each could be physical isolated from its neighbours for periods of time.

CHAPTER 4: THE VALLEYS OF ROME

Introduction:

The site of Rome is situated within the wider Tiber River Valley and is essentially on a floodplain, bringing with it both advantages and potentially catastrophic disadvantages. The advantages of the rich alluvial soil from the plains situated outside the city's boundaries allowed for the cultivation of wheat (this was arguably the most important of Roman crops, as bread was a staple of the Roman diet), olives and grapes for oil and wine. The Romans also farmed oxen, sheep, and goats for milk, cheese, and meat. However the close proximity to the Tiber also brought with it the dangers associated with flooding, which was a common occurrence and could have a lasting impact not only on the population and physical structures in Rome, but also on the local countryside as will be discussed in chapter 5.⁹⁰ As a result, the earliest settlements on the site of Rome were located on the hills (as has been discussed in chapter 3), and it required significant human modification of the environment before the valleys of Rome became the focal point of the city. This chapter focusses on how the geography of the Valleys of Rome has affected the development of the early city. This naturally leads itself to the discussion of human modification of the local environment, primarily focussing on the raising of the level of the valley floors and the construction of drainage canals, both of which facilitated the development of the city within the low lying valleys. This chapter also focusses on the springs on the site of Rome, the relationships the Romans had with these, and their significance to the early development of the city.

Topography and filling of the Forum Valley:

The investigation of the physical modification of the environment in relation to the valleys of early Rome is fraught with issues. There seems to be a disconnection between earlier work (carried out around the early to mid-twentieth century) and the conclusions that have been drawn from this, and newer research – both in the field and in the interpretation of current and older fieldwork. While it is not in dispute that the initial settlements of the site of Rome were focused on the tops of the hills, there are two main theories for urban development and human modification of the valleys of Rome, centring on the Forum Valley. The valley itself was

⁹⁰ For a greater discussion on flooding and the Tiber River, see Chapter 5.

located between the two main Iron Age settlements on the Palatine and Capitoline Hills and was a swampy area dominated by low marshy ground with the Velabrum stream running through it. The two main theories for its development are based on whether or not the Forum Valley had been permanently settled prior to the filling of the valley and the paving of the area which would become known as the Forum Romanum. It is important to note here that even theories arguing for an earlier settlement date for the Forum valley acknowledge that the valleys were settled later, as an extension of the hilltop settlements.

The Italian archaeologist Giacomo Boni first carried out coring of the Forum area of Rome beginning in 1903 in order to gain a fuller understanding of the topography of the ancient forum basin. However while his photographs of core samples have survived, he never published directly on his coring or whatever he may have found. In the 1940s the Swedish archaeologist Einar Gjerstad also carried out a level of coring within the Forum area, and used both his findings, and photographs from Boni's coring to come to the conclusion that there had been a permanent settlement comprised of wattle and daub huts situated in the Forum Valley prior to any formal paving and construction of civic buildings.⁹¹ This was based on evidence of building materials found at lower levels of the coring samples which would have been used in the construction of such buildings. T. J. Cornell also takes the same approach to Boni's work as Gjerstad and is of the opinion that the original wattle and daub huts located on the Forum valley floor were deliberately demolished to make way for the foundation of the Forum for which a "rough, beaten floor was laid".⁹² He also is of the opinion that there were more wattle and daub huts, dating back to the 8th century BCE, which were demolished in order to build newer civic structures around the Forum Boarium such as sanctuaries.⁹³

Andrea Carandini agrees with Gjerstad and Cornell that there was habitation of the Forum basin prior to the official 'foundation' of Rome and the building of the Forum itself, and attributes this to 'proto-urban' settlements dating the 9th century BCE.⁹⁴ However, he disagrees with Gjerstad's views that the building of the Forum was also a deliberate act of unification of the surrounding settlements into one unified geographical and political entity, and instead attributes the initial raising and paving of the Forum (which he says was raised by 2m) to Romulus himself as he consolidated his power over the other local hill tribes of Rome.⁹⁵ Carandini argues that tradition attributes the creation of the Forum to Romulus and Titus Tatius

⁹¹ Gjerstad, in: Ammerman, 1990, pg. 627.

⁹² Cornell, 1995, pg. 94.

⁹³ Cornell, 1995, pg. 95.

⁹⁴ Carandini, 2007, pg. 22.

⁹⁵ Carandini, 2007, pg. 89.

in the early 8th century BCE after the episode of the Rape of the Sabines. However there is no archaeological evidence of any paving or permanent settlement which can be attributed to this period, and I question Carandini's use of literary evidence, using Romulus, Titus Tatius, and the rape of the Sabine women as evidence for his arguments despite them not being historical events.⁹⁶ The original fieldwork undertaken by Gjerstad and Boni was conducted in the early to mid-twentieth century, and the archaeological evidence from these findings is quite limited. Despite this, a great deal of stock has been placed in this limited evidence, with the likes of Cornell and Carandini using the presence of these building materials as evidence to support theories of permanent settlement of the Forum Valley prior to the filling and paving of the site for civic structures.

Albert Ammerman's more recent work on the early site of Rome has also focussed on coring samples taken from the floor of the Forum, however he has a completely differing view point from the other scholars mentioned. He argues that the evidence which previous scholars have used to determine the existence of wattle and daub huts is not sufficient to allow for such conclusions.⁹⁷ Ammerman's conclusion from his own coring samples suggests that this fill was brought in over a period of time, and that the work was carried out in multiple stages, as the original floor of the Forum valley was lower than originally thought which he places at a low 6-7 m above MSL.⁹⁸ This is extremely low in such proximity to the Tiber and, as a result, the area would have been subjected to frequent flooding. At the end of the 7th century BCE, or perhaps at the beginning of the sixth, the ground level of the Forum valley had risen to around 9 m above MSL⁹⁹ which Ammerman puts down to a deliberate filling of the area (with up to 3 m of debris) and is of the opinion that it was at this time that the first paving of the Forum also took place.¹⁰⁰ A project of this magnitude would have included the movement of an enormous quantity of debris to facilitate such an increase in ground level, with minimum estimates of at least 10,000 m³ of fill needed.¹⁰¹ The ground level of the area of the Forum was raised multiple times since its initial paving, which suggests this was still a very dynamic environment, subjected to inundations from the river throughout its life. The first filling of the area, which took place around 600 BCE (although Carandini argues for a far older date of the mid-seventh century BCE),¹⁰² raised the ground level from 6-7 m to 9 m above sea level, however there are

⁹⁶ Carandini, 2007, pg. 92.

⁹⁷ Ammerman, 1990, pg. 638.

⁹⁸ Ammerman, 1990, pg. 633.

⁹⁹ Aldrete, 2007, pg. 177.

¹⁰⁰ Ammerman, 2000, pg. 79.

¹⁰¹ Aldrete, 2007, pg. 177.

¹⁰² Carandini, 2007, pg. 89.

up to eight distinct layers dating from the Roman era which have been paved over one another.¹⁰³

J. N. Hopkins is of the view that the initial process of raising the level of the Forum valley would have required up to 20,000 m³ of fill.¹⁰⁴ He also argues that this was carried out in five distinct phases, each with corresponding drainage and settling, and this explains Gjerstad's five lowest layers unearthed when coring the Forum. After the initial gravel layering, a stone pavement around 10.6-10.9 m above sea level was found, however it is unclear from the sources as to the dating of this pavement layer. Although the later 3 layers are later developments than is within the scope of this thesis, I feel it is relevant to outline them in regards to the continued modification of the Forum valley floor, which I feel is likely a response to continued issues with flooding of the valley. Aldrete points to a comprehensive re-layering of this Forum which is thought to date to 179 BCE, and this pavement is calculated at between 11.8 and 11.9 m above MSL.¹⁰⁵ Aldrete also says there is another layer of paving dating to the Sullan era, of 12.6 m above MSL, and another in the Augustan era which eventually raised the ground level of the Forum to as much as 14 m above MSL.¹⁰⁶

Taking these differing arguments into account, the evidence available suggests that the area around the Forum valley was primarily used as a necropolis by the Iron Age populations until the 7th century BCE, with tombs having been discovered in numerous locations including near the Arch of Augustus, on the Forum of Augustus, and at the lower level of the Forum of Caesar, all within the Forum Valley.¹⁰⁷ As the local population grew, the growing settlement needed more space to thrive and the area that became the Forum started to become more utilised. In my opinion, prior to the paving of the Forum valley, which allowed for large permanent structures to be erected, the construction of buildings on the site of Rome was probably restricted to the hills which overlooked the lower areas, which were inundated on a regular basis. There is no conclusive evidence to determine whether the settlements situated on the hills were acting in a single integrated civic system by this time, and were essentially neighbourhoods separated by marshy valleys. However, in my opinion, the hills were far too close for any realistic argument that they were completely separate communities of people who came together only with the utilisation of the Forum.¹⁰⁸ In either case the necropolis was shifted

¹⁰³ Aldrete, 2007, Pg. 178.

¹⁰⁴ Hopkins, 2007, pg. 8.

¹⁰⁵ Aldrete, 2007, pg. 178.

¹⁰⁶ Aldrete, 2007, pg. 178.

¹⁰⁷ Grandazzi, 2013, Pg. 12.

¹⁰⁸ For more on the argument of the hill tribes within Iron Age Rome, see chapter 5 on the Hills of Rome.

to the far side of the Esquiline Hill sometime around the 7th century, which facilitated the initial in-filling of parts of the Forum Valley for habitation. This move is highly significant as, in the Latial culture of early Rome, burials were usually placed outside any areas of habitation (with the exception of children).¹⁰⁹ This move then indicates a conscious effort to modify an uninhabited area into one which could be fit for human habitation.

The Cloaca Maxima and the movement of water in the valleys of Rome:

The Cloaca Maxima was the earliest and largest drain in the city of Rome, channelling water from the entire area between the Quirinal and Esquiline hills, through the Forum valley and into the Tiber River. Livy states the initial purpose of the Cloaca was to drain the lowest parts of the city which were too flat to carry off floodwaters, indicating that Livy understood the problem the Romans were facing was that the area too slow to drain after a flood event, rather than the Forum being too swampy to inhabit.¹¹⁰ The date of construction of the Cloaca Maxima is uncertain as its construction is attributed to Tarquinius Priscus by Pliny the Elder¹¹¹ but to Tarquinius Superbus by Livy.¹¹² Dionysius, like Pliny, says Tarquinius Priscus started digging the drainage canals for the area, however he also claims these were finished later in the reign of Tarquinius Superbus.¹¹³ This evidence suggests that the Romans attributed the construction to a Tarquin, but did not know which one. Dionysius' account may be the result of this, and he has simply reconciled both versions. It is, however possible that the construction of the Cloaca may have spanned generations and taken decades to complete, given the scale of the drain, which is over 1600 m in length and measures 4 m by 3 m in places.¹¹⁴ The Cloaca started in the *Argiletum*, where the streams and run off originating from the slopes of the Esquiline, Viminal, and Quirinal hills met at the beginning of the Forum (Pliny says it gathered seven tributaries before it entered the Forum area).¹¹⁵ It then followed the course of the Velabrum stream through the Forum Valley so closely that S. B. Platner says they were one and the same thing. That is, the Cloaca was a regulating of the Velabrum through the use of walls.¹¹⁶ These

¹⁰⁹ Edlund-Berry, 2013, pg. 412.

¹¹⁰ Livy 1.38.6. However as Livy was writing some 500 years after the Cloaca was constructed, it is impossible to say with any certainty whether his views reflect the realities of the site at that time. See Aldrete, 2007, pg. 170.

¹¹¹ Plin. *HN* 36.104-108.

¹¹² Livy 1.38.6.

¹¹³ Dion. Hal. *Rom. Ant.* 3.67.5.

¹¹⁴ Aldrete, 2007, pg. 171.

¹¹⁵ Plin. *HN* 36.105.

¹¹⁶ Platner, Ashby, 1929, pg. 126.

walls were made up of large blocks of cappellaccio tuff which measure approximately 1.25 m (wide) by 1.25 m (deep) by 0.3 m (high), and which were most likely sourced from the nearby Capitoline and Palatine Hills.¹¹⁷ This was the same type of cappellaccio stone used in the construction of the Temple of Jupiter on the Capitoline and the Regia in the Forum, built at the end of the sixth century BCE, and also used the same construction techniques.¹¹⁸ Hopkins also argues that some of these blocks had small incisions like niches in which would have sat wooden beams to act as cross braces.¹¹⁹ He also argues that these would have been used (out of necessity) as bridges to cross the more than one metre wide canal. The covering of the Cloaca with a vault, as it is popularly depicted, occurred in the 3rd century BCE, and eventually it was indeed used as a sewer after it was connected to baths and latrines later in the imperial period.

Ammerman makes the valid point that, even if there was early drainage built into the Forum Valley prior to the Cloaca and paving process, such as channels, this would not have stopped any large flood event of the Tiber inundating the area. In fact, any drainage would have facilitated this by creating a backwater for the floodwater to drain to (as this would then have been at a lower level than the Tiber itself during times of flooding). Flooding like this could happen once or twice in any given year and, for this reason, it seems highly unlikely that anyone would build permanent dwellings in this area. Ammerman also disagrees with the earlier conclusion that the area of the Velabrum was originally permanently swampy marshland, as he has found no evidence to support it in any core samples taken in the area.¹²⁰ However, it is very probable that at least parts of the forum valley would have turned swampy after heavy rains or flood events.

The springs of Rome:

The springs of early Rome were extremely important and, along with the Tiber, provided an abundant supply of fresh water for a growing local population until the first aqueducts were established in the late 4th century BCE. The geography and geology of the hills are important factors when discussing these springs and how they formed. Rainwater soaks into the hills and recharges aquifers below the surface.¹²¹ The water from these aquifers (which, in the case of the hills around Rome, would have consisted of pockets of water within the limestone structure)

¹¹⁷ Hopkins, 2007, pg. 9.

¹¹⁸ Hopkins, 2007, pg. 9.

¹¹⁹ Hopkins, 2007, pg. 9.

¹²⁰ Ammerman, 2000, pg. 80.

¹²¹ Heiken et al., 2005, pg. 137.

found its way out through small cracks in the rock, forming springs. Sextus Julius Frontinus, the commissioner of water under the emperor Nerva, remarked: “From the foundation of the city for 441 years, the needs of Romans were satisfied by the water they used to draw either from the Tiber, from wells, or from springs. The memory of the springs is still considered holy and revered; indeed, they are believed to restore sick bodies to health.”¹²² He even references the Camenae and Juturna springs as having particular reverence to the Romans. The spring of the Camenae was located outside the Porta Capena, a gate in the Servian wall at the entrance of the Via Appia, and water from the well was taken by the vestal virgins on a daily basis, and by merchants to sprinkle on their goods and ships during the Mercuralia festival.¹²³ The Lacus Juturnae (Lake of Juturna) was a spring located in the southern corner of the Forum, culminating in a fresh water pool. It was here that the mythological Castor and Pollux were said to have appeared to water their horses after the battle of Lake Regillus in 496 BCE.¹²⁴ This spring in particular continued to be of immense importance to the Romans, and later in the 3rd century CE many dedications were made after the curators of the city’s water supply moved their offices closer (there may even have been a healing shrine located at the pool), and the spring continued to be used into the middle ages.¹²⁵ These springs, which terminated in the valleys of Rome provided an essential resource for the continued development of the city. Water from the Tiber was also used for drinking as well as washing and cleaning, however this was not always a reliable, healthy source to support a growing population.

Conclusion:

Any discussion of the nature of the valleys of Rome centres on the debate about the history of settlement within the valleys, and the extent human modification played in this. Prior to any deliberate modification of the valleys, any permanent settlement within Rome was limited to the hilltops as has been detailed in chapter 3. There have been arguments for a settlement as early the 8th century, however I do not feel the evidence cited for this is sufficient enough for a persuasive argument, as the valleys of Rome would have been subjected to regular inundation from the Tiber, rendering this area uninhabitable. While these valleys may not have been as swampy as has been made out, they would still have been damp and boggy (especially in the

¹²² Front. *Aq.* 4.1.

¹²³ Plut. *Numa* 13.2.

¹²⁴ Campbell, 2012, pg. 15.

¹²⁵ Campbell, 2012, pg. 17.

winter months) due to a lack of drainage to the Tiber. The evidence used to show the presence of an 8th century settlement consists of the remains of wattle and daub huts, which are more likely to have come from hilltop settlements, along with other rubble, and used as fill to deliberately raise the ground level of the Forum Romanum to a level where it could be inhabited. This alone, however, would not have been sufficient to alleviate the effects of flooding, and drainage canals were also constructed. The Cloaca Maxima was the major drainage canal in early Rome, however it is unclear as to exactly when this was constructed, as our ancient sources attribute its construction anywhere from the late 7th century to the late 6th century. The Cloaca was also designed to facilitate the movement of water from localised spring-fed streams into the Tiber to drain the valley, and therefore would not have acted as an efficient flood protection from the Tiber in its original form. The springs which fed these local streams also provided an important security of water supply both in times of war and peace.

CHAPTER 5: THE TIBER RIVER

Introduction:

The relationship of the Romans with the Tiber River goes back to the first settlement of the site, and this relationship has been ever-present and important. Flooding was a constant threat, ever after any modification of the low lying areas of the city. There is ancient evidence for flooding, however this cannot always be taken at face value, and the record may not be complete in any case. We can however use modern approaches and models to estimate both the likely frequency and extent of flood events in antiquity, as well as conjecture to explain the likely effects this had on the city and people of Rome.

Geography and Hydrography of the Tiber Catchment:

The hydrology of the region within the catchment area of the Tiber River has been extensively mapped by the Italian Government over a long period of time, so we have a wide understanding of both the boundaries of, and the interactions between, neighbouring tributaries. The entire area of the Tiber River Catchment is almost 17,500 km²,¹²⁶ beginning in the northern boundary at Monte Fumaiolo in the Apennines – a location which is almost as far north as the city of Florence – at an altitude of 1,268 m above MSL.¹²⁷ The Tiber itself runs mostly in a southerly direction before joining the Mediterranean at Ostia, and is influenced by many smaller rivers and streams throughout its journey to the sea. There are over 40 tributaries large enough to have a significant effect on the Tiber's discharge, the three most influential being the Paglia, the Anio, and the Nera.¹²⁸ The Tiber's catchment can be divided into four major subdivisions which are distinctly different in terms of geography and climate. The upper Tiber drainage basin (originating in the north) covers an area of 6,077 km² and is the predominant driver in river flows, both due to it covering the largest area, and also being the most northern subdivision (as most rainfall falls during the winter months, and the predominant weather patterns are northerly during this time, as will be discussed below).¹²⁹

¹²⁶ Cesari et al., 2010, pg. 836.

¹²⁷ Aldrete, 2007, pg. 54.

¹²⁸ Grandazzi, 1997, pg. 8.

¹²⁹ Aldrete, 2007, pg. 56.

The Nera is the largest of the Tiber's tributaries, with a catchment area of 4,290 km².¹³⁰ This tributary originates high up in the Apennines and its catchment is largely mountainous. The nature of the geographical characteristics of this catchment means it has a large influence on the flows of the entire Tiber system. The high-altitude environment attracts large amounts of precipitation, both in the forms of rainfall and snow accumulation. This is due to the prevailing weather patterns of the region – during the winter the prevailing wind (and therefore the origin of the weather) is from the north, bringing with it colder weather which causes snowfall on the mountainous area. Hannibal ran into this kind of extreme weather during his alpine crossing into central Italy when heavy snowfall affected his march, forcing his army to set up camp in the icy alpine passages for 4 days until the snow had melted enough to resume their march towards Rome.¹³¹ This snow can accumulate and provide a disproportionately high discharge during spring as it melts. This can also lead to flash flooding in the local area, and higher and more sustained flows as far downstream as Rome. During the rest of the year the prevailing weather patterns are West-South-West, with warmer air originating from the tropics and the Atlantic Ocean. As the prevailing weather patterns are from a westerly direction, most of the rainfall falls on the western side of the ranges due the orographic rainfall effect where rain will fall on the side of a mountain range due to the pressure effects as altitude rises (see chapter 2).

The Anio is the smallest of the three main tributaries with an area of 1,474 km².¹³² This catchment originates to the east of Rome at the southern end of the wider Tiber Catchment and runs due west before meeting up with the Tiber to the north of the city. This tributary is somewhat mountainous at its headwaters and is almost as long as the Nera in length, but it does not contribute as much to the discharge, and is not as influential in this regard. The Romans did eventually construct numerous aqueducts to divert water from the Anio to the city itself, but as they were constructed during the later imperial period they will not feature heavily in this investigation.

The Paglia is the northern most of the main tributaries, and, when combined with the lower Tiber Catchment has a joint catchment area of 5,343 km².¹³³ This tributary is the north-western most of the three and is lower in elevation which also leads to lower rainfall falling in these areas, especially during the summer months.

¹³⁰ Aldrete, 2007, pg. 58.

¹³¹ Livy 21.37.1-4.

¹³² Encyclopaedia Britannica, Jul 20 1998.

¹³³ Aldrete, 2007, pg. 56.

All three of these tributaries join the Tiber River before it flows past Rome, with the city being at the very bottom of the catchment, and almost at the end of the river as well (Rome is 25 km in a straight line from Ostia where the Tiber enters the Mediterranean). As the city is downstream of all the major inflows and tributaries, it is not spared when any (or all) of the tributaries have high flows.

Hydrology of the Tiber and flooding within Rome:

Analysing the areas of Rome that were prone to flooding can be done partly through a view of the topography. However this approach has its limitations as the topography of the area has evolved over time. It is also worth noting that an overview of the topography based simply on MSL is not a definitive method to model flood extents as flood water from the Tiber would not necessarily reach all the low lying areas of the city, and flooding from the surrounding tributaries could be highly localised. Aldrete points out that the ground levels also differ spatially and says the accumulation of material was due to a number of factors.¹³⁴ Natural disasters such as earthquakes and fires would have played a considerable part in changing the ground level, as buildings that were destroyed by these means would have been dismantled, and any materials not used in the rebuilding would have been used as fill. In fact some structures would invariably have been built on top of the levelled off remains of these ruins. Floods themselves would have added to this with the build-up of silt and debris as well as the destruction of buildings which would have had the same effect as the frequent fires in Rome. Aldrete suggests the frequency of a major flood within Rome was every 20 years which could reach upwards of 15 m above MSL, and a minor flood every 5 years which is considered to be anything above 10 m above MSL.¹³⁵ After any moderate to large flood there would have been a large deposition of silt and sediments in any low lying areas of the city that had been inundated, as parts of the city itself were effectively built on the flood plain of the river. Any widespread deposition might have been too extensive to remove by hand and would more likely have been levelled and used for a building platform. This accumulation of debris would also have involved the general day to day dumping of domestic rubbish and pottery such as the example of Monte Testaccio – an artificial hill in the Aventine area of Rome which is made up entirely of broken amphorae pots and reaches a height of 35 m.¹³⁶ The end result of this

¹³⁴ Aldrete, 2007, pg. 40.

¹³⁵ Aldrete, 2018, pg. 366.

¹³⁶ Aldrete, 2007, pg. 40.

accumulation is an average change in height of between 5 and 10 metres above MSL across the majority of the valleys that made up the ancient centre of Rome. In fact some areas have been calculated to have been raised by more than 20 m since the 6th century BCE.¹³⁷ Today much of the area of central Rome is 18–20 metres above sea level, an increase from around 10 metres above sea level. The areas with the largest levels of accretion can be found in the valley of the circus, where the Circus Maximus was eventually located, and in the area of the Campus Martius. These areas now have a fill of between 10–15 metres deep and so would have been extremely susceptible to flooding in the period of early Rome. The area around the Forum Boarium was extremely susceptible as it sat at the end of both the valley of the circus and the forum valley, at the low point where they met the Tiber. This would have been susceptible to even the smallest of rising in river level, and yet is one of the oldest used areas of the city (notwithstanding the Capitoline and Palatine hills).

Although the Campus Martius was technically not part of the ancient city itself (almost certainly due to frequent flooding), it would naturally be a point of inundation for even a mid-level flood. At just 10 metres above sea level it would not take much for the Tiber, with a natural water level between 5–7 metres above MSL, to flood it.¹³⁸ This would have been exacerbated by any local rainfall due to the geomorphological characteristics of the area. The Campus Martius was located between the Capitoline and Quirinal hills and the Tiber River, so any run off from these hills would have been directed towards this area. It was also bordered on the north-eastern side by small streams which originated from the hills to the north of the centre of ancient Rome which may have added to concerns of flash flooding originating from localised downpours. As the hills bordering the Campus Martius were increasingly urbanised the resulting land use changes would have exacerbated any surface water run-off. This effect would have been echoed in the area of the city itself, and the removal of vegetation to allow for building and the increased paving that was continuously being built on the sides of all the hills in Rome would have led to the ground being less porous and therefore less able to soak up any rain that fell. This would have led to increased flash flooding as any rain that fell within the city would flow directly to any lower areas without an effective storm-water system.

¹³⁷ Aldrete, 2007, pg. 41.

¹³⁸ Aldrete, 2007, pg. 46.

Evidence for floods:

As is the case with the other topics covered in this thesis, the natural place to begin is with the existing historical evidence, namely the written records of the Romans themselves. The extant primary sources mention 42 different floods which happened across 33 years during an 812 year period.¹³⁹ However, these figures come from the combined evidence of eighteen different authors, the most prominent of whom are Livy and Cicero, and cannot be assumed to account for all significant flood events that happened during this time. It is not certain either if they are all historical. In fact most floods were usually only documented when they were associated with other significant events, and usually appear alongside a host of other ‘supernatural events’ such as fires or other natural disasters.¹⁴⁰ These events that Livy and Cicero refer to are likely to be prodigies, which were deviations from the norm, signifying the displeasure of the gods, and that something needed to be atoned for. These usually come in the form of natural events such as lightning strikes, fires, and flooding (although they also can include raining blood, bloody ears of corn etc.). The issues with using prodigies comes in their reliability. It is unclear whether the records were kept by the Pontifex Maximus or with the Senate. Rawson also argues that the lists of prodigies Livy and his contemporaries used contained only a selection of the year’s events, and even suggests the lists were corrupted to the point that they were not the official prodigies as described in the *Annales Maximi*.¹⁴¹ We do not have any definitive way of verifying whether flood events documented by these sources are exhaustive or whether there are many other events which have not been documented. This may be because other events may not have had the immediately destructive effect as others and were seen as commonplace and so unworthy of mention by ancient historians. The other issue with these historical sources is the vagueness of their accounts. In one instance Livy outlines that there were 12 floods during the year 189 BCE which were large enough to inundate the Campus Martius and the ‘flat area’ of the city, however in other accounts Livy is far more vague, simply stating, for instance, that in 193 BCE there were ‘great floods’ which were severe enough to destroy particular buildings within the city without giving any indication of the number of times the city was inundated or which buildings were affected.¹⁴² Some accounts, such as the ones just discussed, give an explicit outline of flooding and the subsequent effects for any given year, however other accounts are more contentious and uncertain. In these, the damage described is likely to have

¹³⁹ See Aldrete, 2007 for a comprehensive account of the extant sources for the flooding of the Tiber.

¹⁴⁰ Aldrete, 2007, pg. 14.

¹⁴¹ Rawson, 1971, pg. 162.

¹⁴² Livy 38.28.4 and 35.9.2-3.

been the direct result of a flood, such as the account of Julius Obsequens which describes how the supports of the Pons Aemilius were washed away downstream. While there is no direct mention of any flooding, the preceding text does refer to a violent storm which struck the city, so this damage could conceivably have been caused by high winds. The precise meaning of this passage is also uncertain, as there is some contention with the term *tectum*, which could refer to wooden roofing on the bridge itself (which could have been damaged by strong winds alone), or could be refer to a wooden structure which may have covered the stone piers of the bridge, as Aldrete argues is more likely.¹⁴³ As is often the case with our ancient sources, it is unknown how reliable they are. The evidence itself can be unclear if, for example, we are trying to infer a flood event from evidence documenting a ‘storm’ or fire etc. and the sources themselves refer only to 42 floods of significance over a very long period of time which is an implausibly low total given the hydrological evidence. The scale of these events is also somewhat unclear, with some events described as ‘great floods’ and others simply as inundations. The storm which is referred to as damaging the Pons Aemilius is not said to have caused any further damage in the city centre, and so again it is unclear how significant this detail is in regards to any inference of wider flooding.

The Impact of Flooding: the Ancient Evidence

The effects of floods, both direct and indirect, on Rome and its citizens are challenging to examine fully due to the shortage of primary evidence. Generally this evidence refers to buildings being destroyed and some loss of life, and while these may not directly reference flooding, they can allude to damage likely caused by it (see the previous section on the primary sources). However there are some ancient accounts regarding the effects specific floods had on the city such as those of Dio and Livy. While there are no comprehensive accounts in the primary sources of flooding, the immediate effects, and the aftermath, it is possible to get a general idea of the more flood-prone areas from some of these accounts. In the case of one flood, Dio refers to all but the highest areas of the city being inundated, with loss of buildings and life the direct result of the catastrophic event,¹⁴⁴ and Livy refers to low lying areas being inundated with some buildings collapsing as a result.¹⁴⁵ The Campus Martius immediately springs to mind when low lying areas of the city are described as being inundated as this would

¹⁴³ Aldrete, 2007, pg. 19.

¹⁴⁴ Cass. Dio 39.61.3.

¹⁴⁵ Livy 35.9.2.

likely have been the first area to be affected by flooding as has been discussed. However as Aldrete points out, the Campus Martius was a well-known area at this time and there would have been no need to call it a ‘low lying area’ as opposed to simply referring to it as the Campus Martius.¹⁴⁶ Livy also references an inundation to the ‘flatlands’ and well as the Campus Martius.¹⁴⁷ The Campus Martius was never part of the ancient city, so Livy may not have had it in mind when referring to the low-lying areas of the city; instead he may have been thinking of the valleys in the original area of the ancient city – namely the Forum Boarium, Forum Romanum, and the Valley of the Circus. However, it may be that Livy referred to the Campus Martius by name simply because it had one to refer to, while the low-lying areas he mentions may simply have been all areas along the river which were flooded at the time.

Alongside the general description of the ‘flat’ areas, there are also references to 17 specific sites in these original sources which were affected by flooding. The areas which are said to have been affected follow what we would expect when looking at the topography of the area, and understanding how the hydrology of the river and flood waters would have acted. Livy refers to the floods of 193 BCE and 192 BCE as damaging the area around the Porta Flumentana which was the gate in the Servian walls which opened to the Tiber at the Forum Boarium.¹⁴⁸ This would be an obvious area of inundation as it is at the low point of the city, and on an outside bend of the river (which would have a higher water level, and greater velocities at this point). There are also references to floods affecting areas that were further inland from the Forum Boarium. Horace describes the Regia and shrine to Vesta, monuments at the south-eastern end of the Forum Romanum at the foot of the Palatine Hill, being affected by floodwaters which suggests that the water may have followed the low path from the Forum Boarium to the Forum via the Velabrum.¹⁴⁹ The Forum Romanum itself is also described as being underwater in an account from Dio of a flood in 217 CE.¹⁵⁰ Dio also specifically refers to events where the Tiber overflowed onto the low ground, making it navigable for boats.¹⁵¹ These events could last for days, with the low areas being navigable by boat for 3 days during a flood in 23 BCE and for 7 days in 5 CE.¹⁵² While some of these accounts are outside the scope of this thesis, they reinforce our understanding and expectations of how flood waters

¹⁴⁶ Aldrete, 2007, pg. 34.

¹⁴⁷ Livy 38.28.4.

¹⁴⁸ Livy 35.9.2-3, 38.28.4.

¹⁴⁹ Horace *Carm.* 1.2, in Aldrete, 2007, pg. 35.

¹⁵⁰ Cass. Dio 79.25.5.

¹⁵¹ Cass. Dio 53.20.1.

¹⁵² Cass. Dio 53.33.5, 55.22.3.

would have acted based on the topography of the area and can be a valuable tool in our understanding of how these events affected the city and its people.

The Impact of Flooding: Modern Hypotheses

The ancient source evidence we have to work with is neither extensive nor detailed enough to gain a full understating of how the Tiber (and specifically the flooding associated with it) affected early Rome and its people, or the means by which they alleviated this threat. It is therefore necessary to adopt a more hypothetical approach to the study of the effects of flooding on the city. This conjecture is limited to describing likely scenarios, however these scenarios are based on scientific and geological evidence for building stability, the spread of disease, and movement of people around a flooded area.

Aldrete has pieced together various accounts along with scientific data to build a scenario of the likely effects of a typical flood.¹⁵³ The most basic of these effects would have been the disruption of daily life, causing economic disruption as people focussed their efforts on finding shelter or loved ones, and cleaning up the aftermath of such an event. This would also have affected movement around the city, with roads turning into raging torrents of water which isolated individuals and forced communities onto hilltops. The destruction of personal property would have also had a significant effect on the local population. The basic needs of people had to be met, and replacing even the most basic household items would have caused additional stress. These belongings may have been mixed with those of others in the flood waters, which housed harmful bacteria about which no one knew anything, which would have ruined any food stuffs and utensils etc. Structural coverings such as wattle and daub (timer, and clay mixed with soil, sand, dung, straw etc.) could crumble with immediate effect, or be subject to long term rot which would eventually turn to mould. Structures themselves could be destroyed, and those which withstood the immediate barrage of water could be subjected to long term structural issues which will be discussed in greater detail in a later section on the long term effects of flooding. Even in this scenario it is impossible to build up a profile as to what the effects would have been for an individual flood, as these would have varied based on factors such as the magnitude (i.e. how high the river peaked at above MSL) and the duration of the flood. There would have been a significant difference in the effects felt between a flood with one small peak, and a large event spanning a day or more. Where the flood originated

¹⁵³ Aldrete, 2007, pg. 91.

geographically would also have been a large factor in determining its effects, and this would usually be related to the duration of a flood as well. This would be determined by the weather of the entire region (and indeed the entire peninsula) as only one of the four main branches of the river might have been affected by rain at its headwaters, or all four might have been affected. The main rainfall for an event might actually have fallen on the plains closer to the city itself, which would have changed the nature of the flood. In this case there would also have been a lot more surface flooding around the city, caused by localised downpours and overflowing streams originating from the hills of and around Rome itself, resulting in more destruction and a lack of mobility around the sodden city which would have been exacerbated by the high levels of the Tiber itself. In a flood event like this there would have been nowhere for the rain which fell around Rome to go, as the natural outflows into the Tiber might already have been blocked by high water levels within the river itself. This would have caused more damage to the local environment than a flood event originating at the headwaters of the Tiber, as there would be less localised damage around the hillsides and other areas which would not have been as directly affected by a higher water level in the Tiber. If the origin of a flood was indeed from the headwaters in the ranges the behaviour of the event would have been different. Depending on the weather systems and which tributaries were affected, this would determine the nature of the flood peak by the time it travelled downstream to Rome. If the driving weather pattern was from the south, then the Anio would be the first part of the Tiber system where rain would fall. As the system travelled north along the mountain range the rain would fall in the Nera tributary, and finally the headwaters of the Tiber itself would receive the rainfall. Depending on the speed of a weather system and the intensity this may result in three very distinct peaks which would all arrive in Rome at differing times over a period of hours (or even a day), or may result in one large flood peak as the water in all tributaries effectively caught up to one another and passed Rome at the same time.

There are also delayed effects of this kind of disaster, both of a mental and a physical nature, and these can be larger and more devastating to the local community than the immediate effects of the flood itself. One delayed effect is that of immersion in water. This could also be included in the immediate effects as it is directly related to a large volume of water from the river, however immersion in water for any period of time could have a delayed effect on the structural integrity of buildings long after the flood peak had passed. In early Rome most residential buildings were constructed of a combination of timber framing, rubble walls from local rock and tuff, and sun or fire baked terracotta and bricks. The local rock was generally volcanic tuff which could be taken from the hills themselves, but local rubble could also be used as a fill in

the construction of walls. Bricks were used in the construction of walls in all buildings in early Rome as well, however terracotta tiles were generally fixed to the outside of walls constructed of timber and rubble, as well as being used as roofing, and wooden columns could be clad in terracotta as well. The longer any period of immersion in water was, the longer any water had to seep into structures etc. weakening them potentially to the point of collapse, especially when constructed of these porous materials such as timber and concrete which soak up any moisture.¹⁵⁴ When this material becomes waterlogged it has a tendency to swell. This can lead to structural instability especially around joins, and can lead to collapse. Even if a building does not immediately collapse, cracks can form when the material dries out and shrinks back to its original size. As the most severe flooding would generally have occurred during periods of high rainfall in the winter months, the temperature would also have been much colder. During these colder winter months, a freeze-thaw effect can occur, where water finds its way into the cracks caused by swelling from inundation, and is then frozen in the cold temperatures. When frozen the water expands and widens any cracks which may exist, further weakening the structure of the building. If wooden structures stay wet for too long mould and fungi can grow, rotting the wood and causing structural instability. If moisture levels are above 20% fungi can grow, which can be an issue during the wetter winter months when timber structures would not be able to dry out as quickly.¹⁵⁵ Even if the building itself was not structurally weakened there was the potential for scouring of the foundations, and any building around the riverbanks or floodplains would have found itself at risk of this destabilisation. When discussing the flood of 54 BCE, Dio explained that the buildings that were not immediately destroyed became weaker and resulted in many people being injured at a later date.¹⁵⁶

Those who were not affected by the physical effects, both immediate or delayed, could still have been affected by factors such as food spoilage and disease. There are multiple examples where flooding directly impacted on the food stores in Rome, notably in 54 BCE, 23 BCE, 22 BCE, and 5 CE.¹⁵⁷ This spoilage of food was significant as the population of Rome was, by this time, too large to produce enough food for its citizens and the required food supplies needed to stave off famine could take weeks to arrive from other provinces. Another significant effect of flooding is the spread of disease. This is exacerbated in the instance of Rome due to both the Roman burial and sanitation practices, or lack thereof. It would not have been

¹⁵⁴ Aldrete, 2007, pg. 130.

¹⁵⁵ Aldrete, 2007, pg. 130.

¹⁵⁶ Cass. Dio 39.61.1-2.

¹⁵⁷ Cass. Dio 54.1-4.

uncommon in everyday life for half decomposed animals, or potentially humans, to be lying in the street along with raw sewage, however this would have been intensified after an event such as a large flood.¹⁵⁸ There were no state funded burials, and perhaps up to 1,500 bodies per year would eventually either be thrown in the Tiber or in pits outside the city walls.¹⁵⁹ Although Rome did have some sewers, most notably the Cloaca Maxima, these were designed as drainage as opposed to alleviating the city of its waste which, by the time of the Augustan period (with a population of between 1 million and 1.25 million), was around 50,000 kg of human waste per day.¹⁶⁰ As well as the gastrointestinal type of illnesses that would have been rife during these times, there would also have been the threat of malaria spread by mosquitoes which would have swarmed the swampy conditions left by large scale flooding, especially if it occurred during the hot, humid summer months. For psychological trauma, there are no accounts that allow for this in any of the primary sources, and any analysis carried out on this necessarily must focus on modern accounts as this is the only data we have. However due to us not actually having any primary source evidence, and understanding that both the nature and duration of psychological traumas are of such an unknown quantity, it is best if this is not speculated on in this discussion as we are discussing a different world, and things which we would find disturbing could have been mundane in antiquity.

Flood Prevention and Mitigation:

The main form of flood prevention within Rome was the removal of excess water via the construction of sewers in the low-lying areas of the city. The sewers will only be covered briefly in this chapter as they relate to the drainage, or lack thereof, during times of flood, as has been discussed more extensively in chapter 4 which focuses on the valleys of Rome. While some discussions of the Cloaca Maxima, as well as the other drains in Rome, focus incorrectly on its role as a modern-day sewer (to remove sewage from the local area) the drains did help to alleviate some of the flood waters in the city itself. This would not have happened during a flood event itself. In fact the drains would have exacerbated the extent of flooding throughout the city, acting as a conduit for flood waters from the Tiber to 'back flow' up the drain to reach land far from the river bank itself. Even a relatively small sized flood would have caused issues

¹⁵⁸ Suetonius describes an incident of a stray dog finding a human hand in the street and bringing it inside to Vespasian while he was eating breakfast, with the only notable thing seeming to be that this was seen as an omen. See: Suet. *Vesp.* 5.4.

¹⁵⁹ Aldrete, 2007, pg. 142.

¹⁶⁰ Scobie, 1986, pg. 413. For a greater discussion on the population of Rome see: Oates, 1934.

with backflow up the Cloaca Maxima, as the mouth of this drain is only 4.7 m above MSL where it meets the Tiber. This is because the drains were essentially open ditches, and did not have any mechanisms such as valves or gates which would have stopped the majority of flood waters from the river from travelling up the drains into the area of the Forum etc. The drains, however, would have aided in the removal of remaining surface water from the city itself after the flood peak had passed. These drains had the ability to remove water that would otherwise have been trapped by the topography of the area by enhancing naturally low areas of the topography. In a similar frame, the low lying areas of the Forum Valley and the Valley of the Circus were also raised above the majority of low to medium level floods. This deliberate attempt to alleviate flooding was a gradual process where existing buildings and excavated material were simply dumped and levelled as this was easier than removing it from the site (as has been discussed on chapter 4, which focuses on the valleys in greater detail). There is evidence that Augustus dredged part of the bed of the Tiber, and removed structures along the banks which restricted the flow of the river, and Nero built a series of dams on the Anio which somewhat regulated the flow of that tributary (although the specific purpose of these was not to regulate flow, as Nero commissioned them to enhance the beauty of his estate), however these will not be explored in great detail as they too fall outside the chronological scope of this investigation.¹⁶¹ Another method of flood mitigation is the construction of stop-banks or levees. These structures serve to increase the amount of water the river system can carry, and allow for protection of the area behind the embankment. However, they are required to be engineered to a level where they can withstand the immense force of water on one side, and there is no evidence of this type of engineering in the Roman world, and once they have overflowed, they can cause more issues, preventing the water from escaping and causing significant damage. The development of a stopbank system along an area prone to flooding can also bring a false sense of security for local residents who would otherwise be more prepared for a flood event and may put significantly more planning into place such as houses that are more structurally sound or raised above probable flood levels etc. While most of the major lining of the embankments in Rome was developed from the 2nd century CE onwards, there is some evidence that systematic bank modification did take place from the 2nd century BCE, with numerous stone embankments being constructed in key areas around the Forum Boarium, and both at the base and downstream of the Aventine hill.¹⁶² These were large vertical embankments of tufa

¹⁶¹ For a discussion on the dredging of the Tiber by Augustus see Marshall Cavendish, 2010, and for a discussion on Nero's damming of the Anio refer to Viollet, 2007.

¹⁶² Aldrete, 2007, pg. 194.

and travertine with a walkway along the top and flights of stairs leading to the water where boats would be tied up alongside. However these structures were designed as ports to allow for the loading and unloading of large volumes of cargo, and subsequently were too low for flood protection from anything greater than a small flood event, although they would have helped prevent erosion of the banks during such times.¹⁶³

Conclusion:

The inhabitants of Rome have always had a close relationship with the Tiber River, with flooding playing a significant role in this. This is evident in the foundation myth of the city, which may even demonstrate the significant effect this had on the psyche of the Roman people. Modern analysis suggests a high frequency of these events, and it is likely that they have been significantly underreported by ancient sources. The low lying areas of the city must have been regularly inundated, due to their similarity in elevation to that of the river, which would have isolated the hills from one another, and possibly disturbed burial grounds. This regular inundation of the lower areas of the site is a major factor in the establishment of early settlements on the hilltops. Due to the initial settlement on these hilltops, the risks associated with flooding would have been less during the earliest development of the city, however as the city expanded into the valleys this proximity to the river was a constant, serious threat to both life and infrastructure. With the raising of the level of the valley floor and the construction of drainage canals these low areas of the city were able to be settled. However there was still a high risk associated with living in such close proximity to the river, with evidence of floods inundating the city throughout the remaining regal and republican eras. The drainage canals such as the Cloaca Maxima were designed to remove excess water from the area, however their lack of elevation meant flood water from the Tiber would have flowed back up into the city during a large flood event, and this would have exacerbated the effects of such an event. Buildings were either not able to withstand the initial force of water or were subjected to long term effects such as rot, and disease would have spread rapidly in the damp, confined spaces of the valleys.

¹⁶³ Aldrete, 2007, pg. 194.

CHAPTER 6: THE INFRASTRUCTURE OF EARLY ROME

Introduction:

The way in which geography has influenced and impacted on the development of the infrastructure of the city is an important theme for this thesis. This chapter will focus on the major infrastructure of the early city and how this was shaped by the geography of the area. It will also take into account how this infrastructure shaped the development of the city by opening up new areas for settlement and providing them with security both in the form of defensive structures and surety of resources such as water. This chapter will begin with an overview of the defensive structures of the city. This includes the hills as defences, although for a more comprehensive discussion of this see chapter 3, and the debate about what form early defensive walls may have taken as well as the dating of these structures. The bridges and roads within the city are then outlined, with a focus on how these (especially bridges) facilitated the movement of people and goods around and through the city, and increased the ability to access areas such as the right bank of the Tiber for development as well as trade routes. Finally the aqueduct system within the city will be discussed, with a focus on how the topography of the city affected its construction, and how the implementation of these water delivery systems contributed to the continued development of the city.

Early walls and the defence of the city:

It stands to reason that Rome would have had defensible structures in the early stages of its development. The earliest forms of defence were likely the hills themselves as their steep sided topography rendered the hilltops naturally defensible on their own and any permanent structure in the form of a wall may have proved too expensive to build. The extent and nature of Rome's earliest large scale defensive walls are contentious among modern scholars as the archaeological remains only comprise small segments of walls, which has led to debate over whether the early wall went around the entire city, or was restricted to certain parts of it such as the hilltops. Filippo Coarelli adopts a dating for the first wall of somewhere in the first half of the 6th century BCE, which puts the evidence in the reign of either Tarquinius Priscus or Servius Tullius (most ancient sources have credited the construction of this structure to Servius

Tullius)¹⁶⁴. However, prior to the early 6th century BCE there is no conclusive evidence of a permanent stone wall which was attributed to the earlier kings. Any physical evidence is confined to earthen works (potentially fossae or ditches associated with defensive walls) or focussing on smaller hilltops.¹⁶⁵ John Hopkins demonstrates that the archaeological evidence paints a very hazy picture, with elements of both the early archaic wall and the later Servian wall (which will be discussed below) being present in archaeological finds; this is revealed by the type of stone used and the metrology (the size and weight of stone blocks used in construction).¹⁶⁶ He argues that this has led scholars to point to a later date for the establishment of any kind of defensive structure that encompassed the entire city, with any definitive evidence of this dating no earlier than the late 6th century BCE, although there is evidence of smaller structures on the Northern Quirinal, Eastern Esquiline, and Western Capitoline hills dating to earlier than this¹⁶⁷ (Daniela Bruno argues for a clay and wooden wall dating from the time of Romulus encompassing the entire Palatine hill, however there is no definitive evidence for this).¹⁶⁸ Around this same time there is also evidence of defensive walls in other towns throughout the region, and the recent discoveries of walls at Lavinium show that defensive wall structures were built in the same period, and all were built in the same style of *opus quadratum*.¹⁶⁹

The invasion and occupation of Rome at the hands of Brennus in 390 BCE prompted the construction of a larger and more encompassing defensive wall, and Livy specifies the year of 378 BCE for the erection of this new wall.¹⁷⁰ During the invasion of 390 BCE any existing defensive structures were completely overrun, with the only area remaining in Roman hands being a small area at the top of the Capitoline where a small number of Romans held out until their food and water supply became scarce.

The structure of the early walls in Rome (including the Servian wall) was that of rectangular blocks of volcanic tuff which was comprised of ash and rock fragments which were ejected during the many periods of volcanic activity which shaped the geography of the area. The tuff that was used for the so-called Servian wall was sourced from the *Grotta Oscura* quarry, some 15 km north of Rome, which only became available to the Romans after their successful campaigns against their local rival Veii, who previously had had control of the quarry. The tuff

¹⁶⁴ Coarelli, 2014, pg. 11.

¹⁶⁵ Hopkins, 2016, pg. 92.

¹⁶⁶ Hopkins, 2016, pg. 93.

¹⁶⁷ Hopkins, 2016, pg. 94.

¹⁶⁸ Bruno, 2017, pg. 79.

¹⁶⁹ Coarelli, 2014, pg. 11.

¹⁷⁰ Livy 6.31.1.

sourced from this quarry was somewhat stronger and less susceptible to erosion from the elements than the *Cappellaccio* tuff which could be sourced from within the city itself.¹⁷¹ This tuff would have also had a cheaper overall cost associated with it than sourced elsewhere, as transportation costs would have been lower due to the proximity of the quarry to transport links along the Tiber. The *Grotta Oscura* tuff was also somewhat lighter than other local stone due to the presence of large pumice and scoria fragments within the stone, which are far lighter than the ash which comprises the majority of the composition (this tuff is around 1,350 kg/m³, whereas other local tuff can be between 1,600 kg/m³ and 2,250 kg/m³).¹⁷²

The territory within this new Servian wall was around 426 hectares, with the wall itself around 11 km long, however the area within the walls was not necessarily entirely occupied as the course of the walls took more of a strategic path influenced by the topography, especially around the more exposed eastern flanks of the Caelian and Aventine Hills, and the plateau north of the Viminal, Quirinal, and Esquiline Hills.¹⁷³ This wall only extended as far west as the Capitoline Hill, with the Campus Martius outside the defensive walls. However, it is difficult to determine what would have constituted ‘Rome’ at this time as to most inhabitants it is likely there would not have been any distinction between the two, as can be shown in the treatment of the disposal of the dead. Modern scholars say it was forbidden to bury the dead within the Pomerium.¹⁷⁴ However according to the Twelve Tables (Rome’s first written code of law), it is merely stated that “He is not to bury or burn a dead man in the city”,¹⁷⁵ and in *On the Laws* Cicero only refers to being buried outside the city, and outside the gates.¹⁷⁶ This evidence suggests the city walls were a more important distinction of the ‘city’ than the ritual boundaries of the Pomerium, as evidenced by the Aventine being inside the walls but outside the Pomerium.

Geographical effects on spatial settlement distribution:

Due to the excessive difficulties of building and maintaining bridges large enough to traverse the Tiber (and the technology to build bridges large enough for a permanent structure), any early expansion of the city was kept to the eastern bank of the river. This meant that the western

¹⁷¹ Holloway, 1996, pg. 19.

¹⁷² Lancaster, 2005, pg. 13.

¹⁷³ Coarelli, 2014, pg. 12.

¹⁷⁴ Taylor, et al., 2017, pg. 117.

¹⁷⁵ Cherry, 2001, pg. 9.

¹⁷⁶ Cic. *Leg* II.58.

side of the Tiber remained sparsely populated (and indeed outside of the city boundary) during the initial phase of settlement. The periodic inundation which would have occurred along the western bank of the Tiber would also have added complications to permanent occupation of the low lying areas. As is the case today, most of the roads through the city were situated in the low areas and followed the course of streams. This would have followed the path of least resistance and precluded the need for larger earthworks which would have involved cutting through large parts of the hillsides (it is also for this reason the Cloaca Maxima followed an existing stream bed).

With the increased settlement and use of the land to the west of the Tiber, there was also a need for a safe way for people and goods to traverse the river. The Pons Sublicius was the earliest known bridge in Rome, and dated from the late 7th century BCE.¹⁷⁷ No remnants remain of this bridge as the structure was wooden, but it was likely located slightly downstream of the Isola Tiberina (Tiber Island) in an eddy in the current of the river and just upstream of the ancient mouth of the Velabrum (which would become the outlet for the Cloaca Maxima).¹⁷⁸ The fact that the bridge was an entirely wooden structure is of significance as this was in a period where the Romans were constructing large buildings in stone. This may have been deliberately done as an extension of the defensive structures of the city, as a wooden bridge could quickly be destroyed (and subsequently rebuilt) for defensive reasons. The name 'Sublicius' even refers to the wooden piles that were part of its construction.¹⁷⁹ Indeed, it is partly the wooden nature of the bridge which puts it at the forefront of one of Rome's early heroic legends where Horatius holds off an army headed by the Etruscan Lars Porsenna single-handedly on the western side of the Pons Sublicius until the bridge could be destroyed by the Roman forces.¹⁸⁰ This is more patriotic propaganda than history, but it does show the importance of this early bridge to the Romans, and how necessary it was for connection to the lands west of the Tiber. There are suggestions, but no definitive evidence that prior to the construction of any permanent bridge structures the main form of transport across the river was via a ferry at the point in the river where the Pons Sublicius eventually stood,¹⁸¹ as this part of the Tiber was a significant point in the local salt trade route as it would have required some form of crossing.¹⁸²

¹⁷⁷ Livy 1.32.6.

¹⁷⁸ Taylor, 2002, pg. 3.

¹⁷⁹ Taylor, 2002, pg. 3.

¹⁸⁰ Ward, 2003, pg. 78.

¹⁸¹ Richardson, 1992, pg. 299.

¹⁸² Griffith, 2009, pg. 305.

The likely location for the ferry on the eastern side of the river is around the Forum Boarium area, between the mouth of the Cloaca Maxima, and the streams which ran through the Valley of the Circus which joined the Tiber just upstream of the Aventine Hill. This location would have given access to the city without having also to cross these extra streams and waterways. Rayburn Taylor is of the view that the location of the eastern side of this crossing corresponds with the nomenclature of an ancient street which ran along the north-eastern slope of the Palatine from the Forum to the specific location on the river, and which was named the '*Vicus Tuscus*' ('Etruscan Street'), meaning the way to Etruria was along this street.¹⁸³ The Romans themselves had multiple explanations for this name. Dionysius claims its name means 'the habitation of the Tyrrhenians' after the Romans allowed remnants of Lars Porsenna's army to settle in the area after the Battle of Aricia, and Livy's account is similar.¹⁸⁴ Tacitus has a slightly different account for the name as well, suggesting it was named after Etruscan supporters of Tarquinius Priscus who established themselves in the area, and the street was named after these inhabitants.¹⁸⁵ However the differing accounts suggest the Romans were not sure of the exact etymology of the name, and would have been unaware of the original settlement and trade routes of the site, which leaves Taylor's view the likely scenario in this situation.

An issue with having only one bridge across the river was congestion, and given the Pons Sublicius was only a narrow footbridge, the need for the ferries for the transport of goods would likely have continued until at least the 2nd century BCE, when the Pons Aemilius was constructed. This was the first of the bridges in Rome to be constructed with a stone foundation, and alleviated part of the considerable stress that would have been on the Pons Sublicius and ferries. However, this, and the Pons Mulvius to the north, were built on highways designed to facilitate the movement of people and goods in and out of the city. The Pons Fabricius and Pons Cestius connecting Tiber Island to either bank were real urban bridges in Rome in that they were not part of the consular highway system. Taylor's explanation is that the bridges were instead designed to allow access from either side of the river to the island.¹⁸⁶ Indeed, he says the construction of the two bridges may have had little impact on the development other than to take slight pressure off the Pons Aemilius, and that the bridges were more to do with the island being a centre for cults than a connection across the river. This stands to reason, as the main argument for the importance of the Tiber Island bridges is that they were easier to

¹⁸³ Taylor, 2002, pg. 3.

¹⁸⁴ Dion. Hal. *Ant. Rom.* 5.36.1 and Livy 2.14.5-9.

¹⁸⁵ Tac. *Ann.* 4.65.

¹⁸⁶ Taylor, 2002, pg. 6.

build as the span was led at that point, however the Pons Sublicius was built hundreds of years before the Tiber Island bridges and the two bridges may not have been built at the same time as well. The Pons Fabricius was built in 62 BCE, however it is unknown as to the date of construction of the Pons Cestius.¹⁸⁷ Taylor attributes this bridge to C. Cestius Epulo between 18 and 12 BCE, decades after the Pons Fabricius.¹⁸⁸ It is possible this name was given after Cestius restored the bridge, however there is no evidence, either literary or archaeological for the bridge before this time.

The bridges in Rome seem to fall into four different groupings: consular highways, privately owned, aqueducts, and urban bridges. The network of consular highways facilitated the movement of people and goods in and out of the city itself (across the Pons Sublicius, Pons Mulvius, and the Pons Aemilius). There were privately owned and operated bridges, although perhaps the only example – the Pons Agrippae – was still available for public use. There is one example of a bridge in Rome being constructed, not to facilitate the movement of people, but that of water: the Pons Traiani was the only bridge in Rome which was in fact an aqueduct. The clear majority (and the remainder) of bridges in the city were classed as ‘urban’ bridges, which were fully public crossings that served the need of workers, labourers, pilgrims etc. who went about their daily business within the city itself.¹⁸⁹

Roads within the city:

As Rome was built on the crossroads of an important trade route, as has been discussed earlier in this work, the network of roads linking Rome with both its natural resources and its neighbours was of immense importance to the continued development of the city. This extensive roading network has been famous throughout history, with an untold volume of works published on the topic, and is arguably a major reason for the growth of Rome from a city to an empire. However the scope of this work limits us to how the geography of the site of Rome has affected the development of these roads within the city during the early stage of its development.

The roads within Rome itself were influenced by the topography of the city and generally followed the topography of the local area. They often followed the course of streams within

¹⁸⁷ Richardson Jr, 1992, pg. 299.

¹⁸⁸ Taylor, 2002, pg. 7.

¹⁸⁹ Taylor, 2002, pg. 1.

valleys as this would have been easier for both construction and use of the roads than carving out steep streets directly over a hill. Outside the city the roads followed low ridges of hills, as larger mountain ranges limited the ability to transport goods, and therefore the Romans had the discretion to plan the road route which optimised efficiency.¹⁹⁰ However within the city the Romans had less discretion as to which routes roads took as these were needed to link other important infrastructure such as ports and river crossings including bridges and fords; the Sacra Via, for instance, which linked the Palatine to the Forum Romanum, followed the Velia stream on its route through the Forum Valley.¹⁹¹ The Vicus Patricius was another of the older roads in the city which was influenced, but not constricted by, the topography of the area. This street ran from the Argiletum near the Forum to the Porta Viminalis leading out of the city.¹⁹² This street followed the valley between the Cispian and Viminal hills as it increased in altitude to meet the Esquiline plateau. The naming convention of these roads was important to the Romans as this differentiated the nature, and sometimes purpose of the road. The term *Via* was generally used to denote a road which originated from the gates of Rome and ended in a specific destination, although the name of the road could also represent the name of its builder such as the Via Appia (the only exemptions to this rule were the Sacra Via and Nova Via which were both called *Via* for their entirety within the city).¹⁹³ Within Rome streets were called either a *Vicus* or *Clivus* depending on their topographical nature; a *Vicus* being a relatively flat road, and a *Clivus* being a steep, hilly road.¹⁹⁴

Aqueducts:

In terms of harnessing the natural resources of the immediate area, the Romans were heavily influenced by their Etruscan neighbours who had previously developed land drainage through the local volcanic rock and also used this tunnelling technique for regular water supply.¹⁹⁵ The earliest aqueducts in the city were similar to these drainage channels of the Etruscans, and consisted of underground canals bringing water from the springs located in the hills within the city to a more central location which allowed for more regular public access. Eventually the vast system of aqueducts (as well as the corresponding tunnels and arcades) within the city of

¹⁹⁰ Lawrence, 1999, pg. 3.

¹⁹¹ Richardson, 1992, pg. 339.

¹⁹² Richardson, 1992, pg. 426.

¹⁹³ Richardson, 1992, pg. 413.

¹⁹⁴ Richardson, 1992, pg. 413.

¹⁹⁵ Aicher, 1995, pg. 3.

Rome itself would reach up to almost 500 kilometres in length, and essentially powered the network of baths, fountains, and private plumbing to more well-off dwellings, as well as helping to flush the sewer system of the city.¹⁹⁶ Even before the splendour of the empire the aqueducts were more than their basic form, and were designed as monumental attractions, described as “a succession of triumphal arches” as they flowed through the central arcades, symbolising typical Roman pride in conquest – on this occasion, that of water.¹⁹⁷

The Romans also manipulated their local geographical resources by harnessing and storing excess water in large cisterns as a back-up during periods of drought, and any excess at the lower end of the system was used for fountains, and to flush their waste into the free-flowing Tiber. The first aqueduct in Rome was the Aqua Appia, the construction of which began during the censorship of Appius Claudius Caecus in 312 BCE, and by 300 CE there were 14 separate aqueducts in the city, supposedly with the capacity to deliver up to 1.5 million litres of water per day to the inhabitants of Rome.¹⁹⁸ Until this point the population of Rome had an adequate supply of water from the Tiber, wells which tapped into the local ground water, and the local springs, of which there were many throughout the hilly topography of the city.

Although there has been a considerable amount of work carried out on the Roman aqueducts throughout the empire, and even on the aqueducts’ systems which brought water to the city, most of this focuses on the infrastructure of the city, and is unrelated to the geography of the area and how this affected their development. The majority of this work is related to the aqueducts outside the city itself, and there has also not been as much work carried out on the distribution of this water once it was in the city itself.¹⁹⁹ The largest issue when trying to investigate the aqueduct system within the city is that the physical details of this network remain uncertain, and with the modern city having been built on top of the ancient one, there is limited physical evidence that is accessible for study. For literary evidence, there is also not a great deal to refer to (although Vitruvius did have some work on aqueduct building) until Frontinus wrote *De aqueductu Urbis Romae* in 97 CE in his role as commissioner of water under the emperor Nerva. However even this account of the water distribution network is not well preserved in its original manuscript, and some of the statistics within the work seem to conflict on the volume and delivery of individual aqueducts.²⁰⁰ It is also impossible to calculate

¹⁹⁶ Aicher, 1995, pg. IX.

¹⁹⁷ Aicher, 1995, pg. IX.

¹⁹⁸ Kerr, 1960, pg. 28.

¹⁹⁹ Both Andrew Wilson and Christer Bruun have works on the aqueduct system, however these more relate to the aqueducts as they stood outside the city, and mostly during the Imperial period.

²⁰⁰ Evans, 2000, pg. 2.

the average daily volume of water which could be distributed per head of population as there is no means to establish population figures.²⁰¹ Other authors have sought to determine if Frontinus' statistics can be verified and Deane Blackwell has conducted extensive research on the measurements of channel widths and depths of the four major aqueducts, coming within 'modest agreement' of Frontinus' findings.²⁰² However, the amount of head in the system when originating from a spring is not taken into account, and the velocities this would generate (and the potential velocity in general) is just as important to the amount of water that can be delivered at any given point as the diameter of the conduit is. It is also important to note that the pipes used (which were 1.25 Roman digits in diameter) would probably not have been entirely uniform throughout, and any distortion (whether from the lead or clay pipes) or partial blockage would cause a bottleneck, affecting the entire system.

The aqueducts themselves worked entirely on the principle of gravity. This meant that the source invariably had to be higher than the end (or *terminus*). Most of the aqueduct system ran underground in enclosed conduits, constructed of either lead or clay tile pipes, as this was the most cost-effective construction method. This also meant that the water supply was more secure from contamination from people, animals, and even the local environment, as well as the surety of water supply being maintained during times of war. When the topography necessitated, the aqueducts ran above ground, either along an embankment (*substructio*), or along an arcade or bridge. These latter two are what generally come to mind in popular thought when discussing the aqueducts of Rome, and within the central city itself this is also the most likely route the aqueducts would have taken to reach their terminus. Along an aqueduct which had a particularly long run there would have been a number of settling tanks (*piscinae*) to remove any sediment which would have invariably built up over the course of the line.²⁰³ The first aqueduct in Rome, the Aqua Appia, ran almost entirely underground. This is due to the source of this aqueduct being almost 17 m below ground level.²⁰⁴ It entered the city while still underground, and the only time it was above the ground level was as it traversed the Caelian and Aventine Hills on 60 *passus* (paces) on top of an arcade, before ending at the north-west corner of the Aventine, by the Forum Boarium.²⁰⁵ It seems somewhat strange that the aqueduct passed through almost the entirety of Rome without any distribution to other areas within the

²⁰¹ Evans, 2000, pg. 4.

²⁰² Blackwell, 1978, pg. 62.

²⁰³ Evans, 2000, pg. 6.

²⁰⁴ Front. *Aq.* 65.7, in Evans, 2000, pg. 29. This figure seems extraordinary if Frontinus text is indeed correct – he puts it at 50 feet.

²⁰⁵ Evans, 2000, pg. 65.

city, however once the elevations are taken into account it is clear that this was a very limited system in terms of its capacity. The origin, or source of the supply is estimated to be around 24 m above MSL, and the terminus by the Forum Boarium was around 15 m above MSL.²⁰⁶ This is a fall of only 8 m over the course of the entire aqueduct which Ashby puts at 11,190 *passus* (or 16,617 km), giving a fall of only 0.5% over the course of the system, which would have been the minimum slope required for any kind of reliable water supply.

Conclusion:

The impact geography had on both the spatial layout and construction of key infrastructure within the early city cannot be understated. The defence of the city relied heavily on the topography of the area, with the hills functioning as natural strongholds. These hills were reinforced with the construction of early walls around the individual communities, with any permanent defensive structure encompassing the entire city dating to the 6th century. The construction of bridges over the Tiber River opened up areas outside the old boundary marked by the city walls, as well as facilitating the movement of people and goods within the city. These bridges also had a defensive capability, and as they formed an approach to the city, they could also be taken away in order to limit movement for enemy troops. The defence of the city was also enhanced by the security of a water supply, and this came with the construction of aqueducts from the 4th century. The aqueduct system used gravity as its driver, and the arcades Roman aqueducts are famous for were designed to bridge gaps within the topography of the area in order to regulate the flow of water. The majority of the aqueducts around Rome consisted of tunnels with clay or lead pipes, which increased the security of this supply.

²⁰⁶ Ashby, 1935, pg. 54.

CONCLUSION

Geography was an influential factor in the development of the site and city of Rome, affecting both the city itself, and the wider region. Rome was situated in a favorable position on the western coast of the Italian peninsula, with a rich hinterland consisting of volcanic soils fed by high annual rainfall, and a temperate climate. As the city was built on the intersection of two important trade routes, its people had both access to, and some control over, the natural resources of the area. These routes included Via Salaria which transported salt inland from the coast, and the main route north-south along the peninsula which linked the Etruscan tribes in the north with the Greek colonies in Campania. The Tiber River which ran along the northern edge of the city also provided a sea route to trading partners, as well as linking the city to the hinterland upstream. This interaction with close neighbours also introduced new ideas and resources which shaped the direction in which the city developed.

The initial settlements on the site of Rome date to the late bronze age around the 13th century BCE, and were located on the Palatine and Capitoline hills. The close proximity of these hills to the intersection of the aforementioned trade routes illustrates the importance the early inhabitants of the site put on the control of these. The other hills on the site were settled soon after this, and long before any permanent settlement of the valleys took place. This is due both to the favorable conditions for settlement on the hilltops, and the dangers associated with settling in the lower valleys. The natural topography of the hilltops provided safety from both physical enemies and natural dangers such as flooding and disease. Before any human modification of the hills or valleys, the difference in elevation between the two was significant enough to protect communities from the dangers from below, and this was enhanced by steep-sided cliffs which provided a de facto defensive structure. These natural strongholds were reinforced with defensive walls around the individual hilltops, and by the 6th century there is evidence of a permanent defensive structure encompassing the entire city. Flooding from the Tiber River was a common occurrence, and the undeveloped valleys within the location of Rome would have been inundated on a regular basis. This would have rendered them uninhabitable for permanent settlement, and this is emphasized by the location of an Iron Age cemetery discovered in the Forum valley, which, in Latial culture, would have been located outside any inhabited area.

Over time; whether there were population pressures, a developing sense of community, or the need for more organized unification, there was a need to settle the lower lying areas and

this led to major physical modification of the valleys in an attempt to mitigate the environmental hazards associated with these areas. This resulted in a concerted effort around the end of the 7th century to raise the ground level of the Forum Valley by up to 3m, requiring at least 10,000 m³ of fill. This would also have required the relocation of the Forum cemetery outside any inhabited areas. This filling of the valleys allowed for the paving of the Forum Romanum and with this, the ability to construct large religious and civic structures which cemented the Forum Valley as the centre of the city.

Despite the raising of the valley floors, these low lying areas of the city were still susceptible to the periodic flooding of the Tiber which affected the city throughout its history. Buildings located in these valleys were at risk of collapse during flood events, and those which survived would have been subjected to long term effects such as rot and mould, which could destabilize these structures. The flooding could render neighbourhoods uninhabitable for periods of time and disease would have spread quickly in these damp, confined valleys. Around the same time as the valleys were raised, drainage canals were also constructed within the valleys, with the Cloaca Maxima the most significant of these. This was constructed sometime between the late 7th and 6th centuries to help facilitate the movement of excess water from the city to the Tiber. However due to its relatively low elevation in comparison to the Tiber, the Cloaca most likely would have allowed water from the river to flow further into the city during flood events than otherwise would have been possible by creating a backwater effect. When the Tiber was in flood the high water level would also have prevented water originating locally around the city from escaping, and this would have caused more surface ponding of water, resulting in greater damage to the city.

As the city and Roman territory expanded, the need for access to other cities and resources increased, placing pressure on existing infrastructure and resources. The construction of aqueducts which brought a fresh, secure water supply from outside the city relieved some of the pressure on the existing springs which originated in the hills. Roads and bridges traversed geographical features such as rivers and steep hills and facilitated the movement of people and goods within the city as well as to neighbouring cities. The physical building blocks of the city such as stone and timber were initially sourced in the immediate vicinity of the city, however as Roman controlled territory expanded, access to new resources opened up. Control of stone quarries around Veii provided a better quality tuff which was used in the construction of the Servian wall, and greater control of the trade routes provided food security, enabling the continued growth of the city.

The influence of geography cannot be overlooked in any discussion of the development of early Rome, as this was the main factor in the establishment of the early city. The availability of natural resources and key geographical features such as the Tiber River, fertile hinterland, and fresh spring-fed water supply influenced where Rome was situated. Within the location of Rome the river, hills, and valleys all dictated the spatial settlement patterns which affected the layout of the city throughout its history. These geographical features, and the Romans' interactions with them, affected all aspects of their daily life, from providing the physical building blocks of the city, to the constant risk from natural hazards such as flooding, and also led to the need constantly to modify their environment over time, to meet the needs of a growing city.

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