

Roman Forts in their Landscapes

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Abstract

This thesis examines the siting of Roman auxiliary forts and legionary fortresses within the topography of Wales and along the English-Welsh border. The study focusses on forts that were in use from the start of the Roman invasion of the study area up to the end of the Flavian period (96 AD). The siting of these forts has been referred to frequently in modern literature, especially in relation to the themes of control, supply, communication and defence. However, the siting data used is often imprecise and researchers rarely state their methods of collecting the data.

This research aimed to address this problem. A methodology was developed and applied to the forts in the study area. Both fieldwork and a Geographic Information System (GIS) were used to collect data using a systematic approach, so that each fort was considered equally. Siting data was collected, including the forts' proximity to certain topographical features, their relative altitude to the surrounding landscape, their orientation, and views from the fort gates. Distance bands were used so that descriptions such as 'near' and 'far' could be defined.

The results were used to contribute to and refine interpretations regarding the conquest and occupation of Wales. It was argued that views from the forts focused on sections of large valleys and that these areas were monitored from the forts as a method of control by reminding travellers of the presence and dominance of the Roman army. The results were also used to contribute to the arguments that forts were sited to provide access to local supplies, transport routes for imports as well as communication, and with a consideration for defence where possible. Variations within the results revealed that the evidence is not as clear-cut as that usually described in the literature, which tends not to account for variety in fort siting.

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1. Introduction

This study examines the siting of Roman auxiliary forts and legionary fortresses within the topography of Wales and along the English-Welsh border, which forms the extent of the study area. The study focusses on forts that were in use from the start of the Roman invasion of the study area up to the end of the Flavian period (96 AD).¹ The siting of these forts has been referred to frequently in modern literature, especially in relation to Roman defence and control of the area, Roman military supplies and travel and communication. However, the siting data used is often imprecise and researchers rarely state their methods of collecting the data. This research aims to address this problem.

1.1 Site types

A variety of Roman military site types, known or thought to be of pre-Flavian or Flavian date, are known in the study area including legionary fortresses, auxiliary forts, fortlets, temporary camps and practice camps.² A full list of definitions relevant for this study, including site types, is provided in Appendix XI.

The study focuses on 6 legionary fortresses and 42 auxiliary forts (Appendix I and Appendix XIII, Figure 1). These were permanently occupied military bases. The fortresses were bases for troops of the Roman legions, who were Roman citizens

¹ The word 'forts' in this thesis refers to both legionary fortresses and auxiliary forts unless stated otherwise.

² Legionary fortress: A large, fortified permanent Roman military base, made of timber and stone, surrounded by a rampart and ditches. Fortresses are usually rectangular in shape with rounded corners. At least one gateway is present within each wall, often two on the longer sides of the fortress. Evidence for permanent buildings, such as barracks, can be found within fortresses. (Johnson 1983, 31-33; www4)

Auxiliary fort: A permanent Roman fort enclosed by a number of ditches and ramparts, used to house a garrison of auxiliaries. Forts are usually rectangular in shape with rounded corners. At least one gateway is present within each wall. Evidence for permanent buildings, such as barracks, can be found within forts. Their size varies depending on the garrison for which they were built. (Johnson 1983, 31-33; www4)

Fortlet: A fortified Roman site, usually under 1 hectare in area, often defended by a rampart, one or two ditches and a gate. Fortlet garrisons will probably have been a detachment from a nearby fort. (Burnham and Davies 2010, 71; www4)

Temporary camp/practice camp: A temporary camp, enclosed by a single shallow ditch and rampart, frequently with *clavicula* or *titulum* defences to protect entrances. Due to their temporary nature, evidence for permanent structures are not usually found within camps. Types of camp found in the study area include marching camps, which were to house troops temporarily while on campaign or travelling, and practice camps, which are thought to have been constructed as part of training exercises. (Davies, J.L. and Jones, R.H. 2006, 6-7; www4).

(Breeze 2016, 30). Auxiliary forts were bases for *auxilia*, which comprised non-Roman citizens, often from recently conquered areas of the Empire (Breeze 2016, 31). Both forts and fortresses were usually rectangular in shape with timber or stone walls surrounded by at least one ditch and rampart (Johnson 1983, 31). Gates were present in each wall, or occasionally in just two opposing walls. Forts and fortresses usually had towers, often at both the gates and at the corners (Johnson 1983, 31), although the form of these features at the forts within the study area are not known. Roads ran into the forts from the gates and another usually followed the interior line of the fort walls (Johnson 1983, 31). Legionary fortresses in the study area were much larger than auxiliary forts; Caerleon fortress for example was 20.5 hectares (Evans 2010, 162) whereas Llanfor auxiliary fort was 3.86 hectares (Hopewell 2010, 256) and Cae Gaer auxiliary fort was only 1.05 hectares (Davies 2010, 209). The precise internal arrangements varied depending on the garrison, but all permanent forts had a *principia*, which was the administrative headquarters, in the centre, and a *praetorium*, the commander's residence, adjacent to the *principia* (Johnson 1983, 32). The remainder of the space housed barracks, granaries and workshops and sometimes hospitals. Bath houses could be present but, in the case of auxiliary forts, were usually placed in the extra-mural areas (Johnson 1983, 31-32). Other military-related features found outside the fort walls vary from fort to fort and include *mansiones*, amphitheatres, parade grounds and workshops.³ Evidence for *vici* have also been found at many of the forts within the study area.⁴

Temporary camps, practise camps and fortlets are not included in this study. Temporary camps were constructed by the Roman army while on the march or on campaign. They were bases for the army overnight or if staying in the area for just a few days (Gilliver 1999, 63). The strength of their defences varied but they usually had a rampart and ditch and further earthworks covering the gates (Gilliver 1999, 74-75). Due to their temporary nature, their purpose differed from that of forts and the circumstances surrounding their establishment was also likely to have differed,

³ *Mansio*: A type of Roman lodging house, frequently sited near the town [or fort] gate. Their specific functions have been debated, and overnight accommodation for travellers by the imperial post or private inns for example have been proposed (Breeze and Dobson 2000, 203).

Amphitheatre: An oval or circular structure with seats rising in tiers around a central open space. Used for religious ceremonies, entertainment, training and armed combat contests.

Parade ground: A place where military personnel parade, practice marching, assemble or muster for a march or any other special purpose.

Workshop: A building or room used for small scale manufacture (www4).

⁴ *Vicus*: A district, suburb or quarter of a town or village adjacent to a fort, with the lowest legal status accorded to a built-up area (www4).

and therefore their choice of siting may have had alternative aims. Furthermore, although most are assumed to relate to the campaigns in the area, few of the camps have been dated as precisely as the forts considered in this study. A comparison of siting between forts and camps would be interesting but beyond the scope of this study; including camps would greatly increase the number of sites to examine, requiring more time. It was therefore decided to limit the study to forts to enable primary data collection and subsequent analyses to be of an appropriate quantity and standard to meet the aims and objectives. Practice camps were constructed as part of Roman military training exercises and are often smaller in size than temporary camps. They have been found near some of the forts in the study area (Davies and Jones 2006, 68-70), such as Tomen y Mur (for example GAT HER PRN 18200). Since these were not designed to be used, their siting may not have been considered beyond their convenient access from a local fort or various terrains on which to practice, and therefore they were not included in this study. A further difficulty regarding camps is that the distinction between temporary camps and practice camps is not always clear.

Fortlets were much smaller than forts and were occupied by small military patrols, detachments from nearby forts (Breeze 2002, 42-43). They usually comprised a wall surrounded by a rampart and ditch, with a gap for an entrance (Breeze 2002, 43.) Space inside was for basic amenities such as barracks. They therefore operated alongside forts but their purposes were not necessarily the same. It would be interesting to compare the siting of forts and fortlets but, similar to the temporary camps, it was beyond the scope of this project to consider more site types.

1.2 The study area

Britain is a large island, with a collection of much smaller islands, to the north-west of the mainland of Europe. Present-day France is located beyond the English Channel to the south and the island of Ireland is situated to the west. Britain comprises a variety of topography types, ranging from plains and gently rolling hills to areas of mountainous upland. The upland regions can be found to the north of the island (present-day Scotland and the north of England) and to the west (present-day Wales).

The study area encompasses the present-day extent of Wales and extending slightly into England, along a line running roughly south from Chester. The legionary

fortresses of Chester, Wroxeter, Kingsholm and Gloucester are included because their sphere of influence was likely to have extended into Wales and therefore their location has relevance to the study. Wales comprises a large peninsula extending into the Irish Sea. It includes Anglesey, an island off the north coast of the peninsula, separated from the mainland by a narrow strip of sea known as the Menai Straits. The topography of Wales is dominated by hills, mountains, valleys, rivers and estuaries (Appendix XIII, Figure 2). Twenty-five percent of Wales is above 305m in elevation (www1: Robins and Davies 2016), which contrasts with the generally lower-lying terrain of the remainder of southern Britain. The highest mountain in the area is Snowdon/Yr Wyddfa in the north-west, which reaches 1085m in height. There are, however, also lowland areas and coastal plains in Wales. The coastline itself is a prominent feature of the landscape, reaching approximately 1180km in length (www1: Robins and Davies 2016), surrounding Wales to its south, west and north.

This study area was chosen because it is a topographically coherent section of Britain. The area is naturally defined by its extension out into the sea. The bulk of the area is hilly or mountainous which contrasts with its adjacent area to the east, now known as southern England. While there are hilly areas in parts of southern England, there is not the large mass of hills and mountains that defines the character of the study area. The area is therefore distinct from that to the east and the study focuses on how the Roman army reacted to that particular landscape.

Aspects of the topography examined include the forts' altitude in relation to the surrounding topography, their orientation, and their proximity to watercourses, confluences, the sea, valley meeting points and known Roman roads. Views from the forts are examined to identify topography types visible from the forts.

1.3 Period examined: Pre-Flavian and Flavian

The Roman army invaded Britain in AD 43 and progressed through southern Britain, including parts of Wales, and was preparing to advance on Anglesey in north Wales when the Boudiccan rebellion (AD 60-61) forced a withdrawal from the area. In AD 74, the Roman army returned to Wales and completed its conquest of the area by AD 78. They then turned their attention to northern Britain but maintained a strong military presence within the newly conquered area of Wales. A more detailed description of these events is provided in Chapter 2. The pre-Flavian (up to AD 68)

and Flavian (AD 69-96) periods in the study area were therefore eras of conquest and consolidation. Tacitus (*Agricola* 14-18; *Annals* 12 and 14) described strong resistance to the Roman advance from local populations in the study area and, once conquered, the forts scattered throughout the area provided bases from which to control populations who may still have been hostile. The reduction in garrisons in the second and third centuries suggests a sense of an acceptance of Roman rule in the area in the post-Flavian eras (Burnham and Davies 2010, 48-49, 54). This study therefore focuses on the conquest and the immediate aftermath, when the conquest was still fresh in the minds of local populations and before the emergence of subsequent generations, who were perhaps more accustomed to the new situation and less liable to resist. The study of the siting of the forts will be used to consider themes related to the conquest and containment of the area, including supply of the troops stationed there, of defence and of control of the local populations.

1.4 Methodological approach

This research involves the use of both fieldwork and a Geographical Information System (GIS). As explained in detail in Chapter 3, data was collected on-site at as many forts as possible and also through GIS. The use of GIS to collect data concerning site location within the topography and views from the sites is relatively common for prehistoric sites, but less so for Roman sites, especially in Britain. Cummings and Whittle (2004), for example, used GIS to study the placement of, and views from, Neolithic sites in Wales. An example of the use of viewsheds for Roman sites in Britain is that by Eckardt (2009) who studied visibility from Roman barrows in Bartlow, Cambridgeshire. Further examples of the use of GIS for studying Roman sites in Britain have been published since the methodology for this study was planned and undertaken, such as that by Murphy, Gittings and Crow (2018). Their focus was on military sites, using GIS, including viewsheds, to assess whether the hill of Rubers Law in Southern Scotland formed part of signalling infrastructure, focusing mostly on the visibility of towers and Roman roads as opposed to types of terrain. At the end of this project, therefore, some time was spent reflecting on the methodology, in particular the combined use of fieldwork and GIS (Section 5.10).

1.5 Thesis aims

This thesis aims to analyse the siting of Roman forts and fortresses in the study area up to the end of the Flavian era. It uses a combination of fieldwork and GIS to assess whether there are patterns in the topographical locations of the forts and views from the forts. The results will be used to address the themes of supplies, transport and communication and control, discussing whether the results support, undermine, enhance or add further dimensions to arguments surrounding these themes. Consideration will also be given to how changes in the landscape may have affected local populations and whether this was part of the Roman strategy in the area.

A systematic approach is applied to each fort so that they are considered equally. It will examine the topography types in which the forts were situated, including the forts' altitude in relation to the surrounding topography, their orientation, proximity to watercourses, confluences, the sea, valley meeting points and known Roman roads. Views from the forts will also be examined to identify what topography types are visible from the forts. Distance parameters will be defined clearly. The results from each fort will be compared to identify patterns or results that appear consistently amongst the forts. Consideration will be given to potential differences between auxiliary forts and legionary fortresses and between Flavian and the potentially pre-Flavian forts.

1.6 Thesis structure

Chapter 2 provides an outline of the historical and archaeological context of the area and period covered by the study, summarizing sources and the main events of the pre-Flavian and Flavian eras. The chapter then explores relevant ancient and modern literature chronologically before a discussion about the implications of this literature in terms of the study of Roman fort siting. The chapter reveals the imprecise data relating to fort siting and the lack of robust data collection frequently used to discuss fort siting. Key themes in the literature are also highlighted.

Chapter 3 explains the approach to data collection methods and lists the equipment, software, data and processes used to identify and record the data. It then describes each step of the methodology, followed by explanations of certain aspects of the

methodology in more detail. Finally, the chapter provides a summary of the development of GIS and its uses in archaeology and considerations regarding its limitations. The methodology was designed to apply a systematic approach to each fort, collecting data that could be used reliably to consider themes relating to fort siting. This chapter explains the processes involved so that the methods used to obtain the results are clear.

Chapter 4 displays the results of the data collection, which includes data concerning fort elevation and relative altitude to the surrounding topography; topography types in which the forts are sited; topography within the forts; visibility within the forts; topography types within the near, middle and far distances of each fort; visibility of these topography types; proximity to watercourses and their visibility; proximity to known Roman roads and their visibility; fort orientation in relation to the topography. The chapter also reveals which results occurred frequently and less frequently amongst the forts, which may indicate which factors were prioritised when siting forts.

Chapter 2 highlighted the themes of supply, transport, defence and monitoring about which fort siting is frequently discussed in literature. Chapter 5 relates the results to these themes and suggests ways that the results enhance and contribute to our understanding of the Roman invasion and occupation of the study area. Consideration is also given to apparent fort relocations as well as the difference between auxiliary forts and legionary fortresses. A section of the chapter is dedicated to reflecting on the methodology.

Chapter 6 highlights the findings of the study and the arguments made, reflecting on the aims of the study. It also suggests ways in which the methodology can be expanded in the future.

The Appendices present the raw data from the data collection, a list of definitions and figures.

2. Scholarly Context of Study

2.1 Introduction

This chapter provides an outline of the historical and archaeological context of the area and period covered by the study (Section 2.2). It then explores ancient literary sources as evidence (Section 2.3) and previous approaches to the study of the siting of Roman forts in the study area and beyond (Section 2.4). Trends in approaches to Romano-British landscapes in general are also discussed (Section 2.5) and key themes in the literature are highlighted (Section 2.6).

2.2 The historical and archaeological context

Sources for the Roman invasion of Britain and its progress into Wales include ancient literature, archaeology, epigraphy and numismatics. The main literary sources covering events of the Roman conquest of Wales are by Tacitus; the *Annals* and the *Agricola*. Although there are a few reliability issues with Tacitus (Hanson 1987, 16-19, 21; Breeze 2006, 13, 17; Woolliscroft and Hoffman 2006, 198-202), he did provide an outline of the main events of the pre-Flavian and Flavian conquests of Wales. The physical evidence reflects these events. Camps, forts, fortlets and Roman roads have been identified across the Welsh landscape, providing the archaeological evidence for the Roman invasion of the area.⁵ Some sites have received more investigation than others; Caerleon fortress and its surroundings, for example, have been excavated extensively (for example Nash Williams 1940; Wheeler 1952; Boon 1978; Gardner and Guest 2008) whereas some forts have had little or no excavation. Aerial survey and geophysics, however, have helped to provide further data. The Cadw-funded Roman Fort Environs project undertaken mostly by the four Welsh Archaeological Trusts, for example, involved carrying out geophysical surveys of extra-mural areas of some forts, and sometimes within the forts themselves, and provided data about fort layouts, extents and the use of the extra-mural areas (for example Hopewell et al. 2005). Epigraphy, coins and other small finds add further detail to what we know of the events.

⁵ Appendix XI presents definitions of site types.

Prior to the arrival of the Roman army, Britain was not one political unit. Researchers discussing the late Iron Age in Britain, including Wales, have often referred to the presence of tribes (Burnham and Davies 2010, 20 for example). This term, however, has been questioned and the existence of more complex, fluid identities and social structures in Britain has been proposed (Moore 2011). Understanding the relevance of the names of groups of local populations identified in ancient sources, such as the Silures, and linking them to specific geographical areas is therefore potentially problematic (Moore 2011, 339). Although this thesis refers to the names of local populations in certain areas of Britain, it is acknowledged that the relevance of these names to local populations at the time is debated and currently uncertain.

In 55 BC Julius Caesar was the first Roman to campaign in Britain, returning in 54 BC. According to his account his main opponent was the Catuvellauni, in the south-east of Britain, against whom the Trinovantes had sought his help (Wacher 1998, 11). Caesar defeated the Catuvellauni and, as part of their terms of submission, forbade them from harassing the Trinovantes (Wacher 1998, 13). Events elsewhere in the empire brought Caesar away from Britain and the Roman army withdrew from the island.

It was not until the reign of the Emperor Claudius (41-54 AD) that the Roman army returned to Britain. Motives for the invasion have been debated and include the desire to complete the unfinished business begun by Caesar, give Claudius the opportunity to demonstrate military prowess, which Suetonius (*Claudius*, 17) named as the main reason for the campaign, limit the influence of the Druids in Britain, gain access to the mineral wealth of the island and protect the northern borders of the empire (Wacher 1998, 16; Breeze 2006, 31). An apparent triggering factor, however, was an appeal to Rome for help from Verica, king of the Atrebates, against the Catuvellauni.

The Roman army invaded in 43 AD with four legions and supporting auxiliary troops. Claudius joined the army before the Catuvellaunian capital at Colchester was taken then left the governor, Aulus Plautius, to continue (Wacher 1998, 17-19; Breeze 2006, 32). Rome met resistance in southern Britain but some populations surrendered and others claimed their allegiance to Rome.

The Roman army progressed onwards from southern Britain and in AD 47-48. According to Tacitus (*Annals* 12, 33-37), they campaigned under Ostorius Scapula against the Deceangli (Tacitus *Annals* 12, 33 refers to them as the Decangi) in north-east Wales and 'nearly reached the sea facing Ireland' (Tacitus *Annals* 12, 33) but retreated as a result of an uprising of the Brigantes in northern England (Tacitus *Annals* 12, 33). Campaigns against the Silures in south-eastern Wales took place in AD 49-50 and a legion was transferred from south-east England to aid the operations (Tacitus *Annals* 12, 33; Burnham and Davies 2010, 37). Caratacus, a leader of the Catuvellauni, had escaped to Wales and his presence, according to Tacitus (*Annals* 12, 33), rallied the 'natural ferocity' of the native populations. The Roman army followed him to the area of the Ordovices in mid-Wales where the native forces were defeated in battle and, after taking sanctuary with the Brigantes, Caratacus was arrested (Tacitus *Annals* 12, 33-37).

Heavy fighting followed and Tacitus wrote that predominantly guerrilla tactics were used by the local people, and he gave an example of an instance when Roman troops came into difficulties; 'In Silurian country, Roman troops left to build forts under divisional chief of staff were surrounded, and only saved from annihilation because neighbouring fortresses learnt of their siege and speedily sent help' (Tacitus *Annals* 12, 37). Scapula died in office and was replaced by Didius Gallus (Tacitus *Annals* 12, 37), who governed between AD 52 and 57. Tacitus implied that there was a period of consolidation under Gallus (Burnham and Davies 2010, 41), stating that Gallus 'merely held what his predecessors had won, establishing a few forts in more advanced positions so that he could claim the credit of having made some annexations' (Tacitus *Agricola* 14). Burnham and Davies highlight this as a potential era for the construction of the fortresses at Wroxeter and Usk, as well as some forts and roads in southern and central Wales (Burnham and Davies 2010, 41).

Quintus Veranius succeeded Gallus (AD 57-58) and carried out minor raids against the Silures but died before fulfilling his objectives (Tacitus, *Annals* 14, 27). He was succeeded by Suetonius Paulinus who had two years of successful campaigning before turning to the island of Anglesey (Tacitus *Agricola*, 14). Tacitus described his attack and garrisoning of the island but that Paulinus had to withdraw to rush to suppress the Boudiccan rebellion in south-east England (Tacitus *Annals* 14, 27-30). Further advance in Wales was halted and a policy of containment and diplomacy

may have taken place until advance was again taken up under the Flavian emperors (Arnold and Davies 2000, 5).

Civil war in the Roman Empire after Nero's death in 68 AD led to a succession of emperors, with Vespasian, the first of the Flavian emperors, finally taking control. Further campaigns were carried out against the Brigantes under the governor Petilius Cerealis then Julius Frontinus turned his attention to Wales and subdued the Silures in the south (Tacitus *Agricola* 17). Burnham and Davies suggested that forts in the south and south-west of Wales may have belonged to this era and that Frontinus also worked against the Demetae in the south-west (Burnham and Davies 2010, 42-43), but they outlined that it is difficult to assign forts to specific Flavian generals because the dating evidence would need to be so precise (2010, 43).

Tacitus wrote that Agricola arrived as governor of Britain late in the campaigning season⁶ but he nevertheless began a campaign against the Ordovices in reaction to their assault on Roman cavalry (*Agricola*, 18). Tacitus then explained that Agricola decided to take control of Anglesey, describing that he chose auxiliaries with experience of shallow waters to cross the Menai Straits, thereby taking the islanders by surprise and causing them to surrender (*Agricola* 18), completing the conquest of Wales. Agricola then turned his attention to northern Britain but a strong military presence was maintained within the newly conquered area of Wales. It was not until the second and third centuries that a significant reduction in garrisons in the area began. This may suggest a sense of an acceptance of Roman rule in the area during the post-Flavian eras (Burnham and Davies 2010, 48-49, 54), but there may be other reasons for the change, such as a requirement for troops to be redeployed elsewhere.

2.3 Ancient literature relevant to fort siting

Some ancient sources, notably Polybius, Pseudo-Hyginus, Josephus and Vegetius, made comments relevant to the siting of Roman military installations, although their focus was on temporary camps and not permanent forts. Some researchers have considered their advice and descriptions in relation to the siting of forts. Jones (1975, 45-46), for example, drew some parallels between the siting of forts and the advice on camps by Vegetius and Pseudo-Hyginus. Johnson (1983, 3) noted that

⁶ It is uncertain whether Agricola arrived in Britain in 77 AD or 78 AD (Frere and Pitts 1985, 264).

the general principles laid out by Pseudo-Hyginus could apply to a small auxiliary fort.

Polybius, who wrote in the 2nd century BC, was a Greek whose writings describe Rome's conquest of the Mediterranean zone. His account includes digressions describing the Roman army, often expressing admiration for their efficiency, including a description of Roman camps with some notes about their siting (XI, 26-41). He, for example, explained that ideally camps should have wide views (VI, 26), access to water (VI, 27) and plenty of space for troops to exit the camp easily (VI, 31). Polybius was an army officer who was held hostage by Rome, but later accompanied the Roman general Scipio Aemilianus on campaign (Breeze 2016, 19) and therefore had an understanding of Roman military life in his era. His descriptions of camps, however, may have been taken from textbooks, possibly written earlier than the years which Polybius describes (Gilliver 1999, 16, 66). His information about camps therefore represents a period significantly earlier than that covered by this study. The context of his writings is also that of the Mediterranean, providing a landscape and opposition which differed from those in Wales.

Josephus wrote a history of the Jewish uprising, covering the late 60s to early 70s AD. He told his part in the events, where he began as general in the Jewish army (II, 566) but switched his allegiance to Rome (from III, 383). Josephus therefore had experienced the events he described, including spending time in a Roman camp under Vespasian's command (III, 383). He was prone to exaggeration (Gilliver 1999, 153) and had his own agendas, notably defending himself against allegations made by Justus (Smallwood 1981, 9). Like Polybius, Josephus described elements of the Roman army, usually favourably, as digressions in his text. Amongst these was a section on the planning and layout of Roman camps (III, 86). He did not consider camp siting in detail but did note that uneven ground could be levelled if required (III, 86). Josephus therefore wrote about and at a similar time to that of this study and had first-hand experience of a camp. Furthermore, he spent time with Vespasian, who had also served in Britain. Nevertheless, Josephus had not experienced Roman warfare in Britain and the requirements of camps in Wales may have differed from those of his experience.

Pseudo-Hyginus, the name of the author being uncertain, wrote a surveying manual about legionary marching camps, outlining advice on siting and formulae for laying out a hypothetical camp (Johnson 1983, 3; Gilliver 1999, 10). His references to

siting include that camps should be surveyed from a central point (12) and on raised areas, with the porta decumana at the highest point, close to a river or spring were preferable (56). He also noted what should be avoided, including being overlooked, too near woodland in which an enemy could hide or within an area liable flood (57). He was probably writing in the late 1st or early 2nd century (Gilliver 1999, 175), which is slightly later than the period covered by this study, and therefore some priorities and procedures may have differed. There have also been numerous corruptions in the text since it was written, which may lead to some inaccuracies in interpretation (Johnson 1983, 3).

Vegetius wrote a treatise covering army training and campaigning (Johnson 1983, 3; Gilliver 1999, 10), with some details about the layout and siting of camps. In regard to siting, he mentions, for example, that camps should be sited near supplies, not overlooked, away from flooding (I, 22; III, 2; III, 8) and should face east, towards the enemy or towards the line of advance (I, 23). Vegetius was writing in the 4th century and therefore much later than the period of this study. He was, however, summarising previous books on the topic and therefore it is not clear to which period or periods in Roman history his advice was most relevant (Johnson 198, 3; Gilliver 1999, 10). Furthermore, he would only have mentioned what he considered was relevant to his time and aspects of military practice which were considered in need of reform, perhaps omitting vital details which would have applied to earlier periods (Milner 1993, xvi, xviii, xix).

These sources do, therefore, have some reliability problems. Date and geographical context in particular differ from that of this study; none of these sources is writing about the use of camps in this study location, and most are from a different era. Although camps were designed to be flexible to suit a variety of situations and locations, context is likely to have had an influence on the siting of both camps and forts. Furthermore, the military manuals presented theoretical ideals which were not necessarily used in practice (Goldsworthy 1996, 10; Gilliver 1999, 69). These sources concerning camps therefore provide useful indications for reasons behind fort siting in Wales but cannot be relied upon as the main source of data.

2.4 The siting of Roman forts: current understanding and narratives

A consideration of Roman fort siting has contributed to research themes and discussions in the study area, including the themes of policing and control, supplies,

and transport. The relationship with the local populations in the landscape is rarely taken into consideration in a landscape context beyond the discussion of whether they were friendly or hostile to Rome. In spite of its contribution to these themes, fort siting is not usually considered as a main source of evidence in its own right. Furthermore, where it is discussed, the evidence is frequently unbalanced or imprecise. In many cases, the siting of a fort is described but merely to set the scene prior to a discussion about the fort interior, and its setting is not then compared to those of other forts or connected to any research themes.

2.4.1 Policing and control

The study of the siting of forts has made some contributions to theme of policing and control by the Roman army in the study area. The 1969 edition of Nash-Williams's book 'The Roman Frontier in Wales', edited under the direction of Michael Jarrett, outlined what was known about Roman Wales at the time, including discussions about the events of the invasion, known garrisons, known site types and the siting and internal arrangements of the forts. The location of forts was considered when discussing a number of themes but mainly focused on their distribution. The distribution of forts in Wales was used to discuss the functions of the sites, with the argument that a network of forts was used to control the unfriendly populations (1969, 147), placing an emphasis on the use of roads to patrol (1969, 8, 145). It implied that the distribution of forts allowed soldiers to be close to lots of areas of Wales and therefore able to monitor and react to upheaval if required. Exactly how this would work, however, was not detailed; for example, what methods were used to monitor the substantial areas between forts that were not accessible by the Roman roads? It was noted that the forts were distributed no more than a day's march apart so that they could come to each other's aid if necessary (1969, 147).

As part of an article concerning Roman military deployment in Wales and the Marches up to the Antonine period, Davies (1980) considered the siting of forts as part of some discussions but only focusing on the forts' distribution. Similar to Nash-Williams (1969), he used distribution to state that the installations were used to control the newly conquered area in the Flavian period (1980, 261); 'large and small garrison posts, and intervening fortlets, were ingeniously utilised to control a very large and often mountainous tract'. Davies did not, however, expand on precisely how he thought this distribution of installations would bring about control.

In their book *Roman and Early Medieval Wales* Arnold and Davies (2000) referred to fort location in a number of contexts when discussing the Roman invasion and occupation of Wales. They used the distribution of forts to comment on methods of policing the area, stating that,

‘Once organised resistance was over (and the upland distribution of camps and some forts suggests that guerrilla bands had to be countered) no fewer than three legionary bases and a network of garrison posts, incorporating fortlets and watchtowers, eventually linked by an all-weather road system, were ingeniously utilised to police a large and often mountainous tract’ (2000, 15).

They were therefore focusing on distribution and ease of communication between sites as a method of policing, perhaps implying, like the researchers mentioned above, that the wide distribution of sites would allow proximity to many areas to facilitate monitoring and the road network would aid communication in times of trouble. They did not, however, detail precisely how the policing would work, or how areas away from known forts and Roman roads would be policed. Arnold and Davies looked at some elements of fort siting in relation to fort function in slightly more detail, noting that some installations are situated near river crossings, concluding that they were located to control these crossings (2000, 16). They also noted that some forts were located in situations that would enable advances in a number of directions (2000, 5, 9). However, they did not define ‘near’ or state the number of forts to which these situations applied. They noted that a group of forts near Hay-on-Wye were well placed to block enemy approach from the west (2000, 8-9) but they did not elaborate on how the forts were sited in the topography to enable this.

In a book about the 1955-1985 excavations at the legionary fortress of Wroxeter, Webster (2002, 1) described the siting of the fortress briefly in the introductory chapter. He explained that the fortress was near the River Severn, not stating how close the river was to the fortress, although he did provide a map showing their relationship (2002, 3). He emphasised the importance of this relationship from the point of view of travel along the river, stating that it could have been useful as an approach into Wales (2002, 1). He also noted that Wroxeter was on the line of the Roman road of Watling Street. He described that the fortress was located on a flat

plateau within the Severn Valley, arguing that this section of the valley was useful for 'monitoring possible incursions from the Welsh valleys and to control the ancient north-south route linking the Dee and Severn estuaries' (2002, 1). He did not elaborate on how the monitoring or control was put into practice or consider how the precise siting of the fortress within this section of the valley may have aided this. He did, however, put the location of the fortress into context by discussing the distribution of some auxiliary forts in Wales, suggesting that forts to the west of Wroxeter were sited, during the advance into Wales, to impede enemy movement (2002, 10) and to block valleys to contain the enemy by preventing them from moving from Wales to the Severn Valley area (2002, 9, 10). He explained that the forts were placed within the valleys but otherwise the argument was based very much on their distribution, and he did not discuss how their siting within the valleys may have helped. He also did not explain how the Roman army would have prevented the enemy, who would have known the landscape well, from taking alternative routes, avoiding the main valleys. Webster did not consider the fort siting within the topography in relation to defence, although a lack of consideration for this may mean that he was not considering the theme of defence, or it may imply that he did not think the fort was sited to take advantage of this. The remainder of the book focused on the fortress excavation results.

Roman Frontiers in Wales and the Marches, edited by Burnham and Davies (2010) updated Jarrett's 1969 edition of 'The Roman Frontier in Wales', which itself was an update of the work by Nash-Williams (1954). The first section of the 2010 edition discusses various themes based on recent fieldwork and research. Fort location is considered in a number of these themes and discussed as a topic in its own right in two short sub-chapters on Distribution and Siting (2010, 67-68). The second section comprises a gazetteer of known Roman installations in Wales and the Marches, including brief descriptions. Some of these descriptions take note of the location of the sites, sometimes with a brief discussion.

In their Siting sub-chapter, Burnham and Davies (2010, 68) stated that the siting of fortresses and forts was governed by strategy. They noted that most are sited in fertile landscapes, coastal tracts and river valleys which, they argued, are areas where archaeological evidence indicates substantial late Iron Age populations, implying that the proximity of these populations would help the army's cause. They used Hindwell Farm fort as an example but noted that it was 'also well placed to project military power from the margins of lowland Herefordshire into the broken

landscapes of eastern Radnorshire' (2010, 68). However, they did not expand on precisely how they thought the army projected their power.

They highlighted some other location-types typical of fort siting in Wales, such as a river terrace in close proximity to the river, on a bluff overlooking a confluence, a spur between a river and a re-entrant and above a flood-level with good all-round views. They also noted some Flavian late campaign era forts were located on low, commanding hills in river valleys. They were not, however, precise with their descriptions; they noted the close proximity of forts to certain features but did not define close and they did not define what they considered to be good views. They also did not state to how many forts each of these siting-types applied nor outlined their methodologies for collecting the data. They hinted at some of the potential reasons behind these locations, such as hills or terraces to avoid flooding. They also described the low hills of the Flavian forts as strong, defensive locations, suggesting that defence was a primary consideration for these forts. However, they did not put the low hills into context with the surrounding landscape or put the potential requirement for defence into context with the Flavian conquest of the area.

Fort location was also taken into account in some other discussions throughout the first section of the book. Burnham and Davies used fort location in relation to the routeways alongside fort distribution when discussing themes around the Roman advance into Wales for example. It was stated that the distribution of pre-Flavian installations indicates the locations of springboards for military operations and invasion routes (2010, 38). When discussing the preparations for the pre-Flavian advance they stated that, '...What emerged was a more or less linear arrangement of installations looking west and controlling the main access routes into the province...' (2010, 41) and they observed that campaign bases were usually situated at the interface between lowland and upland to enable the forces to advance down one or more valleys (2010, 39). They therefore noted the location of some forts along routeways, such as valleys, and where valleys meet to allow easy access to more than one routeway, although they did not identify the number of forts in Wales to which this applied.

Burnham and Davies focused on distribution again when they described that, once the campaigns were over, a network of installations and roads was used to police the area and to supervise the population (2010, 45). They noted that 'the majority' of Flavian forts were located in areas such as river valleys or coastal plains, where

most of the native population resided (2010, 45), but they did not provide numbers or their evidence for this.

Fort location was also considered in some site descriptions in the site gazetteer in Burnham and Davies (2010), although not consistently and they did not always discuss these sitings in any depth. Some noted the views from the forts, identifying that they had wide views in certain directions or described what topographical features the installations overlooked. For example, it was noted that Castell Collen overlooks the River Ithon (Davies 2010, 234) and Tomen y Mur had wide views over the Vale of Ffestiniog and to the south (Crew and Webster 2010, 282). The extent to which Roman installations have poor views or are overlooked is also sometimes highlighted; Silvester (2010, 276), for example, described Pen y Gaer as being overlooked from the north and south. However, writers did not always discuss how these views may have affected the function of the installations, perhaps assuming that wide views helped the forts' roles in regard to control by enabling observation over wide areas.

Hodgson (Hopewell and Hodgson 2012) focused on distribution when discussing the wider implications of new evidence from Llanfor fort. He described Llanfor as one of the new types of 3-6ha forts that appeared in the early Flavian period, alongside smaller forts, often 2ha or less, that replaced the larger pre-Flavian 'vexillation' fortresses found frequently in southern Britain (2012, 42 cited from Davies 2009). He stressed the idea, originally proposed by Millett (1990, 50-55), that these smaller forts were a response to the more dispersed, less cohesive societies, allowing more troops to be dispersed through the landscape, which meant smaller numbers of troops in each fort and therefore smaller forts (2012, 42). Hodgson therefore considered Llanfor's place within the distribution of forts in Wales, but did not examine its siting within the topography and how this compared to other forts in the landscape.

2.4.2 Supplies and transport

The study of fort location has also been used as evidence when discussing the theme of military supplies and transport. In a sub-chapter on the siting of Roman forts in Wales, Nash-Williams (1969) considered fort location in relation to supply. He stated that an important consideration regarding fort location was access to

water, firewood and sometimes fodder and pasture and that, 'The influence of these factors is probably to be seen in the placing of forts in close proximity to rivers and streams and, with only rare exceptions (e.g. Tomen-y-Mur), in fertile and well-wooded country' (1969, 146). In the same sub-chapter it was also stated that, 'The determining factor in the siting of different forts was their relationship to the frontier road-network' (1969, 146), although roads were not discussed here from the point of view of supplies. Furthermore, it was noted that the presence of quays at Chester and Caerleon emphasised the importance of water transport (1969, 146). The argument therefore referred to how 'close' the forts were to watercourses, woodland, agricultural land and roads but did not define what he meant by 'close' or explain the methods of compiling data about the forts' proximity to these features.

Jones (1975) also discussed fort siting regarding supply, as well as other factors, in a chapter on 'Siting, Size and Shape' of Roman forts, focusing in particular on those in Britain. He mentioned that the importance of a ready water supply was stressed by Pseudo-Hyginus and Vegetius and he then argued that evidence for sites in Britain reflect much of this advice, noting the position of some fort sites near rivers and tidal estuaries (1975, 45-46). He was not focusing on Wales in particular but highlighted that the fortresses at Caerleon and Chester served additionally as ports and noted that most other fortresses in Britain were also accessible to navigable waters, which 'may be related to the supply system' (1975, 48).

In his article 'Economic influences on land use in the military areas of the Highland Zone during the Roman period', Manning (1975) argued that many of the supplies (notably grain) to the Roman army in the highland zones of Britain were produced locally and that, where supplements were required, supplies were transported via water wherever possible. He was not focusing on Wales in particular, but Wales contains some of the upland areas about which he was discussing. He mentioned fort siting in relation to some elements of local topography as part of his discussion; for example, when discussing that water transport was preferred (over road transport) he wrote that, 'It is, of course, largely for this reason that the three legionary fortresses of Britain – Caerleon, Chester, and York – were in places which could be supplied from sea by water' (1975, 114). In this discussion he also noted that few auxiliary forts in Britain were well placed to receive supplies by water, especially from highland rivers, although he thought that in some areas rivers could have been used for local journeys (1975, 114). Manning also mentioned that forts in Britain usually lay in or near areas of good agricultural land (1975, 112) and often in

valleys at the junction of two rivers, the effect of which meant that forts tended to be in or near the best agricultural land in the area and that cereal production for the forts in these areas would be practical (1975, 115). He did not, however, define what he meant by 'near', and did not provide the methods for collecting this data or the statistics regarding the locations of the forts to support his argument.

In the context of discussing the supply of forts, Arnold and Davies (2000) did consider siting in slightly more detail than simply distribution. They noted that the early Flavian garrison in Wales was stationed in bases situated in estuarine or valley bottom locations 'which not only facilitated the control of most of the native population but also eased the burden of supply' (Arnold and Davies 2000, 15). They stated that 'the bulk' of the military bases were sited in these locations but did not state precisely how many. They continued by stating that this 'was also the key to the siting of the new legionary fortresses at Chester and Caerleon; Usk was replaced by the latter because it was subject to flooding and difficult to supply by sea' (2000, 15), although they did not explain why Usk was more difficult to supply by sea or the evidence for this. They also commented that an adequate water supply was a prerequisite for long-term occupation, although they discussed examples of leats and water storage methods used by the army at some forts in Wales as opposed to discussing the proximity of forts to water sources directly (2000, 19). In addition, Arnold and Davies discussed military installations in Wales that may have had specific functions, and drew attention to those that appear to have been to supply the army in the field. They used a small enclosure at Llansantffraid-ym-Mechain as an example, stating it was used for army supplies. Arnold and Davies noted the strategically important location of the site, 'where the Severn is joined by the Vyrnwy and Tanat rivers' (Arnold and Davies 2000, 9) but they did not expand on this statement, explain the advantages of river confluences or explain how usual it was for installations to be sited near confluences.

In 2002, Davies analysed Manning's paper of 1975, discussed above, in light of subsequent research. During his discussions he referred on occasion to the location of forts in regard to supplies. He noted that about 25% of the garrisons in Wales 'will have been well-placed to receive regular supplies by sea' (Davies 2002, 56), although he did not explain his methods for calculating that figure. He continued Manning's discussion of the feasibility of growing grains in the upland zones of Wales, arguing that cereals could indeed be cultivated in these areas and local or regional land could have supplied the Roman army that were stationed there with

some or possibly all of their grain requirements (2002, 50, 55). He did not discuss the forts' topographical locations in relation to the agricultural land and instead his analysis was mostly focused on proximity in terms of the broad area in which both the agriculture and forts were located. He discussed briefly that forts may have used *prata* or *territoria* for supplies at least initially, expressing concern about the lack of evidence for these (2002, 58), and did not extend the discussion to cover the possibility that forts may have been sited with these in mind.

As a further example of research that focused on a particular fort, James's (2003) book on the 1978-1993 excavations of Carmarthen fort noted some points relating to siting in the Introduction. These include the fort's location on a terrace in a valley, where 3 valleys meet, by a natural routeway through the valley, near the River Tywi and possible stream, and near a possible bridging point of the Tywi (James 2003, 1-5). James therefore noted the potential for routeways to and from the fort, although she did not go into detail about these, such as explaining how or why the army could have taken advantage of these routeways. She also briefly discussed the potential for supplies via sea and river (2003, 5). This discussion on fort siting was relatively short and had the function of setting the scene of the fort prior to focusing on the excavations rather than providing a thorough analysis of the fort's position. Like many other publications about individual forts, it did not compare the siting of Carmarthen fort to those of other forts in Wales or elsewhere, which could have provided context and an idea of what the army hoped to achieve by this siting. Fort siting was also discussed in Chapter 2 (2003, 43-45) but this was to identify the potential extent and orientation of the fort more than a consideration of how the fort could have taken advantage of the topography.

In Burnham and Davies's siting sub-chapter (2010, 68) they also considered army supply an important factor in fort siting, noting that some installations were sited on navigable rivers or estuaries; they gave examples of these installations but did not state how many they considered could have been supplied by water. They highlighted that most installations are linked to the road network and argued that the function of the installations was not to guard the roads but to facilitate supplies, although they did not expand on their reasons for this.

Fort siting in Wales in relation to supply is mentioned in some other contexts in the first section of Burnham and Davies (2010). In a chapter discussing the Flavian conquest they commented on fort location in relation to supplies by arguing that

roads and bridges were built to link the newly established military installations to enable the transport of supplies (as opposed to transport of troops) since only 25% of the garrison posts could be supplied by ship (2010, 48). They re-iterated this in the Siting sub-chapter (2010, 68). However, they did not explain their evidence for the statistics for water transport to forts. They also did not explain their reasons why the road system was built mainly for supply as opposed to troop movement, especially since they had argued that the road network was used to police the area (2010, 45). Similar to the arguments by Arnold and Davies (2000), in the 'Water Supply' sub-chapter Burnham and Davies stressed the importance of fresh water at a military base but, also reflecting Arnold and Davies (2000), they described methods of water capture and movements more than commenting directly on fort siting in relation to fresh water supplies (Burnham and Davies 2010, 88-89).

In the 'Shipping' sub-chapter (Evans et al. 2010) the location of some specific sites was mentioned from the point of view of supplies; they stated that the fortress at Gloucester, for example, 'was probably chosen at least partly for its location on the navigable River Severn' (2010, 98). They discussed that some forts, such as Cardiff and Neath, could have been served by coastal crafts, and that some were on or near navigable rivers and therefore could have been supplied by river craft, such as Monmouth and Llandeilo (2010, 99-102). When discussing military installations that may have had predominantly industrial functions Burnham and Davies noted that they lie 'within easy reach of water transport' and used this to contribute to an argument that there were emerging military markets in the 1st and 2nd centuries AD (2010, 125). They were not addressing directly the question of whether forts were located to enable access to water transport, but the sub-chapter nevertheless stressed the importance of watercourses for supplies to forts in Wales.

In the gazetteer section of Burnham and Davies, some writers noted that a fort was situated near known or likely river crossings; writers discussing Caerhun, Penllwyn, Pennal, Monmouth, Loughor, Llanio and Trawscoed, amongst others, noted their locations near river crossings (Hopewell 2010, 217, 272; Davies 2010, 260, 268, 287; Clarke 2010, 264; Marvell 2010, 262). The relation of the installations to the road system was also considered in some cases and some forts, such as Caer Gai (Hopewell 2010, 212-213), Caersws (Jones 2010, 228), Llandoverly (Webster and Murphy 2010, 253) and Tomen y Mur (Crew and Webster 2010, 282) have been identified as being in strategically important or 'nodal points' in the system, when they are situated where a number of roads meet, but did not expand on precisely

how the army may have made use of this proximity. Some writers noted that a fort was orientated towards a river, although they rarely expanded on how this may have been significant. It was noted, for example, that Trawscoed faced the nearby river crossing (Davies 2010, 287) and Castell Collen also faces the river it overlooks (Davies 2010, 234).

Some of the writers, however, took note of the location of the installation they were discussing from the point of view of supplies, often in relation to supplies via water. Mason, for example, commented that Chester was 'sited on an estuary of a major river so as to take advantage of the facility for bringing in supplies by sea' and that it was also a major naval base (2010, 172). As another example, Hopewell, when describing the location of Pennal near the River Dovey, wrote that it 'was probably built in this location in order to allow the unloading of seaborne supplies' (2010, 272). The nature of the gazetteer, however, was to focus on each site individually and there was therefore little comparison of a fort's siting to the siting of others in Wales.

2.4.3 Relationship with Rome

The discussions of whether certain areas were friendly or hostile to Rome have relied heavily on the study of the distribution of forts across the landscape. In Nash-Williams's publication, distribution was also used to argue that the lack of forts in north-east and south-west Wales suggests that Rome had friendly relations with the inhabitants here and therefore was not required to garrison these areas (1969, 4, 145). Arnold and Davies also commented on the Roman army's relationship with local populations using fort distribution as evidence. They observed that good or bad relations may be reflected in the distribution of installations, implying that a dense distribution indicates hostilities, although they acknowledged that a friendly area may provide a base for installations (2000, 4).

In their sub-chapter on Distribution, Burnham and Davies (2010, 67-68) acknowledged that the known distribution is likely to be patchy but addressed some debates that had been centred on the evidence of fort distribution. The sub-chapter is relatively short, however, and therefore did not address the issues in detail. They discussed the matter of whether a dense distribution of installations maps hostile territories, explaining that the absence of pre-Flavian installations in north-east Wales is puzzling, and that the issue remains unresolved. Elsewhere in the book,

when discussing Flavian fort distribution, they noted again the lack of forts in south-west and north-east Wales, here arguing that Jarrett's view (Jarrett 1969) that this represented territories friendly towards Rome is no longer valid, as a result of known or suspected installations in these areas (Burnham and Davies 2010, 46-47). It was also proposed that the Roman army may have benefitted from the security of placing installations in friendly territory and therefore a concentration of forts may not necessarily represent a hostile area (Burnham and Davies 2010, 23).

2.4.4 Other themes

Fort siting has sometimes been used as evidence when discussing other themes. Davies (1980, 258, 260) used the distribution of certain forts to assign them, potentially, to certain phases of the campaign in Wales. Arnold and Davies (2000) used the known distributions of forts to predict the potential locations of other installations; they suggested that a site near Kenchester would fill an apparent gap in the pre-Flavian distribution (Arnold and Davies 2000, 10) and thought that, 'There are undoubtedly some missing forts in the Flavian pattern,' suggesting possible sites that would complete the pattern (2000, 15-16). They also used slightly more topographic detail to suggest some other fort locations; they proposed a fort at a crossing point of the River Wye at Chepstow (2000, 10) and they also suggested that intervisibility with the fortress at Usk and good views of the Severn Estuary supports a Roman date for a site at Coed y Caerau (2000, 11). They did not, however, provide supporting evidence for these suggestions, such as revealing the likelihood of these factors influencing fort siting by providing the number of other forts in Wales located near river crossings or the number of other forts that had good views of estuaries or had intervisibility with other installations.

In their Distribution sub-chapter, Burnham and Davies (2010), 67-68) used fort distribution alongside the known road locations to suggest the locations of forts yet to be identified. They also discussed spacing between the Flavian forts, noting that some are located relatively close together, and they suggested that issues such as greater native population density in river valleys, the supervision of metal extraction and site-shifting may be responsible for some of the denser fort distributions. The topographic location of installations was sometimes considered in the gazetteer of Burnham and Davies's book from the point of view of the defensive nature of the sites. White, who discussed the siting of Wroxeter in some detail in the gazetteer, argued that the fortress was, 'very carefully selected to exploit the landscape to its

full, both in its positioning and its wider landscape impact,' explaining that the fortress made full use of the naturally defensive location (White 2010, 193-194). The prominence of the installations in the local topography has also been taken into consideration on occasion; Pen Llystyn and Tomen y Mur were both described as occupying 'commanding' positions (Burnham 2010, 271; Crew and Webster 2010, 282) and White described Wroxeter as dominating the central Severn Valley (White 2010, 194), although they did not state precisely how this would have been helpful.

Peterson (1995) analysed the locations and orientation of some forts in south Wales to investigate whether a Roman centuriation, postulated to have been surveyed in the English south-west and west midlands, had been extended to also cover south Wales (1995, 87-88). He extended the projected centuriation to cover an area of south Wales and compared the lines of known Roman roads and the orientations of Roman forts to the lines of the centuriation. Peterson identified roads and forts as potentially being associated with the centuriation if the roads followed the line of the centuriation lines and if the forts were orientated on a similar alignment to the centuriation, or were located close to the lines (1995, 90-92). He argued that the results supported the idea that the centuriation survey was extended into south Wales and that the later forts, representing Rome's second advance into Wales, followed the survey (1995, 92). He proposed that the new commander Frontinus, who understood about surveying, ordered the forts to be sited using the centuriation survey but that Frontinus's scheme was never fully completed (1995, 92). Peterson therefore examined the siting and orientation of a selection of forts in Wales but this was very much in relation to the postulated centuriation survey. He noted that topography may have been taken into account, especially concerning roads (1995, 89), but he otherwise did not analyse the relationship of the forts or roads in relation to the topography or discuss in any depth how the centuriation idea may have worked in such a hilly landscape or how topography may have been taken into account for practical or tactical reasons.

Entwistle (2019) also argued that the Roman army used surveyed alignments in Britain and suggested that it showed strategic military planning (2019, 47). He argued that some of the alignments may represent regional boundaries and were later used as a basis for road and fort siting (2019, 70-74, 88, 91, 93-96). He noted that the site of a later Saxon Shore fort at Lancaster was the apparent origins of some northern alignments and argued that the location had some topographical benefits, such as being on a low hill, near a loop in a river, accessible by sea and

providing access to a valley (2019, 87-88). Beyond this, however, he only related fort siting in relation to the proposed alignments and did not consider how they related to the topography.

2.4.5 Discussion

A consideration of fort location has therefore contributed to a number of areas of research in Wales. The distribution of forts, for example, has been considered in discussions about occupation, an even distribution of forts usually being taken as evidence for a conquered area. Fort distribution has also been central to the discussion of whether a lack of forts in a certain area represents an area friendly with Rome, an issue not yet fully resolved. Fort siting has been used as evidence for methods of policing territory, with suggestions that forts were used to block valleys or monitor river crossings for example, although how the blocking or monitoring of certain sections of some valleys was a useful contribution to the Roman occupation is rarely discussed. Beyond these approaches, the impact of the changes made by the Roman army to the landscape on local populations in the study area is rarely discussed. Consideration of fort location concerning supplies has involved assessing the distance of forts from potential sources of supply, such as water courses and agricultural land. Fort location has also been used to identify other potential fort locations, mainly based on gaps in fort distribution but other topographical indicators have also been considered.

In spite of this work, the study of fort location in Wales has not been balanced and frequently has not been supported by evidence. Where researchers have used fort location as evidence, their descriptions of the locations are often vague and imprecise. In discussions about the location of sites in relation to the local topography or other features, exact distances are rarely provided and the site is often described as being 'near' or 'by' the feature in question, or other similar descriptions. The researchers rarely define what they consider to be 'near' or give any parameters to such statements. In the siting sub-chapter, for example, Jarrett (1969, 146) referred to forts 'in close proximity to' rivers and streams.

Furthermore, the researchers rarely outline their methodologies for collecting the location data or how they came to conclusions that relate to fort location. Those that note the proximity of a site to other features usually do not state how they became

aware of the proximity, such as measuring from a map or visiting in person. Researchers who commented on views from the sites similarly tend not to explain how they acquired this data. Davies (2002) stated that 25% of garrisons in Wales would have been 'well placed' for supplies by sea but did not define 'well-placed', how he collected the data to carry out the calculation or any limitations applied to arrive at the figure; were the calculations based on forts that could be accessed directly from the sea, and only forts with evidence for ports or harbours? Or did the calculations allow for an element of transportation by road or river?

A further problem is that detailed examination of fort siting is usually either on a fort-by-fort basis and not in a systematic way across Wales or addressed very briefly during discussions about Wales in general. Fort location has contributed to the study of Roman Wales but it has received relatively little attention as a main source of evidence in its own right. It has not had the depth of study and focus in the manner of other sources of evidence for the areas; literary, epigraphic and numismatic evidence have received more attention, as well as the study of the internal arrangements of forts and their defences. The relationship to local topography, orientation, views from and views to forts have been considered almost on an *ad hoc* basis, where relevant to a specific research question. Fort location in the study area has not had a systematic study, looking at trends, developments, changes over time or any other considerations.

Fort location is rarely the main focus of research questions in Wales. Most of the examples above are using fort location as part of the evidence in the process of answering other research questions, such as 'what lines of advance did the Romans take?' or 'how was the Roman army supplied?'. Only very rarely have researchers questioned fort location directly, asking why forts were sited in these locations precisely. Where location has been discussed directly it is often relatively briefly; the Siting and Distribution sub-chapters in Jarrett (1969) and Burnham and Davies (2010), for example, are very short. Fort siting within the local topography is frequently described at the start of research reports on individual forts but the siting is rarely then used to reflect upon the study's findings. At the start of a report investigating Caerau fort's extra-mural area in order to identify site extents for management, for example, Hankinson (2015, 2) described the fort's location within the topography, proximity to rivers and streams, proximity to Roman roads and topography that was visible from the fort. This data, however, was used merely to set the scene and was not referred to again within the report. This is perhaps to be

expected in a report designed to identify extents without necessarily relating them to research. It nevertheless highlights another example of noting an individual fort's siting without relating it to the situation at other forts or expanding on how it might be relevant.

Similarly, in 1962 and 1963 Simpson brought together evidence about Roman forts in Wales. She focused mainly on evidence for occupation in the 2nd century AD but referred also to earlier periods. Simpson looked at each fort in turn and noted the forts' locations within the topography for most of the forts but concentrated mostly on the evidence from excavations. For example, she mentioned that some forts, including Caer Llugwy, Caer Gai, Caersws, Caerleon, Segontium, and Carmarthen, were located with easy access to one or more routeways, or with access to transport by both water and road (1962, 105, 137, 144, 147; 1963, 38). When describing Caer Llugwy, she noted that its location on a communication route would help block enemy communications, although she did not expand on this point (1962, 138). Simpson occasionally noted a fort's location in relation to topography but did not explain how it would have been useful to the fort. She described, for example, that Caerleon was half encircled by the River Usk and Caerhun was between the rivers Conwy and Roe, but did not expand on the potential benefits of these locations (1962, 105, 124). Similarly, she described that Caer Gai was on a spur with land dropping steeply from 3 sides and Brecon Gaer had land dropping steeply on 2 sides but did not explain how or if this could have been useful (1962, 145; 1963, 16), perhaps assuming it would provide a defensive role. She mentioned that some forts, such as Carmarthen, had wide views in some directions but did not always explain how these could have been used. Tomen y Mur was one of the exceptions, where she quoted Fenton's statement that Tomen y Mur's wide views meant the troops stationed there could not be taken by surprise (1962, 142; 1963, 38; Fenton 1917 cited in Simpson 1962). She also did not state whether other forts had similar features.

The siting of Roman forts of a similar period has had more consideration elsewhere in Britain but this has usually focused on forts distributed in a linear arrangement. The siting of a line of Flavian forts along the edge of the Scottish Highlands and another along the Gask Ridge have received considerable attention, especially when trying to address certain research questions. Their distribution and the relative location of the legionary fortress Inchtuthil, for example, has been used to try to determine whether the forts were springboards for advance or whether they were

just to maintain the conquered area (for example Richmond 1944; Hanson 1980, St Joseph 1985, Breeze 2006). More detailed analysis of their siting has been undertaken to identify how or if the forts worked together as linear systems (Hanson 1980; St Joseph 1985; Breeze 1993). There has also been some consideration of their location in terms of natural defences (St Joseph 1985). The most detailed work on siting in the Highland Line and especially the Gask Line has been by Woolliscroft and Hoffmann (2006), as part of the Gask Project. They conducted extensive analyses of the topographical locations and views from the sites to discuss signalling, observation and how the sites may have worked together. They concluded that the Gask installations were sited for good views to the south, at the expense of views to the north, focusing on main routes through the area, and that they were capable of signalling to each other (Woolliscroft 1993, 299-300; Woolliscroft and Hoffmann 2006, 228-234). They argued that the Highland line of forts provided the military presence in the area obscured from the Gask and that the Gask provided a reserve and fortified supply line for the Highland forts (Woolliscroft and Hoffmann 2006, 230).

In contrast, in lowland Scotland, where the forts are not arranged in a linear fashion but distributed more evenly across the hilly landscape, researchers have tended to focus more on the distribution of forts than on the detail of fort siting. Woolliscroft and Hoffmann (2006), for example, described the distribution of forts here as forming a 'classic holding pattern' but did not analyse the locations of the sites in anything like the detail they assigned to the more northerly installations of the Highland and Gask lines. Wintjes (2020) discussed Roman methods of preventing counterinsurgency in Roman Britain. He argued that one method was the establishment of garrisons, multiple installations and patrols within a troublesome area. He briefly mentioned the events in Wales (2020, 1114-1115) but focused on the Scottish installations when discussing this method of counterinsurgency (2020, 1118, 1121, 1123). Some writers went into slightly more detail, such as Breeze (1993), who thought that some forts were located to provide support for specific areas, but these observations are still very much based on the distribution of the installations as opposed to detailed analysis of their siting. Tibbs (pers. comm. 2022), however, has recently studied the siting of Roman first century AD fortifications in Scotland and visibility from the fortifications, including those south of the Gask and Highland lines. He considered the themes of transport, supplies and control as well as the impact of these structures on local populations. His

conclusions included the arguments that the forts were sited to exert visual control over local populations and to control access to rivers (pers. comm. 2022).

Like the forts of the Scottish lowlands prior to the work of Tibbs, therefore, the siting of the Welsh forts has not had the attention given to forts in a linear arrangement, and few researchers have considered investigating their siting systematically to consider what more can be found beyond their description as a 'classic holding pattern'.

The siting of Roman camps in Wales has received more attention than that of forts, most notably by Davies and Jones (2006) in their book *Roman Camps in Wales and the Marches*. They considered the siting of camps within the topography, noting, for example, a tendency for them to be on gentle rises (2006, 11-13). They also examined views from camps, their proximity to rivers and streams, orientation and apparent hierarchies in siting choice within the topography, sometimes comparing the data to the requirements outlined by Pseudo-Hyginus and Vegetius (2006, 11-15). Davies and Jones (2006) therefore examined camp siting in Wales in quite some detail and used this to address research themes about Roman Wales. The siting of camps in other areas of Britain has also been studied in a similar way. Jones (2011, 29-36), for example, took a similar approach to camps in Scotland. Gilliver (1999) dedicated a sub-chapter to the location of campaign/marching campaign camps in her book *The Roman Art of War*, which outlines the literary evidence for preferred locations as well as trends revealed by the archaeological evidence, including considerations for topography, visibility and water supply (1999, 69-74). The siting of camps in Wales and elsewhere in Britain has therefore been the subject of considerable research in its own right, where researchers have examined siting in more depth and in a more systematic way than examinations of forts in Wales.

The siting of Roman fortifications from frontier zones of other periods has also received more investigation than those in pre-Flavian and Flavian Wales, but again these focused on those based on a linear arrangement. Woolliscroft (2010), for example, also considered the siting of Roman installations along the line of Hadrian's Wall, focusing on the question of whether signalling to or between the forts was possible. Site intervisibility was therefore a main source of evidence but he also considered the installations in relation to accessibility and views of the surrounding landscape (2010, 58-61). Woolliscroft argued that the milecastles were

sited to take advantage of access points along the line where possible, but that the need to signal to other installations took priority (2010, 65). The impact of the installations on local populations was not a highlighted research aim of this publication, but Woolliscroft (2010, 64) did touch on the topic by arguing that flaunting the presence of a signalling system may have been an advantage stating that the flashing beacons and awareness of the strength of the Roman army '...must have been distinctly sobering to any cross-border raiding party not already deterred by the very existence of the system'. Woolliscroft was therefore hinting at an element of control via dominance or intimidation, although he did not discuss the extent to which he thought that this was an aim of the system at Hadrian's Wall. Woolliscroft (1996, 172-175) proposed a similar signalling system for the Antonine Wall, although conceded that it was speculative since his arguments were based on the location of potential sites (1996, 177).

Breeze (2017) reviewed the opinions of previous researchers, notably Richmond (1947; 1966), Daniels (1978) and Swinbank and Spaul (1951), regarding the siting of forts along Hadrian's Wall. He described that their arguments for the siting of specific forts included the aim for a roughly even distribution whilst considering guarding certain points, views from the forts, water supply or commanding high points (Breeze 2017, 24-28). Breeze (2017, 29-37) also commented on the siting of the fortifications in terms of control, water supply and whether or not the Wall was defensive, arguing that it had defensive functions but was also a base for operations to the north. Evidence for these arguments included the siting of forts in relation to the topography, watercourses and roads, fort orientation and the distribution of finds. The impact on local populations was considered from the point of view of changing farming practices in the landscape (2017, 36), but this was in the context of discussing the theme of whether the Wall was defensive, as opposed to focusing directly on the reaction of locals.

The siting of fortifications elsewhere in the Empire has also been a topic of research but again these are usually focused on those in a linear arrangement. Sommer (2009), for example, examined the locations of 1st and 2nd century AD forts along the River Danube. He examined forts in relation to rivers, valleys and roads, arguing that the forts were sited not primarily to have control of the roads but to control the River Danube. He stressed the importance of the use of rivers for supplies, travel and communications (2009, 111, 112), therefore also highlighting the themes frequently discussed regarding forts in Wales. Sommer (2009, 104, 112) also noted

some practical considerations, such as the importance of siting forts away from flood-prone areas, where there was space for *vici* and the potential for a quay or port. Similar to the other studies, the impact on local populations was not a theme on which he focused. Woolliscroft's 2010 publication on Roman signalling also examined signalling between installations on the Wetterau *Limes* and Upper German/Raetian border, using the same methodology as those for the Antonine Wall and Hadrian's Wall (2010, 103-154). Here too he argued for the use of signalling amongst these installations.

Van Dinter (2013) used GIS to examine the location of Roman forts arranged in a linear fashion in the Lower Rhine Delta in the Netherlands; a system which was to become part of the Roman *Limes*. Data included in the GIS were a palaeogeographical map, a DEM based on LiDAR and features that were visible in the field (2013, 14). The methodology included the study of the relationship of forts to the topography, proximity to watercourses and their orientation in relation to watercourses (2013, 20-22). It was argued that the fortifications were sited to monitor river traffic, implying that the Roman army could then react to anything about which they disapproved, and that this was prioritised over any other factors when considering siting (2013, 27). Van Dinter (2013, 27) argued that these fortifications were initially used to safeguard supplies for the invasion of Britain and then later became a frontier zone.

A recent publication by Oltean and Fonte (2020) has analysed the siting of early 2nd century Roman fortifications that were not in a linear arrangement in an upland area of Dacia. They used GIS to create viewsheds from forts and least cost pathways to identify potential routes through the landscape to examine how the forts were located to aid the Roman conquest of the area (2020, 5-6). Oltean and Fonte (2020, 7-13) argued that the Roman army intercepted local communication and access routes and that some forts had poor visibility of certain key areas but that these were compensated by other forts. They concluded that the forts worked together as a system to isolate their targets and secure communication and transport in the area (2020, 13). They considered the usual themes of supply, communication and control but also included an awareness of the impact on local populations by suggesting that control of movement through the landscape may help to condition social order (2020, 5)

2.5 Approaches to Roman landscapes

The work by Oltean and Fonte (2020) highlights a development in the approach to Roman military research; it stresses the importance of the impact of changes to the landscape by the Roman army on the local populations and how this may have changed the social conditions of these local people. The idea that the perception of people who lived in the past could be considered by studying landscape evidence started to be promoted in particular in the late 20th century. Tilley (1994, 1-2, 22; 2004, 27-28) noted that landscape studies had been focusing on site plans, distribution maps and environmental factors such as water supply. He argued that archaeologists could also consider how the landscape was perceived (1994, 1-2, 23). He suggested that space was a container for action, that places take on meaning over time and that culture and identity is bound up with place (1994, 9-11, 15, 26-27). He argued that this phenomenological approach would require a 'continuous dialectic between ideas and empirical data' (1994, 11). Tilley also stressed the importance of experiencing the landscape under investigation in person (2004, 11, 14, 24, 27-8, 218-221) and describes Merleau-Ponty's work regarding experience in relation to the human body (2004, 2-3) and the importance of considering the experience of movement through the landscape (2004, 26). Tilley argued that statistical approaches and the use of GIS were so removed from the human experience that they were potentially worse than the traditional approaches (2004, 218). Tilley's 1994 and 2004 books included case studies presenting the phenomenological approach, all of which focused on prehistoric landscapes.

Since the 1990s and early 2000s, theories and methods have developed and there has been more optimism about using GIS when examining the human experience as part of landscape archaeological research. Gillings (2012, 604, 608-610), for example, argued that instead of attempting to find a middle ground between a methodology that uses GIS and one that relies on the researcher's experience within the landscape, GIS users should create their own approach that considers the latest debates but also takes advantage of what GIS has to offer. He suggested that the notion of affordances could be used as a framework for investigating landscapes (2012, 602, 608-610). Affordances can be seen generally as aspects of a landscape that can potentially be used, but the concept and precise definition has been debated (2012, 604-608). Nevertheless, Gillings (2012, 608) suggested that spatial technologies can be used to 'explore the experiential affordances of the

landscapes, events and features we are studying'. These could focus on the relational situation of interest regarding people and the landscape (2012, 609).

Johnson (2012, 275) argued that the phenomenological approach is just one of a range of methods that can be used to study past human experience within landscapes. He listed some criticisms of phenomenology, including the view that it has dominated the approaches to landscape to the exclusion of others, especially in Britain (2012, 276-278). He thought that it was still important to consider the human experience but that a range of methods and evidence, including the use of GIS, could be used together and therefore contribute to doing so (2012, 279-280).

The study of past human experiences in the landscape in which they lived has therefore been a prominent theme in recent decades. It was, however, a theme which had been focused particularly on studies of prehistoric landscapes and rarely applied to the study of Romano-British landscapes. Mattingly (2006, 91-92, 128, 353-362; 2011, 13-20, 48) argued that the view of the Roman Empire by modern European researchers has retained a 'colonial' view; he argued the recent colonial empires in Europe promoted the idea that the spread of European culture into colonised areas was a positive contribution and scholars of that era also saw ancient Roman influence on conquered populations in a positive light. Mattingly thought that the concept of 'Romanisation' was not this simple and that the impact of Roman invasions on local populations should be reconsidered (2011, 38, 271). He thought that the perspectives of populations ruled by Rome could be explored in a post-colonial light (2011, 28-29, 274), including the social and cultural impact of the empire on these populations and also their impact on Rome (2011, 29). In a selection of case studies Mattingly used some of the approaches that have been used in studies of human perception in prehistoric landscapes by considering the way people experienced Roman rule in a physical way (2011, 174). Using these approaches Mattingly came to conclusions about the effects of Roman rule, such as the idea that Rome could be very harsh to its subjects, and that Rome implemented subtle uses of power beyond violence (2011, 23, 33, 79, 130, 151, 271).

Fernández-Götz, Maschek and Roymans (2020, 1631) argued that relying on material culture to understand social factors of the Roman world leads us to minimise or miss some social aspects. They suggested that landscape studies can contribute to our understanding of social aspects and the impact of the Roman invasion; they thought, for example that the study of settlement patterns can inform

us of the demographic impact of the conquest (2020, 1634). They highlighted post-colonial approaches to research in the north-western provinces of the Roman Empire, including research that has revealed population losses and the movement of people in Germania Inferior, demonstrating how harsh Rome could be to newly conquered populations (2020, 1635).

Approaches to Roman landscapes have therefore developed over recent decades and the theme of the impact of the Roman invasion on populations, beyond the traditional considerations of Romanisation, has become more prominent. A relatively early consideration of perception in Roman research was by Witcher (1998), who studied Roman roads from a phenomenological perspective. He argued that routes through a landscape helped to form a sense of place and identity and that new roads created by Rome interfered with these senses and were a subtle form of power (1998, 62, 64-67).

Taylor (2013, 171-172) argued that not enough emphasis has been placed on the role of people in rural landscapes when studying identity in Roman provinces, with research assuming that these landscapes had a passive role. He suggested that the maintenance of aspects of rural life, such as boundaries and access routes, helped establish cultural identity and that this continued to shape future identities, questioning the idea that these communities would have been influenced culturally by Rome (2013, 175).

Chadwick (2008) examined the habitual movements and routines of populations living within the landscape of Nottinghamshire and South and West Yorkshire during the Iron Age and Romano-British periods. He noted the importance of looking beyond the traditional 20th century approaches to the Romano-British period (2008, 100, 122, 132, 388, 463) and used landscape evidence, such as field systems and settlements, to understand the lives of the people living there, their relationship with the landscape and also the impact of the Roman invasion. Amongst his conclusions Chadwick argued that indigenous populations had strong ties to the landscape and used it to express their identities (2008, 197-198, 249, 286, 309, 408, 460) and he also stressed the importance to these communities of trackways and movement through the landscape (2008, 141-142, 162, 181, 214). In regard to the Roman invasion, he argued that it would have had a traumatic impact on local people, that there was some continuity but it may also have prompted the creation of new identities (2008, 46, 462-463). Similar to Witcher, Chadwick stressed the

significance of Roman roads as expressions of power and disruption to previous ways of moving through the landscape (2008, 51-52).

Wallace and Mullen (2019, 75) argued that social structure can be reflected in connections between features in the landscape. They investigated an Iron Age/Romano-British landscape near Canterbury in Kent. They argued that control over access to certain areas was used to exert power, and that the prominence of certain features such as enclosures and buildings, including as they appear when moving along trackways, may have been a way of expressing status and identity amongst their own communities and to travellers passing through (2019, 96-97, 102). They also suggested the possibility of engineering social change through landscape changes, such as the creation of a possible *civitas* capital by linking social groups with a new ritual centre (2019, 100).

Gardner and Wallace (2020, 327-330) investigated how considerations of the future could be identified in Romano-British landscapes and how this reflects cultural identities. They used field visits for a sensory experience and GIS to study visibility in areas of Kent and the West Country (2020, 331). For the Kent landscape, they found that movement along trackways linked certain features that were visible, such as burial mounds, enclosures and settlements (2020, 332). They argued that the local population may have been strengthening their cohesion and demonstrating their future claim to the land by highlighting their connection with their predecessors and current communities (2020, 334-335).

Studies of Romano-British landscapes have therefore evolved over recent decades, with a focus, particularly in recent years, on how local populations perceived their existence, and how their culture and any cultural changes are reflected in the landscape. This is useful from the point of view of Roman military studies because it can help researchers to understand pre-Roman culture and the extent to which this was altered by Rome. It is also possible to consider if or how the Roman army may have sought to interfere with or deconstruct these ties to the landscape as part of its efforts to control new territories, as argued, for example, by Witcher (1998) regarding the impact of Roman roads.

2.6 Summary

Fort location in relation to the topography has therefore been considered in the context of certain areas of research in Wales, most notably military defence, control and observation, military supplies and travel and communication. The data used, however, is frequently imprecise and researchers rarely outline their methods of data collection. The methodology therefore aims to address these issues.

Approaches to Roman landscapes have evolved over recent decades and this thesis aims to demonstrate that a methodology combining fieldwork and GIS can work well to address the thesis aims.

3. Methodology

3.1 Introduction

The previous chapters outlined the aims of this study. This chapter begins by explaining the approach to data collection methods (Section 3.2) and listing the equipment, software, data and processes used to identify and record the data (Section 3.3). It then describes each step of the methodology (Section 3.4), comprising:

- 3.4.1. Fort selection
- 3.4.2. Plotting gate locations
- 3.4.3. Access permissions
- 3.4.4. Designing the site visit form
- 3.4.5. Fieldwork data collection
- 3.4.6 Applying distance bands in GIS
- 3.4.7 GIS terrain data collection
- 3.4.8 DTM processing
- 3.4.9 Generating viewsheds
- 3.4.10 Viewshed data collection
- 3.4.11 Gradient calculation
- 3.4.12 Fort orientation

The chapter then explains certain aspects of the methodology in more detail, providing explanations for the approaches taken (Section 3.5). Finally, the chapter provides a summary of the development of GIS and its uses in archaeology and considerations regarding its limitations.

3.2 Determining the data collection process

In order to collect data relating to fort siting, a combination of fieldwork and GIS was used. Some elements of the intended data collection suited GIS alone; for example, gradient is easier to calculate using GIS than on-site, and the lines of Roman roads are not always visible on the ground and therefore it was decided that the forts' proximity to them was best assessed via GIS. Otherwise, it was initially the intention to use GIS only if access to a fort was not possible. As discussed below, the

fieldwork experience is generally preferred to that obtained via GIS. However, once the fieldwork began it became clear that features that would not have been present in the Roman era consistently obscured views and prevented complete data collection (Appendix III). Furthermore, during fieldwork, only the topography that was visible from the site was recorded. For most forts, access to the land surrounding the fort was not sought because of the complexities of access permissions to so many parcels of land. The topography surrounding these forts therefore could not be explored to record if anything was obscured from the forts. The fieldwork therefore provided data about what was visible but not what was obscured. This data could be provided by using GIS. It was therefore decided to collect as much data through fieldwork as possible and also collect data for all the forts via GIS. It was noted if the data collected from fieldwork and GIS differed from each other, and an explanation was provided for why the results of one were favoured over the other (Appendix II). Table 3.1 shows an overview of the data collected and the method(s) (for example fieldwork, GIS or both) used to collect it.

3.3 Equipment, software, data and GIS processes

The GIS software used for this research was ArcGIS 10.7.1, produced by ESRI, under an education licence with Cardiff University.

The following datasets were requested and then downloaded from Edina Digimap:⁷

- GB National Outlines 1:250,000 vector polygons. This shows the modern-day extents of England, Wales and Scotland.
- OS Mastermap 1:1000 raster. This is detailed backdrop mapping, showing details such as present-day field boundaries, roads and buildings.
- OS Terrain 5 Contours vector. This shows the contour lines with vertical intervals of 5m and provides the elevation, in metres, of each contour.
- OS Terrain 5 DTM. A digital terrain model with 5m post spacing. The DTM consists of a grid of height values at 5m horizontal intervals, based on OS contour and height points (Ordnance Survey 2017, 5).

⁷ OS data licence: © Crown copyright and database rights 2022 Ordnance Survey (100025252)

Historic map licence: © Crown Copyright and Landmark Information Group Limited 2022. All rights reserved. [1853 - 1904].

- OS Open Rivers vector lines. This provides the lines of watercourses. It also provides the names of most of the larger watercourses.
- 1:2,500 OS County Series 1st Edition mapping raster. Date range 1853-1904.

The following datasets were requested and then downloaded from the regional HERs:

- Roman road vector data in shapefiles, which is the proprietary vector format of ArcGIS.

The computer used for the GIS data collection was a Dell DESKTOP-6NP389C.

The following equipment was used during fieldwork:

- Sanyo VPC-S5 digital camera
- Compass
- Road Atlas
- OS maps
- Site visit forms

The viewshed analysis and gradient tools in ArcGIS were used to generate viewsheds and identify gradients. Their use as part of the methodology is presented below.

Viewsheds calculate and display which areas of a landscape can theoretically be seen from a particular observation point. To carry out a viewshed a Digital Elevation Model (DEM) or Digital Terrain Model (DTM) is used, usually representing the ground surface, comprising cells containing height data. A layer containing the information, including the grid reference and height data, about the observer location is also required. The viewshed analysis calculates whether or not each cell of the DTM would be visible from the observation point. The resulting image is usually represented by two colours; one colour representing all visible cells and another representing those that are not visible (Wheatley and Gillings 2002, pp. 204-205).

Gradients were calculated using the Slope tool. This uses a 3x3 group of cells which contain height data from a DTM or DEM to calculate the gradient of the space they

represent. The results are provided in degrees (between 0 and 90) or percentage rise (www2: ESRI 2022).

3.4 Methodology

3.4.1. Fort selection

To identify the list of forts to examine in Wales a list of sites meeting the criteria of 'Roman' or 'Romano-British' in the geographical area of Wales was requested from the relevant regional Historic Environment Records (HERs). Those in Wales are maintained by Gwynedd, Glamorgan-Gwent, Dyfed and Clwyd-Powys Archaeological Trusts. The English HERs are maintained by the Cheshire, Shropshire, Gloucestershire and Herefordshire County Councils. The HERs provided the name of each site, along with period, National Grid Reference (NGR), type, description, Eastings and Northings in Excel spreadsheets. Since this study focuses on auxiliary forts and legionary fortresses, these site types were extracted from the data. The list was checked against the gazetteer in Burnham and Davies (2010), which was the most recent published work to provide a gazetteer of Roman forts in Wales and along the Welsh/English border, to confirm that none had been missed or duplicated.

Most of the fort dates provided by the Welsh HERs were identified as 'Roman' or 'Romano-British' and not belonging to a particular phase within those periods. Library research was carried out to identify the forts where the evidence indicates that they were occupied during the pre-Flavian or Flavian eras. To ensure that only data relevant to the research aims was used, it was decided not to examine those sites where the occupation date was unconfirmed. For the same reasons, it was decided not to include 'possible' or 'probable' Roman fort site types. The aim, however, was to include as many sites as possible where the evidence was sufficient to determine that a fort of relevant date was present. At Monmouth, for example, there is enough evidence to deduce the extent of a fort and its date, although details such as gate locations are uncertain (Clarke 2010, 264-265).

Forty-eight forts to examine were identified in the study area (Appendix I).

3.4.2. Plotting gate locations

Data regarding views from the fort were collected from the fort gates. The decision to use gates is discussed further below (Section 3.5.1). Not all the forts under consideration are identifiable on the ground. It was therefore necessary to plot the fort gates, where known, onto maps so that they could easily be found during fieldwork.

The Welsh HERs had provided point data in the form of shape files, representing each Roman fort, but these rarely included the location of the fort gates. Library research was therefore carried out to identify scale plans of the forts and therefore to identify the grid references of the gates (Casey and Davies 1993; Hughes 2003; Hopewell 2005; Jones 2005; Hankinson and Jones 2007; Burnham and Davies 2010; Hankinson 2012; Jones 2012). In some cases, the fort extents as well as the gates were present on the OS Mastermap 1:1000 digital mapping. This mapping was therefore used as a basis for plotting the fort and gate locations, and the locations were checked against the researched data for assurance. Where the fort extents were not included on the OS mapping, the scale plans of the extents were traced onto tracing paper, their scale matched on ArcGIS and used to plot the central points of the gates as well as the central points of each fort. Point data was therefore created in the GIS for the central point of each known gate and for the central points of each fort. Where the forts had multiple phases and gate locations within the pre-Flavian and Flavian eras, the location of each known gate was plotted and labelled with the appropriate phase. If the location of a gate was unknown or uncertain it was not plotted and a point was created between the corners, labelled as an estimated gate location.

The maps were printed to be taken on fieldwork. The plotted point data representing each fort would also be used as points from which to collect data in the GIS.

3.4.3. Access permissions

Permission to access private land is necessary in Wales and England. HM Land Registry was used to identify the names and addresses of the landowners of the forts that were located within private land. Where forts had more than one landowner, which landowner owned which section of the fort was noted in case some permitted access and some did not. Letters were sent to the landowners,

bilingually to the Welsh addresses, explaining the project and requesting access. Reply slips in stamped addressed envelopes were provided. Not all landowners responded and two denied access. Thirty-two forts therefore were accessible in total.

3.4.4. Designing the site visit form

A site visit form (Appendix XII) was designed, one standard form to be completed at each fort, so that data could be recorded in a consistent format. Early prototypes of the form were tested at Tomen y Mur fort. The form was designed so that the topography visible from each gate in each distance band could be recorded. The development and use of the distance bands are described below (Section 3.5.2). Space was also provided for open description, enabling comments about any characteristics of fort siting that felt significant or perhaps unique to the fort that would not otherwise have been recorded on the form. The form also enabled the recording of post-Roman features that obscured the view, including weather such as fog or low cloud.

3.4.5. Fieldwork data collection

The fieldwork was conducted in 2015 and 2018. The OS maps with the plotted gates, which showed the gate locations in relation to local features such as field boundaries, roads and buildings, were used to identify the gate locations.

On arrival at a fort, the relevant sections of the visit form were completed. This involved standing at a gate and recording what topography was visible in the near distance to the north, east, south and west. The topography both within the forts and beyond the forts was therefore recorded. Features which obscured the view were also recorded. This method was then repeated for the middle and then the far distances. An explanation for how distance bands were defined and identified is presented below. The process was repeated at the remaining fort gates. Notes were then taken of the geographical setting, comprising a basic description (such as 'valley base') and then a more detailed description, which was an opportunity to highlight any features which dominated or seemed atypical.

Photographs were taken of the view from each gate.

This method was repeated at each fort to which access was possible. If access to a gate was a problem, data would be collected as close as possible to the gate and the location noted. If access near⁸ one or more gates was impossible, data collection at the remainder of the gates would continue if possible.

On completion of the fieldwork the data from the site visit forms was typed into an Excel spreadsheet so that the data could be easily analysed.

3.4.6 Applying distance bands in GIS

A few steps from the mainland onto Bangor Pier was chosen as a location that had long views towards the mountains of Snowdonia, with trees present throughout the view. The weather was fine, with no low cloud, and visibility was excellent. While standing at this point, Higuchi's method of determining distance bands (Section 3.5.2 below) was applied to the view and the limits of what was established to be the near distance and the middle distance were marked on a paper OS map of the area. The limits of human visibility is taken here to be 20km (www3: Buckley 2018) and therefore marking the limit of the far distance band was not attempted; it would not have been possible to identify the furthest visible point on an OS map because the landscape at such a distance could not be seen in enough detail to enable identification on a map. The distance from the observation point to the limit of the near distance was measured on the map and was found to represent 300m. The distance from the observation point to the limit of the middle distance was measured on the map to the nearest 10m and was found to represent 5km.

The radii of the distance bands from the observation point were therefore:

- Near distance: 300m
- Middle distance: 301m to 5km.
- Far distance: 5km to 20km

Based on a Japanese landscape, Higuchi suggested the point at which the short-distance view changes to the middle distance is 360m when viewing broad leaf trees and 140m to 180m when viewing acicular trees (1983, 14-17). For the point at which the middle distance changes to the far distance, he suggested 6.6km for

⁸ A distance that is too far to be worth collecting the data was not decided because it would not be easy to measure the distance on-site. The decision was made on a site-by-site basis.

broad leaf trees and 3.3km to 4.4km for acicular trees (1983, 17). The Japanese landscape is different in character from that of this study area and therefore the results are likely to differ, nevertheless the defined viewshed distances are comparable.

For use in the GIS, the distance bands were therefore generated as circles of the relevant radii from the central points of each fort. However, as the data was being collected from the gates, it would be necessary to account for the distance between forts' central points and the gates. This was considered most important for the near distance bands because the distance between a fort's central point and its gates would be a significant proportion of the 300m radius of its near distance. Therefore, the longest length of each fort was measured, halved, and added on to its 300m radius. This enabled the near distance band to be generated from each fort's central point but accounted for the distance from the central point to the gates furthest from this point. The length of Caerhun from gate to gate, for example, is 135m. 135m divided by 2 is 67.5m, which is the distance from the central point to the gates furthest from the central point. 67.5m was therefore added to 300m to create a near distance band 367.5m in radius, which would appear as 300m from the fort gates.

3.4.7 GIS terrain data collection

Datasets used:

- GB National Outlines 1:250,000 vector polygons.
- OS Terrain 5 Contours vector lines.
- OS Open Rivers vector lines.
- 1:2,500 OS County Series 1st Edition mapping (to identify former courses of watercourses) raster.
- Point vector data representing fort gates.
- Polygon vector data representing the outer extents of the near, middle and far distance bands of each fort.

The contours and watercourses were examined in ArcGIS to record the terrain present within the near, middle and far distances of each fort. The following data was collected at each fort:

- Presence of watercourses in near distance.
- Presence of watercourses in middle distance.
- Presence of watercourses in far distance.
- Presence of river confluences in the near and/or middle distances.
- Type of river closest to the fort (main or tributary).
- Whether land beyond the fort ascends, descends, remains flat or a combination of these in the near distance.
- Topography types present in the middle distance.
- Topography types present in the far distance.
- Presence of valley meeting points in the near and/or middle distances.
- Fort's relative altitude to the topography beyond the fort in the near distance.
- Fort's relative altitude to the topography of the middle distance.
- Fort's relative altitude to the topography of the far distance.
- Topography within the fort (such as sloping, flat or concave).
- Fort aspect.
- Presence of Roman roads in near distance.
- Presence of Roman roads in middle distance.
- Presence of Roman roads in far distance.

Mirroring the fieldwork methodology, notes were taken of the geographical setting, comprising a basic description (such as 'valley base') and then a more detailed description, which was an opportunity to highlight any features which appeared to dominate or seemed atypical.

The data was inputted directly into the spreadsheet into which the fieldwork data had been copied. That this data was collected by GIS was labelled clearly in the spreadsheet.

3.4.8 DTM processing

The DTM data was received in files of separate 5 x 5km map squares. These were combined using the Mosaic to New Raster tool. Combining all the DTM map squares to one large DTM would create a file too large to use reliably. I therefore combined the files to create a DTM for each fort. The distance of 20km was used as the maximum an average human can see (www3: Buckley 2018) and the DTM was

therefore limited to a minimum 20km radius around each fort; the DTM data is in squares therefore the DTM created for each fort is square in shape, with a minimum of 20km distance from the fort centre.

3.4.9 Generating viewsheds

Datasets used:

- OS Terrain 5 DTM.
- Point vector data representing fort gates.

Viewsheds were generated at a height of 1.6m from the point data representing each fort gate using the Viewshed tool in ArcGIS. The decision to use this height is explained in Section 3.5.8. These viewsheds showed the areas that were visible and obscured from each gate. Viewsheds were also generated at each fort from all the gates of each fort combined. These viewsheds showed the areas that would have been obscured from any of the gates and the areas that were visible from at least one gate of each fort. Prior to generating viewsheds for all the forts, the viewsheds for the forts of Tomen y Mur and Segontium were tested on-site to compare the GIS data to the on-site experience. Modern buildings and trees prevented full views on-site and it became more difficult to compare the viewsheds with the topography the further the topography was from where I stood because the ability to see features clearly declines over distance (Higuchi 1983, 9). Nevertheless the test revealed that the viewsheds represented what topography was visible in-person well at these forts.

3.4.10 Viewshed data collection

Datasets used:

- GB National Outlines 1:250,000 vector polygons.
- Viewsheds.
- OS Terrain 5 Contours vector lines.
- OS Open Rivers vector lines.
- 1:2,500 OS County Series 1st Edition mapping (to identify former courses of watercourses) rasters.
- Point vector data representing fort gates.

- Polygon vector data representing the outer extents of the near, middle and far distance bands of each fort.

The contours and watercourses were examined in relation to the viewsheds in ArcGIS to record what terrain the viewsheds identified as visible or obscured within the near, middle and far distances of each fort. The following data was collected at each fort. Visibility was recorded as 'visible', 'partially visible' or 'obscured'.

- Visibility of valley meeting points in near and/or middle distance.
- Visibility of fort interior.
- Visibility of near distance watercourses.
- Visibility of middle distance watercourses.
- Visibility of far distance watercourses.
- Visibility of near distance watercourse banks.
- Visibility of middle distance watercourse banks.
- Visibility of far distance watercourse banks.
- Visibility of watercourse confluences in the near and/or middle distance.
- Visibility of Roman roads in the near distance.
- Visibility of Roman roads in the middle distance.
- Visibility of Roman roads in the far distance.
- Visibility of ascending land beyond the fort in the near distance.
- Visibility of descending land beyond the fort in the near distance.
- Middle distance topography types visible or partially visible.
- Middle distance topography types obscured.
- Far distance topography types visible or partially visible.
- Far distance topography types obscured.
- Full width of valley floor visible in at least one direction?
- Full width of valley floor visible in the direction in which the fort is situated as far along the valley as possible?
- Do views differ significantly between the gates?

The data was inputted directly into the spreadsheet into which the fieldwork data had been copied. It was labelled that the data was collected using the GIS.

3.4.11 Gradient calculation

Datasets used:

- OS Terrain 5 DTM.
- Point data representing fort gates.
- Line data representing the outer extents of the near, middle and far distance bands of each fort.

The steepest gradients within the forts and in the forts' near distances were calculated using the Slope tool in ArcGIS.

The data was inputted directly into the spreadsheet into which the fieldwork data had been copied. It was labelled that the data was collected using the GIS.

3.4.12 Fort orientation

Library research was undertaken to record the orientation of forts where known (Hopewell 2005; Burnham and Davies 2010; Hankinson 2012; Jones 2012).

The data was inputted directly into the spreadsheet into which the fieldwork data had been copied.

3.5 Explanations and discussion

3.5.1 Data collection points

The fieldwork and GIS elements of the methodology involved recording what can be seen from the forts. It was therefore necessary to determine from which points within the forts this data is recorded, so that the recording process would be consistent across the forts. Tomen y Mur, a fort where access to all areas of the fort is possible, was visited to assess the points from which data collection would be most suitable for the research aims (Appendix II; Appendix XIII, figures 137, 138 and 139). Three sets of potential locations from which to collect the data were considered:

1. The centre of the fort. At first consideration, the centre of the site seemed an appealing point from which to collect the data since it could avoid the problem of how to process sites where the location(s) of all or some gates or corners are uncertain. During the visit to Tomen y Mur, however, it became clear that the views from one side of the fort differed greatly from the other side and the centre. Therefore, it was clear that simply standing in the centre would not necessarily identify such variation in view from within one fort. Furthermore, once the fort was constructed, it is likely that views from its centre would have been obscured by the contents and walls of the structure itself and therefore would not have been a point from which views were observed. Polybius (12) noted that the point from which camps were surveyed was their centre and this technique may have also been applied to forts. This does not mean, however, that the benefits of visibility outwards from the full extent of the fort were not considered when a fort site was chosen.

2. The corners of the fort. Collecting data from the corners would, in most cases, overcome the problem of differing views from different locations within the forts; all the forts under consideration are rectangular or square in shape and therefore using the corners would ensure an even distribution of data collection points around the sites.

3. The gates of the fort. Collecting data from the gates is similar in many ways to collecting from the corners. Not all forts necessarily have a gate on each side, however, and they are not always situated exactly halfway between the corners. Another difference when considering corners and gates is that a road usually runs through the gate and continues beyond the fort. This was considered as a factor in favour of collecting data from the gates; tracks and roads would have been important transport and communication features to monitor. Furthermore, although the corners may also have had towers from which to observe, the gate and road creates an 'avenue' through which to look and, by travelling in and out of the gates, it seems likely that occupants of the fort would become more accustomed to looking this way than looking from the corners.

4. Both the corners and gates of the fort. Collecting data from both gates and corners would ensure that no view from the fort would be overlooked. The visit to Tomen y Mur, however, demonstrated that views from the gates alone were enough to enable observation over the land surrounding the fort, without any direction of view being missed. The angles of the views of each section of land from the gates

and corners do differ, which may lead to slightly different observations of the same section of land, depending on the topography surrounding each fort. Collecting data from both gates and corners would, however, almost double the time required at each fort and double the processing and analysis time, which would have reduced the time available for other aspects of the project and therefore would have been beyond the scope of this project. It was therefore decided that, on balance, collecting data from the gates alone would be sufficient.

To account for site irregularities, lack of data and access problems, the following was decided:

- If a gate has not been identified by fieldwork (such as excavation or geophysical survey) on one or more sides of the fort, data would be collected from that side at the halfway point between the corners.
- Where the known gates are not precisely half-way between the corners data would be recorded from the gates nevertheless.
- If the full extent of the site is not known precisely, data would be collected from the known gate points or from what is likely to be the centre of the site.

The variation in views from different sides of the Tomen y Mur fort was noted and therefore it was decided that, during the analysis phase, views from each gate of each fort would be compared to see if forts were potentially placed to enable the widest views possible from the site.

3.5.2 Distance bands

The ability to define distance parameters was required so that the proximity to features surrounding the forts could be analysed and discussed without losing precision and in a way that was consistent amongst the forts. The measuring tool in the GIS would enable accurate distance measurements but the ability to measure the distance from the fort to visible features during fieldwork was not possible. For the fieldwork and GIS data to be analysed side-by-side the approach would have to be similar. Furthermore, a measurement could provide an accurate recording but it would not necessarily be useful; it would not define what a human might consider 'near' or 'far' for example.

It was decided that a method described by Higuchi (1983, 12-16) of dividing the view into distance bands would be an appropriate approach. This would ensure that features could be compared within corresponding distances from the forts.

Higuchi based his method on the observation, noted and used by others previously (such as Ashihara 1970, 50-62), that, '...as the distance from the object increases, a gradual (quantitative) change in the appearance of the object becomes a qualitative change' (Higuchi 1983, 11). To carry out Higuchi's method, an object is chosen as a standard and its appearance in each distance band is defined. The appearance of the object from a certain viewpoint can then classify the distance band in which the object sits. Researchers had previously used objects relevant to the landscape under observation; Ashihara (1970) used architecture in urban spaces, for example. Higuchi was considering rural or natural landscapes and chose to use trees as a standard object because they appear in most views in this natural setting. Using a previous study by Litton (Litton 1968, 4-5) as a guide, he defined their appearance in short, middle and long distance views and used these to classify the distance band under observation from a viewpoint.

Higuchi's description of the relationship of trees to the short-, middle- and long-distance views are quoted as follows:

1. 'In a short-distance view trees are recognizable as individual units from any point of observation... The leaves, trunks and branches are discernible as belonging to particular trees, and people are able to relate the size of each tree to their own height. In other words, the trees are near enough to be sensed as separate trees.

In landscapes the relationship between wind and trees is an element of considerable importance. We are dealing with a short-distance view when we are able to hear the wind blowing through woods or see the branches waving and leaves fluttering...

2. In a middle-distance view the outline of the treetops is visible but not the detail of individual trees... At this range the trees are too distant to be sensed as units, although they form the texture of the visible surface; trees or clumps of trees of different varieties are perceived as spots within the texture. Also sense impressions

other than vision cease to play a part. One does not feel but merely views, and the variations in the shape of the terrain become important compositional elements. We see the forest rather than the trees. In general a middle-distance area is the principal part of the landscape; or, to put it differently, a middle-distance view, in which juxtaposition of topographical patterns gives a strong sense of depth, is what we usually think of when we say landscape. In the middle-distance range mist and haze begin to influence the general appearance of the view, causing subtle changes in lighting and perspective.

3. In a long-distance view the contours of the treetops cannot be perceived; the eye can observe only major topographical features such as valleys or crests or clustery distributions of plant life... Because of the influence of atmospheric perspective, the texture is uniform, and colors are visible only as lighter or darker parts of an overall blur. The color of the mountains is weaker than that of the sky and may serve to emphasize the features of the middle-distance view.

The most salient aspect of a long-distance view is the outline of mountains against the sky. Succession in the long-distance range can be determined only by observing the fashion in which the component forms overlap; consequently there is little sense of depth. The long-distance view usually functions as a backdrop.’
(Higuchi 1983, pp. 12-14)

Most of the forts in the study area of this project are in rural settings and, even in most built-up areas in Britain, trees are prevalent. To trial the method for fieldwork, it was tested at Tomen y Mur, in a rural setting, and Segontium (Appendix II; Appendix XIII, figures 134, 135 and 136), which is now located within the modern town of Caernarfon. It was found to be a simple and effective way of defining distance bands in both the rural and urban settings. The method of using 3 distance bands was also found to be useful; two bands would not be enough to compare the proximity of features meaningfully because the range in distance between features identified in each band would still be too great. Four or more bands would be useful for the purposes of comparison but would require an adaptation of Higuchi’s method

and may require identifying such subtle differences between the views that it would cause inconsistencies. The trials also revealed how the near, middle and far bands reflected the perception of the space in terms of access. Features in the near distance band could be accessed within seconds or minutes on foot and felt part of the space in which the observer was standing. Features in the middle distance could not be reached in seconds or minutes on foot but nevertheless felt accessible. The middle distance appeared as part of the wider environment belonging to the place in which the observer stood. The far distance did not feel accessible and a journey that far would take considerable time and preparation. Land in the far distance appeared so distant that it felt like 'somewhere else', as opposed to having any association with the observation point.

During fieldwork, therefore, the trees in the landscape were used to identify the distance bands into which the topography beyond the forts fell, following Higuchi's method.

To enable data collected during fieldwork to be examined alongside data generated in GIS, the distance bands would also need to be applied to the GIS data collection process. Images and virtual reality could be used to visualise trees in a GIS but this was not considered an accurate enough approach; Higuchi's method involves observations that are currently difficult to replicate in a standard GIS, for example, the ability to relate the size of each tree to the observer's own height, hear the wind through the woods, see leaves fluttering, the influence of mist and haze, texture and colour compared to that of the sky (Higuchi 1983, 12-14). It was therefore decided to define the radii of the near, middle and far distance bands to apply to the GIS data collection process, as described in Section 3.4.6.

3.5.3 Valley meeting points and watercourse confluences

It was decided to limit the examination of valley meeting points and watercourse confluences to those within the near and middle distances of each fort. The distance bands were designed as a tool for considering proximity to forts. It was decided that, if a feature was so far away that it could not be seen clearly and was therefore in the far distance, it would not be considered as a feature that was conveniently close to a fort. Valley meeting points in a fort's far distance, therefore, would not provide fast or convenient access to multiple potential routeways. Such features in a far distance band may in fact be closer to another fort. The study of confluences focused on

those that involved watercourses that were potentially navigable, and therefore did not include small streams. The issue of the navigability of watercourses in the study area is discussed in depth in Chapter 5.

3.5.4 Watercourse migration

It is acknowledged that the courses of watercourses shift over time and that the rivers and streams of the study area may not now follow the courses they had in the Roman era. Some may have migrated naturally and some, such as the River Dee at Chester (Ward 1995, 4), have been altered purposefully by humans in more recent times. In some cases, the course of a section of a river near a fort in the Roman period has been estimated. The Roman era course of the River Severn alongside Gloucester and Kingsholm fortresses has been plotted, for example (Holbrook 2010, 184-185). The course of the River Dee is thought to have run further north past the west of Chester than it does now, before expanding into a wider estuary (Ward 1995, 7-8), although this is not confirmed. The courses of watercourses near most of the forts in the study area, however, have not been studied in depth and their movement since the Roman era is not known.

The early edition Ordnance Survey maps were therefore consulted alongside the modern mapping to identify any potential movement of watercourses. These maps are the earliest that were consistently surveyed to scale throughout the study area and were therefore considered more reliable than earlier maps or images. If a watercourse course on the earlier OS maps differed from that of the modern map, the results were recorded using the course shown on the earlier map. This was the case at Llanfor fort for example. The early OS maps, however, were surveyed in the 19th century, many centuries after the Roman era, and therefore may nevertheless not represent the situation when the forts were built and occupied. The River Dee at Chester was canalised prior to the OS survey of the area, for example. In the case of valley-based forts, however, the rivers only had the width of the valleys in which to migrate and therefore the watercourses would never have been significantly further or closer to these forts than they are now. The results for fort proximity to watercourses may therefore have differed little if watercourses have shifted, although the results for their visibility are less certain. It was decided that data for visibility of watercourses would be recorded nevertheless, but with an acknowledgement that the methodology should ideally be repeated if new evidence determines differing courses for the watercourses examined.

3.5.5 Visibility of watercourse banks

During the GIS data collection it was noted that sections of the banks of watercourses were sometimes visible whereas the watercourses themselves were not. This is because the viewsheds are based on a DTM of the terrain and not the surface of the water. The water level of watercourses may have been lower than the banks for most of the time, or varied depending on rainfall, but could nevertheless have been visible despite the viewshed showing otherwise. Furthermore, any vessels passing along the watercourse may have been as high or higher than the banks and therefore visible if the banks were visible. It was therefore decided to record both the visibility of the watercourses and their banks using the GIS.

3.5.6 Fort location in relation to valley narrowing

During the data collection it was noted that many of the valley-based forts were positioned near to a point where the valley narrows to such an extent that a fort would not fit within the narrowest section. It was assessed whether it was likely that a fort would have been located at any other point between the fort's chosen location and the narrowing of the valley. This was to investigate whether some valley forts were positioned as far along a valley as possible before the valley narrowed considerably. This element of the methodology was therefore carried out at the end of the data collection process, as it relied on some of the results of the data collection already undertaken to assess whether an alternative location for a fort may have been sited between a known fort location and the narrowing of a valley. The fort location priorities considered were those that were found to occur at all or most forts:

- Fort location within the valley: on the valley floor, on a plateau in the valley floor or on a spur projecting from the valley side.
- Topography within fort: flat or gentle gradients
- Near distance topography: land falls descends on one or more side(s) of the fort and ascends gently or remains flat on the remaining side(s).
- Watercourses: a watercourse running through the near distance or middle distance of the fort.

The full data for these are presented in Chapter 4.

3.5.7 Selection of Roman roads

There was a variety of potential sources of data for Roman roads in the study area. Margary (1967) compiled details of Roman roads in Britain, including Wales, and established a numbering system for them. In the 1970s, the Ordnance Survey conducted investigations into known and postulated Roman roads in Wales (Hopewell 2013, 17). Dutton (1997) described some Roman roads, as well as roads associated with other periods, in the context of a circular walks guide of north-east Wales. Bishop (2014) discussed issues such as how the roads in Britain were used as well as road use in the pre- and post-Roman eras, A website associated with the book provides supporting data (www5). The Roman Roads Research Association has an ongoing project of research into Roman roads in Britain and provides regular updates and resources on their website (www6).

A Cadw-funded pan-Wales project, started in 2001, by the Welsh Archaeological Trusts compiled Roman road data from the numerous sources (Sherman and Evands 2004; Hopewell 2007; Hopewell 2013, 19). This was combined with fieldwork to assess for reliability (Hopewell 2013, 19). Sections of roads were labelled by 'status' based on the type and reliability of the evidence; Gwynedd Archaeological Trust for example labelled the roads Known, Proposed, Predicted or Discounted (Hopewell 2013, 19-20) (see Appendix XI for the definitions provided by each HER). Data from this project was added to the four Welsh regional Historic Environment Records (HERs). HER data was therefore used in this thesis because, at the time of data collection for the thesis, the HER data represented the most recently researched and up-to-date data available. HER data was used for the study areas that extended into England for consistency.

To study the proximity and visibility of Roman roads, the locations of known Roman roads were therefore requested from the regional HERs in the study area. These were provided in Shape files which were uploaded into the GIS so that their relationships to the Roman installations could be studied. The roads divided into the two most reliable statuses were used for this project; Known and Proposed for HER data from Gwynedd, Clwyd-Powys and Glamorgan-Gwent Archaeological Trusts and Certain and Probable from Dyfed Archaeological Trusts. The Known and Certain roads are those where there is firm evidence for a Roman road (Hopewell 2007; Schlee 2005). The Proposed/Probable sections of roads have some physical evidence or enough evidence for the presence of a Roman road section to be likely

(Hopewell 2007; Schlee 2005). It was considered that the reliability of the evidence for the Predicted/Suggested Roman roads was not enough to be certain that these roads existed, although their presence amongst the HER data was noted. The associated descriptive data for the Roman road GIS data from HERs in England were studied and Roman roads were included where there was certain evidence for their presence; lines of roads which were predicted based on the locations of other features, such as forts, but where no physical evidence has yet been found were excluded.

Minor roads and trackways, which were not part of the Roman roads project, were not included because, aside from those present in *vici* and *canabae*, their dating evidence is often not precise enough to be certain that they were in use during the study period. Furthermore, there are very many minor roads and trackways possibly dating to the study period and it was beyond the scope of this project to consider them all.

3.5.8 The height from which to generate viewsheds

When generating viewsheds using a GIS it is necessary to input a height from which the viewsheds are taken. 1.7m is often taken as an average adult height for a human in GIS calculations (Wheatley and Gillings 2002, 205). Researching the average height for Roman military men in the pre-Flavian and Flavian periods was an option but the reliability of the evidence could not be guaranteed, especially since the evidence would have represented a very small proportion of the military. A further consideration is that, once the forts were built, the occupants would have been able to observe the views from an elevated position along the walls or, where present, at the gate towers, therefore potentially impacting what was visible. However, the heights of the walls and towers of the forts under investigation, and whether towers were present, are not known. These figures have been identified at some military structures within Britain (Breeze 2002, 25) but it cannot be assumed that the sites being investigated here would have been the same. Furthermore, the fort locations would have been chosen by a human standing on the ground. A trained eye may have predicted the extra benefits of the height provided by fort walls but the views from the site would initially have been assessed from human height. Finally, if the data collected via fieldwork and GIS were to be used together, the height from which the viewsheds were generated should match the height of the

researcher carrying out the fieldwork, which is 1.6m. It was therefore decided that the viewsheds would be generated from a height of 1.6m.

3.5.9 Fort orientation

The orientation of a fort is usually taken to be the direction faced when looking from the *porta* (gate) *praetoria* (Johnson 1983, 41). This gate can usually be identified by its relationship with buildings within the fort interior, which is frequently discovered by excavation or geophysical survey. At Llanfor fort, for example, geophysics revealed the layout of the fort's interior (Hopewell 2005, 248; Hopewell and Hodgson 2012, 30-31). Not all the forts have had such investigations and therefore their orientations are not yet known.

3.5.10 The inclusion of other site types

The proximity to the forts of other contemporary site types and their visibility from the forts could have been a further theme to explore as part of the methodology. Relevant site types include settlements, industrial sites such as mines and quarries, and other Roman military installations. Many of these site types, however, have not yet been dated accurately and their use during the study period is not certain. This applies in particular to settlements, mines and quarries. Furthermore, their inclusion would involve the processing of many hundreds of sites and was therefore beyond the scope of this study.

3.6 The limitations of GIS

3.6.1 The Origins of GIS and its use in archaeology

Computers were used to plot and manipulate data about British plant life in 1950 by the Institute of Terrestrial Ecology in Huntingdon, England (Wheatley and Gillings 2002, 14). In the early 1960s the first true GIS was created in Canada and was known as the Canadian Geographic Information System. It was developed as an aid to countryside management and development. Similar systems were developed in the USA shortly after and by the late 1960s numerous commercially based GIS software companies were being established (Wheatley and Gillings 2002, 13-14; Chapman 2006, 16). GIS was first used in an archaeological context in the 1970s (Wheatley and Gillings 2002, 18).

Archaeologists have used GIS in a variety of ways, which have been categorised by some into two areas; Cultural Resource Management (CRM) and 'landscape analysis' (Lock 2003, 164). CRM involves the recording and management of known archaeological sites, features and finds. The ability of GIS to record spatial information on separate layers with associated databases which can be queried has led to its use for recording the results of fieldwork as well as forming a base for SMRs and HERs. GIS is also useful for landscape analysis because it not only provides a medium to present spatial data but can also use this to create new secondary data, such as viewsheds, to aid research (Wheatley and Gillings 2002, 13). GIS is constantly evolving and its uses in archaeology will no doubt expand as the software develops.

3.6.2 Limitations

There are, however, some issues of which to be aware when using GIS for archaeological research. Gillings and Wheatley explained some of these in the early 2000s and again more recently in 2020, and other researchers have highlighted them as part of their research. This sub-chapter explores some of the issues relevant to this research.

This project involves the creation of viewsheds and calculation of gradients in a GIS. These use a Digital Terrain Model (DTM) to represent the topography. The full methodology is presented above. The accuracy of the viewsheds and gradient calculations therefore depends on the accuracy of the DTM (Wheatley and Gillings 2000, 9-10; Wheatley 2002, 186-187; Conolly and Lake 2006, 9, 230; Gillings and Wheatley 2020, 319). The DTM used here is OS Terrain 5 and provides heighted points at 5m intervals, which is a good source from which to generate viewsheds. LiDAR data, providing heighted points at 0.5m, 1m and 2m intervals were available for sections of the study area but not throughout. This would have provided potentially more accurate results but, at the time of conducting the methodology, did not cover enough of the study area to be useful. The OS Terrain 5 DTM was therefore the most accurate DTM available. As detailed below, the viewsheds were compared to what was visible on the ground at two forts and it was found that they represented the views well. Furthermore, the data was also collected on-site from the forts where possible and the results were compared to the viewsheds so any

inconsistencies could be noted (Appendix II). It is nevertheless acknowledged that the DTM may have led to data that has some inaccuracies.

The presence or absence of vegetation is a factor that has been highlighted as a problem concerning visibility studies (Wheatley and Gillings 2000, 5-6; Conolly and Lake 2006, 230-231; Gillings and Wheatley 2020, 320). Viewsheds generated by a GIS show which areas of the terrain are visible and which areas are obscured by other areas of terrain. The presence of vegetation in the period being researched, however, may have obscured views that viewsheds show as being visible. As a further complication, the impact of vegetation on views may have been seasonal, with extra growth and leaves blocking views to a greater extent in summertime. The problem is usually discussed from the point of view of GIS but it applies also to fieldwork, where a clear view now may once have been obscured by vegetation. Some researchers have developed ways of adding the potential of vegetation to viewsheds. Gearey and Chapman (2006, 175-186), for example, studied pollen samples and watercourses to predict possible locations of alder around an Iron Age enclosure in Doncaster, England. They created viewsheds based on a model with no vegetation and another with the maximum vegetation based on their predictions. Such an approach, however, was not considered appropriate for the study of Roman forts here. Not enough palaeoecological data was available for each fort to be able to compare the results amongst the forts reliably. Furthermore, palaeoecological data could identify that certain vegetation was present in the area but could not show precisely where it was, nor (for some species) its size or shape. The viewsheds incorporating this type of data could therefore contain errors which could be compounded when assessing 48 forts. Llobera (2007, 803) discusses the possibility of using an algorithm to calculate the probability of visibility in a landscape that contains uncertain densities of vegetation. The algorithm is based on the mathematical principles of Beer-Lambert's Attenuation Law, which concerns the attenuation of light through a medium (2007, 801-802). Various densities of potential vegetation can be tested using the algorithm to create potential visibility scenarios (2007, 806). This approach, however, would work best with some understanding of contemporary vegetation (2007, 800). It was therefore decided to base the viewsheds purely on the DTM, acknowledging the potential for vegetation interference. It was also noted that the Roman army had the ability to clear vegetation if required, a theme that is considered further in Chapter 5.

Similarly, changes in geomorphology could also have caused some terrain and views from the fort to have changed since the Roman era (Wheatley and Gillings, 2000, 5; Conolly and Lake 2006, 230; Gillings and Wheatley 2020, 320-321). Erosion and sedimentation for example can alter the topography over time. The potential for the migration of rivers is discussed above. Researchers have assessed geomorphology changes in some landscapes and reconstructed the landscapes to what the evidence suggests matched that of a certain period (for example Alexakis, Sarris, Astaras and Albanakis 2011, 90-93). Similar to the vegetation situation, however, there is not enough required data covering the study area of this project to enable a suggested reconstruction of the landscape of the Roman era. Data collection was therefore based on the modern landscape, with an acknowledgement that some areas may have changed since the Roman period. Some landscape changes have occurred as a result of human actions, such as quarrying or large-scale landscaping associated with buildings and transport. Such changes were noted where possible during the data collection and have been highlighted in Chapter 4 where relevant.

The use of GIS for archaeological research has also received criticism for generating data scientifically but without consideration for how landscape is perceived by humans (Llobera 2003, 25). The scientific approach is in line with methods preferred in the era of New Archaeology of the 1970s, but more recent approaches have valued the incorporation and consideration of the human experience to data collection and analysis. These themes are discussed further in Chapter 2. GIS can provide calculations and generate new data but this is without human involvement. This project, however, uses GIS alongside fieldwork where possible and the site visit forms included space to note anything particular to each fort that would not have been recorded otherwise. It was also decided to assess some elements of the GIS data collection manually instead of using a GIS tool. For example, the number of forts with watercourses within their near distances could be generated automatically using GIS. Instead, each fort was examined in turn manually to identify the presence or absence of watercourses in each distance band by looking at the relevant layers in the GIS. Although not the same as being on-site, this allowed for some human interpretation and for the opportunity to identify unusual or extra data. If this method had not been used, for example, it may not have been noticed that watercourse banks were frequently visible where the watercourses themselves were not. The study therefore included the human experience by the author where possible, but it is acknowledged that how a person

perceives a landscape is drawn in part from their own culture and experiences and may differ considerably from that of a person assessing the landscape in the Roman era.

A further critique of GIS is that it can prompt an emphasis on the study of visibility over other potential topographical advantages (Wheatley and Gillings 2002, 202) and also over the study of other senses (Wheatley and Gillings 2000, 13; Conolly and Lake 2006, 233; Frieman and Gillings 2007, 4-7). This study examines fort siting in the topography and therefore considers more than simply visibility. It aims to examine multiple potential reasons for fort siting, such as proximity to water and other topographical features, with views from the forts balanced alongside other potential factors. It is acknowledged that the other human senses are not considered in this study. Researchers, such as Frieman and Gillings (2007, 10-11), have developed methods of including other senses in their methodologies. Sound and smell may have been a factor in fort siting but it was decided that expanding the methodology to include these was beyond the scope of this study; establishing the extra methodology then recording and analysing the extra data would have meant too much time would have to be taken from other areas of the study.

3.9 Summary

This chapter has explained how the forts were selected, the preparations undertaken for fieldwork and GIS processes, the steps taken during fieldwork and GIS processing, the types of data collected and the equipment, software and data used. It also provided explanations for the approaches that were chosen, expressing an awareness of the relevant limitations.

Table 3.1 summarises the data that was collected, the processes chosen to collect it and an explanation where relevant.

Table 3.1 Data collection processes

Data	Data collection process	Explanation	Potential research themes
Distribution	GIS: each fort, represented by a central point, was plotted onto a map of the study area.	This study is focusing on siting within the topography more than distribution, but the distribution of forts is relevant to some themes in the Discussion.	Communication, defence and control.
Elevation (highest point within fort)	GIS: contours.	To see if elevation may have been a factor in fort siting.	Defence and control.
Topography type in which fort is situated.	Fieldwork GIS: contours	Basic topography type, such as 'valley', 'undulating lowland' or 'undulating upland'. This is to identify potential patterns of fort siting.	Supply, transport and communication, defence and control.
Location within topography type.	Fieldwork GIS: contours	Siting within the basic topography type, such as 'valley side' or 'valley floor'. This is to identify potential variation or similarities in siting amongst forts in similar topography types and, if similarities are found, what their advantages may have been.	Supply, transport and communication, defence and control.
Topography within fort	Fieldwork GIS: contours	Basic description of the topography within the walls of a fort, such as 'sloping', 'flat' or 'concave'. To see if patterns might suggest key considerations to fort siting, such as scope for wide views.	Defence and control, practical aspects.

Data	Data collection process	Explanation	Potential research themes
Steepest gradient within fort	GIS: gradient calculation tool.	To see whether gradient may have been a factor in fort siting. This is to investigate themes such as a consideration for key practical aspects to fort siting, or what gradients may have been avoided.	Practical aspects.
Visibility within fort	Fieldwork GIS: viewsheds	Visibility of the area within the fort walls from the fort gates. To investigate whether forts consistently had good views of the space within their walls from the gates.	Defence and control.
Topography beyond the fort: near distance	Fieldwork GIS: contours	The character of the topography in the near distance beyond the fort walls, such as 'flat' or 'sloping'. This is to investigate patterns which may help contribute to themes such as the provision of natural defences, or space for extra-mural features.	Defence and control, practical aspects.
Gradients of land beyond the fort	GIS: gradient calculation tool.	The maximum gradients of land beyond the fort, either descending from the fort or ascending from the fort. To investigate themes such as the provision of natural defences, or space for extra-mural features.	Defence and control, practical aspects.
Visibility of topography	Fieldwork GIS: viewsheds	To see if there are patterns of visibility of	Defence and control.

Data	Data collection process	Explanation	Potential research themes
beyond the fort: near distance		near distance areas amongst the forts.	
Topography types beyond the fort: middle distance	Fieldwork GIS: contours	To identify what topography types are present within the middle distances of forts and whether there are any similarities amongst the forts.	Defence, transport, communication and supply.
Visibility of topography beyond the fort: middle distance	Fieldwork GIS: viewsheds	To identify what topography types are visible in the forts' middle distances and whether there are patterns or similarities amongst the forts.	Defence and control.
Topography types beyond the fort: far distance	Fieldwork GIS: contours	To identify what topography types are present within the far distances of forts and whether there are any similarities amongst the forts.	Defence, transport, communication and supply.
Visibility of topography beyond the fort: far distance	Fieldwork GIS: viewsheds	To identify what topography types are visible in the forts' far distances and whether there are patterns or similarities amongst the forts.	Defence and control.
Fort's relative altitude to surrounding topography: near, middle and far distances	Fieldwork GIS: contours	To consider whether forts were ever at the lowest points or highest points within their near, middle and far distances.	Defence and control.

Data	Data collection process	Explanation	Potential research themes
Presence of valley meeting points in near and/or middle distances	GIS: contours	To identify what proportion of forts were situated near to valley meeting points.	Supply, transport and communication.
Location of fort in relation to valley meeting point(s)	GIS: contours	To identify what proportion of forts were located at the point where valleys meet.	Supply, transport and communication.
Visibility of valley meeting point(s)	GIS: viewsheds and contours	To identify the number of forts, which have valley meeting points in the near and middle distances, had some visibility of the meeting points.	Defence and control.
Visibility of the full widths of valleys	GIS: viewsheds and contours	Whether or not the full width of a cross-section of a valley, including valley sides, is visible from the fort.	Defence and control.
Type of watercourse closest to fort	Fieldwork GIS: Modern OS maps and early edition OS maps	For the purposes of this study, rivers which empty directly into the sea (i.e. are not tributaries) are referred to as 'main' rivers. Watercourse types therefore could include main rivers, rivers and streams. Watercourses are identified as rivers, as opposed to streams, if they are named as such on the OS mapping.	Supply, transport and communication.
Watercourse(s) present on 2 or more sides of the fort	GIS: Modern OS maps and early edition OS maps	To record how many forts were located within a bend in a watercourse or similar	Defence, transport and communication.

Data	Data collection process	Explanation	Potential research themes
Presence of watercourse confluences in near and/or middle distances of fort.	GIS: Modern OS maps and early edition OS maps	How many forts have confluences in their near and/or middle distances.	Supply, transport and communication.
Visibility of confluences	GIS: viewsheds, Modern OS maps and early edition OS maps	To determine how many forts had some visibility of the confluences.	Defence and control. defence and control.
Occurrence of watercourses: near distance	Fieldwork GIS: Modern OS maps and early edition OS maps	To determine how many forts had watercourses close enough to run through their near distances.	Defence, supply, transport and communication.
Visibility of watercourses: near distance	Fieldwork GIS: viewsheds, modern OS maps and early edition OS maps	To determine how many forts had at least some visibility of the watercourses running through their near distances. This may be relevant to the themes of defence and control.	Defence and control.
Occurrence of watercourses: middle distance	Fieldwork GIS: Modern OS maps and early edition OS maps	To determine how many forts had watercourses running through their middle distances.	Defence, supply, transport and communication.
Visibility of watercourses: middle distance	Fieldwork GIS: viewsheds, modern OS maps and early edition OS maps	To determine how many forts had at least some visibility of the watercourses running through their middle distances.	Defence and control.
Occurrence of watercourses: far distance	Fieldwork GIS: Modern OS maps and early edition OS maps	To determine how many forts had watercourses running through their far distances.	Supply, transport and communication.

Data	Data collection process	Explanation	Potential research themes
Visibility of watercourses: far distance	Fieldwork GIS: Modern OS maps and early edition OS maps	To determine how many forts had at least some visibility of the watercourses running through their far distances.	Defence and control.
Fort location in relation to the narrowing of valleys	GIS: contours	During the data collection, it was noted that some forts were located as close to the narrowing of the valley as possible. It was therefore decided to record the number of forts to which this applied.	Defence and control.
Visibility of valley floor towards valley narrowing	GIS: viewsheds and contours	During the data collection it was also noted that some forts which were located as close to the narrowing of the valley as possible also had full views of a cross-section of the valley in the direction of the valley narrowing. It was therefore decided to record the number of forts to which this applied.	Defence and control.
Orientation of forts	Desk-based research: published books and journals	The layout of buildings within the interior of some of the forts is known enough to be able to identify their orientation. The orientation of the forts, where known, was noted.	
Topography types towards which fort is orientated: near,	GIS: contours, modern OS maps and early edition	To examine whether forts tended to point towards certain features in the topography.	Defence, control and supply.

Data	Data collection process	Explanation	Potential research themes
middle and far distances	OS maps, HER data		
Proximity to Roman roads: near, middle and far distances	GIS: OS maps and HER data	To examine how close the forts were to the Roman road network.	Communication and transport, supply and control.
Visibility of Roman roads: near, middle and far distances	GIS: OS maps, HER data and viewsheds	To record how many forts had at least some visibility of the Roman roads.	Supply, defence and control.

The table also presents the research themes to which, prior to the data collection, it was predicted the results may have been relevant. Themes that were found to be relevant once the data had been collected and analysed are discussed in Chapter 5.

4. Results

4.1 Introduction

This chapter presents the results of the data collection. The aims were to examine the topography types in which the forts were situated, the forts' altitude in relation to the surrounding topography, their orientation, proximity to watercourses, confluences, the sea, valley meeting points and known Roman roads and views from the forts of these features. It aims to use this data to contribute to questions and debates regarding the advance and occupation of Wales up to the end of the Flavian era.

Section 4.2 outlines which forts had data collected by GIS or fieldwork and GIS combined. Section 4.3 explains any differences in the results between the data collected by fieldwork and by GIS and Section 4.4 explains the approaches used when the two sets of data differed. Section 4.5 presents the data regarding the siting of forts in the topography of the study area. It presents data in relation to distribution, elevation, topography types in which the forts were sited, topography types within the near, middle and far distances of the forts and their visibility, proximity to valley meeting points and their visibility, and the visibility of the full width of valleys. Section 4.6 presents the data regarding the siting of forts in relation to water features. This includes the proximity of forts to main watercourses, confluences, the occurrence of watercourses in the near, middle and far distance bands, proximity to the sea and visibility of these features from the forts. Section 4.7 presents data concerning fort location in relation to the narrowing of valleys and Section 4.8 sets out the data regarding fort orientation in relation to the topography. Section 4.9 presents the data relating to the proximity of Roman roads to the forts and their visibility. Section 4.10 highlights the differences between visibility from the gates of each fort. Sections 4.11 and 4.12 compare the results for sites that have apparently relocated and between legionary fortresses and auxiliary forts. Section 4.13 highlights the results that occurred most frequently at the forts.

4.2 Forts assessed

As discussed in Chapter 3, 48 forts were identified for data collection. Data was collected for all 48 of these forts (Table 4.1). GIS data collection was carried out for all 48 forts. Twenty-two forts were visited and fieldwork data collection was carried out. Data collection was attempted on-site at a further 4 forts but could not be carried out. Appendix IV provides details of the data collected for each fort and explanations for the attempted visits. Six forts were not accessed because of time or weather restraints.

The fieldwork and GIS data collection took place from the gates of each fort; a full explanation can be found in Chapter 3. All the forts had a maximum of 4 gates. Of the 22 visited forts, all the gates were accessed at 10 forts, 3 gates were accessed at 4 forts, 2 gates were accessed at 6 forts and 1 gate was accessed at 2 forts (Table 4.1). Access to all gates was not possible at all forts because access had not been granted for all gates or because it was not physically possible to reach the gate location.

Table 4.1 Data collection at the forts

Data collection	Number of forts
Forts from which data were collected by GIS	48
Forts visited and data collected	22
Forts not visited	26
Attempted visits (no data collected)	4
Forts where all gates were accessed	10
Forts where 3 gates were accessed	4
Forts where 2 gates were accessed	6
Forts where 1 gate was accessed	2
Total number of fort gates from which data was collected via fieldwork.	66

The possibility of changes in topography after the Roman era was kept in mind during the fort visits. Such changes could be caused by events such as quarrying and landscaping for parkland or building projects. No potential topographical

changes were noted during the fort visits but it is possible that some were not easily identified on the ground and therefore overlooked.

4.3 Fort visit and GIS data comparison

In some instances, the data collected by fieldwork differed from that collected by GIS; the GIS based its viewsheds on topography alone and therefore, where non-topographical features (such as modern houses) obscured the views during fieldwork, the results from the two methods differed. The view northwards from the north-west gate of Segontium (Figure 134), for example, was recorded as obscured by trees during fieldwork, whereas the results from the GIS viewsheds recorded a downward slope, becoming obscured. Occasionally, where modern non-topographical features did not obscure the view, topographical features appeared differently during fieldwork from the results of the GIS viewsheds. At Llandeilo I and II, for example, the interiors of the forts were recorded as partially visible (semi-obscured by topography) during fieldwork but fully visible by the GIS (Figures 89 and 92). Where both fieldwork and GIS data collection had been carried out, therefore, the two sets of results were compared and it was recorded whether the results were the same or differed and, where possible, what may have caused the discrepancies (Appendix II).

4.4 Data sources used for results analysis

To process the results, it was necessary to choose which set of data to use where the data collected during fieldwork differed from that collected by GIS. In each case, the data set and reasons for the decision were recorded. These records can be found in Appendix II. Where the views of the topography differed between the fieldwork and GIS results but the differences were not caused by post-Roman features, the fieldwork data was chosen. As discussed in the Methodology, it is possible that both the GIS data and fieldwork data contain inaccuracies or errors. The experience on-site, however, is the closest to that experienced at the time of the Roman occupation and therefore the preferred data source where a choice is required. For example, the fieldwork data was used at Llandeilo I and II.

In most cases, the site visit and GIS data of the forts were similar. It should be noted, however, that where obscured areas were recorded during fieldwork, it was

frequently the result of modern, non-topographical features instead of or alongside the topography that were also causing the obscured areas in the GIS. This was the case at the fort of Llanfor, for example, where trees obscured some near distance views beyond the fort extent during fieldwork but the GIS data showed that the views beyond the fort were also partially obscured by the topography (Figures 101 and 102).

4.5 Topography

4.5.1 Distribution

Figure 1 (Appendix XIII) shows the location of the 48 forts within the study area.⁹ The possibly pre-Flavian forts (Appendix I) are present in the north, centre and south of the study area but do not extend as far west as some of the later forts. The Flavian forts are also present in the north, centre and south. Some forts are situated very close to others. In some cases these are known to represent shifts in site; Caersws I was replaced by Caersws II for example. Frequently, in these cases, the original site is thought to be pre-Flavian and the later was Flavian in date. Some forts were situated relatively near to each other but no evidence of site shifting has yet come to light. Pen Llwyn and Trawscoed are only approximately 8.2km apart, for example, and Forden Gaer and Brompton are 6.9km apart. There are areas where, in light of the density of forts elsewhere in the study area, it appears that there are forts missing. No confirmed pre-Flavian or Flavian forts are known in the SW of Wales or NE of Wales, for example. There is also a slightly higher concentration of forts known in the S of the region than in the N.

The 6 legionary fortresses known in the study area are confined to the E. Four are present in the SE, although they were not contemporary; Kingsholm's site was shifted to Gloucester. The later fortress of Usk was also abandoned in favour of Caerleon. Wroxeter was a pre-Flavian fortress in the centre-E of the study area. Chester fortress, of Flavian or possibly earlier foundation (Mason 2010, 172), is located to the NE.

Figure 2 also shows the terrain of the study area. The relationship of the forts to topographical features are presented below.

⁹ All Figures are located in Appendix XIII.

This research focused on the forts' visibility of topographic features and siting within the topography but it was noted that none of the forts was intervisible with any of the other forts in the study area.

4.5.2 Elevation

The elevation ranges of the forts were recorded using the contour files within the GIS. (The elevation ranges for each fort are presented in Appendix V Table V.2).

Table 4.2 Fort elevation data

Lowest elevation	10 MASL
Highest elevation	370 MASL
Lowest elevation range within a fort	0m
Highest elevation range within a fort	15m

As presented in Table 4.2, the lowest elevation within a fort was 10 MASL (metres above sea level), recorded at Neath II, Loughor, Carmarthen and Kingsholm. The full extent of Kingsholm fort is uncertain and therefore its elevation was estimated. The highest elevation within a fort was 370 MASL, recorded at Cae Gaer. The lowest range in elevation was 0m, representing forts with flat interiors (discussed further in Section 4.5.5 below). The greatest elevation range was 15m, which occurred at the forts of Tomen y Mur, Clyro and Leighton. The remainder of the forts had elevation ranges of 10m or less.

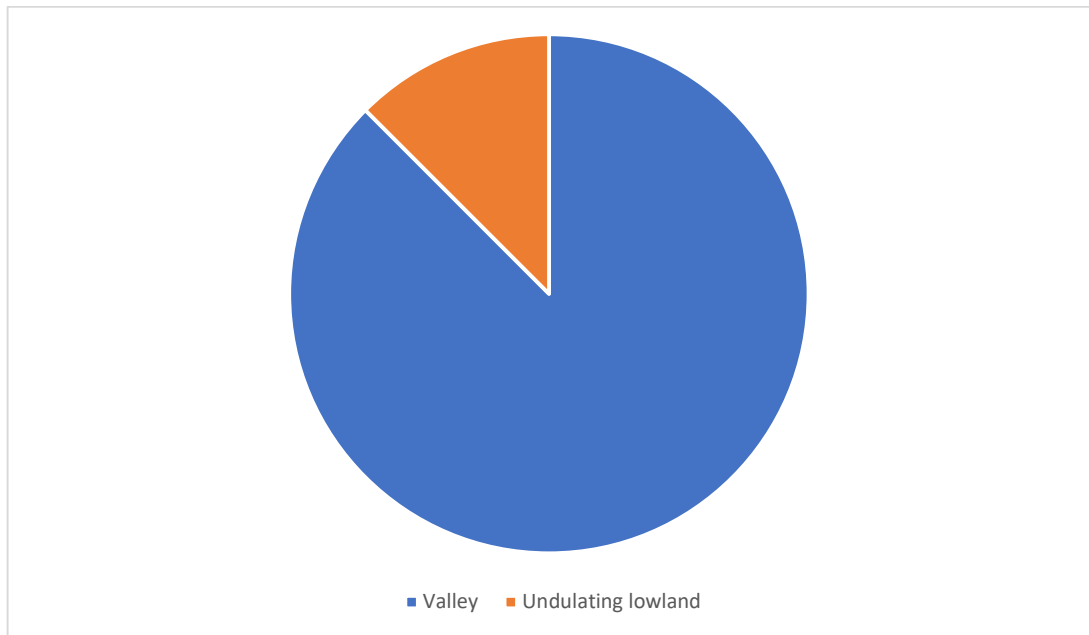
4.5.3 Topography type

The topography types in which the forts were located were recorded. The results for each fort are displayed in Appendix V, Table V.1.

Table 4.3 Forts in each topography type

Topography type	Number of forts	Percentage of forts
Valley	42	87.5
Undulating lowland	6	12.5

Chart 4.1 Forts in each topography type



Forts categorised within the 'valley' topography type are located within the valley bases or valley sides. Caerhun, for example, is located within the valley floor, Tomen y Mur on a valley side and the Llandovery forts are on a promontory extending from the valley side separating two valleys (Figures 29, 30, 137, 138, 95, 96, 98 and 99).

Table 4.3 and Chart 4.1 show that most (87.5%) of the forts are associated with valleys. As discussed in Chapter 1, this reflects the terrain of the study area; with large areas of hills and mountains, valleys are numerous. Nevertheless, it is within the valleys of these areas, as opposed to hilltops, mountaintops or areas of undulating upland, that most of the forts were located.

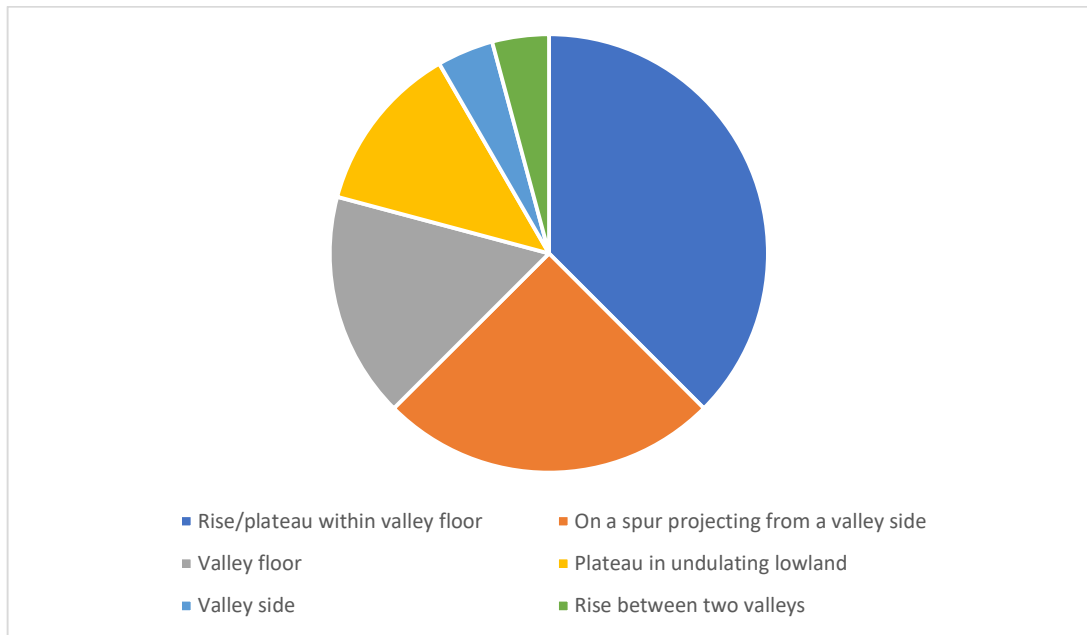
4.5.4 Location within topography type

The fort locations within the topography types were also recorded.¹⁰ The results for each fort are presented in Appendix V, Table V.1.

Table 4.4 Specific locations of forts within topography types

Location type	Number of forts	Percentage of forts
Rise/plateau within valley floor	18	37.5
On a spur projecting from a valley side	12	25
Valley floor	8	16.7
Plateau in undulating lowland	6	12.5
Valley side	2	4.2
Rise between two valleys	2	4.2

Chart 4.2 Specific locations of forts within topography types



As shown in Table 4.4 and Chart 4.2, the topography type with the greatest number of forts (37.5%) was a rise or plateau within a valley floor, such as Caerhun and

¹⁰ Appendix XII provides definitions of the topography types.

Neath II (Figures 29 and 113). The next most common location was on a spur projecting into the valley floor from a valley side (25%), such as Pennal and Llandovery I and II (Figures 122, 95 and 98). The highest points of these spurs tended to be lower in altitude than those of the valley sides. Only 8 (16.7%) of the forts were located on the valley floor, including Caer Llugwy and Caersws II, as opposed to on a definite rise or plateau within the valley floor (Figures 20 and 41). As discussed below, however, the valley bases were rarely completely flat. Even fewer forts (2; Tomen y Mur and Pen Llwyn) were located on valley sides (Figures 137 and 116).

Two forts, Gelligaer I and Segontium, have been assigned the location type 'rise between 2 valleys'. Gelligaer I is in an unusual location on the gentle E slope of a wide but not particularly high hill between two valleys (Figures 71 and 72). The hill is too large to represent a rise in a wide valley but cannot comfortably be characterised as a valley side. Segontium is on a rise that separates the Cadnant and Seiont valleys, in an area where the valleys are widening to a coastal zone (Figures 134 and 135).

The 6 forts in the topography type of 'undulating lowland', including Caerau and Chester, were located on plateaus/wide undulations within the lowland zones. Cardiff is included here, although the undulations surrounding the fort were only very slight (Figures 23, 24, 53, 54, 44 and 45).

The location within the topography types are therefore varied but most (83.4%) are on a significant rise of some sort (rise, plateau or spur); only the 16.7% that were on the base of a valley were not elevated, although, as discussed below, these areas were rarely completely flat.

4.5.5 Topography within forts

The topography within the forts was recorded during fieldwork and using the GIS. The topography within each fort is varied. Appendix V, Table V.2 shows the results for each fort.

Table 4.5 Topography within the forts

Topography within forts	Number of forts	Percentage of forts
Sloping	11	22.9
Flat	4	8.3
Domed	5	10.4
Central spine	2	4.2
Mix of flat and sloping	3	6.3
Sloping and domed	13	27.1
Sloping and central spine	10	20.8

Chart 4.3 Topography types within forts showing all the sloping forts together

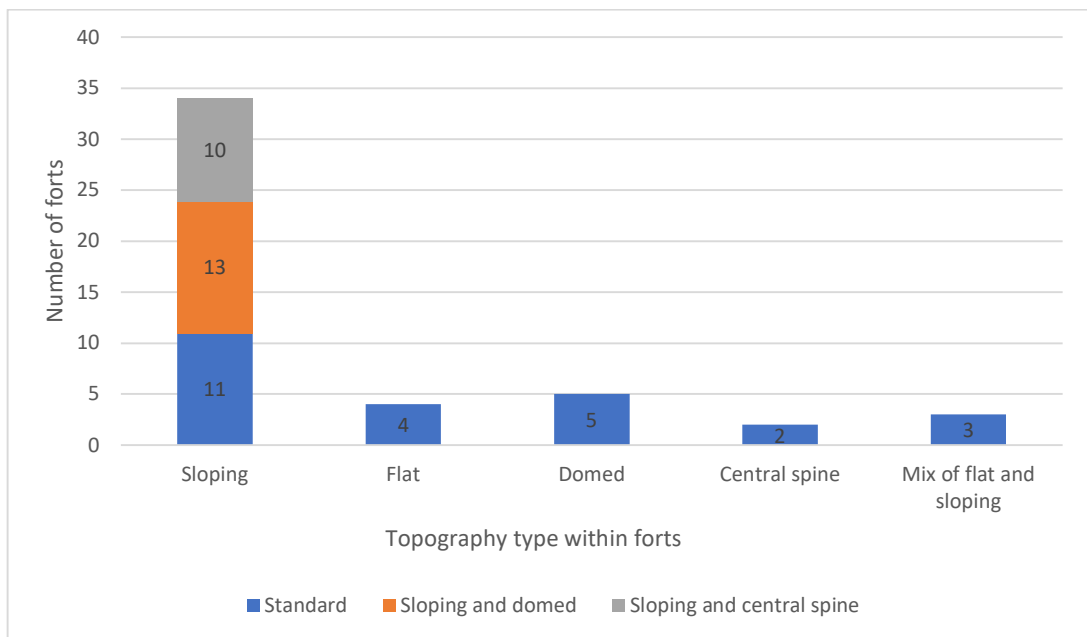


Chart 4.4 Topography types within forts showing all the domed forts together

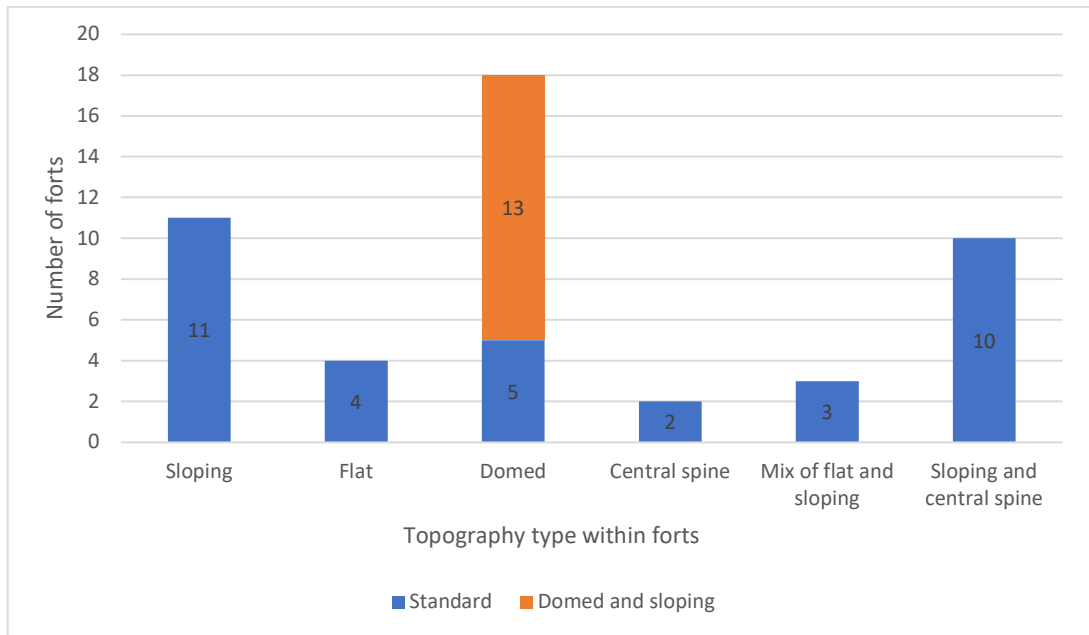
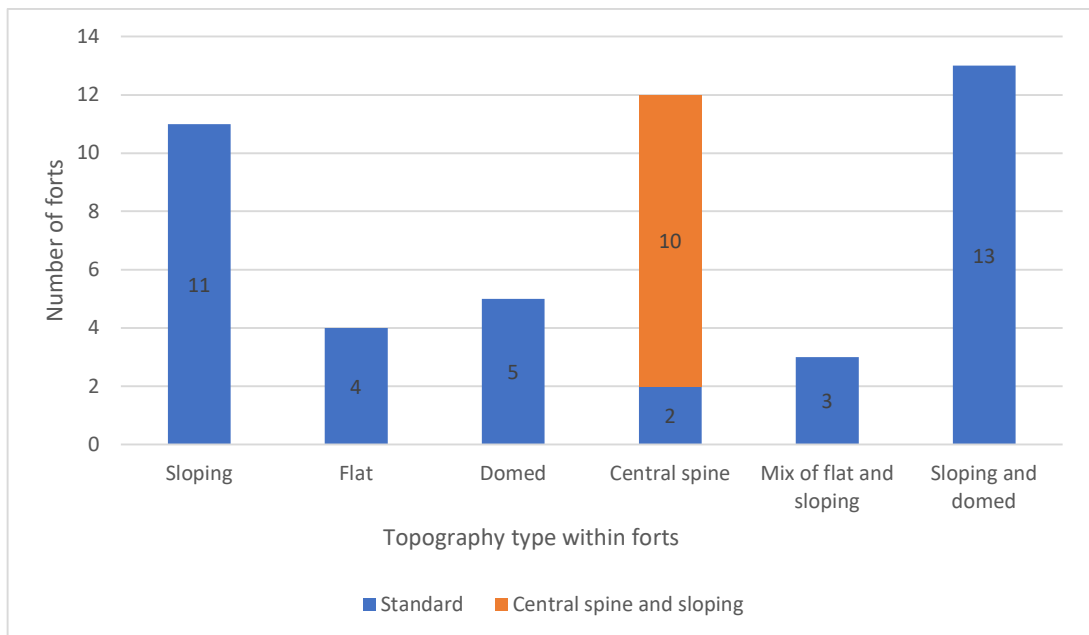


Chart 4.5 Topography types within forts showing all the central spine forts together



Most forts also had some slight (usually less than 1m) undulations, which were not recorded here.

Most of the forts are on sloping ground, either with a central spine or dome or with a simple slope. Chart 4.3 demonstrates this by showing all the forts that are on sloping land compared to forts that have other types of topography within their extents. Pumsaint is an example of a fort on gently sloping ground (Figure 128). The proportions of forts on ground with a dome or central spine, with or without a slope, are also high, as demonstrated in Chart 4.4 which compares numbers of forts containing domed topography to forts containing other types and Chart 4.5 which shows the same for forts containing a central spine. Tomen y Mur is an example of a sloping fort with a central spine (Figure 137). Caergwanaf has a central spine without a slope along its axis (Figure 26). Coelbren is located on domed land with a gentle slope and the land within the fortress of Gloucester has a slight dome (Figures 62 and 74).

In contrast, only 4 forts are categorised as completely flat, such as Caer Llugwy (Figure 20), and 3 have a combination of flat and sloping areas, including Jay Lane where the NE of the fort is flat but the SW slopes towards the River Clun (Figure 80).

Most forts, therefore, had at least one aspect; those on land which was sloping and domed or sloping with a central spine had a dominant aspect in the direction of the main slope, but also aspects created by the dome or central spine. Fort gates therefore frequently had aspects which differed slightly from the other gates of the same fort, enabling a wider range of views from each fort. Comparisons of views from the fort gates are discussed further in Section 4.10. It was noted that none of the forts was located on land that was concave in shape, which would have created aspects from the gates directed towards the space within the forts.

The steepest gradients within the forts were calculated using GIS. Results for each fort are presented in Appendix V, Table V.2. The steepest gradients range from 0.5 degrees (Caer Llugwy) to 23 degrees (Loughor). These gradients represent the steepest sections of the fort, and therefore a steep but small undulation could exaggerate the impression of a fort's gradient slightly. Nevertheless, the results show a wide range of maximum gradients.

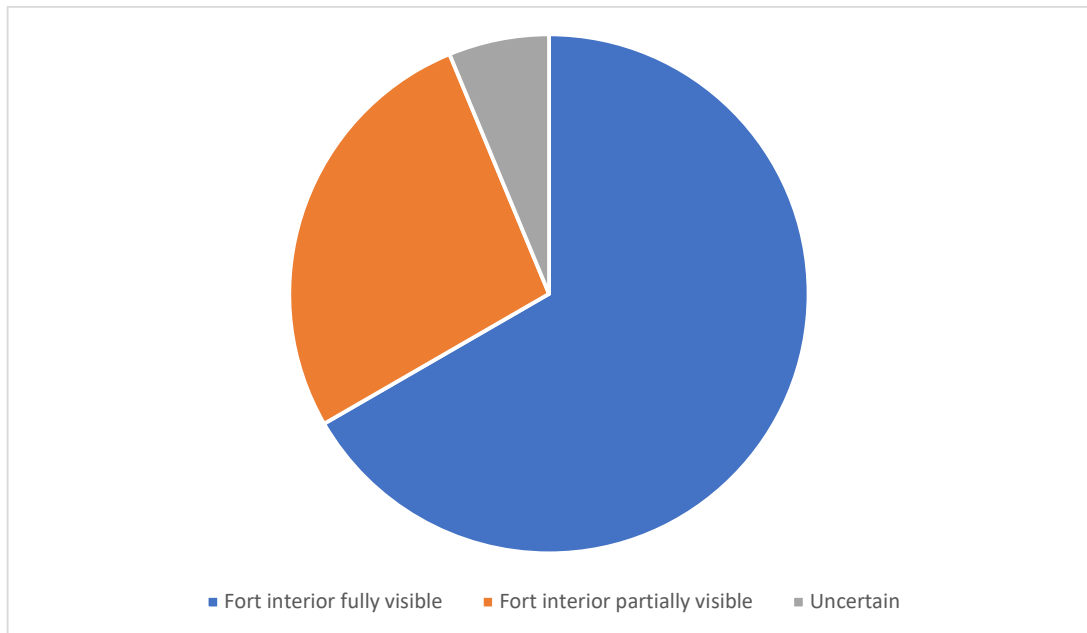
4.5.6 Visibility within forts

The levels of visibility within the forts from the fort gates were recorded. Appendix V, Table V.2 shows the results for each fort.

Table 4.6 Levels of visibility within forts

Level of visibility	Number of forts	Percentage of forts
Fort interior fully visible	32	66.7
Fort interior partially visible	13	27.1
Uncertain	3	6.3

Chart 4.6 Levels of visibility within forts



The forts that are marked as uncertain are Monmouth, Colwyn Castle and Kingsholm. The precise location of their gates are not known and it is therefore not possible to determine the visibility within the forts from the gate locations.

All the other fort interiors were at least partially visible and most (66.7%) were fully visible. The full interior of Brecon Gaer, for example, was visible (Figure 5). Where the interiors were partially visible it was only usually very small areas that were

obscured, such as Pennal (Figure 122). Features such as undulations, domes, central spines and sometimes slopes of the interior topography caused obscured areas within the forts from some individual gates. In these cases, however, most of the obscured areas from one gate were usually visible from another gate of the fort, such as Caer Gai. Comparisons between gates will be outlined further in Section 4.10 below.

Although visibility within the fort from the gates may have been useful, an argument that will be explored further in Chapter 5, it should be noted that once the fort was filled with buildings and structures, visibility of the fort interiors from the gates would have reduced.

4.5.7 Topography beyond the forts: near distance

The topography of the areas beyond the forts in the near distances was recorded during fieldwork and using GIS. The results for individual forts are displayed in Appendix V, Table V.3.

All but one of the forts have land that:

- descends beyond the fort extents on 1 to 3 sides of the fort and
- remains flat or ascends on the remaining side(s).

Usk is the exception; apart from some small undulations it is flat on all sides beyond its defences in the near distance until the start of the rise of the valley sides (Figures 143 and 144). The areas beyond Cardiff and Caerphilly forts have been subject to some landscaping since the Roman era and the extents and gradients of the land may have altered slightly.

In some instances, the descending and ascending slopes continue into the middle distance band, such as at Tomen y Mur, Penydarren and Gelligaer (Figures 137, 125 and 71). In other cases, the topography changes again within the near distance band; where a river runs through the near distance, for example, the land usually descends to the river then flattens or ascends again beyond the river. Examples of this can be found at Jay Lane, Brecon Gaer and Trawscoed (Figures 80, 5 and 140).

The gradients of the land descending and ascending beyond the forts was calculated using the GIS and there was a wide range of results (Appendix V, Table V.3 shows the full results).¹¹

Table 4.7 Maximum gradients of land descending beyond the forts in the near distances

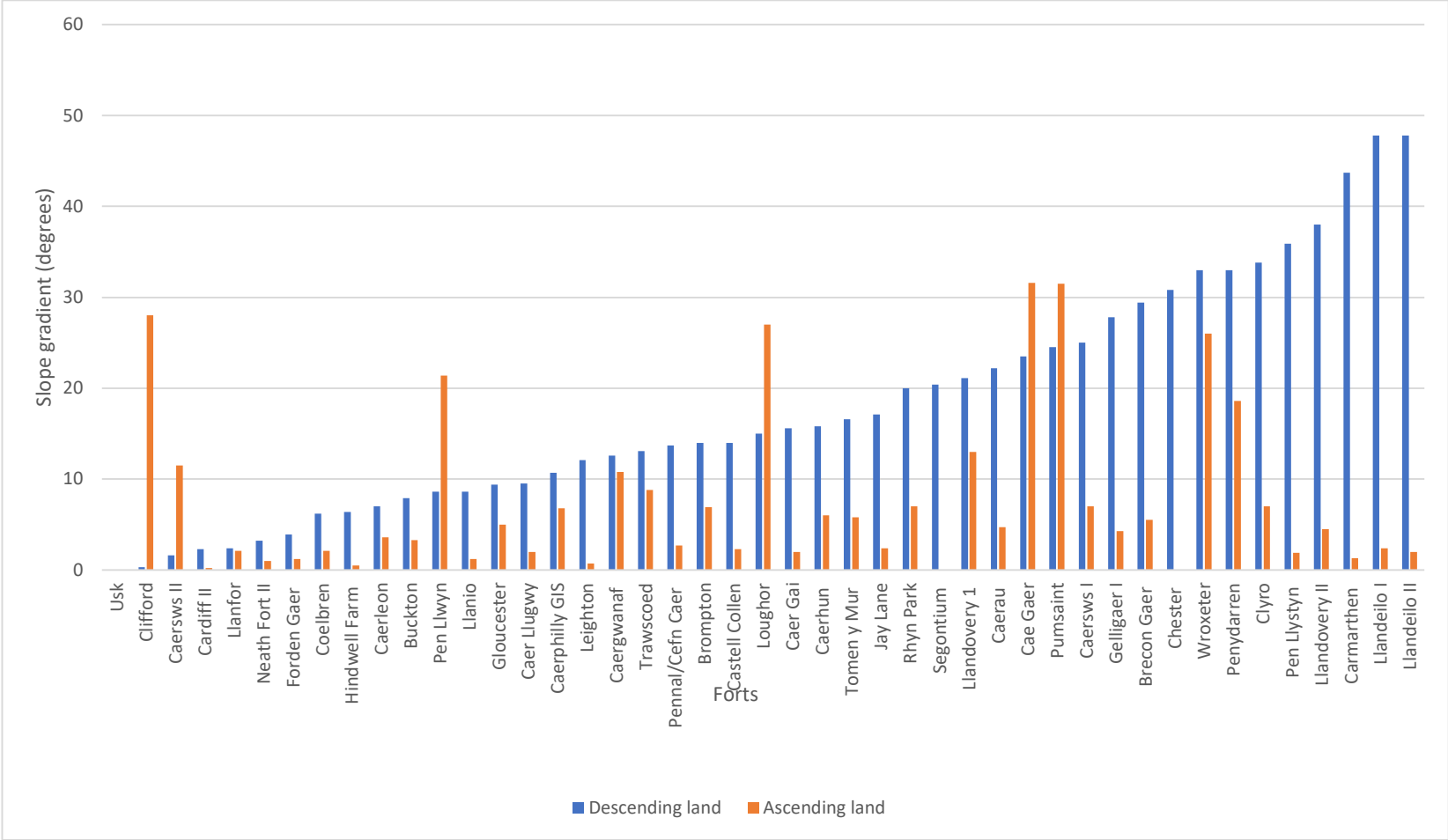
Lowest gradient	Highest gradient	Average gradient
0 degrees	47.8 degrees	17.9 degrees

Table 4.8 Maximum gradients of land ascending beyond the forts in the near distances

Lowest gradient	Highest gradient	Average gradient
0 degrees	31.6 degrees	7.4 degrees

¹¹ The gradients calculated did not include the banks of rivers or streams.

Chart 4.7 Maximum gradients of descending and ascending land beyond the forts in the near distances.



These results do not include the gradient of land beyond Monmouth, Colwyn Castle and Kingsholm forts because the full extent of these forts are not certain.

The data in Tables 4.7 and 4.8 and Chart 4.7 show a wide range of maximum gradients of both the ascending and descending areas beyond the fort extents in the near distance. As discussed above, the land beyond the fortress of Usk was 0 degrees on all sides, apart from some small undulations. This was the only fort that was completely flat on all sides immediately beyond the defences. Some forts, such as Clifford, had very shallow descending land (0.3 degrees) whereas the descending land at some others was much steeper, such as 47.8 degrees at Llandeilo I and II (Figures 56, 89 and 92). Similarly, there was a wide range of gradients of ascending land, such as Neath with a gradient of 1 degree and Cae Gaer with a gradient of 31.6 degrees (Figures 113 and 14). As shown in Chart 4.7, if the ascent or descent was shallow or steep, the corresponding descent or ascent beyond the same fort was not necessarily equally as shallow or steep; at Gelligaer I, for example, the maximum descent was 27.8 degrees but the maximum ascent was only 4.3 degrees (Figure 71).

The average descending gradients (17.9 degrees) and the average ascending gradients (7.4 degrees) demonstrate that the gradients of the descending land tended to be higher than those of the ascending land. Chart 4.7 similarly demonstrates that at each fort, with some exceptions, and as a general trend, the ascending land tended to be of lower gradients than the descending land beyond the forts.

Furthermore, some of the ascending and descending land had very low gradients but the low-gradient slopes were more numerous amongst the ascending land; only 8 forts had descending land beyond the fort that was 5 degrees or less, whereas 27 forts had ascending land of 5 degrees or less beyond the fort extents.

The low gradients beyond some forts made some ascending and descending areas appear flat on-site, although lack of access to all fort areas and views obscured by non-contemporary features may also have contributed to the inconsistency. The ascending area at Caerhun, for example, was recorded as flat during fieldwork but only 2 gates were accessible and trees obscured some of the views. Of the forts that were visited, 5 had ascending areas beyond the forts that were recorded as flat during fieldwork (such as Caerhun), 2 (Llanfor and Caersws II) had both ascending

and descending areas that were recorded as flat and 1 (Hindwell Farm) had descending areas recorded as flat.

As explained in the previous chapters, this study focuses on the topography in which the forts were sited and does not examine other contemporary sites. However, during the data collection it was noted that buildings associated with the extra-mural settlements (*vici* and *canabae*), where known, were usually located on the areas of descending land outside the forts, leaving the flat or ascending areas free or partially free. At Caer Gai, geophysics has identified vicus features to the south-west and north-east of the fort (Hopewell et al. 2005, 233-235). The south-west area is on land descending from the fort and the north-east area takes up a small section of the level area to the north and north-east of the fort but leaves much of it clear. In some instances this may be a result of a lack of research on all sides of some forts and further investigations may alter this apparent trend. At Segontium, for example, *vicus* features are known to the north-west, west and east of the fort (Davies and Casey 2010, 220, 223; Hopewell 2020, 1) but few are known in the flat area to the fort's north-east, but this area is heavily built-up with modern housing and may conceal further evidence.

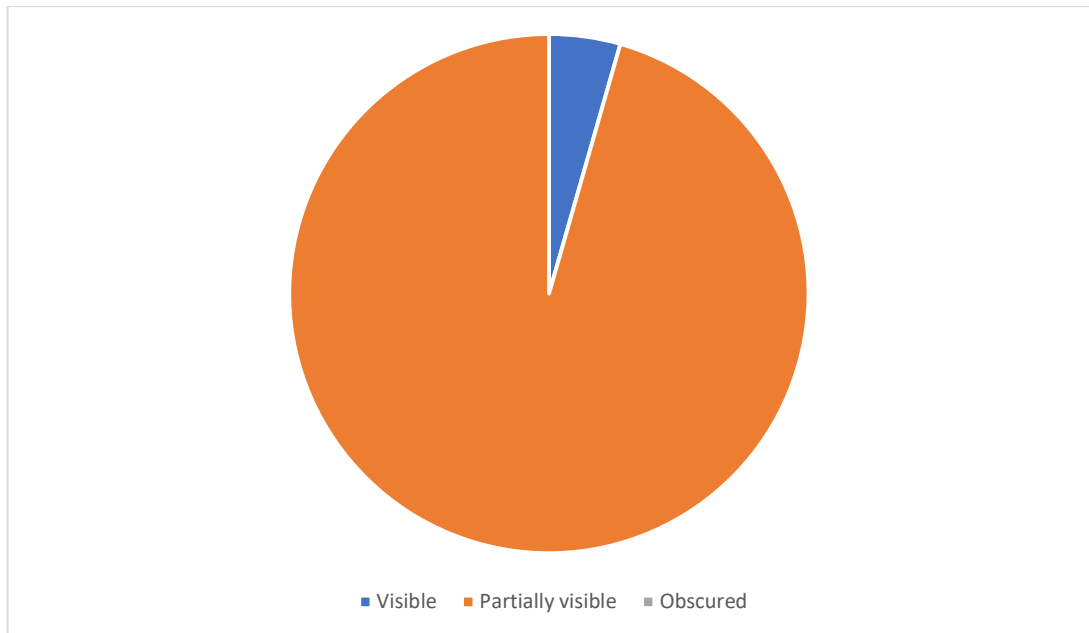
4.5.8 Visibility beyond the forts: Near distance

As discussed above, the results show that all but one of the forts have land in the near distance that descends beyond the fort extents on 1 to 3 sides and remains flat or ascends on the remaining side(s). The visibility of these slopes from the combined views from the fort gates was recorded (Appendix V, Table V.4).

Table 4.9 Visibility of descending or flat land beyond the forts in the near distance

Level of visibility	Number of forts	Percentage of 45 forts (which exclude the 3 forts whose full extents are uncertain)	Percentage of all 48 forts (including uncertain)
Visible	2	4.4	4.2
Partially visible	43	95.6	89.6
Obscured	0	0	0

Chart 4.8 Visibility of descending or flat land beyond the forts in the near distance



No descending areas beyond the forts were completely obscured from the fort gates; all were visible or partially visible, although only two were completely visible. The ascending and descending areas beyond both Cardiff and Caerphilly forts were recorded as partially visible although, as mentioned above, the areas have altered since the Roman era and therefore it is possible that the views may have differed during their occupation.

The obscured areas were frequently caused by the ‘hidden dips’ created as the land falls away beyond the fort extents and is obscured by the land between the observation point and the descent. The land frequently come into view again further from the fort extents as it continues to descend or levels out, such as at Brecon Gaer (Figure 5). This may account for the fact that slightly more of the ascending/flat areas were fully visible. These obscured areas may have been visible from the height of the fort gates and therefore the presence of so many obscured sections of descents may in part be a result of the methodology.

Table 4.10 Visibility of ascending or flat land beyond the forts in the near distance

Level of visibility	Number of forts	Percentage of 45 forts (which exclude the 3 forts whose full extents are uncertain)	Percentage of all forts (including uncertain)
Visible	9	20	18.8
Partially visible	36	80	75
Obscured	0	0	0

Chart 4.9 Visibility of ascending or flat land beyond the forts in the near distance

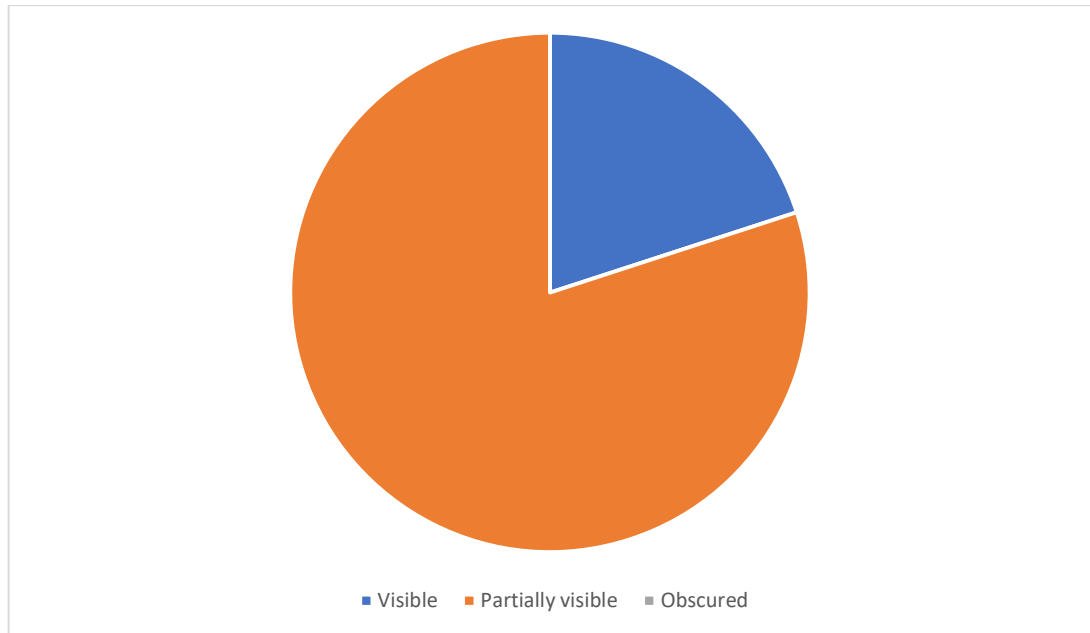


Table 4.10 and Chart 4.9 show that all the ascending/flat areas were visible or partially visible from the fort gates. The views of these ascending/flat areas were partially visible from most (80%) of the forts. The obscured sections were usually caused by changes in gradient and undulations in the ascending areas. The ascending area beyond Caerleon is recorded as partially visible although, prior to the construction of the modern road running through the area, it may have been visible (Figure 32). Modern features obscure some views beyond other forts but topographical features also obscured some of the views and therefore the 'partially visible' result for these forts would still apply regardless of the modern features. At Caersws II, for example, both the ascending and descending areas beyond the forts were recorded as partially visible during fieldwork and using the GIS. The obscured areas were caused by topography on the GIS but during fieldwork it was non-contemporary features that obscured the views.

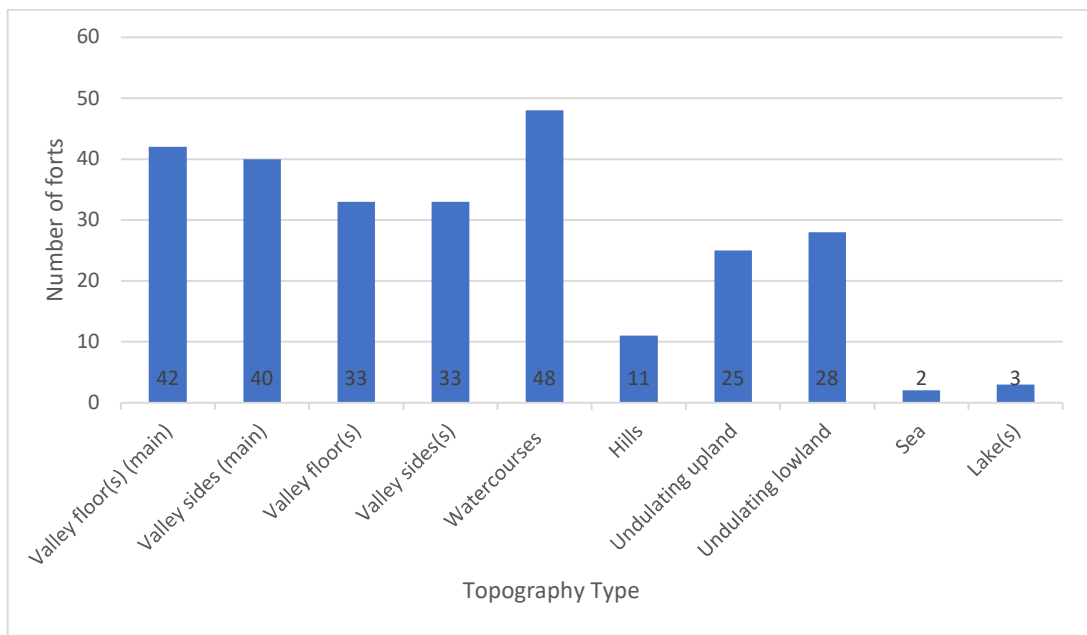
4.5.9 Topography types present: Middle distance

Topography types within the middle distance of each of the 48 forts were recorded using the GIS. Visible topography types in the middle distance were also recorded during fieldwork; the visibility of the topography types is presented in section 4.5.10 below. The results for each fort are presented in Appendix V, Table V.5.

Table 4.11 Number of forts which contain each topography type within the middle distance

Topography type	Number of forts	Percentage of forts
Valley floor(s) (main)	42	87.5
Valley sides (main)	40	83.3
Valley floor(s)	33	68.8
Valley sides(s)	33	68.8
Watercourses	48	100
Hills	12	25
Undulating upland	25	52.1
Undulating lowland	28	68.3
Sea	2	4.2
Lake(s)	3	6.25

Chart 4.10 Number of forts which contain each topography type within the middle distance



Main valley floor(s) and main valley sides refer to the valley in which a valley-based fort is situated.¹² At some forts there was more than one main valley. At Segontium,

¹² For definitions please refer to Appendix XI.

for example, the fort is situated between the Seiont and Cadnant valleys and Seiont and Cadnant rivers which run through the fort's middle distance (Figure 135). Similarly, Llandovery I and II are situated between the Bran and Tywi valleys and rivers (Figures 96 and 99). These forts were equally distant from each valley. The results (Table 4.11 and Chart 4.10) reflect the topography types and specific topographic locations of the forts (presented in sections 4.5.3 and 4.5.4); the valleys of the 42 forts situated in valley locations extend into the middle distance, represented as valley floor(s) (main) and valley side(s) (main). The fortresses of Kingsholm and Gloucester are situated within a wide section of the Severn Valley and the valley sides are situated within their far distance bands (Figures 85 and 76). The undulating lowland of the 6 forts located in this topography type also extended into the middle distance.

Other topography types beyond those in which the forts were situated also extended into the middle distances. Thirty-three (68.8%) of the forts were recorded as having valleys other than a main valley within the middle distance. The Aeron Valley, for example, extends into the middle distance of Llanio fort (Figure 105). Isolated hills were not a common feature within the middle distances, appearing in only 12 (25%) of the middle distances, such as Coxall Knoll hill within the middle distances of Buckton and Jay Lane (Figures 12 and 81). Areas of undulating upland were only recorded in just over half (52.1%) of the middle distances, such as that of Llanio (Figure 105), but areas of undulating lowland (including the undulating lowland in which 6 forts were situated; section 4.5.3) were more numerous and were recorded in 68.3% of the fort middle distances.

Watercourses were identified in all the middle distance zones and will be discussed further below. Other water features were less numerous. The sea was only recorded in the middle distance of two forts (Cardiff II and Segontium; Figures 45 and 135), and large lakes were only identified within the middle distance of 3 forts (Llyn Tegid extended into the middle distances of Llanfor and Caer Gai and Llynau Mymbyr at Caer Llugwy; Figures 102, 18 and 21).

4.5.10 Visibility of middle distance topography types

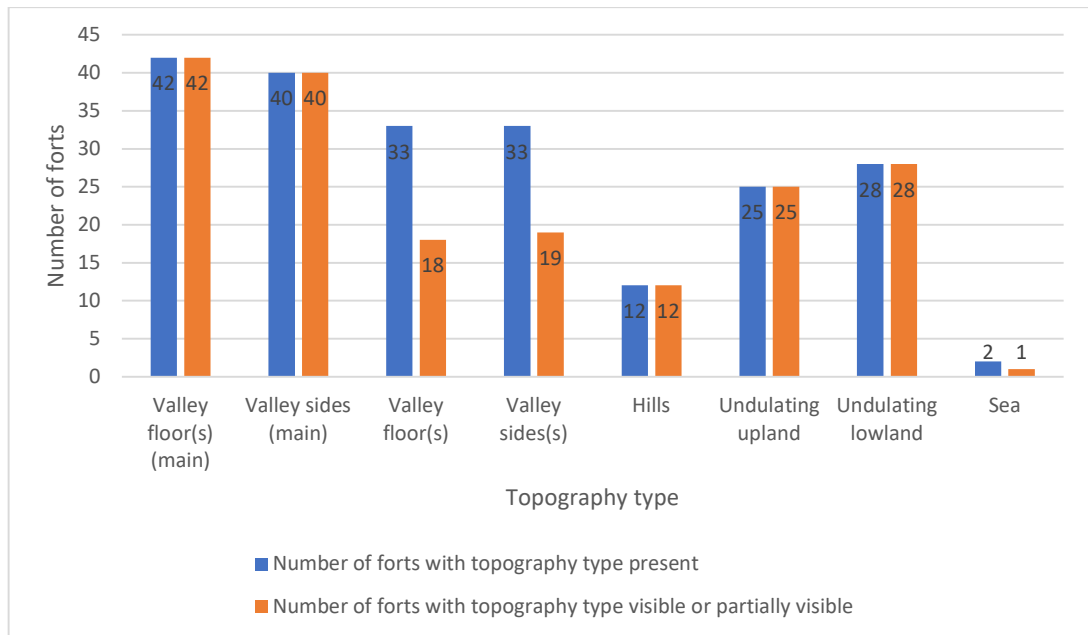
The visibility of topography types in the middle distance of the forts was recorded during fieldwork and using the GIS. Appendix V, Table V.5 presents the results for

each fort and Appendix II, Table II.3 shows which result was used when the fieldwork and GIS results differed.

Table 4.12 Numbers of forts with each topography type alongside numbers and percentages of those forts where the topography type is visible or partially visible.

Topography type	Number of forts with topography type present	Number of forts with topography type visible or partially visible	Percentage of forts with topography type present and visible or partially visible	Percentage of all 48 forts with topography type visible or partially visible
Valley floor(s) (main)	42	42	100%	87.5
Valley sides (main)	40	40	100%	83.3
Valley floor(s)	33	18	54.5	37.5
Valley sides(s)	33	19	57.6	39.6
Isolated hills	12	12	100%	25.0
Undulating upland	25	25	100%	52.1
Undulating lowland	28	28	100%	58.3
Sea	2	1	50	2.1

Chart 4.11 Numbers of forts with each topography type and numbers of those forts where the topography type is visible or partially visible.



Results for watercourses and other water features are presented in Section 4.6 below.

The main valley floor of Tomen y Mur is now a reservoir. The fieldwork and GIS revealed that a large portion of the surface of the reservoir is visible and it is likely that a large portion of the valley floor would also have been visible. It was therefore included as visible or partially visible in these results. The main valleys and valley sides of Segontium are also recorded as visible or partially visible in these results. It should be noted, however, that there are two main valleys, the Seiont and Cadnant, at Segontium. Seiont valley floor and valley sides were partially visible and Cadnant valley floor was obscured.

Table 4.12 and Chart 4.11 show that all the main valley floors were visible or partially visible. No main valley floor was completely visible within the middle distance. Undulations within the valley floor created obscured areas, such as at Caer Llugwy (Figure 21). Some valleys curved, such as the main valley of Pen Llwyn (Figure 117), so that the valley sides obscured some views from the forts. Some valley sides protruded or narrowed in places, obscuring sections of the valley floor beyond, such as at Pennal and Leighton (Figures 123 and 87). At 3 forts, the

main valley floors in the middle distances were partially visible from the fort in one direction and obscured in another. At Llandovery I, the Tywi valley floor to the NW of the fort was partially visible but the same valley to the SW was obscured (Figure 96). At Llandovery II the valley was partially visible in both directions (Figure 99). At Clyro, the Wye valley floor was partially visible to the NE of the fort and obscured to the SW (Figure 60). At Brecon Gaer, the SW stretch of the Usk valley was partially visible from the fort but the E stretch was obscured (Figure 6).

Similar to the main valley floors, the main valley sides in the middle distances were all partially visible from the forts. Obscured areas were similarly a result of bends, protrusions or the narrowing of the valley sides. The main valley sides of Kingsholm and Gloucester were present in the far distance bands of the fortresses and did not extend into the middle distances but, as presented below, these were also partially visible.

Of the 33 forts with other valleys (not main valleys) within the middle distance, 18 (54.5%) had partial visibility of the valley floors and at the remainder the valley floors were obscured. Valley floors were recorded as partially visible if only the mouths of the valleys were visible. At some forts there were two or more valleys, besides the main valley, extending into the middle distance. The levels of visibility of these other valley floors at each fort happened to match each other at all but 3 forts; at Carmarthen, Caerphilly and Caerleon one of the valley floors was obscured and the other partially visible. These 3 forts are recorded as having valley floors as visible/partially visible in Table 4.19 above.

Nineteen forts (57.6% of the forts with other valleys) had views of other (not main) valley sides. Where other valley floors were partially visible their valley sides also had partial visibility. At only one fort (Monmouth) was the other valley floor obscured but the other valley sides were visible (Figure 111).

All 12 of the forts with isolated hills within their middle distances had full or partial visibility of the fort-facing side of the hills. The hills tended to be located within the same valley floor or low-lying area as the forts themselves and therefore there were no other topographical features, such as valley sides, to obscure them completely from view. Coxall Knoll hill was visible from both Buckton and Jay Lane, for example, and the hill at SO02309292 to the W of Caersws I and Caersws II was visible from both forts (Figures 12, 81, 39 and 42).

Areas of undulating upland, undulating lowland or areas of both were present within the middle distances of all the forts. All the forts had partial views of these areas. The forts located within undulating lowland therefore had partial visibility of this space. The undulating nature of this topography type created obscured areas of varying sizes beyond the rise of each undulation. Furthermore, where forts were located within valleys, the valley sides obscured some views of the undulating upland or lowland beyond and it was often only the highest points of the undulating land that were visible from the forts. At Cae Gaer, for example, the valley sides obscured most of the undulating land beyond (Figure 15). At Carmarthen, only small patches of the highest undulations beyond the valley sides were visible from the fort (Figure 48). Forts in the undulating lowland topography type also had large obscured areas resulting from the undulations. Nevertheless, there were some forts with large areas of undulating land visible, such as Chester (Figure 54).

4.5.11 Topography types present: Far distance

Topography types within the far distance of each of the 48 forts were recorded using the GIS. Visible topography types in the far distance were also recorded during fieldwork; the visibility of the topography types is presented in section 4.5.12 below. The results for each fort is presented in Appendix V, Table V.6.

Table 4.13 Number of forts which contain each topography type within the far distance

Topography type	Number of forts	Percentage of forts
Valley floor(s) (main)	41	85.4
Valley sides(s) (main)	41	85.4
Valley floors	48	100
Valley sides	48	100
Watercourse (closest)	47	97.9
Watercourses	48	100
Sea	18	37.5
Undulating upland	43	89.6
Undulating lowland	44	91.7
Lake(s)	4	8.3
Land beyond sea	6	12.5

Chart 4.12 Number of forts which contain each topography type within the far distance

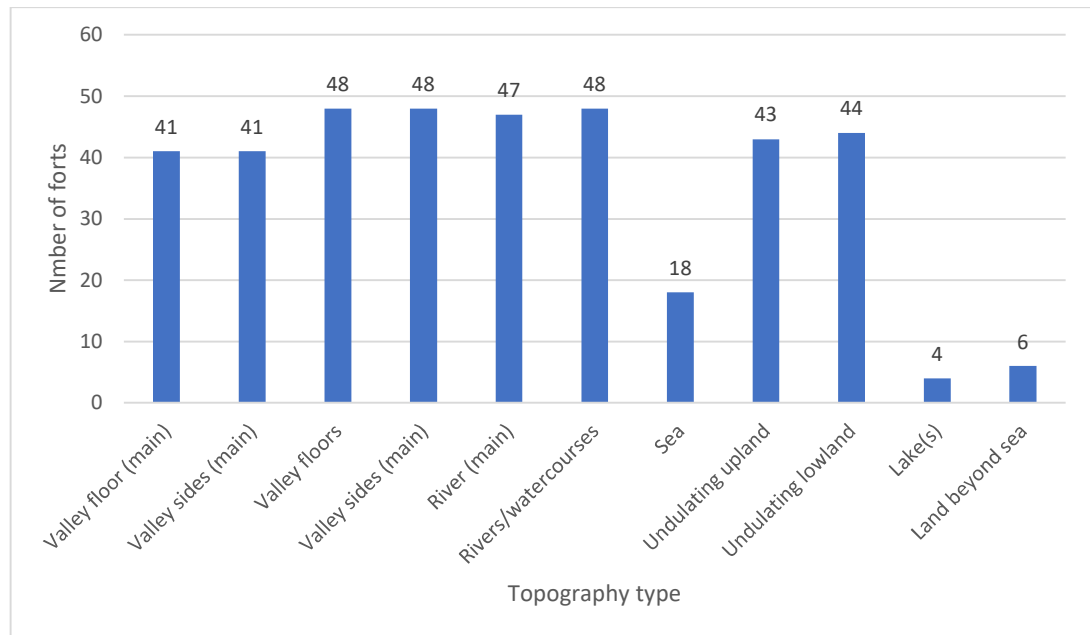


Table 4.13 and Chart 4.12 show that of the 42 forts that were situated within valleys, all except one of the valleys in which the forts are situated extend into the far distance. The exception is the fort at Coelbren, where the main valley ends within the middle distance (Figure 64). As noted above, the Severn Valley at Kingsholm and Gloucester forts is so wide that the valley sides are only present within the far distance bands of the forts. The closest rivers of all forts except Coelbren extended into the forts' far distances. The main river of Coelbren fort, the Afon Pyrddin, met the River Neath within the fort's middle distance. All the far distance areas contained at least one valley that is not classed here as a 'main' valley. This includes the Dee valley within the far distance of Chester; the closest river to the fortress is the Dee but the Dee valley has opened to a wide estuary zone in the near, middle and northern half of the far distances of the fortress (Figure 55). All the forts contained watercourses other than the closest watercourse within their far distance bands.

Most of the forts (89.6%) contained areas of undulating upland within their far distances; only 5 forts had no undulating upland within this distance band, including Loughor (Figure 109). Similarly, most forts (91.7%) contained some areas of undulating lowland within their far distance bands. Four forts did not, including

Penydarren (Figure 127). Only 18 forts (37.%) were located close enough to the coast for the sea to extend into their far distance bands. At 6 (12.5%) of these forts, land beyond the sea was present within the far distance bands. At Segontium, Pen Llystyn and Caerhun the sections of sea included the Menai Straits, and Anglesey extended into their far distance bands beyond; at Segontium both the Straits and Anglesey were present in both the far and middle distance bands (Figures 136, 121 and 31). At Cardiff, Caerleon and Monmouth the area of sea present was the Bristol Channel, and the coast on the far side of the Channel extended into their far distance bands (Figures 46, 34 and 112). Not every fort that had the Bristol Channel within the far distance band also had sections of the coast beyond within the band; 6 forts, including Usk and Caerphilly, included the Bristol Channel within their far distance bands but not the coast beyond (Figures 145 and 37).

4.5.12 Visibility of far distance topography types

The visibility of topography types in the far distance of the forts was recorded during fieldwork and using the GIS. Appendix V, Table V.6 presents the results for each fort and Appendix II, Table II.4 shows which result was used when the fieldwork and GIS results differed.

Table 4.14 Numbers of forts with each topography type alongside numbers and percentages of those forts where the topography type is visible or partially visible in the far distance.

Topography type	Number of forts with topography type present	Number of forts with topography type visible or partially visible	Percentage of forts with topography type present and visible or partially visible	Percentage of all 48 forts with topography type visible or partially visible
Valley floor(s) (main)	41	15	36.7	31.3
Valley sides (main)	41	31	75.6	64.6
Valley floor(s)	48	2	4.2	4.2
Valley sides(s)	48	7	14.6	14.6
Undulating upland	43	39	90.7	81.3
Undulating lowland	44	29	65.9	60.4
Lake(s)	4	1	25.0	2.1
Sea	18	5	27.8	10.4
Land beyond sea	6	2	33.3	4.2

Chart 4.13 Numbers of forts with each topography type and numbers of those forts where the topography type is visible or partially visible in the far distance.

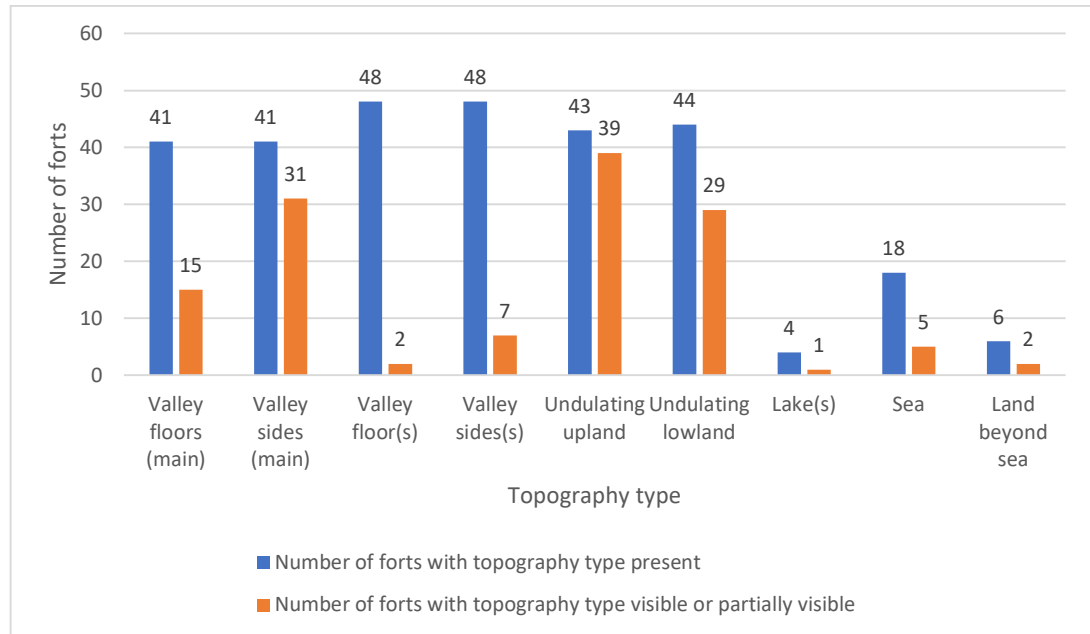


Table 4.14 and Chart 4.13 show that only slightly over a third (36.7%) of the forts that had main valleys had some visibility of the valleys in the far distance but three quarters (75.6%) had some visibility of the main valley sides. Llandeilo I and II forts had partial views of the main valley floor in their far distances, for example, and Penyardren had partial views of the main valley sides (Figures 91, 94 and 127). Some forts, such as Caer Gai, however had no views of the main valleys or main valley sides (Figure 19). There was poor visibility of other valleys in the far distance bands however; 4.2% of forts had some visibility of other valley floors and 14.6% had views of other valley sides. At Jay Lane, for example, the Clun valley floor, which met the main valley in the middle distance, was partially visible from the fort (Figure 82). Loughor is an example of a fort where other valley sides are visible in the far distance band (Figure 109). Most forts, such as Pennal, had no views of the other valleys within their far distances (Figure 124).

Over 90% of forts with undulating upland in the far distance bands had partial views of this topography, although sometimes the views were very slight, with only the highest points visible, such as at Caer Llugwy (Figure 22). Over two thirds (65.9%) of forts with undulating lowland in the far distance bands had some visibility of this

lowland, such as at Rhyn Park (Figure 133). Of the 18 forts with sea in the far distance bands, only 5 (27.8%) (Segontium, Loughor, Cardiff, Pen Llystyn and Tomen y Mur) had any views of the sea. The sea views from Tomen y Mur were very slight but those from Loughor, Cardiff II and Pen Llystyn, while not revealing the full expanse of the far distance sea, were wide ranging (Figures 46, 109, and 121). Two of the 6 forts with land beyond the sea present in the far distances had views of this land; Segontium had partial views of Anglesey, and Cardiff II had partial views of what is now the English coast (Figures 136 and 46).

4.5.13 Relative altitude to surrounding topography: near, middle and far distances

The altitude of each fort relative to the surrounding topography in the near, middle and far distances was recorded during fieldwork and using the GIS (Appendix V, Table V.8).

Table 4.15 Relative altitude of the forts to their near distances

Relative altitude	Number of forts	Percentage of forts
Higher than all other topography	0	0
Higher than some, equal to some other topography	11	22.9
Higher than some, equal to some, lower than some other topography	33	68.8
Equal to the other topography	0	0
Lower than some, equal to some other topography	1	2.1
Lower than all other topography	0	0
Uncertain	3	6.3

Table 4.15 shows that most forts (68.8%) had areas of land in the near distances that was both higher and lower in altitude than the land of the forts. Only 11 (22.9%) had a mix of land that was the same and lower than that of the forts and only 1 fort (Llanio) had a mix of land that was the same elevation or higher than that of the fort in its near distance (Figure 104). Three forts are recorded as uncertain (Monmouth,

Colwyn Castle and Kingsholm) because the full extents of these forts are not certain.

Table 4.16 Relative altitude of the forts to their middle distances

Relative altitude	Number of forts	Percentage of forts
Higher than all other topography	0	0
Higher than some, equal to some other topography	0	0
Higher than some, equal to some, lower than some other topography	48	100
Equal to the other topography	0	0
Lower than some, equal to some other topography	0	0
Lower than all other topography	0	0

Table 4.16 shows that every fort had land within their middle distances that was both higher and lower in elevation than the fort itself.

Table 4.17 Relative altitude of the forts to their middle distances

Relative altitude	Number of forts	Percentage of forts
Higher than all other topography	0	0
Higher than some, equal to some other topography	0	0
Higher than some, equal to some, lower than some other topography	48	100
Equal to the other topography	0	0
Lower than some, equal to some other topography	0	0
Lower than all other topography	0	0

Table 4.17 shows that every fort had land within their far distances that was both higher and lower in elevation than the fort itself.

4.5.14 Valley meeting points

The instances where two or more valleys meet in the near and middle distances were recorded (Appendix V, Table V.7). In some instances, these meeting points mirrored those of the river meeting points; within the area where the Camlad valley meets the Severn valley within Forden Gaer fort's middle distance, for example, the Camlad river also joins the River Severn (Figure 69). At some forts, however, valleys meet within the near or middle distances but their watercourses do not. At Gelligaer I for example the Bargod Taf and Rhymney valleys are connected by a stretch of fairly low ground to the south of the fort in the middle distance but the two rivers do not meet (Figure 72). River confluences are presented in Section 4.6.3.

Table 4.18 Numbers and percentages of forts where 2 or more valleys meet in the forts' near and/or middle distances

Two or more valleys meet?	Number of forts	Percentage of forts
Yes	30	62.5
No	18	37.5

Chart 4.14 Forts where 2 or more valleys meet in the forts' near and/or middle distances

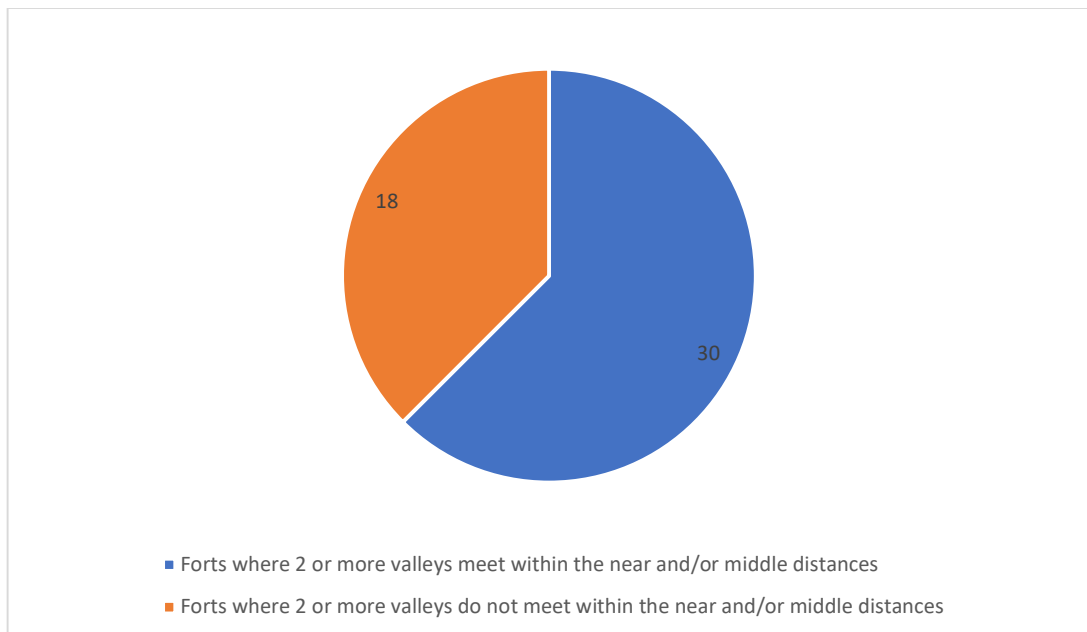


Table 4.18 and Chart 4.14 show that nearly two thirds (62.5%) of the forts have 2 or more valleys that meet within the near or middle distances. Three forts that are located within undulating lowland, Cardiff II, Loughor and Pen Llystyn, have been included in this group because two or more valleys emerge into the lowland zone within the middle distances of the forts (Figures 45, 108 and 120). The Elai, Taf and Rhymney valleys, for example, emerge into the undulating lowland of the middle distance of Cardiff II. At some forts, there are more than one meeting of valleys but they do not converge on one place. At Carmarthen, for example, the Tawelan Brook valley meets the Tywi valley to the WSW of the fort and the Gwili valley meets the Tywi valley to the E of the fort (Figure 48). In some instances, a few valleys converge at the same point. Within the middle distances of Caersws I and II the Cerist/Trannon valley and the Carno valley join the Severn valley at the same point (Figures 38, 39, 41 and 42). Within the middle distances of Jay Lane and Buckton the Clun valley and numerous smaller valleys head towards the same point of the Teme valley (Figures 81 and 12).

The location of the forts in relation to these meeting points of valleys was assessed and it was found that some forts were located at the point where two or more valleys meet.

Table 4.19 Numbers and percentages of forts that are located where two or more valleys meet

Fort in centre of meeting point?	Number of forts	Percentage of the 30 forts with valley meeting points in near and/or middle distances	Percentage of all 48 forts
Yes	17	56.7	35.4
No	13	43.3	27.1

Chart 4.15 Forts with valley meeting points in the near and/or middle distances that are located where two or more valleys meet

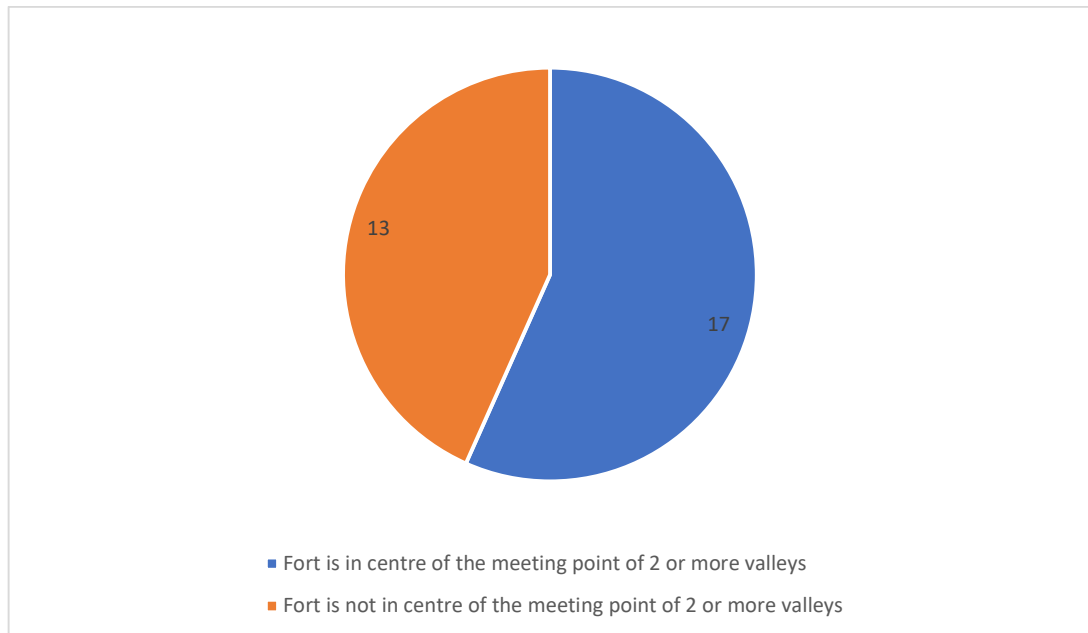


Table 4.19 and Chart 4.15 show that slightly over half (56.7%) of the forts where valleys meet in the near and middle distances are situated where 2 or more valleys meet. Pumsaint fort, for example, is located where the Cothi and Twrch valleys meet (Figures 128 and 129). The meeting point of the valleys takes place in the near distance, extending into the middle distance. At Llandoverly, the valleys meet just to the S of the forts, in their middle distances (Figures 95, 96, 98 and 99). The lowland forts of Loughor, Cardiff and Pen Llystyn, mentioned above, are recorded as being located where 2 or more valleys meet because they are situated at points towards which the valleys are directed before they change to undulating lowland. Both Caersws I and Caersws II are recorded as being located at the point where the Cerist/Trannon valley and the Carno valley join the Severn valley. Caersws II, however, is more centrally placed within the meeting point than its predecessor (Figures 38, 39, 41 and 42). Caerleon is an example of a fort where there is more than one point at which 2 or more valleys meet. The fortress is recorded as being located at the point where two valleys (the Lwyd and Usk) meet (Figure 33). The Sor Brook valley also meets the Usk to the W of the fortress. The remainder of the forts (43.3%) are not located at the point where valleys meet. At Pen Llwyn, for example, Melindwr valley meets the Rheidol valley to SE of fort (Figure 117).

4.5.15 Visibility of the valley meeting points

The visibility of the valley meeting points was also recorded (Appendix V, Table V.7).

Table 4.20 Visibility of the valley meeting points from each fort

Visibility of valley meeting points	Number of forts	Percentage of the 30 forts with valley meeting points in near and/or middle distances	Percentages of all 48 forts
Visible	0	0	0
Partially visible	23	76.7	47.9
Obscured	7	23.3	14.6

Chart 4.16 Visibility of the valley meeting points from each fort

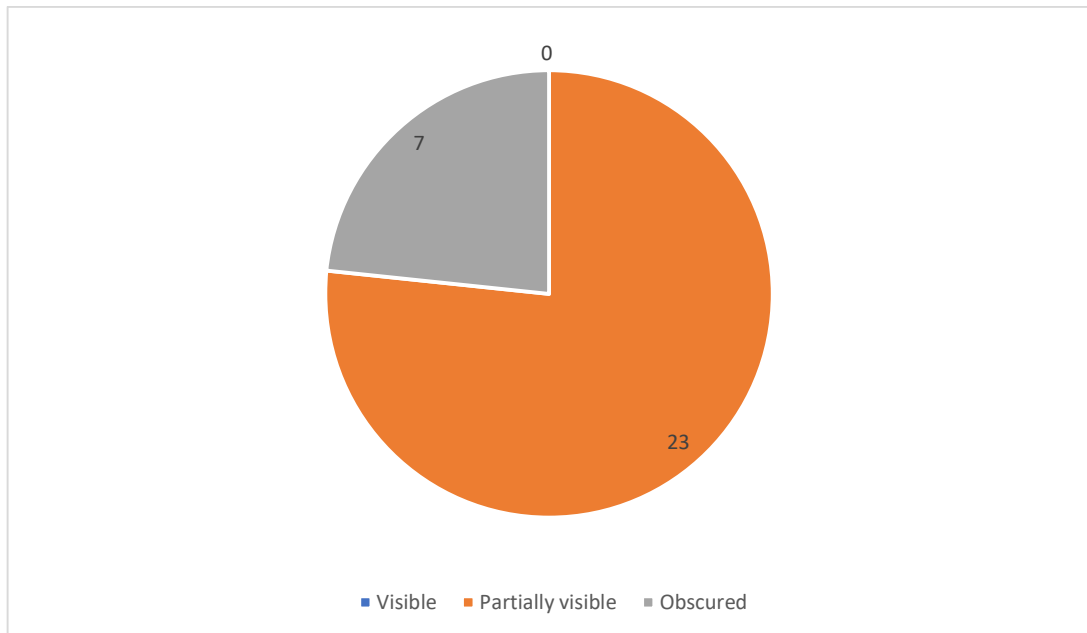


Table 4.20 and Chart 4.16 show that at slightly over three quarters (76.7%) of the forts where valleys meet within the near and middle distances, the meeting points were partially visible. At Forden Gaer, which is situated where the Camlad valley meets the Severn Valley, there is good visibility of the meeting area although some

gentle undulations cause some obscured areas and an extension from the valley side to the north-west of the fort obscures some views of the meeting area to the north-west (Figure 69). The viewshed also displayed an obscured area to the east but this is caused by earthworks associated with a railway line and the view in this direction was likely to be visible or partially visible prior to the railway. At Pumsaint, located where the Cothi and Twrch valleys meet, gentle undulations obscure small sections of the meeting area (Figures 128 and 129). At Pen Llwyn the meeting place of the Melindwr and Rheidol valleys to the south-east of the fort was partially visible (Figure 117). At Carmarthen, the area where the valley linking Tywi valley with Cywyn valley to west-south-west of fort is partially visible and where the Gwili valley meets Tywi valley to east of fort is also partially visible (Figure 48).

At 7 forts (23.3%) the meeting points were obscured completely. At Caer Llugwy, for example, the Llugwy valley meets the Conwy valley to the east of the fort but meanders in the Llugwy valley obscure the meeting area from the fort (Figures 21 and 22). At Rhyn Park the Ceiriog valley meets the Dee valley to the north-north-east of the fort but the meeting area of the valleys is not visible from the fort gates (Figure 132). None of the forts that was positioned at the meeting points of the valleys had obscured views of the meeting areas. At 4 forts (Hindwell Farm, Penydarren, Gelligaer and Caergwanaf) one of the valleys that met another valley was obscured but the area beyond the mouth of the obscured valley, where it adjoins the other valley, was visible (Figures 78, 126, 72 and 27). The meeting points of these valleys were therefore recorded as visible. Where forts had multiple valley meeting areas within the near and middle distances, such as Carmarthen, the visibility results happened to be the same at each meeting area. At none of the forts was the views of the meeting points completely visible.

Jay Lane and Buckton are located within the same valley meeting area, Buckton succeeded Jay Lane. Although both had partial visibility of the valley meeting area, Buckton had fewer obscured areas than Jay Lane (Figures 81 and 12). Similarly, both Llandovery I and Llandovery II had partial visibility of the Bran and Tywi valleys meeting area but Llandovery II had fewer obscured areas (Figures 96 and 99).

4.5.16 Visibility of full widths of valleys

It was recorded whether the full width of the main valley floor was visible along at least one cross-section of the valley and in at least one direction in the near and/or

middle distances from the 42 valley-based forts (Appendix V, Table V.7). The visibility of any watercourses running through the valley floors was not included here.

Table 4.21 Number and percentages of valley-based forts where the full width of the main valley floor was visible in at least one direction

Was the full width of the main valley floor visible in at least one direction?	Number of forts	Percentage of the 42 valley-based forts	Percentage of all 48 forts
Yes	37	88.1%	77.1
No	5	11.9%	10.4

Chart 4.17 Number of valley-based forts where the full width of the main valley floor was visible in at least one direction

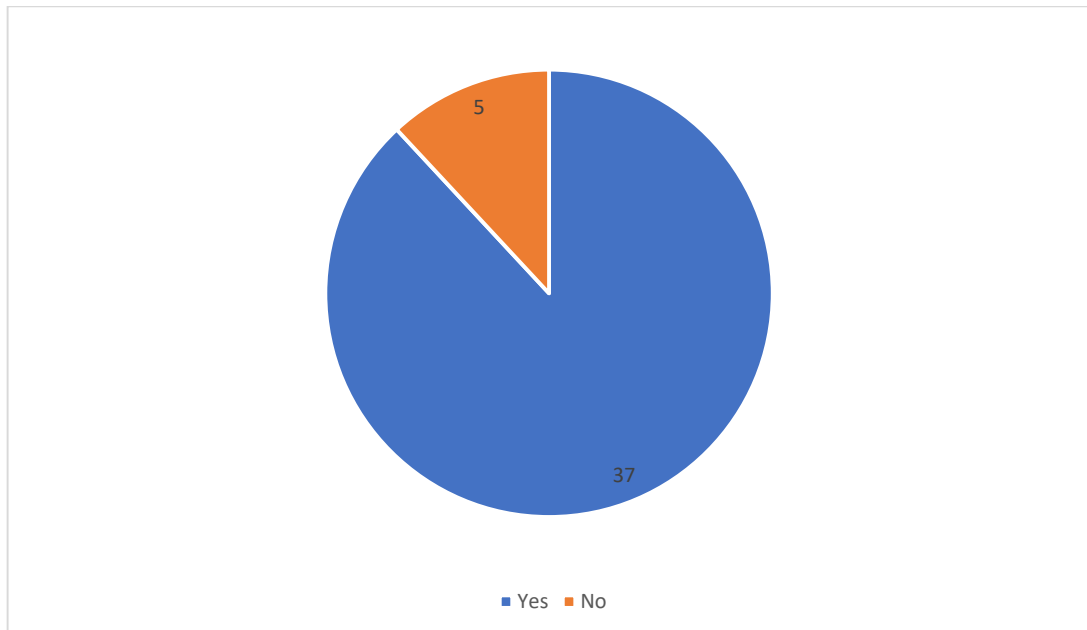


Table 4.21 and Chart 4.17 show that most (88.1%) of the forts had a full view of at least one section of the main valley floor in at least one direction. At Caerhun, for example, the full width of the valley floor was visible along a cross-section to the

south of the fort (Figures 29 and 30). The full width of the valley floor was visible to the south and south-west of Caer Gai (Figures 17 and 18). At only 5 forts there was not a full view of the valley floor. At Neath, for example, there was not a fully visible cross section of the main valley, although there were numerous large and small dispersed areas that were visible (Figure 114).

It was also recorded whether the full width of valleys entering the undulating lowland in which 6 of the forts were situated were visible

Table 4.22 Forts in undulating lowland that have a full view of at least one valley floor or valley mouth that opens into the area of undulating lowland in which the fort is located

At least one valley floor/mouth visible?	Number of forts	Percentage of the 6 forts in undulating lowland	Percentage of all 48 forts
Yes	3	50	6.3
No	3	50	6.3

Three of the 6 forts located in undulating lowland have full views of the valley mouths that open onto the lowland area. At Cardiff, the Taf valley opens into the undulating lowland in which the fort is situated. The fort had a clear view of the mouth of the valley (Figure 45). Other valleys also opened into the undulating lowland but, whilst sections of the valley mouths were visible, there were not full views of them from the fort. The short Dwyfach valley opens into the undulating lowland in which Pen Llystyn is located and a cross-section of the opening is visible from the fort (Figure 120). The Loughor valley opens out into the undulating lowland in which Loughor fort is located (Figure 108). The full width of the mouth of the valley and a cross-section of the valley floor is visible from the fort.

Table 4.23 Valley and undulating lowland forts combined: all forts that had full views of at least one cross-section of a valley or valley mouth

At least one valley floor/mouth visible?	Number of forts	Percentage of forts
Yes	40	83.3
No	8	16.7

Table 4.23 shows that most forts (83.3%), whether located in a valley or undulating lowland, had a full view of at least one cross section of the valley floor of either the valley in which they were situated or a valley entering the undulating lowland in which they were situated.

4.6 Water

4.6.1 Types of watercourses closest to the forts

The status of main (where the watercourse reaches the sea or an estuary) or tributary (the watercourse joins a larger river) of the watercourses running closest to each fort was recorded to identify how many forts were located near rivers with direct access to the sea. Appendix VI, Table VI.4 shows the results for each fort.

Table 4.24 Numbers of forts where the nearest watercourse was a main watercourse and numbers of forts where the nearest watercourse was a tributary.

Watercourse status	Numbers of forts	Percentage of forts
Main	28	58.3
Tributary	20	41.7

Chart 4.18 Numbers of forts where the nearest watercourse was a main watercourse and numbers of forts where the nearest watercourse was a tributary.

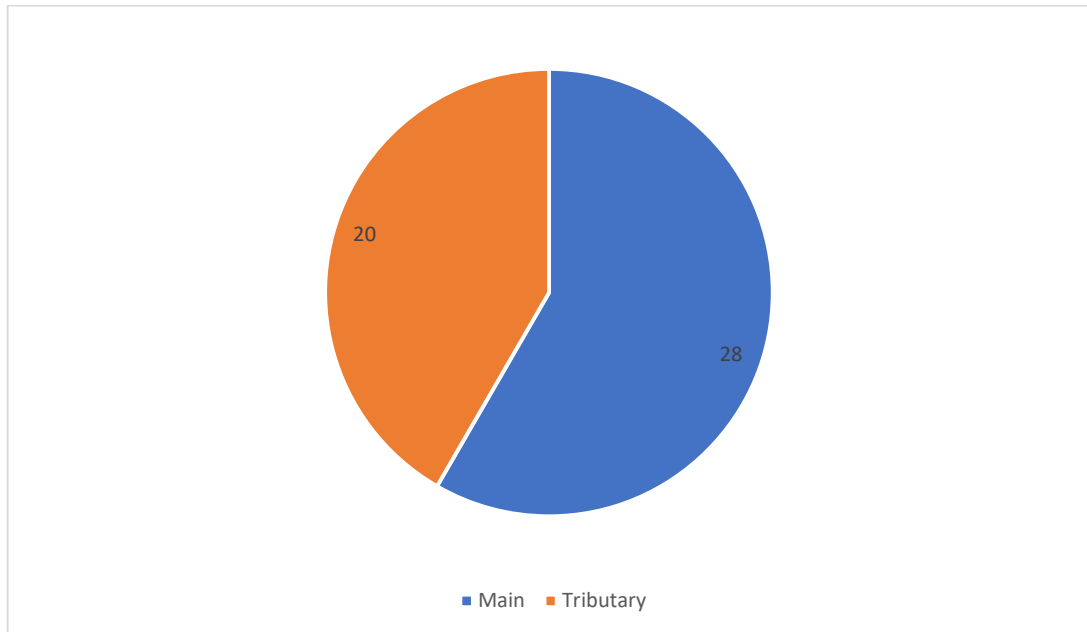


Table 4.24 and Chart 4.18 show that 58.3% of the forts had main rivers as their closest watercourse (Figure 4). These are large rivers that empty into the sea or an estuary, such as the rivers Dee, Severn and Usk. Of the 20 forts with tributaries as their closest watercourse, 11 had main rivers within the near or middle distances; some of these were very close to the forts, such as Afon Rheidol at Pen Llwyn, which was nearly as close to the fort as the Afon Melindwr, a tributary of the Rheidol. Thirty-nine of the forts (81.3%), therefore, were situated near to a main watercourse. The 9 remaining forts had tributaries nearby. Some of these tributaries were significant rivers, such as the Afon Cothi at Pumsaint. In contrast, only streams and brooks were present within the near and middle distances of Hindwell Farm.

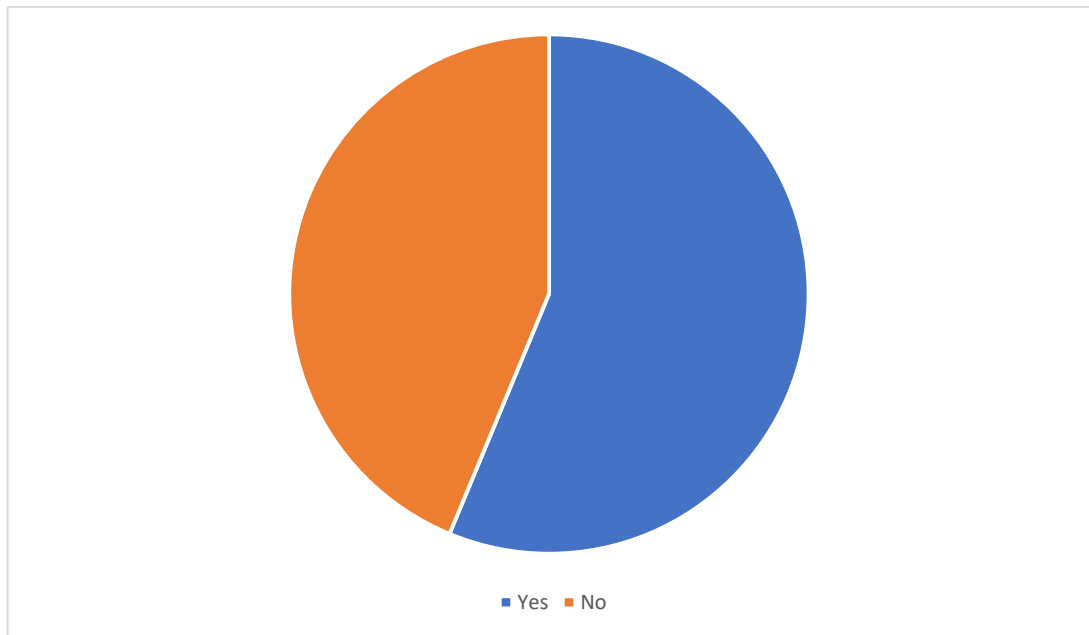
4.6.2 Forts in bends in watercourses or with watercourses on 2 or more sides

Some forts were located within a bend in a watercourse, where the watercourse curves around all or part of the fort, or were positioned where a watercourse ran past the fort on two or more sides. Appendix VI, Table VI. 5 presents the results for each fort.

Table 4.25 Forts within a bend in a watercourse or with watercourses present on 2 or more sides

In a bend in the watercourse/watercourse present on 2 or more sides?	Number of forts	Percentage of forts
Yes	27	56.3
No	21	43.7

Chart 4.19 Is the fort within a bend in a watercourse or are watercourses present on 2 or more sides?



Penydarren is included as a fort with watercourses on two or more sides, although the lines of the watercourses may have been altered significantly by subsequent landscaping as a result of house-building (Figure 125). A section of the River Dee at Chester has been diverted since the time of the Roman occupation (Ward 1995, 4). The fortress is recorded here as being within a bend in the river. The diverted section is to the west and north-west of the fort (Ward 1995, 7-8) and, not including this section, the fortress would still be considered to be within a bend in the river (Figure 53). The presumed course of the river, however, continues the shape of the curve around the fortress. Kingsholm and Gloucester fortresses are not recorded as

being within a river bend or have watercourses on two or more sides. This is based on the former course of the River Severn (Holbrook 2010, 184-185) (Figures 83, 84, 74 and 75).

The results in Table 4.25 and Chart 4.19 show that slightly over half (56.3%) of the forts were in a bend in a watercourse or had watercourses present on 2 or more sides. Some of these forts are located within a bend in one watercourse. The fort of Caer Llugwy, for example, is situated within a bend of the Afon Llugwy and the fort of Clifford within a bend of the River Wye (Figures 20 and 56). Some forts were located near the confluence of two watercourses and each watercourse passed by two or more sides of the fort. Llanfor, for example, is in a 'U' shape formed by the Rivers Tryweryn and Dee; the courses of both rivers have changed slightly since the OS 1st edition map but the basic 'U' shape remains unchanged. Brecon Gaer fort is within a 'C' shape formed by the Rivers Usk and Ysgir (Figure 5). Segontium is located between Afon Cadnant to the north and Afon Seiont to the south; in this case the rivers run roughly parallel to each other, with the fort in between, and the rivers do not meet (Figure 134).

Most of the watercourses associated with the 27 listed above are rivers. At 9 forts, however, one or all of the watercourses present on two or more sides of the fort are streams or brooks. These watercourses may not be as large as a river but they are nevertheless a source of water and a potential obstacle when approaching or leaving the fort. Rhyn Park, for example, is located within a 'V' shape caused by the Afon Ceiriog and Morlas Brook and Coelbren in within a 'Y' shape formed by Afon Pyrdin and Nant y Bryn stream (Figures 131 and 62).

4.6.3 Meeting points of watercourses

River confluences were recorded within the near and middle distances of the forts (Appendix VI, Table VI.6).

Table 4.26 Numbers and percentages of forts where two or more rivers meet within the near and middle distance bands

Do two or more rivers meet in the near or middle distances?	Number of forts	Percentage of forts
Yes	30	62.5
No	18	37.5

Chart 4.20 Numbers of forts where two or more rivers meet within the near and middle distance bands

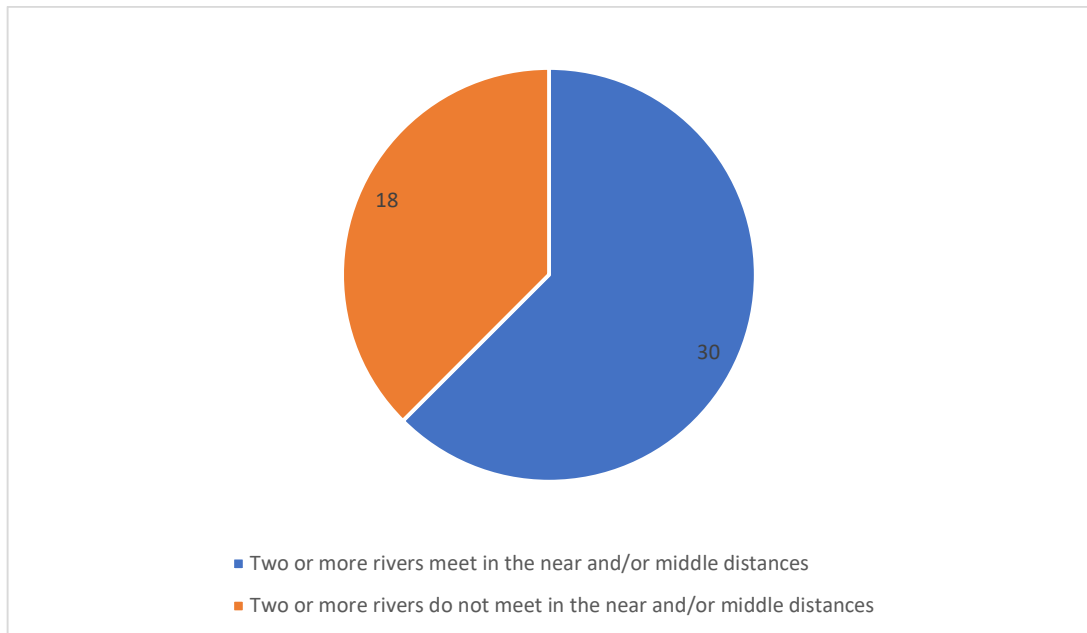


Table 4.26 and Chart 4.20 show that nearly two thirds (62.5%) of the forts had at least one confluence of rivers within their near or middle distances. Most of the river confluences were in the middle distances of the forts but 4 (at Caersws II, Pumsaint, Brecon Gaer and Loughor) were within the forts' near distances. At Caersws II and Pumsaint the river meeting points had moved since the production of the OS 1st edition map. Their current meeting points and those on the 1st edition maps were all in the near distance bands.

As presented above, some of the watercourses within the near and middle distances were main watercourses, which flowed directly into the sea or an estuary. The number of watercourses which met a main watercourse within the near or middle distances of the forts was recorded.

Table 4.27 Numbers and percentages of forts where the river confluences within the near and middle distances include a main watercourse

Includes a main watercourse?	Number of forts	Percentage of the 30 forts with confluences within their near and/or middle distances	Percentage of all 48 forts
Yes	25	83.3	52.1
No	5	16.7	10.4

Chart 4.21 Numbers of forts where river confluences within the near and middle distances include a main watercourse

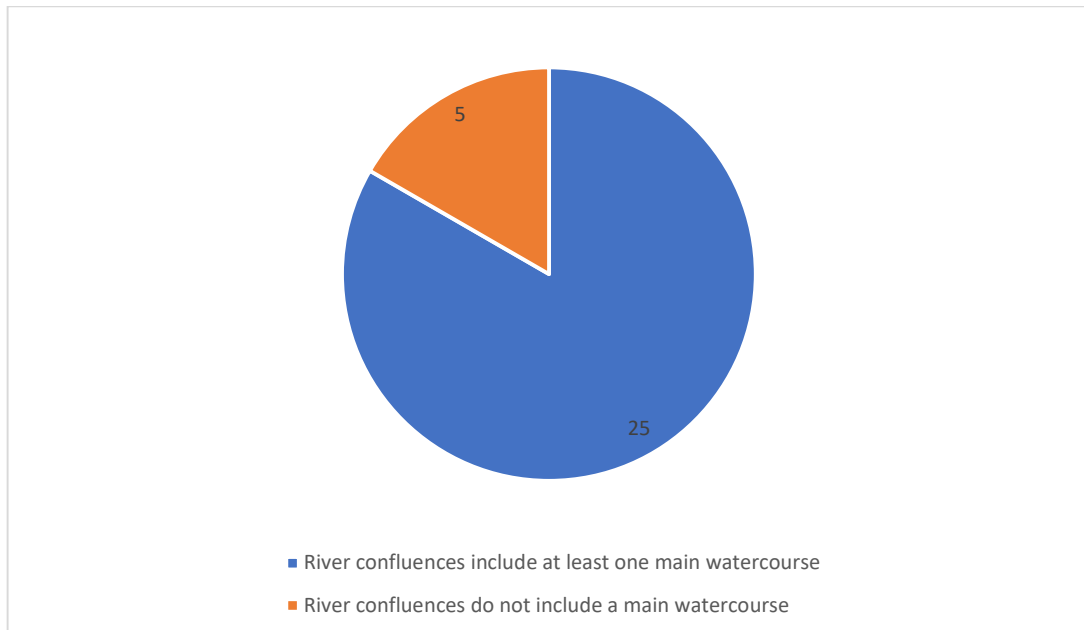


Table 4.27 and Chart 4.21 show that at most of these forts (83.3%) the confluences of rivers present involved at least one main river. This was not always the closest watercourse to the fort. At Rhyn Park, for example, Morlas Brook and Afon Ceiriog

are closer to the fort than the main river, the River Dee, into which the Afon Ceiriog runs in the middle distance (Figure 131).

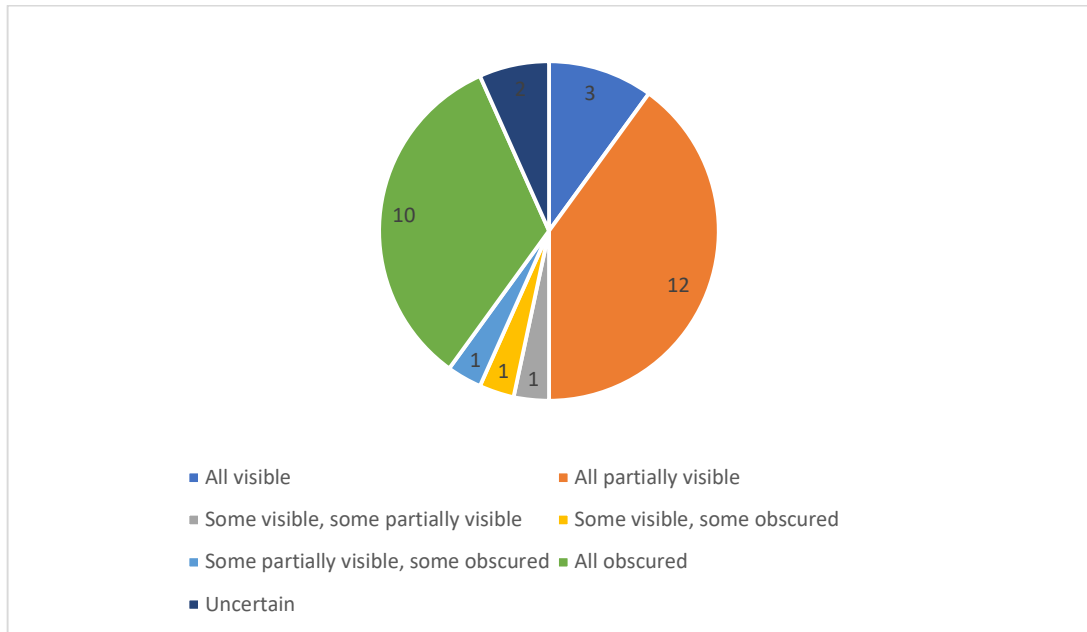
4.6.4 Visibility of watercourse meeting points

The visibility of the confluences in the near and middle distances of the forts was recorded (Appendix VI, Table VI.6).

Table 4.28 Visibility of the confluence of rivers in the near and middle distances from the forts.

Visibility	Number of forts	Percentage of the 30 forts with confluences within their near and/or middle distances	Percentages of all 48 forts
All visible	3	10	6.25
All partially visible	12	40	25
Some visible, some partially visible	1	3.3	2.1
Some visible, some obscured	1	3.3	2.1
Some partially visible, some obscured	1	3.3	2.1
All obscured	10	33.3	20.8
Uncertain	2	6.6	4.2

Chart 4.22 Numbers of forts with each level of visibility of the confluence of rivers in the near and middle distances from the forts.



The location of the confluences of some rivers within the near and middle distances of Llanfor, Caersws I and II forts have changed since the production of the 1st edition map. As explained in Section 3.5.4, when considering the visibility of the confluences, the locations shown on the 1st edition maps were used, although it is acknowledged that they may have moved again since the Roman era.

Table 4.28 shows that a large proportion of the 30 forts (40%) had partially visible river confluences within the near and middle distances, such as at Pennal (Figures 122 and 123). At 3 forts (10%; Pumsaint, Brecon Gaer and Loughor) the meeting points were completely visible (Figures 128, 129, 5, 6, 107 and 108). The river confluences at these 3 forts were within their near distance bands. Some forts had more than one instance of rivers meeting and at 3 of these forts the visibility of river confluence points differed. At Caersws II, for example, the River Severn and River Carno meet within the fort's near distance and this was partially visible (Figure 41). The Rivers Cerist and Severn and the Rivers Cerist and Trannon meet within the middle distance of the fort (Figure 42). These two meeting points were obscured. At Caersws I the confluence of Rivers Carno and Severn and the Rivers Cerist and

Trannon were partially visible. That of the River Trannon and River Severn was visible (Figures 53 and 54). At Wroxeter, the meeting place of the Rivers Tern and Severn is obscured and the confluence of the Rivers Roden and River Tern is visible (Figures 146 and 147).

Eighteen of the 30 forts (60%) therefore had some visibility of at least one river confluence within their near or middle distances. At 10 forts (33.3%), however, all confluences were obscured completely. At Llandovery, the earlier fort (Llandovery I) the views of the confluence of the rivers Tywi and Bran were obscured, whereas from Llandovery II the confluence was partially visible (Figures 95, 96, 98 and 99). The visibility of the river confluences at 2 forts (the Rivers Leadon and Severn at Kingsholm and Gloucester) is recorded as uncertain because the courses of the rivers have changed since the Roman era and their river meeting point is uncertain.

The visibility of the river meeting points that included main rivers was also recorded.

Table 4.29 Visibility of river confluences in the near and middle distances that include a main watercourse

Visibility	Number of forts	Percentage of the 25 forts that have river confluences which include a main river.	Percentage of all 48 forts
All visible	2	8	4.2
All partially visible	9	36	18.8
Some visible, some partially visible	1	4	2.1
Some partially visible, some obscured	1	4	2.1
All obscured	10	40	20.1
Uncertain	2	8	4.2

Chart 4.23 Visibility of river confluences in the near and middle distances that include a main river

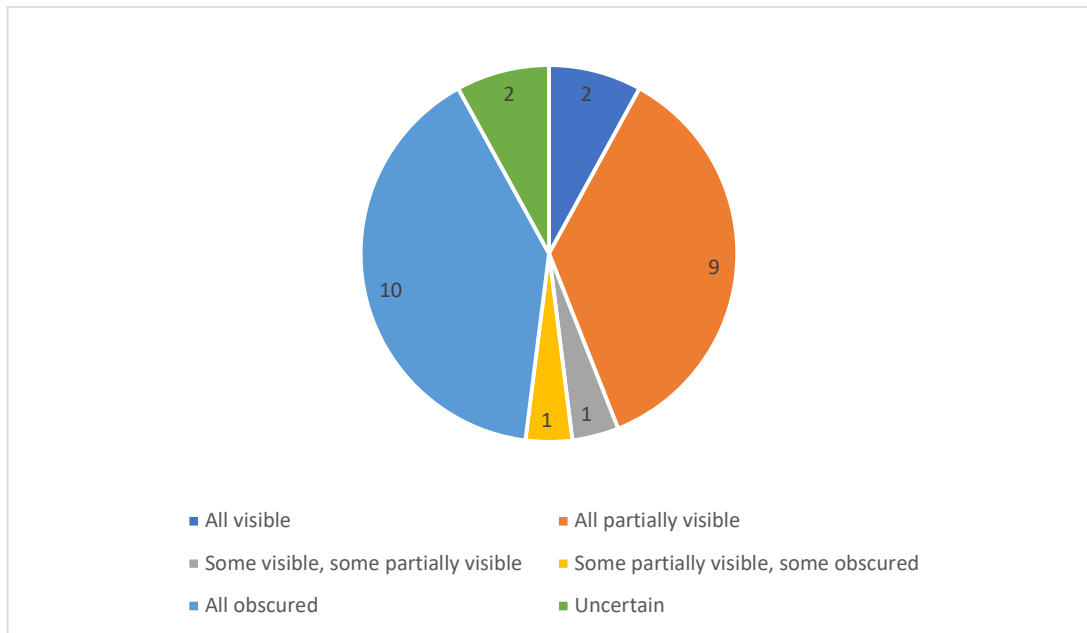


Table 4.29 and Chart 4.23 show that 2 of the forts (Brecon Gaer and Loughor) that had river confluences that were completely visible had confluences that involved a main river. At Brecon Gaer the Afon Ysgir meets the main River Usk. At Loughor, the Afon Llan meets the main River Loughor. Both of these confluences were in the near distances of the forts (Figures 5 and 107).

At 9 forts, river confluences that involved a main river were partially visible. At Caerhun, for example, the River Roe meets the main River Conwy in the middle distance and this is partially visible from the fort (Figure 30). One fort, Caersws I, had two confluences in the middle distance involving a main river where one was visible and one partially visible, as described above in relation to the rivers Carnon and Trannon meeting the Severn. At 1 other fort, Caersws II, which had two confluences involving a main river, one was partially visible and one obscured, as described above in relation to the rivers Carno (near distance) and Cerist (middle distance) meeting the Severn. At 10 forts the confluences involving main rivers were obscured. As explained above, the visibility of the meeting of the Rivers Severn and Leadon beyond Kingsholm and Gloucester forts are uncertain. There were no forts where some confluences were completely visible and some were completely obscured.

Slightly over half (52%) of the forts with river confluences including main rivers in the near and middle distances therefore had some visibility of at least one of these confluences.

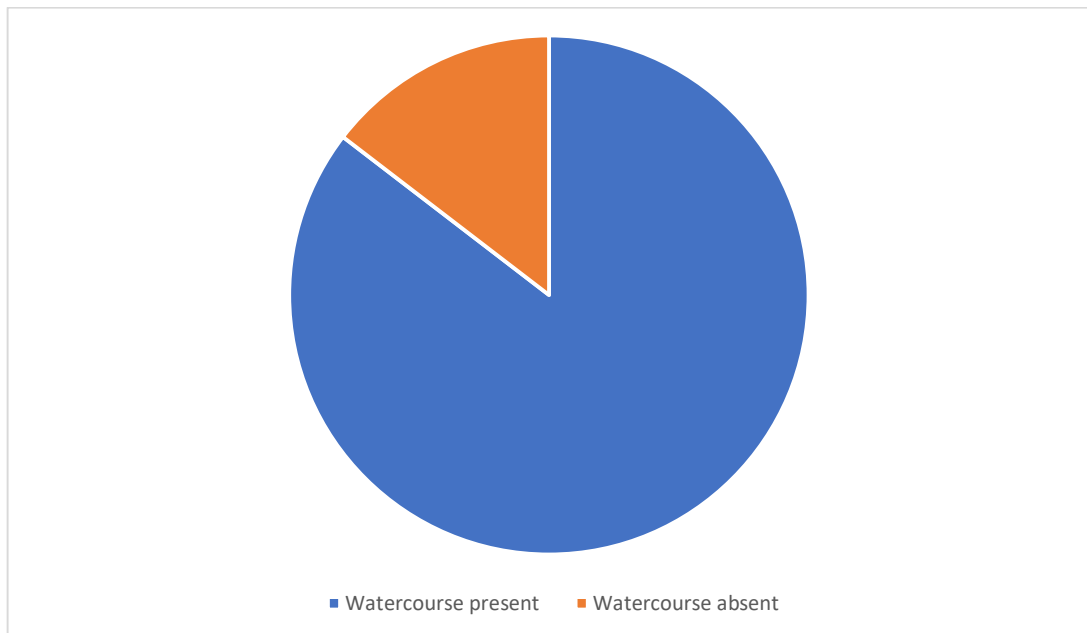
4.6.5 The occurrence of watercourses in the near distances

The presence of watercourses within the near distances of the forts was recorded using the GIS and during fieldwork. The results for each fort are provided in Appendix VI, Table VI.1.

Table 4.30 Occurrences of watercourses within the near distance of the forts

	Number of forts	Percentage of forts
Watercourse present	41	85.4
Watercourse absent	7	14.6

Chart 4.24 Occurrences of watercourses within the near distances of the forts



As discussed in the Methodology, watercourses include rivers and streams. These were recorded as 'present' within the near distance zones if any part of the

watercourse extended into the near distance. For example, if only one side of a river's banks was present within the near distance, such as the Conwy River at Caerhun, the river was recorded as present (Figure 29).

As discussed in Section 3.5.4, the OS 1st edition map revealed an inconsistency in the near distance at some forts. The 1st edition map showed that the rivers Dee and Tryweryn had extended into the near distance of Llanfor fort. These rivers no longer extend into the fort's near distance. They were therefore recorded as 'present' within the near distance of Llanfor, although it is acknowledged that the courses of the rivers may not have been the same during the fort's occupation. The courses of the watercourses within the near distances of Caersws I and II, Pumsaint and Llandovery have also changed since the publication of the OS 1st edition map. In these cases, however, the different courses of the watercourses did not affect their presence/absence within the near distance bands or the outcome of their visibility from the fort gates.

The areas surrounding the forts of Caerphilly and Cardiff were subject to landscaping after the Roman occupation and the courses of rivers and streams prior to the works are uncertain. The watercourses shown on the 1st edition and modern OS maps were used as a guide and they were recorded as 'present' within the near distance. It is possible that these watercourses differed significantly in the Roman era however.

The results reveal that most forts (89.6%) had watercourses running through their near distances. Streams were the largest watercourses identified within the near distance of 6 of the forts. The remainder of the watercourses were rivers.

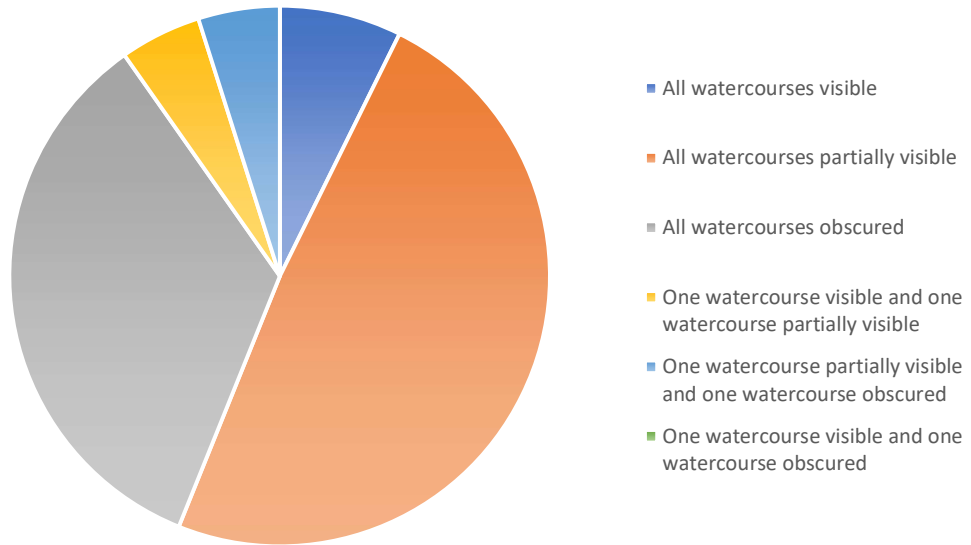
4.6.6 Visibility of watercourses in the near distances

The levels of visibility of the watercourses and the banks of the watercourses that extended into the near distance of each fort were recorded during fieldwork and using the GIS. Appendix VI, Table VI.1 shows the results for each fort.

Table 4.31 Levels of visibility of watercourses in the near distance from the fort gates

Levels of visibility	Number of forts	Percentage of the 41 forts that have a watercourse running through the near distance.	Percentage of all 48 forts
All visible	3	7.3	6.3
All partially visible	20	48.8	41.7
All obscured	14	34.1	29.2
One watercourse visible and one watercourse partially visible	2	4.9	4.2
One watercourse partially visible and one watercourse obscured	2	4.9	4.2
One watercourse visible and one watercourse obscured	0	0	0

Chart 4.25 Levels of visibility of watercourses in the near distance from the fort gates



4.32 Levels of visibility of banks of watercourses in the near distance from the fort gates

Levels of visibility	Watercourse	Percentage of the 41 forts that have a watercourse running through the near distance.	Percentage of all 48 forts
All visible	7	17.1	14.6
All partially visible	23	56.1	47.9
All obscured	8	19.5	16.7
One set of watercourse banks visible and one partially visible	2	4.9	4.2
One set of watercourse banks partially visible and one obscured	1	2.4	2.1
One set of watercourse banks visible and one watercourse obscured	0	0	0

Chart 4.26 Levels of visibility of banks of watercourses in the near distance from the fort gates

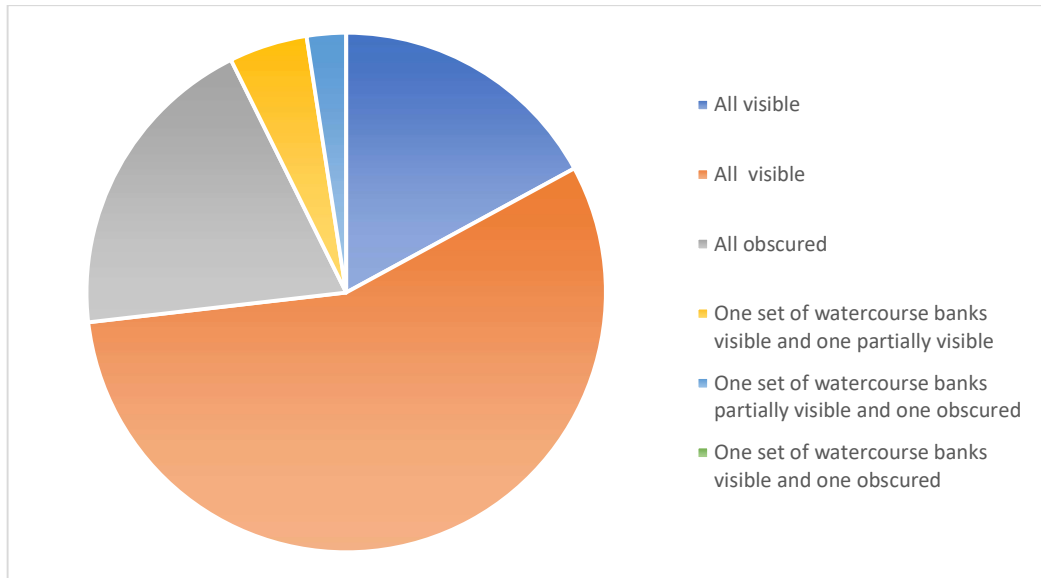
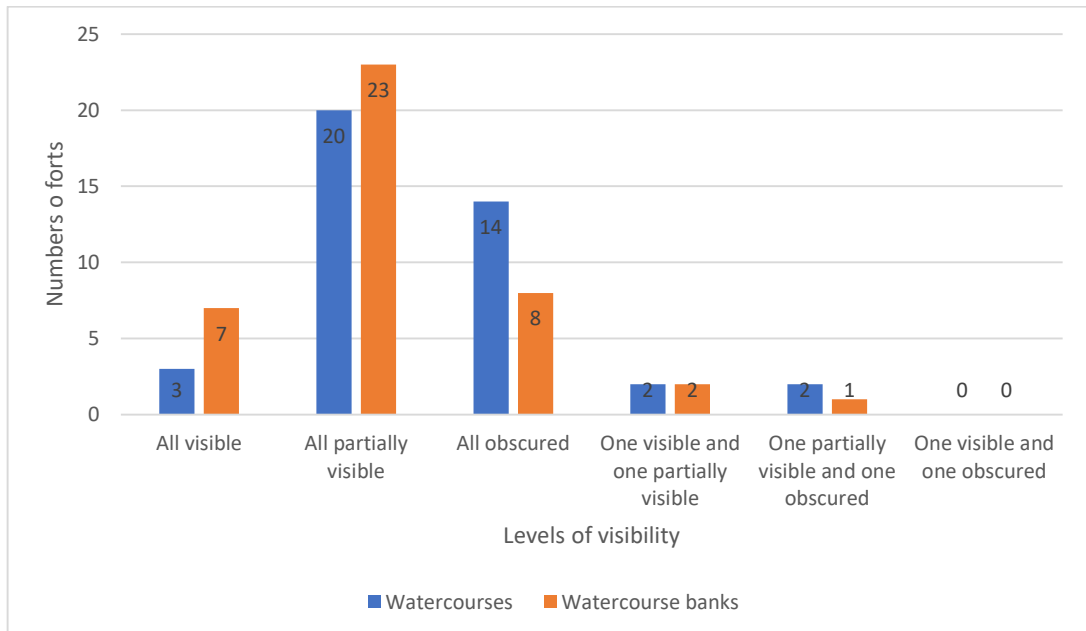


Chart 4.27 Comparison of levels of visibility of near distance watercourses and watercourse banks from each fort.



The watercourse and the watercourse banks at the fort of Rhyn Park (Morlas Brook) were recorded as obscured (Figure 131). The brook runs past the E of the fort and

views from the E gate were not recorded because the gate's location is unknown. It is therefore possible that the watercourse was visible or partially visible from the E gate.

The visibility of the watercourses and watercourse banks from the central points of the forts of Monmouth, Colwyn Castle and Kingsholm are included in these results. It should be noted, however, that the results may have differed if they had been collected from the gate locations, had the gate locations been certain. At Monmouth in particular the watercourses (Wye and Monnow) and watercourse banks were recorded as obscured from the fort but it is possible that they were visible from the gates (Figures 110 and 111). The watercourses and watercourse banks were partially visible from the central points of Colwyn Castle and Kingsholm. It seems unlikely, although not impossible, that the visibility of the watercourses would be reduced from the gates of these forts because it is likely that a larger area would be visible from four locations than one (Section 4.10). It is more likely that the method of using a central point to record visibility would cause a reduced view of the watercourses. It is therefore possible that the watercourses at Colwyn Castle and Kingsholm may have been fully visible as opposed to partially visible from the fort gates.

The visibility of watercourses in the near distances from the forts is varied (Table 4.31 and Chart 4.25). Only 3 forts (7.3% of forts with watercourses in their near distances) had watercourses that were all completely visible, such as the Afon Teifi at Llanio, but nearly half (48.8%) had watercourses that were all partially visible, such as Afon Elai at Caergwanaf (Figures 104, 105, 26 and 27). Plus two forts (4.9%) had a watercourse that was visible and another that was partially visible. Therefore, of all the forts with watercourses in the near distance, 61% had all watercourses in the near distance that were visible or partially visible.

As discussed in Chapter 3 (Section 3.5.5), visibility of the watercourse banks was also recorded (Table 4.32 and Chart 4.26). All watercourse banks within the near distance were completely visible from 7 forts (17.1%), such as Caergwanaf, and all were partially visible from 23 forts (56.1%), such as Carmarthen (Figures 26 and 47). All watercourse banks were therefore visible or partially visible from 75.6% of the forts. When compared to the results from the watercourse visibility (Chart 4.27), this shows more forts could see all or part of the watercourse banks than forts that

could see the watercourses alone. There were no forts where the watercourse was visible but the banks were not.

In a few instances, where there were two watercourses present within the near distance of a fort, the visibility of each watercourse differed. At 2 forts, Pumsaint and Cae Gaer, one watercourse was visible and the other partially visible (Figures 128, 129, 14 and 15). At another 2 forts, Caersws II and Pen Llystyn, one watercourse was partially visible and the other was obscured (Figures 41, 42, 119 and 120). There was similar variation in bank visibility where two watercourses were present. As with the watercourses, Pumsaint and Cae Gaer had one set of watercourse banks that was visible and the other partially visible. At Pen Llystyn, one set of banks was partially visible and the other was obscured.

The data reveal that most of the watercourses that ran through the near distance of the forts were at least partially visible from the forts. They also show that the fort gates tended to have as good or better views of the watercourse banks than of watercourses themselves.

4.6.7 The occurrence of watercourses in the middle distances

As shown in Table 4.11, all 48 forts had watercourses (rivers and streams) present within their middle distances. All middle distance rivers were recorded. Streams were recorded if they were the nearest watercourse to the fort or if their course ran as near to a fort as a river.

4.6.8 Visibility of watercourses in the middle distances

The visibility of watercourses and watercourse banks in the middle distances of the forts was recorded during fieldwork and using the GIS. Appendix VI, Table VI.2 provides the results for each fort and Appendix II, Table II.9 shows which result was used in instances where the fieldwork and GIS results differed.

The levels of visibility of the watercourses from the forts is presented in Table 4.33 and Chart 4.28. and watercourse banks in Table 4.34 and Chart 4.29.

Table 4.33 Levels of visibility of watercourses in the middle distances from the fort gates

Levels of visibility	Number of forts	Percentage of forts
All visible	0	0
All partially visible	20	41.7
All obscured	5	10.4
Some visible, some obscured	0	0
Some partially visible, some obscured	23	47.9

Chart 4.28 Visibility of watercourses within the middle distances of the forts

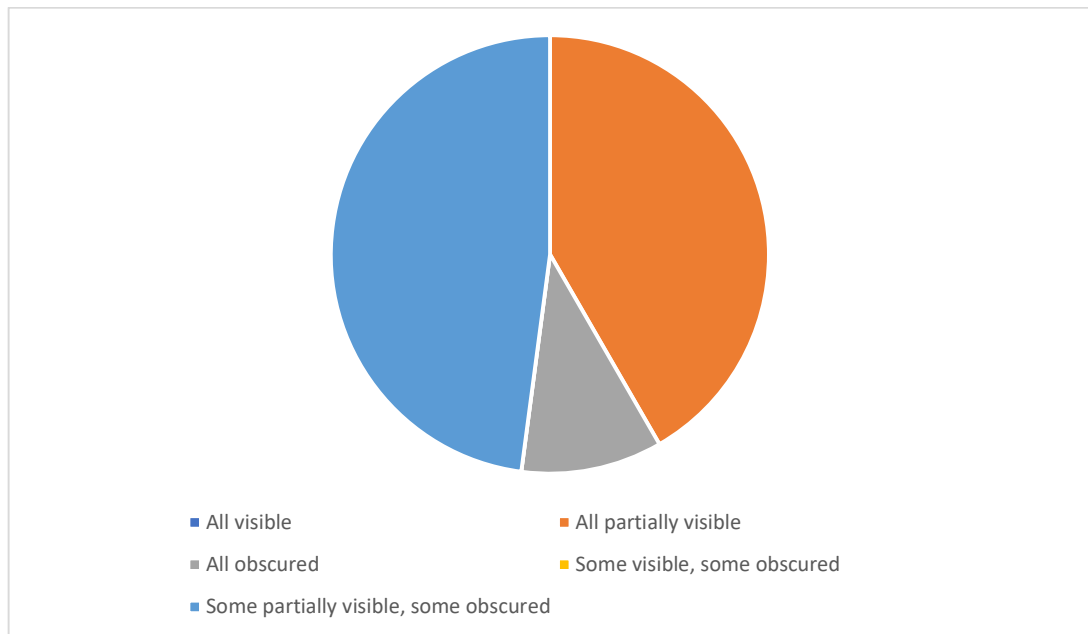


Table 4.34 Levels of visibility of watercourse banks in the middle distance from the fort gates

Levels of visibility	Number of forts	Percentage of forts
All visible	0	0
All partially visible	27	56.3
All obscured	1	2.1
Some visible, some obscured	0	0
Some partially visible, some obscured	20	41.7

Chart 4.29 Levels of visibility of watercourse banks in the middle distance from the fort gates

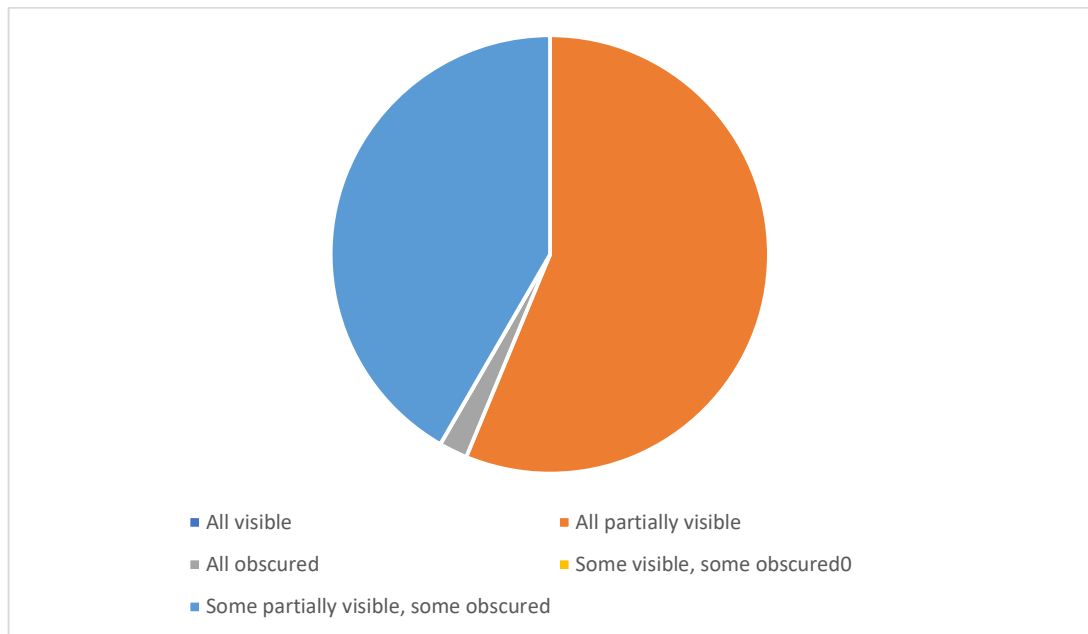
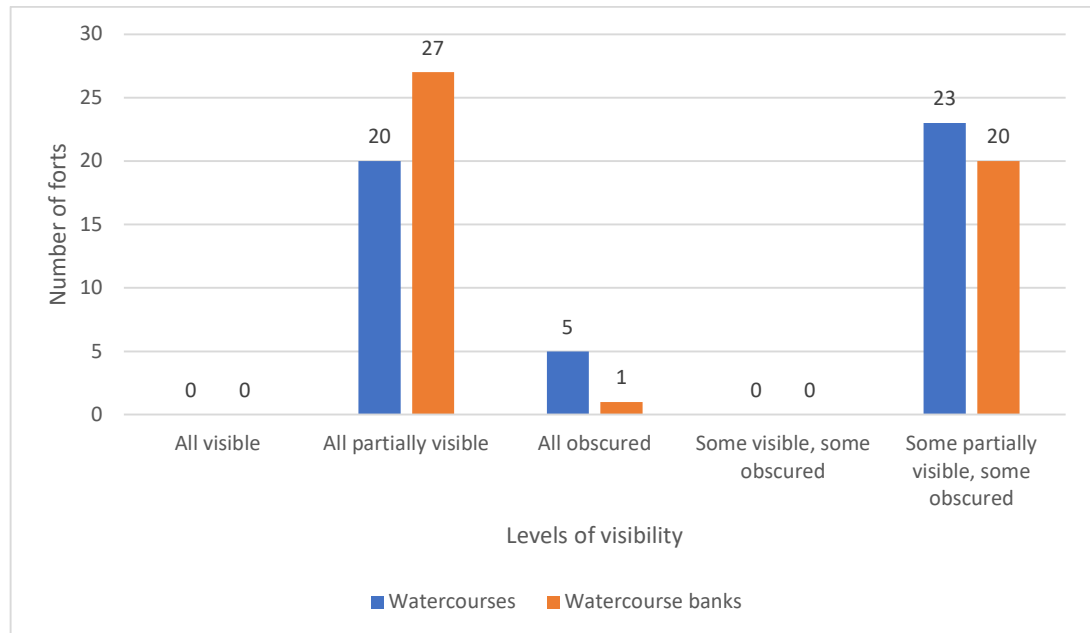


Chart 4.30 Comparison of levels of visibility of middle distance watercourses and watercourse banks from each fort.



At Tomen y Mur, the results exclude a section of the Afon Prysor. Part of the former course of the Prysor is now within a reservoir (Llyn Trawsfynydd) and the visibility of its former course from the fort is uncertain. The former course is shown on the OS 1st edition map but the contours used for the GIS do not cover the area now within the reservoir so the GIS could not be compared to the 1st edition map. The area was observed during fieldwork and it seemed likely that the Prysor was at least partially visible within the reservoir area but this is not certain. The middle distance sections of the river that are not within the reservoir were recorded as partially visible. At Forden Gaer, the River Camlad watercourse and banks were recorded as partially visible although earthworks associated with a trainline have changed the contours and it is possible that the river and/or its banks were fully visible during the Roman occupation. The river was obscured by trees during fieldwork. Since the views from Colwyn Castle, Monmouth and Kingsholm are taken from central points, the middle distance rivers may have had greater visibility from the four fort gates. At Colwyn Castle, the watercourses and banks of the River Edw were recorded as partially visible, Colwyn Brook partially visible and a stream to the S was obscured. From Monmouth fort, the Wye was recorded as obscured and the Monnow also obscured. At Kingsholm the watercourses and banks of the River Severn (former course) were partially visible and River Leadon obscured.

At 8 forts the courses of the rivers within the middle distances are known to have changed in recent years. The courses at 6 of the forts differed from those of the present day on the OS 1st edition maps. At 4 of these forts, Caersws I, Pumsaint, Llandovery I and Llandovery II, the outcome of the visibility of the watercourse would not have differed. At Pumsaint, for example, the Rivers Cothi and Twrch would have been partially visible based on both the 1st edition and current courses of the rivers. At Llanfor and Caersws II, the outcomes would have differed. The two rivers that run through the middle distance of Llanfor are the Dee and Tryweryn. Both rivers have changed courses slightly since the OS 1st edition map and, as discussed in Chapter 3 (Section 3.5.4), the courses shown on the OS 1st edition were used here. Based on the OS 1st edition map, both rivers were partially visible. If the results had been based on the modern courses, the River Dee would have been recorded as obscured. At Caersws II, the course of the River Severn on the 1st edition map, which was used for the results, would have been partially visible. Its present course is obscured. Both courses of the Afon Carno are partially visible from Caersws II. At all 6 of the forts where the courses now differ from those on the 1st edition map, the results would not have differed for the watercourse banks; all were recorded as partially visible based on the earlier courses and all are partially visible now.

As discussed in Section 4.6.5, the courses of the rivers in the vicinity of Cardiff and Caerphilly forts during the Roma era are uncertain. The results here are based on the current river courses but the results may have differed with the original lines of the rivers. At Chester, part of the River Dee in the middle distance to the W of the fortress was canalised in the 18th century (Ward 1995, 4). The results here are based on the assumed former course (Ward 1995, 7-8). Also discussed above, the courses of the River Severn at Kingsholm and Gloucester have changed and the results are based on the former course. As mentioned above, it is acknowledged that it is possible that the lines of all the watercourses may have differed during the Roman era.

Table 4.33 and Chart 4.28 show that none of the watercourses within the middle distances was completely visible from a fort. Only 5 forts (10.4%), however, had no views at all of watercourses within their middle distances. Watercourses were partially visible from 20 forts (41.7%). Twenty-three forts (47.9%) had some partially visible and some obscured watercourses. No forts had some watercourses that

were completely visible and some obscured. Table 4.34 and Chart 4.29 show that, like the watercourses, none of the watercourse banks within the middle distances was completely visible from a fort. Twenty-seven (56.3%) of the forts had partial visibility of the banks and at only 1 fort (2.1%) were the banks completely obscured. Twenty (41.7%) forts had some banks partially visible and some obscured.

These results, compared in Chart 4.30, reveal that, similar to the near distance results, there was greater visibility of the watercourse banks than the watercourses from the forts. They also show that at least some sections of the watercourses or watercourse banks were visible from most forts.

4.6.9 Visibility of the watercourses closest to the forts

The visibility of the watercourses that ran closest to the forts was recorded. The results for each fort are presented in Appendix VI, Table VI.4.

Table 4.35 Visibility in the near and middle distances of the watercourses that ran closest to the forts

Levels of visibility	Number of forts	Percentage of forts
Watercourse and watercourse banks both partially visible	42	87.5
Watercourse obscured and watercourse banks partially visible	5	10.4
Watercourse and watercourse banks both obscured	1	2.1

Chart 4.31 Visibility in the near and middle distances of the watercourses that ran closest to the forts

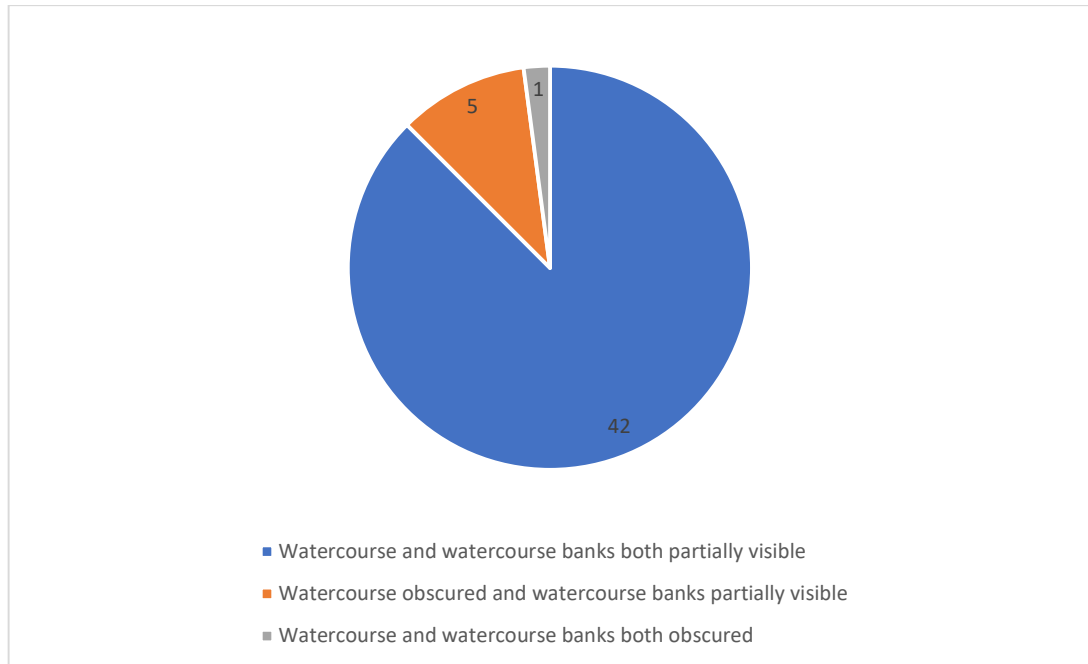


Table 4.35 and Chart 4.31 show that most (87.5%) forts had some visibility in the near or middle distances of the watercourses that ran closest to them. At 5 forts (10.4%) the nearest watercourses were obscured but their banks were partially visible. At Forden Gaer, for example, the River Severn is obscured in the near and middle distances but its banks are partially visible (Figures 68 and 69). At only 1 fort (Rhyn Park) were both the nearest watercourse (Morlas Brook) and its banks obscured (Figures 131 and 132). The location of Rhyn Park's east gate, however, is uncertain and the visibility of the Brook, which runs past the east of the fort, may have been possible from this gate. Therefore most, and possibly all, forts had some visibility of the nearest watercourse or the banks of their nearest watercourse.

4.6.10 The occurrence of watercourses in the far distances

As shown in Section 4.5.11, all 48 forts had watercourses (rivers and streams) present within their far distances. All rivers in the far distance bands of each fort were recorded during fieldwork and using the GIS. Streams were recorded if they were the nearest watercourse to the fort.

4.6.11 Visibility of watercourses in the far distances

Appendix VI, Table VI.3 provides the results for each fort and Appendix II, Table II.11 shows which result was used in instances where the fieldwork and GIS results differed.

Table 4.36 Levels of visibility in the far distances of the watercourses and watercourse banks that ran closest to the forts in their near or middle distances

Levels of visibility	Watercourses			Watercourse banks		
	No. of forts	Percentage of the 42 forts where the nearest watercourses extend into the far distance	Percentage of all 48 forts	No. of forts	Percentage of the 42 forts where the nearest watercourses extend into the far distance	Percentage of all 48 forts
Partially visible	9	21.4	18.8	11	26.2	22.9
Obscured	33	78.6	68.9	31	73.8	64.6

Chart 4.32 Visibility in the far distances of the watercourses that ran closest to the forts in their near or middle distances

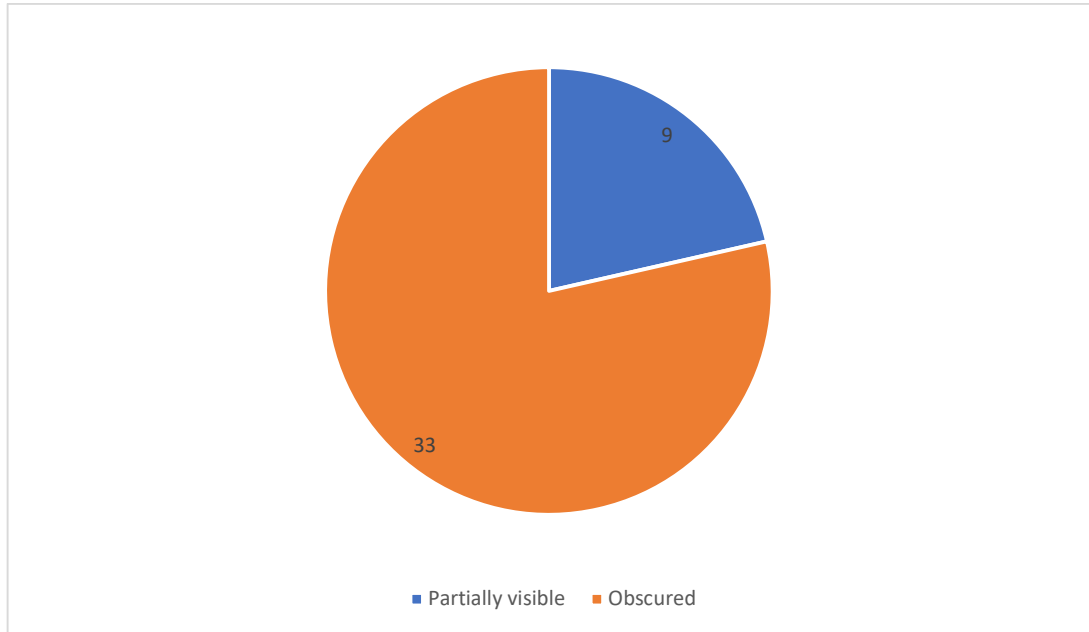
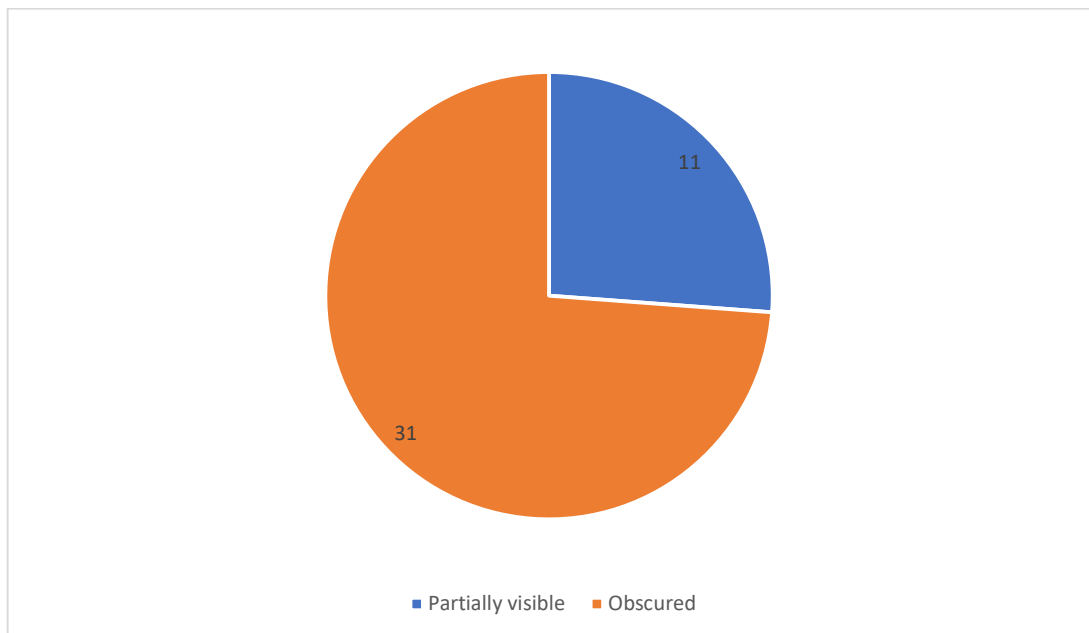


Chart 4.33 Visibility in the far distances of the watercourses banks that ran closest to the forts in their near or middle distances



The levels of visibility in the far distances of the watercourses that ran closest to the forts were recorded. At 6 forts, the watercourses that ran closest to the forts did not extend as far as the far distance bands. The 6 forts in question are Tomen y Mur, Colwyn Castle, Hindwell Farm, Coelbren, Gelligaer I and Caerphilly. All of the closest rivers to these forts had their sources within the near or middle distances of the forts and all, except that at Tomen y Mur, joined larger watercourses within the near or middle distances. Each of these larger watercourses extended into the far distance bands and each one is recorded as obscured from the forts in the far distance bands. Tomen y Mur is noted as an exception because the course of the closest watercourse to the fort, Nant Tyddyn-yr-yn, is uncertain due to subsequent works. From its direction, however, it is likely to have joined the Afon Prysor in the middle distance to the W. The course of the Prysor in the far distance band was obscured from the fort. At Segontium there are two rivers equally close to the fort. The Cadnant did not extend into the far distance of the fort but the Seiont did and this fort has therefore been included in Table 4.36.

Table 4.36 and Chart 4.32 show that just over three quarters (78.6%) of the nearest watercourses to the forts were obscured from the forts in their far distances, with 9 forts (21.4%) having partial visibility of these watercourses in their far distances. Only slightly more (11 forts; 26.2%) of the watercourse banks (Chart 4.33) were partially visible in the far distances. The 9 forts with partially visible watercourses also had partially visible banks, and therefore two forts (Llanfor and Cardiff) had banks that were partially visible but the watercourses obscured (Figures 103 and 46). As noted above, where the closest watercourses did not reach the far distances, the watercourses into which they fed were all recorded as obscured from their relevant forts in their far distance bands. None of the closest watercourses or watercourse banks was completely visible from the forts in their far distances. Eleven forts¹³ (22.9% of all 48 forts), therefore, had some visibility of their closest watercourses or closest watercourse banks within their far distances.

¹³ The 11 forts that had some visibility of their closest watercourses or closest watercourse banks within their far distances are Segontium, Llanfor, Brompton, Chester, Jay Lane, Llandoverly I and II, Llandeilo I and II, Cardiff II and Gloucester.

Table 4.37 Visibility in the far distances of the other large watercourses and watercourse banks

Levels of visibility	Watercourses		Watercourse banks	
	Number of forts	Percentage of forts	Number of forts	Percentage of forts
Partially visible	2	4.2	2	4.2
Obscured	46	95.8	46	95.8

Chart 4.34 Visibility in the far distances of the other large watercourses

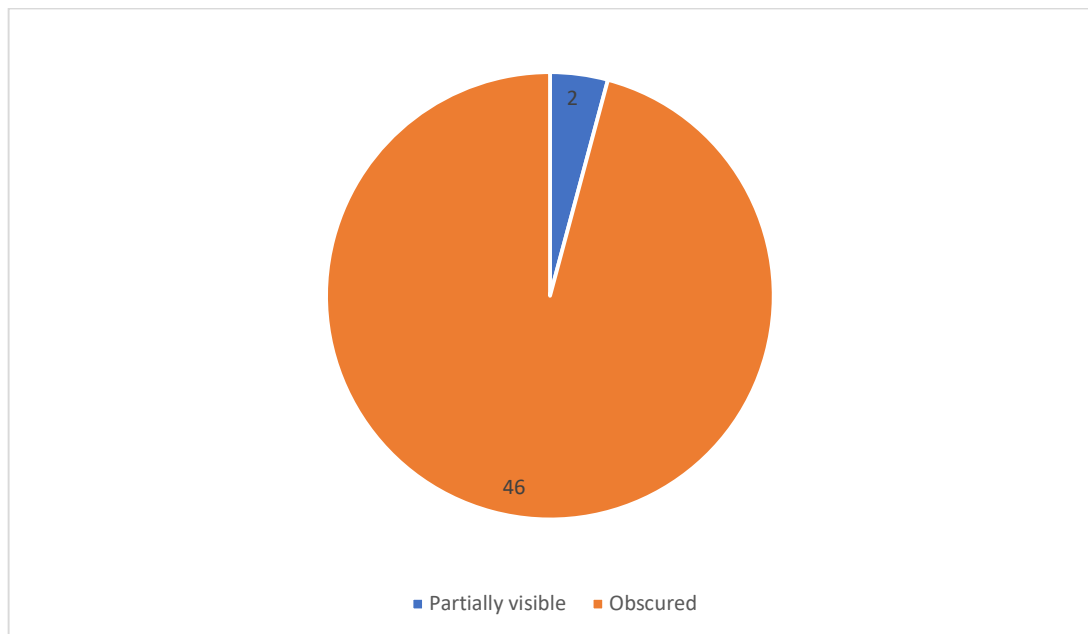
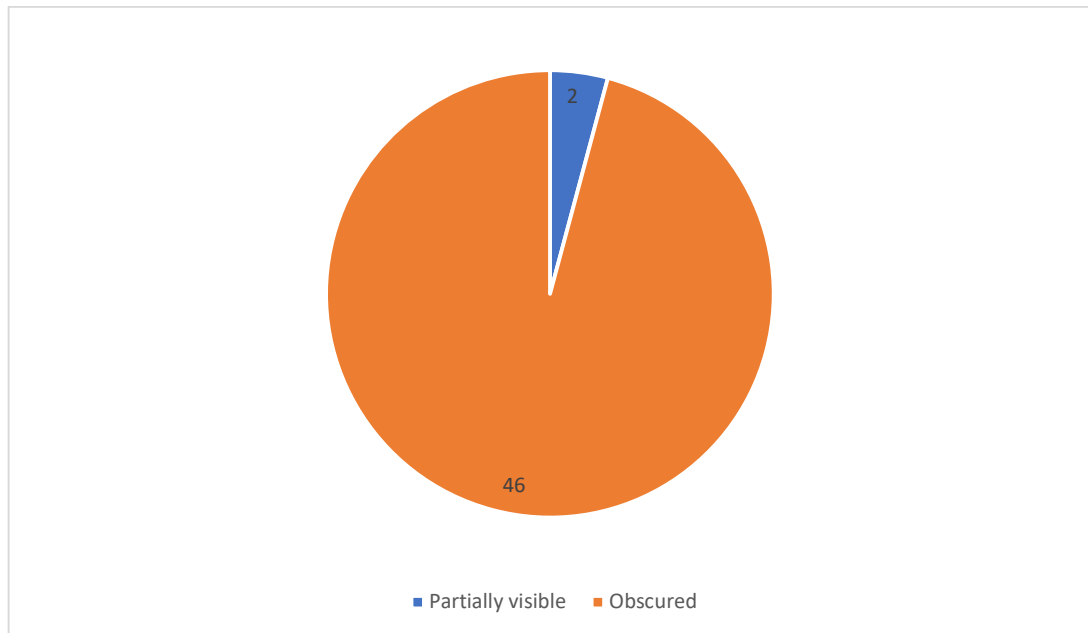


Chart 4.35 Visibility in the far distances of the other large watercourse banks



The results in Table 4.37 exclude the data from the forts' closest watercourses, which are presented in Table 4.36. Table 4.37 and Chart 4.34 show that other large watercourses were obscured from the forts in their far distances at all forts except for two. The results for the watercourses and watercourse banks do not differ (Chart 4.35). The two forts with some visibility of the other large watercourses were Llanfor and Chester (Figures 103 and 55). The closest rivers to these two forts also had partial visibility of either the watercourses or their banks in their far distances. Nine forts therefore had visibility of their closest rivers and/or river banks in their far distances but the other watercourses in their far distances were obscured¹⁴. Tables 4.36 and 4.37 show therefore that the watercourses that ran closer to the forts were slightly more prone to having some visibility in the forts' far distances than the other watercourses.

4.6.12 Other water features and their visibility

There were no other water features identified in the near distances of the forts.

¹⁴ Forts that had visibility of their closest watercourses and/or watercourse banks in their far distances but the other watercourses in their far distances were obscured are Segontium, Brompton, Jay Lane, Llandovery I and II, Llandelio I and II, Cardiff and Gloucester.

Table 4.38 Numbers of forts with other water features present, visible, partially visible or obscured in their middle distances

Water feature	Present	Partially visible	Percentage of forts with water feature present and partially visible	Percentage of all 48 forts with water feature partially visible	Obscured	Percentage of forts with water feature present and obscured	Percentage of all 48 forts with water feature obscured
Lake(s)	6	2	33.3	4.2	4	66.7	8.3
Sea	2	1	50	2.1	1	50	2.1

Only six forts were recorded as containing large lakes within their middle distances.¹⁵ At none of the forts was a lake fully visible. At 2 forts (Llanfor and Caer Gai) a lake was partially visible. Llyn (Lake) Tegid was the partially visible lake at both of these forts (Figures 102 and 18). Llyn yr Oerfel appears in the middle distance of Tomen y Mur. The lake itself is obscured and is recorded as obscured here. However, the land surrounding the lake is visible (Figures 137 and 138).

The sea extended into the middle distance of 2 forts, Segontium and Cardiff (Figures 135 and 45). In neither case was this open sea; Foryd Bay is now a tidal bay of marshes and mudflats, although its character may have changed since the Roman period, and opens out onto the Menai Straits. The Menai Straits, or Afon Menai in Welsh, is a narrow passage of sea between Anglesey and the mainland and is river-like in appearance. Its modern Welsh name reflects this; it is named in the manner of a river, with 'afon' translating to 'river'. Foryd Bay and the Menai Straits extended into the middle distance of Segontium and both were partially visible. The section of sea in the middle distance of Cardiff fort formed part of the Bristol Channel. Although this area of the Bristol Channel is not as narrow as that of the Menai Straits¹⁶, the English coast extends into the far distance of Cardiff fort beyond the Channel and the Channel narrows as it progresses eastwards to the Severn Estuary, with land enclosing the area of water to the east. This area of the Bristol Channel in Cardiff's middle distance was obscured from the fort.

The presence and visibility of other water features were also recorded in the far distances of the forts.

¹⁵ Large lakes cover 40 acres or more.

¹⁶ The distance between the coast south of Cardiff fort and the English coast on the far side of the Channel is approximately 13km. The width of the Menai Straits immediately north of Segontium is 1.3km.

Table 4.39 Numbers of forts with other water features present, visible, partially visible or obscured in their far distances

Water feature	Present	Number of forts with water feature partially visible	Percentage of forts with water feature partially visible	Percentage of all 48 forts with water feature visible or partially visible
Lake(s)	4	1	25.0	2.1
Sea	18	5	27.8	10.4

A greater number of forts had the sea present withing their far distance bands than within their near or middle distances, although only 5 (10.4% of all forts) had any visibility of the sea in their far distances.

4.7 Fort locations within valleys

4.7.1 Fort locations in relation to narrowing of valleys

During the data collection it was noted that many of the valley-based forts (identified in Section 4.6.1) were positioned near to a point where the valley narrows to such an extent that a fort would not fit within the narrowest section. Based on the themes and patterns identified above in relation to fort location, it was assessed whether it was likely that each valley-based fort would have been located at any other point between the fort's chosen location and the narrowing of the valley. If not, it was recorded that the fort was positioned as far along a valley as possible before the valley narrowed considerably (Appendix V, Table V.7).

Table 4.40 Numbers and percentages of valley-based forts that are located as close as possible to a narrowing in the forts' main valley

Fort located as close to valley narrowing as possible?	Number of forts	Percentage of the 42 valley-based forts	Percentage of all 48 forts
Yes	21	50	43.8
No	21	50	43.8

Table 4.40 shows that, based on the topographical priorities listed above, half the valley-based forts were recorded as being located as close to a narrowing of the forts' main valleys as possible.

At Llanfor, for example, the valley in which the fort was located, the Dee valley, narrows considerably in the middle distance to the E of the fort at SH968358 (Figures 101 and 102). The valley side to the S at this point is quite steep, reaching a gradient of over 38 degrees. The valley side to the N is slightly shallower, reaching just over 31 degrees. The valley floor here is narrow, with little space each side of the River Dee before the valley sides begin to rise. The fort is located as close to this narrowing as possible before the OS 1st edition map starts to label the area as being liable to flood. There are no other locations within the valley, such as a plateau or spur from the valley sides, between the fort and the narrowing that meet the criteria listed above.

As another example, at Caerhun the Conwy Valley similarly narrows to the S of the fort at SH797562, this time in the far distance band of the fort (Figure 31). The valley floor between the fort and the narrowing is low-lying and part of the flood plain and therefore, at present, would not be suitable for a fort location; the fort is located on the southernmost area of the higher ground in the valley floor before the start of the flood plain zone. There are areas of land that could have housed a fort to the SW and SE of the fort, where the land starts to rise to the valley sides before they become too steep. These locations are not adjacent to the river, however, and are part of the valley sides themselves, not spurs into the valley floor. It would seem, therefore, that the fort is located at the southernmost point in the valley where it can be next to the river (river falls within or near the near distance band) without being on the valley sides (where valley side itself is not in near distance band).

4.7.2 Visibility of valley floor towards the narrowing of the valleys

As presented in Section 4.5.16 above, some forts had full views, excluding watercourses, of the valley floors in which they were situated. It was also recorded whether the forts that were situated as close as possible to a narrowing of the valley also had full views, excluding watercourses, of at least one cross-section of the valley in the direction of the narrow points (Appendix V, Table V.7).

Table 4.41 Numbers and percentages of forts situated as close as possible to the narrowing of the main valley which had full views of at least one section of the main valley in the direction of the narrow point.

Full view?	Number of forts	Percentage of the 21 forts identified as being located as close to the main valley narrowing as possible	Percentage of all 48 forts
Yes	17	81	35.4
No	4	19	8.3

Table 4.41 shows that most (81%) of these forts did have a full view of the valley in at least one cross section in the direction of the valley narrowing. These visible areas could be in the near or middle distances, or both, such as at Caer Llugwy (Figures 20 and 21). Some forts also had visibility of the full width of the valley in the other direction, such as Pennal (Figures 122 and 123).

4.8 Fort orientation

4.8.1 Orientation of forts

The orientation of the forts, where known, was recorded (Appendix VI).

Table 4.42 Number of forts orientated towards each compass point

Compass point	Number of forts	Percentage of 48 forts
N	0	0
NE	5	10.4
E	3	6.3
SE	7	14.6
S	1	2.1
SW	5	10.4
W	2	4.2
NW	1	2.1
Unknown	24	50

Chart 4.36 Number of forts orientated towards each compass point

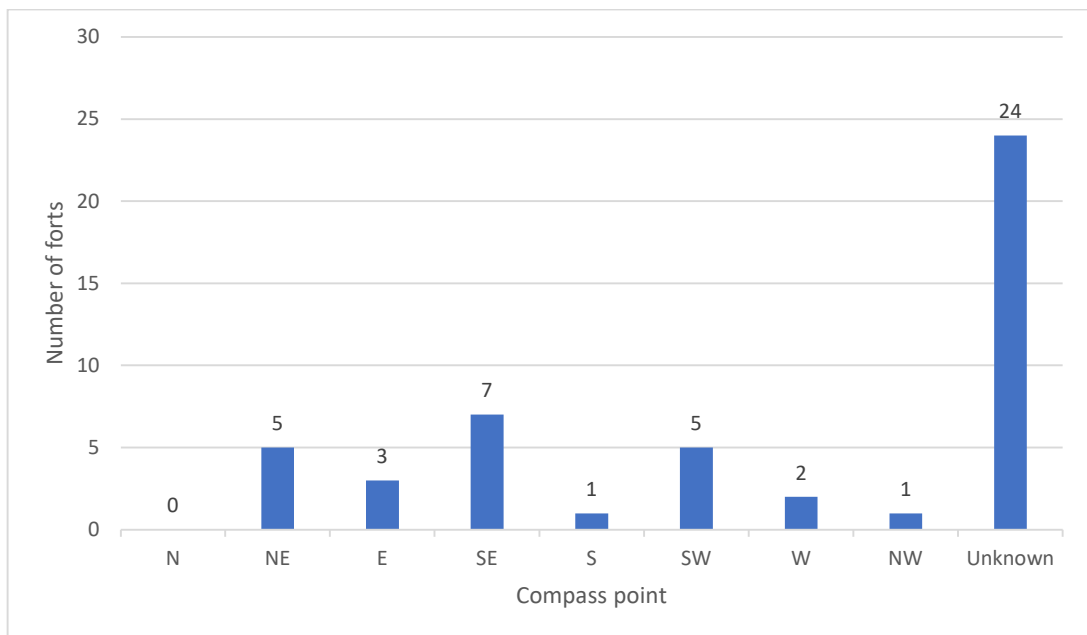


Table 4.42 and Chart 4.36 show that at half of the forts the orientation of the fort is not known. This is usually because the fort has not received enough investigation to determine the direction it faced. The remaining forts show that orientation was varied, but with a slight weight towards forts facing roughly east or west, with relatively few facing roughly north or south. This may give a little support to the possibility that forts followed Vegetius's advice for camps to face east if not towards the enemy (I, 23), although this does not explain the fairly high proportion facing west. It is possible that, for some currently unknown reason, orientations to the north or south were avoided where possible. It seems likely, however, that topographical influences also had a part to play.

4.8.2 Topography types towards which forts were orientated in the near distance

The topography types towards which forts were orientated were recorded for each distance band. The visibility of these topography types in the directions in which the forts were facing was also recorded.

Table 4.43 Topography types towards which forts were orientated in the near distance bands.

Topography type	Number of forts	Percentage of the 24 forts whose orientation is known	Percentage of all 48 forts
Descent	8	33.3	16.7
Descent and watercourse	16	66.7	33.3

As shown in Section 4.5.7 all except one of the forts have land that descends on 1 to 3 sides of the forts and remains flat or ascends on the other side(s) in their near distances. All the forts with known orientation were facing the descending land in the near distance. Table 4.43 shows that two thirds (16) of these forts also had a watercourse running through the near distance area towards which they were facing. As shown in Section 4.6.5, most of the near distances of the forts did contain a watercourse, and the proportion of the descent to watercourses presented here reflects this. These watercourses would inevitably occur on the descending side(s)

of the land beyond the forts but the forts' orientation towards watercourses may nevertheless be significant.

Table 4.44 Visibility of topography types towards which forts were orientated in the near distance bands.

Topography type	Number of forts				
	All visible	All partially visible	Descent partially visible, watercourse and watercourse banks obscured	Descent and watercourse banks partially visible, watercourse obscured	All obscured
Descent	0	8	N/A	N/A	0
Descent and watercourse	1	11	2	2	0

Table 4.44 shows that all the forts had some visibility of the topography they were facing in their near distances. Llanio was orientated towards both a descent and watercourse in its near distance and both were fully visible from the fort (Figure 104). At the remainder of the forts all the descending areas that the forts were facing were partially visible. Where present, most of the watercourses were also partially visible. There were 4 exceptions; at Chester and Wroxeter the watercourses and watercourse banks were obscured and at Caerleon and Usk the watercourses were obscured but the watercourse banks were partially visible.

4.8.3 Topography types towards which forts were orientated in the middle distance

Table 4.45 Topography types towards which forts were orientated in the middle distance bands.

Topography type	Number of forts	Percentage of the 24 forts whose orientation is known	Percentage of all 48 forts
Main valley	2	8.3	4.2
Main valley and main river	16	66.7	33.3
Undulating upland and/or lowland	3	12.5	6.3
Undulating upland and main river	1	4.2	2.1
Main valley and main river and sea	1	4.2	2.1
Main river	1	4.2	2.1

Table 4.45 shows that, of the forts whose orientation we know, over two thirds were directed towards the main valley of the forts. As shown in Sections 4.5.3 most forts were situated within valleys and therefore it would seem inevitable that most forts would be directed towards their main valley regardless of their orientation. Section 4.5.4 however, shows that forts were not always within the centre of the valleys; in some instances it would have been possible for forts to be directed towards valley sides as opposed to the valley itself, but the results suggest that this was avoided. Four forts are directed towards undulating lowland and/or upland in their middle distances, which reflects the lower number of forts located in undulating lowland or upland. At 17 forts (66.7%) the main river was also present in the direction in which the forts were facing. One fort (Loughor) is recorded as facing its main river only. In this instance, in its middle distance the fort faces the estuarine area just prior to the river meeting the sea (Figures 107 and 108). The sea, along with one of the main

valleys and river, is present in the direction in which Segontium faces (SW) (Figures 134 and 135). This is the only fort which faces the sea in its middle distance, although it is a bay as opposed to open sea.

Table 4.46 Visibility of topography types towards which forts were orientated in the middle distance bands; numbers of forts which are facing each topography type in their middle distances and numbers of forts with each topography type visible, partially visible or obscured

Topography type	Number of forts									
	Total	Percentage of the 24 forts whose orientation is known	Fully visible	Percentage of Total	Partially visible	Percentage of Total	Percentage of all 48 forts	Obscured	Percentage of Total	Percentage of all 48 forts
Main valley	19	79.2	0	0	19	100	39.6	0	0	0
Closest watercourse	19	79.2	0	0	18	94.7	37.5	1	5.3	2.1
Undulating upland and/or lowland	4	16.7	0	0	4	100	8.3	0	0	0
Sea	1	4.2	0	0	1	100	2.1	0	0	0

Table 4.46 shows the topography types found within the middle distances in the directions in which the forts faced and the numbers of forts where they occurred. These numbers are shown in the Total column. The table also shows the numbers of forts where these topography types were visible, partially visible and obscured. At Usk the main watercourse, the River Usk, was obscured but its banks were partially visible. The watercourse has been included as partially visible here. The totals for the main valleys and closest watercourses are the same but, as shown in the preceding tables, not all these 19 watercourses ran through the 19 valleys; some of the 19 watercourses ran past undulating land-based forts.

Over three quarters (19; 79.2%) of the forts whose orientation is known were directed towards land in their middle distances that included the forts' main valleys. All 19 of these forts had some visibility of these valleys. Similarly, over three quarters of the forts (79.2% of the 24 forts whose orientation is known) had their closest watercourse running through the middle distances in the directions in which they were facing. All except one of these (at Llanio) was partially visible. Four forts (16.7% of 24 forts) were directed towards undulating land in their middle distances and all four forts had some visibility of this land. One fort (Segontium) was directed towards topography types that included the sea in its middle distance and this was partially visible from the fort.

4.8.4 Topography types towards which forts were orientated in the far distance

Table 4.47 Topography types towards which forts were orientated in the far distance bands.

Topography type	Number of forts	Percentage of the 24 forts whose orientation is known	Percentage of all 48 forts
Undulating upland and/or lowland	5	20.8	10.4
Undulating upland and/or lowland, main valley and main watercourse.	8	33.3	16.7
Undulating upland and/or lowland, main valley, main watercourse and sea.	1	4.2	2.1
Undulating upland and/or lowland, other valley(s) and main watercourse.	4	16.7	8.3
Undulating upland and/or lowland and sea.	4	16.7	8.3
Main watercourse and sea	2	8.3	4.2

Table 4.47 shows that there was a variety of topography types towards which forts were facing in their far distance bands. The topography types towards which the greatest number of forts (9) were pointing was undulating upland and/or lowland with the forts' main valleys and main rivers. At 4 forts the forts were directed towards undulating land and other valleys in their far distances. At 5 forts the forts were facing simply undulating land. Seven forts were facing the sea and at 3 of these (Usk, Pennal and Loughor) the forts were facing the area where their main rivers met the sea (Figures 143, 144, 122, 123, 107 and 108).

Table 4.48 Visibility of topography types towards which forts were orientated in the far distance bands; numbers of forts which are facing each topography type in their far distances and numbers of forts with each topography type visible, partially visible or obscured

Topography type	Number of forts									
	Total	Percentage of the 24 forts whose orientation is known	Fully visible	Percentage of Total	Partially visible	Percentage of Total	Percentage of all forts	Obscured	Percentage of Total	Percentage of all forts
Undulating upland and/or lowland	23	95.8	0	0	16	69.6	33.3	7	30.4	14.6
Main valley(s)	10	41.6	0	0	5	50	10.4	5	50	10.4
Main watercourse(s)	11	45.8	0	0	5	45.5	10.4	6	54.5	12.5
Other valleys	4	16.7	0	0	0	0	0	4	100	8.3
Sea	6	25	0	0	3	50	6.3	3	50	6.3

Table 4.48 shows the topography types found within the far distances in the directions in which the forts faced and the numbers of forts where they occurred. These are shown in the Total column. The table also shows the numbers of forts where these topography types were fully visible, partially visible and obscured. Most of the forts (23; 95.8%) whose orientation is known were directed towards topography types that included undulating upland and/or lowland. At over two thirds of these 23 forts (16; 69.6%) the undulating land was partially visible. At no forts were the undulating areas completely visible; the undulations themselves caused hidden dips and frequently the main valley sides obscured undulating land beyond. Ten forts (41.6% of the 24 forts whose orientation is known) were orientated towards a stretch of their main valleys in their far distance bands. At 5 of these forts the valleys were partially visible and at the other 5 they were obscured. At 11 (45.8% of 24) forts their closest watercourses were present in the far distance areas towards which they were orientated. Slightly under half of these (45.5%) were partially visible, the remainder was obscured. At 4 (16.7%) forts other valleys were amongst the topography types towards which they were orientated, all were obscured from the forts. Six forts (25% of 24) were directed towards the sea in their far distances; 3 of these had some visibility of the sea.

4.8.5 Orientation in relation to areas where two or more rivers meet

Section 4.6.3 revealed that 30 of the 48 forts have two or more river confluences within their near or middle distances. Three of these are visible, 12 partially visible, 10 obscured and 3 have a mixture of visibilities. The locations of the river confluences in relation to the forts were compared to the orientation of the forts, where known. Of the 30 forts which have river meeting points in their near and middle distances, 14 have a known orientation.

Table 4.49 List of forts that have both river confluences within their near and/or middle distances and a known orientation; comparing visibility of river confluences, orientation of the forts and location of the river confluences in relation to the forts.

Fort where 2+ rivers meet and orientation is known	Visibility of river meeting points		Orientation of fort	Location of river meeting points in relation to fort	
	Confluence 1	Confluence 2		Confluence 1	Confluence 2
Brecon Gaer	Visible	-	W	SW	-
Loughor	Visible	-	SW	SW	-
Caerhun	Partially visible	-	E	SE	-
Llanfor	Partially visible	-	NE	S	-
Pen Llwyn	Partially visible	-	SW	SW	-
Buckton	Partially visible	-	SE	NE	-
Caerleon	Partially visible	-	SE	NE	-
Usk	Partially visible	-	S	S	-
Caersws I	Visible	Partially visible	E	W	SW
Caersws II	Obscured	Partially visible	SW	SW	S
Wroxeter	Obscured	Visible	NW	NW	S
Tomen y mur	Obscured	-	SE	NW	-
Caergwanaf	Obscured	-	E	NW	-
Gloucester	Uncertain	-	NE	Uncertain	-

Some forts had two river confluences within their near and middle distances and these are represented in Table 4.49 as Confluence 1 and Confluence 2. Within the near and middle distances of Gloucester, the former course of the River Severn is likely to have met the River Twyver, and possibly other rivers, but the precise meeting point is uncertain.

Table 4.49 shows that, of the forts that have river confluences within their near and/or middle distances and whose orientation is known, 5 forts were orientated towards a river confluence. One of these was visible from the fort (Loughor), two (Pen Llwyn and Usk) were partially visible and two (Caersws II and Wroxeter) were obscured (Figures 107, 108, 116, 117, 143, 144, 41, 42, 146 and 147).

4.8.6 Orientation in relation to areas where two or more valleys meet

Section 4.5.14 shows that 30 of the 48 forts have two or more valleys that meet within their near or middle distances and that 23 of these forts have partial visibility of the meeting points. The locations of the valley meeting points in relation to the forts were compared to the orientation of the forts, where known. Of the 30 forts which have valley meeting points in their near and middle distances, 14¹⁷ have a known orientation. Of these 14 forts, 10 had partial visibility of the meeting points.

¹⁷ This is the same number of forts as those where orientation is known and two or more rivers meet within the near or middle distances. Whilst some forts are on both lists, the list of 14 forts are not identical. Furthermore, when valleys meet, the rivers running through the valleys often (but not always) join also, but not necessarily at the same location as the valley meeting points. At Pen Llwyn, for example, valleys meet to the SE of the fort but their rivers meet to the fort's SW. Pen Llwyn faces SW.

Table 4.50 List of forts that have both valleys that meet within their near and/or middle distances and where their orientation is known; comparing visibility of valley meeting points, orientation of the forts and location of the valley meeting points in relation to the forts.

Fort where 2+ valleys meet and orientation is known	Visibility of valley meeting points	Orientation of fort	Location of valley meeting points in relation to fort
Caersws I	Partially visible	E	Centre
Caersws II	Partially visible	SE	Centre
Wroxeter	Partially visible	NW	NW
Pen Llwyn	Partially visible	SW	SE
Buckton	Partially visible	SE	E
Brecon Gaer	Partially visible	W	Centre
Loughor	Partially visible	SW	Centre
Caerleon	Partially visible	SE	Centre and NE
Usk	Partially visible	S	Centre
Pen Llystyn	Partially visible	SW	Centre
Tomen y Mur	Obscured	SE	NW
Caer Llugwy	Obscured	NE	E
Hindwell Farm	Obscured	SW	SW
Caergwanaf	Obscured	E	NW

Table 4.50 shows that, out of the forts that have valleys that meet within their near and/or middle distances and whose orientation is known, 2 forts (Wroxeter and Hindwell Farm) are directed towards the point where the valleys meet (Figures 146, 147, 77 and 78). The meeting points were partially visible from Wroxeter but obscured from Hindwell Farm. Table 4.50 shows that seven of the forts were located at the points where the valleys meet (noted as Centre in the Table) and therefore fort orientation in relation to these valley meeting points is not applicable. The remaining forts were not directed towards the valley meeting points.

4.8.7 Orientation in relation to river direction

The orientation of the forts in relation to the direction of flow of their closest watercourses was recorded.

Table 4.51 The orientation of the forts in relation to the direction of flow of their closest watercourses

Orientation of fort in relation to watercourse	Number of forts	Percentage of the 24 forts whose orientation is known	Percentage of all 48 forts
Upstream	6	25	12.5
Across	10	41.7	20.8
Downstream	8	33.3	16.7

Chart 4.37 The orientation of the forts in relation to the direction of flow of their closest watercourses

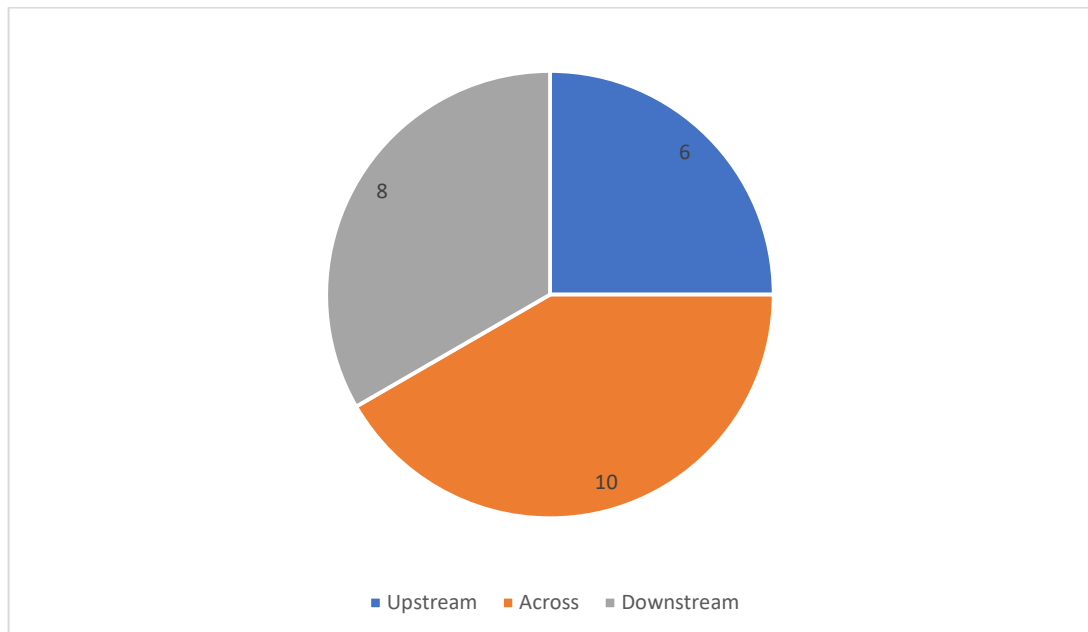


Table 4.51 demonstrates that, whilst the greatest proportion of the forts were directed across their nearest watercourse (41.7%), the proportions facing upstream (25%) and downstream (33.3%) were also relatively high.

4.8.8 Orientation/aspect comparison

The orientation of the 24 forts whose orientation is known was compared to their aspect.

Table 4.52 Fort orientation and aspect comparison

	Number of forts	Percentage of the 24 forts whose orientation is known	Percentage of all 48 forts
Fort aspect matched fort orientation direction	14	58.3	29.2
Fort aspect differed from fort orientation direction	4	16.7	8.3
Fort had no aspect	6	25.0	12.5

The forts categorised as being without an aspect are those that are on land that is flat, flat with a dome or with a central spine where the spine has no gradient.

Table 4.52 shows that the orientation of most of the forts (58.3%) matched that of their aspect. At only 4 forts (16.7%; Tomen y Mur, Segontium, Llanfor and Castell Collen) did these differ.

It would be useful to re-address the question of orientation when the orientation of more forts is determined.

4.9 Roman roads

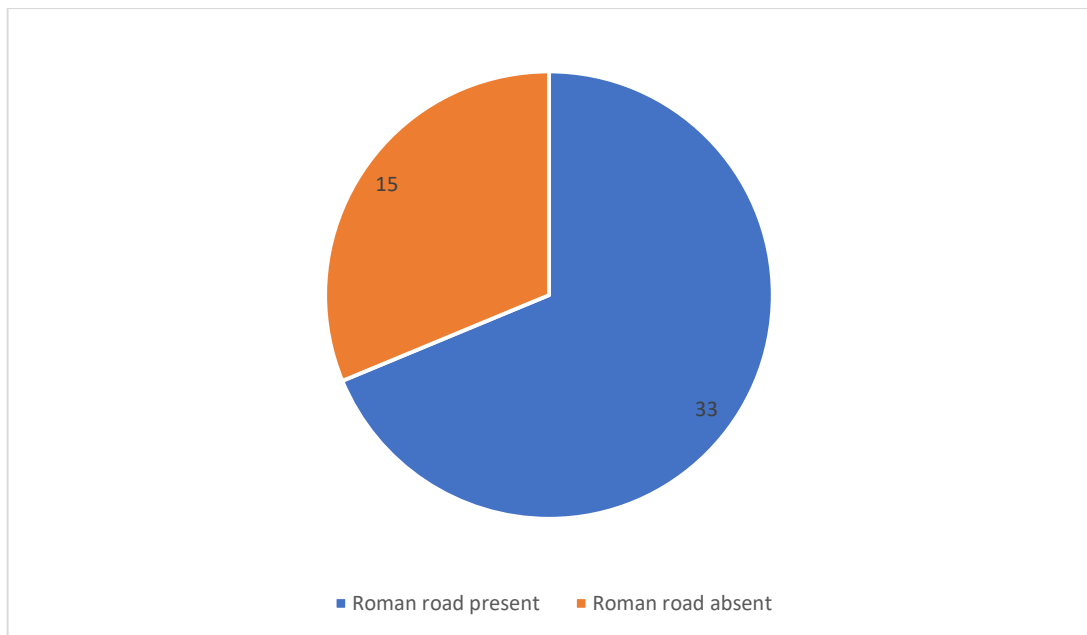
4.9.1 Proximity of Roman roads

The presence of Roman roads in the near, middle and far distances of each installation was noted (Appendix VIII; (Figure 4). The number of roads passing through the distance bands of each fort varied. Minor roads such as extramural settlement back streets were not included.

Table 4.52 Number of forts with at least one Roman road present in their near distances

Roman road present?	Number of forts	Percentage of forts
Yes	33	68.75
No	15	31.25

Chart 4.38 Forts with at least one Roman road present in their near distances



At 8 of the installations with no known or proposed/probable Roman roads in their near distances, predicted/suggested roads were present in the near distance, showing that researchers consider it likely that a road passed through the area but there is currently little evidence for them. In most cases, the presence of the forts

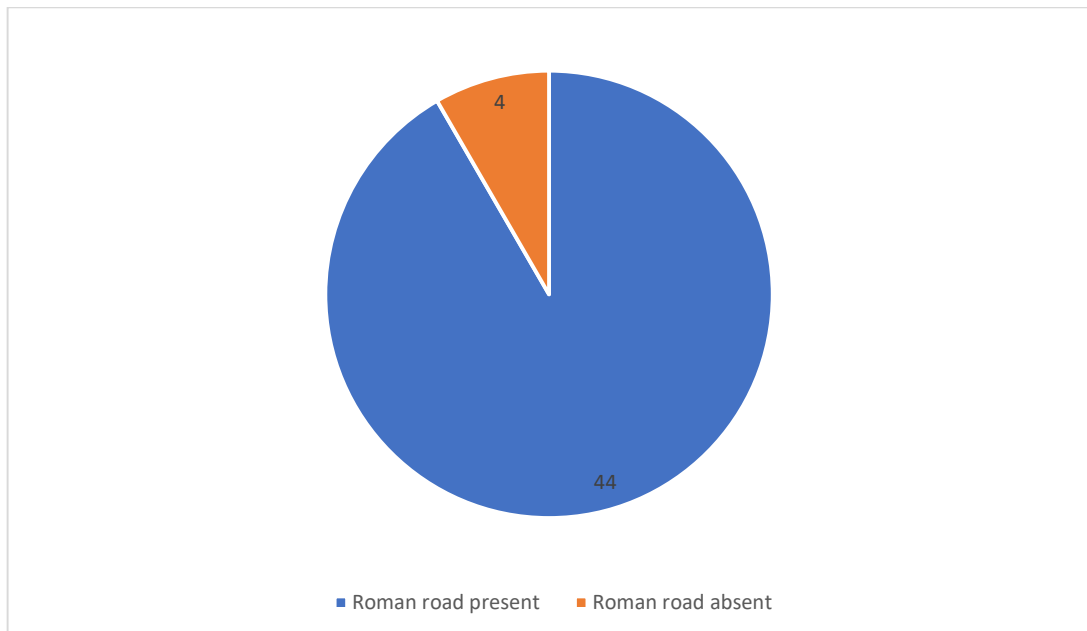
will be the main argument for the predicted/suggested roads. At Carmarthen, for example, suggested lines of Roman roads run through the near distance but none has yet been confirmed as known or proposed/probable (DAT HER PRNs 3382, 3401, 218).

Most, but not all, of the known and proposed/probable roads which passed through the near distances ran to a gate of the installation. At Hindwell Farm, for example, known roads ran towards the north, east and west gates (CPAT HER PRNs 33124, 83927, 33121). At Llanio, a road ran north-south past the west of the fort, with a probable extension leading to the fort gate (DAT HER PRN 51958).

Table 4.53 Number of forts with at least one Roman road present in their middle distances

Roman road present?	Number of forts	Percentage of forts
Yes	44	91.7
No	4	8.3

Chart 4.39 Forts with at least one Roman road present in their middle distances



At 2 of the installations with no known or proposed/probable Roman roads in their middle distances, predicted/suggested roads were present. At Caersws I, known and/or proposed/probable roads were present in the middle distance but they were all running towards Caersws II (CPAT HER PRNs 14303, 11725, 47063 and 14401) which suggests they were associated with the later fort and possibly were not present at the time Caersws I was in use. This is not certain, however, and therefore the roads in the middle distance of Caersws I are included as present here. Some of the roads present in the middle distances are continuations of roads noted in the near distances.

Table 4.54 Number of forts with at least one Roman road present in their far distances

Roman road present?	Number of forts	Percentage of forts
Yes	48	100
No	0	0

Some of the roads present in the far distances are continuations of roads noted in the middle distances. The far distance bands cover wide areas and therefore some of the stretches of roads present in these bands fall within the near and middle distances of other forts.

The results show that just over two thirds of the installations had roads running through their near distances. If any of the predicted/suggested roads are correct then this percentage would increase. Even more (91.7%) had roads running through their middle distances. All the forts had roads in their far distance bands although, considering the areas covered by the far distances, this is likely. Where no roads are recorded this may reflect a lack of investigation and not necessarily an absence of roads. Very few of the roads have been dated accurately, however, and therefore the relative dates of the roads and nearest forts cannot always be certain, especially those that do not run right up to the gates of a fort. As illustrated by the Caersws I and II example, an optimistic approach was taken and roads were noted as present even if their dates in relation to the forts are not known.

The results reveal both the extensive development of roads in the study area during the Roman period and the close proximity of the installations to the roads.

4.9.2 Visibility of Roman roads

The visibility of the known and proposed/probable roads within each distance band from each fort was recorded using the viewsheds generated in the GIS.

Table 4.55 Numbers and percentages of forts where all the roads within their near distances were visible/partially visible, some roads visible/partially visible and some roads obscured, or all roads obscured.

Visibility of roads	Numbers of forts	Percentage of the 33 forts with roads in their near distances	Percentage of all 48 forts
All roads visible or partially visible	30	90.9	62.5
Some roads visible or partially visible, some roads obscured	3	9.1	6.3
All roads obscured	0	0	0

Table 4.56 Numbers and percentages of forts where all the roads within their middle distances were visible/partially visible, some roads visible/partially visible and some roads obscured, or all roads obscured.

Visibility of roads	Numbers of forts	Percentage of the 44 forts with roads in their middle distances	Percentage of all 48 forts
All roads visible or partially visible	39	88.6	81.3
Some roads visible or partially visible, some roads obscured	4	9.1	8.3
All roads obscured	1	2.3	2.1

Table 4.57 Numbers and percentages of forts where all the roads within their far distances were visible/partially visible, some roads visible/partially visible and some roads obscured, or all roads obscured.

Visibility of roads	Numbers of forts	Percentage of all 48 forts
All roads visible or partially visible	7	14.6
Some roads visible or partially visible, some roads obscured	17	35.4
All roads obscured	24	50

The roads included were only those that had been designated known or proposed/probable by the Welsh HERs or had physical evidence mentioned in the descriptions provided by the English HERs. Even if the predicted/possible roads did pass through any of the distance bands, their courses are not known accurately enough to be certain that they fell within visible or obscured areas.

Table 4.55 shows that, where roads ran through the near distances of installations, most (90.9%) were fully or partially visible from the forts. At 3 forts, including Castell Collen, some roads were visible or partially visible and some obscured. No forts had all roads completely obscured within their near distances.

Table 4.56 reveals that most forts (39; 88.6% of forts with middle distance roads) had at least some visibility of all the roads that ran through their middle distances. At only 1 fort (Pen Llwyn) were all the roads in the middle distance obscured. At 4 forts, (9.1% of forts with middle distance roads; Tomen y Mur, Segontium, Llanfor and Neath), some roads were at least partially visible in the middle distances and some were obscured.

Table 4.57 shows that visibility of roads reduces in the far distance bands. Half the forts, including Caerhun and Caersws II, had no visibility of any roads in their far distances. Seventeen (35.4%) had some visible or partially visible and some obscured roads in the far distances, such as Neath, and 7 (14.6%), including Loughor, had at least some visibility of all the roads in their far distances.

4.10 Fort gate comparison

The views from the fort gates of each fort were compared to each other. For each gate of each fort (where the location of all 4 gates are known¹⁸) it was noted whether the views of the descending land and ascending land beyond the forts in their near distances were obscured or visible/partially visible. As described above, the combined views from the gates of each fort had some visibility of the ascending and descending areas beyond all their forts.

¹⁸ The location of some gates were estimated based on the known perimeter of the fort and the known location of opposite gates. These forts are included here.

Table 4.58 Comparison of visibility of rising and descending land beyond each fort in the near distances from each gate.

Visibility from each gate	Descent beyond fort (percentage)	Rise/flat area beyond fort (percentage)
Visible or partially visible from each individual gate	65.9	52.3
Obscured from 1,2 or 3 gates and visible or partially visible from the remaining gates	34.1	47.7

Table 4.58 shows that at just under two thirds (65.9%) of the forts all 4 gates had some visibility of the land descending beyond the forts. At the remaining forts, 1, 2 or 3 of the gates had no visibility of the descending areas. At just over half of the forts (52.3%) all 4 gates had some visibility of the rising land beyond the forts and 47.7% had 1 or more gates where these areas were obscured. At most of the forts, therefore, all gates had some visibility of the surrounding land in their near distances. At the others, although 1, 2 or 3 of the gates could not see these areas, the remaining gates did have some visibility of these areas.

Furthermore, most of the near distance areas beyond the forts were partially visible, as opposed to fully visible. At all the forts where all 4 gate locations are known, it was noted whether some gates had visibility of areas beyond the forts that others did not, thus helping to reduce the size of the obscured areas. Although the visibility of areas beyond the forts frequently overlapped those of the other gates, it was found that the combined views from the gates of each fort did give a fuller overall view of the near distance of their forts (Appendix V, Table V.9).

Similarly, although most gates from each fort had partial views of each topography type within their middle distances (all 4 gates of 87.8% of all valley-based forts had some views of their forts' main valleys for example), at most of the forts the combined view of the gates gave a fuller view of the middle distance of each fort than from each gate alone. At only 2 forts where the location of all 4 gates are known (Hindwell Farm and Brecon Gaer) were the views from each gate of each fort much the same as the views from the others.

At Tomen y Mur, for example, each of the gates has large obscured sections of the near distance but, when views from the gates are combined, most of the near distance is visible (Figures 149 to 152). The situation on the middle distance is similar. For example, the fort is situated on quite a steep slope and the NW gate is near the top of this slope and has views of the areas to the NW, N and NE that are obscured from the other gates.

4.11 Fort relocation comparisons

Where forts are thought to have relocated their results were compared to see if the newly-occupied sites shared topographical or visibility results that the former sites did not.

The criteria for identification as relocations were:

- The sites were proven or likely to have been occupied successively, with little overlap.
- The forts were geographically close to each other, such as within the same valley.

The forts within the study area that were identified as having relocated during the period under study are:

Llanfor and Caer Gai

Caersws I and Caersws II

Jay Lane and Buckton

Llandovery I and Llandovery II

Llandeilo I and Llandeilo II

Usk and Caerleon

Kingsholm and Gloucester

The results of themes that applied to the forts in question were compared.

Table 4.59 Comparison of Results in fort relocations

Theme	Similar	Different	Details	N/A
Fort size	3	3	In 3 instances the 2 nd fort was smaller.	1
Topography type	7	0		0
Location within topography type	2	5	1 st fort valley floor, 2 nd fort spur from valley side: 2 1 st fort plateau in valley floor, 2 nd fort valley floor: 1 1 st fort spur from valley side, 2 nd fort plateau in valley floor: 1 1 st fort valley floor, 2 nd fort plateau in valley floor: 1	0
Watercourse type closest to the fort (main or tributary)?	7	0		0
Watercourse on 2+ sides of fort?	5	2	1 st fort has watercourse on 2+ sides, 2 nd does not: 1 2 nd fort has watercourse on 2+ sides, 1 st does not: 1	1
Do 2+ watercourses meet in the near and/or middle distances?	6	1	1 st fort yes, 2 nd fort no: 1.	0

Theme	Similar	Different	Details	N/A
			Caersws I and II are similar; both have the same watercourse meeting points within their near/middle distances but Caersws II is situated closer to the meeting points.	
Visibility of river confluences	2	2	1 st fort the confluences were obscured, 2 nd fort they were partially visible: 1 (Llandovery I and II) 1 st fort all visible/partially visible, 2 nd fort 1 partially visible, 2 obscured (Caersws I and II)	3
Do 2+ valleys meet in near or middle distances?	6	1	1 st fort no, second fort yes: 1	0
Is fort in centre of the valley meeting points?	4	0	Both Caersws I and II are within an area of valley meeting points but Caersws II is closer to the centre of the meeting point. Caersws I is located as far along the valley length as possible before the valley narrows.	3
Visibility of valley meeting points.	4	0	The valley meeting points at Buckton and Jay Lane are both partially visible but Jay Lane has larger visible areas. Similarly, the meeting points from Llandovery I and II are partially visible but there are larger visible areas from Llandovery II.	3

Theme	Similar	Different	Details	N/A
Topography within fort	2	5	1 st fort slope, 2 nd fort dome: 2. 1 st fort dome, 2 nd fort flat: 1 1 st fort flat and slope, 2 nd fort slope and central spine: 1 1 st fort flat, 2 nd fort slope and dome: 1	0
Visibility of fort interior	6	0		1
Steepest gradient within fort	3	3	2 nd fort is steeper: 2 2 nd fort is shallower: 1	1
Steepest gradient of descending land beyond the forts in near distance	1	5	2 nd fort steeper: 3 2 nd fort shallower: 2	1
Steepest gradient of ascending land beyond the forts in the near distance	4	2	2 nd fort is shallower: 1 2 nd fort is steeper: 1	1
Visibility of descending land beyond the forts in the near distance	6	0		0
Visibility of ascending land beyond the forts in the near distance	6	0		0
Watercourse present in near distance?	7	0		0
Visibility of near distance watercourse.	5	1	1 st fort the watercourse was partially visible, 2 nd fort obscured: 1	1

Theme	Similar	Different	Details	N/A
Visibility of near distance watercourse banks.	6	0		1
Middle distance visibility of main valley floor.	6	1	1st fort valley floor was obscured, 2 nd fort partially visible: 1. The valley floor from both Kingsholm and Gloucester was partially visible but larger areas were visible from Gloucester. The viewshed was only taken from the central point of Kingsholm, however, so larger areas may have been visible from all 4 gates combined.	0
Middle distance visibility of main valley sides.	7	0		0
Full width of valley floor visible in at least 1 direction?	7	0	Caersws I has a full view downstream, Caersws II upstream. Tywi valley visible in 1 direction from Llandoverly I and 2 directions from Llandoverly II.	
Is the middle distance closest watercourse visible, partially visible or obscured?	4	3	1 st fort the watercourse was obscured, 2 nd fort partially visible: 2.	0

Theme	Similar	Different	Details	N/A
			Caersws I and II; numerous watercourses with a mixture of visibilities for each fort. Recorded as 'different' here.	
Are the middle distance closest watercourse banks visible, partially visible or obscured?	6	1	Caersws I and II; numerous watercourses with a mixture of visibilities for each fort. Recorded as 'different' here.	0
Visibility of other water features in middle distance	1	0	Llyn Tegid is partially visible from both Llanfor and Caer Gai.	6
Relative altitude compared to the rest of the middle distance	7	0		0
Far distance visibility of main valley floor.	4	3	1 st fort the main valley floor was partially visible, 2 nd fort obscured: 3	0
Far distance visibility of main valley sides.	6	1	1 st fort the main valley sides were visible. 2 nd fort obscured: 1	0
Far distance visibility of closest watercourse	5	2	1 st fort the watercourse was visible, 2 nd fort obscured: 1 1 st fort obscured, 2 nd fort visible: 1	0
Far distance visibility of closest watercourse banks	4	3	1 st fort the watercourse banks were visible, 2 nd fort obscured: 2	0

Theme	Similar	Different	Details	N/A
			1 st fort the watercourse banks were obscured, 2 nd fort visible:1	
Fort placed as far along the valley as possible before a narrowing of the valley?	5	2	1 st fort yes, 2 nd fort no: 1 (Caersws I and II) 1 st fort no, 2 nd fort yes: 1 (Usk and Caerleon) Caersws I is located as far along the valley length as possible before the valley narrows, whereas Caersws II is not but II is located closer to the centre of valley meeting points.	0
Full width of the valley floor visible in at least one location in the direction in which the fort is situated as far along a valley as possible before the valley narrows?	3	0		3

Table 4.59 shows the numbers of the pairs of relocated forts where the results of each theme were similar or different. In most cases the results for each fort were either positive or negative and therefore differences were simple to record; for example, a river could have some visibility from a fort (be visible or partially visible (positive)) or obscured (negative). Identifying differences between forts with some themes was less clear, however. None of the forts was exactly the same size as another, for example, so a definition of what would be considered a 'significant difference' was developed. The definitions are as follows:

- Fort size: if the smaller fort was two thirds (66.6%) of the size of the larger fort or less, the fort sizes were recorded as 'different'.
- Steepest gradient within fort: If the shallower fort was less than two thirds of the gradient of the steeper fort AND the gradient of the steeper fort was 10 degrees or higher¹⁹ (unless the shallowest gradient was completely flat²⁰), the fort sizes were recorded as 'different'.
- Gradients of ascending and descending land beyond the forts in the near distance: If the shallower gradient was less than two thirds of the gradient of the steeper fort AND the gradient of the steeper fort was 10 degrees or higher (unless the shallowest gradient was completely flat), the fort sizes were recorded as 'different'.

It is acknowledged, however, that these definitions are subjective.

Where N/A is recorded, it means that results for some forts could not be collected. The full extent of Kingsholm fortress, for example, is not certain and therefore its size could not be compared to that of Gloucester fortress. As another example, some forts did not have watercourse confluences within their near and/or middle distances. The visibility of confluences therefore could not be compared in these cases.

¹⁹ Where gradients were under 10 degrees, the contrast between gradients of 2/3 or shallower would have been minimal.

²⁰ If one gradient was under 10 degrees and the other was 0 degrees (flat), the comparison was recorded as 'different' because it was considered that the choice of using flat ground in contrast to even a slight slope is significant; most fort interiors and the land beyond had some gradient and therefore the use of flatter areas was unusual and considered here useful to acknowledge as 'different'.

4.12 Fort type comparisons

The results for the auxiliary forts and legionary fortresses were compared to see if there were any differences between the site types. Appendix IX shows the full comparison of data for both site types. The results that differ significantly are presented here.

There are 6 legionary fortresses and 42 auxiliary forts identified for study within the research area. It is acknowledged that 6 is a small number to be used as a comparison against 42 of a differing site type. It was nevertheless considered worthwhile identifying significant contrasts in order to identify potential differences in the use of topography for different site types. In some cases, data from all the fortresses was not available; when considering the visibility of middle distance main valley sides, for example, the data was not available for 3 fortresses (one was in undulating lowland and 2 only had valley sides only in the far distance bands). Where data from only 3 fortresses or fewer was available, it was considered that the number of fortresses was too few to compare to the auxiliary forts.

Table 4.60 Data that differed significantly between legionary fortresses and auxiliary forts

	Legionary fortresses	Auxiliary Forts	Notes
Fort size (ha)	Mean (of 5 fortresses): 19.64 Range: 16 to 24.4	Mean: 2.73. Range: 1.05 to 9.5	The fortresses are considerably larger than the auxiliary forts.
Elevation: highest point within fort (MASL)	Mean: 28.3 Range: 15 to 70	Mean: 124.0 Range: 10 to 370	The mean elevation of the auxiliary forts is over 4 times higher than that of the fortresses. The lower ranges of both sets of forts are similar but the upper range for the auxiliary forts is over 5 times higher. The fortresses therefore appeared to avoid higher ground, which was not avoided by the auxiliary forts. However, depending on what was considered a priority, this may reflect the distribution of the fortresses; they were all located to the E of the study area where the elevation of the topography was generally lower than that further W.
Maximum gradient within fort (degrees)	Mean: 5.85 Range: 5.1 to 9	Mean: 7.15 Range: 0.5 to 25	The mean gradient was similar in both data sets but there was a greater range with the auxiliary forts, showing that a small number of auxiliary forts' maximum gradients were up to 3.5 times steeper than the average fortress. The results indicate that steeper gradients were avoided by fortresses.

	Legionary fortresses	Auxiliary Forts	Notes
Maximum gradient of descending land beyond the forts in near distance (degrees)	Mean: 16.04 Range: 0 to 33 (Mean of 5 forts)	Mean: 18.1 Range: 0.3 to 47.8	The maximum range for auxiliary forts is over a third higher than fortresses. The mean, however, is similar.
Watercourse type closest to the fort (main or tributary)?	Main: 6 (100%) Tributary: 0 (0%)	Main: 26 (61.9%) Tributary: 16 (38.1%)	All the fortresses had main rivers as the closest watercourse. A high proportion (61.9%) of the auxiliary forts were similar but not all.
Watercourse present in the near distance?	Yes: 6 (100%) No: 0 (0%)	Yes: 35 (83.3%) No: 7 (16.7%)	All the fortresses had a watercourse in the near distance. Most (83.3%) of the auxiliary forts were similar but not all.
Visibility of near distance watercourse	All fully visible: 0 All partially visible: 2 (33.3%) All obscured: 4 (66.7%)	All fully visible: 3 (8.6%) All partially visible: 18 (51.4%) All obscured: 10 (28.6%)	A greater proportion of near distance watercourses were completely obscured from fortresses (66.7%) than auxiliary forts (28.6%).

	Legionary fortresses	Auxiliary Forts	Notes
	<p>One watercourse visible and one partially visible: 0</p> <p>One partially visible and one obscured: 0</p> <p>One visible and one obscured: 0</p>	<p>One watercourse visible and one partially visible: 2 (5.7%)</p> <p>One partially visible and one obscured: 2 (5.7%)</p> <p>One visible and one obscured: 0 (0%)</p>	
Visibility of near distance watercourse banks	<p>All fully visible: 0</p> <p>All partially visible: 4 (66.7%)</p> <p>All obscured: 2 (33.3%)</p> <p>One watercourse visible and one partially visible: 0</p> <p>One partially visible and one obscured: 0</p> <p>One visible and one obscured: 0</p>	<p>All fully visible: 7 (20%)</p> <p>All partially visible: 19 (54.3%)</p> <p>All obscured: 6 (17.1%)</p> <p>One watercourse visible and one partially visible: 2 (5.7%)</p> <p>One partially visible and one obscured: 1 (2.9%)</p> <p>One visible and one obscured: 0 (0%)</p>	<p>A greater proportion of near distance watercourse banks were completely obscured from fortresses (33.3%) than auxiliary forts (17.1%), although the contrast is not as great as with the near distance watercourses; more of the fortresses (66.7%) had visible watercourse banks than visible watercourses, which made the banks results closer to those of the auxiliary forts.</p>

	Legionary fortresses	Auxiliary Forts	Notes
Do 2+ watercourses meet in the near and/or middle distances?	Yes: 5 (83.3%) No: 1 (16.7%)	Yes: 25 (59.5%) No: 17 (40.5%)	A greater proportion of fortresses had river confluences in the near and/or middle distances than the auxiliary forts.
Is the fort in the centre of the valley meeting points?	Yes: 4 (100%) No: 0 Percentages of the 4 fortresses where 2+ valleys meet in near and/or middle distances.	Yes: 14 (51.9%) No: 13 (48.1%) Percentages of the 27 auxiliary forts where 2+ valleys meet in near and/or middle distances.	All relevant fortresses were in the centre of the valley meeting points, compared to only about half of auxiliary fortresses. There were only 4 relevant fortresses to use as a comparison, however,
Full width of main valley floor visible in at least one direction?	Yes: 3 (60%) No: 2 (40%) Percentages of the 5 fortresses which have main valleys in their	Yes: 34 (91.9%) No: 3 (8.1%) Percentages of the 37 auxiliary forts which have main valleys in their near	A greater proportion of auxiliary forts had a full view of the main valley in at least one direction.

	Legionary fortresses	Auxiliary Forts	Notes
	near and middle distances (i.e., are located within valleys).	and middle distances (i.e., are located within valleys).	
Fort placed as far along the valley as possible before a narrowing of the valley?	Yes: 1 (20%) No: 4 (80%) Percentages of the 5 fortresses located within valleys.	Yes: 20 (54.1%) No: 17 (45.9%) Percentages of the 37 auxiliary forts located within valleys.	A greater proportion of auxiliary forts were placed as far along a valley as possible. This was only the case for 1 fortress, suggesting it was not a priority for fortresses.
Far distance main valley floor visible or partially visible?	Yes: 5 (83.4%) No: 1 (16.6%) Percentages of the 6 fortresses with a main valley present in the far distance band.	Yes: 10 (28.6%) No: 25 (71.4%) Percentages of the 35 auxiliary forts with a main valley present in the far distance band.	A greater proportion of the fortresses had some visibility of their main valley in their far distance bands.
Far distance main valley sides visible	Yes: 6 (100%) No: 0 (0%)	Yes: 25 (71.4%) No: 10 (28.6%)	A greater proportion of the fortresses had some visibility of their main valley in their far distance bands, although the contrast was

	Legionary fortresses	Auxiliary Forts	Notes
or partially visible?	Percentages of the 6 fortresses with a main valley present in the far distance band.	Percentages of the 35 auxiliary forts with a main valley present in the far distance band.	not so great as with valley floors; more auxiliary forts had some visibility of the valley sides.

Percentages and mean calculations in the Auxiliary Forts column represent the percentages of the 42 auxiliary forts unless otherwise stated. Percentages and mean calculations in Legionary Fortresses column represent the percentages of the 6 legionary fortresses unless otherwise stated.

The comparison shows that much of the data for the fortresses was similar to that of the auxiliary forts but there were some instances where there were significant differences.

4.13 Location priorities

The results from each section above were compared to identify which occurred the most frequently in order to suggest what may have been considered a priority when fort sites were chosen.

4.13.1 Results which applied to two thirds or more of all forts

In light of the topography of the study area, some of the results in this section are perhaps unsurprising and do not necessarily help to identify what were considered priorities. The hilly terrain with numerous rivers and streams explains the high occurrence of valley floors, valley sides, undulating upland, undulating lowland and watercourses. These distance bands cover large areas and it is inevitable that these topography types would occur, especially within the far distance bands, which cover the largest areas.

In relation to topography, this section of the results reveals that two thirds of the forts or more:

- Were located within valleys.
- Had the valleys in which they were situated (where relevant) extend into the forts' middle and far distances.
- Had partial visibility of the main valley floors and sides in their middle distances.
- Had a full view of at least one cross section of the valley floor of either the valley in which they were situated or a valley entering the undulating lowland in which they were situated.

- Had land that ascended/remained flat one or more sides of the fort and descended on the other side(s).
- Had views of the ascending and descending land in the near distance beyond the forts.
- Had partial visibility of undulating upland in their far distances.
- Were located at points higher than some, equal to some and lower than some topography in their middle and far distances.

Data concerning watercourses was frequent in this section of the results, showing that a high proportion of forts had:

- Watercourses within their middle distances.
- Some visibility of watercourses and/or watercourse banks within the near and/or middle distances.
- Main rivers as their closest watercourse.
- No visibility of watercourses or watercourse banks, including those that ran closest to the forts, in their far distance bands.

4.13.2 Results which applied to between one third and two thirds of all forts

Topography results that fell into this section include forts which:

- Were located on rises in valley floors.
- Had valleys (not main) extend into their middle distances.
- Had undulating upland extend into their middle distances.
- Had partial visibility of undulating upland in their middle distances.
- Had partial visibility of undulating lowland in their middle distances.
- Had partial visibility of undulating lowland and valley sides in their far distances.
- Had two or more valleys meet in the near and/or middle distances.
- Had two or more valleys which did not meet in the near and/or middle distances.
- Were located at the points where valleys met.
- Had some visibility of the valley meeting points.
- Were valley-based forts located as close to a narrowing of the main valley as possible.

- Were valley-based forts not located as close to a narrowing of the main valley as possible.
- Were situated as close as possible to the narrowing of the main valley and had full views of at least one section of the main valley in the direction of the narrow point.

Data relating to water in this section included forts that had:

- Watercourses in their near distances that were visible or partially visible.
- Watercourse banks in their near distances that were visible or partially visible.
- Watercourses in their middle distances that were visible or partially visible.
- Watercourse banks in their middle distances that were visible or partially visible.
- Watercourses present on two or more sides.
- Did not have watercourses present on two or more sides.
- Two or more watercourses that met within the near and/or middle distances.
- Did not have two or more watercourses that met within the near and/or middle distances.
- Tributaries as their closest watercourse.
- A mix of watercourses that were partially visible and watercourses that were obscured in their middle distances.
- A mix of watercourse banks that were partially visible and watercourses that were obscured in their middle distances.
- The sea present in their far distance bands.
- The banks of watercourses that ran closest to the forts obscured in their far distances.

4.13.3 Results which applied to less than one third of all forts

Topography results that fell into this section include forts:

- Which were situated in undulating lowland.
- Whose locations within their topography type were anything but a rise within a valley (including spur from valley side and valley floor).
- Which had each type of topography within their interiors (sloping, domed etc.)
- Which had partially visible views of their interiors.

- Which had uncertain levels of visibility within their walls.
- Which had partially visibility of main valley floors in their far distances.
- Which had partial visibility of other valley sides and valley floors in their far distances.
- Which had partial visibility of other valley floors in their middle distances.
- Which were not located at the points where valleys meet.
- Which had views of valley meeting points which were fully visible.
- Which had views of valley meeting points which were obscured.
- Which did not have full views of at least one cross-section of the valley floor in which the fort was situated or 1+ valleys entering the lowland in which a fort was situated.
- Which were situated as close as possible to a valley narrowing but did not have full views in the direction of the narrowing.
- Where isolated hills were present in the middle distances.
- Which had partial visibility of isolated hills in the middle distance.
- Where land beyond the sea was present in their far distances.
- Which had partial visibility of land beyond the sea in their far distances.

Data relating to water in this section included forts that had:

- No watercourses in their near distances.
- Watercourses in their near distances that were all completely visible.
- Watercourses in their near distances that were all obscured.
- Multiple watercourses within their near distance with a variety of levels of visibility.
- Watercourse banks in their near distances that were all completely visible.
- Watercourse banks in their near distances that were all obscured.
- Multiple watercourse banks within their near distance with a variety of levels of visibility.
- Watercourses in their middle distances that were all obscured.
- Watercourse banks in their middle distances that were all obscured.
- Large watercourses (not the closest to the forts) within their far distances that were partially visible.
- The banks of large watercourses (not the closest to the forts) within their far distances that were partially visible.
- Watercourses that ran closest to the forts obscured in the near and/or middle distances combined.

- Watercourses that ran closest to the forts in the middle distances - some partially visible, some obscured.
- Watercourse banks that ran closest to the forts in the middle distances - obscured.
- Watercourses that ran closest to the forts in the middle distances - some partially visible, some obscured.
- Watercourses that ran closest to the forts partially visible in the far distances.
- Watercourse banks that ran closest to the forts partially visible in the far distances.
- River confluences that were all partially visible.
- River confluences that were all obscured.
- River confluences that were all visible.
- Multiple river confluences within their near and/or middle distances with a variety of levels of visibility.
- No river confluences which included a main river.
- River confluences which included a main river that were all partially visible.
- River confluences which included a main river that were all obscured.
- River confluences which included a main river that were all visible.
- River confluences which included a main river that were all partially visible.
- Multiple river confluences which included a main rivers with a variety of levels of visibility from the fort.
- Partial visibility of the sea in their far distances.
- Lakes present in their middle distances.
- Lakes present in their far distances.
- Partial visibility of lakes in their middle distances.
- No visibility of lakes in their far distances.

The results also revealed that some of the research questions regarding topography and watercourses applied to none of the forts. This frequently applied to the questions of whether certain features were fully visible or whether they were obscured completely. For example, at none of the forts was the valley meeting points in their near or middle distance completely visible; where present they were either partially visible or obscured. At none of the forts was the ascending and descending land beyond the forts in the middle distances completely obscured; they were either partially visible or fully visible.

4.14 Summary

This chapter has presented the data collected regarding the location of the forts in relation to the topography, watercourses and Roman roads, as well as the visibility of these features from the forts. It also presented data regarding fort orientation, the differences between site types and site-shifting. Finally, it presented the data that was most and least common amongst the forts.

Key findings include that most forts were valley-based, often slightly elevated but not at the highest points in the valleys. Most forts were near large watercourses. There was good visibility within forts, of their near distances and of main valleys within the middle distances. Forts also had good views of sections of their nearest watercourses (including watercourse banks) and roads within their near and middle distances. At over 75% of forts, the full width of the main valley was visible along at least one cross-section of the valley. Visibility of significant topographical features, such as valleys and watercourses, worsened in the far distances.

The following chapter discusses the results in relation to the research aims and relevant debates as examined in Chapter 2.

5 Discussion

5.1 Introduction

Chapter 2 highlighted the themes of supply, transport, defence and monitoring about which fort siting is frequently discussed in the literature. This chapter considers the results in relation to the literature that discusses these themes. It argues that the results reveal the importance placed on practical considerations, local supplies, the transport of supplementary supplies and of people to and from forts, the siting of forts to dominate specific areas within the landscape, and the monitoring of movement through main valleys. The impact on local populations is also discussed within these themes. Based on the results, the chapter then discusses which themes were likely to have been considered a priority when siting forts in Wales.

The occurrence of certain topography types within the near, middle and far distances reflect the study area to an extent. The area is predominantly hilly and mountainous, with some lower-lying areas, surrounded on 3 sides by sea and with high rainfall, leading to numerous watercourses. The occurrence of valleys, undulating upland, lowland and watercourses are therefore to be expected, especially in the middle and far distances, each of which cover large areas. Similarly, considering the large numbers of watercourses in the study area, it is unsurprising that numerous watercourses were present in each of the forts' middle and far distances. The proportion of forts located in valleys compared to undulating lowland, for example, reflects the proportions of these topography types in the study area. However, it is the forts' siting in relation to these features, and their visibility of these features, that is the focus of this study and is addressed and discussed here.

5.2 Practical considerations

The results suggest that certain key practical considerations were taken into account when choosing the locations of forts. Most forts were sited in such a way that dampness within the fort could be minimised, for example. Most were located on a slight rise, aiding drainage and avoiding the lowest-lying areas which may have been the most prone to bogs and dampness, as demonstrated further by the relative altitude of the forts to their near and middle distances. Caerhun, for example, was

located slightly higher in altitude than the lowest points in the valley to its south, which is currently a marshy flood plain (Figures 29 and 30). Usk was not located on a slight rise but this fortress was relocated to Caerleon (Evans 2010, 161) and flooding and dampness may have contributed to the change of site (Manning 1981, 55). Tomen y Mur was located on a valley side (Figures 137 and 138), which is unusual compared to the rest of the forts of the study area, which tended to be placed within the valley floors or on spurs from the valley sides. The OS 1:2500 1st edition map shows that a river, Afon Brysor, ran through the valley (which is now a reservoir) and that there were numerous streams running across the valley to meet the river. Farmsteads and mills were present within the valley on the map, but only near the edges of the present day reservoir. These points suggest that the valley base may have been quite damp. The south-east area of the reservoir (SH70333503) is labelled as being 'liable to floods' on the 1st edition map. The 1st edition map (and modern maps) does not show the contours of the valley base and there may not have been a rise in ground within the valley suitable for a fort. The valley may therefore have been one in which the Roman army wanted to base a fort but the valley floor itself may have been considered too damp for occupation.

The land in the near distances beyond the fort walls descended on 1 to 3 sides at all except one fort (Usk), and remained flat or ascended on the remaining sides. The relative altitude of the forts to their near distances reflects this. These gradients would have helped water to drain past or away from the forts and also helped waste water to be carried away from the forts. The topography within the forts themselves also suggests consideration was given to drainage. Most had a slope and the numbers that were domed or with a central spine were also high, aiding drainage away from the fort interiors. None of the fort interiors was concave in shape, helping to prevent the possibility of water pooling in the centre.

Consideration of dampness and flooding when choosing a site is mentioned in some relevant literature and the results support their statements. Regarding camps, Vegetius (II, 22) wrote that 'thought must be given that the site is not liable to flooding from torrents and the army suffer harm from this cause'. Pseudo-Hyginus (57) similarly advised against damp or flood-prone areas. It has been argued that some fort relocations have been prompted by flooding; Batz (1983, 172) for example mentioned that the fortress was moved from Usk to Caerleon probably as a result of flooding of the River Usk into the site of the original fortress. Usk was the only installation not to have land sloping beyond its walls in its near distances, which

perhaps left it more vulnerable, although possible flood defences identified at Caersws II (Jones 2010, 229) indicates that the descents beyond the fort were not always sufficient.

The results also suggest consideration for the ease of establishing structures within the forts. Although most forts had sloping land within the forts (Section 4.5.5), the elevation range was mostly 10m or less. Although the maximum gradients within the forts varied greatly (Section 4.5.5), the particularly steep areas at some forts usually represented small undulations and none of the forts had large steep areas or large cliff-like features within their walls. Most forts could therefore have had roads and structures constructed within their walls without having to take the steep gradient of all or some of the area into account. When describing how the Romans made temporary camps, Josephus (III, 86) mentioned that if the ground is uneven it is levelled prior to marking out the extent of the camp. This implies the levelling of minor undulations, however, as opposed to altering the overall gradient of the topography. A similar approach was likely during fort construction.

A further practical consideration suggested by the results is the consideration of siting forts where there is usable space surrounding the fort defences. As discussed below, the results indicate that the proximity to watercourses was a factor in fort siting and it could therefore be argued that a slope descending to a fort then descending from the fort (Section 4.5.7) was chosen simply because it also carried a watercourse alongside a fort. This was the case at some forts, however the closest watercourses were frequently found to be at the base of the descending slope, running perpendicular to the slope and not using the gradient of the ascending/descending land in the near distances beyond the forts.

The average gradients of the ascending and descending land in the near distances varied but those of the descending land tended to be of higher gradient than those of the ascending land and the maximum gradients were higher in the areas of descent (Section 4.5.7). The areas of flat or ascending land could therefore have been considered more consistently useful for activities beyond the forts than those of the descent, and forts may have been sited to ensure such spaces were available; where forts were located on a rise or plateau within a valley floor, for example, the fort did not necessarily occupy the highest point but left a rising area (or sometimes flat area) to one side. The fact that locations were not chosen with land descending on all sides, which may have aided drainage and potentially

defence, although this is discussed further below, indicates a purpose for these ascending or flat areas. The results revealed that the extra mural settlements were usually located on the descending land beyond the fort (Results Section 4.5.7), leaving the flat or ascending areas free or partially free. This may have been at least in part a consideration of drainage; the troops may have prevented extra-mural structures from being built at a higher altitude than the forts so that waste water from the settlements did not have to run through or past the forts. Alternatively they may have focused on the roads closest to the main routeways for ease of access to supplies, and these would have mostly been on the downwards slopes towards the valleys. Defensive considerations may also have been a factor; buildings upslope from a fort would have made the forts more vulnerable in the event of an attack. It is also possible that extra-mural features were present in these flat or ascending areas but that they have not yet been identified; most of the extra-mural features in the study area have been identified by geophysics (for example Hopewell 2005), which does not identify all potential features. Few of the extra-mural areas have been subject to large-scale excavation. The army, however, may have kept these areas free for their own purposes, such as recreation, training and grazing of animals. A parade ground (GAT HER PRN 5082; Gresham 1938, 198) has been identified within part of the flat then gently rising area beyond the walls at Tomen-y-Mur, which supports the argument that these areas were used, at least in part, for exercises.

Vegetius (III, 2) stressed the importance of the exercise of troops outdoors when the weather allowed and the flat or gently rising areas may have provided a convenient location for some of these activities. Polybius (VI, 33), when discussing camps, stated that most of the Roman troops passed daytime within the open space within the camps. In contrast to forts, camps were usually of a more temporary nature, often in a new or hostile environment, and the spaces beyond the camp extents were not necessarily considered accessible or safe. The extra-mural settlements and *territoria* developed around the forts, and, as discussed further below, these were areas that were likely to have been controlled and influenced by the Roman army. Therefore to train, exercise or have leisure time beyond fort defences, in times of relative peace or stability, would have been more likely than at the camps discussed by Polybius. Researchers have suggested that such exercises took place beyond the fort walls (for example Hanel 2007, 413). Parade grounds have been identified in the extra-mural areas of some forts of the study area, such as Tomen y Mur (GAT HER PRN 5082) and Chester (Ward et al. 2012, 3, 309), which

emphasises the use of these areas for military activities. More space may have been required for cavalry training (Vegetius III, 2; Huntley 2013, 35) but the gently rising land in the near distances would have been suitable for smaller scale activities.

Similarly, Polybius (VI, 27, 31) noted the space within camps for horses and livestock but animals at forts are likely to have had more opportunity to graze beyond the fort walls. Part of the gently rising land in the near distances beyond forts may have been used for grazing some of the military horses, since it provided space for them to roam but kept them nearby in case they were needed quickly. Huntley (2013, 35) noted the need to keep some horses within or close to the forts so that they were available for immediate use. She was discussing animal management in relation to forts in northern Britain but the use of horses would have been similar in Wales. The number of horses at each fort would vary depending on the troops stationed at each, but some horses were likely to be present at each for purposes such as facilitating fast communications. The gently rising land beyond the forts would have provided pasture and space to keep the animals comfortable whilst being close enough to access them quickly.

Although most known *vicus/canabae* structures were on the descending slopes of the forts' near distances, it is also likely that space for their construction, and that of extra-mural military features, was taken into account when siting forts, and the results reflect this. Researchers have been increasingly considering the inhabitants of the forts and the *vici* as having complex, semi-integrated communities (Kolbeck 2018, 10), forming a 'symbiotic' relationship with the army (Sommer 2006, 110). The *vici* were therefore likely to have been expected and space for their development considered at forts where *vici* would be present. Sommer (2006, 128-130) highlighted the possible presence of boundaries limiting the extents of *vici* beside forts in Wales and suggested that certain areas were set aside for military use, implying that the *vici* were either marked out or their presence was accepted but their extents restricted. Sommer (2006, 120-2) also noted that fort annexes, where known, were usually kept separate from the *vicus* areas and Burnham and Davies (2021, 71-76) recently argued that extra-mural areas had distinct zones, keeping civil areas away from military zones. The consistency in topography type in the near distances beyond the forts, therefore, may have been in part a consideration of the zones which were expected to develop beyond the fort walls. The tendency for the flat/ascending areas to be mostly free of *vicus* features suggests that this space was

reserved for military use. The descending areas were steep in places at some forts but there was usually nevertheless space to house *vici* as well as military structures within the extra-mural areas.

5.3 Military considerations

5.3.1 Use of topography

The locations of the forts within the topography (Section 4.5.4) show that the forts were not located in what could be argued were the most defensively strong locations, such as the tops of valley sides or isolated hills. The relative altitude of the forts to the topography within the middle distances of each fort (Section 4.5.13) shows that, although there was always land lower in altitude than the forts, the forts were never at the highest points in their middle distances, indicating that undulating lowland and valley-based forts did not take advantage of the highest points, and therefore the most difficult to access, available in the vicinity.

The most elevated locations would have been the more inaccessible areas of the landscape and could have worked alongside the forts' defences to put off potential attackers and make the process of attack more difficult should they try. These locations were sometimes chosen in pre- and post-Roman eras, such as for some hillforts and some medieval castles, but the results show that this was not a main aim for Roman forts in the study area and study period. An isolated hill known as Coxall Knoll, for example, (SO365734) is situated to the west of Buckton (Figure 11) and Jay Lane Roman forts, falling within the middle distances of both forts. It met many of the siting conditions common amongst forts as identified by the results, such as valley location and near watercourses, although the interior of a fort there may have been more undulating than typical. An Iron Age hillfort has been identified on the hill but, even though they were both within the same valley as the hill, both Roman forts were sited in different areas of the valley, and both lower in altitude than the highest point of Coxall Knoll²¹. Since none of the forts was located

²¹ Whether or not the hillfort of Coxall Knoll was occupied by local populations during the Roman era is uncertain. This discussion is assuming that the hillfort was unoccupied, as some were during this period. Roman forts have been identified within abandoned or seized hillforts elsewhere in Britain, such as at Hod Hill in Dorset, but the results reveal that Roman forts avoided such settings in this study area.

at the highest or most inaccessible locations possible, it shows that, more than not being a priority, these locations were not sought out for the forts and were not part of the military tactics. As discussed below, most forts, in contrast, were located within or near areas that were more easily accessible, such as valley floors. Other considerations were therefore given priority. This contrast with some Iron Age and medieval fortifications suggests different approaches to the command of the landscape between these eras. The Roman approach may have been less based on physical defence, for example, and, as discussed below, more focused on alternative ways to dominate the landscape.

Although the most inaccessible locations in the landscape were not chosen, however, the results (Section 4.5.7) show that the forts were frequently located within topography that could nevertheless aid or complement the forts' defences. The ascent towards the forts would have worked alongside the fort's artificial defences by adding an extra obstacle to overcome in the face of an attack. Some gradients on all or some descending sides outside of the forts, however, were so shallow that they were recorded as 'flat' during the fieldwork element of this study (Section 4.5.7), such as at parts of Caerhun (Figure 29). These gradients would have made little difference to an approach to the forts. Others, such as at Llandeilo I and II (Figures 95 and 98), were very steep and would have provided more of a hindrance. The fact that almost all the forts had sloping ground outside their walls on 1 to 3 sides suggests that this was considered an important element to fort location. The variety of these gradients between forts may suggest that providing obstacles for defence was not a consideration and that other advantages to the descents, such as drainage and visibility, as discussed above and below respectively, were the reasons behind choosing locations near descending land. Shallower gradients may have been preferred because they allowed easier access from the fort to the landscape beyond. However, comparisons between the gradients of the ascending and descending land outside the forts (Section 4.5.7) suggests that more emphasis was placed on the necessity to have a steep descent outside the forts' walls, which could indicate some consideration of the defensive benefits. This may also suggest there was some acknowledgement that the steeper descents provided some defensive advantages, although, since not every fort had steep descents beyond its walls, other factors must have been considered a priority in some situations.

It could be argued that forts with the steepest descents beyond their walls were located where they were considered most at risk of assault. This could therefore be useful when studying Roman relationships with local populations. Movements of forts to or from sites with differing gradients of descending land could indicate changing relationships with local populations; the adoption of the site of Caer Gai, with steep descents outside its walls, instead of the original Llanfor fort which had shallow descents could suggest a change of relationship with local people over time (Figures 17 and 101). As mentioned in Chapter 2, evidence for volatile relationships with local populations in certain areas of Wales has similarly been sought by considering the density of forts in the area, with a high density being taken as evidence for unfriendly populations which require more troops to control (for example Jarrett 1969, 4, 145). A correlation between high densities of forts and steep descents beyond the forts may support this theory.

However, no such correlation was noted when studying the results. In addition, there have been counter-arguments to the fort density idea. For example, some researchers argued that the army would be more inclined to place bases in the more secure friendly areas, that some apparently dense areas of forts may represent supervision of industries or site-shifting and that forts are yet to be found in the apparently sparse areas (Arnold and Davies 2000, 16; Burnham and Davies 2010, 23, 46). The extent of the natural defences in terms of local relations is therefore a consideration but would require further evidence to be considered a reliable interpretation. At present, a more likely scenario is that other factors were prioritised, and they took advantage of steeper descents if they were fortunate enough to find them alongside these factors. Such priorities could be the reasons behind site shifting; the abandonment of Llanfor, for example, may have been for a practical reason, such as being prone to flooding, especially considering its proximity to rivers and the shallow gradients beyond the fort.

While not necessarily providing a hindrance to accessing the forts, the presence of flat or ascending land beyond the fort walls on the remaining sides may also have provided defensive advantages. All the forts had these areas and the areas tended to slope gently, with lower gradients than the descending areas. The results (Section 4.5.7) also show that frequently these areas appear to have been kept mostly clear of extra-mural structures. These areas could therefore have provided space which may have been useful in an unanticipated military situation; as mentioned above, it may have been an area to keep horses close at hand in the

event that fast correspondence with troops elsewhere was required, or it may have provided an area for troops to congregate or evacuate quickly if necessary. The shallow gradients of these areas would also prevent the forts from being overlooked from the immediate vicinity and helped prevent the rise of the land from blocking views from the fort or from the land itself. These areas may therefore have provided the space for action, while the remaining descending land on the other sides of the forts helped to protect the people within the forts and the ascending land beyond.

The consideration for defence in the siting of forts in the study area has not been a theme that has received wide attention. The results point to defence being a consideration in fort siting but also highlight variety amongst the forts in this respect, showing that defensive locations were not always a priority. Burnham and Davies (2010, 68) wrote that some Flavian forts were sited in, 'defensive positions on low, but commanding hills within river valleys...'. Their description of low hills within valleys suggests that the forts were not located at the highest points available. The results therefore support their statement, although the results place a greater emphasis on the variety of naturally defensive locations; some forts, although conforming to the ascending/descending land pattern, had very gentle slopes providing minimal hindrance and hinting at other priorities, and this was not stressed by Burnham and Davies. The results also support Johnson's statement (1983, 36) that auxiliary forts of the 1st and 2nd centuries in Britain were not sited primarily to be highly defensible strongholds but had their own man-made defences from which the troops could leave and fight in open ground. She stated that, instead, they could be found on a 'slight prominence on gently sloping land'. This latter statement is supported by the results, although the results indicate that some forts were sited with better natural defences than implied by Johnson. Furthermore, the usable space surrounding the forts, especially the flat or gently ascending areas, identified by the results may have been considered if many troops were required to leave the fort and fight in open ground. The naturally defensive locations of individual forts in the study area were occasionally highlighted by those researching the fort in question, although the researchers rarely compare the topographic setting of other forts in terms of defence in this context. White (2010, 193) for example noted that Wroxeter made use of a naturally defensive location. The results, therefore, help to put the studies of individual forts into context.

Despite the reliability and dating problems in regard to ancient writers, the results also show that some of the ideas expressed within the ancient literature in regard to

camps may have been considered in regard to the forts in the study area. Vegetius (I, 22) wrote that camps should avoid nearby mountains or high hills which could 'be dangerous if captured by the enemy'. He was presumably concerned that the camps would be overlooked and within reach of missiles or advance from above. Pseudo-Hyginus (57) made a similar statement, and he went on to explain that, 'A mountain should not loom over a camp by which the enemy could attack from above or look down on what was happening inside the camp.' The results show that there was always descending land and flat or gently rising land in the near distances (or completely flat land on all sides at Usk), which frequently extended slightly into the middle distances. Many forts therefore may have had valley sides within their middle distances, which were of higher altitude than the forts, but there was always land lower or only very slightly higher than the forts immediately surrounding their walls.

In the context of discussing fortifications in Mediterranean areas, Polybius (VI, 42) mentioned that the Greeks preferred to use naturally defensive locations for their camps, whereas the Romans preferred to construct their own defences, therefore enabling a standardised layout within the camps. If Roman ideas about camps can indeed be extended to Roman forts in Britain (Johnson 1983, 36), the results suggest that his remark could not be entirely accurately applied to forts in Wales; although they may not have been sited in the most inaccessible locations, there was some consideration of natural defences.

Vegetius (III, 8) also explained that the dispersal of grazing horses provided an opportunity for attack. This statement was in the context of discussing camps, which were unlikely to have developed the *territoria* associated with forts, discussed further below, in which grazing may have taken place and which may have been considered a secure, patrolled place for grazing. Nevertheless, fast access to horses in the event of an emergency may have been provided by the land surrounding the forts in their near distances, in which a selection of horses could have had the space to graze. Although not secured by the fort defences, these areas were mostly visible from the forts, as discussed below, and would have had a high military presence. If a threat was foreseen, the horses could have been quickly brought within the fort walls. Sommer (2018, 103) mentioned the presence of ring-type *vici* on the continent, so far only found associated with forts with an equestrian garrison. These *vici* are located on the far side of a road that circles the fort, quite far from the fort's ditches, possibly leaving space for exercising or grazing the horses close to the forts. Such arrangements have not yet been found in Britain,

although Sommer (2018, 106) suggested that further research may indicate a similar set-up at Caerhun²². The flat or gently sloping areas in the near distances of the forts may have provided a similar space, not only for the horses associated with an equestrian garrison, but for horses used by all garrisons, which could be accessed quickly when required. Recent work on extra-mural areas has highlighted the importance of annexes at some forts in Wales (Burnham and Davies 2021), although the annexes were possibly of a later date than that of this study (Burnham and Davies 2021, 74), and future research could perhaps consider where they fell in relation to the gradients of the topography and whether they would have been suitable areas for grazing horses.

5.3.2 Proximity of water

Fort location in relation to watercourses also indicates consideration towards defence against land-based attack when choosing fort locations. The close proximity of watercourses to the forts and the large size of most of these watercourses (Section 4.6.5 and 4.6.7) meant that these rivers could provide an extra layer of defence by providing a barrier that would need to be crossed by any attacker approaching from beyond the far banks. Most of these watercourses were main rivers (Section 4.6.1), which tended to be larger, or very large tributaries and although varying in width along their courses, would therefore have been amongst some of the most difficult to cross, helping to slow the progress of an enemy advancing via land. Even streams and brooks, however, would provide some hindrance to an advance.

Furthermore, slightly over half of the forts had watercourses that surrounded the forts on 2 or more sides (Section 4.6.2). In most of these instances, the watercourses involved were rivers, as opposed to smaller streams or brooks (Section 4.6.2). Having such potential obstacles on 2 or more sides of some forts could have helped to protect these forts from approaches from numerous angles. The landscape contained numerous watercourses and it is perhaps inevitable that most forts would have had a watercourse nearby. However, the results show that

²² The area Sommer suggests includes quite a steep descent from the fort with a flatter area beyond (Figure 29). The flatter area may have been suitable for horses but this may not have been the area that could be accessed fastest from the fort; there were no such obstacles to the gently rising area beyond the western gate of the fort. Geophysics has not taken place to the east or west of the fort therefore further research may help to suggest how/if these areas were utilised.

most had them very near, at least within their near distances, were usually closest to the larger rivers and often had watercourses on two or more sides. This indicates purposeful positioning in relation to watercourses and the potential defensive advantages is a likely factor in the decision to choose these locations. An enemy advance on a fort via a watercourse was also a possibility and the proximity of the forts to the watercourses may have made them vulnerable. Similar to the avoidance of the highest most inaccessible locations, the decision to nevertheless site the forts so close to the watercourses suggests that either an unforeseen attack via water was considered unlikely or the benefits of proximity to the watercourses, such as the supply and communication advantages and obstacle to land-based attack, outweighed the perceived risks.

The sea and lakes could also provide potential obstacles to an attack, although at only two forts (Cardiff II and Segontium; Figures 45 and 135) did the sea extend into their middle distances and none of the forts had the sea within their near distances. The sea, however, may have been considered more of a threat than defence, although whether local populations had the resources or inclination to mount an offensive by sea is uncertain (Jones 2009, 41 discussing the Silures in particular). Raids from pirates or from populations further afield, such as Ireland, may also have been a threat. An attack along a river could only come from the opposite bank, upstream or downstream. The width of the river would also limit the numbers of attackers who could arrive at a location at any one time. In most cases, however, the sea provides numerous angles from which to attack and no limit on how many vessels reach the shore at one time, although large numbers would potentially cause the occupants to be dispersed along the coast initially. The areas of sea in the middle distance of Segontium comprised the Menai Straits and Foryd Bay, the characters of these are described in Chapter 4 (Section 4.6.12). Neither, therefore, was open sea. The Menai Straits is river-like in character and may have been treated as such. It would also be fairly simple to block the entrance to the Foryd Bay and prevent vessels from leaving. It therefore seems an unlikely route for an attack on the fort. The sea which extends into the middle distance of Cardiff fort is part of the Bristol Channel and not the open sea (Section 4.6.12). Therefore this section of the Channel is less like a typical British river in appearance, and there is more space to manoeuvre than the within Menai Straits, but it differs in character from the open sea.

The two forts therefore had the transport advantages of being very close to the sea, as discussed below, without having the exposed area of open sea as close as its middle distance. Their location in terms of Roman military transport and monitoring is discussed further below. From the point of view of defence against a potential attack, their positioning away from the open sea within their middle distances suggests that the relative security of sea enclosed by Roman-occupied lands enabled the positioning of the forts so close to the coast. Roman navy vessels, the presence of which in large numbers in both stretches of water in this study period has been considered likely but uncertain (Jones 2009, 40-41), would enhance the security of these nearby areas of sea.

At 18 forts (37.5%) the sea extended into the far distances. These 18 forts include the forts where the sea was present in their middle distances. At some of these forts the sea comprised the Menai Straits or the Bristol Channel; 6 of the forts had land beyond the sea (Anglesey or the English coast) extend into their far distances. At the other forts the sea was unenclosed by coast, such as that in the far distance of Pennal fort (Figure 124). These forts may have been considered far enough from the coasts to have been at minimal risk from attack via the sea. Alternatively, other advantages to their locations may have been prioritised over any perceived threat via the sea.

This project has focused on forts and fortresses but Roman first century AD fortlets have been identified in and near the study area, some sited near the coast. A first to early second century fortlet is known on the north coast of Anglesey to the south-west of Cemlyn Bay (Hopewell 2018, 313). Hopewell (2018, 320) described that it is near one of the few good landing places along this coast and that the site has good views of the sea. He suggested that it may have been a guide for those using the landing bay, a navigational aid along the main shipping route from Chester, a control point for shipments and also used for policing the access to the north coast, guarding against coastal incursions (2018, 320). Hopewell (2018, 320) noted another potential fortlet at Mynydd Eilian towards the eastern coast of Anglesey, possibly of a similar date, which may have had similar functions to the Cemlyn fortlet. Erglodd fortlet, which is possibly first century in date, is located near the west coast of Wales (Davies 2010, 292-294). It is slightly further inland than those of Cemlyn and Mynydd Eilian but research into its siting may suggest a potential role associated with the sea.

Symonds (2018, 61, 67, 72) argued that two fortlets, Old Burrow and Martinhoe, on the Exmoor coast worked together to guard and protect against coastal raids from the Bristol Channel. A fortlet, possibly first century AD, has been identified alongside the Mersey estuary at Ince (Philpott 1998, 349-350). It has good views of the estuary and Philpott (1998, 350-352) suggested that its role included policing or monitoring the estuary and signalling to the fleet, with its support base at Chester. It is therefore possible that fortlets, perhaps alongside the Roman fleet, were used where necessary in and around Wales to watch and react to events at sea, enabling fort siting to have other priorities. The distribution of Roman goods in Ireland reveals the importance of trade and travel across the Irish Sea (Hanson 2020, 95-96, 98, 100). This, combined with Roman army supplies, highlights how busy the waters in this area must have been. Further research into the siting of the known fortlets and the identification of potentially more first century AD coastal fortlets would help our understanding of their roles and relationships with the forts.

No forts had large lakes which extended into their near distances and only 3 forts (Llyn Tegid at Llanfor at Caer Gai and Mymbyr Lakes at Caer Llugwy; Figures 102, 18 and 21)) had large lakes which extended into their middle distances. The River Dee, which is the closest watercourse to both Llanfor and Caer Gai forts, flows into and from Llyn Tegid and at both forts the river runs closer to the forts than the lake. Therefore, the river, as opposed to the lake, would have provided protection from a land-based attack. Similarly, any water-based attack involving the lake would require the enemy to continue along the river to reach the forts by boat, making the presence of the lake irrelevant in this respect. The same situation applies to the Mymbyr Lakes at Caer Llugwy fort.

There has been an emphasis in the literature on the use of forts for protecting watercourses, especially at certain points, such as river crossings (for example Arnold and Davies 2000, 16). Relatively little has been discussed in relevant literature about the use, or otherwise, of watercourses or the sea for fort defence in Wales. There has been discussion about whether river frontiers elsewhere in the Empire had defensive roles (Breeze 2011, 116) but such discussions are rarely extended to rivers that did not form frontiers. Discussions about individual forts in the study area sometimes include the observation that a nearby watercourse aided the defences. White (2010, 193), for example, noted that a stream to the south of Wroxeter fortress added to the natural defences (Figure 146). Davies (2010, 234) mentioned that Castell Collen was located with the River Ithon to the east and was

flanked by streams to the north and south (Figure 50), but did not state directly that these would have been useful defensively. The proximity of most of the forts to a watercourse suggests that the threat of an attack via a watercourse was not considered likely. However, forts were similarly located adjacent to Roman roads, which, following the same theory, would suggest that an attack via land using Roman roads was also considered unlikely. It seems, however, that the benefits of the watercourses for defence as well as communication and supplies outweighed the potential risks.²³ Furthermore, the Roman army may have used the watercourses themselves as a form of surveillance by patrolling the watercourses and observing those who used them. Combined operations with the Roman fleet (Jones 2009, 3), especially along watercourses near forts closest to the coast, would have ensured a strong military presence along watercourses, aiding Roman intelligence and defence.

5.3.3 Observation from the forts

The results revealing the visibility of topographical features can be used to argue that the forts were located to monitor activities which took place within the forts, extra-mural areas and the possible military *territoria*, as well as spot potential attacks on the forts. In particular, however, the results suggest that forts were located to be able to observe movement through sections of the larger valleys in the study area and, as a result, create a sense of imposition and control on the local populations.

The results revealed that the observation of certain elements of the landscape was possible from the fort gates. This included observation of the military areas themselves, which will have enhanced general security and reminded non-military people in the area of the power of the Roman army. The results (Section 4.5.6) showed good visibility of fort interiors from their gates. Buildings within the forts, however, would have obscured some views. Gate towers may have overlooked internal buildings but nevertheless the full visibility apparent now would not have been the case with buildings present. Some areas, however, would have been visible, including the roads leading from the gates through the centre of the fort. Activities and events within the forts could therefore be monitored from the fort

²³ Rivers could freeze in extreme weather, therefore allowing crossing on foot (Breeze 2011, 92) but this would have been relatively infrequent in Britain.

gates. This would have been useful for security and for the monitoring of known visitors and the troops themselves.

The remainder of the near distance beyond the fort walls are also likely to have had a strong military presence. Structures which are considered to be associated with the army are frequently found within these areas, such as bath-houses, *mansiones*, amphitheatres and parade grounds, all of which have been found at Tomen y Mur, for example (GAT HER PRNs 5080, 5081 and 5082). As discussed above, the sloping areas of the near distances may have been used to enhance the artificial defences and therefore been considered a part of the fort area. Extra-mural settlements have been identified at many of the forts in the study area and these occupied some areas of the near distances, sometimes extending into the middle distances. It has been argued that these were settled by civilians to benefit from the Roman presence by trading with the troops. The precise relationship these civilians had with the Roman army has been debated but it is thought that the civilian presence was expected and possibly encouraged (Hanel 2007, 412). Burnham and Davies (2021, 71-72) argued that there was planning of the layout of these areas, and that some areas were used by the military and not civilians. The settlements are likely therefore to have been considered part of the military zone.

The visibility of these areas within the near distances from the fort gates was also good (Section 4.5.8). The 'hidden dips' were unlikely to cause a problem because anyone approaching would be visible each side of the obscured areas. As discussed in Chapter 3, the visibility data was collected at 1.6m above the ground. The obscured sections may have been smaller from the full height of the fort gates or towers. It should also be noted that the extra mural buildings will have obscured some areas, although observation of the buildings themselves may have been considered useful.

Similar to the observations within the forts, this good visibility of the near distances would have enabled the observation of the troops when within the settlements and when carrying out activities near the known military structures outside the forts. As mentioned above, it is possible that the ascending/flat areas were useful areas to keep animals to hand or congregate where necessary and good visibility of these areas may have been considered important; the slightly better visibility of the ascending/flat areas in the near distances (Section 4.5.8), beyond being the result of the hidden dips of the descending land, may reflect their importance. The

monitoring of the civilians in the civil settlements as well as visitors in *mansiones* would also have been possible. The location of the civil settlement buildings so close to the forts, mostly within the forts' near distances, would have been convenient and provided them with security, but the army would have had excellent views of the civilians from the forts. Such potential surveillance could have been a reminder to the settlement occupants where the balance of power lay; off-duty Roman troops would have been present within the settlements, making use of shops and taverns, but the presence of the forts and on-duty watchmen patrolling the boundaries would have dominated the scene. The off-duty troops would also have been aware that they could be seen within the extra-mural areas and this would have encouraged good behaviour. James (1999, 15-16) argued that unruliness of Roman soldiers was normal and that the need to manage this was expected. He suggested that military bases were designed with the surveillance of troops in mind as much as defence against external threats (1999, 16). The visibility at night, however, would have been considerably reduced. The good views of the near distances from the forts also enabled the observation of unexpected visitors approaching the forts.

The good visibility from the valley-based forts of the valleys floors and valley sides in which they were located (Section 4.5.10) would have helped to observe military activities, which no doubt extended into the middle distances, as indicated by the presence of practice camps within the middle distances of forts and thought to be contemporary with their nearby forts, such as at Tomen y Mur. (GAT HER PRNs 5098, 5422, 17215 and 17214). As discussed below, the land surrounding the forts, especially the valley floors and undulating lowland, is likely to have provided supplies for the troops. The ability to observe these agricultural areas from the forts would have helped to keep valuable supplies secure and to monitor the agricultural progress within these areas. The monitoring of local populations in the area and the ability to identify anyone approaching the forts would also have aided the security of the forts.

The proximity of some forts to valley meeting points (Section 4.5.14), enabled them to take advantage of the benefits to having access to valley bases, such as agricultural land, space for military activities and transport routes. Valleys could provide useful transport routes, and many were chosen by the Roman army for routes of Roman roads. The meeting of valleys therefore provided useful junctions. The location of most forts near to these meeting points, and the ability of most of

these to observe these points (Section 4.5.15), suggests that, although not such a priority that every fort had a valley meeting point view, the Roman army took the opportunity to observe such junctions where possible. This suggests that observation of movement through likely routes was considered useful.

As outlined in Chapter 2, researchers have argued that forts in Wales were placed to police and monitor local populations, highlighting the good all-round views of some forts, their location at 'nodal points' in communication links and at places where they could 'supervise' river crossings (for example Arnold and Davies 2000, 16 and Burnham and Davies 2010, 45, 68). Writers did not always explain how this supervision or monitoring took place, perhaps assuming that good views allowed observation of local populations in these areas and proximity to the junctions and crossing points enabled observation of these features, giving the army an opportunity to react if they disapproved of what they saw. The results generally support these opinions and provide statistics in support. The results do, however, highlight subtleties that can be used to suggest further ideas about how the forts used the landscape and dominate local populations through surveillance.

Although all the main valleys and valley sides were partially visible, this visibility was not consistent throughout the middle distances of each fort. At most forts, the undulations within the valley floors created obscured areas of varying sizes, some very large. At 3 forts, the main valley floors in the middle distances were partially visible from the fort in one direction and obscured in another. At Clyro, for example, the Wye valley floor was partially visible to the north-east of the fort and obscured to the south-west (Figures 59 and 60). Isolated hills also obscured some views. Therefore, although the available visibility of the main valleys will have been beneficial for the monitoring of the area, the results show that wide views throughout the main valleys were important but not necessarily a priority. Similarly, all the undulating lowland-based forts had partial visibility of the undulating lowland in which they were situated (Section 4.5.10) and, whilst there were rarely very large areas obscured, the undulations prevented full views of the lowland in the forts' middle distances. As discussed above in relation to defensive locations, if very wide views of as much of the main valleys and beyond and the undulating lowland had been vital, the forts would have been located within the highest points of the landscape but the results show that such locations were not chosen (Section 4.5.13).

However, the results do show that at most valley-based forts the full width of the valley floor (excluding watercourses) was visible along at least one cross-section of the valley within the middle and/or near distances (Section 4.5.16). Most of the forts could therefore monitor movement through their main valleys since all travel through the valleys would have to pass these visible sections. Half the undulating lowland-based forts also had views of a valley cross-section (Section 4.5.16). At most forts, therefore, passage along a main valley or along at least one valley near an undulating lowland-based fort could be spotted. Most of the forts had a main river as their closest watercourse or were within the same valley as a main river (Section 4.6.1). These main rivers emptied directly into the sea and usually ran through some of the longest valleys in the study area, such as the Dee, Severn and Usk valleys. It is possible, therefore, that these large valleys provided long-established transport routes for travel and trade. The smaller valleys may also have been part of the network. Forts could therefore observe who was passing through certain points of these valleys, sometimes at numerous points along the same valleys, with the travellers no doubt aware that they could be seen from the nearby fort.

Furthermore, the forts that were located as close as possible to a valley narrowing (Section 4.7.1), especially those with full-valley views towards the narrowing (Section 4.7.2), enabled the monitoring of movement through the narrowest points of the valleys, in a funnel-effect. This reduced the area that would need to be observed and therefore made observation more efficient. The fact that this occurred in the near and/or middle distances enabled clear observation and aided recognition, or otherwise, of those passing through. Half of the forts being close to a valley narrowing (Section 4.7.1) is a substantial amount, but it was clearly not so important that it was prioritised over other factors. However, the fact that 81% had a view of a cross section of the valley in this direction (Section 4.7.1) suggests that the Roman army took advantage of the situation where it was available.

The visibility of other topography types as shown by the results highlights the emphasis placed on the ability to monitor the main valleys from the forts. The location of most forts within the valleys would make better visibility of the main valleys inevitable, but the results suggest that attempts to have wide views of features beyond the valleys were not prioritised. The results show that 27 forts had other (not main) valleys within their middle distances. Some of these, as discussed above, met the main valleys but others remained separate from the main valleys within the forts' middle distances. Relatively few forts had any visibility of these

other valley's floors and sides (Section 4.5.10; Table 4.19; Chart 4.17). Chart 4.17 illustrates the contrast between the presence of other valleys and their visibility from the forts. Even when sections of other valleys or valley sides were visible, these were not always large sections and therefore could not provide useful information about activities taking place in these valleys. The emphasis on the ability to monitor certain valleys is also evident in the results from the undulating lowland-based forts. Some undulating lowland-based forts, such as Cardiff, also had views of the mouths of some valleys and therefore anyone passing through the valley mouths could be observed from the forts.

All the forts with undulating lowland and undulating upland in their middle distances had some visibility of these topography types but frequently these were merely high points visible beyond the main valley sides (Section 4.5.10). The forts located in undulating lowland inevitably had better views of this topography type because there were no valley sides to obscure the view, although small undulations nevertheless created obscured areas.

The results also reveal an emphasis on the ability to observe the passage of vessels along certain watercourses. The results (Section 4.6.6) reveal that relatively few forts could see the full length of the watercourses or watercourse banks running through their near distances. This would mean that activities within the full length of the rivers in the near distance could not be observed from a fort's gates. As shown in Chart 4.15, a greater number, however, had partial visibility of the watercourses and this would enable the passage of vessels along the watercourses to be identified and noted. The results for the visibility of fort banks were even higher (Section 4.6.6; Section 3.5.5). At 2 forts there were sections of watercourses in the near distances that were partially visible whereas other watercourses in their near distances were obscured, suggesting an emphasis on the monitoring of certain watercourses.

This was enhanced by the visibility of the watercourses in the forts' middle distances (Section 4.6.8). Although the middle distance did not provide the clarity of vision of the near distance, it was still close enough to enable monitoring of transport through these areas. That none of the watercourses in the middle distances of the forts was fully visible from the forts is unsurprising considering the meandering nature of the watercourses and undulating terrain of the study area. The good levels of partial visibility of watercourses and watercourse banks, however, shows that almost all

forts had the potential to observe passage along at least one watercourse in their middle distances. The visibility of the closest watercourses to the forts in their middle distances was particularly good (Section 4.6.9). The better visibility of the banks, however, shows that all except 1 fort, Rhyn Park, could probably observe vessels passing along these watercourses. Only Rhyn Park fort had no visibility of a watercourse or watercourse banks in its middle and near distances. The uncertainty over the Rhyn Park's eastern gate, however, could mean that it did have some visibility of its closest watercourse, Morlas Brook, which ran past the eastern side of the fort (Figure 131). Therefore, most of the forts, if not all the forts, had some visibility of their closest watercourses. Better visibility of the forts' closest watercourses than the other watercourses is perhaps inevitable, but the fact that almost all the forts had some visibility of them, especially in the particularly undulating landscape of the study area, suggests that this was by design.

The results showed that main rivers were the closest type of watercourse at most of the forts, and large rivers were the closest for some of the remaining forts. The use of watercourses by local populations for transport and trade is likely and the main watercourses would have been large enough to navigate in a variety of vessels, extended long distances through the study area and would have been less susceptible to drought, and therefore were no doubt a popular choice for navigation. The proximity of most forts to the main and larger watercourses (Section 4.6.1), and the good views of these watercourses, would therefore have enabled the Roman army to observe those who passed along the more popular navigation routes. As discussed below, the use of watercourses, especially the larger ones, as a source of supplies for the forts was highly likely and the ability to see the arrival of supply vessels from the forts may have been considered useful.

Nearly two-thirds of forts had river confluences within their near or middle distances and most of these included a main watercourse, although these main watercourses were not always the closest watercourses to the forts (Section 4.6.3). Visibility of confluences may have been considered useful because traffic from numerous directions could be monitored, including those meeting or leaving the main rivers. Watching the traffic may have been considered useful to identify unanticipated attacks, supervise trade with or around the fort and as surveillance to intimidate. At 3 forts the confluences were fully visible. These junctions may have been considered particularly important or the forts may have simply been fortunate enough to have a location where full views were possible. The fact that 60% of forts

with confluences nearby had some visibility of at least one confluence suggests that visibility of confluences may have been desirable when a fort was situated near a confluence. Out of the total number of forts, with or without confluences, however, the figure falls to 37.5% of forts that had some visibility of a confluence. This suggests that the visibility of confluences was not a priority for all forts; there may have been confluences that were deemed significant, for supply reasons for example, or particularly busy and forts were sited with visibility of these. Alternatively, visibility of confluences may have not always have been prioritised and proximity alone, which would have been useful to provide multiple transport routes, may have been the priority.

Although the undulating nature of the terrain would mean that good visibility of watercourses from the forts in their far distance bands would have been difficult to achieve, the lower levels of visibility of watercourses in these areas indicates that the observation of watercourses within this distance band was not a priority (Section 4.6.11). In most cases the stretches of watercourses in the far distance bands would have been within the near or middle distances of other forts and would have been easier to monitor from them. The results (Section 4.6.11) reveal that the watercourses that ran closer to the forts were slightly more prone to having some visibility in the forts' far distances than other watercourses. This stresses again some preference for observation of certain watercourses, but the numbers are low for comparison and the visibility of these watercourses in the far distance bands may not have been planned. Movement along watercourses in the far distances may have been perceived but the recognition of the vessels and their occupants would have been unlikely at such a distance (Section 3.5.2).

So few forts had the sea present in their middle distances (Section 4.5.9) that it cannot have been considered a priority to monitor the sea from the forts. Of the two forts with the sea present (Cardiff and Segontium), only Segontium had any visibility of this feature in its middle distance (Figure 135). The area of sea that was visible was the western stretch of the Menai Straits which, as discussed above, is river-like in appearance and separated the island of Anglesey from the mainland. The full length of the Menai Straits was not visible from Segontium; only a section of the water was visible between a ridge of land and an isolated hill to the north and north-west of the fort respectively. Similar to the monitoring of rivers, therefore, the passage of vessels along the Menai Straits could be noted from the fort but activities along its full length could not be observed from this location. It is possible,

therefore, that sections of the Menai Straits were chosen to be observed in a similar manner to the sections of certain rivers. The Roman fleet would also have contributed to the surveillance, enhancing the Roman dominance of these areas.

While a greater number of forts had the sea extending into their far distances (Section 4.5.11), this was still only 37.5% of all forts and only 5 of these had any visibility of the sea. One of these (Tomen y Mur) had only very slight views of the sea (Figure 139). The other forts had larger areas of sea visible but these were still not views of wide expanses of sea. Forts near the south coast of Wales, for example, could not see the full width of the Bristol Channel. The forts therefore had views of small sections of sea beyond some areas of the study area's coast, and these were not evenly distributed around the coast; there were no views of the sea beyond the mid and southern west coasts of Wales, or the north-east coast of Wales, from the known forts for example. The views of the far distances would also make observation of the presence of vessels possible but their identification at such a distance would be more difficult. It is unlikely, therefore, that the monitoring of sea-borne vessels from the forts was a consideration in fort siting. The only exception may have been at Segontium, where the sea was visible in the middle distance but, as discussed above, this may have been considered in the manner of a river. Access to forts from the sea would have continued via river, unless docking and progressing on land, and the visibility of rivers, especially those connecting directly with the sea, was much greater. The Menai Straits at Segontium appears to fit into this pattern. The results suggest that the focus of observation from the forts was inland and not out to sea.

5.3.4 Discussion

It is therefore suggested here that the results indicate a focus on the observation of the passage of travellers through certain valleys and along certain watercourses. Other areas in the landscape were visible from forts, providing some observation of other activities, but not consistently. The monitoring of travel through certain routes could have had a variety of benefits. Many of the valleys in which the forts were situated contained main rivers and, mirroring the rivers, the valleys were the larger ones in the study area and provided long routes through the area, forming the backbones of the travel network. It could be argued that these were the routes through which local populations would have rushed to attack the forts, and the ability to spot such advances from the forts would have been a benefit, allowing

troops an opportunity to react. However, the Roman troops would not have been confined to their forts and the use of scouts and intelligence gathering, alongside surveillance during the daily tasks in the surrounding landscape, would have alerted the Roman army to a mounting attack. Vegetius (III, 6; IV, 37), for example, mentions the use of scouts on land and water in the context of discussing how armies should behave in enemy territory and they undoubtedly also continued to be used immediately post-conquest. Patrolling of the landscape to anticipate attacks has also been suggested for the vicinity of other frontiers such as Hadrian's Wall (Woolliscroft 2010, 79). The approach of an enemy was therefore likely to have been anticipated prior to the enemy reaching the areas visible from the forts. The Roman army was also facing an opponent population who knew the landscape well and could have avoided the easiest and therefore most obvious routes if planning an attack on a fort. When discussing Roman occupied Scotland, for example, Breeze (1993, 55) argued that the Caledonians could have avoided the most convenient routes and travelled along mountain ridges if they wanted to attack or pass a valley-based fort. He noted parallels with the situation in Wales.

Furthermore, the forts were built as areas of the study area were conquered by the Roman army. By the time the forts were built, the idea that the local populations might gather and attack may have been considered unlikely. Roman forts in Britain, regardless of the military situation at the time, were undoubtedly constructed with security and defence in mind, as shown at least by their walls, banks and ditches. Some forts had wide views of the surrounding landscape in the middle and far distances and all had good views of their near distances. In the event of an attack, this would have aided the coordination of a response, especially if the near distances beyond the forts had spaces designated for such action, as discussed above. The surveillance of select lines of approach for defence however, although an enhancement to the defences, may not have been considered necessary in the context of the situation in the study area at the time.

The large valleys and watercourses in which the forts had such good views of certain points could have provided the trade routes for local populations long before the Roman army arrived. Some traders passing along these routes would have been supplying the forts and the ability to see them approach and prepare for their arrival may have been useful. It is also possible that the monitoring of trade was undertaken by the army. It could further be argued that the ability to view the narrowest points of the valleys was a way of funnelling travellers to monitor their

progress, perhaps for taxation or toll purposes. Such systems have been suggested for passage through the later Hadrian's Wall and Antonine Wall (Breeze and Dobson 2000, 40, 115-116). However, most of the narrowing points were in the middle distances of the forts and, although this was close enough to identify the travellers and any goods they transported, it is not a useful distance for communication with travellers or to take records for taxation or toll purposes. No contemporary structures have been identified in the areas of the narrowing points that could have been used for these purposes and, if they had been present, the need for visibility from the forts would have been unnecessary. In addition, many of the Roman roads ran through the forts themselves, entering through a fort gate and leaving from the gate in the opposite wall. If tolls or taxation were required, this could have been implemented as travellers passed through the forts. There were undoubtedly roads and local tracks which ran past, not through, the forts. A Roman road ran past the north-west of Brecon Gaer, for example (Silvester, Hopewell and Grant 2005, Figures 18 and 19). Visibility of all traffic passing through one point of the valley may therefore have been a way of identifying those who avoided payment or acknowledgement of their passing. Such a system, however, seems awkward and unlikely.

Furthermore, although the installations under examination in this project were permanent forts, as opposed to temporary camps, troops were nevertheless not necessarily stationed in each fort continuously. If the numbers did fluctuate, there may have been times when there were not enough troops present to record or tax trade or transport at each fort.

A further benefit to the observation of certain routeways was its contribution, alongside other aspects to the topographical location of the forts, to the projection of dominance over the local populations. It could be argued that the decision to avoid the highest points in the landscape meant that the forts avoided being in the most visually dominant locations; the highest points would have been visible from a wider area. This could therefore have worked to intimidate the local populations, providing a constant reminder of the new balance of power. However, it is argued here that the forts were located in dominant locations, but not to be seen from far-ranging areas but to be seen and dominate specific, more localised zones. The valley-based forts were usually within the valley floors or on spurs which extended into the valley floors and therefore occupied central locations within the valleys. They were also usually on platforms or rises, which provided a little height and could accentuate the

forts' locations within the valleys or undulating lowland. If the main rivers and valleys were indeed popular routeways for local populations, the forts' locations within these valleys, or in undulating lowland near the mouths of these valleys, would bring the local populations past these forts which dominated these sections of landscape. Also, not only could the travellers see the forts but also be seen as they passed by. At most of the forts there was at least one point in the valleys or valley mouths through which travellers had to pass where they could not avoid being seen from the fort. The fact that, in some cases, these areas of full visibility were where the valleys narrowed, funnelling travellers into an area fully visible from the nearby fort, itself placed as close to this narrow point as possible, would have given travellers a clear indication of who was in control. Although roads passed through forts, a constant stream of traffic through a fort would have been a security risk. The ability to observe traffic running past the forts would enable surveillance without the need for travellers to enter the forts.

As discussed in the Chapter 3, the presence of trees and vegetation surrounding the forts is uncertain. If there was enough vegetation to interfere with views from the forts, however, the Roman army would have been able to clear the area where necessary. Lines of view from the fort to the points at which the full cross-sections of valleys were visible could be kept clear. If these areas were mainly agricultural, as discussed below, they may have been clear already. If not, the sections of cleared land between the forts and these sections of valleys may have further directed passers-by to the presence of the forts, emphasising the Roman control.

This interpretation of the results does support the relevant literature that claims that forts were located to control the local populations. As discussed in Chapter 2 however, most of this literature uses the wide distribution of the forts in the study area and observation that some were in valleys to argue for control, and does not go into detail about how it would work. Mattingly (2006, 146), for example, argued that forts in Wales were located to control corridors of movement, but did not explain precisely how this control might have worked. The results therefore contribute some detail and a potential method to the hypothesis. The argument here, however, differs slightly from what is implied by those, such as Mattingly, who argue that the forts were sited to control transport corridors specifically. The results suggest that the forts could indeed observe and react to events along certain stretches of transport routes. It is argued, however, that the fort siting contributed to control beyond these areas by reminding the passers by of where the balance of power lay.

This interpretation of the results also contributes to some discussions about Roman control and surveillance that are not limited to Roman Wales. Yekutieli (2006) drew on the ideas of Bentham and Foucault (1980) that behaviour could be controlled by surveillance, especially when the observer was obscured from site and those under surveillance had no knowledge of if or when they were being watched. Unlike Foucault (1980, 151, 155), Yekutieli argued that similar surveillance practices were used in ancient times as well as modern. He was aware of criticisms of Foucault's argument (2006, 84), quoting Bevir (1999, 192-193) who criticised Foucault on four counts, including his rejection of the idea that individuals can act creatively without being limited by the social context, but acknowledged that individuals were unlikely to be completely uninfluenced by society. Yekutieli gave an example of a 1st to 2nd century AD quarry in the Southern Judean Desert, the remains of which suggest that a supervisor could watch the workmen without the workmen knowing if or when they were observed. Although the workmen could clearly see the lookout point, they would not have been certain if anyone was there. Yekutieli (2006, 77) argued that the fear of the hidden observer would enhance discipline and argued that this was an example of, 'the Romans manipulating the landscape in order to control once rebellious Jews and make them work in the quarry.'

There are some differences between the surveillance described by Yekutieli and that suggested here for the Roman forts in Wales. It is likely that the surveillance of the quarry was to control certain people within a set area (including the quarry, some shelters and a cooking area) while they were there and not necessarily when or if they moved away from the area. The surveillance from the forts would have observed people passing through the area and then moving beyond the visibility from the forts, although it may have often been the same people passing through repeatedly and some may have lived or worked within view of the forts. As discussed below, however, the Welsh landscape would have been scattered with reminders of the Roman presence, which may not have provided the impact of being watched but could have reinforced the feeling of dominance in additional ways. A further potential difference is that the observers were obscured from the workmen at the desert quarry. It is uncertain whether anyone passing the Welsh forts could have seen whether individuals were watching them from the fort walls. The closer passers by were to the forts the easier it would have been to see if anyone was watching. Most of the cross sections of valleys that had full views from the forts were in the forts' middle distances, which meant that travellers would have

had more difficulty seeing if they were watched from the forts than if they were in the near distance; they may have been able to see that people were present but not necessarily the direction of their gaze. The design of the fort towers would also have influenced visibility of the observers and this is something on which we have very little evidence at present. Some researchers, such as Breeze and Dobson (2000, 37) discussing Hadrian's Wall, have used towers on Trajan's Column as a guide to potential towers used in Britain. The towers on Trajan's Column had an observation balcony (2000, 37) and therefore the wall behind the balcony may have made the presence of someone standing there difficult to see from a distance. Roman forts did have watchmen (for example Vegetius III, 77), however, and therefore observation from the forts may have been assumed.

Although there are differences in method and context the results add further support to Yukutieli's view that surveillance techniques were used in the Roman era to control behaviour and make statements about where the balance of power lay. He gave a further example of surveillance, similar to that of the quarry, of the only point at which ascent was possible over a ridge, also in the Judean desert (2006, 83). This belonged to the Bronze Age period but it nevertheless shows the use of surveillance of certain points in the landscape to control behaviour in the ancient world. The watching of the only possible passing point has similarities to the observation of the narrow valley points from the Roman forts in this study.

Yukutieli's quarry example differed from the situation in Wales in a further respect; the quarry workers were enslaved and fully under the power of those who watched them. The local populations in Wales were in the process of coming under the control of the Roman empire. Furthermore, most who were passing the forts were not necessarily bound to a geographical space like the slaves in the quarry; they were passing through the areas under surveillance and could continue into spaces that were not surveyed. In this respect, Yukutieli's second example has more similarities to the situation in Wales, although his example referred to a much earlier period.

Williams (2017) examined visibility from towers in the Alentejo region of Portugal during a period when Roman control of the area was becoming established; the army had seized the area but resistance from indigenous populations was still a risk. The origins of the towers have been debated but Williams (2017, 3-4) followed the conclusion that, during this era, they were used by or for the Roman army.

Williams (2017, 108-112) used GIS to generate viewsheds from the towers. He found that the towers had views of certain parts of the landscape, such as routeways, watercourses and agricultural land (2017, 4, 12, 113-114, 119). He explained that in some regions the towers could have worked together, not necessarily by communicating between themselves, but by being able to observe parts of the landscape that other towers could not (2017, 116-118). He argued that the towers were used to prevent lingering resistance and brigandage and that, by observing the landscape areas considered most important, this behaviour would be pushed to the margins of these areas (2017, 119). Williams (2017, 113, 135, 136) argued that knowledge of surveillance would modify the behaviour of those who considered brigandage or resistance. He argued that surveillance was therefore a tool, amongst others, that could be used to subdue a newly conquered territory (2017, 6, 7, 11, 121, 136). He examined the ideas of Bentham and Foucault, highlighting that the situations differed; the power relationships in the newly conquered territory were not as clear as those where imprisoned people were observed, and Williams argued that surveillance was therefore used as part of a larger process of negotiation in the Alentejo example (2017, 2, 6-7, 119, 123).

Williams therefore argued that surveillance could be, and was, used by Rome as part of the processes involved in subduing a recently conquered territory. He examined some other surveillance methods known or thought to have been used by Rome elsewhere in the empire and identified three systems; border control, oversight and borderless surveillance (2017, 128-131). The latter system is the one he thought was in use in Alentejo and it could be argued that this system had some relevance to the forts in Wales; parallels include the newly conquered territory without a defined border, the forts dispersed through the landscape, an emphasis on observing specific parts of the landscape, an aim to prevent lingering resistance and encourage settlement and negotiation. There are, however, some differences. This borderless surveillance system was based greatly on the results from the Alentejo towers study. These towers worked together by having visibility of areas that other towers did not. The Welsh forts, however, were more dispersed. They had visibility of areas that other forts did not, but there were usually large obscured areas between these areas of visibility²⁴. In Wales, the surveillance may have

²⁴ The results (Section 4.10) do show that this method of finding locations which compensate for the lack of visibility from other vantage points was also applied to military installations in Wales, but from vantage points within each fort as opposed to amongst a group of forts. The results showed that at most forts, the fort was set out within the topography in such a way

discouraged resistance and trouble in important areas, such as particular road junctions, but large areas of routeways, watercourses, agricultural land and other important spaces were not observed from the forts. They may have been monitored by scouts but the threat of constant surveillance would not have been the same. The emphasis on Wales, therefore, seems to have not been to push unwanted behaviour away from certain areas but to provide one of many reminders that Rome was in control and had the balance of power. This study nevertheless adds a further dimension to how surveillance may have been used by the Roman army. The results and arguments here have many similarities to those presented by Williams and can contribute to the understanding of the use of surveillance in newly conquered areas in the Roman empire.

The work of Oltean and Fonte (2020), described in Chapter 2, also has similarities. The Roman fortifications they studied in Dacia were also scattered throughout an upland landscape. They similarly argued for the concept of conditioning social order using a form of control of movement through the landscape (2020, 5). The recent research by Tibbs (pers. comm. 2022), however, shows very many similarities. Tibbs studied 1st century AD Roman fortifications in Scotland, mostly in upland areas, and came to similar conclusions about the use of psychological control through the placement of the fortifications within the landscape, enabling visual control over the immediate area (pers. comm. 2022).

Other researchers have proposed that the Roman army used subtle techniques to impose dominance over local populations and the interpretation of the results here not only adds support to these ideas but also provide a further example of its use. Gilliver (1999, 65-66), for example, when discussing the function of Roman camps commented on the monumentality of the sites, explaining that, by not destroying the camp defences when the army moved on, the camps would have remained as permanent symbols of Roman power in the areas through which the army travelled. Although nobody would have been present to watch passers-by, abandoned camps would have been a reminder of the dominating Roman power, even resembling the forts which were placed along the main routes, observing all who passed.

that the view from each gate compensated for obscured areas from other gates within the same fort.

The presence of camps, towers, forts and military buildings would therefore have worked alongside the surveillance to reinforce the sense of Roman control and power. As highlighted in Chapter 2, a consideration for people's perception of their landscapes and how this can be identified by landscape archaeology studies has been an important research theme in recent years, especially by those following a post-colonial approach. Some researchers have used the word 'taskscape' to represent the many layers of meaning and activity that made up past landscapes (Chadwick 2016, 94). As discussed in Chapter 2, recent studies into Iron Age/Romano-British landscapes have argued that local communities used landscape features to express their identity within the landscape and display their ownership of the space, including their connections to ancestors who occupied the landscape in the past (for example Chadwick 2008, 249, 309, 408). Taylor (2013, 175) similarly noted that, 'An important observation of the anthropological work is that for many agricultural communities, agricultural practice itself and the continuing maintenance of aspects of the rural landscape, such as field boundaries or traditional routes of access to grazing, that structure relations with neighbouring communities and the wider world are crucial to their sense of identity.' The construction of Roman military buildings within their landscapes would have disturbed these pre-existing cultural patterns and therefore emphasised the shift in power and control.

The numerous Roman roads would be a particularly strong reminder of the new Roman power, some of which may have followed the line of old trackways or replaced the use of existing ones. The importance of trackways to indigenous populations in the Iron Age/Romano-British periods has been emphasised by recent research. Research by Chadwick has highlighted the significance to local populations of trackways and movement through the landscape. As part of his investigations into Iron Age and Romano-British landscapes in Nottinghamshire and parts of Yorkshire, he argued for the social importance of trackways. He suggested that they linked taskscapes, referenced significant cultural features in the landscape and emphasised an attachment to place (2008, 141-142, 167-169, 181; 2016, 97-98, 111-112). In the context of discussing Historic Landscape Characterisation, Chadwick (2013, 17) emphasized the complexities of people's relationships with the landscape regarding land use, division and ownership. He noted that centuries of rights of access and negotiations may have led to the establishment of routeways. Chadwick (2008, 51-52; 2016, 108) argued that Roman roads demonstrated Roman power by ignoring local trackways and traditions, severing local trackways and

disrupting familiar movement and routines. He also suggested that the Roman roads would have introduced a new style of movement; the fast pace of Roman soldiers and others compared to the possibly slower pace traditionally used along local trackways may have been unsettling (2016, 107). Chadwick (2008, 142) also discussed the possibility that, prior to the Roman invasion, routeways could be used for control and surveillance. If this was the case, a similar approach by Rome may have strengthened the realisation that Rome was now the dominant power.

In the context of discussing the Boudican Revolt, Rogers (2015, 49) wrote that 'Routes through the landscape, and the act of moving through the landscape itself, may have been imbued with more meaning than we often consider in historical narratives because of the long histories of use and action in these landscapes.' As explained in Chapter 2, Witcher (1998), Wallace and Mullen (2019) and Gardener and Wallace (2020) also argued for the significance to culture, identity and landscape ownership of movement through the landscape, especially along trackways. Whatever meaning the landscape had to local populations prior to the Romans, the presence of new Roman forts and surveillance will have interfered and, it is argued here, injected a sense of dominance. The construction of new routeways by an invading force will have damaged such ties to the existing landscape, distancing the indigenous population from the ownership of their land without necessarily any violent acts taking place. If local populations chose to use a Roman road, this decision would also work to confirm Roman control. When discussing roads in Etruria, Witcher (1998, 64) argued, '...the use of a Roman road by anyone, from military to subjugated populations, comes to represent a participation in that road's social and ideological nature regardless of the real or rationalised reasons for their use of it'. Combined with the surveillance of such movement through certain busy valleys, this would have contributed to Rome's method of control via dominance.

It is possible that Roman involvement in the landscape meant that they too became a part of the existing communities. This may have happened in time but, in the immediate aftermath of the invasion, it is more likely that the Roman influence interrupted the existing way of life, interfering with the sense of local identity and reinforcing Roman dominance. Chidwick (2021) discussed the impact of the Roman army on the geographical spaces they inhabited and through which they moved, citing a variety of contemporary and modern literature. Her work focused on the Republican period but has themes relevant to this study. She argued that the

Roman army had a dominating power over newly conquered landscapes and was capable of altering the landscape's social and political identity (2021, 109). A theme that she highlighted was the potentiality or threat of violence caused by the presence of an army within the environment of the indigenous population, and she gave examples from literature that demonstrated such violence (2021, 113-114). She continued by suggesting that Roman de- and reterritorialization of the space 'was not always so dramatically and devastatingly actioned' and highlighted the change in the landscape required to sustain the troops as an example of exerting a shift in the identity of the landscape without direct aggression (2021, 114). As discussed below, the Roman army was likely to have sourced local supplies in Wales and therefore benefitted from this land use adaptation in terms of their expression of control and dominance over local people. This combined with the threat of surveillance when travelling along certain routes, as shown by the results, and the reminder of presence of the Roman army by the numerous forts, roads, camps and other Roman army features could have been further ways of exerting power without frequent use of direct violence.

This approach by the Roman army could suggest that Mattingly's (2006, 105) argument that the Roman campaign in Wales was brutal and that Rome took a heavy-handed approach against conquered territories was mistaken. Gambash (2012, 13-14) argued that Rome preferred a more placating approach. The dominating approaches, even if without violence, however, hardly seems placating. The violence suggested by Mattingly (2006) may have begun during Rome's initial advances into Wales, whereas the surveillance from the forts would have become more useful once the Roman occupation had been established and trade, travel and daily tasks resumed. Foucault (1980, 155) suggested that violence was not required when suitable surveillance was in place, but violence, or the threat of it, may have remained present in Roman Wales; individuals or groups may have at times persisted in resisting the Roman presence, in spite of the measures in place. In 2011, Mattingly argued that Rome also used more subtle methods of domination and the results here support this theory (2011, 23, 33, 79, 130, 151, 271).

The results therefore support the theory, taken especially by some researchers who have adopted a post-colonial approach to Romano-British studies, that Rome frequently took a harsh approach to native populations. The surveillance and new military features in the landscape were not necessarily accompanied by violence but nevertheless would have had significant psychological effects on local people. This

is at odds with the more traditional views of seeing Roman influence on conquered populations in a more positive light (Mattingly (2011, 13-20, 48).

5.4 Local supplies

5.4.1 Food supplies

The results show that almost all the forts were located within areas of good agricultural potential, indicating that the forts were located with the intention to source at least some supplies locally. The hilly and mountainous terrain of large sections of the study area mean that not all the area could have provided land suitable for growing crops and/or grazing animals. As discussed in Chapter 2, researchers such as Jarrett (1969), Manning (1975) and Arnold and Davies (2000) have noted that forts tended to be located within the best agricultural land available, but rarely provide statistics to support the statement. The results here show that all the forts were located within undulating lowland or valleys, avoiding the undulating upland which had less agricultural potential (Section 4.5.9). Furthermore, the valley-based forts were mostly located within the valley floors, as opposed to the valley sides or hilltops overlooking the valleys (Section 4.5.4), and were therefore within the most potentially fertile section of the valleys.

Nearly two thirds of the forts had valley meeting points within their near or middle distances (Section 4.5.14), which meant that these forts had access to more than one valley and source of potentially good agricultural land. Over half of these were located within the centre of the valley meeting points (Section 4.5.14) and therefore were situated as close as possible to large areas of valley floor and therefore potential sources of supply. Other valleys, which were not the main valleys or connected to the main valleys, and other areas of undulating lowland were present within the middle distances of some forts (Section 4.5.9) which could have provided further agricultural land, although proximity did not always mean easy access; sometimes access would have required travel over or around high ground. Similarly, valley floors were present in all the far distance bands of the forts, and undulating lowland was present in most of the far distance bands (Section 4.5.11), but access to these areas would often have required travel over or around high ground. Furthermore, in light of the distribution of known forts (Section 4.5.1), these valleys and undulating lowland areas in a fort's far distance band are likely to have been

closer to other forts and, unless the distribution of supplies from further afield was required, are more likely to have provided agricultural land to their closer forts.

Some valleys or areas of undulating lowland may have been more suitable for agriculture than others and this may have been a factor in fort location. Based on the evidence available, however, it is difficult to make these distinctions.

Comparisons to modern agriculture may be an approach; the landowner of Brompton fort explained that the installation was located on what is currently the most fertile section of the valley, for example (Paul Beddoes pers. comm. 2015). The land in Wales has been subject to a variety of farming practices and land uses since the Roman era, however, and the quality of soil may have changed. A study of the distribution of late Iron Age rural settlements may indicate areas of the most fertile land. However, we cannot be certain that the concentrations we see today reflect those at the time. Too few of the known rural settlements in the study area are dated accurately enough to confirm that they were occupied at the same time and therefore represent concentrations of contemporary farmsteads. Lack of data about farmsteads in the vicinity of Caerleon was noted as part of a framework for research on the fortress, for example (Evans 2004, 10-12, 17, 22-23). Also, there may be as yet unidentified settlements, some of which may have been ploughed away, especially if the land has been considered suitable for cultivation at some point since the Roman era; a lack of evidence for farmsteads may therefore indicate better agricultural conditions in some situations. Furthermore, other factors, such as cultural and social, may have influenced the location of concentrations of farmsteads. Therefore, although the results show that forts were likely to have been located in areas of good agricultural potential, further archaeological evidence would be required to determine how much better the agricultural land was compared to other valley and undulating lowland areas without known forts.

The proximity of the forts to good agricultural land supports the view that the Roman army preferred to source basic supplies locally where possible. Manning (1975, 114), for example, argued that long supply lines would be a weakness and require constant guarding and the transport would be costly. He also cited an instruction to the praetorian prefect in 369AD, recorded in the Theodosian Code, which suggested supplies for camps should be sourced locally (7.4.15 cited in Manning 1975, 114), although this is referring to a camp not a fort and a period later than that of this study. Mason (1988, 167) noted the cost of transporting supplies when arguing that the Roman army tried to source supplies locally where possible. He

also noted that Tacitus recorded that Agricola put an end to the requirement of provincials to take taxes long distances, which was causing resentment (Mason 1988, 167; Tacitus, *Agricola* 19). Stallibrass and Thomas (Thomas and Stallibrass 2008, 9; Stallibrass and Thomas 2008, 159) suggested that supplies were sourced locally where possible and supplemented from further afield where necessary. Kolbeck (2018, 5-6) noted the reference to the purchase of grain on the northern frontier, as opposed to obtaining it via taxation (Vindolanda Tablet. 343). Kolbeck (2018, 6, 7) argued that this formed part of the regular army supplies and that purchasing grain was preferred, as opposed to obtaining a percentage via tax, because more could be sourced locally, and therefore be cheaper to transport and require less manpower. He was focusing on the northern frontier but it is possible that such an arrangement was also in place in Wales. It has also been argued that locally-sourced hay for military horses would have been preferable because it is bulky to transport (Huntley 2013, 46).

The extent to which the Roman army in Wales did source basic supplies locally has been the subject of debate. Some researchers have expressed doubt as to whether the upland regions of Britain, including those in Wales, were capable of providing all the basic supplies to the Roman army, notably cereals. This could cast doubt on the value of the fort locations' proximity to the better agricultural land locally and add weight to other factors being a priority in fort location. Piggott (1958, 7-25) when discussing Britain as a whole, argued that most grain was grown in the south and east of England and that the other areas were mostly under pasture. Supplies of grain to the Roman army in Wales would therefore need to be transported from the south-east of England. Rivet (1969, 195) similarly argued for grain production focusing in the south and east of England.

Others, more recently however, have been more optimistic about the ability of upland areas to provide a range of supplies to the Roman army. Manning (1975, 113, 115) questioned the opinion that few highland areas in Britain had land suitable for growing cereals as well as the assumption that there was no tradition of growing crops in such areas prior to the Roman invasion. He noted that forts in Britain tended to be located in the best agricultural land in their area and argued that they took advantage of this to supply the forts, even in upland zones. Davies (2002) re-assessed Manning's 1975 paper in light of updated data and he too argued that cereals may have been grown in Wales, but perhaps with some regional variations. Smith et al. (2016, 367) also suggested that there were regional variations,

doubting, for example, that north-west Wales could have provided enough [grain] supplies locally for the army there but that other areas in Wales were capable of producing grain. They suggested some areas of Wales and the Marches concentrated on arable farming, some on pastoral and others a mix (Smith et al. 2016, 306, 380). Kolbeck (2018, 4, 6-7) argued that fertile valleys suitable for growing cereals were present in upland areas. His study focused on the northern frontier but the landscape shares many characteristics with those found in Wales and the Marches.

Researchers of some individual forts in Wales have argued that the evidence suggests cereals were sourced locally. At Segontium, for example, it has been argued that a small weed assemblage, associated with grain found from excavations within the fort, indicates that the grain could have been sourced locally and that grain was readily available in north-west Wales (Casey and Davies 1993, 75-76). Those that argued for substantial cereal production in Wales noted that supplies could be supplemented from regional sources or further afield where the local resources were not sufficient (Manning 1975, 116; Davies 2002, 55, 58). Situations that prompted this may have included maximum occupancy of military sites or poor harvests (Carrington 2008, 23).

A potential lack of cereal production in some areas, however, does not necessarily mean that the Roman army did not take advantage of the best local agricultural areas for grazing stock, especially if the army did indeed prefer to source supplies locally. Cereals were central to the military diet and grain rations were allocated to each soldier, however evidence suggests that the soldiers' diet was varied and could include meat and dairy (Davies 1971, 124, 126; Johnson 1983, 195). Evidence for cattle have been found at or near some of the forts in the study area. Isotope analysis of animal bones from a military store building at Caerleon, from all phases of the site, found that most appear to have been reared locally (Madgwick et al. 2019, 224, 225, 231), although the writers warned that the local plant samples used for comparison could also represent those of other parts of the UK (Madgwick et al. 2019, 232). Burials of young cattle and possible cattle enclosures have been found in the Nash area to the south of Caerleon fortress (Evans 2004, 11), and Boon noted that the area has excellent resources for pasture highlighting its reputation for pasture since the Roman period (Boon 1980, 28-29). Casey and Davies (1993, 77) discussed that animal bones identified during excavations at Segontium were difficult to assign as local or imported because of a lack of bone

assemblages from local farmsteads for comparison, but they suggested that they were likely to be local. Valley floors and undulating lowland could have provided grazing and appropriate ground for animals such as cattle and horses. It seems likely that the Roman army of each installation took advantage of the agriculture that the landscape could offer, whether arable, pasture or a combination.

It has been argued that the Roman army claimed ownership of large areas of land surrounding the military forts in the form of *prata*. *Pratum* is usually translated as 'meadow' or the contents of a meadow (Glare 1968, 1450), and this has been interpreted as areas for grazing, and possibly other activities, to provide or supplement supplies. Mason, referring to the work of Mócsy, suggested that the name '*prata*' implies that the land was at least initially intended for grazing of a legion's animals, but that this was not necessarily the land's only purpose (Mason 1988, 164; Mócsy 1967, 211-14 cited in Mason 1988, 164). Manning (1975, 115) thought that the *territorium*²⁵ of a fort could provide the supplies for the fortress or supplement grain from the nearby farms. Higham, in the context of discussing the northern frontier of Britain, argued that the land of the forts themselves were only a small part of the army's requirements and that it also had *territoria* beyond the forts for supplies (Higham 1991, 96, 98). Davies (2002, 58) also considered that the land around the forts was used for supplies, especially immediately after the conquest when native farmers may have struggled to provide supplies, a topic which is discussed further below. Both Manning (1975, 114-115) and Mason (1988, 163) explained that *prata* had been identified at legionary fortresses in mainland Europe and considered it likely that they were also in place at fortresses in Britain. The location of the forts in good agricultural land supports the argument for *prata* in the study area; if *prata* were indeed spaces focused on agriculture, the provision of good agricultural land surrounding the forts would have been a requirement. As discussed below, however, there is not currently enough other evidence for *prata* in the study area to use as evidence to support the argument that a priority for the location of forts was good agricultural land.

²⁵ '*Territorium*', meaning territory, is sometimes used to refer to land 'owned' by forts or fortresses. It does not have the agricultural suggestion of *pratum* but this does not necessarily mean that, when referring to a *territorium*, the writer does not wish to include any agricultural land. Manning (1975) did not define the difference but used the term *territorium*, writing '(or *prata*)' after the term at one point, indicating he perhaps considered them interchangeable in the context of his argument. Higham (1991) saw the *territoria* as supply sources, including timber, stone and metals.

The possible extents of *prata* surrounding some legionary fortresses in Britain have been suggested, including those of some of the fortresses in this study area (Manning 1975, 115; Mason 1988, 171-182; Ward et al. 2012, 344; Smith et al. 2016, 301). The results show that the suggested *prata* extents for the fortresses in the study area do include lands that are considered here to be the better agricultural land in their areas; valley floors and undulating lowland (Section 4.5.3). There is the concern, however, that *prata* extents are assumed and identified at least partly based on the presence of good agricultural land, creating a circular argument.

It could be argued that the location of the fortresses within lowland areas, as opposed to the more mountainous regions, makes the inclusion of these areas of better agricultural potential in their potential *prata* inevitable, assuming that the *prata* always start just beyond the fortress walls. Even in the low-lying areas of the fortresses, however, there is topography that is considered less promising for agriculture, but the results show that it was the better agricultural land that dominated the land immediately surrounding the fortresses. The presence of significant hills or ridges, where cultivation would have been more difficult, are sufficiently far away from the fortresses that they have been used as the limit of potential *prata* extents. Mason (1988, 168-169) suggested that a *pratum* at Wroxeter would not have extended beyond the high ground of the Wrekin to the south-east and other hills to the south and south-west, for example. An alternative approach to suggesting potential extents of *prata* may be the consideration of surveillance extents from each fort. This study has argued that the forts focused on certain areas of the landscape for surveillance of passers-by. It is possible that these areas also made natural extents for *prata*, allowing the monitoring of land that may have provided valuable resources, reducing the requirements for imports.

A variety of evidence types has been used to identify potential *prata* extents, including the presence of buildings with a military character and the distribution of tiles bearing a legion's stamp (for example Mason 1988, 171-182 and Manning 1975, 115). One of the potentially strongest pieces of evidence in Britain comes from the Goldcliff Priory area to the south-southeast of Caerleon, where an inscribed stone, marking the completion of an engineering project, was found (RIB 395), possibly related to drainage ditches identified in the area (Mason 1988, 181; Lockock 1996, 65). The fact the works were undertaken by the legion, along with their proximity to the fortress, has been used to argue that the area fell within the legion's lands, or *pratum*, and that the stone marked the *pratum* extent (Mason

1988, 181; Boon 1980, 28). Mason (1988, 181-182) considered the possible extent of a *pratum* in other directions from the fortress. Further Roman period land reclamation to the south-west prompted him to suggest that this was also carried out by the legion, and that the *pratum* may therefore have extended as far as the River Rhymney in this direction. He did not consider that the *pratum* extended far to the east; the ribbon settlement at Bulmore was only approximately 1.5km to the east of the fortress and he argued that such small ribbon settlements, aside from *canabae*, tended to not be included in legionary *prata* known elsewhere. He was uncertain about the extent to the North but suggested that a large part of the Usk valley may have been included. Boon (1980, 28) considered the inscribed stone to belong to the late 2nd or 3rd centuries, which is later than the period under investigation in this study. This does not necessarily mean, however, that the fortress did not have a *pratum* in the earlier occupation of Caerleon.

The evidence, however, is far from conclusive. Evans (2004, 16), for example, explained that, although a programme of Roman land reclamation to the south-south-east and south-west of Caerleon is considered likely by most, it could also be argued that the remains are the result of natural processes, and further work is required to be certain. Evans (2004, 16, 23) also suggested that more work is needed to define the Caerleon *pratum* extent and to understand how it may have been utilised by the Roman army. She argued that more research is needed to understand how it related to the local population, which will be discussed further below. The evidence for *prata* at the other fortresses in the study area (Mason 1988, 168-180) is similarly limited at present and requires more research to support or discount their presence.

The presence of *prata* around some or all the auxiliary forts in Wales is uncertain. An inscription from Chester-le-street in the north of England refers to the lands of an auxiliary unit (RIB 1049; Johnson 1983, 195) but little more is known about such spaces in Britain. Manning (1975, 115) considered that, since auxiliary forts were smaller in size than fortresses, their *prata* would not have needed to be large, suggesting approximately 280ha for a garrison of 480 men. How the potential *prata* of forts and fortresses relate to each other is also uncertain; for example, the land reclamation area to the south-west of Caerleon fortress was only approximately 5.5km from Cardiff fort. Whether the Cardiff fort had a *pratum*, how the two *prata* potentially interacted, and the impact on local populations of large areas of land in military control are not yet known.

The evidence for *prata* in the study area is therefore minimal at present. The presence of good agricultural land surrounding all the forts and fortresses, as shown by the results, supports the case for the establishment of *prata* in this area. The Roman army, however, may have taken advantage of this land and those who lived and worked there without necessarily defining it as their *prata*. The results therefore add weight to the argument for *prata* but further research is needed into their presence during this era of Roman conquest and occupation. If a main purpose of the *prata* is to farm supplies, their presence would add weight to the argument that the proximity of land suitable for providing food for animals and humans was a priority for fortress locations.

Some researchers have suggested that an apparent increase in agricultural production (cereals and animal products) in the vicinity of forts could be evidence that the Roman army was sourcing supplies locally. A range of sources of evidence has been used to assess production levels over time, such as an increase in corn-dryers (Fulford 2020, 301-302), but these can sometimes be limited to certain regions or potentially the result of other influences (Fulford 2020, 302). The increase in rural settlement sites, however, has been used as an indication of an increase in production throughout the UK. Smith et al. (2016) collected a large body of data to analyse settlement patterns in the Roman period in Britain. They divided Britain into regions based on varying criteria (Fulford and Brindle 2016, 4); their regions of Upland Wales and the Marches and sections of the Central West cover most of the study area of this project. They noted a general trend in these areas for an increase in rural settlements from the late Iron Age through to the second century AD (Brindle 2016, 288, 365), indicating a continuity of a trend that had begun prior to the conquest (Brindle 2016, 408). The Roman army may have had an impact, such as a changing situation which nevertheless presented little change to the settlement number trajectory, but this cannot be certain based on current evidence.

Smith and Kenward (2011), expanding on the work of Buckland (1978, 44-45), argued that any apparent increase in the production of grain after the Roman invasion should take into account the appearance of grain pests, which have not been identified in pre-Roman deposits, the presence of which may have required increased production to compensate for some grain being lost due to infestation (Smith and Kenward 2011, 248, 255). This could be used as evidence that any expansion of local production that might be to supply the Roman army was not as

great as it appears. They did, however, explain that the extent of the problem cannot be certain on the evidence available and that it is difficult to determine the extent to which it needs to be taken into account. One problem is that the data is frequently found in deposits of dumped grain, which may have been dumped intentionally due to infestation, and therefore distort the results (Smith and Kenward 2011, 255). Furthermore, only one of the deposits cited by Buckland was taken from Wales and the Marches and none from Smith and Kenward's evidence (Smith and Kenward 2011, 243-244, 246) therefore the extent of the problem here is uncertain. Smith and Kenward (2011, 257) also pointed out that grain may also have been lost to other problems, such as birds, rodents, mould and spillage. These, however, may have been problems prior to the Roman invasion and would not necessarily have prompted the need to produce more grain in the Roman period, although changing grain storage practices could have impacted mould growth for better or worse.

The appearance of pests in the Roman era, therefore, may have caused a required increase in grain production in the study area, but there is too little evidence at present to be certain, and to what extent if it was required. Further data would be needed to confirm whether it has an impact on discussions about whether agriculture in the study area was scaled up to meet the demands of the locally stationed Roman army. A further influence on grain production was highlighted by Higham (1991, 95) when discussing the northern British frontier. He argued that any increase in grain production after the Roman conquest may have been a result of the end of the inter-tribal warfare which, prior to the Roman occupation, had taken up the manpower required for large-scale cereal cultivation. He did, however, state that this is only one possible explanation for possible land-use change and may not have been the most significant (Higham 1991, 95).

Fulford et al. (2016, 385-6) did identify some regions which differed from the general trend of an increase in production since the late Iron Age. The numbers of settlement sites near Chester, for example, increased later, from the late first century to early second century (Brindle 2016, 301). They suggested a reason for the increase was to meet the demands of the Roman army at Chester (Brindle 2016, 301). They also suggested it may have been the result of colonisation (Brindle 2016, 301), which would perhaps explain the apparent lag between the arrival of the army and the increase in settlement numbers. In the south-west of Wales, they noted a greater number of rural settlement types in the late Iron Age and then a gradual decrease thereafter (Brindle 2016, 365). They put forward possible reasons,

including that the area had fewer forts to supply, that some of the local population were forced to move after the conquest and the later establishment of a *civitas* capital in the area which may have required fewer supplies (Brindle 2016, 365, 417). In north-west Wales they noted an increase in rural settlements reflecting the arrival of the Roman army, especially around the Segontium area. They proposed, however, that this area was not capable of providing all the necessary supplies to its forts (Brindle 2016, 367), although they did not provide detail on why they considered this to be the case.

Aside from these regional variations, the apparent general trend for an increase in settlements from the late Iron Age contrasts with evidence from some areas of Gaul, where a similar project to that of Smith et al. (2016) highlighted a decrease in rural settlements in the aftermath of the Roman conquest there, possibly caused by the disruption from the conquest (Roymans 2019, 444-455; Roymans and Fernandez-Gotz 2019, 418; Fulford 2020, 296-297). This possible disruption could be used to support the views of some researchers who argued that the Roman approach to conquest was brutal and had a significant disruptive effect on indigenous populations. As discussed in Chapter 2, Mattingly (2006, 91-94, 99, 128, 353-362; 2011, 13-20, 48) argued that the Roman conquest of the regions of Britain had been frequently examined in a positive light, and that viewing the evidence in a post-colonial light reveals that the Roman behaviour to the conquered could be ruthless and damaging. He suggested that the campaigns in Wales in 57-60 AD were particularly brutal (Mattingly 2006, 105, 116). Roymans et al. (2020, 288) noted the contrast with Gaul but stressed the argument for what they termed power-related themes, including violence and deportation, affecting rural communities. Davies (2002, 55) proposed that it may not have been possible for the Roman army to source supplies from Wales immediately after the conquest there because of the impact of the conquest on the native population. As noted above, Brindle (2016, 365) suggested a forced population movement in south-east Wales as a potential reason for a rural settlement decrease.

However, in Britain this may not have been the precise approach of the Romans. The lack of evidence for a rural settlement decrease post-conquest similar to that of Gaul in many parts of Britain, including the areas of this study, has been highlighted by Fulford (2020, 297-298). Fulford raised the possibility that there may have been a deliberate policy in Britain to not cause disruption so that supplies could be obtained. Rivet (1969, 196) implied that during the period of conquest of Britain

under Plautius, the Romans were aware of a need to not cause a severe population fall that would lead to supply problems. He did suggest, however, that the productivity of the initial period of Roman occupation was probably under strain nevertheless due to a high concentration of troops compared to the availability of land to supply them, and the use of labour for other purposes, such as road construction (Rivet 1969, 196-198, 190). Gambash (2012, 1, 4, 10, 13-14) argued the Roman authorities had a purposely appeasing and placating approach because discontent caused disruption to governance and that they may have disapproved of the severe response of Paulinus to the Boudiccan Revolt, although Gambash is referring to a population that, unlike that of Wales, was no longer within such a heavily militarised zone.

It is possible, therefore, that an initial lull in production due to the impact of the conquest may have been avoided purposely by the Roman authorities in Britain, and that this was, amongst other reasons, in order to establish supplies. The location of the forts in good agricultural land as shown by the results could support this view, emphasising the importance placed on supplies, especially those sourced locally to the forts. The idea of an avoidance of disruption may account for the lack of a lull in settlements but, at present, there is not enough evidence to be certain this approach took place. The trend of an increase in rural settlements from the late Iron Age in most of the study area has no obvious association with the events of the Roman conquest, although this does not mean that an association was not present. Does this lack of fluctuation in rural settlements in response to the conquest and occupation highlight the possibility that settlement numbers do not necessarily reflect agricultural production levels in the study area? If this is the case then rural settlement quantity fluctuations cannot be used reliably to consider whether fort supplies were sourced locally. The literary evidence (for example Tacitus *Annals* 12 and 14) for the Roman invasion of the area implies that the conquest was protracted, which suggests that disruption was not avoided. Even if there was disruption from the conquest, the inability of the local population to provide supplies would not necessarily have been a permanent situation and the Roman authorities could have anticipated future local supplies and located the forts to take advantage of this.

The argument that settlement numbers reflect production levels also assumes that most of the local supplies were obtained from the indigenous population. Is it possible, however, that the army farmed some its own supplies, especially in the

prata if such areas were present? Davies put this forward as a possibility (Davies 1971, 123). Josephus mentioned that most legionaries carried sickles to reap crops on campaign (Josephus *The Jewish War* iii, 95; Davies 1971, 122), which suggests that the legionaries had at least some understanding of crops. It was beyond the scope of this study to examine the known dates of settlements surrounding the forts to determine whether those nearest were occupied at the same time as the forts, and therefore were potentially farming the surrounding land. In many cases, further data may be required to determine this; when discussing the environs of Caerleon, Evans (2004, 10, 12) noted only 4 known excavated contemporary settlements to the south of the fortress and even fewer in the Usk valley to the N, both areas falling within the proposed *prata legionis* (Mason 1988, 180-182). Evans (2004, 16-17) recommended a search for settlements to the south and a systematic survey of the Usk valley to identify potential contemporary settlements to help understand how and if they related to the fortress. It is also possible that land may have been farmed by the occupants of the *vici* and *canabae*, as suggested by Manning (1795, 115) although, again, further data would be required to confirm this. It has been argued that the occupants of the *vici* served as merchants for supplies (for example Kolbech 2018, 2-4); perhaps some also produced the supplies that they sold. There may have been variations between forts or regions in the study area, as hinted at by Fulford et al., which is explained above. If few settlements surrounding the forts were contemporary with the forts, then it is possible that the army took control of at least some land and farmed it themselves. As explained above, this may have meant the displacement or death of populations in this area; accurate dating of settlements may help to determine this.

From the point of view of interaction with local populations, therefore, there are arguments for and against their harsh treatment at the time of the Roman conquest of the study area and the results could support either approach; the importance of agricultural land in the siting of forts shows the value of local supplies, supporting the argument for maintaining local production. Equally, however, the Roman army could have sited their forts anticipating future production, tended the land themselves temporarily at least, or relied on the occupants of the extra mural settlements to farm. As discussed above, however, whatever approach was taken, the results suggest that the Roman army kept firm control of the land surrounding their forts.

More evidence would therefore help to ascertain how the army interacted with local populations and the extent to which the Roman army in Wales sourced supplies locally and, more specifically, within the valleys and undulating lowland in which their forts were situated. Archaeobotanical data would be useful to help determine potential crops grown in the land surrounding the forts but not enough of this data is currently available in the study area to identify trends amongst the forts, and the conditions required to preserve this evidence can be limiting; some are best preserved in waterlogged conditions and the acidic soils in much of Wales does not help preservation (Van der Veen et al. 2008, 16, 30; Brindle 2016, 305, 362, 398). Dating evidence is also a problem. As noted above, for example, settlement concentrations and their dates in relation to the Roman forts and events cannot always be certain because too few have been dated accurately (Brindle 2016, 288; Fulford 2020, 298). Gaps in the data of rural sites may also be present due to research biases; for example, Smith et al. (2016) focused on the results of development-led research but certain areas have been subject to more development than others (Brindle 2016, 298, 362, 390; Fulford and Brindle 2016, 1). Many arguments concerning agriculture in Roman Wales have therefore been based on limited evidence. In 1969 Rivet noted that a lack of data was hampering research (Rivet 1969, 195) and, although the situation has improved, it is still a problem. The suggestion of Brindle (2016, 380), for example, that arable farming may have concentrated in the north and east of Wales, and pastoral to the south-west was based on bone and cereal remains, field systems and artefacts but very small numbers of these.

Evidence for agriculture types throughout Wales in this period is still growing and therefore our knowledge of what was farmed and where will become refined. The location of these forts, however, would certainly provide easy access to what was likely to have been the most productive land within the local topography. The fact that the results show that all the forts were associated with valley or undulating lowland where the most productive agricultural land was likely to be, and that all except 4 valley forts (Tomen y Mur, Pen Llwyn, Gelligaer I and Segontium) were within the valley bases and therefore within the agricultural land, adds considerable weight to the argument that the Roman authorities intended to source at least some supplies locally.

Fort siting therefore implies agricultural land was a priority and that some supplies were produced around the forts. As discussed in Section 5.5.1, supplies from

elsewhere was not impossible and valley and undulating lowland locations had other benefits. Nevertheless, the results showing that almost all the forts are located within agricultural land with the greatest potential within the topography types (i.e. valley bases) suggests that the potential to provide supplies was considered important. Although not the only priority, the forts were placed within the areas of most potential within the local topography types; valley floors within valleys for example. Some of these valleys in the upland zones are nevertheless likely to have been considered to have less agricultural potential than the large areas of undulating lowland or wide, shallow valleys of other parts of the study area and elsewhere in Britain, suggesting other motives for the forts' locations, combined with supply, were considered.

5.4.2 Water supply

Access to water was required for drinking, cooking, agriculture, sanitation and potentially fishing. Whilst watercourses are not scarce in the study area, the results show that proximity to watercourses was considered important. Most of the forts had at least one watercourse running through their near distances (Section 4.6.5) and all forts had watercourses present in their middle (Sections 4.5.9 and 4.6.7) and far distances (Sections 4.5.11 and 4.6.10). Some of the watercourses in the middle and far distances may have required travel over or around high ground to gain access but this would not have been required for at least one watercourse in every middle distance. This proximity of the forts to watercourses indicates that it was an important factor in choosing fort locations.

The larger watercourses provided a greater quantity of water throughout the year and a more reliable source in the dryer seasons, and the chance of more fish. Streams and tributaries did run through undulating upland and down valley sides but the more substantial rivers ran through valley floors and undulating lowland, which is where most of the forts were located (Section 4.5.4). Main rivers were the closest or very near to most forts (Section 4.6.1). These main rivers emptied directly into the sea and were larger rivers, into which numerous tributaries flowed. Few forts had streams instead of rivers as their closest watercourse (Section 4.6.5). Proximity to the larger watercourses was therefore preferred, although there were exceptions, such as Hindwell Farm which had only streams and brooks in its near and middle distances (Figures 77 and 78). Other factors must have been prioritised in these instances, a concept which is discussed further below.

In spite of the proximity of the watercourses, however, it seems that not all forts relied on their proximity for water supply. Some have evidence for the use of wells, such as Segontium (for example Hopewell 2020, 11-15), although the known wells here were extra-mural and perhaps associated with those occupying the *vicus*. Some forts used leats from other water sources, such as Tomen y Mur which had leats running from a nearby small lake (Crew and Webster 2010, 284).²⁶ Both these forts are in unusual locations however; Segontium on a rise between two valleys and Tomen y Mur on a valley side, and therefore alternative water sources may have been more practical. The collection of rainwater may have also been a possibility; Beaumont (2008) argued that rainwater was collected from rooftops at Housesteads fort on Hadrian's Wall. Housesteads did not have a reliable source of water nearby and therefore alternative supply methods have been investigated but Beaumont (2008, 84) suggested that it may have been a useful source of water at other forts in Britain. Evidence for sources of water is not yet known from all forts in the study area and therefore we cannot yet be certain to what extent nearby watercourses were used for water supply, although their proximity would have been useful for removing waste water.

The proximity of substantial rivers may have enabled the fort occupants to supplement their supplies with fish or shellfish. Locker (2007) collated evidence of fish from Roman period sites in Britain. Few of these sites fell into this study area of Wales and the Marches (Locker 2007, 141). It nevertheless demonstrated that fish were caught to eat in Roman Britain, and that the remains of some were found in Roman forts (Locker 2007, 144, 161) indicating that at least some of the Roman army consumed them. Most of the assemblages were from urban sites (Locker 2007, 147), however, although this, and the lack of assemblages in Wales, may represent the circumstances surrounding the data collection more than a true representation of assemblage distribution. Locker (2007, 149) noted that a lot of fish remains found in Wroxeter town was probably fished from the River Severn which ran through the near distance of the earlier fortress at Wroxeter. She also suggested salmon remains identified in the south-west of Britain were fished from

²⁶ The visibility of the lake (Llyn yr Oerfel) that was a source of water for Tomen y Mur fort was noted in the results (Section 4.6.12). The lake itself was obscured from the fort but the area around it was visible and therefore access to the water source could be monitored. Too little is currently known about non-river water sources at all the forts in the study area to study whether their visibility from the forts was common, but it is a potential avenue of future research.

the Severn Estuary (Locker 2007, 153). If correct, this demonstrates that these watercourses were used for fishing during the Roman era. It is therefore likely that other watercourses were used for the same purpose. Locker (2007, 144) noted that there was little variation amongst assemblages throughout the Roman period, which could ease the worry of changes in popularity of fish over time, but more data for the study area would be required to be certain of this here. Fresh fish may therefore have been sourced from watercourses near the forts but much more evidence is required to be certain that the Roman army's source of fish from rivers was considered important enough to influence the siting of Roman forts in relation to watercourses.

Nearby watercourses may therefore have been useful for water supply and fishing, but the use of other sources of water and the relatively low numbers of freshwater fish known at military sites suggests the proximity of watercourses as shown by the results may not have been solely for these purposes, and that they were also useful in other ways, discussed further below.

The sea would also have been a potential source of supplies of fish and seafood. Davies (1971, 128) argued that seafood was popular with the Roman army, although his evidence was not specific to this study area. Locker (2007, 157) suggested that the Romans valued marine fish over freshwater, and her study showed that many of the fish remains found at Roman era sites in Britain were sourced from the sea (Locker 2007, 160). The results reveal that none of the forts had the sea present within their near distances, only 3 had the sea extend into their middle distances (Section 4.5.9) and 18 (37.5%) in their far distances (Section 4.5.11). The data therefore suggests that proximity to the sea was not a priority in order to gain easy access to seafood supplies; if there was ever a demand for marine-sourced fish, it would need to rely on the transport system to reach the Roman forts. Seafood may have been a popular supplement, but it was not prioritised in the same way as cereals and livestock.

5.5 Transport

5.5.1 River, sea and roads: supplies

In spite of an apparent preference for local supplies where possible, there is evidence that some supplies, such as food, drink, clothing and equipment, were transported to Roman military installations from elsewhere in Britain or from overseas. Vindolanda tablets provide evidence of both local and imported supplies to the area, including from southern Britain, and Bowman (1998, 47-48) argued that the tablets support the notion that the army was supplied by a combination of imports from abroad and from local sources. Accounts of supplies, including those that must have been imported from overseas, are amongst the tablets identified at Vindolanda and mention imported items such as wine, pepper, oil and olives (Bowman 1998, 46, 47, 68-70; Vindolanda Tablets II. 9, 10, 26, 193, 203). The Vindolanda Tablets are from a period slightly later than that of this study period and some may reflect supplies to certain people within Vindolanda, such as the commander's family, as opposed to all the troops (Bowman 1998, 13-14, 68, 76). They nevertheless demonstrate the variety of food that was imported to an occupied area in Britain and forts in the study area would also have had the same variety of occupants expecting similar types of supplies.

Buckland (1978) and Smith and Kenward (2011) noted that certain grain pests, for which there is no evidence in Britain prior to the Roman invasion, became a problem from the start of the Roman period, implying that the pests were carried to Britain amongst imported grain. Smith and Kenward (2011, 253-254) argued that the frequent movement of large amounts of grain helped the pests to thrive. Van der Veen et al. (2008) assessed archaeobotanical records from the Roman era across Britain. They acknowledged some biases in the data (van der Veen et al. 2008, 14-16) but nevertheless found that imported vegetables and fruits were sent to military sites from the start of the Roman period (van der Veen et al. 2008, 25). An increase in the size and diversity of animals farmed during the Roman period in Britain has been used to argue for imports, although alternative causes for these variations have been proposed (Thomas and Stallibrass 2008, 6-7). Research by Rizzetto, Crabtree and Albarella (2017, 540-541, 546, 547, 550, 552) also found an increase in cattle size in the Roman period of Britain compared to the Iron Age, although herds of smaller cattle also existed and regional variations existed. They suggested

that a combination of large imported cattle and improvement through selective breeding led to the change (2017, 547).

Evidence for long-distance supplies to forts within the study area has also been found. Isotope analysis of animal bones from a Caerleon store building found that 19% (7 animals) had values that were not consistent with being raised in the Caerleon area; 4 animals were possibly from chalklands such as those of southeast and east England and parts of continental Europe, and 3 animals had values less common in Britain but similar have been found in mid Wales, the Malvern area, Scotland and possibly Brittany (Madgwick et al. 2019, 231-232). Madgwick et al. also explained that, since the plant samples from the vicinity of Caerleon reflect a range available throughout much of Britain, it is possible that some of the animal samples which matched those of the local plants could have been sourced from further afield. The sample size was modest but it nevertheless demonstrates that, although most animals were likely to be sourced locally, at least some importation of animals to the fortress occurred from elsewhere in Britain or possibly even further afield. Also at Caerleon, weeds associated with carbonised grain found to the south west of the fortress were likely to be of foreign origin, probably brought to the fortress amongst imported grain (Helbeck 1964, 158, 162-164). Vessels carrying imported products have been found at excavated forts in the study area (Webster 2010, 157-158). For example, excavations within Flavian phases at Segontium fort found amphorae which would have contained imported olive oil and wine (Casey and Davies 1993, 77-78) and first century pottery from Gaul was found during excavations at Caerphilly (Simpson 1966, 81-83) and Gelligaer I (Webster 2005, 12). Locker (2007, 157) argued that the Romans preferred marine fish to freshwater fish and, since few of the forts in the study area are close to the sea, marine fish would have needed to be transported to the forts. Locker (2007, 157) noted that Spanish mackerel was found at Chester.

The extent to which watercourses were used as part of the transport network for supplies to Roman forts in Britain has been debated. The location of forts in the study area in relation to watercourses, as shown by the results, supports the view that transport via inland watercourses was used routinely as part of the supply system.

Some researchers have argued for transport of supplies via water where possible, especially for heavy, bulky items, with connections via land where necessary, and

one of the main arguments for a preference for water transport of supplies has been that it was cheaper than transport over land (Brindle 2016, 299; Jones 2009, 5, 23, 28, 83; Orengo and Livarda 2016, 25-27; Stallibrass and Thomas 2008, 156). The proximity of the forts to watercourses, as shown by the results of this study, supports the view that some products were supplied by water and that water transport to the forts was considered when siting forts. The fact that most forts had watercourses running through their near distances shows that the majority of forts had ready access to watercourses (Section 4.6.5). Only 6 of these forts had streams as opposed to rivers running through their near distances (Section 4.6.5), although, depending on their sizes, streams were not necessarily impossible to navigate. All the forts had watercourses running through their middle distances (Section 4.6.7; Table 4.19), revealing that forts without watercourses in their near distances nevertheless had at least one nearby. Furthermore, most forts (Section 4.6.1) had a main river as their nearest watercourse; although varying in width and depth along their courses, these had direct access to the sea, enabling efficient access for sea-borne supplies, and tended to be larger than the tributaries, potentially allowing for a greater range of boats to navigate their courses. These rivers also had numerous tributaries, which could have provided transportation of local or regional supplies to the main river and onwards to the forts. Of the 20 forts with tributaries as their nearest watercourse, 11 also had a main river in their near or middle distances, some very close to the forts (Section 4.6.1). Forty forts (83.3%) therefore had access to a main watercourse. The remaining 8 forts had tributaries nearby, which were smaller than the main watercourses but, as discussed below, still had the potential to be navigable.

Some forts were situated along the same main watercourse and, where occupied at the same time²⁷, would enable efficient transportation from one fort to the next or between forts. Caer Gai, Llanfor and Chester, for example, all had the River Dee running through their near distances. Similarly, Forden Gaer, Caersws I, Wroxeter, Kingsholm and Gloucester were all adjacent to the River Severn (Appendix VI). Those which had watercourses on two or more sides had more potential points to dock close to the fort (Section 4.6.2). At 9 of these forts, one or more of the watercourses present on 2 or more sides of the fort were streams or brooks (Section 4.6.2). This may have detracted from their appeal as a route for supplies

²⁷ Llanfor and Caer Gai, for example, are not believed to have been occupied at the same time as each other but both are thought to have been in occupation during times in which Chester fortress was occupied. All were adjacent to the River Dee.

but some streams could be navigable in an appropriate vessel. The forts located near confluences (Section 4.6.3) had the advantage of multiple potential routes from which to access supplies. Most of the confluences involved a main river which connected directly with the sea, from which supplies from abroad, and possibly elsewhere in Britain, would have been transported. Rivers adjoining these may have aided unloading or may have provided transport of supplies from the local area. All forts had watercourses, including main rivers, within their far distance bands. Watercourses in the far distances of a fort that did not extend into the fort's middle distance may still have been valuable to a fort's supplies if they were used in combination with the road network, as discussed further below.

Some researchers, however, have expressed doubt over the notion that watercourses were used routinely for the transport of supplies in the study area. Manning (1975, 114) argued that 'few of the auxiliary forts in Britain were well placed to receive their supplies by water' and that most highland rivers were not suited for long-distance transport. He considered that the legionary fortresses of Caerleon and Chester were located where they could be supplied by sea then river, along with some auxiliary forts such as Segontium, but that most in the study area were not. Although he stated that some could have been used for local journeys in some areas, he did not detail how they can be certain of the navigability of watercourses during the Roman period and did not consider in depth the potential differences in the navigability of watercourses depending on the vessels available to the army and merchants of the time. Fulford (2007, 68) argued that supplies were rarely shipped via the sea directly to the coast of Wales. He used the lack of Severn Valley wares found at Roman forts, which could have been transported along these routes had they existed, as evidence. He argued that most imports from overseas were distributed, usually via road, from the south-east of England, although he does propose some transport of supplies along the River Severn to Wroxeter (Fulford 2007, 68-69). Fulford (2007, 68-69) suggested that the presence of forts near coasts and on navigable rivers may have been more for protection against raids than for supply.

If researchers such as Manning and Fulford were correct then the proximity of the forts to watercourses for the sake of supplies may not have been prioritised, indicating that they may have taken advantage of nearby watercourses, confluences and main rivers in the study area for other purposes, and that supply via water was not a priority. Jones (2009), however, had a more optimistic view of the

watercourses' navigability for supplies. He argued that transport via water was a major part of the supply system in the west of Roman Britain, including this study area (Jones 2009, 1, 57), arguing that military engineers were capable of improving and maintaining the watercourses (Jones 2009, 4, 48) and that the long coast of Wales provided plenty of access to inland watercourses (Jones 2009, 5), which would have been useful for supplying forts throughout the area. He noted references to supplies via sea and watercourses in contemporary literature, including Tacitus's remarks that long baggage trains of supplies over land to an army on campaign were vulnerable and supply by sea was more easily controlled and less accessible to enemies (Jones 2009, 2; Tacitus *Agricola* 2.5), although this comment from Tacitus concerns a situation where the army had not yet secured the area in which they were located. He also gave examples of a range of vessels available to the Roman military and merchants, some of which were capable of both carrying heavy loads and navigating rivers (Jones 2009, 12-19, 21), indicating that navigation inland was possible.

One of Jones's (2009, 17-18) examples, the remains of the Barland's Farm Boat, was found in Gwent, south Wales, near a stream which flowed to the River Severn. It had sea-faring capabilities if winds were not severe but was also shallow, enabling it to operate in rivers and possibly far inland (McGrail and Robert 1999, 144, 141). It may also have been able to travel along some streams propelled by a pole (McGrail and Robert 1999, 139). Its location near a stream further suggests that tributaries were not excluded from navigation, although the navigability of some streams may have decreased during periods of drought. When discussing possible trade routes taken by the boat, McGrail and Robert (1999, 142) argued it could have visited forts such as Gloucester, Caerleon, Cardiff, Neath and Loughor. McGrail and Robert (1999, 142) considered that the boat could have carried 3 crew and the equivalent of 15 medium-sized wine barrels or 90 sacks of grain. The boat was dated to the late 3rd century, which is later than this study period, but nevertheless indicates a type of boat which was found useful in the study area. Jones (2009, 12-15) also described other slightly earlier vessels found in Britain which were capable of navigating rivers, such as the 2nd century St Peter Port Ship found in Guernsey and the 2nd century Blackfriar's Ship from the River Thames. The transfer from sea-faring ships to river-ships (Orengo and Livarda 2016, 24), if required, would not necessarily have discouraged water transport. Orengo and Livarda (2016, 24) noted that the low weight and small size of some exotic imports worked well with this process. If the arguments of Jones are correct, the supply of most forts in Wales

would indeed have been possible and, reciprocally, the results of this study support Jones's argument by demonstrating that most forts had watercourses nearby.

Docks are known or suspected at adjacent watercourses at some forts in the study area, which supports the argument that watercourses were used for transport to and from at least some forts and therefore could have been areas to load and unload supplies. A dock to the north-east of Caerhun fort, for example, has been used in recent times but is thought likely to have had Roman origins (Gardner 1925, 318; GAT HER PRN 2485). The presence of docks to the south-west of Caerleon fortress has been suggested. Boon (1978, 2) identified what he interpreted as a 2nd century quay wall in this area. Excavations in a similar area in 2011 revealed that remains of any dock or quay wall in the excavated area must have been lost to erosion from the River Usk, but the excavators expressed the possibility that structures identified in the area may have been warehouses or similar that fronted the quay (Guest et. al 2012, 88) and that this area was first developed at a similar time to the construction of the fortress (2012, 92). This indicates that the notion that docks were in this location has not been dismissed and Guest et. al (2012, 92) suggested that the port was established at the same time as the fortress in 74/75 and that it was used to accept supplies transported by the sea for the fortress and to send provisions to auxiliary forts further upstream. It has been suggested that slate identified as being sourced from the Prescelly Mountains in Pembrokeshire, found at Caerleon, was used as ballast in ships that transported men and materials to and from the fortress, although this slate was associated with a slightly later phase than this study period (Boon 1972, 52). The proposed locations of the Caerleon docks were not at the closest point of the River Usk to the fortress and buildings have been identified between the proposed dock and the fortress walls. Boon (1978, 4) suggested that some of the buildings may have been convenient locations to store supplies. Guest et. al (2012, 93) proposed that a large courtyard building, identified during their investigations, and other buildings in the vicinity were gathering places for people, animals and equipment arriving by the port. This suggests that, although proximity was important, the docks and quays were not necessarily at the closest possible points to the forts. This may, however, depend on the local topography and the docking and storage systems at the particular forts, especially legionary fortresses which may have differed from auxiliary forts.

It is thought that a harbour lay to the west of Chester fortress; the exact location is uncertain but researchers are confident that a port was present here (Mason 2002,

65). A wall to the west of the fortress had originally been identified as part of the port but this has since been questioned for a variety of reasons, including that the quay wall would have been higher than the deck of a boat moored there (Mason 2002, 70). Remains of a 1st century harbour near the fortress of Gloucester have been found on the former course of the River Severn (Jones 2009, 52). The presence of docks or quays further adds weight to the use of watercourses for supplies, although they would also have been useful from the point of view of defence and monitoring.

Further evidence is required to ascertain the degree of supplies via watercourse to the Roman forts in the study area. The location of the forts, however, supports the view that watercourses were an important part of the methods of supply. Furthermore, the forts' location in relation to watercourses would also help to observe local trade by local populations of goods that were not necessarily to supply the Roman army.

The results show that none of the forts had the sea extending into the near distances and only 2 forts, Cardiff and Segontium, both auxiliary forts, had the sea within their middle distances (Section 4.5.9). Cardiff and Segontium forts nevertheless had main rivers closer than the sea. Even those forts closest to the coasts of the study area, therefore, did not have the sea close by. At only 18 forts did the sea extend into their far distance bands (Section 4.5.11). Of these, only 2 (Usk and Caerleon) were legionary fortresses. Supplies to the forts via sea would have to be shipped directly along a river or offloaded and transported by road. This suggests that, even if supplies were being shipped directly to the shores of the study area, access directly from the sea to the forts (avoiding rivers) was either not considered or was not a priority. Many forts had a main river, which led directly to the sea, as its nearest watercourse and therefore supplies could have accessed the forts directly from the sea via just one river, perhaps requiring a change of vessel if necessary. All the legionary fortresses in the study area (Chester, Wroxeter, Kingsholm, Gloucester, Usk and Caerleon) had a main river as a nearest watercourse and therefore would have benefitted from this arrangement. The fortresses were the largest installation types in the study area, and would have contained, at full capacity, the largest numbers of people to supply. The fact that so few of the fortresses were located close to the sea suggests that supply via river, or road as discussed below, as opposed to directly from the sea was not considered a hindrance. The extra travel along road or river would add time to the journey. If the

supplies were sent continuously, however, this would only affect the initial imports, or any new or particular requests for specific products. Access to the sea simply for speed of supplies may therefore have been considered unnecessary if other factors for fort siting were considered a priority. Travel via road would have been faster, although more expensive, and if speed was required this was an alternative.

Just over two thirds of the forts had Roman roads present within their near distances and almost all had roads within their middle distances (Section 4.9.1; Figure 3), showing that most forts had access to at least one road. The roads counted were those that had been designated as Known or Proposed/Probable. The lines of numerous Predicted roads, the locations of which are considered likely but not yet proven, also extend into the near, middle and far distances of many forts. There may also be further Roman roads to be found that have not been predicted. The numbers of forts with roads within their near and middle distances are therefore likely to be higher than the numbers recorded here. All the forts had roads present within their far distance bands, although these roads were likely to have been closer to other forts. Local trackways would also have been present throughout the landscape but the extents and relative dates of these are currently uncertain and therefore are not included in the discussions here.

If any of the forts preceded the roads, which is the chain of events interpreted by many (for example Hopewell 2013, 14), the proximity of roads to the forts suggests that forts were usually sited in areas that were suitable for future road construction or development. The transport of supplies or raw materials via road would frequently have involved equids and oxen (Johnstone 2008, 128, 129) and these would have required space for grazing. The siting of forts in good agricultural land would have aided this. The areas of slightly rising or flat land beyond the forts (Section 4.5.7) possibly providing immediate access to such pasture for animals intended to be used on the roads. Possible *mansiones* have been identified at some forts in the study area, including Tomen y Mur, Caerleon and Chester, which may have provided overnight resting places for those using the road network (Evans 2010, 168; Mason 2010, 179; GAT HER PRN 5080).

The proximity of roads to the forts supports the view that roads were also used to transport supplies. Although many supplies may have been transported by watercourses, some products may have been more suited to road transport; for example, fresh seafood would require fast transportation, even if transported live

(Locker 2007, 156), and travel via river would have been slower (Orengo and Livarda 2016, 25). There may also have been times when the navigability of some watercourses was impossible or unwise, such as during droughts, floods or very cold weather, whereas the Roman roads were designed to be used in all weathers (Hopewell 2013, 9). A Vindolanda tablet, however, suggests that even roads could at times be affected by weather to the extent that animals were not moved along them until the situation improved (Vindolanda Tablet II, 19-21). Furthermore, the routes of many of the roads differed from those of rivers and they therefore accessed areas that rivers could not (Figure 4). This may have been useful for accessing areas which provided or needed supplies that were not near a watercourse. They also provided more direct routes between some points. Rivers do not connect Pumsaint fort and the forts at Llandoverly directly, for example, but these forts were connected by a road (RR62c; DAT HER PRN 51964). Where forts had more than one road running through their near and/or middle distances, they benefitted from having options to travel in numerous directions. Caersws II, for example, has Known or Proposed roads running towards the north-west, north-east, east and west from the fort. If evidence for predicted roads and as yet unidentified/unpredicted roads emerges, it is likely that most forts would have had more than one road running through their near and/or middle distances.

It is likely that, where required or efficient, a combination of river and road would have been used for the transportation of some goods (Johnstone 2008, 131; Allen and Smith 2016, 40). When the numerous roads available to each fort are combined with the forts' river access, some forts being situated close to river confluences, it reveals the wide range of transport routes available to each fort. This could have enabled the sharing of supplies between forts and provided access to supplies from a wide range of regions within the study area and from further afield. The use of roads, rivers or a combination would no doubt have depended on the type of goods being moved, the speed in which they were required and the locations from which they departed. As the road system developed, it would have provided the means for an efficient import system as well as providing useful routes for local supplies. Smaller, possibly pre-existing trackways would no doubt have contributed to the supply routes, especially when sourcing supplies locally. If the road system did indeed develop after the establishment of the forts, the security problems highlighted by Tacitus (Tacitus *Agricola* 2.5, as discussed above) during campaigns would have been less of a threat; the monitoring of the landscape would have aided the security of supply routes.

The extensive network of roads created after the Roman advance into the area highlights the importance placed on this mode of transport. The proximity of the forts to the roads indicates the importance placed on ensuring the forts had access to the network. The use of the roads to supply the forts, at least to enhance or complement supplies via watercourses, is likely.

5.5.2 River, sea and roads: communication and transport of people

The benefits of the forts' proximity to the watercourses in terms of supplies would have similarly aided the transport of people and communication across the study area. The network of rivers and their tributaries, often with confluences near the forts, provided a range of travel routes accessible from the forts with the variety of vessels available. The siting of some forts along the same watercourses as each other would make communication between them particularly simple. Few forts were close to the sea but the watercourses provided links with the sea and, where speed was required, the road network could be used.

The Roman roads' proximity to the forts reveals that movement and communication from, to and between the forts was a priority. Roads link many of the forts, including forts that were not connected directly by rivers, and the ability to travel between them must have been important. Similar to the supply routes, a combination of watercourses and roads may have been used for the transportation of troops and messages between forts. This extensive travel network would have been useful for surveillance, intelligence and diplomacy, enabling scouts and envoys to proceed easily to certain areas. It would have provided easy communication between troops, including calls for assistance if required. The known distribution of forts reveals that in most cases, troops from each fort could reach another fort within a day. The network would also have facilitated a military advance into or towards numerous areas if required, either to meet an enemy or for training purposes. Prior to the establishment of the Roman roads, the location of forts within major valleys would have aided advancement along the valleys into new areas in the early days of the conquest of the area. Troops also worked on engineering projects away from their base forts and the transport network would have been useful for access to various parts of the study area. Traders would have also found the network useful and troops would have benefitted from merchants' easy access to the forts and extra

mural settlements. The network would also have aided access to raw materials found within the study area; large mines that have known or likely Roman date include Parys Mountain copper mines (Gwyn 1998) and Dolaucothi gold mines (DAT HER PRN 1961).

As mentioned in Chapter 2, the usefulness of the forts' relationship with the transport network for some of these themes has been noted in the relevant literature. The results generally support these statements, but sometimes contribute further detail. Arnold and Davies (2000, 5), for example, noted that forts in Wales were located where advances in numerous directions was possible, which is supported by the results. They also noted how the Roman forts were linked by the road system, which was used to police the area (2000, 15). They did not explain how the army policed it but probably assumed that scouts and patrols used the roads. They did not, however, suggest in this context that rivers were used alongside the roads. Discussing forts throughout Britain, Johnson (1983, 36) explained that ease of communication was one of the considerations when choosing a fort site, although she did not detail the use of roads and rivers together here. Pseudo-Hyginus (57) stated that a camp should have a river on one side, although this is likely to be for a source of water because he suggests a spring could be an alternative. Vegetius and Pseudo-Hyginus dedicated little time to the ease of communication from camps, presumably because of the camps' temporary nature.

5.6 Fort Relocations

In some cases, forts that are located very close together are known or strongly suspected to have been relocated from one site to the other. This may have been when the initial fort was abandoned and then, instead of re-establishing the original site, another site was chosen when the area was reoccupied at a later date. This is what may be the case at the possibly pre-Flavian era Llanfor and Flavian era Caer Gai (Hopewell 2005, 252-253), each at opposite ends of Llyn Tegid. Alternatively, an area may have continued in occupation while an alternative site was chosen. There are relatively few known or suspected relocations in the study area to allow a reliable comparison to suggest patterns in the data but nevertheless the results have shown some points that could be used to suggest why the changes were made in each case. For each original fort and its successor the results were compared and significant differences between each were identified and examined

(Section 4.11). Some of the relocations may represent the two stages to the advance in Wales; the initial fort was the pre-Flavian advance and the replacement the later Flavian advance. A comparison of the earlier and later forts could identify potential changes in fort siting priorities between the two periods. However, the results suggest that the basic priorities remained the same and that relocations may have been for practical reasons or to find sites that improved upon or refined the priorities that influenced the siting of the initial forts.

For Llanfor and its replacement Caer Gai (Figures 101, 102, 19 and 18), the original fort was significantly larger, suggesting a practical consideration that the returning force was smaller and therefore did not require such a large site. This would not, however, prevent the army returning to the Llanfor site and constructing a reduced fort within the walls of the original fort had they wished. Other forts, such as Tomen y Mur, kept the same site but were reduced in size when the full extent was no longer required (GAT HER PRN 5080). The site change is therefore likely to have had other causes. Caer Gai was of significantly higher altitude than Llanfor. This may indicate that better views were required. However, the results show that the topography types visible from each fort were similar in each distance band. Caer Gai had a slightly larger area of the main valley floor visible but otherwise the results were similar and both had views of a complete cross-section of the valley, enabling surveillance of movement. The descents beyond the fort in the near distance of Caer Gai were much steeper than that of Llanfor. This could suggest extra defences were required and that the local populations in the area were particularly troublesome. Llanfor, however, was surrounded by rivers on more than one side and therefore had a form of protection that Caer Gai did not. They were both located along the River Dee, indicating that river supplies or communication did not prompt the move. Caer Gai was closer to the meeting point of 2 valleys but Llanfor was closer to a river confluence. It is possible therefore that the surveillance of the valleys was prioritised. There may have been a practical reason however; Llanfor was located on the valley floor, with rivers on at least 2 sides and shallow descending land beyond the fort whereas Caer Gair was in a more elevated location. It is possible, therefore, that Llanfor suffered from occasional flooding and an alternative location was therefore found.

The early Flavian Caersws II replaced the pre- or early Flavian Caersws I (Figures 38, 39, 41 and 42). Unlike Llanfor and Caer Gai, Caersws I had the more elevated position and Caersws II was on the valley floor, in the area more at risk of floods.

Possible flood banks have been identified at Caersws II (Jones 2010, 229). This indicates that something other than flooding prompted the relocation. Both forts had similar levels of visibility of the surrounding topography. Caersws I had the steeper descending land beyond the forts but Caersws II was within a bend of a river and therefore both had some natural defences. Although both forts had valley meeting points and river confluences within the near and/or middle distances, Caersws II was located closer to these meeting points. This may have been beneficial for transport, communication, supplies and surveillance of these routes. Caersws I was placed as far along the valley as possible before it narrowed, whereas Caersws II was not, suggesting that proximity to the valley meeting points was prioritised. Both had full views of a cross section of the Severn valley, although the direction of these views differed; Caersws I had a full view of the cross-section downstream to the east, Caersws II had a full view of a cross section upstream to the south. It is possible that approaching travellers from the south were prioritised for surveillance. Johnson (1983, 37) argued that Caersws I benefitted from a tactical location with extensive views during the area's initial pacification then shifted to supervise the road and river junctions in the more settled times. The results, however, show that there was little difference between the views from each fort. Proximity to the junctions does appear to have been an important factor but the results hint further of a consideration of movement upstream from the south.

The situation at Jay Lane and Buckton is similar (Figures 80, 81, 11 and 12). Although both forts had partial visibility of mostly the same topographic features, Jay Lane had slightly larger visible areas of the main and joining valleys. Both forts had full views of a cross section of the valley, and therefore both could survey movement through the main valley. Jay Lane also had a slightly higher elevation and steeper descents beyond the fort walls. Buckton, however, was closer to the centre of valley meeting points than Jay Lane, suggesting that proximity and easy access to potential travel routes was an advantage and prioritised over slightly more extensive views over sections of the valley. Johnson (1983, 38) suggested that this relocation was to suit local needs rather than a tactical advantage. The results support this view; the second fort had much the same advantages as Jay Lane, with the exception of the steeper slopes providing a natural defence, with the addition of easier access to the various transport routes.

The results indicate that reasons for likely relocation of the fortress from Usk to Caerleon may have been that the original site was prone to flooding and that the

new site provided enhanced surveillance of the Usk valley (Figures 143, 144, 32 and 33). Usk was on the Usk valley floor with no descending areas surrounding the fortress whereas Caerleon is on a terrace in the valley. Dampness and flooding may therefore have been a problem at the Usk fortress, although the Ordnance Survey 1st edition map does not label the site as being liable to floods. The presence of descending land beyond the walls of Caerleon could indicate a defensive advantage to this site, but the gradients here were quite shallow and would not have been a great hinderance to an advance. Regarding visibility, there were advantages and drawbacks to the move. At Usk, the main river was obscured from the fortress in its near and middle distances, although the banks were partially visible. Usk had a full view of cross sections of both the Usk and Olwyn Valleys. Caerleon did not have such a view of any valleys other than the Usk Valley but had views of cross-sections of the Usk to both the east and west. The ability to have surveillance of approaches from both directions may have been considered an advantage. Manning (2010, 189) argued that the River Usk at the Usk fortress was not navigable, which may have been a cause of the relocation. As discussed above, there are arguments that a variety of rivers in the study area could be navigated in an appropriate vessel, although if more vessel types could reach Caerleon supplies would have reached there with more efficiency.

The move of the fortress from Kingsholm to Gloucester may also have been prompted by the practical reason of flooding; Kingsholm was located on the valley floor whereas Gloucester was on a plateau in the same valley (Figures 83, 84, 74 and 75). The results showed that Gloucester had large areas of the topography visible from the fortress. However, since the location of Kingsholm gates are uncertain, views were taken from a central point of the fortress. It is likely, therefore, that Kingsholm had wider views than those recorded here.

The forts of Llandoverly I and Llandoverly II are so close to each other that they overlap but the results suggest that the slight shift in location may have provided some advantages (Figures 95, 96, 98 and 99). Llandoverly II is considerably smaller than the original fort, suggesting a change in garrison size. Both have visibility of valley meeting points but Llandoverly II has slightly wider views of these areas. Llandoverly II has visibility of a river confluence that Llandoverly I did not. Furthermore, the south-west of the main valley (Tywi) was obscured from I but partially visible from II and Llandoverly II had the full width of the Tywi valley floor to both the west and south-west whereas Llandoverly I had a full view only to the W.

Llandovery II is almost as far to the south-west of a ridge as possible before the descent to the valley starts, allowing better views of the south valley. Llandovery I sits further back from the descent and some views to the south-west are obscured by a flat area beyond the SW of the fort before the descent begins. Llandovery II may therefore have been sited closer to edge of ridge for better views of the south-west of the valley, enabling better surveillance of movement from the south-west. This may have been prompted by more activity from the south-west to observe or simply an improvement on the previous fort siting.

5.7 Fort type comparison

The fortresses were all located towards the east of the study area; fortresses were usually set back from the frontier to enable support and supplies, and this is reflected here (Burnham and Davies 2010, 47-48). Within their local topography, however, most of the contrasts that were identified between legionary fortresses and auxiliary forts (Section 4.12) suggests that the fortresses were sited in topography that was considered ideal for both forts and fortresses. All fortresses, for example, had main rivers as their closest watercourse and had watercourses within their near distances, all valley-based fortresses were sited where 2 or more valleys meet and a greater proportion had river confluences within their near and middle distances. This emphasises a desire for good access to supplies, transport and communication. The results stress that these were favoured at all forts but the results show that their presence was essential at the siting of fortresses in the study area.

Some variations in results between fortresses and auxiliary forts may be a product of the distribution of the forts. Although there are hilly areas in the east of the study area, the west is more mountainous. The results for forts in the west reflect this landscape difference. The greater range in elevation, gradients within forts and gradient of descending land in the near distances of the auxiliary forts may therefore be because many auxiliary forts were in the more mountainous area and may not necessarily reflect a difference in the aims of fort and fortress siting, beyond their distribution across the area.

A greater proportion of auxiliary forts than legionary fortresses had a full view of a section of their main valley in at least one direction. It is argued above that the high

numbers of forts that had this visibility aided the Roman army's dominance over the local populations. It could be argued, therefore, that this was not an aim of the legionary fortresses since few had full views of the main valleys. It is possible, however, that the much larger sizes of the fortresses, their extensive extra-mural areas with associated buildings and their larger *territoria* were sufficient to remind passers-by of the army's dominance.

5.8 Priorities

When considering the elements of topography that were prioritised by the Roman army when siting forts, the results (Section 4.13.1) support the arguments that surveillance of movement through valleys and the ability to source supplies were important factors. An emphasis on how each topography type had multiple uses can also be seen. The preference for valley locations enabled forts to be located alongside routeways through hilly terrain. The good visibility of these valleys, especially of full widths of cross-sections of valleys, enabled surveillance of travel from most of the forts. The proximity to routeways ensured that forts could easily access supplies that were not obtained locally. Rivers tend to run through the valleys and the results demonstrated that most forts were close to a large river, and had some visibility of these rivers, which also aided surveillance of travel and access to supplies. Valleys furthermore provided the better agricultural land, providing a further source of supplies. For similar access to supplies, local populations may also have focused on valley bases. The siting of forts in these areas would have aided Roman dominance either by displacing local populations or living side-by-side, and then by surveillance of movement through the valleys. The prioritised topography also suggests a consideration of practical factors; that most forts had descending land beyond their walls and were sited on neither the highest nor lowest spots in the area suggests a consideration for dampness and flooding.

The results which applied to few of the forts can be used to further reinforce these arguments. The low levels of visibility of the main valleys and watercourses in the far distance bands shows that surveillance from the forts at these distances was not considered useful. As discussed in the Methodology, the levels of detail visible at this distance would have been minimal and, as indicated by the results, not considered worthwhile enough to position the forts to secure such views. Considering the distribution of forts in the study area, activities in the far distance of

a fort were also likely to have been within the near or middle distance of another fort. The low levels of visibility of land beyond the sea (Anglesey beyond the Menai Straits and the English coast beyond the Bristol Channel) in the far distance bands suggests that, similarly, the visibility of these areas at such a distance was not considered useful. Forts may have relied on scouts and other intelligence methods for knowledge of unwelcome activities in these areas. The results which applied to few forts in regard to watercourses similarly reveals an emphasis for surveillance in the near and middle distances. For example, few forts had visibility of their nearest watercourses into their far distance bands and few forts had no visibility of nearest watercourses in their near and middle distances. Few forts had full visibility of watercourses in their near or middle distances but this was not likely or necessarily required; movement along the watercourses would be visible from the forts as the travellers passed through the visible sections. This lack of interest in the far distance bands demonstrates a focus on the near and middle distances, where visibility from and to the forts was more clear.

The results (Section 4.13.3) also show that few forts had isolated hills within their middle distances. These hills may have been avoided because they blocked views along the valley or overlooked the forts from directions other than that of the valley sides. Coxall Knoll, for example, blocked views from Jay Lane and Buckton along the Teme Valley to the west, although the forts were not situated any closer to the hill than to the valley sides and therefore being overlooked may not have been a problem here. The other advantages of the location must have outweighed the presence of the hill but the results indicate that valleys with isolated hills were avoided. It is also possible that isolated hills are rarely a feature within valleys within this study area.

As explained in Chapter 2, the orientation of forts towards certain topographical features has been used to stress the significance of these features in terms of fort siting. If this interpretation is correct, the results suggest that the orientation of forts could also be used to support the arguments for surveillance of movement and the importance of supplies. Only half of the 48 forts in this study have a known orientation (Section 4.8.1), however, and therefore there are fewer forts to consider to make a reliable judgement. Furthermore, the consideration of orientation assumes that the Roman army directed their forts towards features in the landscape that they considered important. At most of the forts, orientation matched the fort's aspect (Section 4.8.8) and it may therefore have been the aspect which dictated

these forts' orientation, although choice of aspect may also reflect the army's concerns. An optimistic view is taken here that fort orientation can contribute to evidence but further research into its role may clarify its value. The fact that the valley forts of known orientation tended to face their valleys (as opposed to their closest valley sides), that most forts of known orientation faced their closest watercourses, and that the forts had good views of these features (Section 4.8.3), reinforces the significance of these landscape features. The undulating-lowland based forts of known orientation were recorded as facing undulating lowland in their middle distances but this was perhaps inevitable since there were no valley sides or isolated hills to provide an alternative. One of the features towards which Segontium was orientated was Foryd Bay. The River Seiont, however, lies between the fort and the Bay and it may have been the river and valley that were the foci.

Few of the forts were orientated towards river confluences or valley meeting points (Section 4.8.5 and 4.8.6), and few that were had visibility of these landscape features (Section 4.8.5 and 4.8.6). This could suggest that, although proximity to such features was useful, they were not a main focus for the forts. In both cases, of the 30 forts which have river or valley meeting points in their near or middle distances, only 14 have known orientations. The numbers, therefore, may be too low for reliable comparison. In regard to valley meeting points, however, over half of the forts were located at valley meeting points (Section 4.5.14), and the 5 further forts that were known to be orientated towards valley meeting points could add weight to their importance. There was little preference for orientation regarding river flow (Section 4.8.7). The orientation upstream or downstream may represent a direction in which traffic was expected. Many of the forts had views across the watercourses, however, and it is likely that views of any sections of the watercourses was prioritised over direction of orientation.

In the near distances (Section 4.8.2), the forts were orientated towards the land that descended from beyond the forts' walls, and therefore towards a watercourse, if present, that ran through the near distances. This may represent a focus on watercourses, or be a product of the preference for matching orientation to aspect. The watercourses towards which the forts were facing in their near distances were all visible within the near distances apart from at Chester and Wroxeter, which had no views of the watercourses or their banks, and Caerleon and Usk which only had partial visibility of the river banks in their near distances. These four installations were legionary fortresses and this may suggest that there was a difference in

approach at fortresses. It is possible, however, that this was simply a coincidence; at Gloucester, the fortress was orientated towards the former course of the River Severn in its near distance and did have partial visibility of the watercourse in its near distance. A comparison with the fortress of Kingsholm, if its orientation is discovered, would be useful. Orientation towards features in the far distances (Section 4.8.4) reflects the reduced concern with the main valleys in this distance band, since considerably fewer forts were orientated towards both them and the forts' closest watercourses in their far distances.

The study of camps in Wales by Davies and Jones identified some patterns in camp orientation (2006, 14-15), some of which reflected the results of fort orientation here. They noted, for example, a possible tendency for an orientation to the east, although this was not so strong amongst forts, as well as a trend for facing downhill. Vegetius (I, 23) advised that camps should face east, towards the enemy or in the direction of the army's march. Pseudo-Hyginus (56) stated camps should face the downward slope and face the enemy. Davies and Jones discussed the possibility of the camps facing the direction of march, or otherwise facing east. The more static situation of the forts suggests that they would not be required to face a direction of march. There was a slight weighting of the forts towards facing roughly east, but not enough to suggest that this was a default orientation. Milner (1993, 23) noted that the recommendation by Vegetius to face east may reflect Vegetius's Christian influence, although Milner (1993, xxiv) earlier observed that Vegetius generally took a secular approach to his writings. The tendency for forts to face the main valleys may suggest that they were facing the enemy, who also made use of the valleys. It seems more likely, however, that the forts were directed towards the numerous things which were considered of importance within their immediate landscape; routes of travel, supplies and people, which tended to be within the valleys.

5.9 Implications for frontier studies

The role of Roman fortifications in frontier areas has been the focus of much research, mostly, as discussed in Chapter 2, those that form a linear barrier. The evidence here shows that themes frequently discussed in relation to linear frontiers also have relevance to forts in frontier zones that are distributed in other formations, most notably the way that forts worked together as a system. Researchers who have investigated fortifications at the Gask Ridge, Hadrian's Wall and the Antonine

Wall, for example, frequently focus on how the fortifications may have worked together (for example Breeze 2017; Woolliscroft 1996; Woolliscroft 2010, 51-78). This study argued that the forts in Wales also worked as a system; they were not sited simply to respond to local requirements but were sited at specific points in relation to certain valleys so that they could together control indigenous populations by domination, secure supplies and enable communications. This highlights the importance of the study of Roman fortifications in the era of recently conquered territories that are not necessarily in a linear formation.

The study of these fortifications can also help us understand the Roman approach to frontier zones. This study has demonstrated the importance placed on maintaining supplies and communications and also the importance of the psychological impact of fortifications on local populations of frontier zones and those passing through. By focusing on the study of forts in newly conquered areas that were not in linear arrangements, as well as those in linear patterns, we can increase our understanding of Rome's approach to frontiers and how they may differ depending on variables such as era, terrain and political circumstances,

5.10 Reflection on Methodology

It was found that collecting data by a combination of fieldwork and GIS worked well. The GIS compensated for fort gates that were not accessible during fieldwork and for post-Roman features that obscured views. It also provided data that could not easily be collected by fieldwork regardless of fort access or obscured views, such as Roman road visibility, gradient calculations and the nature of the terrain that was present beyond the forts but not visible from them. The ability to collect some data via fieldwork provided the on-site experience that is difficult to recreate via GIS. Comparing the data collected from fieldwork and GIS enabled the monitoring of any significant differences in results between the two approaches.

More areas of the LiDAR 2m, 1m and 50cm DTMs are now available than when the data collection took place. Nevertheless, the OS Terrain 5 DTM that was used for the viewsheds and gradient calculations worked well and provided results that were comparable to those of the on-site data collection at those forts where data was collected from both GIS and fieldwork.

It was also found that the use of the distance bands worked well in both the fieldwork and GIS. It defined terms such as 'near' and 'far' that had often been used without any definition in previous research. During fieldwork the use of trees to define the bands worked well because of their prevalence throughout the study area. The approach worked particularly well for this research because there was little variety in tree types throughout the landscape. If this study area was compared to another in a country with a different climate, and therefore different tree types, the interpretation of near, middle and far distances may have differed between the two areas.

As discussed in Chapter 2, theoretical approaches to landscapes have developed over recent decades. Phenomenology encouraged the study of past communities' perceptions of their landscapes and this remains a strong theme in current research. The methodology here took the approach that GIS can contribute to studies that consider human perception. Field visits were undertaken wherever possible to gain experiences of the landscape in-person but the GIS data was relied upon where access was impossible or where modern features obscured views. The results provided evidence to support conclusions about practical and logistical matters, such as those relating to supplies, as well as conclusions about the emotional impact the forts had on local populations and how this was used by Rome. It is hoped that this approach helps to demonstrate the value of the use of GIS to explore themes such as these.

5.11 Fort gate comparison

As part of the Methodology (Section 3.5.1) the variation on views from different sides of Tomen y Mur fort was noted and it was decided that, during the analysis phase, views from each gate of each fort would be compared to see if forts were potentially placed to enable the widest views possible from each fort.

The results (Section 4.10) show that at most forts, the fort was set out within the topography in such a way that the view from each gate compensated for obscured areas from other gates within the same fort. This demonstrates that, far from choosing fort siting based on the central point, the forts were sited based on the full extent of the fort and the views that it provided.

5.12 Summary

The research found that the topography types in which the forts were situated had multiple uses, ranging from practical, military, supply and travel concerns. The results revealed that the evidence is frequently more varied and not as clear-cut as that described in relevant literature, and new ways that the topography was used to the Roman army's advantage are suggested. It is argued that surveillance of movement through certain valleys as a method of control, as well as the sourcing of supplies were the most important considerations in fort siting. Fort relocations were usually found to have improved the siting priorities of the original forts, as opposed to suggesting new tactics. Legionary fortresses were located in topography that the results suggest were ideal for both auxiliary forts and fortresses. The forts were sited in such a way that views from each side compensated for lack of certain views from the other sides.

6. Conclusion

The research found that forts were sited to provide access to local supplies, good transport routes for imported supplies as well as travel and communication, and with a consideration for defence where possible. The ability to monitor movement, particularly through the larger valleys, was a priority. It was argued that this monitoring was used to reinforce the Roman dominance over local populations and that this was used as a method for controlling the area in the aftermath of the conquest.

Fort siting has frequently contributed to discussions regarding Roman Wales, especially in relation to themes of defence, control, military supply, travel and communication. The fort siting data used, however, is often vague and imprecise, and the methods of collecting the data are rarely defined. This study therefore aimed to address this problem. A new methodology was developed and applied to the forts in the study area. Both fieldwork and GIS was used to collect data using a systematic approach, so that each fort was considered equally. Siting data was collected, including the forts' proximity to certain topographical features, their relative altitude to the surrounding landscape, their orientation, and views from the fort gates. Distance bands were used so that descriptions such as 'near' and 'far' could be defined.

The results were used to suggest further interpretations of some research themes. The visibility results highlighted the importance of the theme of Roman monitoring and control. The good views from the forts of cross-sections of the larger valleys and valley sides, especially compared to other topographical features, was used to argue that movement through these areas was monitored by the Roman army. It was argued that this would have enabled the troops to react to events in the vicinity of the forts; an assault by a large enemy force may have been unlikely but guerrilla tactics and smaller forces approaching the fort may have been a possibility. The main purpose of this monitoring, however, was to remind passers-by of where the power lay. Travellers through these larger valleys could see the forts and also know that they were being seen. It was argued that this was used to create a sense of imposition and dominance to assert Roman control. Examples of research that identified potential surveillance methods by Romans elsewhere in the empire, which differed slightly from that proposed here, were discussed. It was proposed that this

suggested method in Wales was a further adaptation of surveillance techniques used by Rome as one of their methods of control.

The results showed that almost all the forts were located within areas of good agricultural potential, indicating that the forts were located with the intention to source at least some supplies locally. This therefore supported the argument of some researchers, such as Manning (1975) and Mason (1988), that there was a preference for local supplies where possible. This in turn suggests that *prata* may have been present in the study area, perhaps at both auxiliary forts and legionary fortresses, indicating a strong Roman military influence over land extending far beyond the walls of the forts. A preference for local supplies also had potential implications for the treatment of local populations during the advance into Wales; a consideration for ensuring that local populations were capable of producing supplies may have ensured that the conquest was less brutal than has sometimes been argued, supporting Fulford's (2020) argument that there may have been a deliberate policy to minimise supply disruption.

The proximity of forts to routeways and watercourses stressed the importance placed on transport, communication and imports of further supplies. These results suggest that both imported supplies and locally sourced supplies were used. It was argued that the placement of forts with access to both roads and watercourses indicates that both were used for the transportation of supplies. Which method chosen would depend on the nature of the goods being transported and the speed with which they needed to travel. The forts' siting in relation to the roads and watercourses also stresses the importance placed on the requirements of travel and communication, both between forts and into the wider landscape.

Defensive considerations revealed by the results included the use of topography to aid the man-made defences, the use of rivers to slow a land-based advance, and land in the near distances providing extra space if required. This theme in particular highlighted the variety of some results amongst the forts; not all forts were sited where topography could enhance the natural defences. It was argued that the Roman army took advantage of the topography in this way only if other prioritised features, such as transport routes and the ability to monitor, were also present. This revealed that the evidence is not as clear-cut as that often described in the literature, which tends not to reveal or account for variety in fort siting.

The results also revealed that key practical considerations were likely to have been taken into account when choosing fort locations, including an avoidance of areas liable to flood, ease of building within the forts and space surrounding the forts for buildings and activities.

The siting of forts that were likely to have relocated within the study period were compared to see if the differences revealed any potential changes in the Roman approach to the conquest and consolidation of the study area. The results revealed, however, that relocations were usually found to have improved the siting priorities of the original forts, as opposed to reflecting new approaches by the Roman army. Similarly, a comparison of legionary fortresses and auxiliary forts showed that the fortresses tended to be sited in topography that would have been considered ideal for auxiliary forts.

Having completed the project and found the approach contributed to research by providing data that led to new and refined interpretations, the research could be expanded in the future to include other site types, areas and time periods. The inclusion of fortlets, such as Brithdir in Gwynedd and Erglodd in Ceredigion, would be a useful expansion. How their siting within the topography resembled or differed from that of forts may contribute to our understanding of their uses and how they complemented the work of the forts, especially how the coastal fortlets may have interacted with events at sea. Symonds (2018, 62-63, 91) noted that some fortlets in Wales were sited in 'nondescript' locations alongside roads and suggested that they were part of a rapid communication system in the years immediately following the conquest. He argued that some other fortlets were sited for more specific reasons, such as to guard a river crossing (2018, 59). Symonds's arguments were in the context of a book about fortlets throughout the empire and he therefore did not consider their siting in Wales in detail. A comparison with temporary camps would also be interesting. Their siting in Wales has been examined by Davies and Jones (2006) and an in-depth comparison of their siting may lead to ideas about how and if their roles differed, such as whether camps were less focused on long-term supplies and more focused on defence.

The methodology could be expanded to conquest-era Roman forts in other similar landscapes in the Roman Empire, such as in northern England and southern Scotland. It would be useful to compare the results of the Welsh forts to these areas to identify any potential differences in approach by the Roman army. It would also

be interesting to see whether the siting of the Highland line forts and the Gask Ridge, which are in a linear arrangement, differed from those that had a more dispersed distribution. Comparisons to military sites in newly conquered areas of similar topography beyond Britain would also be useful to establish whether similar themes were prioritised by the Roman army throughout the empire and whether approaches changed over time.

Another line of potential research would be to use the methodology to analyse the relationship, especially proximity and visibility, between Roman forts and other contemporary sites. Such sites could include, settlements, hillforts and mines and quarries. An association between Roman forts and some of the larger mines and quarries is already known, such as Pumsaint fort and the Dolaucothi gold mines. There are many hundreds of sites identified as Iron Age/Romano-British in the HERs covering the study area but relatively few of these have been dated with precision or at all and therefore it cannot be certain that they were in use at the same time as the Roman forts in the pre-Flavian and Flavian eras. This research may therefore have to wait until future work identifies the dates of these sites or limit their inclusion to only those whose dates are known. It has been noted that some medieval mottes have been located on or near the sites of Roman forts in the study area Moore (1977). Moore noted these similarities in siting and discussed how they may have benefitted both the Romans and Normans. He did not investigate the location of each site type in depth, however, and therefore the comparison could be extended further to identify different approaches to the landscape between the two periods.

In the Discussion it was explained that the methodology had worked well for the purposes of this research. In the future, however, methods could be adapted to incorporate the latest data and techniques. As more research is undertaken in the study area, pollen analyses may increase enough to enable suggestions about vegetation surrounding the forts. Other forms of paleoenvironmental data may also become available, including fluvial geomorphology data which would aid understanding of the development of rivers and river valleys. This could then be taken into account when considering both agricultural practices and visibility, although pollen analyses would not help identify where small areas potentially cleared by the army to aid visibility may have been located. LiDAR DTM data in resolutions of 0.5m, 1m or 2m may fully cover the study area in the future, allowing even more accurate viewsheds to be generated. GIS methods are constantly being

adapted and refined and, since the methodology was undertaken, new ideas have been tested and proposed, some of which could be used or adapted for future studies of Roman fort siting. For example, Fábrega-Álvarez and Parcero-Oubiña (2019) refined the distance band method by defining distances at which different levels of recognition of human individuals become possible. Future GIS developments may provide further techniques to enhance the methodology.

Finally, Chapter 2 explained how some researchers used fort distribution to suggest the locations of as-yet unidentified forts. The data collected for this research could help identify areas of land that have the potential to be suitable for fort locations by focusing on the data that was found at most forts. The potential identification of more forts would help our overall understanding of the Roman invasion and occupation of Wales.

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Historic Environment Record (HER) data

HER data was supplied by:

Cheshire Council
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PRN refers to the Primary Record Number allocated to each record in the HERs.

Appendix I: Fort Basic Data

Table I.1 Fort basic data

Fort	Grid reference	Fort size (hectares) ²⁸	Era established ²⁹
Caerhun	SH77637037	1.97	Flavian
Tomen y Mur	SH70703880	2.03	Flavian
Segontium	SH48506250	2.27	Flavian
Bryn y Gefeiliau / Caer Llugwy	SH74605725	2.4	Flavian
Llanfor	SH93773612	3.86	Pre-Flavian or early Flavian
Caer Gai	SH87753148	1.75	Flavian
Pennal/Cefn Caer	SH70490008	2.6	Flavian
Forden Gaer	SO20809890	3.25	Flavian
Brompton	SO24709310	2.7	Flavian (argument for pre-Flavian)
Caersws I	SO04109260	3.9	Pre-Flavian or early Flavian
Caersws II	SO02909200	3.2	Flavian
Chester	SJ40506640	24.4	Flavian
Rhyn Park	SJ30503700	Minimum 6 ha.	Flavian
Wroxeter	SJ56600850	16 ha	Pre-Flavian
Leighton	SJ59800520	6.9 ha	Pre-Flavian
Pen Llwyn	SN65008060	2.7	Flavian
Trawscoed	SN67107270	2.1	Flavian
Cae Gaer	SN82408180	1.05	Flavian
Jay Lane	SO39907440	2.2	Pre-Flavian
Buckton	SO39007330	2.36	Flavian
Llanio	SN64405640	1.55	Flavian
	SN65604060	1.9	Flavian

²⁸ Size during pre-Flavian and/or Flavian period unless otherwise stated.

²⁹ Pre-Flavian up to AD 68; Flavian AD 69-96.

Fort	Grid reference	Fort size (hectares)²⁸	Era established²⁹
Pumsaint			
Llandovery I	SN77903520	3 (estimate) (Webster and Murphey 2010, 254)	Pre-Flavian or early Flavian
Llandovery II	SN77903520	2 (estimate) (Webster and Murphey 2010, 255)	Pre-Flavian or early Flavian
Caerau (Beulah)	SN92305020	1.9	Flavian
Castell Collen	SO05506280	2.04	Flavian
Colwyn Castle	SO10755396	2.79 (estimated) (Frere 2010, 241)	Flavian
Hindwell Farm	SO25806060	2.29 (estimated) (Silvester in Burnham and Davies 2010, 249)	Pre-Flavian
Clifford	SO24804670	6.5	Pre-Flavian or early Flavian
Clyro	SO22804340	9.5	Pre-Flavian
Brecon Gaer	SO00202970	3.14	Flavian
Llandeilo I	SN62002250	3.84	Flavian
Llandeilo II	SN62002250	1.54	Flavian
Carmarthen		2 (estimate) (James 2010, 234)	Flavian
Loughor	SS56349798	2.15	Flavian
Neath 2	SS74709760	2.3	Flavian
Coelbren	SN85901070	2.25	Flavian
Penydarren	SO05000680	2.3	Flavian
Gelligaer I	ST13309720	2.4	Flavian
Caerphilly	ST15388729	1.7 (estimate)	Flavian
Caergwanaf	ST04408070	1.56	Flavian
Cardiff II	ST18107660	1.7 (estimate) (Webster and Marvell 2010, 230-233)	Flavian
Caerleon	ST33909060	20.5	Flavian
Usk	SO37900070	19.5	Pre-Flavian
Monmouth	SO50001200	Uncertain	Pre-Flavian or Flavian
Pen Llystyn	SH481449	1.8	Flavian

Fort	Grid reference	Fort size (hectares)²⁸	Era established²⁹
Kingsholm	SO83201950	Uncertain	Pre-Flavian
Gloucester	SO83301840	17.8	Pre-Flavian or Flavian

Appendix II: Fieldwork data and GIS data use explanations

This appendix displays the instances where the data collected via fieldwork and GIS differed from each other. In each instance it presents the data that was chosen to be used in the analysis and provides an explanation for why it was chosen.

Table II.1 Visibility within forts (Results Section 4.5.6)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Caer Gai	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views during fieldwork.
Brompton	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views during fieldwork.
Caersws II	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views during fieldwork.
Llanio	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views during fieldwork.
Llandeilo I	Partially visible	Visible	Partially visible	Topography was obscuring some of the view. Default to on-site experience.
Llandeilo II	Partially visible	Visible	Partially visible	Topography was obscuring some of the view. Default to on-site experience.
Neath II	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views during fieldwork.
Caerphilly	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views during fieldwork.

Caerleon	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views during fieldwork.
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Table II.2 Visibility beyond the forts - ascending land: near distance (Results Section 4.5.8)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Caerhun	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views of the ascending area during fieldwork.
Segontium	Obscured	Partially visible	Partially visible	It was non-contemporary features that obscured the views of the ascending area during fieldwork.
Caer Gai	Obscured	Partially visible	Partially visible	The only accessible gate was the one furthest from the ascending land beyond the fort. Also, non-contemporary features obscured the views.
Brompton	Visible	Partially visible	Visible	Default to on-site experience.
Neath II	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views of the ascending area during fieldwork.
Clyro	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views of the ascending area during fieldwork.

Forde Gaer	Partially visible	Visible	Visible	It was non-contemporary features that obscured the views of the ascending area during fieldwork.
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There were no differences between the field visit and GIS results of views of the descending land beyond the forts.

Table II.3 Visibility of middle distance topography types (Results Section 4.5.10)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Segontium	Visible/partially visible: Undulating lowland. Menai Straits.	Visible/partially visible: 2 main valleys and rivers. River Seiont. River Cadnant. Seiont Valley floor and valley sides. Foryd Bay. Menai Straits. Undulating lowland. Hills.	Visible/partially visible: 2 main valleys and rivers. River Seiont. River Cadnant. Seiont Valley floor and valley sides. Foryd Bay. Menai Straits. Undulating lowland. Hills.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Llanfor	Visible/partially visible: Valley floor (main), valley sides (main), hilltops	Visible/partially visible: Valley floor (main). Valley sides (main). Hilltops of undulating upland. Lake. Afon Tryweryn. River Dee.	Visible/partially visible: Valley floor (main). Valley sides (main). Hilltops of undulating upland. Lake. Afon Tryweryn. River Dee.	Non-contemporary features obscured the views during fieldwork.

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Caer Gai	Visible/partially visible: Valley floor. Valley sides. Lake. Hilltops. Mountaintops.	Visible/partially visible: Valley floor(main). Valley sides (main). Lake. Hilltops of undulating upland. River (closest) Mountaintops. Valleys (mouths of)	Visible/partially visible: Valley floor(main). Valley sides (main). Lake. Hilltops of undulating upland. River (closest) Mountaintops. Valleys (mouths of)	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Forden Gaer	Visible/partially visible: Valley floor (main). Valley sides (main).	Visible/partially visible: Valley floor (main). Valley sides (main). Hilltops. Rivers.	Visible/partially visible: Valley floor (main). Valley sides (main). Hilltops. Rivers.	Non-contemporary features obscured the views during fieldwork.
Brompton	Visible/partially visible: Valley floor (main). Valley sides (main).	Visible/partially visible: Valley floor (main). Valley sides (main). River (closest). Undulating upland of hilltops.	Visible/partially visible: Valley floor (main). Valley sides (main). River (closest). Undulating upland of hilltops.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Caersws II	Visible/partially visible: Valley floor (main). Valley sides (main).	Visible/partially visible: Valley floor (main). River (main). Valley sides	Visible/partially visible: Valley floor (main). River (main). Valley sides	Non-contemporary features obscured the views during

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		(main). Hilltops of undulating upland. Mountaintops. Rivers. Valley floors. Valley sides. Hill	(main). Hilltops of undulating upland. Mountaintops. Rivers. Valley floors. Valley sides. Hill	fieldwork. Not all gates were accessible during fieldwork.
Chester	Visible/partially visible: Undulating lowland	Visible/partially visible: Undulating lowland. River Dee (including likely former course).	Visible/partially visible: Undulating lowland. River Dee (including likely former course).	Non-contemporary features obscured the views during fieldwork.
Llanio	Visible/partially visible: Undulating lowland. Hillsides. Hilltops.	Visible/partially visible: Valley floor (main). Valley sides (main). River (closest). Rivers (minor). Hilltops of undulating upland. Hill.	Visible/partially visible: Valley floor (main). Valley sides (main). River (closest). Rivers (minor). Hilltops of undulating upland. Hill.	Non-contemporary features obscured the views during fieldwork. Valley floor mistaken for undulating lowland on-site.
Pumsaint	Visible/partially visible: Valley floor (main). Valley/hillsides (main). Hilltops	Visible/partially visible: Valley floor (main). River (closest). Rivers (other). Valley sides (main). Hilltops of undulating upland.	Visible/partially visible: Valley floor (main). River (closest). Rivers (other). Valley sides (main). Hilltops of undulating upland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible

Fort	Fieldwork result	GIS result	Chosen result	Explanation
				during fieldwork.
Hindwell Farm	Visible/partially visible: Hillsides/valleys (main). Hilltops.	Visible/partially visible: Valley floor (main). Valley sides (main). Hilltops of undulating upland. Brook (closest).	Visible/partially visible: Valley floor (main). Valley sides (main). Hilltops of undulating upland. Brook (closest).	Non-contemporary features obscured the views during fieldwork.
Clyro	Visible/partially visible: Valley floor (main). Hill/valley sides (main). Hilltops	Visible/partially visible: Valley floor (NE) (main). River Wye (closest). Brook. Valley sides (main). High points of undulating upland. Undulating lowland.	Visible/partially visible: Valley floor (NE) (main). River Wye (closest). Brook. Valley sides (main). High points of undulating upland. Undulating lowland.	Non-contemporary features obscured the views during fieldwork.
Brecon Gaer	Visible/partially visible: Valley floor (main). Hill/valley sides (main). Hilltops	Visible/partially visible: Valley floor (Usk to SW) (closest), Valley sides (Usk to SW and E) (main), Ysgir. River Usk (closest). River Ysgir. Hilltops of undulating	Visible/partially visible: Valley floor (Usk to SW) (closest), Valley sides (Usk to SW and E) (main), Ysgir. River Usk (closest). River Ysgir. Hilltops of undulating	Non-contemporary features obscured the views during fieldwork.

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		upland. Undulating lowland.	upland. Undulating lowland.	
Llandeilo I	Visible/partially visible: Valley floor (main). Valley sides (main).	Visible/partially visible: Valley floor (main). River (Tywi) (closest). Valley sides (main). Hilltops of undulating lowland.	Visible/partially visible: Valley floor (main). River (Tywi) (closest). Valley sides (main). Hilltops of undulating lowland.	Non-contemporary features obscured the views during fieldwork.
Llandeilo II	Visible/partially visible: Valley floor. Valley sides	Visible/partially visible: Valley floor (Tywi) (Main). Tywi river (closest). Valley sides (main). Hilltops of undulating lowland.	Visible/partially visible: Valley floor (Tywi) (Main). Tywi river (closest). Valley sides (main). Hilltops of undulating lowland.	Non-contemporary features obscured the views during fieldwork.
Carmarthen	Visible/partially visible: Valley floor (main), valley sides (main), hilltops	Visible/partially visible: Tywi valley (main), valley connecting Cywyn valley (Cywyn in far distance) and Tywi valley. River Tywi (closest). Valley sides (main). Hilltops	Visible/partially visible: Tywi valley (main), valley connecting Cywyn valley (Cywyn in far distance) and Tywi valley. River Tywi (closest). Valley sides (main). Hilltops	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		of undulating lowland	of undulating lowland	
Loughor	Visible/partially visible: River. Hillside. Hilltops. Flat area.	Visible/partially visible: Loughor valley floor, valley sides, river/estuary. Lliw valley floor, valley sides, river. Undulating lowland.	Visible/partially visible: Loughor valley floor, valley sides, river/estuary. Lliw valley floor, valley sides, river. Undulating lowland.	Non-contemporary features obscured the views during fieldwork.
Neath II	Visible/partially visible: Valley floor (Neath valley), hillsides. Hilltops.	Visible/partially visible: Sections of valley floor (Neath valley (main) and Clydach valley), sections of valley sides. Undulating lowland.	Visible/partially visible: Sections of valley floor (Neath valley (main) and Clydach valley), sections of valley sides. Undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Caerleon	Visible/partially visible: Valley floor. Flat area beyond river. Valley sides.	Visible/partially visible: Usk (main) valley floor. River Usk (closest). Lwyd valley floor. River Lwyd. Valley sides.	Visible/partially visible: Usk (main) valley floor. River Usk (closest). Lwyd valley floor. River Lwyd. Valley sides.	Non-contemporary features obscured the views during fieldwork. Differentiation between the Usk and Lwyd

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		Undulating lowland.	Undulating lowland.	valleys was not made on-site, although modern features obscuring would have made this difficult.

Visibility of far distance topography types (Results Section 4.5.12)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Caerhun	Undulating upland and lowland.	Main valley floor, valley sides, undulating upland, undulating lowland.	Main valley floor, valley sides, undulating upland, undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Tomen y Mur	Undulating upland.	Hilltops/mountaintops of undulating upland. Main valley floor. Main valley sides. Sea.	Hilltops/mountaintops of undulating upland. Main valley floor. Main valley sides. Sea.	Non-contemporary features obscured the views during fieldwork.
Llanfor	Undulating upland.	Valley floor (main). Lake. Valley sides. Undulating upland.	Valley floor (main). Lake. Valley sides. Undulating upland.	Non-contemporary features

Fort	Fieldwork result	GIS result	Chosen result	Explanation
				obscured the views during fieldwork.
Forde Gaer	Undulating upland and undulating lowland.	Valley sides (main). Valley sides. Undulating upland. Undulating lowland.	Valley sides (main). Valley sides. Undulating upland. Undulating lowland.	Non-contemporary features obscured the views during fieldwork.
Brompton	Undulating upland and undulating lowland.	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland.	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Caersws II	Undulating upland.	Valley sides (main). Undulating upland. Undulating lowland.	Valley sides (main). Undulating upland. Undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Chester	Undulating lowland.	River (closest - assumed course). Undulating lowland. Valley. Valley sides.	River (closest - assumed course). Undulating lowland. Valley. Valley sides.	Non-contemporary features obscured the

Fort	Fieldwork result	GIS result	Chosen result	Explanation
				views during fieldwork.
Wroxeter	Undulating lowland and undulating upland.	Valley (main). Valley sides (main). Undulating lowland. Undulating upland.	Valley (main). Valley sides (main). Undulating lowland. Undulating upland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Pumsaint	Obscured	Undulating lowland.	Undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Hindwell Farm	Obscured	Valley side (main). Undulating upland.	Valley side (main). Undulating upland.	Non-contemporary features obscured the views during fieldwork.
Clyro	Undulating lowland and undulating upland.	Valley side (main). Undulating lowland. Undulating upland.	Valley side (main). Undulating lowland. Undulating upland.	Non-contemporary features obscured the views during fieldwork. Not

Fort	Fieldwork result	GIS result	Chosen result	Explanation
				all gates were accessible during fieldwork.
Brecon Gaer	Undulating lowland and undulating upland.	Valley sides (main). Undulating upland.	Valley sides (main). Undulating upland.	Non-contemporary features obscured the views during fieldwork.
Llandeilo I	Undulating lowland.	Valley floor (main). Valley sides (main). Undulating lowland.	Valley floor (main). Valley sides (main). Undulating lowland.	Non-contemporary features obscured the views during fieldwork.
Llandeilo II	Undulating lowland.	Valley floor (main). Valley sides (main). Undulating lowland.	Valley floor (main). Valley sides (main). Undulating lowland.	Non-contemporary features obscured the views during fieldwork.
Carmarthen	Undulating lowland.	Valley (main). Valley side (main). Undulating lowland.	Valley (main). Valley side (main). Undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Loughor	Undulating lowland	Valley sides. Undulating lowland. Sea	Valley sides. Undulating lowland. Sea	Non-contemporary features obscured the views during fieldwork.
Neath II	Undulating lowland.	Valley side (main). Undulating lowland.	Valley side (main). Undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Caerphilly	Undulating lowland	Valley sides (main). Undulating lowland.	Valley sides (main). Undulating lowland.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Caerleon	Undulating upland. Undulating lowland.	Valley sides (main). Undulating upland. Undulating lowland.	Valley sides (main). Undulating upland. Undulating lowland.	Non-contemporary features obscured the views during fieldwork.

Table II.5 Relative altitude to near distance topography (Results Section 4.5.13)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Caerhun	Higher than some, equal to some other topography. (Rising land appeared flat on-site).	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Not all areas of the fort were accessible. Non-contemporary features obscured the views during fieldwork.
Llanfor	Equal to the other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.
Forden Gaer	Higher than some, equal to some other topography. (Rising land appeared flat on-site).	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.
Caersws II	Equal to the other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.
Llanio	Higher than some, equal to some, lower	Lower than some, equal	Lower than some, equal	Non-contemporary features

	than some other topography	to some other topography	to some other topography	obscured the views during fieldwork.
Hindwell Farm	Lower than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.
Caerleon	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.

Table II.6 Relative altitude to middle distance topography (Results Section 4.5.13)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Llanfor	Lower than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.
Caersws II	Lower than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible

				during fieldwork.
Hindwell Farm	Lower than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.
Caerleon	Lower than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Non-contemporary features obscured the views during fieldwork.

Table II.7 Visibility of watercourse meeting points (Results Section 4.6.4)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Llanfor	Obscured	Partially visible (OS 1st ed and modern OS)	Partially visible	Non-contemporary features obscured the views during fieldwork. Visibility of the courses of rivers as shown on OS 1 st edition map could not be assessed reliably during fieldwork.
Brompton	Obscured	Partially visible	Partially visible	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Caersws II	All obscured	River Severn and River Carno - 1st ed map - partially visible, OS Mastermap - obscured. Afon Cerist and River Severn - obscured. Afon Cerist and Afon Trannon - obscured.	River Severn and River Carno - partially visible. Afon Cerist and River Severn - obscured. Afon Cerist and Afon Trannon - obscured.	Non-contemporary features obscured the views during fieldwork. Visibility of the courses of rivers as shown on OS 1 st edition map could not be assessed reliably during fieldwork. Unable to establish whether the Afon Cerist has been canalised. Not all gates were accessible during fieldwork.
Wroxeter	All obscured	River Tern meets the River Severn - obscured. River Roden meets the River Tern - visible.	River Tern meets the River Severn - obscured. River Roden meets the River Tern - visible.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Pumsaint	Obscured	Visible	Visible	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Brecon Gaer	Obscured	Visible	Visible	Non-contemporary features obscured the views during fieldwork.
Carmarthen	Obscured	Partially visible	Partially visible	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Loughor	Obscured	Visible	Visible	Non-contemporary features obscured the views during fieldwork.
Caerleon	Obscured	Partially visible	Partially visible	Non-contemporary features obscured the views during fieldwork.

Visibility of watercourses in the near distances (Results Section 4.6.6)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Hindwell Farm	Summertil Brook - obscured	Summertil Brook - partially visible	Summertil Brook - partially visible	Non-contemporary features obscured the views during fieldwork.
Llanfor	River Dee - obscured. River Tryweryn - obscured.	River Dee (1st edition map course) - visible. River Tryweryn (1st edition map	River Dee - visible. River Tryweryn - visible.	Non-contemporary features obscured the views during fieldwork. Visibility of the courses of rivers as shown on OS 1 st

		course) - visible.		edition map could not be assessed reliably during fieldwork.
Caer Gai	River Dee - obscured	River Dee - partially visible	River Dee - partially visible	Non-contemporary features obscured the views during fieldwork. Only one gate was accessible.
Neath 2	River Neath banks - obscured	River Neath banks - visible	River Neath banks - visible	Non-contemporary features obscured the views during fieldwork.

Table II.9 Visibility of watercourses in the middle distances (Results Section 4.6.8)

Watercourses

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Segontium	Obscured	River Seiont - partially visible. Afon Gwyrfai - partially visible. Afon Cadnant - partially visible.	River Seiont - partially visible. Afon Gwyrfai - partially visible. Afon Cadnant - partially visible.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Llanfor	Obscured	OS 1st edition: Dee - partially visible. Tryweryn -	OS 1st edition: Dee - partially visible. Tryweryn - partially visible.	Non-contemporary features obscured the views during

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		partially visible. Modern OS: Dee - obscured. Tryweryn - partially visible.		fieldwork. Visibility of the courses of rivers as shown on OS 1 st edition map could not be assessed reliably during fieldwork.
Caer Gai	Obscured	Partially visible	Partially visible	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Forden Gaer	Obscured	River Severn - partially visible. River Camlad - partially visible but may have been visible prior to the railway line.	River Severn - partially visible. River Camlad - partially visible	Non-contemporary features obscured the views during fieldwork. Cannot be certain of visibility prior to railway line.
Brompton	Obscured	River Caebitra - partially visible. River Camlad -	River Caebitra - partially visible. River Camlad - partially visible.	Non-contemporary features obscured the views during fieldwork. Not all

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		partially visible.		gates were accessible during fieldwork.
Caersws ll	Obscured	River Severn - OS Mastermap - obscured, OS 1st ed map - partially visible. Afon Carno OS Mastermap - partially visible, OS 1st ed map - partially visible. Afon Cerist (very straight on 1st ed and modern maps - canalised?) - partially visible. River Trannon - obscured.	River Severn - OS 1st ed map - partially visible. Afon Carno -partially visible. Afon Cerist partially visible. River Trannon - obscured.	Non-contemporary features obscured the views during fieldwork. Visibility of the courses of rivers as shown on OS 1 st edition map could not be assessed reliably during fieldwork. Unable to establish whether the Afon Cerist has been canalised. Not all gates were accessible during fieldwork.
Chester	Obscured	River Dee - partially visible (along assumed course).	River Dee - partially visible	Non-contemporary features obscured the views during fieldwork.
Wroxeter	Obscured	River Severn - partially	River Severn - partially visible.	Non-contemporary

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		visible. River Tern - obscured.	River Tern - obscured.	features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Llanio	Obscured	River Teifi - partially visible. Afon Aeron - obscured.	River Teifi - partially visible. Afon Aeron - obscured.	Non-contemporary features obscured the views during fieldwork.
Pumsaint	Obscured	Cothi - partially visible. Twrch - partially visible. (OS 1st ed and OS modern Mastermap courses)	Cothi - partially visible. Twrch - partially visible.	Non-contemporary features obscured the views during fieldwork. Visibility of the courses of rivers as shown on OS 1 st edition map could not be assessed reliably during fieldwork. Not all gates were accessible during fieldwork.
Hindwell Farm	Obscured	Summergeil Brook - partially visible.	Summergeil Brook - partially visible.	Non-contemporary features obscured the

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		Hindwell Brook - obscured.	Hindwell Brook - obscured.	views during fieldwork.
Clyro	Obscured	River Wye - partially visible	River Wye - partially visible	Non-contemporary features obscured the views during fieldwork.
Brecon Gaer	Obscured	Afon Ysgir - partially visible. River Usk - partially visible. Afon Tarell - obscured.	Afon Ysgir - partially visible. River Usk - partially visible. Afon Tarell - obscured.	Non-contemporary features obscured the views during fieldwork.
Llandeilo I	Obscured	Afon Tywi - partially visible	Afon Tywi - partially visible	Non-contemporary features obscured the views during fieldwork.
Llandeilo II	Obscured	Afon Tywi - partially visible	Afon Tywi - partially visible	Non-contemporary features obscured the views during fieldwork.
Carmarthen	Obscured	Tywi - partially visible. Gwili - obscured.	Tywi - partially visible. Gwili - obscured.	Non-contemporary features obscured the views during fieldwork. Not all

Fort	Fieldwork result	GIS result	Chosen result	Explanation
				gates were accessible during fieldwork.
Loughor	River Loughor - partially visible. Afon Llan - obscured	River Loughor - partially visible. Afon Llan - partially visible	River Loughor - partially visible. Afon Llan - partially visible	Non-contemporary features obscured the views during fieldwork.
Caerphilly	Nant yr Aber partially visible. Rhymney River, Nant Gledyr/Porset and Afon Taf obscured.	Rhymney river - obscured. (Nant Gledyr/Porset Brook - partially visible. Nant yr Aber - partially visible). Afon Taf - obscured.	Rhymney river - obscured. (Nant Gledyr/Porset Brook - partially visible. Nant yr Aber - partially visible). Afon Taf - obscured.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Caerleon	Obscured	Usk - partially visible. Lwyd - partially visible.	Usk - partially visible. Lwyd - partially visible.	Non-contemporary features obscured the views during fieldwork.

Watercourse banks

The variations in the results for the middle distance watercourse banks matched those of the closest watercourses with the exception of those listed below:

Table II.10 Visibility of watercourse banks in the middle distances

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Carmarthen	Obscured	Tywi - partially visible. Gwili - partially visible.	Tywi - partially visible. Gwili - partially visible.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Neath	Obscured	River Clydach - obscured. River Neath - partially visible.	River Clydach - obscured. River Neath - partially visible.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Caerphilly	Nant yr Aber partially visible. Rhymney River, Nant Gledyr/Porset	Rhymney river - partially visible. Nant Gledyr/Porset Brook - partially visible. Nant yr	Rhymney river - partially visible. Nant Gledyr/Porset Brook - partially visible. Nant yr	Non-contemporary features obscured the views during fieldwork. Not all gates were

Fort	Fieldwork result	GIS result	Chosen result	Explanation
	and Afon Taf obscured.	Aber - partially visible. Afon Taf - obscured.	Aber - partially visible. Afon Taf - obscured.	accessible during fieldwork.

Table II.11 Visibility of watercourses in the far distance (Results Section 4.6.11)

Fort	Fieldwork result	GIS result	Chosen result	Explanation
Segontium	All obscured.	River Seiont watercourse and banks partially visible.	River Seiont watercourse and banks partially visible.	Non-contemporary features obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Llanfor	All obscured	Afon Wnion - watercourse and banks partially visible. River Dee/Afon Dyfrdwy banks partially visible.	Afon Wnion - watercourse and banks partially visible. River Dee/Afon Dyfrdwy banks partially visible.	Non-contemporary features obscured the views during fieldwork.
Brompton	All obscured	River Caebitra watercourse and banks	River Caebitra watercourse and banks	Non-contemporary features

Fort	Fieldwork result	GIS result	Chosen result	Explanation
		partially visible.	partially visible.	obscured the views during fieldwork. Not all gates were accessible during fieldwork.
Chester	All obscured	River Dee watercourse and banks partially visible.	River Dee watercourse and banks partially visible.	Non-contemporary features obscured the views during fieldwork.
Llandeilo I	All obscured	Afon Tywi watercourse and banks partially visible.	Afon Tywi watercourse and banks partially visible.	Non-contemporary features obscured the views during fieldwork.
Llandeilo II	All obscured	Afon Tywi watercourse and banks partially visible.	Afon Tywi watercourse and banks partially visible.	Non-contemporary features obscured the views during fieldwork.

Appendix III Visibility from visited forts³⁰

Unobscured, partially visible and obscured

During the fort visits, data of views towards each compass point from each gate were collected. The full fieldwork data collected for each fort are provided in Appendices V to VIII. The data include whether views within each distance band were unobscured, partially visible or obscured. Sixty-six gates were visited in total. An explanation for the use of distance bands can be found in the Methodology.

Table III.1 Numbers and percentages of gates with unobscured, partially visible and obscured views of each distance band in each direction during fieldwork

	Near distance		Middle distance		Far distance	
	Number of gates	Percentage of visited gates	Number of gates	Percentage of visited gates	Number of gates	Percentage of visited gates
Views were unobscured in one direction ³¹	2	3.0	0	0	0	0
Views were unobscured in 2-4 directions	0	0	0	0	0	0
Views were partially visible in all directions	48	72.7	13	19.7	4	6.0
Views were partially visible in 1-3	16	24.2	51	77.3	43	65.2

³⁰ For definitions used throughout this chapter, please refer to the Methodology chapter and the Glossary.

³¹ North, East, South, West

	Near distance		Middle distance		Far distance	
directions and obscured in the other directions.						
Views were obscured in all directions	0	0	2	3.0	19	28.8

The data in table III.1 show that only two visited gates (3% of all visited gates) had unobscured views and these unobscured views were only in one direction in the near distance. These two gates were at Tomen y Mur and Wroxeter. No gates had unobscured views in more than one direction in the near distance or in one or more directions in the middle and far distances. The remainder of the gates therefore had views that were partially visible or obscured in each direction in each distance band.

Although there were low numbers of unobscured views, there were also relatively low numbers of views which were completely obscured, especially in the near and middle distances. No gates had obscured views of the near distance in all directions and only 2 gates (3%), at Chester and Carmarthen, had obscured views of the middle distance in all directions. The percentage rose to 28% (19 gates) in the far distance band. Carmarthen, Caersws II, Chester and Pumsaint, for example, had gates with views of the far distance obscured. All four gates at Hindwell Farm had obscured views of the far distance. This rise is perhaps inevitable since the further the area of observation from the observer, the greater the number of features in between and it becomes more likely that one or more of these features will block the view.

At most of the gates, therefore, views were visible or partially visible in at least one direction in each distance band, with a decrease in visibility as the distance viewed increased.

Features which obscure

The features causing the obscured or partially obscured views were noted. These features were then categorised as either non-contemporary features or topographical features.

Non-contemporary features are features that were obscuring the views but would not have been present at the time of the Roman occupation of the forts. This includes buildings, structures and earthworks, such as houses, bridges, roads and mottes that were constructed after the timeframe being studied here. It also includes vegetation, such as trees, crops and hedges, and weather features such as fog and cloud. The impact of non-contemporary features on fieldwork and the use of GIS to help overcome any visibility problems alongside fieldwork is discussed in the Methodology (Section 3.2). Topographical features were the only identified features that obscured the views during the fort visits that would have been present at the time of the Roman occupation of the forts.

Table III.2 Numbers and percentages of gates where views of each distance band were obscured or partially obscured during fieldwork by non-contemporary features only, a mix of non-contemporary features and topography, and only topography.

	Near distance		Middle distance		Far distance	
	Number of gates	Percentage of visited gates	Number of gates	Percentage of visited gates	Number of gates	Percentage of visited gates
Views from gates obscured or partially obscured by only non-contemporary features	43	65.2	29	43.9	9	13.6
Views from gates obscured or partially obscured by a mix of non-	23	34.8	37	56.1	53	80.3

	Near distance		Middle distance		Far distance	
contemporary features and topography						
Views from gates obscured or partially obscured only by topography	0	0	0	0	4	6.1

The data in Table III.2 show that, during fieldwork, where views were obscured or partially obscured, non-contemporary features alone were causing large proportions of the obstructions. This is especially the case in the near distance where non-contemporary features alone account for 65.2% of the obstructions. At Llanfor, for example, it was only non-contemporary features that were recorded as obscuring the views of the near distance from the four gates. In the middle distance non-contemporary features account for 43.9% of the obstructions but only 13.6% for the far distance views. At Caersws II, hedges, trees and buildings obscured the middle (and near) distances from the accessible gates. At Chester only non-contemporary features (buildings and trees) were recorded as obscuring the views from all four gates.

In contrast, very low proportions of views from the gates were obscured or partially obscured by topography alone; none was obscured by topography alone in the near and middle distances and only 6.1% in the far distance. At Clyro, for example, topography alone obscured views of the far distance.

The remainder of the views were obscured by a combination of topography and non-contemporary features. The largest proportion of views from gates which fall into this category is the far distance (80.3%). The percentage is 56.1% for the views from middle distance gates; feature types causing obstructions of middle distance views is very nearly split half and half between non-contemporary features and a combination of topography and non-contemporary features. At Caerhun, it was a mixture of trees, buildings and topography that obscured views of each distance band.

Most of the views from the gates are partially obscured or obscured. Purely non-contemporary or a combination of non-contemporary and topographical features were causing most of the obscured views. Therefore, most of the views that were obscured or only partially visible may not have been obscured, or obscured in the same ways, during the period under study.

It was initially proposed that GIS would be used to collect data for forts or gates that could not be visited. In light of the amounts of obscured and partially visible views caused by non-contemporary features during fieldwork, however, it was decided that GIS data would be collected at all gates to supplement the fieldwork data.

Appendix IV Data collection

Table IV.1 Forts and gates accessed during fieldwork and data collection by GIS

Fort	Fort visited?	Numbers of gates accessed	Data collected by GIS?
Caerhun	Yes	2	Yes
Tomen y Mur	Yes	4	Yes
Segontium	Yes	2	Yes
Bryn y Gefeiliau / Caer Llugwy	No		Yes
Llanfor	Yes	4	Yes
Caer Gai	Yes	1	Yes
Pennal/Cefn Caer	No		Yes
Forden Gaer	Yes	2	Yes
Brompton	Yes	3	Yes
Caersws I	No		Yes
Caersws II	Yes	2	Yes
Chester	Yes	4	Yes
Rhyn Park	No (attempted)		Yes
Wroxeter	Yes	2	Yes
Leighton	No (attempted)		Yes
Pen Llwyn	No		Yes
Trawscoed	No		Yes
Cae Gaer	No		Yes
Jay Lane	No		Yes
Buckton	No		Yes
Llanio	Yes	4	Yes
Pumsaint	Yes	2	Yes
Llandovery I	No (attempted)		Yes
Llandovery II	No (attempted)		Yes
Caerau (Beulah)	No		Yes
Castell Collen	No		Yes

Fort	Fort visited?	Numbers of gates accessed	Data collected by GIS?
Colwyn Castle	No		Yes
Hindwell Farm	Yes	4	Yes
Clyro	Yes	3	Yes
Brecon Gaer	Yes	4	Yes
Llandeilo I	Yes	4	Yes
Llandeilo II	Yes	4	Yes
Carmarthen	Yes	3	Yes
Loughor	Yes	4	Yes
Neath	Yes	3	Yes
Coelbren	No		Yes
Penydarren	No		Yes
Gelligaer I	No		Yes
Gelligaer II	No		Yes
Caerphilly	Yes	1	Yes
Caergwanaf fort	No		Yes
Cardiff	No		Yes
Caerleon	Yes	4	Yes
Usk	No		Yes
Monmouth fort	No		Yes
Pen Llystyn	No		Yes
Kingsholm	No		Yes
Gloucester	No		Yes

At Rhyn Park a pheasant shoot was taking place on adjacent land and it was not safe to proceed. At Leighton, I was given permission to access the fort on a certain date but, upon arrival, access was not possible and I was not able to contact the landowners. At Llandovery I and II I was taken ill and could not continue the fieldwork that day. The fieldwork was planned under a strict schedule because it required travel and overnight accommodation and most landowners requested that I inform them of visit dates and times prior to my arrival. It was therefore difficult to return to a fort if the fieldwork was not completed on the assigned date.

Appendix V Topography data

Table V.1 Topography types in which the forts are located

Fort	Topography type	Specific location within topography type
Caerhun	Valley	Rise/plateau within valley floor
Tomen y Mur	Valley	Valley side
Segontium	Valley	Rise between two valleys
Bryn y Gefeiliau / Caer Llugwy	Valley	Valley floor
Llanfor	Valley	Valley floor
Caer Gai	Valley	Spur projecting from valley side
Pennal/Cefn Caer	Valley	Spur projecting from valley side
Forden Gaer	Valley	Rise/plateau within valley floor
Brompton	Valley	Rise/plateau within valley floor
Caersws I	Valley	Rise/plateau within valley floor
Caersws II	Valley	Valley floor
Chester	Undulating lowland	Plateau in undulating lowland
Rhyn Park	Undulating lowland	Plateau in undulating lowland
Wroxeter	Valley	Rise/plateau within valley floor
Leighton	Valley	Rise/plateau within valley floor
Pen Llwyn	Valley	Valley side
Trawscoed	Valley	Spur projecting from valley side
Cae Gaer	Valley	Spur projecting from valley side
Jay Lane	Valley	Rise/plateau within valley floor

Fort	Topography type	Specific location within topography type
Buckton	Valley	Rise/plateau within valley floor
Llanio	Valley	Rise/plateau within valley floor
Pumsaint	Valley	Valley floor
Llandovery 1	Valley	Spur projecting from valley side
Llandovery 2	Valley	Spur projecting from valley side
Caerau (Beulah)	Undulating lowland	Plateau in undulating lowland
Castell Collen	Valley	Rise/plateau within valley floor
Colwyn Castle	Valley	Spur projecting from valley side
Hindwell Farm	Valley	Valley floor
Clifford	Valley	Valley floor
Clyro	Valley	Rise/plateau within valley floor
Brecon Gaer	Valley	Rise/plateau within valley floor
Llandeilo 1	Valley	Spur projecting from valley side
Llandeilo 2	Valley	Spur projecting from valley side
Carmarthen	Valley	Rise/plateau within valley floor
Loughor	Undulating lowland	Plateau in undulating lowland
Neath 2	Valley	Rise/plateau within valley floor
Coelbren	Valley	Rise/plateau within valley floor
Penydarren	Valley	Spur projecting from valley side
Gelligaer I	Valley	Rise between two valleys
Caerphilly	Valley	Rise/plateau within valley floor
Caergwanaf fort	Valley	Spur projecting from valley side
Cardiff Fort 2	Undulating lowland	Plateau in undulating lowland
Caerleon	Valley	Spur projecting from valley side
Usk	Valley	Valley floor

Fort	Topography type	Specific location within topography type
Monmouth fort	Valley	Rise/plateau within valley floor
Pen Llystyn	Undulating lowland	Plateau in undulating lowland
Kingsholm	Valley	Valley floor
Gloucester	Valley	Rise/plateau within valley floor

Table V.2 Fort interior data

Fort	Highest point (altitude) within fort (MASL).	Lowest point (altitude) within fort (MASL).	Altitude range	Steepest gradient within fort (degrees)	Is fort on sloping, flat, domed/central spine or other land?	Is fort interior visible, partially visible or obscured?	Fort aspect
Caerhun	25	20	05/01/1900	4.5	Sloping. Slight dome.	Visible	E
Tomen y Mur	295	280	15	16	Steeply sloping. Central spine.	Partially visible	SW
Segontium desktop	50	45	5	6.8	Sloping (gentle).	Visible	W
Bryn y Gefeiliau / Caer Llugwy	135	135	0	0.5	Flat	Visible	N/A
Llanfor	165	160-165	0-5	1.7	Sloping (very gentle)	Visible	SE
Caer Gai	200	195	5	5.5	Domed.	Visible	S
Pennal/Cefn Caer	20	15	5	6.9	Domed and sloping.	Partially visible.	SW
Forden Gaer	80	80-85	0-5	3.7	Domed (slight)	Visible	N/A
Brompton	145	140-145	5	1.5	Sloping (gentle).	Visible	SE

Fort	Highest point (altitude) within fort (MASL).	Lowest point (altitude) within fort (MASL).	Altitude range	Steepest gradient within fort (degrees)	Is fort on sloping, flat, domed/central spine or other land?	Is fort interior visible, partially visible or obscured?	Fort aspect
Caersws I	135	130	5	15.5	Domed	Visible	N/A
Caersws II	125	125	0	0.8	Flat, undulating (gentle).	Visible	N/A
Chester	30	20	10	5.3	Slope. Central spine.	Partially visible	SE
Rhyn Park	95	90 (estimate - E gate location uncertain).	5	25 Possibly significantly lower depending on E extent of the fort.	Flat with slight undulations. E half sloping.	Visible (although E extent is uncertain).	E
Wroxeter	70	60	10	6.8	Sloping. Slight dome.	Visible	NW
Leighton	70	55	15	7	Sloping (steep, shallower to N of fort). Slight dome.	Partially visible	S
Pen Llwyn	70	60	10	3.7	Slope and central spine	Visible	SW
Trawscoed	70	65	5	3.1	Sloping.	Visible	W
Cae Gaer	370	360	10	12.2	Sloping. Central spine.	Visible	N
Jay Lane	155	150	5	5 .	NE section flat. Remainder sloping.	Visible	SW
Buckton	125	125-130	0-5	2.1	Slope (gentle). Central spine.	Visible	SE

Fort	Highest point (altitude) within fort (MASL).	Lowest point (altitude) within fort (MASL).	Altitude range	Steepest gradient within fort (degrees)	Is fort on sloping, flat, domed/central spine or other land?	Is fort interior visible, partially visible or obscured?	Fort aspect
Llanio	145-150	145	0-5	2.4	Slight spine along E-W axis. Very gentle slope.	Visible	SE
Pumsaint	135	125	10	4.9	Sloping	Partially visible	SW
Llandovery I	85	80-85	0-5	7.8	Central spine (NE-SW). Gentle slope	Visible	NE
Llandovery II	90	85	5	18.6	Central spine (NE-SW). Gentle slope	Visible	NE
Caerau (Beulah)	225	215-220	10-Jan	7.5	Sloping. Domed.	Visible	E
Castell Collen	195	190	5	4.2	Sloping.. Central spine along NE/SW.	Visible	E
Colwyn Castle	235 (not including motte).	230 possibly (full extent of fort uncertain so may have been a lower)	0	9.2 (although full extent of fort is uncertain so this is based on a conservative estimate of the fort's extent. It does not include the motte).	Central spine.	Uncertain	N/A
Hindwell Farm	190	185-190	0-5	5.4	Slope (gentle). Slight dome.	Visible	S
Clifford	70-75	70	0-5	0.9 (avoiding railway).	Very gentle slope towards N.	Visible	N

Fort	Highest point (altitude) within fort (MASL).	Lowest point (altitude) within fort (MASL).	Altitude range	Steepest gradient within fort (degrees)	Is fort on sloping, flat, domed/central spine or other land?	Is fort interior visible, partially visible or obscured?	Fort aspect
Clyro GIS	115	100	15	8.7	Sloping and domed.	Partially visible	NE
Brecon Gaer	175	165	10	2.8	Slope. Central spine.	Visible	W
Llandeilo I	80	75	5	7.4	Gentle slope. Undulating	Visible	NE
Llandeilo II	80	75	5	7.6	Sloping and undulating.	Visible	NE
Carmarthen	20	10	10	10	NW section flat. SE section sloping.	Partially visible	SE
Loughor	20. (Not including castle mound).	10	10	23 (not including castle mound)	Sloping. Domed.	Partially visible	SW
Neath	10-15	10	0-5	2.5	Sloping	Visible	SE
Coelbren	230	225	5	3.7	Sloping. Slight dome.	Visible	SE
Penydarren	210	200	10	16.1	Sloping. Slight hump/dome.	Visible	SW
Gelligaer I	240	230	10	5.7	Sloping. Slight dome.	Visible	NE
Caerphilly	90-95	90.	0-5	5.4	Slope. Slight dome.	Visible	E
Caergwanaf	50	45-50	0-5	8.4	Central spine	Visible	N/A
Cardiff Fort II	15 although excavations indicate that	15	0	4.2 (steepest gradient not associated with	Currently fairly flat but originally probably on	Visible	

Fort	Highest point (altitude) within fort (MASL).	Lowest point (altitude) within fort (MASL).	Altitude range	Steepest gradient within fort (degrees)	Is fort on sloping, flat, domed/central spine or other land?	Is fort interior visible, partially visible or obscured?	Fort aspect
	<p>the countours have changed slightly since the occupation of Forts I, II and III. Excavations suggest that originally the site may have descended from the NE down towards the W. It is possible that in the 2nd or 3rd century that this slope may have been terraced along the line of the north-south road which ran through the middle of the first three forts. The area was landscaped</p>			<p>watercourse banks or subsequent features, but also note that subsequent landscaping has altered gradients)</p>	<p>sloping land (descending NE-W) (Webster 1981, 210-11).</p>		<p>W</p>

Fort	Highest point (altitude) within fort (MASL).	Lowest point (altitude) within fort (MASL).	Altitude range	Steepest gradient within fort (degrees)	Is fort on sloping, flat, domed/central spine or other land?	Is fort interior visible, partially visible or obscured?	Fort aspect
	and flattened in places by Capability Brown and later by the Burges period (Webster 1981, 210-11).						
Caerleon	15-20	15	0-5	2.5	Gentle slope. Slight dome.	Visible	SE
Usk	15	15	0	9 (small undulation).	Flat with gentle undulations.	Partially visible	N/A
Monmouth	25	20 (estimated - extent of fort uncertain).	5	Uncertain	Domed (likely - depends on fort extent)		Uncertain
Pen Llystyn	130 (but affected by quarrying)	125 (but affected by quarrying)	5		Sloping (but quarry).	Partially visible (but contours affected by quarry)	SW
Kingsholm	10-15	10 (estimated - extent of fort uncertain)	5	6.4?	Sloping	Uncertain	Uncertain
Gloucester	20	15	5	5.1	Domed	Partially visible	N/A

Table V.3 Near distance topography

Fort	NEAR: Does land descend beyond one side(s) of the fort and ascend/remain flat on other side(s)?	NEAR: Steepest gradient of descending land beyond the fort (degrees)	NEAR: Steepest gradient of rising land beyond the fort (degrees)
Caerhun	Yes	15.8	6
Tomen y Mur	Yes	16.6	5.8
Segontium desktop	Yes	20.4	0
Bryn y Gefeiliau / Caer Llugwy	Yes	9.5	2
Llanfor	Yes	2.4	2.1
Caer Gai	Yes	15.6	2.0
Pennal/Cefn Caer	Yes	13.7	2.7
Forden Gaer	Yes	3.9	1.2
Brompton	Yes	14.0	6.9
Caersws I	Yes	25	7
Caersws II	Yes	1.6	11.5
Chester	Yes	30.8	0.
Rhyn Park	Yes	20	7
Wroxeter	Yes	33	26
Leighton	Yes	12.1	0.7
Pen Llwyn	Yes	8.6. (27.8 at riverbanks).	21.4
Trawscoed	Yes	13.1. (22 at riverbank).	8.8
Cae Gaer	Yes	23.5	31.6
Jay Lane	Yes	17.1 (excluding riverbanks)	2.4
Buckton	Yes	7.9 (excluding river/mill race banks).	3.3

Fort	NEAR: Does land descend beyond one side(s) of the fort and ascend/remain flat on other side(s)?	NEAR: Steepest gradient of descending land beyond the fort (degrees)	NEAR: Steepest gradient of rising land beyond the fort (degrees)
Llanio	Yes (although flat not descending).	8.6.	1.2
Pumsaint	Yes	24.5	31.5
Llandovery I	Yes	21.1	13
Llandovery II	Yes	38	4.5
Caerau (Beulah)	Yes	22.2	4.7
Castell Collen	Yes	14	2.3
Colwyn Castle	Yes	13.2 (excluding motte)	2.3
Hindwell Farm	Yes	6.4	0.5
Clifford	Yes	0.3	28
Clyro	Yes	33.8	7
Brecon Gaer	Yes	29.4	5.5
Llandeilo I	Yes (Very small area of level area before descends again. Part of fort occupies the high point).	47.8	2.4
Llandeilo II	Yes	47.8	2
Carmarthen	Yes	43.7	1.3
Loughor	Yes	15 (excluding riverbanks)	27 (excluding castle mound)
Neath	Yes	3.2	1.0
Coelbren	Yes	6.2	2.1
Penydarren	Yes	33	18.6
Gelligaer I	Yes	27.8	4.3
Caerphilly	Yes	10.7	6.8
Caergwanaf	Yes	12.6	10.8 (there is a steeper section but it is associated with a modern road)

Fort	NEAR: Does land descend beyond one side(s) of the fort and ascend/remain flat on other side(s)?	NEAR: Steepest gradient of descending land beyond the fort (degrees)	NEAR: Steepest gradient of rising land beyond the fort (degrees)
Cardiff	Yes - currently very gentle descent to W but more so in Roman era.	2.3 (but note subsequent landscaping)	0.2 (but note subsequent landscaping)
Caerleon	Yes	7	3.6 (not including steeper slope associated with modern road).
Usk	Flat on all sides until start of valley side at far edge of near distance to N and E and river to W and S.	0 (small undulations but essentially flat)	33.4 (start of valley side near boundary with middle distance. Otherwise small undulations but mostly flat) (undulations cause small obscured areas in essentially flat area).
Monmouth		Uncertain	Uncertain
Pen Llystyn	Yes	35.9 (but affected by quarrying)	1.9
Kingsholm		3.4?	5.5?
Gloucester		9.4	5

Table V.4 Visibility of near distance topography

Fort	Near: is descending land beyond the fort visible, partially visible or obscured	Near: is rising land beyond the fort visible, partially visible or obscured
Caerhun site visit	Partially visible	Partially visible
Caerhun GIS	Partially visible	Visible
Tomen y Mur site visit	Partially visible	Partially visible
Tomen y Mur GIS	Partially visible.	Partially visible
Segontium site visit	Partially visible	Obscured.
Segontium GIS	Partially visible.	Partially visible.
Bryn y Gefeiliau / Caer Llugwy GIS	Partially visible.	Partially visible.
Llanfor site visit	Partially visible	Partially visible
Llanfor GIS	Partially visible	Partially visible.
Caer Gai site visit	Partially visible	Obscured (but only assessed from the gate furthest from the rising land)
Caer Gai GIS	Partially visible	Partially visible.
Pennal/Cefn Caer GIS	Partially visible	Partially visible
	Partially visible	Partially visible
Fornden Gaer site visit	Partially visible (N and S gate views only - also partially visible)	Visible (N and S gate views only - partially visible (small area obscured).
Fornden Gaer GIS		
Brompton site visit	Partially visible	Visible
Brompton GIS	Partially visible	Partially visible
Caersws I GIS	Partially visible	Partially visible.
Caersws II site visit	Partially visible	Partially visible
Caersws II GIS	Partially visible	Partially visible.
Chester site visit	Partially visible	Partially visible
Chester GIS	Partially visible.	Partially visible
Rhyn Park GIS	Partially visible.	Partially visible.
Wroxeter site visit	Partially visible	Partially visible
Wroxeter GIS	Partially visible	Partially visible

Fort	Near: is descending land beyond the fort visible, partially visible or obscured	Near: is rising land beyond the fort visible, partially visible or obscured
Leighton GIS	Partially visible	Partially visible.
Pen Llwyn GIS	Partially visible	Visible
Trawscoed GIS	Partially visible	Partially visible
Cae Gaer GIS	Partially visible	Partially visible
Jay Lane GIS	Partially visible	Partially visible
Buckton GIS	Partially visible	Partially visible
Llanio GIS	Visible	Partially visible
Pumsaint site visit	Partially visible	Partially visible
Pumsaint GIS	Partially visible	Partially visible
Llandovery I GIS	Partially visible	Partially visible
Llandovery II GIS	Partially visible	Partially visible
Caerau (Beulah)	Partially visible	Partially visible
Castell Collen	Partially visible	Visible
Colwyn Castle	Obscured	Partially visible
Hindwell Farm site visit	Partially visible	Partially visible
Hindwell Farm GIS	Partially visible	Partially visible
Clifford	Visible	Partially visible
Clyro Site Visit	Partially visible	Partially visible
Clyro GIS	Partially visible	Visible
Brecon Gaer site visit	Partially visible	Partially visible
Brecon Gaer GIS	Partially visible	Partially visible
Llandeilo 1 site visit	Partially visible	Visible
Llandeilo 1 GIS	Partially visible	Visible (very small patch - fort nearly occupies the highest point)
Llandeilo 2 site visit	Partially visible	Visible
Llandeilo 2 GIS	Partially visible	Visible (very small patch - fort nearly occupies the highest point)
Carmarthen site visit	Likely partially visible	Likely visible
Carmarthen GIS	Partially visible	Partially visible

Fort	Near: is descending land beyond the fort visible, partially visible or obscured	Near: is rising land beyond the fort visible, partially visible or obscured
Loughor site visit	Partially visible	Partially visible
Loughor GIS	Partially visible	Partially visible
Neath site visit	Partially visible	Partially visible
Neath Fort GIS	Partially visible	Visible
Coelbren GIS	Partially visible	Partially visible
Penydarren GIS	Partially visible	Partially visible
Gelligaer I GIS	Partially visible	Partially visible
Caerphilly site visit	Partially visible	Partially visible
Caerphilly GIS	Partially visible	Partially (mostly) visible.
Caergwanaf	Partially visible	Partially visible (some but not all of the obscured areas are obscured by modern road).
Cardiff Fort	Partially visible	Partially visible
Caerleon site visit	Partially visible	Partially visible
Caerleon GIS	Partially visible	Partially visible (although area obscured is obscured by a modern road - whole area is likely to have been visible prior to road construction).
Usk GIS	Partially visible (undulations cause small obscured areas in essentially flat area).	Partially visible (valley sides and flat area between fortress and valley).
Monmouth GIS		
Kingsholm GIS		
Gloucester GIS	Partially visible	Partially visible
Pen Llystyn GIS	Partially visible	Partially visible

Table V.5 Topography types (excluding watercourses) present in the forts' middle distances and their visibility from the forts

Fort	All topographic features in middle distance	Middle: topography types visible or partially visible	Middle: topography types obscured
Caerhun	Valley floor (main). Valley sides (main). Hilltops of undulating upland. Undulating upland. Valleys.	Valley floor (main). Valley sides (main). Hilltops of undulating upland.	Valley floor. Valley sides.
Tomen y Mur	Main valley floor (modern reservoir). Undulating upland. Main valley sides. Hilltops. Mountaintops. Valleys.	Main valley floor (reservoir). Undulating upland. Main valley sides. Hilltops of undulating upland. Mountaintops.	Valley floor (to N).
Segontium	Cadnant valley. Foryd Bay. Menai Straits. Undulating lowland. Hills.	2 main valleys. Seiont Valley floor and valley sides. Foryd Bay. Menai Straits. Undulating lowland. Hills.	Cadnant valley floor and valley sides.
Bryn y Gefeiliau / Caer Llugwy	Valley floor (main). Valley sides (main). Hilltops. Undulating upland. Lakes. Conwy valley.	Valley floor (main). Valley sides (main). Hilltops. Hilltops of Undulating upland.	Lakes. Conwy Valley
Llanfor	Valley floor (main). Valley sides (main). Hilltops. Lake. Undulating upland.	Valley floor (main). Valley sides (main). Hilltops of undulating upland. Lake.	
Caer Gai	Valley floor(main). Valley sides (main). Lake. Hilltops. Mountaintops. Undulating upland. Valleys	Valley floor(main). Valley sides (main). Lake. Hilltops of undulating upland. Mountaintops. Valleys (mouths of).	Valleys.
Pennal/Cefn Caer	Valley floor (main). Valley sides (main). Hilltops. Mountaintops. Undulating upland.	Valley floor (main). Valley sides (main). Hilltops of undulating upland. Mountaintops.	

Fort	All topographic features in middle distance	Middle: topography types visible or partially visible	Middle: topography types obscured
Fornden Gaer	Valley floor (main). Valley sides (main). Hilltops. Undulating lowland. Valley floor. Valley sides.	Valley floor (main). Valley sides (main). Hilltops. Undulating lowland. (N and S gate views only - the same). Valley floors. Valley sides.	
Brompton	Valley floor (main). Valley sides (main). Hilltops. Undulating upland. Valley floor and valley sides (Camlad).	Valley floor (main). Valley sides (main). Undulating upland of hilltops. Valley. Valley sides.	Valley floor and valley sides (Camlad).
Caersws I	Severn valley floor (main). Trannon/Cerist and Carno Valley floors. Valley sides (main). Valley sides. Hilltops. Mountaintops. Undulating upland. Hill	Severn valley floor (main). Trannon/Cerist and Carno Valley floors. Valley sides (main). Valley sides. Hilltops of undulating upland. Mountaintops. Hill	
Caersws II	Valley floor (main). Valley sides (main). Hilltops. Mountaintops. Undulating upland. Valley floors, valley sides. Hill.	Valley floor (main). Valley sides (main). Hilltops of undulating upland. Mountaintops. Valley floors. Valley sides. Hill	
Chester	Undulating lowland.	Undulating lowland.	
Rhyn Park	Hillsides. Hilltops. Undulating lowland. Hills. Valley floors.	Hillsides. Hilltops. Undulating lowland	Valley floors.
Wroxeter	Valley floor (main). Valley sides (main). Undulating lowland. Hillsides. Hilltops. Hills. Tern valley.	Valley floor (main). Valley sides (main). Undulating lowland. Hillsides. Hilltops. Other valley floor. Other valley sides.	Hills.
Leighton	Valley floor. Valley sides (main). Hill. Hilltops. Undulating lowland.	Valley floor. Valley sides (main). Hill. Hilltops. Undulating lowland.	

Fort	All topographic features in middle distance	Middle: topography types visible or partially visible	Middle: topography types obscured
Pen Llwyn	Main valley floor. Main valley sides. Hilltops. Valleys. Valley sides. Undulating lowland.	Main valley floor. Main valley sides. Hilltops of undulating lowland. Other valleys. Other valley sides.	Valleys.
Trawscoed	Valley floor (main). Valley sides (main). Hilltops. Undulating upland.	Valley floor (main). Valley sides (main). Hilltops of undulating upland.	
Cae Gaer	Valley floor (main - Tarennig). Valley sides (main). Hilltops. Undulating upland.	Valley floor (main - Tarennig). Valley sides (main). Hilltops of undulating upland.	
Jay Lane	Valley floor (main). Valley sides (main). Hilltops. Undulating lowland. Hills. Valleys. Valley sides.	Valley floor (main). Valley sides (main). Hilltops. Clun valley sides. Hills. Undulating lowland. Other valleys. Other valley sides.	Clun valley floor.
Buckton	Valley floor (main). RValley sides (main). Hills (including Knoll). Hilltops. Undulating upland. Clun valley floor and valley sides. Undulating lowland.	Valley floor (main). Valley sides (main). Clun valley floor and valley sides. Hills (including Knoll). Hillsides. Hilltops of undulating upland. Undulating lowland.	
Llanio	Valley floor (main). Valley sides (main). Hilltops. Undulating upland. Valley floor (other). Hill	Valley floor (main). Valley sides (main). Hilltops of undulating upland. Hill.	Valley floor (other).
Pumsaint	Valley floors Cothi and Twrch (main). Valley sides Cothi and Twrch (main). Hilltops. Undulating upland.	Valley floor (main). Valley sides (main). Hilltops of undulating upland. Valleys (other). Valley sides (other).	
Llandovery I	2 main valleys: Bran and Tywi. Bran valley floor (main). Tywi valley floor (NW) (main).	2 main valleys: Bran and Tywi. Bran valley floor (main). Tywi valley floor	Tywi valley floor (SW).

Fort	All topographic features in middle distance	Middle: topography types visible or partially visible	Middle: topography types obscured
	Valley sides - partially visible. Undulating upland. Hilltops.	(NW) (main) . Valley sides - partially visible. Hilltops of undulating upland.	
Llandovery II	Bran valley floor (main). Tywi valley floor (NW and SW) (main). Valley sides (main)- partially visible. Hilltops. Undulating upland.	Bran valley floor (main). Tywi valley floor (NW and SW) (main . Valley sides (main)- partially visible. Hilltops of undulating upland.	
Caerau (Beulah)	Undulating lowland. Undulating upland. Hilltops.	Undulating lowland. Undulating upland. Hilltops of undulating upland.	
Castell Collen	Valley floor (main). Valley sides (main). Hilltops. Undulating upland.	Valley floor (main). Valley sides (main). Hilltops of undulating upland.	
Colwyn Castle	Edw Valley floor (main). Colwyn Brook valley floor. Valley sides (main). Hilltops. Undulating upland.	Edw Valley floor (main). Colwyn Brook valley floor and sides. Valley sides (main). Hilltops of undulating upland.	
Hindwell Farm	Valley floor (main). Valley sides (main). Hill tops. Undulating upland. Valley. Valley sides.	Valley floor (main). Valley sides (main). Hilltops of undulating upland.	Narrowing valley floor to E. Valley to S.
Clifford	Valley floor (main). Valley sides (main). Hilltops. Undulating lowland. Undulating upland.	Valley floor (main). Valley sides (main). Hilltops of undulating upland.	Undulating lowland.
Clyro	Valley floor (NE) (main) Valley sides (main). High points. Valley floor (SW) (main). Undulating lowland. Undulating upland.	Valley floor (NE) (main). Valley sides (main). High points of undulating upland. Undulating lowland.	Valley floor (SW) (main).

Fort	All topographic features in middle distance	Middle: topography types visible or partially visible	Middle: topography types obscured
Brecon Gaer	Valley floor (Usk) (main), Valley sides (Usk) (main), Ysgir. Hilltops (high points). Undulating upland, undulating lowland. Valley. Valley sides.	Valley floor (Usk to SW) (main), Valley sides (Usk to SW and E) (main), Ysgir. Hilltops of undulating upland. Undulating lowland. Valley. Valley sides.	Valley floor (Main - Usk to E). Ysgir valley floor.
Llandeilo I	Valley floor (main). Valley sides (main). Hilltops. Undulating lowland.	Valley floor (main). Valley sides (main). Hilltops of undulating lowland.	
Llandeilo II	Valley floor (Tywi) (Main). Valley sides (main). Hilltops. Undulating lowland.	Valley floor (Tywi) (Main). Valley sides (main). Hilltops of undulating lowland.	
Carmarthen	Tywi valley (valley), valley connecting Cywyn valley and Tywi valley. Valley sides (main). Hilltops. Gwili valley. Undulating lowland.	Tywi valley (valley), valley connecting Cywyn valley (Cywyn in far distance) and Tywi valley. Valley sides (main). Hilltops of undulating lowland. Valleys. Valley sides.	Gwili valley.
Loughor	Loughor valley floor, valley sides. Lliw valley floor, valley sides. Hilltops. Undulating lowland.	Loughor valley floor, valley sides. Lliw valley floor, valley sides. Undulating lowland.	
Neath	Sections of valley floor (Neath valley (main) and Clydach valley), sections of valley sides. Undulating lowland.	Sections of valley floor (Neath valley (main) and Clydach valley), sections of valley sides. Undulating lowland.	
Coelbren	Valley (Pyrddin) (main) floor. Valley sides (main). Hilltops. Tawe valley. Undulating upland.	Valley (Pyrddin) (main) floor. Valley sides (main). Hilltops of undulating upland.	Tawe valley.
Penydarren	Valley floor (Taf) (main), valley sides (main), hilltops.	Valley floor (Taf) (main), valley sides (main), hilltops of undulating upland.	Taf Fechan valley

Fort	All topographic features in middle distance	Middle: topography types visible or partially visible	Middle: topography types obscured
	Undulating upland. Taf Fechan valley (narrow).		
Gelligaer I	Rhymney valley (W) (main). Rhymney valley sides (E and W) (main). Hilltops. Sections of the high ground/valley side on which the fort is situated. Bargod Taf valley (main). Taf valley. Undulating lowland. Undulating upland. Connecting area of lowland between Bargod Taf and Rhymney valleys.	Two main valleys. Rhymney valley (W) (main). Rhymney valley sides (E and W) (main). Undulating lowland. Sections of the high ground/valley side on which the fort is situated. Undulating upland.	(Two main valleys present). Bargod Taf valley (main). Taf valley. Connecting area of lowland between Bargod Taf and Rhymney valleys.
Caerphilly	Nant Gledyr valley floor (main). Rhymney valley floor. Valley sides. Taf valley. Undulating lowland.	Nant Gledyr valley floor (main). Rhymney valley floor. Valley sides. Undulating lowland.	Taf valley.
Caergwanaf	Ely valley floor (main). Rise of undulations/valley sides beyond river. Small sections of other undulations. Undulating lowland. Clun valley.	Ely valley floor (main). Rise of valley sides beyond river. Small sections of undulating lowland.	Clun valley.
Cardiff	Undulating lowland. Hilltops. Sea. Ely and Rhymney valleys.	Undulating lowland. Hilltops. Rhymney valley (mouth partially visible). Elai valley (mouth partially visible)	Low-lying area to E and SE. Sea.
Caerleon	Usk (main) valley floor. Lwyd valley floor. Valley sides. Valley sides (main). Sor Brook valley floor. Undulating lowland. Low-lying area (to S).	Usk (main) valley floor. Lwyd valley floor. Valley sides. Undulating lowland.	Sor Brook valley floor and valley sides. Low-lying area (to S).

Fort	All topographic features in middle distance	Middle: topography types visible or partially visible	Middle: topography types obscured
Usk	Usk valley floor (main). Olwyn valley floor. Valley sides. Hilltops. Undulating lowland.	Usk valley floor (main). Olwyn valley floor (mostly obscured, mouth of valley visible). Valley sides. Undulating lowland. Hilltops.	
Monmouth	Wye valley floor (main). Wye valley sides (main). Monnow valley sides. Monnow valley floor. Undulating lowland.	Wye valley floor (main). Wye valley sides (main). Undulating lowland. Monnow valley sides.	Monnow valley floor.
Kingsholm	Valley floor (main). Hillsides. Undulating lowland.	Valley floor (main). Hillsides. Undulating lowland.	
Gloucester	Valley floor (main). Hills. Undulating lowland.	Valley floor (main). Hills. Undulating lowland.	
Pen Llystyn	Undulating lowland. Hillsides and hilltops.	Undulating lowland. Hill. Hillsides and hilltops.	

Table V.6 Topography types (excluding watercourses) present on the forts' far distances and their visibility from the forts

Fort	Far: topography types present	Far: topography types visible or partially visible	Far: topography types obscured
Caerhun	Valley floor (main). Valley sides (main). Valley floors. Valley sides. Undulating upland. Undulating lowland. Sea/Menai Straits.	Main valley floor, valley sides. Hilltops.	Valley floors and sides beyond main valley. Sea. Hilltops.
Tomen y Mur	Valley (main). Valley sides (main). Valleys. Valley sides. Lake. Undulating lowland. Undulating upland. Sea.	Hill/mountaintops. Main valley floor. Main valley sides. Sea (small section)	Valley floors beyond main valley. Hilltops. Lake.
Segontium	Valleys (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Menai Straits. Foryd Bay. Sea.	Sea, including Menai Straits. Coast. Hillsides. Undulating upland. Undulating lowland (Hilltops. Mountaintops.) Anglesey.	Valleys (main). Valley sides (main). Valleys. Lakes. Undulations.
Bryn y Gefeiliau / Caer Llugwy	Valley (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea	Undulating upland. (Hilltop)	Valley (main). Valley sides (main). Valleys. Valley sides. Undulating lowland. Sea Valleys. Lakes.
Llanfor	Valley (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Lake.	Valley floor (main). Lake. Valley sides. Undulating upland. (Hilltops. Mountaintops.)	Undulating upland. Valleys. Lakes.
Caer Gai	Valley (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Lake.	Undulating upland. (Hilltops. Mountaintops.)	Lake (Tegid). Valleys (including main/dominant).
Pennal/Cefn Caer	Valley floor (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea.	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland. (Hilltops. Mountaintops.)	Valleys. Valley sides. Sea.

Fort	Far: topography types present	Far: topography types visible or partially visible	Far: topography types obscured
Forden Gaer	Valley floor (main). Valley sides (main). Valley floors. Valley sides. Undulating upland. Undulating lowland.	Valley sides (main). Valley sides. Undulating upland. Undulating lowland. (Hillsides. Hilltops.) (N and S gate views only - the same)	Valley floor (main). Valley floors. (N and S gate views only - the same)
Brompton	Valley floor (main). Valley sides (main). Valley floors. Valley sides. Undulating upland. Undulating lowland.	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland. (Hilltops)	Valley floors. Valley sides.
Caersws I	Valley floor (main). Valley sides (main). Valley floors. Valley sides. Undulating upland. Undulating lowland.	Valley sides (main). (Valley floor (continuation of Trannon). Undulating upland. Undulating lowland. (Mountainsides. Mountaintops.)	Valley floor (main). Valley floors. Valley sides.
Caersws II	Valley floor (main). Valley sides (main). Valley floors. Valley sides. Undulating upland. Undulating lowland.	Valley sides (main). Undulating upland. Undulating lowland. (Hillsides. Hilltops. Mountaintops.)	Valley floor (main). Valley floors. Valley sides.
Chester	Undulating lowland. Dee valley. Valley sides.	Undulating lowland. Valley. Valley sides.	
Rhyn Park	Valley. Valley sides. Undulating lowland. Undulating upland.	Undulating lowland. Undulating upland.	Valley floor. Valley sides.
Wroxeter	Valley (main). Valley sides. Valleys. Valley sides. Undulating upland. Undulating lowland.	Valley (main). Valley sides (main). Undulating lowland. Undulating upland.	Valley floors. Valley sides.
Leighton	Valley (main). Valley sides (main). Undulating upland. Undulating lowland. Valleys. Valley sides.	Valley sides (main). Undulating lowland. Undulating upland.	Valley (main). Valleys. Valley sides.

Fort	Far: topography types present	Far: topography types visible or partially visible	Far: topography types obscured
Pen Llwyn	Valley floor (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea.	Undulating lowland.	Valley floor (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Sea.
Trawscoed	Valley (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea. Lakes.	Valley sides (main).	Valley (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea. Lakes.
Cae Gaer	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland. Valleys. Valley sides.	Undulating upland.	Valley floor (main). Valley sides (main). Undulating lowland. Valleys. Valley sides.
Jay Lane	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland. Valleys. Valley sides.	Valley floor (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland.	
Buckton	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland. Valleys. Valley sides.	Valley sides (main). Valley sides. Undulating upland.	Valley floor (main). Undulating lowland. Valleys.
Llanio	Valley floor (main). Valley sides (main). Undulating upland. Undulating lowland. Valleys. Valley sides. Sea.	Undulating upland.	Valley floor (main). Valley sides (main). Undulating lowland. Valleys. Valley sides. Sea.
Pumsaint	Valley floors (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland.	Undulating lowland.	Valley floors (main). Valley sides (main). Valleys. Valley sides. Undulating upland.
Llandovery I	Valley floors (main). Valley sides (main). Valleys. Valley sides.	Undulating upland. Undulating lowland. Valley sides	Valley sides (main). Valley floors (main). Valleys.

Fort	Far: topography types present	Far: topography types visible or partially visible	Far: topography types obscured
	Undulating upland. Undulating lowland.		
Llandovery II	Valley floors (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland.	Undulating upland. Undulating lowland. Valley sides.	Valley sides (main). Valley floors (main). Valleys.
Caerau (Beulah)	Valleys. Valley sides. Undulating upland. Undulating lowland.	Valley sides. Undulating upland.	Valleys. Undulating upland.
Castell Collen	Valley floor (main). Valley sides (main). Valleys. Valley sides. Undulating lowland. Undulating upland.	Valley floor (main). Valley sides (main). Valley sides. Undulating upland.	Valleys. Undulating lowland.
Colwyn Castle	Valleys (main). Valley sides (main). Valleys, valley sides. Undulating upland. Undulating lowland.	Undulating upland	Valleys (main). Valley sides (main). Valleys, valley sides. Undulating lowland.
Hindwell Farm	Valley (main). Valley side (main). Valleys, valley sides. Undulating upland. Undulating lowland.	Valley side (main). Undulating upland.	Valley (main). Valleys, valley sides. Undulating lowland.
Clifford	Valley (main). Valley side (main). Valleys, valley sides. Undulating upland. Undulating lowland.	Valley (main). Valley side (main). Undulating upland.	Valleys, valley sides. Undulating lowland.
Clyro	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland.	Valley side (main). Undulating lowland. Undulating upland.	Valley (main). Valleys. Valley sides.
Brecon Gaer	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Lakes.	Valley sides (main). Undulating upland.	Valley (main). Valleys. Valley sides. Undulating lowland. Lakes.

Fort	Far: topography types present	Far: topography types visible or partially visible	Far: topography types obscured
Llandeilo I	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland.	Valley floor (main). Valley sides (main). Undulating lowland.	Valleys. Valley sides.
Llandeilo II	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland.	Valley floor (main). Valley sides (main). Undulating lowland.	Valleys. Valley sides.
Carmarthen	Valley (main). Valley side (main). Valleys. Valley sides. Undulating lowland. Sea.	Valley (main). Valley side (main). Undulating lowland.	Valleys. Valley sides. Sea.
Loughor	Valleys. Valley sides. Undulating lowland. Sea	Valley sides. Undulating lowland. Sea	Valleys
Neath	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea.	Valley side (main). Undulating lowland.	Valley (main). Valleys. Valley sides. Sea.
Coelbren	Valleys. Valley sides. Undulating upland. Undulating lowland.	Undulating upland.	Valleys. Valley sides. Undulating lowland.
Penydarren	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland.	Valley side (main). Undulating upland.	Valley (main). Valleys. Valley sides.
Gelligaer I	Valleys (main). Valley sides (main). Valleys. Valley sides. Undulating upland. Undulating lowland.	Valleys sides (main). (Top of Ebbw valley and Sirhowy valley sides). Undulating upland.	Valley (main). Valleys. Valley sides. Undulating lowland.
Caerphilly	Valley (main). Valley side (main). Valley sides. Undulating upland. Undulating lowland. Sea.	Valley sides (main). Undulating lowland.	Valley (main). Valleys. Valley sides. Undulating lowland. Sea.
Caergwanaf	Valley (main). Valley side (main).. Valley sides. Undulating upland. Undulating lowland. Sea.	Undulating lowland.	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Sea.

Fort	Far: topography types present	Far: topography types visible or partially visible	Far: topography types obscured
Cardiff	Valleys. Valley sides. Undulating upland. Undulating lowland. Sea. English coast.	Valley sides. Undulating lowland. Sea. English coast.	Valleys. Undulating upland.
Caerleon	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea. English coast.	Valley sides (main). Undulating upland. Undulating lowland.	Valley (main). Valleys. Valley sides. Sea. English coast.
Usk	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea.	Valley (main). Valley side (main). Undulating upland. Undulating lowland.	Valleys. Valley sides. Sea.
Monmouth	Valley (main). Valley side (main). Valleys. Valley sides. Undulating upland. Undulating lowland. Sea. English coast beyond Severn Estuary/sea.	Undulating upland. Undulating lowland.	Valley (main). Valley side (main). Valleys. Valley sides. Sea. English coast beyond Severn Estuary/sea.
Kingsholm	Valley (main). Valley side (main). Valleys. Valley sides. Undulating lowland.	Valley (main). Valley side (main). Undulating lowland	Valleys. Valley sides.
Gloucester	Valley (main). Valley side (main). Valleys. Valley sides. Undulating lowland.	Valley (main). Valley side (main). Undulating lowland.	Valleys. Valley sides.
Pen Llystyn	Valleys. Valley sides. Undulating lowland. Undulating upland. Sea. Menai Straits.	Undulating upland. Undulating lowland. Sea (not including Menai Straits).	Valleys. Valley sides. Menai Straits.

Table V.7 Valley data

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
Caerhun	No	N/A	N/A	Yes	Yes	Yes	Yes.
Tomen y Mur	Yes	No	Obscured	Yes	No	No	N/A
Segontium desktop	No	N/A	N/A	Yes - Cadnant valley to NE	Yes	No	N/A
Bryn y Gefeiliau / Caer Llugwy	Yes (Llugwy meets Conwy valley).	No	Obscured	Yes. Also in NEAR distance.	Yes	Yes	Yes but in NEAR distance. Also in MIDDLE distance to W.
Llanfor	No	N/A	N/A	Yes	Yes	Yes	Yes
Caer Gai	Yes. Valley of the Afon Lliw (narrow and small valley) meets the Dee valley.	No	Partially visible	Yes	Yes (1+ road)	Yes	Yes
Pennal/Cefn Caer	No	N/A	N/A	Yes	Yes	Yes	Yes. (And the other direction).

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
Forden Gaer	Yes. Severn valley meets Camlad valley to the E.	Yes	Partially visible	Yes (N and S gate views only - the same)	Yes	Yes	Yes. And also towards Camlad valley.
Brompton	Yes. The Caebitra and Camlad valleys (middle distance).	Yes	Partially visible	Yes	No	No	N/A
Caersws I	Yes. Two further river valleys meet the Severn to the W of the fort; the wide valley containing the Afon Cerist and Afon Trannon to the fort's SW and the valley containing the Afon Carno	Yes (although Caersws II is closer to the heart of the meeting point)	Partially visible	Yes	Yes		Yes (and opposite direction of Severn Valley).

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	to the NW. The latter valley widens as it approaches the Severn. The fort is therefore located at the junction of three large valleys.					Yes	
Caersws II	Yes. Two further river valleys meet the Severn to the W of the fort; the wide valley containing the Afon Cerist and Afon Trannon to the fort's SW and the valley containing the Afon Carno	Yes	Partially visible	Yes	Yes	No	N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	to the NW. The latter valley widens as it approaches the Severn. The fort is therefore located at the junction of three large valleys.						
Chester	No	N/A	N/A	N/A [Full width of Dee Valley that open to undulating lowland is not visible]	N/A	No	N/A
Rhyn Park	Yes. Middle distance, the Dee Valley meets the valley of the River Ceiriog (a	No	Obscured	N/A [Full width of Dee Valley to E is not visible. A vakkey does not 'open out' into the	N/A		N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	tributary of the River Dee).			undulating lowland here.]		No	
Wroxeter	Yes. Severn valley meets Tern valley.	Yes	Partially visible	Yes (Severn Valley floor).		No	N/A
Leighton	No	N/A	N/A	Yes		Yes	Yes
Pen Llwyn	Yes. Valley of Afon Melindwr meets valley of Afon Rheidol to SE of fort in MIDDLE distance	No	Partially visible	Yes	Only suggested line.	Yes	Yes
Trawscoed	No	N/A	N/A	Yes	Yes (but across valley not through it. Suggested lines run through valley).	Yes	Yes
Cae Gaer	No	N/A	N/A	Yes	None known.	No	N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
Jay Lane	Yes. Clun valley meets Teme valley to SE of fort, just beyond NEAR distance. Numerous other rivers join Clun or Teme nearby.	Yes	Partially visible	Yes		Yes	Yes
Buckton	Yes. Clun valley meets Teme valley to E of fort, just beyond NEAR distance. Numerous other rivers join Clun or Teme nearby.	Yes	Partially visible (more visible than Jay Lane)	Yes		Yes	Yes
Llanio	No	N/A	N/A	Yes	Yes. (Good example).	Yes	Yes (both to E and SW).
Pumsaint	Yes. Cothi valley meets Twrch	Yes	Partially visible	Yes	Yes	Yes. Cothi valley narrows to NE and Twrch valley is narrow	Cothi valley to NE - no. Twrch valley - yes. (Cothi valley

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	valley in near distance.					to NNW. There are locations along the Cothi valley floor to the S with space for a fort, although not with the scarp and within the 'Y' of the rivers, or within proximity of the two valleys together and the Dolaucothi mines.	to S - yes but it remains wide).
Llandovery I	Yes. Bran valley meets Tywi valley.	Yes	Partially visible	Yes - Tywi to W, Bran to E of fort.	Yes (just to E)	Yes	Yes? Full width of both Tywi and Bran valleys visible from fort.
Llandovery II	Yes. MIDDLE distance	Yes	Partially visible (better visibility than	Yes - Tywi to W and SW, Bran to E of fort.	Yes (to SW and E)	Yes	Yes? Full width of both Tywi and Bran valleys visible from fort.

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
			Llandovery I)				
Caerau (Beulah)	No	N/A	N/A	N/A [Valleys do not 'open out' into this undulating lowland.	N/A	No	N/A
Castell Collen	No	N/A	N/A	Yes	Yes	No	N/A
Colwyn Castle	Yes. (Narrow valleys with streams meet the Edw in places).	No	Partially visible	Colwyn Brook valley - yes. Edw valley - no.		No. The Edw valley does narrow to the SE but alternative fort locations are present between the fort and the narrowing.	N/A
Hindwell Farm	Yes (although small valley). Back Brook (small) meets Hindwell Brook	No	Obscured	No	N/A		No

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	valley in MIDDLE distance.					Yes	
Clifford	No	N/A	N/A	Yes		Yes. Valley narrows briefly to the SW (a hill in the middle of the valley floor). Clifford is on the first area of the valley base to the NE of the narrowing that is not labelled as 'liable to flood' on the OS 1st edition map. The possibly later fort of Clyro is located on the narrow area of the valley to the SW of Clifford, so perhaps a fort in the vicinity of the narrowing was a priority? Clyro is at a higher altitude and	No

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
						therefore maybe less prone to flooding (Brewer/Davies note that, 'Though situated above normal flood level it [Clifford fort] is liable to inundation in exceptional circumstances' (Brewer/Davies in 2010, 237)).	
Clyro	No	N/A	N/A	Yes	Yes	Yes (fort placed at valley narrowing)	N/A
Brecon Gaer	Ysgir (narrow valley) meets Usk.	Yes	Partially visible	Yes (Usk to SW)	Yes	No	No
Llandeilo I	No	N/A	N/A	Yes	Yes	No	N/A
Llandeilo II	No	N/A	N/A	Yes	Yes	No	N/A
Carmarthen	Yes. Valley linking Tywi valley (main)	No	Both partially visible	Yes	Only suggested line.		N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	with Cywyn valley to WSW of fort. Gwili valley meets Tywi valley to E of fort.					No	
Loughor	Yes. Valleys of Loughor and of Afon Llan/Lliw run into lowland area.	Yes	Partially visible	[Full width of Loughor valley is visible]	[Yes]	No	
Neath	Yes. Valley of River Clydach meets valley of River Neath/Nedd.	No	Partially visible	No	N/A	Yes	N/A
Coelbren	No. Tawe valley nearly meets Pyrddin valley in MIDDLE distance but they			Yes	Yes?	No	N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	are separated by a low ridge. Ridge obscures Tawe valley from the fort.						
Penydarren	Yes. Valley of Taf Fechan (narrow) meets Taf Fawr in middle distance.	No	Obscured	Yes	Yes. (Runs along valley side)	No	N/A
Gelligaer I	Yes. The Bargod Taf and Rhymney valleys are connected by a stretch of fairly low ground to the S of the fort in the MIDDLE distance. The fort is situated between the two	No	Both obscured	No	N/A		N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	valleys. The two rivers do not meet. Also the Bargod Taf valley meets the Taf valley (and their rivers meet) to the SW of the fort, close to the boundary with the FAR distance.					No	
Caerphilly	Fort is in Nant Gledyr which connects the Rhymney and Taf valleys (the rivers don't meet up) and also the smaller Nant yr Aber.	Yes	Partially visible	Yes	Yes? Runs across valley. And right past the fort.	No	N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
Caergwanaf	Clun valley meets the Ely/Elai.	No	Obscured	Yes	No known roads	No	N/A
Cardiff	Yes. Low-lying estuary zone into which the Elai, Taf and Rhymney valleys emerge.	Yes	Partially visible	View from undulating lowland: Ely and Rhymney valleys - no. Taf valley - yes.	[No - road ran to E of Taf valley].	No	N/A
Caerleon	Yes. Lwyd River valley meets the Usk in near and middle distances (centre). Sor Brook valley meets the Usk in middle distance (NE).	Yes (Lwyd and Usk). No (Sor and Usk)	Partially visible - both	Usk - yes (to E and W). Lwyd - no.	Yes	Yes	Yes
Usk	Yes - Olwy valley meets the Usk	Yes	Partially visible	Yes - in Usk valley and	Yes	No	N/A

Fort	Is there a point where 2+ valleys meet within NEAR or MIDDLE distances?	Is fort in centre of meeting point(s)?	Visibility of valley meeting points.	Full width of main valley floor visible in at least one location? (not including river(s)).	Known or proposed Roman road runs through the cross section of valley that is fully visible from the fort?	Fort placed as far along valley as possible before a narrowing of the valley?	Full valley floor visible in the direction in which the fort is situated as far along the valley as possible?
	valley in the Near distance.			entrance to Olwyn valley but in NEAR distance.			
Monmouth	Yes. Wye and Monnow.	Yes	Partially visible	Yes	Yes	No	
Kingsholm	No	N/A	N/A	No	N/A	No	N/A
Gloucester	No	N/A	N/A	No	N/A	No	N/A
Pen Llystyn	Yes. Dwyfor valley runs into the lowland area. And to the N the land around the Afon Dwyfach forms a valley briefly.	Yes	Partially visible	View from undulating lowland: Yes - Dwyfach valley (low-lying area between hills)	[Yes]	No	Yes

Table V.8 Forts' relative altitude to the topography in their near, middle and far distances

Fort	Overall relative altitude compared to remainder of NEAR distance.	Overall relative altitude compared to remainder of MIDDLE distance.	Overall relative altitude compared to remainder of FAR distance.
Caerhun	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Tomen y Mur	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Segontium	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Bryn y Gefeiliau / Caer Llugwy	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Llanfor	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Caer Gai	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Pennal/Cefn Caer	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Forde Gaer	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography

Fort	Overall relative altitude compared to remainder of NEAR distance.	Overall relative altitude compared to remainder of MIDDLE distance.	Overall relative altitude compared to remainder of FAR distance.
Brompton	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Caersws I	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Caersws II	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Chester	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Rhyn Park	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Wroxeter	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Leighton	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Pen Llwyn	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Trawscoed	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography

Fort	Overall relative altitude compared to remainder of NEAR distance.	Overall relative altitude compared to remainder of MIDDLE distance.	Overall relative altitude compared to remainder of FAR distance.
Cae Gaer	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Jay Lane	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Buckton	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Llanio	Lower than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Pumsaint	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Llandovery I	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Llandovery II	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Caerau (Beulah)	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Castell Collen	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography

Fort	Overall relative altitude compared to remainder of NEAR distance.	Overall relative altitude compared to remainder of MIDDLE distance.	Overall relative altitude compared to remainder of FAR distance.
Colwyn Castle	Uncertain	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Hindwell Farm	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Clifford	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Clyro	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Brecon Gaer	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Llandeilo I	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Llandeilo II	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Carmarthen	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Loughor	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography

Fort	Overall relative altitude compared to remainder of NEAR distance.	Overall relative altitude compared to remainder of MIDDLE distance.	Overall relative altitude compared to remainder of FAR distance.
Neath	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Coelbren	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Penydarren	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Gelligaer I	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Caerphilly	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Caergwanaf	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Cardiff	Higher than some, equal to some other topography (but note changes in topography since Roman era)	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Caerleon	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Usk	Equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography

Fort	Overall relative altitude compared to remainder of NEAR distance.	Overall relative altitude compared to remainder of MIDDLE distance.	Overall relative altitude compared to remainder of FAR distance.
Monmouth	Uncertain	Higher than some, equal to some, lower than some other topography (only higher than one small area however, along river banks).	Higher than some, equal to some, lower than some other topography
Kingsholm	Uncertain	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Gloucester	Higher than some, equal to some.	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography
Pen Llystyn	Higher than some, equal to some other topography	Higher than some, equal to some, lower than some other topography	Higher than some, equal to some, lower than some other topography

Table V.9 Whether views from the gates of each fort differ significantly

Fort	Do views differ significantly between gates?
Caerhun	Yes
Tomen y Mur	Yes
Segontium	Yes
Bryn y Gefeilliau / Caer Llugwy	No
Llanfor	Yes
Caer Gai	Yes
Pennal/Cefn Caer	Yes
Forde Gaer	Yes. Note only two gates have been identified. Views from the N and S gates do differ.
Brompton	Yes
Caersws I	Yes
Caersws II	Yes
Chester	Yes
Rhyn Park	No (although E gate location is not known and, if it extended down the slope to the E (as seems likely) the views would have differed significantly).
Wroxeter	Yes
Leighton	Yes
Pen Llwyn	Yes
Trawscoed	Yes
Cae Gaer	Yes
Jay Lane	Yes
Buckton	Yes
Llanio	Yes
Pumsaint	Yes
Llandovery I	Yes
Llandovery II	Yes

Fort	Do views differ significantly between gates?
Caerau (Beulah)	Yes
Castell Collen	Yes
Colwyn Castle	N/A
Hindwell Farm	Yes
Clifford	No (although views differ as a result of railway line so difficult to assess).
Clyro GIS	Yes
Brecon Gaer	Yes
Llandeilo I	Yes
Llandeilo II	Yes
Carmarthen	Yes
Loughor	Yes
Neath	Yes
Coelbren	Yes
Penydarren	Yes
Gelligaer I	Yes
Caerphilly	Yes
Caergwanaf	Yes
Cardiff	Yes (but note subsequent landscaping).
Caerleon	Yes
Usk	Yes (views of E gate hindered slightly by E valley sides.)
Monmouth	N/A
Kingsholm	N/A
Gloucester	Yes
Pen Llystyn	Yes

Appendix VI Watercourses

Table VI.1 Watercourses present in the forts' near distances and their visibility from the forts

Fort	Near: Watercourses present	Near: Watercourses visible, partially visible or obscured?	Near: Watercourse banks visible, partially visible or obscured?
Caerhun	Yes. River Conwy (W bank).	Partially visible.	Partially visible
Tomen y Mur	Yes Nant Tyddyn-yr-yn - minor river/stream	Partially visible.	Partially visible
Segontium	No	N/A	N/A
Bryn y Gefeiliau / Caer Llugwy	Yes. Afon Llugwy.	Partially visible.	Partially (mostly) visible
Llanfor	Yes (on OS 1st edition map). River Dee/Afon Dyfrdwy and Afon Tryweryn.	River Dee (1st edition map course) - visible. Afon Tryweryn (1st edition map course) - visible.	River Dee (1st edition map course) - visible. Afon Tryweryn (1st edition map course) - visible.
Caer Gai	Yes. River Dee.Afon Dyfrdwy	Partially visible.	Partially visible
Pennal/Cefn Caer	Nant Caer stream.	Visible	Visible
Forde Gaer	Yes. River Severn	Obscured	Partially visible. (N and S gates only - partially visible).
Brompton	River Caebitra (minor river).	Obscured	Obscured
Caersws I	Yes, River Severn	River Severn - partially visible (both modern OS Mastermap and OS 1st ed map courses).	Partially visible.
Caersws II	Yes. River Severn. River Carno (minor river - course has changed since OS 1st ed map but it extended into the near distance in both 1st ed and modern maps).	River Severn - obscured. River Carno - partially visible on both 1st ed and modern maps.	River Severn - partially visible. River Carno - partially visible on both 1st ed and modern maps.
Chester	Yes. River Dee/Afon Dyfrdwy	Obscured	Obscured

Fort	Near: Watercourses present	Near: Watercourses visible, partially visible or obscured?	Near: Watercourse banks visible, partially visible or obscured?
Rhyn Park	Yes Morlas Brook is present	N/A (Morlas Brook obscured, although may have been visible from E gate).	N/A (Morlas Brook banks obscured, although may have been visible from E gate).
Wroxeter	Yes. River Severn	Obscured	Obscured
Leighton	No	N/A	N/A
Pen Llwyn	(Afon Melindwr - tributary river).	(Afon Melindwr - obscured).	(Afon Melindwr - obscured).
Trawscoed	Yes. River Ystwyth.	Partially visible.	Partially visible
Cae Gaer	Afon Tarennig (tributary of Wye). Small section in near distance).	Visible	Visible
Jay Lane	Yes, River Clun (a large tributary river).	Partially visible.	Partially visible
Buckton	Yes. River Teme.	Partially visible.	Partially visible
Llanio	Yes River Teifi	Visible	Visible
Pumsaint	Yes Cothi (tributary of the River Tywi). Also River Twrch (tributary of the Cothi).	Cothi - partially visible. Twrch - visible. (OS 1st ed and OS modern Mastermap courses)	Cothi - partially visible. Twrch - visible.
Llandovery I	Yes Afon Bran (tributary of the Tywi/Towy).	OS Modern Mastermap - partially visible. OS 1st edition map - partially visible.	OS Modern Mastermap - visible. OS 1st edition map - visible.
Llandovery II	Yes Afon Bran (tributary of the Tywi/Towy).	OS Modern Mastermap - partially visible. OS 1st edition map - partially visible.	OS Modern Mastermap - partially visible. OS 1st edition map - partially visible.
Caerau (Beulah)	River Cammarch, a tributary of the Irfon, which is a tributary of the Wye.	Partially visible.	Partially visible
Castell Collen	River Ithon.	Partially visible.	Partially visible
Colwyn Castle	Yes Colwyn Brook and stream to S present.	Colwyn Brook - obscured. Stream - obscured.	Colwyn Brook - obscured. Stream - obscured.

Fort	Near: Watercourses present	Near: Watercourses visible, partially visible or obscured?	Near: Watercourse banks visible, partially visible or obscured?
Hindwell Farm	Small watercourse (Summergeil Brook)	Partially visible.	Partially visible
Clifford	No	N/A	N/A
Clyro	Yes. River Wye	Partially visible.	Partially visible
Brecon Gaer	Yes. River Usk and Afon Ysgir	River Usk - partially visible. River Ysgir - partially visible.	River Usk - partially visible. River Ysgir - partially visible.
Llandeilo I	No	N/A	N/A
Llandeilo II	No	N/A	N/A
Carmarthen	Yes River Tywi/Towy	Obscured	Partially visible
Loughor	River Loughor	Partially visible.	Partially visible
Neath	River Neath.	Obscured	Obscured
Coelbren	Afon Pyrddin (a tributary river). River Camnant.	Afon Pyrddin - partially visible. Camnant - partially visible.	Afon Pyrddin - partially visible. Camnant - partially visible.
Penydarren	No	N/A	N/A
Gelligaer I	No	N/A	N/A
Caerphilly	Yes (Minor stream/river Nant Gledyr/Porset Brook present although course likely to have changed as a result of subsequent activities).	(Nant Gledyr - obscured).	(Nant Gledyr - obscured).
Caergwanaf	River Ely/Afon Elai	Partially visible.	Visible
Cardiff Fort	River Taf (although now canalised therefore not necessarily following its original course. River course during Roman period is uncertain).	Obscured	Visible

Fort	Near: Watercourses present	Near: Watercourses visible, partially visible or obscured?	Near: Watercourse banks visible, partially visible or obscured?
Caerleon	River Usk (closest). River Lwyd.	Usk - obscured. Lwyd - obscured.	Usk - partially visible. Lwyd - S bank visible (N bank in middle distance band).
Usk	Usk. (Nant Olwy - minor River).	Usk - obscured. Nant Olwy - obscured.	Usk - partially visible. Nant Olwy - partially visible.
Monmouth	Wye. Monnow (tributary of Wye).	Obscured	Obscured
Kingsholm	Yes. Former course of River Severn	Partially visible	
Gloucester	Yes. Former course of River Severn	Partially visible	
Pen Llystyn	Afon Dwyfach. Afon Blaen-y-cae.	Afon Dwyfach - partially visible. Afon Blaen-y-cae - obscured.	Afon Dwyfach - partially visible. Afon Blaen-y-cae - obscured.

Table VI.2 Watercourses present in the forts' middle distances and their visibility from the forts

Fort	Middle: Watercourses present	Middle: Watercourses visible, partially visible or obscured?	Middle: Watercourse banks visible, partially visible or obscured?
Caerhun	Yes. River Conwy. Afon Roe, minor river.	Conwy - Partially visible. Roe - partially visible	Conwy - Partially visible. Roe - partially visible
Tomen y Mur	Yes. Afon Prysor (tributary of the Dwyryd). Afon Dwyryd (Closest river).	Afon Brysor - partially visible (barring viewshed results along its previous course prior to reservoir). Afon Dwyryd - obscured. Nant Tyddyn-yr-yn - partially visible	Afon Brysor - partially visible (barring viewshed results along its previous course prior to reservoir). Afon Dwyryd - obscured. Nant Tyddyn-yr-yn - partially visible

Fort	Middle: Watercourses present	Middle: Watercourses visible, partially visible or obscured?	Middle: Watercourse banks visible, partially visible or obscured?
Segontium	Yes. River Seiont (closest). Afon Gwyrfa. Afon Cadnant.	River Seiont - partially visible. Afon Gwyrfa - partially visible. Afon Cadnant - partially visible.	River Seiont - partially visible. Afon Gwyrfa - partially visible. Afon Cadnant - partially visible.
Bryn y Gefeiliau / Caer Llugwy	Yes. Afon Llugwy.	Obscured.	Partially visible
Llanfor	Yes. River Dee/Afon Dyfrdwy and Afon Tryweryn.	OS 1st edition: Dee - partially visible. Tryweryn - partially visible. Modern OS: Dee - obscured. Tryweryn - partially visible.	OS 1st edition: Dee - partially visible. Tryweryn - partially visible. Modern OS: River Dee/Afon Dyfrdwy - partially visible. Afon Tryweryn - partially visible.
Caer Gai	Yes. River Dee/Afon Dyfrdwy.	Partially visible.	Partially visible
Pennal/Cefn Caer	Yes. River Dovey/Afon Dyfi (Closest river). Afon Pennal (tributary to Dovey).	River Dovey - partially visible (mostly obscured). Afon Pennal - partially visible.	River Dovey - Partially visible (large sections visible). Afon Pennal - partially visible.
Forden Gaer	Yes. River Severn. River Camlad (long but not wide river flows along Eng-Welsh border)	River Severn - partially visible (very small sections visible). River Camlad - partially visible (very small sections visible) but may have been visible prior to the railway line.	River Severn - partially visible. River Camlad - patchy visibility but would possibly have been more visible if the modern trainline was not in the way.
Brompton	River Caebitra (minor river). River Camlad (minor river).	River Caebitra - partially visible. River Camlad - partially visible.	River Caebitra - partially visible. River Camlad - partially visible.
Caersws I	Yes. River Severn. River Carno. River Trannon. River Cerist.	River Severn - partially visible (both modern OS Mastermap and OS 1st edition map courses). Afon Carno - obscured. River Trannon - partially visible. River Cerist - partially visible.	River Severn - partially visible (both modern OS Mastermap and OS 1st edition map courses). River Carno - partially visible. River Trannon - partially visible. River Cerist - partially visible.

Fort	Middle: Watercourses present	Middle: Watercourses visible, partially visible or obscured?	Middle: Watercourse banks visible, partially visible or obscured?
Caersws II	Yes. River Severn. River Carno. River Trannon. River Cerist.	River Severn - OS Mastermap - obscured, OS 1st ed map - partially visible (but note contours used for VSs would also have differed). Afon Carno OS Mastermap - partially visible, OS 1st ed map - partially visible (but note contours used for VSs would also have differed). Afon Cerist (very straight on 1st ed and modern maps - canalised?) - partially visible. River Trannon - obscured.	River Severn - OS Mastermap - partially visible, OS 1st ed map - partially visible (but note contours used for VSs would also have differed). Afon Carno OS Mastermap - partially visible, OS 1st ed map - partially visible (but note contours used for VSs would also have differed). Afon Cerist - partially visible. River Trannon - obscured.
Chester	Yes. River Dee/Afon Dyfrdwy	River Dee - partially visible (along assumed course).	River Dee - partially visible (along known and assumed course).
Rhyn Park	Yes. River Ceiriog. River Dee.	River Ceiriog - obscured. River Dee - obscured. (Morlas Brook - obscured).	River Ceiriog - obscured. River Dee - obscured. (Morlas Brook - obscured).
Wroxeter	Yes. River Severn. River Tern (tributary of Severn).	River Severn - partially visible. River Tern - obscured.	River Severn - partially visible. River Tern - obscured.
Leighton	Yes. River Severn	Partially visible.	Partially visible
Pen Llwyn	Afon Clarach. Afon Melindwr. Afon Rheidol. Afon Ceunant.	Afon Clarach - obscured. Afon Melindwr - partially visible. Afon Rheido - partially visible. Afon Ceunant - obscured.	Afon Clarach - obscured. Afon Melindwr - partially visible. Afon Rheido - partially visible. Afon Ceunant - obscured.
Trawscoed	Afon Ystwyth. Afon Wyre.	Afon Ystwyth - partially visible. Afon Wyre - obscured.	Afon Ystwyth - partially visible. Afon Wyre - obscured.

Fort	Middle: Watercourses present	Middle: Watercourses visible, partially visible or obscured?	Middle: Watercourse banks visible, partially visible or obscured?
Cae Gaer	Afon Tarennig. Afon Dilliw. River Wye	Afon Tarennig - partially visible. Afon Dilliw - obscured. Wye - obscured	Afon Tarennig - partially visible. Afon Dilliw - obscured. Wye - obscured
Jay Lane	River Clun (tributary of the River Teme). River Teme (tributary of the Severn). (Numerous minor rivers).	River Clun - partially visible (very small section visible). River Teme - partially visible.	River Clun - partially visible (very small section visible). River Teme - partially visible.
Buckton	River Clun (tributary of the River Teme). River Teme (tributary of the Severn). (Numerous minor rivers).	River Clun - partially visible. River Teme - partially visible.	River Clun - partially visible. River Teme - partially visible.
Llanio	Yes River Teifi (closest). Afon Aeron.	River Teifi - partially visible. Afon Aeron - obscured.	River Teifi - partially visible. Afon Aeron - obscured.
Pumsaint	Yes Cothi (tributary of the River Tywi). Also River Twrch (tributary of the Cothi).	Cothi - partially visible. Twrch - partially visible. (OS 1st ed and OS modern Mastermap courses)	Cothi - partially visible. Twrch - partially visible.
Llandovery I	Yes. Afon Tywi/River Towy and Afon Bran (tributary of the Tywi).	Afon Tywi - obscured (Mmap and 1st ed). Afon Bran - OS Modern Mastermap - partially visible, OS 1st edition map - partially visible.	Afon Tywi - partially visible. Afon Bran - OS Modern Mastermap - partially visible, OS 1st edition map - partially visible.
Llandovery II	Yes. Afon Tywi/River Towy and Afon Bran (tributary of the Tywi).	River Tywi - partially visible (OS 1st edition and OS Mastermap). River Bran - partially visible (OS 1st edition and OS Mastermap).	River Tywi - partially visible (OS 1st edition and OS Mastermap). River Bran - partially visible (OS 1st edition and OS Mastermap).
Caerau (Beulah)	Afon Cammarch. Afon Irfon.	Afon Cammarch - partially visible. Afon Irfon - obscured.	Afon Cammarch - partially visible. Afon Irfon - obscured.
Castell Collen	River Ithon.	Partially visible.	Partially visible

Fort	Middle: Watercourses present	Middle: Watercourses visible, partially visible or obscured?	Middle: Watercourse banks visible, partially visible or obscured?
Colwyn Castle	River Edw (tributary of Wye). (Also continuation of Colwyn Brook and stream to S)	River Edw - partially visible . (Colwyn Brook -partially visible. Stream to S - obscured).	River Edw - partially visible . (Colwyn Brook -partially visible. Stream to S - obscured).
Hindwell Farm	Numerous small watercourses, notably Summergil Brook, leading to Hindwell Brook.	Summergil Brook - partially visible. Hindwell Brook - obscured.	Summergil Brook - partially visible. Hindwell Brook - obscured.
Clifford	Yes. River Wye/Afon Gwy. River Arrow.	River Wye/Afon Gwy - obscured. River Arrow - obscured.	River Wye/Afon Gwy - partially visible. River Arrow - obscured.
Clyro	River Wye	Partially visible.	Partially visible
Brecon Gaer	Afon Ysgir. River Usk. Afon Tarell.	Afon Ysgir - partially visible. River Usk - partially visible. Afon Tarell - obscured.	Afon Ysgir - partially visible. River Usk - partially visible. Afon Tarell - obscured.
Llandeilo 1	Afon Tywi	Partially visible.	Partially visible
Llandeilo 2	Afon Tywi	Partially visible.	Partially visible
Carmarthen	River Tywi. Afon Gwili.	Tywi - partially visible. Gwili - obscured.	Tywi - partially visible. Gwili - partially visible.
Loughor	River Loughor. Afon Llan.	River Loughor - partially visible. Afon Llan - partially visible	River Loughor - partially visible. Afon Llan - partially visible
Neath	River Clydach. River Neath.	River Clydach - obscured. River Neath - obscured.	River Clydach - obscured. River Neath - partially visible.
Coelbren	Afon Pyrddin. (Nant y Bryn stream). River Neath. Afon Tawe. River Camnant (minor river).	Afon Pyrddin - partially visible. (Nant y Bryn stream - partially visible). River Neath - obscured. Afon Tawe - obscured. River Dulais - partially visible. River Camnant - partially visible.	Afon Pyrddin - partially visible. (Nant y Bryn stream - partially visible). River Neath - obscured. Afon Tawe - obscured. River Dulais - partially visible. River Camnant - partially visible.
Penydarren	Afon Taf	Partially visible.	Partially visible

Fort	Middle: Watercourses present	Middle: Watercourses visible, partially visible or obscured?	Middle: Watercourse banks visible, partially visible or obscured?
Gelligaer I	River Bargod Taf. River Rhymney. Sirhowy River. Afon Taf. (Nant Cylia - minor river but closest watercourse to the fort).	River Bargod Taf - obscured. River Rhymney - obscured. Sirhowy River - obscured. Afon Taf - obscured. (Nant Cylia - minor river but closest watercourse to the fort - partially visible).	River Bargod Taf - obscured. River Rhymney - obscured. Sirhowy River - obscured. Afon Taf - obscured. (Nant Cylia - minor river but closest watercourse to the fort - partially visible).
Caerphilly	Rhymney river. . Afon Taf.	Rhymney river - obscured. (Nant Gledyr/Porset Brook - partially visible. Nant yr Aber - partially visible). Afon Taf - obscured.	Rhymney river - partially visible. (Nant Gledyr/Porset Brook - partially visible. Nant yr Aber - partially visible). Afon Taf - obscured.
Caergwanaf	River Ely . Afon Clun.	River Ely - partially visible. Afon Clun - obscured.	River Ely - partially visible. Afon Clun - obscured.
Cardiff	River Taf (although course altered since Roman era). River Rhymney. River Elai.	River Taf (although course altered since Roman era) - partially visible. River Rhymney - obscured. River Elai - obscured.	River Taf (although course altered since Roman era) - partially visible. River Rhymney - partially visible. River Elai - obscured.
Caerleon	Usk. Lwyd	Usk - partially visible. Lwyd - partially visible.	Usk - partially visible. Lwyd - partially visible.
Usk	Usk. (Nant Olwy).	Usk - obscured. Nant Olwy - partially visible	Usk - partially visible. Nant Olwy - partially visible.
Monmouth	Wye. Monnow.	Wye - obscured. Monnow - obscured	Wye - partially visible. Monnow - partially visible
Kingsholm	River Severn (former course of River Severn (Fig. 7.15 in Burnham and Davies 2010). Full extent of former course not	River Severn (former course) - partially visible. River Leadon - obscured.	River Severn (former course) - partially visible. River Leadon - obscured.

Fort	Middle: Watercourses present	Middle: Watercourses visible, partially visible or obscured?	Middle: Watercourse banks visible, partially visible or obscured?
	certain). River Leadon (although course possibly changed).		
Gloucester	River Severn (former course of River Severn (Fig. 7.15 in Burnham and Davies 2010). Full extent of former course not certain). River Leadon (although course possibly changed).	River Severn (former course) - partially visible. River Leadon - obscured.	River Severn (former course) - partially visible. River Leadon - obscured.
Pen Llystyn	Afon Dwyfach. Afon Blaen-y-cae. Afon Dwyfor.	Afon Dwyfach - partially visible. Afon Blaen-y-cae - partially visible. Afon Dwyfor - obscured.	Afon Dwyfach - partially visible. Afon Blaen-y-cae - partially visible. Afon Dwyfor - obscured.

Table VI.3 Watercourses present in the forts' far distances and their visibility from the forts

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
Caerhun	Yes. River Conwy (closest), Afon Llugwy	Obscured.	Obscured

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
Tomen y Mur	Afon Dwyrhyd (main valley river). Afon Conwy. Afon Glaslyn. Afon Tryweryn. Afon Prysor	Afon Dwyrhyd - obscured. Afon Conwy - obscured. Afon Glaslyn - obscured. Afon Tryweryn - obscured.	Afon Dwyrhyd - obscured. Afon Conwy - obscured. Afon Glaslyn - obscured. Afon Tryweryn - obscured.
Segontium	Yes. River Seiont (one of the closest). Afon Llyfni. Afon Ogwen.	River Seiont - partially visible. Afon Llyfni - obscured. Afon Ogwen - obscured.	River Seiont - partially visible. Afon Llyfni - obscured. Afon Ogwen - obscured.
Bryn y Gefeiliau / Caer Llugwy	Yes. Afon Llugwy (closest - tributary of Afon Conwy). Afon Conwy. Afon Glaslyn. Afon Seiont.	Afon Llugwy - obscured. Afon Conwy - obscured. Afon Glaslyn - obscured. Afon Seiont - obscured.	Afon Llugwy - obscured. Afon Conwy - obscured. Afon Glaslyn - obscured. Afon Seiont - obscured.
Llanfor	Yes. River Dee/Afon Dyfrdwy (closest). River Conwy. Afon Wnion. River Vrynwy. River Clwyd. Afon Alwen.	Yes. River Clwyd - obscured. Afon Alwen - obscured. River Conwy - obscured. River Dee/Afon Dyfrdwy - obscured. Afon Tryweryn - obscured. River Vrynwy - obscured. Afon Wnion - partially visible.	Yes. River Clwyd - obscured. Afon Alwen - obscured. River Conwy - obscured. River Dee/Afon Dyfrdwy - partially visible. Afon Tryweryn - obscured. River Vrynwy - obscured. Afon Wnion - partially visible.
Caer Gai	Yes. River Dee/Afon Dyfrdwy (closest). Afon Conwy. Afon Ceirw. Afon Tryweryn. Afon Alwen. Afon Dyfi/River Dovey. Afon Wnion. Afon Mawddach. Afon Eden.	River Dee/Afon Dyfrdwy (closest) - obscured. Afon Conwy - obscured. Afon Ceirw - obscured. Afon Tryweryn - obscured. Afon Alwen - obscured. Afon Dyfi/River Dovey - obscured. Afon Wnion - obscured. Afon Mawddach - obscured. Afon Eden - obscured.	River Dee/Afon Dyfrdwy (closest). Afon Conwy - obscured. Afon Ceirw - obscured. Afon Tryweryn - obscured. Afon Alwen - obscured. Afon Dyfi/River Dovey - obscured. Afon Wnion - obscured. Afon Mawddach - obscured. Afon Eden - obscured.

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
Pennal/Cefn Caer	Afon Mawddach. Afon Wnion. River Dovey (closest after stream). Afon Dulas. River Severn. River Wye. Afon Rheidol. Afon Dysnni.	Afon Mawddach - obscured. Afon Wnion- obscured. River Dovey (closest after stream)- obscured. Afon Dulas- obscured. River Severn- obscured. River Wye- obscured. Afon Rheidol- obscured. Afon Dysnni- obscured.	Afon Mawddach - obscured. Afon Wnion- obscured. River Dovey- obscured. Afon Dulas- obscured. River Severn- obscured. River Wye- obscured. Afon Rheidol- obscured. Afon Dysnni- obscured.
Forden Gaer	River Camlad. Rivr Onny. River Clun. River Severn (closest). Afon Rhiw.	River Camlad - obscured. Rivr Onny - obscured. River Clun - obscured. River Severn - obscured (closest). Afon Rhiw - obscured.	River Camlad - obscured. Rivr Onny - obscured. River Clun - obscured. River Severn - obscured. Afon Rhiw - obscured.
Brompton	River Caebitra (closest). River Severn. River Camlad. River Clun. River Teme.	River Caebitra (closest) - partially visible. River Severn - obscured. River Clun- obscured. River Teme- obscured.	River Caebitra (closest) - partially visible. River Severn - obscured. River Clun- obscured. River Teme- obscured.
Caersws I	Afon Rhiw. River Ithon. Afon Marteg. River Severn (closest). Afon Clywedog. Afon Trannon. Afon Carno.	Afon Rhiw - obscured. River Ithon- obscured.. Afon Marteg- obscured.. River Severn (closest)- obscured.. Afon Clywedog- obscured.. Afon Trannon- obscured.. Afon Carno- obscured..	Afon Rhiw - obscured. River Ithon- obscured.. Afon Marteg- obscured.. River Severn- obscured.. Afon Clywedog- obscured.. Afon Trannon- obscured.. Afon Carno- obscured..
Caersws II	Afon Rhiw. River Ithon. River Teme. Afon Marteg. River Severn (closest). River Wye. Afon Clywedog. Afon Trannon. Afon Carno.	Afon Rhiw - obscured. River Ithon- obscured. River Teme- obscured. Afon Marteg- obscured. River Severn (closest)- obscured. River Wye-	Afon Rhiw - obscured. River Ithon- obscured. River Teme- obscured. Afon Marteg- obscured. River Severn (closest)- obscured. River Wye-

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
		obscured. Afon Clywedog- obscured. Afon Trannon- obscured. Afon Carno- obscured.	obscured. Afon Clywedog- obscured. Afon Trannon- obscured. Afon Carno- obscured.
Chester	Yes. River Weaver. River Dee (closest). River Alyn.	River Weaver - obscured. River Dee (closest) - partially visible. River Alyn - partially visible.	River Weaver - obscured. River Dee (closest)- partially visible. River Alyn - partially visible.
Rhyn Park	Morlas Brook (closest). River Alun/Afon Alyn. River Dee. River Ceiriog (also fairly close). River Perry. Afon Tanat.	Morlas Brook (closest) - obscured. River Alun/Afon Alyn - obscured. River Dee - obscured. River Ceiriog (also fairly close) - obscured. River Perry - obscured. Afon Tanat - obscured.	Morlas Brook (closest) - obscured. River Alun/Afon Alyn - obscured. River Dee - obscured. River Ceiriog (also fairly close)- obscured. River Perry - obscured. Afon Tanat - obscured.
Wroxeter	River Roden. River Tern. River Severn (closest).	River Roden - obscured. River Tern - obscured. River Severn (closest)- obscured.	River Roden - obscured. River Tern - obscured. River Severn (closest)- obscured.
Leighton	River Tern. River Roden. River Severn (closest). River Corva.	River Tern - obscured. River Roden - obscured. River Severn (closest) - obscured. River Corva - obscured.	River Tern - obscured. River Roden - obscured. River Severn (closest)- obscured. River Corva - obscured.
Pen Llwyn	Afon Melindwr (closest). Afon Dyfi. Afon Leri. Afon Clarach. Afon Rheidol. Afon Ystwyth. Afon Teifi.	Afon Melindwr (closest) - obscured. Afon Dyfi - obscured. Afon Leri- obscured. Afon Clarach- obscured. Afon Rheidol- obscured. Afon Ystwyth- obscured. Afon Teifi- obscured.	Afon Melindwr (closest) - obscured. Afon Dyfi - obscured. Afon Leri- obscured. Afon Clarach- obscured. Afon Rheidol- obscured. Afon Ystwyth- obscured. Afon Teifi- obscured.
Trawscoed	Afon Ceulan. Afon Rheidol. Afon Teifi. Afon Ystwyth (closest). Afon Aeron. Afon Wyre.	Afon Ceulan - obscured. Afon Rheidol - obscured. Afon Teifi - obscured. Afon Ystwyth (closest)	Afon Ceulan - obscured. Afon Rheidol - obscured. Afon Teifi - obscured. Afon Ystwyth (closest)

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
		- obscured. Afon Aeron - obscured. Afon Wyre - obscured.	- obscured. Afon Aeron - obscured. Afon Wyre - obscured.
Cae Gaer	Afon Cerist. River Severn. River Wye/Afon Gwy. Afon Tarennig (tributary of Wye) (closest). Afon Elan. Afon Teifi. Afon Ystwyth. Afon Rheidol. Afon Leri.	All obscured.	All obscured.
Jay Lane	River Camlad. River Clun (closest). River Onny. River Teme. River Lugg.	River Camlad - obscured. River Clun (closest) - partially visible. River Onny - obscured. River Teme - obscured. River Lugg - obscured.	River Camlad - obscured. River Clun (closest) - partially visible. River Onny - obscured. River Teme - obscured. River Lugg - obscured.
Buckton	River Camlad. River Clun. River Onny. River Teme (closest). River Lugg.	River Camlad - obscured. River Clun - obscured. River Onny - obscured. River Teme (closest) - obscured. River Lugg - obscured.	River Camlad - obscured. River Clun - obscured. River Onny - obscured. River Teme (closest) - obscured. River Lugg - obscured.
Llanio	Afon Ystwyth. Afon Teifi (closest). Afon Tywi. Afon Aeron.	Afon Ystwyth - obscured. Afon Teifi (closest)- obscured. Afon Tywi- obscured. Afon Aeron- obscured.	Afon Ystwyth - obscured. Afon Teifi (closest)- obscured. Afon Tywi- obscured. Afon Aeron- obscured.
Pumsaint	Yes. Afon Teifi. Afon Aeron. Afon Twrch (closest). Afon Cothi (closest). Afon Tywi.	Afon Teifi - obscured. Afon Aeron - obscured. Afon Twrch (closest) - obscured. Afon Cothi (closest)- obscured. Afon Tywi - obscured.	Afon Teifi - obscured. Afon Aeron - obscured. Afon Twrch (closest) - obscured. Afon Cothi (closest)- obscured. Afon Tywi - obscured.
Llandovery I	Yes. Afon Bran (closest). Afon Tywi (also fairly close). River Usk. Afon Cothi	Afon Bran (closest) - partially visible. Afon Tywi (also fairly close) - obscured. River Usk - obscured. Afon Cothi - obscured.	Afon Bran (closest) - partially visible. Afon Tywi (also fairly close) - obscured. River Usk - obscured. Afon Cothi - obscured.

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
Llandovery II	Yes. Afon Bran (closest). Afon Tywi (also fairly close). River Usk. Afon Cothi	Afon Bran (closest) - partially visible. Afon Tywi (also fairly close) - obscured. River Usk - obscured. Afon Cothi - obscured.	Afon Bran (closest) - partially visible. Afon Tywi (also fairly close) - obscured. River Usk - obscured. Afon Cothi - obscured.
Caerau (Beulah)	Afon Cammarch (closest). River Wyw/Gwy. River Irfon. Afon Tywi.	Afon Cammarch (closest) - obscured. River Wyw/Gwy - obscured. River Irfon - obscured. Afon Tywi - obscured.	Afon Cammarch (closest) - obscured. River Wyw/Gwy - obscured. River Irfon - obscured. Afon Tywi - obscured.
Castell Collen	River Ithon/leithon (closest). River Wye. River Irfon.	River Ithon/leithon (closest) - obscured. River Wye - obscured. River Irfon - obscured.	River Ithon/leithon (closest) - obscured. River Wye - obscured. River Irfon - obscured.
Colwyn Castle	Afon Ithon/leithon. River Arrow/Arwy. River Edw. River Wye/Gwy. River Irfon. [Colwyn Brook is closest watercourse but doesn't extend into far distance. Next closest is River Edw]	Afon leithon - obscured. River Arrow/Arwy - obscured. River Edw - obscured. River Wye/Gwy - obscured. River Irfon - obscured.	Afon leithon - obscured. River Arrow/Arwy - obscured. River Edw - obscured. River Wye/Gwy - obscured. River Irfon - obscured.
Hindwell Farm	River Teme. River Lugg. Back Brook (leading to Hindwell Brook). River Arrow. River Wye. River leithon. [Summergil Brook is the closest watercourse but this doesn't extend into far distance. Back Brook leading to Hindwell Brook are the next closest - Summergil Brook joined Hindwell Brook]	River Teme - obscured. River Lugg- obscured. Back Brook (leading to Hindwell Brook)- obscured. River Arrow- obscured. River Wye- obscured. River leithon- obscured.	River Teme - obscured. River Lugg- obscured. Back Brook (leading to Hindwell Brook)- obscured. River Arrow- obscured. River Wye- obscured. River leithon- obscured.
Clifford	(Summergil/Hindwell Brook). River Wye (closest). River Dore.	(Summergil/Hindwell Brook) - obscured. River Wye (closest)-	(Summergil/Hindwell Brook) - obscured. River Wye (closest) -

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
	River Monnow. Afon Honddu. River Edw.	obscured. River Dore - obscured. River Monnow - obscured. Afon Honddu - obscured. River Edw - obscured.	obscured. River Dore - obscured. River Monnow - obscured. Afon Honddu - obscured. River Edw - obscured.
Clyro	River Arrow. River Dore. River Wye (closest). Afon Llyfni.	River Arrow - obscured. River Dore - obscured. River Wye (closest)- obscured. Afon Llyfni - obscured.	River Arrow - obscured. River Dore - obscured. River Wye (closest)- obscured. Afon Llyfni - obscured.
Brecon Gaer	River Usk (closest). Afon Ysgir (closest). River Wye. Afon Tarell.	River Usk (closest) - obscured. Afon Ysgir (closest) - obscured. River Wye- obscured. Afon Tarell- obscured.	River Usk (closest) - obscured. Afon Ysgir (closest)- obscured. River Wye- obscured. Afon Tarell- obscured.
Llandeilo I	Afon Cothi. Afon Tywi (closest). River Loughor.	Afon Cothi - obscured. Afon Tywi (closest)- partially visible. River Loughor - obscured.	Afon Cothi - obscured. Afon Tywi (closest)- partially visible. River Loughor - obscured.
Llandeilo II	Afon Cothi. Afon Tywi (closest). River Loughor.	Afon Cothi - obscured. Afon Tywi (closest)- partially visible. River Loughor - obscured.	Afon Cothi - obscured. Afon Tywi (closest)- partially visible. River Loughor - obscured.
Carmarthen	Afon Cothi. Afon Tywi (closest). River Taf.	Afon Cothi - obscured. Afon Tywi (closest)- obscured. River Taf - obscured.	Afon Cothi - obscured. Afon Tywi (closest)- obscured. River Taf - obscured.
Loughor	River Loughor (closest). Afon Llan. Afon Tawe.	River Loughor (closest) - obscured. Afon Llan - obscured. Afon Tawe - obscured.	River Loughor (closest) - obscured. Afon Llan - obscured. Afon Tawe - obscured.
Neath	Adon Nedd/Neath (closest). Afon Tawe. Afon Afan. Afon Loughor. Afon Lliw.	Afon Tawe - obscured. River Neath (closest) - obscured. Afon Clydach - obscured. Afon Afan - obscured. Afon Loughor - obscured. Afon Lliw - obscured.	Afon Tawe - obscured. Afon Afan - obscured. Afon Clydach - obscured. River Neath (closest) - obscured. Afon Loughor - obscured. Afon Lliw - obscured.

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
Coelbren	River Usk. Afon Taf. River Neath. Afon Cynon. Afon Tawe. Afon Aman. [Closest river, the Pyrddin, meets the River Neath/Nedd in the middle distance. Next closest is the Neath/Nedd].	River Usk - obscured. Afon Taf - obscured. River Neath - obscured. Afon Cynon - obscured. Afon Tawe - obscured. Afon Aman - obscured.	River Usk - obscured. Afon Taf - obscured. River Neath - obscured. Afon Cynon - obscured. Afon Tawe - obscured. Afon Aman - obscured.
Penydarren	River Usk. Ebbw River. Sirhowy River. Afon Taf (closest). Afon Rhondda. Afon Cynon. River Neath.	River Usk - obscured. Ebbw River - obscured. Sirhowy River - obscured. Afon Taf (closest)- obscured. Afon Rhondda - obscured. Afon Cynon - obscured. River Neath - obscured.	River Usk - obscured. Ebbw River - obscured. Sirhowy River - obscured. Afon Taf (closest) - obscured. Afon Rhondda - obscured. Afon Cynon - obscured. River Neath - obscured.
Gelligaer I	River Bargod Taf. River Rhymney. Sirhowy River. Afon Taf. River Ebbw. Afon Lwyd. Afon Elai. Afon Cynon. [Nant Cylla is the closest watercourse, this meets the Rhymney in the middle distance. Rhymney is the next closest].	River Bargod Taf - obscured. River Rhymney - obscured. Sirhowy River - obscured. Afon Taf - obscured. River Ebbw - obscured. Afon Lwyd - obscured. Afon Elai - obscured. Afon Cynon - obscured.	River Bargod Taf - obscured. River Rhymney - obscured. Sirhowy River - obscured. Afon Taf - obscured. River Ebbw - obscured. Afon Lwyd - obscured. Afon Elai - obscured. Afon Cynon - obscured.
Caerphilly	Sirhowy River. Ebbw River. River Usk. Rhymney River. Afon Taf. Afon Elai. Afon Cynon. [Nant Gledyr. Porset Brook are the closest watercourses and meet the River Rhymney in the middle	Sirhowy River - obscured. Ebbw River - obscured. River Usk - obscured. Rhymney River - obscured. Afon Taf - obscured. Afon Elai - obscured. Afon Cynon - obscured.	Sirhowy River - obscured. Ebbw River - obscured. River Usk - obscured. Rhymney River - obscured. Afon Taf - obscured. Afon Elai - obscured. Afon Cynon - obscured.

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
	distance. Rhymney is the next closest].		
Caergwanaf	River Ely (closest). Afon Rhondda Fach. Afon Taf. Rhymney River. Sirhowy River. Afon Ddawan. Afon Ogwyr.	River Ely (closest)- obscured. Afon Rhondda Fach - obscured. Afon Taf - obscured. Rhymney River - obscured. Sirhowy River - obscured. Afon Ddawan - obscured. Afon Ogwyr - obscured.	River Ely (closest) - obscured. Afon Rhondda Fach - obscured. Afon Taf - obscured. Rhymney River - obscured. Sirhowy River - obscured. Afon Ddawan - obscured. Afon Ogwyr - obscured.
Cardiff	River Taf (closest, although course has changed). River Rhymney. Ebbw River. River Usk. Afon Elai.	River Taf (closest, although course has changed) - obscured. River Rhymney - obscured. Ebbw River - obscured. River Usk - obscured. Afon Elai - obscured.	River Taf (closest, although course has changed)- partially visible. River Rhymney - obscured. Ebbw River - obscured. River Usk - obscured. Afon Elai - obscured.
Caerleon	Lwyd. Usk (closest). Severn. Rhymney. Sirhowy. Ebbw.	Lwyd - obscured. Usk (closest)- obscured. Severn - obscured. Rhymney - obscured. Sirhowy - obscured. Ebbw - obscured.	Lwyd - obscured. Usk (closest)- obscured. Severn - obscured. Rhymney - obscured. Sirhowy - obscured. Ebbw - obscured.
Usk	Usk (closest). Nant Olwy. Troddi. Gwy/Wye. Severn. Lwyd. Ebbw. Sirhowy.	Usk (closest)- obscured. Nant Olwy - obscured. Troddi - obscured. Gwy/Wye - obscured. Severn - obscured. Lwyd - obscured. Ebbw - obscured. Sirhowy - obscured.	Usk (closest)- obscured. Nant Olwy - obscured. Troddi - obscured. Gwy/Wye - obscured. Severn - obscured. Lwyd - obscured. Ebbw - obscured. Sirhowy - obscured.
Monmouth	Monnow (closest). Wye (closest). Severn. Usk.	Wye (closest) - obscured. Severn - obscured. Usk - obscured. Monnow (closest)- obscured.	Wye (closest) - obscured. Severn - obscured. Usk - obscured. Monnow (closest) - obscured.

Fort	Far: Watercourses present	Far: Watercourses visible, partially visible or obscured?	Far: Watercourse banks visible, partially visible or obscured?
Kingsholm	River Severn (closest - former course). River Afon. River Leadon.	River Severn (closest - former course). - obscured. River Afon - obscured. River Leadon - obscured.	River Severn - obscured. River Afon - obscured. River Leadon - obscured.
Gloucester	River Severn (closest - former course).. River Afon. River Leadon.	River Severn (closest - former course). - partially visible (small sections). River Afon - obscured. River Leadon - obscured.	River Severn (closest - former course).- partially visible (small sections). River Afon - obscured. River Leadon - obscured.
Pen Llystyn	Afon Cadnant. Afon Dwyfach (closest). Afon Dwyfor.	Afon Cadnant - obscured. Afon Dwyfach (closest)- obscured. Afon Dwyfor - obscured.	Afon Cadnant - obscured. Afon Dwyfach (closest)- obscured. Afon Dwyfor - obscured.

Table VI. 4 Type and visibility of watercourses that run closest to the forts

Fort	Closest watercourse	Watercourse type	Visibility of watercourse	Visibility of watercourse banks	Closest watercourse present in near and/or middle distances if closest watercourse is a tributary?
Caerhun	Conwy	Main	Partially visible	Partially visible	
Tomen y Mur	Nant Tyddyn-yr-yn	Tributary	Partially visible	Partially visible	Yes. Afon Dwyrhyd
Caer Llugwy	Llugwy	Tributary	Partially visible	Partially visible	No
Llanfor	Dee and Tryweryn	Main	Partially visible	Partially visible	
Caer Gai	Dee	Main	Partially visible	Partially visible	
Pennal	Nant Caer	Tributary	Partially visible	Partially visible	Yes. River Dovey
Forden Gaer	Severn	Main	Obscured	Partially visible	
Brompton	Caebitra	Tributary	Partially visible	Partially visible	No
Caersws I	Severn	Main	Partially visible	Partially visible	
Caersws II	Severn	Main	Partially visible	Partially visible	
Chester	Dee	Main	Partially visible	Partially visible	
Rhyn Park	Morlas Brook	Tributary	Obscured	Obscured	Yes. River Dee

Fort	Closest watercourse	Watercourse type	Visibility of watercourse	Visibility of watercourse banks	Closest watercourse present in near and/or middle distances if closest watercourse is a tributary?
Wroxeter	Severn	Main	Partially visible	Partially visible	
Pen Llwyn	Melindwr	Tributary	Partially visible	Partially visible	Yes. Afon Rheidol
Leighton	Severn	Main	Partially visible	Partially visible	
Trawscoed	Ystwyth	Main	Partially visible	Partially visible	
Cae Gaer	Tarennig	Tributary	Partially visible	Partially visible	Yes. River Wye
Jay Lane	Clun	Tributary	Partially visible	Partially visible	No
Buckton	Teme	Tributary	Partially visible	Partially visible	No
Llanio	Teifi	Main	Partially visible	Partially visible	
Pumsaint	Cothi and Twrch	Tributary and Tributary	Partially visible	Partially visible	No
Llandoverly I	Bran	Tributary	Partially visible	Partially visible	Yes. Afon Tywi
Llandoverly II	Bran	Tributary	Partially visible	Partially visible	Yes. Afon Tywi
Caerau	Cammarch	Tributary	Partially visible	Partially visible	No
Castell Collen	Ithon	Tributary	Partially visible	Partially visible	No

Fort	Closest watercourse	Watercourse type	Visibility of watercourse	Visibility of watercourse banks	Closest watercourse present in near and/or middle distances if closest watercourse is a tributary?
Colwyn Castle	Colwyn Brook	Tributary	Partially visible	Partially visible	No
Hindwell Farm	Summergeil Brook	Tributary	Partially visible	Partially visible	No
Clyro	Wye	Main	Partially visible	Partially visible	
Brecon Gaer	Usk and Ysgir	Main and tributary	Partially visible	Partially visible	
Carmarthen	Tywi	Main	Partially visible	Partially visible	
Loughor	Loughor	Main	Partially visible	Partially visible	
Neath II	Neath	Main	Obscured	Partially visible	
Coelbren	Pryddin and Camnant	Tributary and Tributary	Partially visible	Partially visible	Yes. River Neath
Caerphilly	Nant Gledyr/Porset Brook	Tributary	Partially visible	Partially visible	Yes. Afon Taf
Penydarren	Nant Marlais	Tributary	Partially visible	Partially visible	Yes. Afon Taf
Gelligaer	Nant Cyllen	Tributary	Partially visible	Partially visible	Yes. Afon Taf
Caergwanaf	Ely	Main	Partially visible	Partially visible	

Fort	Closest watercourse	Watercourse type	Visibility of watercourse	Visibility of watercourse banks	Closest watercourse present in near and/or middle distances if closest watercourse is a tributary?
Cardiff II	Taf	Main	Partially visible	Partially visible	
Caerleon	Usk	Main	Partially visible	Partially visible	
Usk	Usk	Main	Obscured	Partially visible	
Monmouth	Wye and Monnow	Main and Tributary	Obscured	Partially visible	
Kingsholm	Severn	Main	Partially visible	Partially visible	
Gloucester	Severn	Main	Partially visible	Partially visible	
Pen Llystyn	Dwyfach and Blaen y cae	Main and Tributary	Partially visible	Partially visible	
Segontium	Seiont and Cadnant	Main and main	Partially visible	Partially visible	
Clifford	Wye	Main	Obscured	Partially visible	
Llandeilo I	Tywi	Main	Partially visible	Partially visible	
Llandeilo II	Tywi	Main	Partially visible	Partially visible	

Table VI.5 Forts with watercourses on 2 or more sides

Fort	Watercourse(s) on 2 or more sides?
Caerhun	In 'U' shape of Afon Roe and River Conwy
Tomen y Mur	No
Segontium	Yes - between Cadnant and Seiont.
Bryn y Gefeiliau / Caer Llugwy	Yes - bend in Afon Llugwy
Llanfor	In 'U' shape formed by Rivers Dee and Tryweryn (although the courses of both have changed slightly)
Caer Gai	No
Pennal/Cefn Caer	Yes In 'C' shape caused by river Dovey and stream (Nant Caer), but stream may be too small to be significant.
Forden Gaer	Yes (slight) - River Severn
Brompton	No
Caersws I	No
Caersws II	In wide 'V' caused by rivers Carno and Severn.
Chester	Yes - River Dee
Rhyn Park	Yes - between Ceiriog river and Morlas Brook
Wroxeter	Between River Severn to W, Bell Brook to N and stream to S
Leighton	Yes River Severn
Pen Llwyn	No
Trawscoed	Yes Afon Ystwyth
Cae Gaer	yes - within 'C' shape made by river and two streams. Nant Ceiliogyn and Nant Fagwyr-fraith
Jay Lane	No
Buckton	No
Llanio	No
Pumsaint	Yes (in 'Y' shape where 2 rivers meet). Afon Cothi and Afon Twrch

Fort	Watercourse(s) on 2 or more sides?
Llandoverly I	No
Llandoverly II	No
Caerau (Beulah)	No
Castell Collen	Yes - Pentre Brook to N and Afon Ieithion to E
Colwyn Castle	No - Clowyn Brook to N, unnamed (too small) stream to S
Hindwell Farm	No.
Clifford	Yes. River Wye
Clyro	No
Brecon Gaer	Yes within 'Y' shape of the rivers Usk and Ysgir.
Llandeilo 1	No
Llandeilo 2	No
Carmarthen	No
Loughor	Yes - Rivers Loughor and Lliw
Neath Fort	Yes - in 'U' shape formed by riverd Neath and Clydach.
Coelbren	Yes - in 'Y' shape formed by Afon Pyrddin and Nant y Bryn stream.
Penydarren	Yes. River Taf to SW and Nant Morlais to SE and E but their courses may have been affected by subsequent housing.
Gelligaer I	No
Caerphilly	Yes. Streams Nant yr Aber and Nant Gladyr running E-W to N and S. Small section of Rhymney River to E.
Caergwanaf	Yes (although quite a large bend). Afon Elai and Nant Dyfrygi. Within slight bend of Elai.
Cardiff	No
Caerleon	Yes - in 'U' shape formed by Usk and Lwyd rivers
Usk	Yes. In slight bend in River Usk. Also between River Usk (to W) and Nant Olwy (to E).
Monmouth	Yes - in 'U' shape of Wye and Monnow rivers.

Fort	Watercourse(s) on 2 or more sides?
Pen Llystyn	Between rivers Dwyfach and Blaen y Cae.
Kingsholm	No (based on former course of River Severn)
Gloucester	No (based on former course of River Severn)

Table VI.6 River confluences

Fort	Do 2+ rivers meet within the near or middle distances?	Are the meeting points of the rivers visible, partially visible or obscured?
Caerhun	Conwy and Roe in MIDDLE distance (SE).	Partially visible
Tomen y Mur	Yes. Afon Dwryrd and some tributaries. Rivers Brysor and Dwryrd meet just beyond the middle distance. (NW)	Prysor and Dwryrd - obscured
Segontium	No	N/A
Bryn y Gefeiliau / Caer Llugwy	No	N/A
Llanfor	Yes. River Dee/Afon Dyfrdwy and Afon Tryweryn. (S)	Partially visible (1st ed and modern OS)
Caer Gai	No	N/A
Pennal/Cefn Caer	Afon Pennal and River Dovey.	Partially visible
Forde Gaer	Yes. River Severn and River Camlad.	Obscured
Brompton	(Rivers Caebitra and Camlad meet - minor rivers).	Partially visible
Caersws I	Yes. River Carno and River Trannon meet the River	River Carno and River Severn - partially visible. River Trannon and River

Fort	Do 2+ rivers meet within the near or middle distances?	Are the meeting points of the rivers visible, partially visible or obscured?
	Severn. River Cerist meets the River Trannon. To SW and W.	Severn - visible. River Cerist and River Trannon - partially visible.
Caersws II	Yes. River Severn and River Carno (NEAR distance - meeting place has moved since OS 1st ed map but the meeting places on 1st ed and modern maps are both within the near distance. Afon Cerist and River Severn (MIDDLE distance). Afon Cerist and Afon Trannon (MIDDLE distance).	River Severn and River Carno - 1st ed map - partially visible, OS Mastermap - obscured. Afon Cerist and River Severn - obscured. Afon Cerist and Afon Trannon - obscured.
Chester	No	N/A
Rhyn Park	Yes River Ceiriog and River Dee (main) MIDDLE distance. (Morlas Brook meets River Ceiriog - MIDDLE distance)	River Ceiriog and River Dee - Obscured. River Ceiriog and Morlas Brook - obscured.
Wroxeter	Yes. River Tern meets the River Severn (MIDDLE distance). River Roden meets the River Tern (MIDDLE distance).	River Tern meets the river Severn - obscured. River Roden meets the River Tern - visible.
Leighton	No	N/A
Pen Llwyn	Afon Rheidol and Afon Melindwr (although Melindwr is minor river) in MIDDLE distance. (SW)	Partially visible
Trawscoed	Only minor rivers.	N/A

Fort	Do 2+ rivers meet within the near or middle distances?	Are the meeting points of the rivers visible, partially visible or obscured?
Cae Gaer	(Afon Tarennig meets River Wye in MIDDLE distance).	Obscured
Jay Lane	Yes. River Clun and River Teme.	Partially visible
Buckton	Yes. River Clun and River Teme. (NE)	Partially visible
Llanio	No	N/A
Pumsaint	Yes. Cothi and Twrch (although both tributaries) in NEAR distance. (Meeting point is the same on both the OS 1st ed and OS modern Mastermap courses)	Visible
Llandovery I	Yes. Afon Tywi and Afon Bran in MIDDLE distance.	Obscured
Llandovery II	Yes. Afon Tywi and Afon Bran in MIDDLE distance.	Partially visible
Caerau (Beulah)	Yes. Afon Cammarch meets Afon Irfon.	Obscured
Castell Collen	No	N/A
Colwyn Castle	No	N/A
Hindwell Farm	No	N/A
Clifford	No	N/A
Clyro	No	N/A
Brecon Gaer	Yes . Afon Ysgir meets River Usk in NEAR distance.	Visible
Llandeilo I	No	N/A
Llandeilo II	No	N/A

Fort	Do 2+ rivers meet within the near or middle distances?	Are the meeting points of the rivers visible, partially visible or obscured?
Carmarthen	Afon Gwili meets Afon Tywi (although Gwili is a minor river) in MIDDLE distance.	Partially visible
Loughor	Afon Llan meets River Loughor in NEAR distance. (SW)	Visible
Neath Fort	Yes. Afon Clydach meets River Neath.	Obscured
Coelbren	No (Pryrdin meets River Neath in Far distance).	N/A
Penydarren	Taf Fawr and Taf Fechan meet in the MIDDLE distance to form the Afon Taf.	Obscured
Gelligaer I	Bargod Taf and Taf in MIDDLE distance.	Obscured
Caerphilly	No	N/A
Caergwanaf	River Ely and River Clun (tributary of Ely). (NW)	Obscured
Cardiff	No	N/A
Caerleon	Lwyd and Usk (NE)	Partially visible
Usk	Usk and Nant Olwy within Middle distance. (S)	Partially visible
Monmouth	Wye and Monnow in MIDDLE distance.	Partially visible
Kingsholm	River Leadon and River Severn	Uncertain - not certain where their former meeting point was.

Fort	Do 2+ rivers meet within the near or middle distances?	Are the meeting points of the rivers visible, partially visible or obscured?
Gloucester	River Leadon and River Severn	Uncertain - not certain where their former meeting point was.
Pen Llystyn	No	N/A

Appendix VII Fort orientation

Table VI.1 Data relating to fort orientation

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
Caerhun	E	Across	Descent to river. River.	All partially visible	River. Valley. Valley side. Hills beyond.	River - partially visible. Valley - partially visible. Valley side - partially visible. Hills beyond - obscured.	Undulating upland.	All obscured
Tomen y Mur	SE	Across	Descending slope. Stream. Ascending slope.	All partially visible	Undulations	Partially visible	Undulating upland.	All partially visible
Segontium	SW	Across River Seiont.	Slope (descending)	Partially visible	River/estuary . Valley. Undulating lowland. Bay (Y Foryd).	River/estuary - partially visible. Valley - partially visible. Undulations	Flat area. Sea.	All partially visible

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
						(low) - partially visible. Bay (Y Foryd) - partially visible.		
Bryn y Gefeiliau / Caer Llugwy	NE	Downstream	Slope (descending). River.	All partially visible	Valley floor (main). Valley sides (main). Undulating upland.	Valley floor (main). Valley sides (main). Undulating upland. - All partially visible	Undulating upland. Valley floor (Conwy valley). River (River Conwy main).	Undulating upland - partially visible. Valley floor (Conwy valley) - obscured. River (River Conwy main) - obscured.
Llanfor	NE	Downstream River Dee	Slope (descending).	Partially visible	Valley floor. River. Valley sides. Undulating upland. Minor river (Afon Meloch).	Valley floor. River. Valley sides. Undulating upland. Minor river (Afon Meloch). All	Undulating upland. Valley (main) (Continued Dee Valley).	Undulating upland - partially visible. Valley (main) - Obscured (Continued Dee Valley).

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
						partially visible		
Caer Gai	Uncertain.	N/A	N/A	N/A	N/A		N/A	
Pennal/Cefn Caer	SW	Downstream	Slope (descending). Then flat area.	Partially visible	Valley floor. River. Estuary.		Estuary. Sea.	
Forden Gaer	Uncertain	N/A	N/A	N/A	N/A		N/A	
Brompton	Unknown	N/A	N/A	N/A	N/A		N/A	
Caersws I	E	Downstream	Slope (descending).	Partially visible	Valley floor. River. Valley sides. Undulating upland.	Valley floor. River. Valley sides. Undulating upland. - All partially visible	Valley floor (main). River (main). Undulating upland.	Valley floor (main) - obscured. River (main) - obscured. Undulating upland - partially visible.
Caersws II	SE	Upstream	Slope (descending).	Partially visible	River (main). Valley floor. Valley sides. Undulating upland.	River (main, dominant). Valley floor. Valley sides. Undulating upland. - All partially visible	Undulating upland. Rivers.	Undulating upland. Rivers. - All obscured.

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
Chester	SE	Downstream	Slope (descending). River.	Descent - partially visible. River - obscured. River banks - obscured.	River. Undulating lowland.	All partially visible	Undulating lowland. Hill.	All partially visible
Rhyn Park	Uncertain.	N/A	N/A	N/A	N/A		N/A	
Wroxeter	NW	Upstream	Slope (descending). River.	Descent - partially visible. River - obscured. River banks - obscured.	Valley floor. River Severn.	All partially visible	Undulating lowland. Severn Valley . River Severn. Rivers. Hills. Haughmond Hill.	Undulating lowland - partially visible. Severn Valley (NW) - partially visible. River Severn - obscured. Rivers - obscured.
Leighton	Uncertain.	N/A	N/A	N/A	N/A		N/A	
Pen Llwyn	SW	Downstream Afon Rheidol	Slope (descending)	Partially visible	Valley floor. River (Rheidol). Meeting point of Rheidol and Melindwr	Valley floor. River (Rheidol). Valley sides. All partially visible	Valley floor. River (Rheidol). Estuary (Rheidol). Valley sides.	All obscured

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
					rivers. Valley sides.			
Trawscoed	W	Across	Slope (descent). River (main). Valley floor. Slope (ascending).	All partially visible	Valley sides. Undulating upland. Rivers.	Valley sides - partially visible. Undulating upland - partially visible. Rivers - obscured.	Undulating upland. Rivers. Sea.	All obscured
Cae Gaer	Uncertain	N/A	N/A	N/A	N/A		N/A	
Jay Lane	Uncertain.	N/A	N/A	N/A	N/A		N/A	
Buckton	ESE?	Upstream River Teme	Slope (descending). Stream. River (Teme).	All partially visible	River Teme. Undulating wide valley floor (where 2 valleys (Teme and Clun)meet). Continuation of Teme valley to SE.	River Teme - partially visible. Undulating wide valley floor - partially visible. Continuation of Teme valley to SE - partially visible.	Continuation of Teme valley. Undulating upland. Undulating lowland. Valleys. Rivers.	Continuation of Teme valley - obscured. Undulating upland - partially visible. Undulating lowland-obscured. Valleys - obscured.

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
								Rivers - obscured.
Llanio	SE	Across	Slope (descending). River. Flat area beyond.	All visible	Valley floor. Hill. River (Brefi). Valley sides. Undulating upland.	Valley floor - partially visible. Hill - partially visible. River (Brefi) - obscured. Valley sides - partially visible. Undulating upland - partially visible.	Undulating upland. Rivers.	Undulating upland - partially visible. Rivers - obscured.
Pumsaint	Uncertain	N/A	N/A	N/A	N/A		N/A	
Llandovery I	Uncertain	N/A	N/A	N/A	N/A		N/A	
Llandovery II	Uncertain	N/A	N/A	N/A	N/A		N/A	
Caerau (Beulah)	Uncertain	N/A	N/A	N/A	N/A		N/A	
Castell Collen	SE	Downstream	Slope (descending). River Ithon/Ieithon.	All partially visible	Valley floor. Valley sides. Undulating lowland.	All partially visible	Undulating lowland. Undulating upland.	All obscured

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
			Flat area beyond river.				Valleys. Rivers.	
Colwyn Castle	Uncertain	N/A	N/A	N/A	N/A		N/A	
Hindwell Farm	SW	Across Summerygill/Hindwell Brook	Slope (descending). Summerygill/Hindwell Brook.	All partially visible	Valley floor. Valley sides. Undulating upland. Brooks.	All partially visible	Undulating upland. Rivers. Wye valley.	Undulating upland - partially visible. Rivers - obscured. Wye valley - obscured.
Clifford	Uncertain	N/A	N/A	N/A	N/A		N/A	
Clyro	Uncertain	N/A	N/A	N/A	N/A		N/A	
Brecon Gaer	W	Across Afon Ysgir. Upstream of River Usk.	Slope (descending). River (Ysgir).	All partially visible	Valley floor (Usk). Valley sides. River (Usk).	All partially visible	Valley (Usk). Undulating upland and lowland.	Valley (Usk) - obscured. Undulating upland and lowland - partially visible.
Llandeilo I	NE	Upstream	Slope (descending)	Partially visible	Steep descent. Valley floor (Tywi). Valley sides. River	All partially visible	Valley floor (Tywi). Valley sides. River (Tywi - main).	Valley floor (Tywi) - partially visible. Valley sides - P partially

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
					(Tywi - main).			visible. River (Tywi - main) - partially visible. River banks (Tywi - main) - partially visible.
Llandeilo II	NE	Upstream	Slope (descending)	Partially visible	Steep descent. Valley floor (Tywi). Valley sides. River (Tywi - main).	All partially visible	Valley floor (Tywi). Valley sides. River (Tywi - main).	Valley floor (Tywi) - partially visible. Valley sides - partially visible. River (Tywi - main) - partially visible. River banks (Tywi - main) - partially visible.
Carmarthen	Uncertain	N/A	N/A	N/A	N/A		N/A	

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
Loughor	SW	Downstream	Slope (descending). Loughor river/estuary.	All partially visible	River	Partially visible	Estuary	Partially visible
Neath Fort	Uncertain	N/A	N/A	N/A	N/A		N/A	
Coelbren	Uncertain	N/A	N/A	N/A	N/A		N/A	
Penydarren	Uncertain	N/A	N/A	N/A	N/A		N/A	
Gelligaer	Uncertain	N/A	N/A	N/A	N/A		N/A	
Caerphilly	Uncertain	N/A	N/A	N/A	N/A		N/A	
Caerwanaf	E (possibly, based on an interpretation of barracks from geophysics. (Young in Burnham and Davies 2010, 215-6))	Across Afon Elai/Ely	Slope (descending). River. Rise beyond river.	Descent - partially visible. River - partially visible. River banks - visible.	Rise to undulating lowland.	All partially visible	Undulating lowland. Taf valley and Rhymney valley.	Undulating upland - PV partially visible obscured.
Cardiff Fort	Uncertain	N/A	N/A	N/A	N/A		N/A	
Caerleon	SE	Across the Usk	Slope (descending). River Usk. Flat area beyond.	Descent - partially visible. River (Usk) -	Flat area/valley floor. River. Then valley	Flat area/valley floor - partially	Undulating lowland. Coast/ Sea.	All obscured

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
				obscured. River banks (Usk) - partially visible.	sides. Hills. Then low-lying area.	visible. River-partially visible. Then valley sides-partially visible. Undulating lowland - obscured. Then low-lying area - obscured.	English coast.	
Usk	S	Downstream (Usk)	Flat area. River Usk.	Descent - partially visible. River (Usk) - obscured. River banks (Usk) - partially visible.	Usk valley floor. Usk valley sides. River Usk.	Usk valley floor - partially visible. Usk valley sides-partially visible. River Usk - obscured. River Usk banks - partially visible.	Short stretch of Usk valley floor and river before they turn SW. Undulating lowland. Then low-lying area. Then sea.	Short stretch of Usk valley floor and river before they turn SW - partially visible. Usk valley sides - partially visible. Undulating lowland - obscured. Then low-

Fort	Fort orientation (compass points)	Is fort orientation upstream, downstream or neither of the closest/main river?	Topography type(s) towards which fort is orientated - near distance	Visibility of topography type towards which fort is orientated - near distance	Topography type towards which fort is orientated - middle distance	Visibility of topography type towards which fort is orientated - middle distance	Topography type towards which fort is orientated - far distance	Visibility of topography type towards which fort is orientated - far distance
								lying area - obscured. Then sea - obscured.
Monmouth	Uncertain	N/A	N/A	N/A	N/A		N/A	
Kingsholm	Uncertain	N/A	N/A	N/A	N/A		N/A	
Gloucester	NE	Upstream	Slope (descending)	All partially visible	Undulating lowland of Severn valley. River Severn (former course)	All partially visible	Undulating lowland of Severn valley. Rivers.	All partially visible
Pen Llystyn	SW	Across	Slope (descending). River (Dwyfach). Flat area beyond river.	All partially visible	Undulating low-lying area. Hill.	All partially visible	Llyn Peninsular. Sea either side of Llyn Peninsular.	All partially visible

Appendix VIII Roman roads

Table VIII.1 Presence and visibility of Roman roads

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Caerhun	GAT HER PRN 17585 N from N gate. GAT HER PRN 1758 N from N gate then turns NE.	GAT HER PRN 17578 - 17579 E-W Canovium - Segontium. (GAT HER PRN 17818 N-S from S of Caerhun - predicted; GAT HER PRN 17702 N-S from S of Caerhun - predicted).	N/A	GAT HER PRN 17703 S from S gate then turns SW.	GAT HER PRN 17657 E-W Canovium - Varis.	CPAT HER PRN 46868 - 46844 E-W St Asaph - Caerhun. GAT HER PRN 17709 E-W Caer Llugwy - Betws-y-Coed. GAT HER PRN 17840 E-W Canovium - Segontium.
Tomen y Mur	Visible and partially visible.	Partially visible and obscured.	Partially visible and obscured			
Segontium	None K or PP. All roads from fort would have been partially visible.	GAT PRN 36425-17832-17831-17564 - partially visible. GAT PRN 36427-36428 - partially visible.	GAT PRN 17565 - partially visible. GAT PRN 36429- 36430-36433 -36434 - partially visible.			GAT PRN 17834 - obscured. GAT PRN 17600 - obscured.
Llanfor	GAT PRN 17760 - partially visible.	GAT PRN 17609 - 17614 - partially visible (extends SW	GAT PRN 17612-17616- obscured. CPAT predicted			

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
	GAT PRN 17760 - partially visible.	to NE past N of Llanfor fort).	Roman roads beyond - obscured. GAT PRN 17795 - 17800 from SW to Caer Gai)- obscured. GAT PRN 17633-17647 (SW to Caer Gai) - partially visible. GAT PRN 17528-17524 (towards Tomen y Mur)- obscured. GAT PRN 17525 towards Tomen y Mur - obscured.			
Caer Gai	GAT PRN 17606 - Partially visible. GAT PRN 17792 - partially visible. GAT PRN 17650 - partially visible.	GAT PRN 17608-17609 - partially visible. GAT PRN 17794-17799 - partially visible. GAT PRN 17845 - visible. GAT PRN 17648-17644 - partially visible.	N/A			GAT PRN 17609-17617 -(continuing from Middle distance) obscured. GAT PRN 17799 (continuing from Middle distance) - obscured. GAT PRN 17528-17507 (continuing from Middle distance) - obscured. GAT PRN 17748 (TyM to Brithdir) - obscured.

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Pennal/Cefn Caer	GAT PRN 17712 (from NE gate) - partially visible. GAT PRN 17776 (from NW gate) - visible. GAT PRN 17775 (from SW gate) - partially visible.	GAT PRN 36445 (continuation from SW gate). Some predicted roads present.	GAT PRN 17867-17871 (Brithdir to Pennal)- obscured.			GAT PRN 36446 continuation from NE gate.
Forden Gaer	CPAT PRN 11709 Forden-Caersws from S gate - partially visible. CPAT PRN 47061 Wroxeter-Forden from N gate - visible.	CPAT PRN 47060 Wroxeter to Forden towards NE, line then becomes uncertain - partially visible. (Predicted Roman road to SW (Forden-Caersws), line not confirmed. Would have been partially visible.	Roman road Forden to Wroxeter (to NE) (varies between predicted and proposed) - possibly partially visible.			CPAT PRN 14359 - 14307 Caersws-Banwy valley (runs N-S past W of Forden), varies between known and predicted - obscured. Roman road Caersws-Forden (SW of Forden), varies between known and predicted - obscured. Roman road Long Mountain to Mallwyd - (E-W to N of Forden) (varies between predicted and proposed) - obscured.

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort						
Brompton	(Short length of RR road - Object ID 193948/HOB UID 1395844 RR from E gate for 250m).	CPAT PRN 47067 NW to SE past fort towards Forden Gaer. Object ID 5351/ HOB UID 1358747 running E-W past S of fort. CPAT PRN 47060.	Continuation of CPAT PRN 47067. Continuation of Object ID 5351/ HOB UID 1358747. Predicted roads present.	N/A	N/A	N/A
Caersws I	N/A (courses uncertain)	All heading towards Caersws II. CPAT PRN 47007-14305-14308-14315 Caersws - Banwy valley (N-S past W of Caersws I)- partially visible. CPAT PRN 11728-11727-47052 Forden - Caersws (E-W past S of Caersws I - becomes proposed route towards E) - partially visible. CPAT PRN 11732 Caersws -	N/A			CPAT PRN 14322 Caersws-Banwy Valley (N-S from middle distance - only sections known or proposed) - obscured. CPAT PRN 86625 Caersws II - Trefeglwyd, continued from middle distance - only sections known or proposed - obscured. Other lines (Forden-Caersws; Caersws-Carno-Pennal; Carno-Penycrocbren are not known or predicted lines - suggested lines obscured). Some

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort		Trefeglwyl E-W from Caersws II (becomes predicted towards W - partially visible).				predicted roads present.
Caersws II	CPAT PRN 14302-14301 Caersws-Banwy valley. CPAT PRN 11731-47063 Caersws-Trefeglwys. CPAT PRN 14401 Caersws-Carno-Pennal.	CPAT PRN 14301-14316 Caersws-Banwy Valley - partially visible. CPAT PRN 47410 - 11725 Forden-Caersws (short section 'Proposed' and 'Known')-partially visible. CPAT PRN 47063-11737 Caersws-Tregelwys - partially visible. (Castell Collen to Caersws predicted line-partially visible).	N/A			CPAT PRN 14319 Caersws-Banwy Valley (mis of proposed and predicted) - obscured. CPAT PRN 47040 Forden-Caersws (small proposed section) - obscured. CPAT PRN 47230 Castell Collen-Caersws (small known section) - obscured. CPAT PRN 14409 Caersws-Carno-Pennal - obscured. CPAT PRN 11517-11501 Carno-Penycrocbren - obscured.
Chester	Chester to Wirral from N gate Object ID 4022. Chester to Warrington;	Continuation of Chester to Wirral from N gate Object ID 4022.	Continuation of Chester to Wirral from N gate Object ID 4022.	N/A	N/A	Continuation of Chester to Warrington; uncertain if from a gate or road junction; Object

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
	uncertain if from a gate or road junction; Object ID 4486. Chester to Manchester from E gate; Object ID 4688. Watling Street; Chester to Wroxeter; from S gate; Object ID 4686.	Continuation of Chester to Warrington; uncertain if from a gate or road junction; Object ID 4486. Continuation of Chester to Manchester from E gate; Object ID 4688. Continuation of Watling Street; Chester to Wroxeter; from S gate; Object ID 4686. Other conjectured roads present.	Continuation of Chester to Manchester from E gate; Object ID 4688. Continuation of Watling Street; Chester to Wroxeter; from S gate; Object ID 4686. Other conjectured/predicted roads present.			ID 4486. Other conjectured/predicted roads present.
Rhyn Park	N/A (courses uncertain)	CPAT PRN 47501 Rhyn Park to Rhug (small 'proposed' section - obscured. (Remainder of road 'predicted' - partially visible).	N/A	N/A (courses uncertain).	CPAT PRN 47501 Rhyn Park to Rhug (small 'proposed' section - obscured.	CPAT PRN 47955 Chester - Ffridd - Caer Gai - small sections 'proposed' - obscured. (Continuation of Rhyn Park to Rhug - predicted - obscured.) (Shropshire HER 31285 Possible Roman

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
						road section - obscured). (Shropshire HER 08003 Possible Roman road Morton Common - Redwith - obscured.) Shropshire HER 00895 - possible Roman road sections - obscured.
Wroxeter	Shropshire HER 00066 (Margary RR6a in Burnham and Davies) - N-S - it was aligned on the porta principalis dextra of the Wroxeter auxiliary fortress. It was diverted to the porta principalis dextra of the fortress (partially visible). It emerged from the porta principalis sinistra, running towards the	Continuation of Shropshire HER 00066 (Margary RR6a in Burnham and Davies) - N-S (sections identified/known). Continuation of Shropshire HER 00099 Watling Street (Margary RR1b) SW/NE. Continuation of Shropshire HER 06485 Wroxeter E road to S of Wrekin then Greensforge	Continuation of Watling Street to SW Shropshire HER 00108.	-Shropshire HER 00099 Watling Street (Margary RR1b) SW/NE- met RR6a at an oblique angle to N of fortress. HER data also includes proposed road running off Watling St to fortress N	N/A	Continuation of Shropshire HER 00066 N-S. Continuation of Watling Street to NE Shropshire HER 00099. (Possible routes: Continuation of Shropshire HER 06486 (now 00098) E-W towards Forden Gaer; Shropshire HER 04076 Greensforge (Staffs) to Central Wales E-W to S of Wroxeter)

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
	<p>ford and putative vicus (partially visible). Wroxeter to Rutinium and Whitchurch and eventually to Chester - Shropshire HER 06486 (Margary 64) - road running W from where Watling St meets RR6a. - Shropshire HER 06485 Wroxeter E road to S of Wrekin then Greensforge from the porta decumana. Continuation of Watling Street Shropshire HER 00108 (Margary 6b) NE-SW towards Gloucester and Usk.</p>	<p>from the porta decumana E-W. (Possible lines: Shropshire HER 06484 Wroxeter to Leighton NW-SE; continuation of Shropshire HER 06486 E-W towards Forden Gaer.</p>		<p>gate, also not visible. - Shropshire HER 06486 (Margary 64) - road running W from where Watling St meets RR6a.</p>		

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Leighton	Roman road routes unknown.	N/A Routes near Leighton unknown.	N/A	Known Roman road routes unknown.	Routes near Leighton unknown. Watling Street Shropshire HER 00099 and 00108. (Possible Roman road running S from Wroxeter fortress Shropshire HER 02247).	Watling Street Shropshire HER 00099 and 00108. Shropshire HER 00066 N-S Wroxeter to Rutinium and Whitchurch and eventually to Chester. Shropshire HER 00098 NE-SW Wroxeter to Forden Gaer. (Possible Shropshire HER 04076 E-W to S of fort Greensforge (Staffs) to Central Wales.
Pen Llwyn	(Suggested line of Roman road RR69c Pen Llwyn to Pennal N-S through near distance - visible).	(Continuation of Suggested line of Roman road RR69c Pen Llwyn to Pennal N-S - to N and S of fort - partially visible.).	N/A	N/A	Gilfach - Goch RR69c N-S to S of fort CERTAIN and PROBABLE - obscured. (Trawscoed - Pen Llwyn SUGGESTED-obscured. Taihirionrhos - Talybont	Llanio - Trawscoed (DAT PRN 5222) N-S to S of fort PROBABLE - obscured. Caer Gaer-Trawsgoed SW-NE - PROBABLE - obscured. (Pen Llwyn - Pennal SUGGESTED - obscured. Taihirionrhos - Talybont SUGGESTED - obscured

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort					SUGGESTED - obscured).	
Trawscoed	DAT HER PRN 106535Cae Gaer - Trawscoed from E gate. (4 suggested lines)	DAT HER PRN 106535Cae Gaer - Trawscoed continuation from E gate. (5 suggested lines).	N/A	N/A	N/A (1 suggested line)	DAT HER PRN 106535Cae Gaer - Trawscoed continuation from E gate. Trawscoed - Llanio N-S (RR69c). (5 suggested/possible roads).
Cae Gaer	N/A (no known or proposed Roman roads) Predicted R road present	DAT HER PRN 106535Cae Gaer - Trawscoed.	N/A	N/A	N/A	CPAT HER PRN 11502 - 11518 Carno - Penycrocbren. CPAT HER PRN 11737 Caersws - Trefeglwys. CPAT HER PRN 47221 Castell Collen - Caersws (short section Known). (Suggested/predicted roads also present).
Jay Lane	None K or PP. Roads from NW, NE and SE gates would have been partially visible.	Hereford HER No.58248/ Shropshire HER No. 00108 Watling Street W - sections	Continuation of Hereford HER No.58248/ Shropshire HER No. 00108 Watling Street	Road from the SW gate would have been partially visible or	N/A	N/A. (Some predicted roads present).

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort	Road from the SW gate would have been partially visible or possibly obscured.	are known/proposed. Runs N-S past E of fort. Hereford HER No. 53399 Short cropmark of trackway, E-W to W of fort (may not be Roman road).	W - sections are known/proposed. Shropshire HER No. 00157 The Portway - N-S to N of fort (prehistoric and medieval trackway, Roman use assumed).	possibly obscured. (Some predicted roads present).		
Buckton	Hereford HER No. 53736 vicus: survey noted road from N gate. Roads from all gates would have been partially visible or visible.	Hereford HER No.58248/ Shropshire HER No. 00108 Watling Street W - sections are known/proposed. Runs N-S to E of fort. Hereford HER No. 53399 Short cropmark of trackway, E-W to W of fort (may not be Roman road). Extension of Roman roads from fort uncertain but would	Continuation of Hereford HER No.58248/ Shropshire HER No. 00108 Watling Street W - sections are known/proposed. Shropshire HER No. 00157 The Portway - N-S to N of fort (prehistoric and medieval trackway, Roman use assumed). (Some predicted roads present).	N/A	N/A	N/A. (Some predicted roads present).

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort		have been at least partially visible through valley floor.				
Llanio	DAT HER PRN 5222 A segment of the Roman road RR69c running N-S past W of fort. DAT HER PRN 51958 A segment of the Roman road RR69c (PRN 5222) including an extension of the road leading E-W to the fort's W gate.	Continuation of DAT HER PRN 5222 A segment of the Roman road RR69c running N-S past W of fort.	N/A	N/A	N/A	Continuation of DAT HER PRN 5222 A segment of the Roman road RR69c. DAT HER PRN 106535 between Cae Gaer and Trawsgoed. DAT HER PRN 51972 the route of Roman road RR62c from Llandovery to Pumsaint
Pumsaint	DAT HER PRN 51972 RR62c from Llandovery to Pumsaint and on to Llanfair Clydogau. (Other suggested routes present)	Continuation of DAT HER PRN 51972 RR62c to N and S of fort, some suggested segments. (Other suggested routes present)	N/A	N/A	N/A	Continuation of DAT HER PRN 51972 RR62c to N and S of fort, some suggested segments. DAT HER PRN 5222 Roman road RR69c, (the northern continuation of RR69d) from Pennal to Llanio. Also referred to as

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
						Sarn Helen, some suggested sections, NE-SW to N of fort. DAT HER PRN 3419 This PRN represents part of the route of RR623 as proposed by Margery, running from Castell Collen to Llandovery. RR623 itself continues on to Carmarthen, SW-NE to S of fort, some suggested sections.
Llandovery II	RR623 DAT HER PRN 33981 between Llandovery and Castell Collen, N-S to E of fort. RR62c DAT HER PRN 51972 from Llandovery to Pumsaint and on to Llanfair Clydogau, NW-SE to SW of	Continuation of RR623 DAT HER PRN 33981 between Llandovery and Castell Collen, N-S to E of fort. Continuation of RR62c DAT HER PRN 51972 from Llandovery to Pumsaint and on to Llanfair Clydogau,	N/A	N/A	N/A	Continuation of RR623 DAT HER PRN 33981 between Llandovery and Castell Collen, N-S to E of fort. Continuation of RR62c DAT HER 51972 from Llandovery to Pumsaint and on to Llanfair Clydogau. (Suggested/predicted roads present).

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort	fort. (Suggested lines present).	NW-SE to NW of fort (mostly obscured). (Suggested lines present).				
Llandovery II	RR623 DAT HER PRN 33981 between Llandovery and Castell Collen, N-S to E of fort. RR62c DAT HER PRN 51972 from Llandovery to Pumsaint and on to Llanfair Clydogau, NW-SE to SW of fort. (Suggested lines present).	Continuation of RR623 DAT HER PRN 33981 between Llandovery and Castell Collen, N-S to E of fort. Continuation of RR62c DAT HER PRN 51972 from Llandovery to Pumsaint and on to Llanfair Clydogau, NW-SE to NW of fort (only small section visible). (Suggested lines present).	N/A	N/A	N/A	Continuation of RR623 DAT HER PRN 33981 between Llandovery and Castell Collen, N-S to E of fort (very small patch visible at middle/far distance border). Continuation of RR62c DAT HER PRN 51972 from Llandovery to Pumsaint and on to Llanfair Clydogau. (Suggested/predicted roads present).
Caerau (Beulah)	CPAT HER PRN 14238 Carmarthen - Castell Collen, known, partially visible, N-S to W of	Continuation of CPAT HER PRN 14238 Carmarthen - Castell Collen, known, proposed and predicted	Continuation of CPAT HER PRN 14238 Carmarthen - Castell Collen, proposed and predicted sections.	N/A	N/A	CPAT PRN 14202 Carmarthen - Castell Collen, predicted and proposed sections. CPAT PRN 14234 Carmarthen - Castell

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort	fort. (Predicted road present).	sections. (Predicted roads present).				Collen, predicted and proposed sections. CPAT HER PRN 14005 - 14015 Cardiff - Castell Collen, known, proposed and predicted sections. CPAT HER PRN 47215 - 47205 Castell Collen - Caersws, known, proposed and predicted sections. (Predicted lines present).
Castell Collen	CPAT HER PRN 47201 Castell Collen - Caersws from NE gate. CPAT HER PRN 47637 Cardiff - Castell Collen from SW gate. (Predicted and Discounted roads present).	CPAT HER PRN 47205 - 47211 Castell Collen - Caersws (continuation of PRN 47203 from NE gate), Known and Proposed sections. CPAT HER PRN 47033 - 14008 Cardiff - Castell Collen (continuation	N/A	CPAT HER PRN 47203 Castell Collen - Caersws branching from PRN 47201 (from NE gate) towards NW.	N/A	CPAT HER PRN 47213 - 47230 Castell Collen - Caersws (Continuation of PRN 47205 - 47211 towards NW). CPAT HER PRN 47642 Mortimer's Cross - Castell Collen (E-W to E of fort; small stretch known, the remainder is predicted). CPAT HER

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
		of PRN 47637), proposed and known sections. CPAT HER PRN 14201 - 14202 Carmarthen - Castell Collen (proposed). (Predicted roads present).				PRN 33127 Hindwell - Penybont, small stretch of proposed Roman road, E-W to E of fort. CPAT HER PRN 14008 - 14015 Cardiff - Castell Collen (continuation), N-S. proposed and predicted sections. CPAT HER PRN 14202 - 14239 Carmarthen - Castell Collen (continuation) NE-SW, proposed, known and predicted sections.
Colwyn Castle	N/A Routes near Colwyn Castle unknown.	N/A Routes in Colwyn Castle middle distance unknown.	N/A	N/A Routes near Colwyn Castle unknown.	N/A Routes in Colwyn Castle middle distance unknown.	CPAT HER PRN 47615 Mortimer's Cross - Castell Collen, E-W to N of fort, small known section. CPAT HER PRN 33125 - 33127 Hindwell - Penybont, small stretch E-W to NE of fort.

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
						CPAT HER PRN 11601 Kenchester - Brecon, NE-SW to SE of fort (SW of Clyro), small proposed stretch. CPAT HER PRN 14015 Cardiff - Castell Collen, N-S to SW of fort, small proposed section. CPAT HER PRN 48300 - 14229 (also 14202) Carmarthen - Castell Collen, SW-NE to W of fort, know, proposed and predicted sections.
Hindwell Farm	CPAT HER PRN 83927 from N gate. CPAT HER PRN 3312 Hindwell - Penybont from E gate. Road from S gate (no PRN; CPAT Reports 301 & 1138). CPAT HER PRN 33124	Continuation of CPAT HER PRN 33124: CPAT HER PRN 33125 - 33127 Hindwell - Penybont E-W to W of fort. Continuation of others from fort not identified in HER.	N/A	N/A	N/A	Route of Watling Street W Hereforshire HER Number 53317, N-S to W of fort. Hereforshire HER Number 58247 Kenchester to Brecon, SE-NW to SE of fort, continuing as CPAT HER PRN 11601 Kenchester to Brecon

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort	Hindwell - Penybont from W gate.					to S of fort towards Clyro. CPAT HER PRN 47613 Mortimer's Cross - Castell Collen (small section Known), NE-SW to NW of fort. (Predicted routes present).
Clifford	No known roads. Likely to be a result of lack of investigation.	CPAT HER PRN 11601 - 11602 Kenchester - Brecon SW-NE to W of fort. CPAT HER PRN 14602 Mortimer's Cross - Clyro N-S to W of fort, small Proposed section in a predicted line. Hereford HER No. 58247 Kenchester - Brecon E-W past N of fort.	Continuation of Hereford HER No. 58247 Kenchester - Brecon E-W past N of fort.	No known roads. Likely to be a result of lack of investigation.	N/A	CPAT HER PRN 33127 Hindwell - Penybont small section of proposed R rd E-W to N of fort. Hereford HER No. 58244 Abbey Dore - Newton E-W past N of fort. Continuation of CPAT HER PRN 11602 - 11607 Kenchester - Brecon N-S to SW of fort.
Clyro GIS	CPAT HER PRN 11602 Kenchester - Brecon, N-S to W of fort.	Continuation of CPAT HER PRN 11602: PRN 11604 - 11601 Kenchester -	Hereford HER No. 58244 Abbey Dore - Newton E-W to NE of fort, small stretch	N/A	N/A	CPAT HER PRN 33127 Hindwell - Penybont small section

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
		Brecon, N-S past W of fort, turning to NE to N of fort. CPAT HER PRN 14602 Mortimer's Cross - Clyro, N-S to N of fort, mostly predicted, small stretch of proposed.	visible. Continuation of CPAT HER PRN 11602 - 11607 Kenchester - Brecon N-S to SW of fort..			of proposed R rd E-W to N of fort.
Brecon Gaer	CPAT HER PRN 11201 Kenchester - Brecon Gaer from N gate. CPAT HER PRN 47091 Abergavenny - Brecon Gaer E-W past N of fort. (Predicted roads present.)	Continuation of CPAT HER PRN 47092 Abergavenny - Brecon Gaer towards E. CPAT HER PRN 14103 Coelbren - Brecon Gaer towards SW, possibly from W gate of fort, small sections proposed and known, mostly predicted. (Other predicted roads present).	N/A	N/A	Continuation of CPAT HER PRN 11201 Kenchester - Brecon Gaer towards NE.	CPAT HER PRN 14015 - 47036 Cardiff - castell Collen N-S past E of fort (through MIDDLE distance, which was predicted line), small proposed sections, mostly predicted. Continuation of Kenchester - Brecon CPAT HER PRN 11607 ENE-WSW to W of fort. Continuation of Abergavenny - Brecon Gaer CPAT HER PRN 11104 NW-SE to E of fort, small proposed

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
						sections, mostly predicted. Continuation of Coelbren - Brecon Gaer, CPAT HER PRN 14118 - 14152, NE-SW to SW of fort, Known, proposed and predicted sections. CPAT HER PRN 11311 Brecon Gaer - Llandovery E-W to W of fort (towards W gate, MIDDLE AND NEAR sections Predicted), small proposed section, mostly predicted.
Llandeilo I	RR623 DAT HER PRN 11089 Llandovery-Carmarthen SW-NE to NE of fort and E-W to W of fort - the line on the W side is only suggested.	Continuation of RR623 DAT HER PRN 11089 Llandovery-Carmarthen SW-NE to NE of fort and E-W to W of fort - the line on the W side is only suggested.	Continuation of RR623 DAT HER PRN 11089 Llandovery-Carmarthen SW-NE to NE of fort and E-W to W of fort - both sides have known or probable stretches.	N/A	N/A	RR62c Llandovery - Pumsaint PRN 51972 - 33993, E-W to NE of fort.

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
	Possibly associated with the road (identified by geophysics and therefore undated and uncertain if in use during Fort 1) leading from the NE gate of Fort 2. The road branches about 60m from the fort. The branch possibly goes to the N of Penlan hill. (DAT Rep 47835, 5)	(Other suggested lines present).	W side is obscured. (Other suggested lines present).			
Llandeilo II	RR623 DAT HER PRN 11089 Llandovery-Carmarthen SW-NE to NE of fort and E-W to W of fort - the line on the W side is only suggested. Possibly associated	Continuation of RR623 DAT HER PRN 11089 Llandovery-Carmarthen SW-NE to NE of fort and E-W to W of fort - the line on the W side is only suggested.	Continuation of RR623 DAT HER PRN 11089 Llandovery-Carmarthen SW-NE to NE of fort and E-W to W of fort - both sides have known or probable stretches. W side is obscured.	N/A	N/A	RR62c Llandovery - Pumsaint PRN 33993 - 51972, E-W to NE of fort.

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
	<p>with the road (identified by geophysics and therefore undated and uncertain if in use during Fort 1) leading from the NE gate of Fort 2. (DAT Rep 47835, 5). This road forks about 90m from the fort. The branch possibly goes to the N of Penlan hill. (DAT Rep 47835, 5). Geophysics shows road from SE gate, which would have possibly continued to the S of Penlan hill, possibly bridging the river in the middle distance. Geophysics shows</p>	<p>(Other suggested lines present).</p>	<p>(Other suggested lines present).</p>			

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
	possible road from SW gate, which may have linked up with the road to Carmarthen (W side of RR623 DAT HER PRN 11089). (DAT Rep 47835, 5).					
Carmarthen	All suggested lines only.	DAT HER PRN 7459 (RR60d?) Cwmffrwd - Blwch y Gwynt N-S to S of fort, known section obscured but will pass through visible section as it proceeds N. RR623 DAT HER PRN 11089 - 33944 Carmarthen - Llandeilo, E-W to E of fort, small certain and probable stretches, mostly suggested. Some suggested lines.	Continuation of RR623 DAT HER PRN 11089 Carmarthen - Llandeilo, E-W to E of fort. DAT HER PRN 14277 - 28139, E-W to W of fort (continuous with RR623 via suggested line running through NEAR distance past N of fort), mostly certain and probable stretches.	N/A	Some suggested lines.	Continuation of DAT HER PRN 7459 (RR60d?) Cwmffrwd - Blwch y Gwynt N-S to S of fort. Suggested lines present.

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Loughor	GGAT RR60d-04. DAT RR60d DAT PRN 3401	Continuation of GGAT RR60d-04. GGAT RR60d-04 (meets RR60d-04 in middle distance). Continuation of DAT RR60d DAT PRN 3401	Continuation of GGAT RR60d-04. Continuation of GGAT RR60d-04. Continuation of DAT RR60d DAT PRN 3401.	N/A	N/A	N/A
Neath	GGAT RR60c-06 Cardiff - Neath. GGAT Neath - Y Gaer RR622-02.	Continuation of GGAT RR60c-06 Cardiff - Neath. Continuation of GGAT Neath - Y Gaer RR622-02.	Continuation of GGAT Neath - Y Gaer RR622-02.	N/A	N/A	Continuation of GGAT RR60c-06 Cardiff - Neath. RR60d-05 Neath - Loughor.
Coelbren	GGAT RR622-04 Neath - Y Gaer.	Continuation of GGAT RR622-04 Neath - Y Gaer, turning to RR622-03 and -02.				Continuation of GGAT RR622-02 Neat - Y Gaer.
Penydarren	N/A Road through Penydarren (RR621-02b) is conjectural (GGAT Report 2004/073).	GGAT RR621-02a. (Continuation of Road through Penydarren (RR621-02b) is conjectural (GGAT Report 2004/073).)	N/a	N/A	N/A	Continuation of GGAT RR621-02a (becomes -14). RR622-04 Coelbren-Brecon Gaer.

	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Fort						
Gelligaer I	N/A Possible line of Roman road	RR621 Castell Collen to Cardiff	N/A	N/A	N/A	Continuation of RR621 Castell Collen to Cardiff. RR60b Caerleon - Cardiff. (Predicted roads also present).
Gelligaer II	N/A Possible line of Roman road	RR621 Castell Collen to Cardiff	N/A	N/A	N/A	Continuation of RR621 Castell Collen to Cardiff. RR60b Caerleon - Cardiff. (Predicted roads also present).
Caerphilly	RR621 proposed road running N-S. (Predicted road also present).	Continuation of RR621 proposed road running N-S. (Predicted road also present).	N/A	N/A	N/A	Continuation of RR621 proposed road running N-S. RR60 runs E-E to S of fort. (Predicted road also present).
Caergwanaf	N/A None known.	N/A None known.		N/A None known.	N/A None known.	RR60 running E-W to S of fort. RR621 running N-S to E of fort. (Other predicted lines present)
Cardiff	RR621 and RR60	Continuation of RR621 and continuation of RR60	Continuation of RR621 and continuation of RR60	N/A	N/A	(Some predicted roads present).

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Caerleon	RR60b. RR62a. (Predicted road present).	Continuation of RR60b. Continuation of RR62a. RR62a (var). RR60a. (Predicted routes present).	Continuation of RR62a (var).	N/A	N/A	Continuation of RR60b. Continuation of RR62a. Continuation of RR60a. (Predicted routes present).
Usk	RR612b. (Predicted road present - RR62a exact course here is not certain). RR62a (var).	Continuation of RR612b. Continuation of RR62a. Continuation of RR62a (var).	Continuation of RR62a. Continuation of RR62a (var).	N/A	N/A	Continuation of RR612b.
Monmouth	RR612a	RR612a. RR6d	N/A	N/A	N/A	Continuation of RR612. Continuation of RR6d. RR62a. PastScape the Dean Road Obj ID2433/HOB UID 916680.
Kingsholm	GI HER Object ID 45297/Tag 8090. Ermin Street GI HER Object ID 45208/Tag 7542.	Continuation of GI HER Object ID 45297/Tag 8090. Continuation of Ermin Street GI HER Object ID 45208/Tag 7542.	Continuation of GI HER Object ID 45297/Tag 8090. Continuation of Ermin Street GI HER Object ID 45208/Tag 7542. GI HER Tag 12306.	N/A	N/A	N/A

Fort	NEAR: Known or proposed Roman roads partially visible or visible.	MEDIUM: Known or proposed Roman roads partially visible or visible.	FAR: Known or proposed Roman roads partially visible or visible.	NEAR: Known or proposed Roman roads obscured.	MEDIUM: Known or proposed Roman roads obscured.	FAR: Known or proposed Roman roads obscured.
Gloucester	GI HER Tag 8090. GI HER Tag 7365. GI HER Tag 7542 Ermin Street. GI HER Tag 7677.	Continuation of: GI HER Tag 8090. GI HER Tag 7365. GI HER Tag 7542 Ermin Street. GI HER Tag 7677.	Continuation of: GI HER Tag 8090. GI HER Tag 7542 Ermin Street. GI HER Tag 7677. GI HER Tag 12306.	N/A	N/A	GI HER Tag 7365.
Pen Llystyn	GAT PRN 36434. (Predicted lines also present).	Continuation of GAT PRN 36434. (Predicted lines also present).	Continuation of GAT PRN 36434 (it becomes PRN 36433, 36432, 36431, 36428, 36427). GAT PRN 17812. GAT PRN 17600. (Predicted roads also present)	N/A	N/A	N/A

Table VIII.2 Roman roads: watercourse crossings and presence/absence of Roman roads in each distance band

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
Caerhun	Likely.	Location uncertain	Yes	Yes	Yes
Tomen y Mur	No	N/A	Yes	Yes	Yes
Segontium	Yes. GAT PRN 5564 (uncertain date).	Partially visible.	No. Probable roads present	Yes	Yes
Llanfor	Yes	Partially visible.	Yes	Yes	Yes
Caer Gai	Yes.	River Dee SH87973122 Roman road GAT PRN 17792 - visible. Afon Lliw SH87243081 Roman road GAT PRN 17648- visible. Afon Llafar SH89283245 Roman road GAT PRN 17609. Afon Llafar SH89223257 Roman road 38164 - obscured.	Yes	Yes	Yes
Pennal/Cefn Caer	Probably - if the proposed extent of Roman road GAT PRN 36445 extended slightly further it would have crossed the river - a potential crossing point.	Partially visible.	Yes	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
Forден Gaer	Yes, middle distance. CPAT PRN 176 Rhydwhyman/Rhyd Chwima Ford across River Severn. See also CPAT Rep 690 p.3 which refers to CPAT PRN 163 possible ford marker stone.	Partially visible. (N and S gate views only - also partially visible)	Yes	Yes	Yes
Brompton	No	N/A	No. (No predicted roads present).	Yes	Yes
Caersws I	Yes (but closer to Caersws II) SO83849185 CPAT PRN 11729 known Roman road up to River Severn.	Partially visible	No. (No predicted roads present).	Yes but all heading towards Caersws II.	Yes
Caersws II	Yes. Known Roman road crossed Afon Carno at SO02639183.	Partially visible.	Yes	Yes	Yes
Chester			Yes	Yes	Yes
Rhyn Park	No. Proposed Roman road section CPAT PRN 47501 is near River Ceiriog but does not run right up to it..	N/A	No. (No predicted lines present).	Yes	Yes
Wroxeter	Likely crossing point of the Severn in the MIDDLE distance near SJ56080812, as a known Roman road runs up to this point of the river.	River Severn - obscured. River Tern - obscured.	Yes	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
	Shropshire HER 02884 possible Roman bridge remains at this location, although the remains have also been interpreted as a fish weir. Likely crossing point of the River Tern in the MIDDLE distance near SJ57001136.				
Leighton	Yes (possible). Historic crossing point of Severn to S of fort in MIDDLE distance at SJ59400450	Visible	No. (No predicted lines present).	None known. One possible R Road present.	Yes
Pen Llwyn	SUGGESTED Roman road running N-S crosses Afon Melindwr at SN65238029 and Afon Rheidol at SN64947981.	Afon Melindwr crossing - obscured. Afon Rheidol crossing - visible.	No (Suggested lines present)	Yes	Yes
Trawscoed	(2 suggested lines of Roman road cross the River Ystwyth to the W of the fort in the NEAR distance; one at SN66877275 and one at SN66897258.)	(SN66877275 - obscured. SN66897258 - obscured)	Yes	Yes	Yes
Cae Gaer	Uncertain	N/A	No (predicted lines present).	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
Jay Lane	Hereford HER No. 21088 Bridge or Ford - approximate location of assumed bridge or fort over Watling St to SE of fort (S of town). Exact location unknown - MIDDLE DISTANCE: could have been visible or obscured, depending on crossing point. If a road ran from the fort's W gate it is likely to have crossed the River Clun. This too may have been obscured or visible.	Hereford HER No. 21088 Bridge or Ford - Exact location unknown - MIDDLE DISTANCE: could have been visible or obscured, depending on crossing point. Possible road from W gate is likely to have crossed the River Clun. This too may have been obscured or visible.	No. Predicted lines present.	Yes	Yes
Buckton	Likely crossing point of Teme but location uncertain.	Uncertain.	Yes	Yes	Yes
Llanio	Known section of Roman road approaches the Afon Teifi to SW of fort at SN642559. Crossing point is likely in this area.	Visible	Yes	Yes	Yes
Pumsaint	Yes? Probable line of Roman road DAT HER PRN 51972 RR62c crosses the Afon Cothi to S of fort in proximity of SN65644045 in NEAR	Rver Cothi probable crossing point - visible. River Annell crossing - obscured.	Yes	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
	distance. Probable line of Roman road DAT HER PRN 51972 RR62c crosses the Afon Annell to S of fort in proximity of SN66143850 in MIDDLE distance.				
Llandovery I	Probable line of RR623 crosses Afon Bran at SN78323625 to NE of fort in MIDDLE distance. Probable line of RR62c crosses Afon Tywi at SN75533775 in MIDDLE distance. Also 2 probable line crossings of Tywi to SW of fort in MIDDLE distance (SN76003455 and SN75653381). (Possible bridging point noted along SUGGESTED line of Roman road DAT HER PRN 4085 and another on a SUGGESTED route to SW of fort DAT HER PRN 51962).	Probable line of RR623 crosses Afon Bran at SN78323625 to NE of fort - partially visible. Probable line of RR62c crosses Afon Tywi at SN75533775 - obscured. Also 2 probable line crossings of Tywi to SW of fort in MIDDLE distance (SN76003455 and SN75653381) - obscured.	Yes	Yes	Yes
Llandovery II	Probable line of RR623 crosses Afon Bran at SN78323625 to NE of fort in	Probable line of RR623 crosses Afon Bran at SN78323625 to NE of	Yes	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
	MIDDLE distance. Probable line of RR62c crosses Afon Tywi at SN75533775 in MIDDLE distance. Also 2 probable line crossings of Tywi to SW of fort in MIDDLE distance (SN76003455 and SN75653381. (Possible bridging point noted along SUGGESTED line of Roman road DAT HER PRN 4085 and another on a SUGGESTED route to SW of fort DAT HER PRN 51962).	fort - partially visible. Probable line of RR62c crosses Afon Tywi at SN75533775 - obscured. Also 2 probable line crossings of Tywi to SW of fort in MIDDLE distance (SN76003455 and SN75653381) - partially visible.			
Caerau (Beulah)	Known line of Roman road heads towards Afon Cammach at SN92285069 to N of fort in MIDDLE distance. Proposed line of Roman road crosses Afon Irfon near SN91954698 to S of fort in MIDDLE distance.	SN92285069 - visible. SN91954698 - obscured.	Yes	Yes	Yes
Castell Collen	CPAT HER PRN 47637 from SW gate in NEAR distance is likely to cross River <i>eithon</i> near SO056625.	Obscured	Yes	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
Colwyn Castle	No	N/A	No. (No predicted lines present).	No	Yes
Hindwell Farm	No. Road from S gate may have crossed Summergil Brook but uncertain where.	N/A	Yes	Yes	Yes
Clifford	No known crossing points (potential Roman road lines from fort unknown)	N/A	No (No predicted lines present).	Yes	Yes
Clyro	Proposed line of Roman road CPAT HER PRN 11602 crosses River Wye in MIDDLE distance to S of fort SO22814260.	Partially visible	Yes	Yes	Yes
Brecon Gaer	NEAR: only predicted lines cross a river (Ysgir). MIDDLE: only predicted lines cross a river (Usk)	N/A	Yes	Yes	Yes
Llandeilo I	No	N/A	Yes	Yes	Yes
Llandeilo II	No. (Not certain - road from SE gate may have crossed river but not confirmed)	N/A	Yes	Yes	Yes
Carmarthen	Yes? Suggested line of RR60d is thought to cross river Towy to S of fort as it's the lowest crossing point	Partially visible (most of S banks are visible)	No. Suggested lines only.	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
	(James in Burnham and Davies 2010, 234).				
Loughor	Yes. (Ford point where DAT RR60d PRN 6401 crosses river).	Partially visible	Yes	Yes	Yes
Neath	Yes - known RR crosses the Neath.	Partially visible	Yes	Yes	Yes
Coelbren	No (line of road crosses minor river)	N/A	Yes	Yes	Yes
Penydarren	N/A (Line of RR uncertain)	N/A	No. (Predicted lines present).	No. (Predicted roads present).	Yes
Gelligaer I	N/A (Line of RR uncertain)	N/A	No. (Predicted lines present).	Yes	Yes
Gelligaer II	N/A (Line of RR uncertain)	N/A	No. (Predicted lines present).	Yes	Yes
Caerphilly GIS	N/A (known/proposed RR crosses minor river)		Yes	Yes	Yes
Caergwanaf	N/A	N/A	No. (No predicted lines present).	No	Yes
Cardiff	Yes - Afon Taf, although river has changed course.	Visible, although river has changed course.	Yes	Yes	Yes
Caerleon	Yes. RR likely crossed the Aon Llwyd.	Incertain - precise line of RR in vicinity of river Llwyd is uncertain.	Yes	Yes	Yes

Fort	Known major river crossing point in NEAR or MIDDLE distance?	River crossing point visible, partially visible or obscured?	Known or proposed Roman roads present in near distance?	Known or proposed Roman roads present in middle distance?	Known or proposed Roman roads present in far distance?
Usk	RR62a crosses the Usk at some point but exact location uncertain (GGAT Rep 2004/073).	Partially visible (Usk).	Yes	Yes	Yes
Monmouth	Yes - roads would have crossed Monnow and Wye, but locations uncertain.	Uncertain	Yes	Yes	Yes
Kingsholm	Yes - assumed crossing of River Severn Holbrook 2010 in Burnham and Davies).	Uncertain	Yes	Yes	Yes
Gloucester	Yes. GI HER Tag 7677 crosses the Severn (former course).	Visible.	Yes	Yes	Yes
Pen Llystyn	No. (Predicted line crosses the Afon Dwyfor).	N/A	Yes	Yes	Yes

Appendix IX Legionary fortress and forts comparison

Table IX.1 Legionary fortress and auxiliary fort data comparison

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
Fort size (ha)	24.4	16	19.5	20.5	Uncertain	17.8	Mean (of 5 fortresses): 19.64 Range: 16 to 24.4	Mean: 2.73. Range: 1.05 to 9.5	The fortresses are considerably larger than the auxiliary forts.
Elevation: highest point within fort (MASL)	30	70	15	20	15	20	Mean: 28.3 Range: 15 to 70	Mean: 124.0 Range: 10 to 370	The mean elevation of the auxiliary forts is over 4 times higher than that of the fortresses. The lower ranges of both sets of forts is similar but the upper range for the auxiliary forts is over 5 times higher.
Topography type	Undulating lowland	Valley	Valley	Valley	Valley	Valley	Undulating lowland: 1 fortress (16.7%)	Undulating lowland: 5	The proportions of undulating

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
							Valley: 5 fortresses (83.3%)	forts (11.9%) Valley: 37 forts (88.1%)	lowland to valley is similar for both sets of forts.
Location within topography type	Plateau in undulating lowland	Rise/plateau in valley floor	Valley floor	Spur from valley side	Valley floor	Rise/plateau in valley floor	Rise/plateau in valley floor: 2 (33.3%) Spur from valley side: 1 (16.7%) Valley floor: 2 (33.3%) Plateau in undulating lowland: 1 (16.7%) Valley side: 0 Rise between 2 valleys: 0	Rise/plateau in valley floor: 16 (38.1%) Spur from valley side: 11 (26.2%) Valley floor: 6 (14.3%) Plateau in undulating lowland: 5 (11.9%) Valley side: 2 (4.8%) Rise between 2 valleys: 2 (4.8%)	The legionary fortresses show a range of locations within the topography types, which is similar to the auxiliary forts. Some of the proportions of each differ between the two sets of forts, notably <i>spur from valley side</i> and <i>valley floor</i> , but there are too few fortresses compared to location types to form

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
									a reliable comparison.
Topography within fort	Sloping and central spine	Sloping and domed	Flat	Sloping and domed	Sloping	Domed	Sloping: 1 (16.7%) Flat: 1 (16.7%) Domed: 1 (16.7%) Central spine: 0 Mix of flat and sloping: 0 Sloping and domed: 2 (33.3%) Sloping and central spine: 1 (16.7%)	Sloping: 10 (23.8%) Flat: 3 (7.1%) Domed: 4 (9.5%) Central spine: 2 (4.8%) Mix of flat and sloping: 3 (7.1%) Sloping and domed: 11 (26.2%) Sloping and central spine: 9 (21.4%)	The legionary fortresses show a range of topography types within the fortresses, which is similar to the auxiliary forts. Some of the proportions of each differ slightly between the two sets of forts, but there are too few fortresses compared to topography types to form a reliable comparison.
Visibility of interior	Partially visible	Fully visible	Partially visible	Fully visible	Uncertain	Partially visible	Fully visible: 2 (33.3%)	Fully visible: 30 (71.4%)	A far greater proportion of auxiliary fort

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
							Partially visible: 3 (50%) Uncertain: 1 (16.7%)	Partially visible: 10 (23.8%) Uncertain: 2 (4.8%)	interiors were fully visible from fort gates than the interiors of the fortresses. This may be a consequence of the larger size of the fortresses; a larger area gives more opportunity for undulations to cause obscured areas. In both sets of data, however, none of the fort interiors was completely obscured.
Maximum gradient	5.3	6.8	9	2.5	6.4	5.1	Mean: 5.85 Range: 5.1 to 9	Mean: 7.15 Range: 0.5 to 25	The mean gradient was similar in

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
within fort (degrees)									both data sets but there was a greater range with the auxiliary forts, showing that a small number of auxiliary forts' maximum gradients were up to 3.5 times steeper than the average fortress. The results indicate that steeper gradients were avoided by fortresses.
Maximum gradient of descending land beyond the forts in near	30.8	33	0	7	Uncertain	9.4	Mean: 16.04 Range: 0 to 33 (Mean of 5 forts)	Mean: 18.1 Range: 0.3 to 47.8	Maximum range for auxiliary forts is over a third higher than fortresses.

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
distance (degrees)									The mean, however, is similar.
Maximum gradient of ascending land beyond the forts in near distance (degrees)	0	26	0	3.6	Uncertain	5	Mean: 6.92 Range: 0 to 26 (Mean of 5 forts)	Mean: 7.5 Range: 0 to 31.6	Similar
Visibility of descending land beyond the forts in near distance	Partially visible	Partially visible	Partially visible	Partially visible	Uncertain	Partially visible	Visible: 0 (0%) Partially visible: 5 (100%) Obscured: 0 (0%) Uncertain: 1	Visible: 2 (4%) Partially visible: 38 (95%) Obscured: 0 (0%) Uncertain: 2	Similar
Visibility of ascending land beyond the forts in near distance	Partially visible	Partially visible	Partially visible	Partially visible	Uncertain	Partially visible	Visible: 0 (0%) Partially visible: 5 (100%) Obscured: 0 (0%) Uncertain: 1	Visible: 9 (22.5%) Partially visible: 31 (77.5%) Obscured: 0 (0%) Uncertain: 2	No fortresses had complete visibility of the ascending land whereas nine auxiliary forts did. The ascending land was not completely obscured in

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
									either data set however.
Within a bend in a watercourse or with watercourses present on 2 or more sides?	Yes	Yes	Yes	Yes	No	No	Yes: 4 (66.6%) No: 2 (33.3%)	Yes: 23 (54.8%) No: 19 (45.2%)	Similar
Watercourse type closest to the fort (main or tributary)?	Main	Main	Main	Main	Main	Main	Main: 6 (100%) Tributary: 0 (0%)	Main: 26 (61.9%) Tributary: 16 (38.1%)	All the fortresses had main rivers as the closest watercourse. A high proportion (61.9%) of the auxiliary forts were similar but not all.
Watercourse present in the near distance?	Yes	Yes	Yes	Yes	Yes	Yes	Yes: 6 (100%) No: 0 (0%)	Yes: 35 (83.3%) No: 7 (16.7%)	All the fortresses had a watercourse in the near distance. Most (83.3%) of the auxiliary forts

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
									were similar but not all.
Visibility of near distance watercourse	Obscured	Obscured	Obscured	Obscured	Partially visible	Partially visible	All fully visible: 0 All partially visible: 2 (33.3%) All obscured: 4 (66.7%) One watercourse visible and one partially visible: 0 One partially visible and one obscured: 0 One visible and one obscured: 0	All fully visible: 3 (8.6%) All partially visible: 18 (51.4%) All obscured: 10 (28.6%) One watercourse visible and one partially visible: 2 (5.7%) One partially visible and one obscured: 2 (5.7%) One visible and one obscured: 0 (0%)	A greater proportion of near distance watercourses were completely obscured from fortresses (66.7%) than auxiliary forts (28.6%).
Visibility of near distance watercourse banks	Obscured	Obscured	Partially visible	Partially visible	Partially visible	Partially visible	All fully visible: 0 All partially visible: 4 (66.7%) All obscured: 2 (33.3%)	All fully visible: 7 (20%) All partially visible: 19 (54.3%)	A greater proportion of near distance watercourse banks were completely

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
							<p>One watercourse visible and one partially visible: 0</p> <p>One partially visible and one obscured: 0</p> <p>One visible and one obscured: 0</p>	<p>All obscured: 6 (17.1%)</p> <p>One watercourse visible and one partially visible: 2 (5.7%)</p> <p>One partially visible and one obscured: 1 (2.9%)</p> <p>One visible and one obscured: 0 (0%)</p>	<p>obscured from fortresses (33.3%) than auxiliary forts (17.1%), although the contrast is not s great as with the near distance watercourses ; more of the fortresses (66.7%) had visible watercourse banks than visible watercourses , which made the banks results closer to those of the auxiliary forts.</p>
Do 2+ watercourses meet in the near and/or middle distances?	No	Yes	Yes	Yes	Yes	Yes	<p>Yes: 5 (83.3%)</p> <p>No: 1 (16.7%)</p>	<p>Yes: 25 (59.5%)</p> <p>No: 17 (40.5%)</p>	

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
Visibility of river confluences	N/A	Severn and Tern: obscured Rodan and Tern: visible	Partially visible	Partially visible	Uncertain	Uncertain	<p>All visible: 0 All partially visible: 2 (40%) Some visible, some partially visible: 0 Some visible, some obscured: 1 (20%) Some partially visible, some obscured: 0 All obscured: 0 Uncertain: 2 (40%)</p> <p>Percentages of the 5 fortresses where 2+ watercourses meet in the near and/or middle distances.</p>	<p>All visible: 3 (12%) All partially visible: 10 (40%) Some visible, some partially visible: 1 (4%) Some visible, some obscured: 0 Some partially visible, some obscured: 1 (4%) All obscured: 10 (40%) Uncertain: 0</p> <p>Percentages of the 25 auxiliary forts where 2+ watercourses meet in</p>	<p>None completely obscured from fortresses, compared to 40% from auxiliary forts. However, there are too few fortresses (3) with certain river confluences to form a reliable comparison.</p>

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
								the near and/or middle distances.	
Is there a point where 2+ valleys meet in the near and/or middle distances?	Yes	Yes	Yes	Yes	No	No	Yes: 4 (66.6%) No: 2 (33.3%)	Yes: 27 (64.3%) No: 15 (35.7%)	Similar
Is the fort in the centre of the valley meeting points?	Yes	Yes	Yes	Yes	N/A	N/A	Yes: 4 (100%) No: 0 Percentages of the 4 fortresses where 2+ valleys meet in near and/or middle distances.	Yes: 14 (51.9%) No: 13 (48.1%) Percentages of the 27 auxiliary forts where 2+ valleys meet in near and/or middle distances.	All relevant fortresses were in the centre of the valley meeting points, compared to only about half of auxiliary fortresses. There were only 4 relevant fortresses to use as a comparison, however,
Visibility of the valley	N/A	Partially visible	Partially visible	Partially visible	N/A	N/A	Fully visible: 0 (0%)	Fully visible: 0 (0%)	All of the fortresses had some

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
meeting points							Partially visible: 3 (100%) Obscured: 0 (0%) Percentages of the 3 fortresses where 2+ valleys meet in near and/or middle distances.	Partially visible: 20 (74.1%) Obscured: 7 (25.9%) Percentages of the 27 auxiliary forts where 2+ valleys meet in near and/or middle distances.	visibility of the valley meeting points compared to most (74.1%) but not all of the auxiliary forts. There were only 3 relevant fortresses to use as a comparison, however,
Middle distance main valley floor visible or partially visible?	N/A	Yes	Yes	Yes	Yes	Yes	Yes: 5 (100%) No: 0 (0%) Percentages of the 5 fortresses which have main valleys in their middle distances.	Yes: 37 (100%) No: 0 (0%) Percentages of the 37 auxiliary forts which have main valleys in their middle distances.	Similar
Middle distance main valley sides visible	N/A	Yes	Yes	Yes	N/A	N/A	Yes: 3 (100%) No: 0 (0%) Percentages of the 3 fortresses	Yes: 37 (100%) No: 0 (0%)	Similar There were only 3 relevant

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
or partially visible?							which have main valleys in their middle distances.	Percentages of the 37 auxiliary forts which have main valleys in their middle distances.	fortresses to use as a comparison, however.
Full width of main valley floor visible in at least one direction?	N/A	Yes	Yes	Yes	No	No	Yes: 3 (60%) No: 2 (40%) Percentages of the 5 fortresses which have main valleys in their near and middle distances (i.e., are located within valleys).	Yes: 34 (91.9%) No: 3 (8.1%) Percentages of the 37 auxiliary forts which have main valleys in their near and middle distances (i.e., are located within valleys).	A greater proportion of auxiliary forts had a full view of the main valley in at least one direction.
Fort placed as far along the valley as possible before a narrowing of the valley?	N/A	No	No	Yes	No	No	Yes: 1 (20%) No: 4 (80%) Percentages of the 5 fortresses located within valleys.	Yes: 20 (54.1%) No: 17 (45.9%) Percentages of the 37 auxiliary	A greater proportion of auxiliary forts were placed as far along a valley as possible.

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
								forts located within valleys.	
Full width of valley floor visible in the direction in which the fort is situated as far along the valley as possible?	N/A	N/A	N/A	Yes	N/A	N/A	Yes: 1 (100%) No: 0 (0%) Percentages of the 1 fortress placed as far along a valley as possible before a narrowing of the valley.	Yes: 16 (80%) No: 4 (20%) Percentages of the 20 auxiliary forts placed as far along a valley as possible before a narrowing of the valley.	Similar but there was only 1 relevant fortress to use as a comparison.
Is the closest watercourse visible, partially visible or obscured in the middle distance?	Partially visible	Partially visible	Obscured	Partially visible	Partially visible	Partially visible	Fully visible: 0 (0%) Partially visible: 5 (83.3%) Some partially visible, some obscured: N/A Obscured: 1 (16.7%)	Fully visible: 0 Partially visible: 36 (85.7%) Some partially visible, some obscured: 1 (2.4%)	Similar

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
								Obscured: 5 (11.9%)	
Are the closest watercourse banks visible, partially visible or obscured in the middle distance?	Partially visible	Partially visible	Partially visible	Partially visible	Partially visible	Partially visible	Fully visible: 0 (0%) Partially visible: 6 (100%) Some partially visible, some obscured: N/A Obscured: 0 (0%)	Fully visible: 0 Partially visible: 41 (97.6%) Some partially visible, some obscured: 0 Obscured: 1 (2.4%)	Similar
Overall altitude of fort compared to the rest of the middle distance	Higher than some, equal to some, lower than some	Higher than some, equal to some, lower than some	Higher than some, equal to some, lower than some	Higher than some, equal to some, lower than some	Higher than some, equal to some, lower than some	Higher than some, equal to some, lower than some	Higher than all other topography: 0 (0%) Higher than some, equal to some other topography: 0 (0%) Higher than some, equal to some, lower than some other	Higher than all other topography: 0 (0%) Higher than some, equal to some other topography: 0 (0%) Higher than some, equal to some, lower than	Similar

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
							topography: 6 (100%) Equal to the other topography: 0 (0%) Lower than some, equal to some other topography: 0 (0%) Lower than all other topography: 0 (0%)	some other topography: 42 (100%) Equal to the other topography: 0 (0%) Lower than some, equal to some other topography: 0 Lower than all other topography: 0 (0%)	
Far distance main valley floor visible or partially visible?	Yes	Yes	Yes	No	Yes	Yes	Yes: 5 (83.4%) No: 1 (16.6%) Percentages of the 6 fortresses with a main valley present in the far distance band.	Yes: 10 (28.6%) No: 25 (71.4%) Percentages of the 35 auxiliary forts with a main valley present in the far distance band.	A greater proportion of the fortresses had some visibility of their main valley in their far distance bands.

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
Far distance main valley sides visible or partially visible?	Yes	Yes	Yes	Yes	Yes	Yes	Yes: 6 (100%) No: 0 (0%) Percentages of the 6 fortresses with a main valley present in the far distance band.	Yes: 25 (71.4%) No: 10 (28.6%) Percentages of the 35 auxiliary forts with a main valley present in the far distance band.	A greater proportion of the fortresses had some visibility of their main valley in their far distance bands, although the contrast was not so great as with valley floors; more auxiliary forts had some visibility of the valley sides.
Is the closest watercourse visible, partially visible or obscured in the far distance?	Obscured	Obscured	Obscured	Obscured	Obscured	Partially visible	Visible: 0 (0%) Partially visible: 1 (16.7%) Obscured: 5 (83.3%) Percentages of the 6 fortresses where the nearest watercourses extended into	Visible: 0 (0%) Partially visible: 8 (22.2%) Obscured: 28 (77.8%) Percentages of the 36 auxiliary forts where the nearest	Similar

	Chester	Wroxeter	Usk	Caerleon	Kingsholm	Gloucester	Legionary fortresses	Auxiliary Forts	Notes
							the forts' far distance bands.	watercourses extended into the forts' far distance bands.	
Are the closest watercourse banks visible, partially visible or obscured in the far distance?	Obscured	Obscured	Obscured	Obscured	Obscured	Partially visible	Visible: 0 (0%) Partially visible: 1 (16.7%) Obscured: 5 (83.3%) Percentages of the 6 fortresses where the nearest watercourses extended into the forts' far distance bands.	Visible: 0 (0%) Partially visible: 10 (27.8%) Obscured: 26 (72.2%) Percentages of the 36 auxiliary forts where the nearest watercourses extended into the forts' far distance bands.	Similar

Percentages mean calculations in the Auxiliary Forts column represent the percentages of the 42 auxiliary forts unless otherwise stated.

Percentages and mean calculations in Legionary Fortresses column represent the percentages of the 6 legionary fortresses unless otherwise stated.

Appendix X Fieldwork and GIS data collection notes

Caerhun fieldwork notes

On a plateau overlooking the river in a narrow, undulating valley. Valley extends roughly N-S, with fort beyond closer to the E side. Fairly flat, usable area just beyond and below fort to S, before descent to flood plain. Gently sloping area to N (vicus location) before steeper descent. Probable usable areas to W too- views obscured by trees. To E is a fairly steep descent to the river and beyond this is the hillside forming the E side of the valley.

The views are much obscured by trees and a chapel. The furthest visible points appear to be to the N and S; the valley sides to the E and W are closer and obscure views beyond, apart from a few gaps to the E. The best views are along the valley and river to the S. Middle distance topography obscures the view in more places to the N. The fort would have dominated the views from the river and valley sides. Good views along quite a long stretch of the river. The hillside to the E of this dominates and obscures views beyond. Views W are heavily obscured by trees but there appears to be good views of an undulating valley (with hidden dips) rising to valley sides in the middle distance and glimpses of mountaintops beyond.

Views from fort: near

Probably good views of rivers and along valley to W, although obscured by trees now. Good views along valley to SE and E.

Views from fort: middle

Good views along the river, especially to S and E and some to N. There are some hidden areas of the valley as a result of the topography. Also obscured beyond valley sides.

Views from fort: far

The best views of the far distance are to the S. Otherwise, mountaintops are visible in places between gaps in the middle distance topography.

Caerhun GIS notes

Situated on a plateau overlooking the river. It is located as close to the W bank of the river as possible without being on inappropriately steep or damp/flooding land. The land rises gently to the W, showing that the fort is not at the highest point in the near distance, perhaps indicating that proximity to the river or proximity to the steep descent on the E was considered more useful than altitude.

Views from fort: near

There is a steep descent to the flood plain and river immediately beyond the E wall of the fort, showing that the fort is located as close to the river as possible without being on inappropriately steep or damp/flooding land. To the N and S are areas of fairly flat land (vicus area to the N), beyond which the ground slopes away fairly steeply.

Views from fort: middle

The valley widens slightly to the N of the fort before narrowing again at the northernmost area of the middle distance. This valley base N of the fort is undulating and includes points that are higher than the fort itself; the fort is located on the most southerly section of the area of the valley's undulations. Some higher locations within this area appear to have also been suitable for a fort; perhaps not quite so flat but overlooking the river with land falling away on most sides. The higher altitude, however, would mean that the river itself could not be accessed so quickly. To the S, areas adjacent to the river are low-lying and part of the flood plain and therefore, at present, would not be suitable for a fort location. There are areas of land that could have housed a fort to the SW and SE of the fort, where the land starts to rise to the valleysides before they become too steep. There is modern housing here now. These locations, while overlooking the river, are not adjacent to the river, however, and are in the shadow of the hillsides and therefore a different character from the fort location. It would seem, therefore, that the fort is located at the southernmost point in the valley where it can be next to the river (river falls within near distance band) without being in the shadow of the valley side (where valley side is not in near distance band). To the E of the fort, the land rises steeply beyond the river to the valleysides. Beyond these is another smaller, narrow valley with a river which flows into the Conwy river further N. Beyond that is undulating upland. To the W, is gently undulating valley base before the rise of the valley sides. The fort, like the river, is therefore located closer to the E side of the valley. Beyond

the W valley sides is undulating upland, with some rivers that run into the Conwy River. The closest river to the fort, apart from the R Conwy, is a tributary of the Conwy River and runs south-westward from the river past the S of the fort, just beyond the extent of the near distance band. It then turns northwards past the fort and westwards again, extending beyond the middle distance band. Other rivers are also present within the middle distance band, most run into the R Conwy at various points.

Views from fort: far

N- Undulating upland, some habitable valleys, coastline, Great Orme, SE of Anglesey and start of M Straits. The river turns to estuary and empties into the sea. The sea takes up much of the far distance band. S-Continuation of valley with undulating upland beyond and surrounding it. Some habitable valleys. Rivers and lakes. E and W - undulating upland with some habitable valleys, rivers, lakes.

Much of the near distance view to the W is visible but only well from the W gate. There are hidden dips to the S where the land falls away, but these may have been visible from fort towers. Most of the area of flood plain and river that extends into the near distance view is visible from at least one of the gates. Patchy visibility to the N - hidden dips to NE as land falls away, possibly visible from towers. Patchy visibility of Roman roads extending to N and S.

Patchy visibility of undulating valley floor for approximately 2km and then obscured. Valley sides are visible, apart from hidden areas of overlapping hills, and some hilltops are visible beyond. Only approximately 1km of river is visible northwards from the fort, ie one straight patch before bend north-eastwards 900m to the N. Small patches of river visible here and there beyond this to the N. To the S, quite large patches of the valley floor/flood plain are visible but the river itself is mostly obscured beyond about 600m S of the fort. The complete width of the valley floor is visible approximately 950m S of the fort (looking upstream). Also good visibility of the valley sides, apart from overlapping topography, but there are only limited views beyond. Much of the tributary river/stream that flows just to the S of the fort and into the R Conwy is visible as it passes the S of the fort. To the W, the valley floor just beyond the near distance is obscured for approximately 600m. Beyond that is the start of the rise of the valley sides and has patch visibility. To the SW, the valleysides begin a little nearer and therefore visibility starts nearer accordingly. To the E, the river, banks beyond and rise of the valley sides are

visible. The high valley sides obscure views beyond. To N- patches of R road visible, to S good patches of Roman road visible.

Small patches of upland visible to the NE, NW and W in the nearer section of the far distance band. Patches of the valley are visible to the S to the end of the valley and then patches of upland beyond.

Comparison with OS 1st edition map: Land use similar. Path of river and extent of flood plain the same. To S, the course of the river and extent of the flood plain remains much the same. 1st ed OS notes that the river is still tidal S of the fort. Course of river also the same to the N. Land use in middle distance remains similar on both maps, although there are now more and larger areas of housing, other buildings and associated infrastructure.

Tomen y Mur fieldwork notes

On the side of a wide valley. Undulating upland to S. Some boggy areas. Area to E of fort area appears to be one of the most level spots in the area. Lake to W is a modern reservoir, would have been valley. River/stream runs past S of fort. Fort itself is on quite a steep slope but there are relatively few undulations within the fort area and, apart from the gradient, is one of the 'flattest' spaces at such an elevation within the area. There is possibly an equivalent on the hill to the S but there would be poor views beyond. There is a hillside and higher ground to the E.

Views to the N are obscured by the topography (slope of ground on which fort is placed) when standing in the centre of the fort. The motte also obscures views and is now a dominant feature. Otherwise there is a general impression of rolling hills with higher mountains beyond.

Views from fort: near

Motte obscures some views. Trees also obscure some views, especially to the NE. From the highest point of the fort - hidden dip just beyond the NW of the fort, obscures quite a large area. N and NE are some undulations with hidden dips but otherwise good views. Trees to E obscure some views.

Views from fort: middle

From fort centre - higher hills to E and SE obscure views beyond. High ground to S on far edge of middle distance. Obscures view beyond. Similar situation beyond the reservoir to the W. Much of the base of the reservoir would probably have been easily visible. from highest point of fort - rises in ground in near and mid distances obscures some views to the N and NW.

Views from fort: far

From fort centre - mountaintops to S, W and NE.

Tomen y Mur GIS notes

The fort is draped over the apex of a hill; the highest point being approximately 30m into the fort from the NW gate. The fort was later reduced in size (under Hadrian) and the NW wall was brought back to follow the line of the highest point. From this high point the land falls away to the NW, S and E. The fort itself is on part of the S and E slope. There is a small fairly flat area beyond the NW gate before the steep descent begins to the NW. A stream runs through the near distance, past the fort to the SE. To the E, beyond the fort the ground is fairly flat, with a gentle rise starting just beyond the amphitheatre on the edge of the near distance band.

Middle distance topography: To the N is a descent to an undulating valley, running roughly E-W, then turning northwards on the E side. Beyond that is the rise of valley sides, apart from where the valleybase turns N and runs beyond the middle distance band. To the E, the hill on whose lower slopes the fort is situated, rises and extends eastwards. To the SW a valley (now reservoir) runs N-S, past the W of the fort. To the S is undulating land, the lower parts of which contain streams which meet the valley to the SW/W. To the W, the fort overlooks lower land spanning the gap between the two valleys.

The fort had good views over the valley (now reservoir) to the SW and only limited views in other directions within the middle distance. Why not put the fort within the valley? The OS 25inch 1st ed map shows that a river, Afon Brysor, ran through the valley and that there were numerous streams running across the valley to meet the river. Farmsteads and mills were present within the valley, but only near the edges of the present day reservoir. These points suggest that the valley base may have

been quite damp. The SE area of the reservoir (SH70333503) is labelled as being 'liable to floods' on the 1st ed map. The 1st ed map (and modern maps) does not show the contours of the valley base - there may not have been a rise in ground within the valley suitable for a fort. The fort had views of some of the descent to the valley to the N (Ffestiniog) but no views of the valley itself. This valley was somewhat further away than the one to the SW (approximately 3km to Ffestiniog, approximately 2km to the middle of the reservoir).

Views from fort: near

In total, most of the N, E and S of the near distance is visible, although there are patches of invisibility, including most of the stream that runs past the S of the fort. A large section of the steep slope to the W of the fort is obscured from all gates. The fort is on land sloping NW-SE and there is also a slight rise in the centre of the fort, running NW-SE, meaning that some of the gates are obscured from each other, although this probably would not have been the case from the top of the towers.

Views from fort: middle

To the N, patches of the descent beyond the fort are visible but most of the valley running roughly E-W to the N of the fort is obscured. This is in contrast to the valley running N-S to the SW, where most of the valley and valley sides are visible from the fort. The section of undulating land connecting the two valleys to the fort's W is visible in patches (hidden dips of undulations) and becomes mostly obscured beyond the higher undulations towards the furthest half of the middle distance. To the E, the land rises and patches of this rise are visible from the fort and then obscured beyond the highest points. There are therefore only limited views to the N and E. If a road had run through the valley to the SW it would have been visible for most of the valley extent.

Views from the fort: far

Upland points visible in all directions and extending far into the far distance band.

Comparison with OS 1st edition map: Land use in the middle and near distances are very similar on modern and 1st edition maps. Exceptions - reservoir, power station and associated features on modern map and there are a few more buildings on modern map, especially in the villages.

Segontium site visit notes

View very much obscured by trees and houses. On a high plateau overlooking the Menai Straits and surrounding land in the near and middle distances. Higher ridge to the NW in the middle distance. Mountains dominate in the far distance to the S and E. Fort may have dominated the view from near and middle distances, including parts of the Straits and S Anglesey, although the ridge would have obscured some view of fort area from the Straits/Anglesey direction.

Appears likely to have been good views in the near distance. Higher ground - ridge - in the middle distance to the NW and W obscures the view beyond. Anglesey and mountains dominate in the far distance.

Views from fort: near

Views obscured to NE, E and SE (trees). Probably good views from fort as ground is level and falls away within and beyond the fort.

Views from fort: middle

Views obscured to the NE, E and SE. Generally probably good views of the middle distance as the fort appears to be higher than most of the mid distance area. There is higher ground to the N/NW - a ridge in the middle distance - which obscures views of the Straits and Anglesey beyond. The rest of the area is probably undulating lower ground with hidden dips. Menai Straits to N.

Views from fort: far

Much obscured. Probably good views of Anglesey, the sea and mountains.

Segontium GIS notes

The fort is on a high point near the Menai Straits, the sea and a river; where the river meets the sea. It is not the highest point of the middle distance; there are rises to the E and NW of a similar height but these are not flat enough to accommodate a fort. There are also high, fairly flat areas approximately 1.5km to the S (at the base of steep hillsides) and 2.3km to the NE. These are not 'near' the combination of the sea, Straits and a river/estuary. The areas to the S are at the base of steep hillsides,

essentially in the 'shadow' of the hills, and further from the Straits and the sea. A river is nearby but it is not at the point of an estuary. Essentially, the S areas are of a different character. The areas to the NE are in undulating land. Potential fort locations are not so near a river. It is also overlooking the Straits but further from the open sea to the W. It would therefore appear that proximity to the river/estuary, M Straits and sea to the N were of significance. The fort is on a high point, with land falling away fairly steeply on all but the E side in the near distance. In the middle distance, to the NE, E and S, the land undulates and then, to the SE and S, rises to hill/mountainsides. To the W, the land undulates then descends to the shore, the sea inlet, more land, then the sea. To the N are undulations, including a couple of hills/ridges, then the M Straits, then undulating Anglesey. The far distance includes much of Anglesey, the coast and sea to the W, the start of the Llyn Peninsula, N coast to the NE and mainland to the E, SE and S.

Views from fort: near

From all four gates combined, much of the near distance area is visible, although there are some obscured areas on all sides, especially as the land falls away to the estuary in the NW and a section where the land falls away to the S.

Views from fort: middle

Views of patches of the land between the fort and the Straits; certainly not excellent visibility of this area. Much of the view of the shore is blocked by ridge to the N and hill to the NW; the best view of the shore is the small patch between the two. Similarly, a surprisingly small section of the M Straits can be seen; it is a wedge-shaped section of the Straits and shore beyond to the NW of the fort, viewed between the ridge and hill. A further section, where the Straits meets the sea, is visible. The remainder of the Straits and shores either side are obscured in the middle distance view. Small patches of Anglesey are visible; higher points of the undulating landscape. To the NE, visibility is quite good along the N side of a very shallow river valley (more like undulation than valley) that runs towards the fort from the NE. The river runs past the S of the fort then turns northwards to the fort's W to meet the M Straits. Most of the river itself is obscured. To the S and SE patches of land are visible in the undulating landscape, until visibility increases as the ground rises to hills. Hidden dips between hills. To the SW and W, the river is obscured then patches are visible of the undulating land beyond. Very little of the coast on the E of the Foryd Bay is visible and only a small patch of the water of the inlet itself is

visible. Similarly, small patches of the N part of the land beyond is visible, then the coast and about 1km into the sea is obscured.

Views from fort: far

Very small patches of Anglesey visible. Highest points to the E and S. Patches of coastline and sea to the SW and W.

Caer Llugwy GIS notes

Near distance topography:

The fort itself is on a fairly level area within a bend in the meandering River Llugwy. The river runs past the N of the fort. The land descends gently beyond the fort to the river. Then the land rises slightly, then there is a short level/very gently sloping area, then the land ascends steeply to the valley sides. Eastwards, the land gently descends towards a bend in the river (which is beyond the near distance). Southwards, there is a short stretch of flat/very gently rising land. Then there is a gentle then steep ascent of the valley sides. Westwards, is a 'U' shaped bend in the river. The land is fairly flat between the river and the descents/ascents of the river banks.

Middle distance topography:

The fort is within a narrow, meandering river valley (River Llugwy), running roughly E-W. The valley to the E is generally narrower than that to the W; in fact the fort appears to be in the most appropriate place as far E as possible prior to it becoming uncomfortably narrow (parallels with Llanfor). The widening of the valley prior to the R. Llugwy joining the River Conwy to the E starts within the middle distance. The valley is wider to the W, and includes the modern town of Capel Curig and extends to the Mymbyr Lakes. To the N and S are undulating upland and lakes.

Far distance topography:

The Conwy Valley runs past the fort, just beyond the edge of the middle distance. To the N, the NW coast of Wales and sea beyond is present within the far distance band. Otherwise it is undulating upland including some habitable valleys.

Only a small section of the valley base each side of the fort is visible. The narrow valley obscure views far into the mid distance N and S. The only long views, that

extend far into the middle distance, are of the rising hillsides to the SW. Most of the far distance band is obscured.

Views from fort: near

Little difference between the views from each gate. The area within the fort is visible. Almost all of the river is obscured, although large patches of land beyond the banks are visible. The river itself may have been visible from fort gate towers. To the E, into the extending valley, the area beyond the fort is visible for approximately 100m until it descends towards a bend in the river. Only small patches of the valley base are visible beyond that. The rise of the valley sides on each side of the E valley base are visible. Northwards, a small patch of land beyond the fort is visible, then the descent to the river, the river and the rise to the bank are obscured. Beyond this, the rise of the N side of the valley side is visible. Westwards, the river bends in a 'U' shape. The river itself is obscured but the fairly flat land beyond the banks is mostly visible. Southwards, the land beyond the fort and the rise of the valley sides are visible, apart from a small obscured patch behind a large undulation at the base of the valley.

Views from fort: middle

Very little difference between the views from each gate. Northwards, the continuation of the valley sides are visible, and these obscure the views beyond. Eastwards, very small patches of the valley base, for approximately 1.5km, are visible, until the valley bends south-eastwards and becomes completely obscured by the valley sides. Large patches of the valley sides are visible for 1.5km, with patches obscured by overlapping topography. Beyond this, small patches of high areas are visible. Southwards, the valley sides are visible, and these obscure views beyond, apart from a small high patch to the SE. Westwards, large patches of the valley base are visible, until the valley narrows temporarily and then turns north-westwards. A high hill/valley side around which the valley turns towards the NW obscures views beyond. To the SW, the valley sides are visible, and there are continuing good views of the topography as it gains height towards the SW.

Views from fort: far

Obscured, apart from a small patch of high ground to the NE.

Alternative fort locations? The fort appears to be at the furthest most 'appropriate' point eastwards in the valley base. A point further east, at SH750574, is within a bend in the river, although it is more 'V' shaped than 'U' shaped and therefore does not enclose the area so well. It is also a small area of land, therefore phase I of the fort would have struggled to fit and there would be less space beyond the fort to the E. Furthermore, the valley is narrower here and there would be less available space beyond the fort to the N and S. Further E, and the valley becomes too narrow to house a fort until it expands to meet the Conwy valley 4.6km to the E. It could therefore be supposed that it was important that the fort was situated within this valley as opposed to the Conwy Valley. Westerwards, there are potential alternative locations within the valley base (for example SH740570 and SH737569 and towards Capel Curig), and with 'U' or 'n' shaped bends within the river, although perhaps nowhere quite as flat as the chosen location. This is what makes me consider that the fort was chosen as far E as possible, before the valley narrows.

OS 1st edition map comparison: land use remains similar. River course remains the same. No mention of river flood areas on 1st ed map.

Llanfor site visit notes

The fort is located in a large area of relatively flat ground with valley sides in the middle distance. It appears to be in one of the lowest points (altitude) in the area. Fort would have been visible from surrounding valley sides and higher points in valley floor. No rivers visible, although trees hinder views in most directions.

To the S a plantation blocks views of the near and middle distances. Blocks of trees to the W also obscure views, but not completely. Trees to the N and E block some views but an idea of the landscape in this direction is easier to establish through the trees, although sections are obscured and therefore significant features may be obscured.

Views from fort: near

The near distance is fairly flat, with only slight undulations.

Views from fort: middle

Undulating valley floor then valley sides which obscure the remainder of the middle distance. The valley side to the N is closest. Views of middle distance to S are obscured by trees.

Views from fort: far

Some hilltops are visible in all directions. Far distance is mostly obscured by trees and middle distance topography.

Llanfor GIS notes

Near distance topography:

Fairly flat within the near distance at about 165m OD. A stream runs past the S of the fort and there is a slight, gentle descent to the stream in the SE of the near distance area.

Middle distance topography:

The fort is situated in the fairly flat area to the NE of Llyn Tegid. The River Dee runs past the fort to its E, S and W. To the N and S, after small flat areas, the land rises to undulations and valley sides. The flat area continues to the E, then the valley base narrows to follow the meandering river. Undulations continue each side of this, with rivers running in to meet the Dee from the N and S. To the SW, the flat valley base continues and then Llyn Tegid extends to the SW. The land rises just beyond the lake to the lake's N and S, to valley sides to the S and a heavily undulating wide valley to the N.

Far distance topography:

Undulating upland. The Dee Valley widens again to the E, forming the longest and widest valley within the far distance band.

First fort in the area then relocated to Caer Gai. Moved/did not return to this site due to dampness? But evidence for marching camps prior to the fort were found on-site (Burnham and Daview 2010, 256) so they may have already known the character of the location? Or were they there for too short a time to realise?

Views from fort: near

Combined gate views: The interior of the fort is fully visible. Beyond the fort, most of the area to the NW is visible. To the NE, visibility is good beyond the fort for approximately 160m, then the view is obscured by land falling away towards a stream to the NE. To the E, visibility gradually declines to small patches as the land descends towards the river in the middle distance to the E. To the SE, S and SW, beyond the fort is visible, then the descent to a stream passing the S of the fort is obscured, then the rise beyond the stream is mostly visible. Small stretches of the stream are visible, including where the stream crosses the near/middle distance divide to the E. The NW the view is obscured where the stream runs into the near distance band. 1ST ED MAP RIVER: were the river extends into the near distance band, it is visible.

Views from fort: middle

There is little significant difference between the middle distance views from each gate. In total, northwards, slightly less than half the area of the remaining low-lying valley base is visible. Then the rise in land beyond that is visible, then higher undulations and hills are visible where they extend above the heights of the nearer undulations. A stream running through this area to meet the River Dee to the east is obscured by the steep topography either side. Eastwards, the low-lying area beyond the near distance is obscured as it descends to the River Dee, but most of it comes into view again as it ascends on the river's far side. Visibility is lost as the valley base narrows before it meanders through the undulating upland. The rising land on the sides of the low-lying valley base is visible and then the patches of higher land beyond that are visible. Southwards, most of the remaining low-lying area is visible, up to the River Dee, which is not visible. Beyond that, the rise of the hill/valley sides can be seen and these obscure most of the view beyond them. Westwards, large patches of low-lying valley base can be seen up to the River Tryweryn, which is obscured. The low-lying area beyond the river (where the modern town of Bala is situated) and most of Llyn Tegid is also obscured. Only a far, SW patch of the lake is visible. The S side of the higher land lining the N of the lake is visible. 1ST ED MAP RIVER: small patches of the river are visible but it is mostly obscured, although may have been visible from towers as visibility returns just beyond the river banks throughout much of its length as it circles the fort.

Views from fort: far

Very little difference between views from each gate. N- far-distance views are obscured. E- a few high points are visible. The Dee valley is obscured. S- obscured. SW tip of Llyn Tegid, patches of the low-lying area beyond and patches of upland beyond that are visible. W- small patches of high points are visible (similar to Caer Gai).

Why located here? The fort's location is in a low-lying area, not far from areas labelled 'liable to flood' on the OS 1st edition map. The fort itself could have been within the flood plain during wetter seasons. Although views from the fort along the Dee Valley eastwards, as it narrows and meanders, do not extend far, the fort sits squarely within the valley base as it widens to the W and extends to Llyn Tegid. It appears to be located as far E as possible before the 1st edition map starts to label the area as being liable to flood. The fort is on land that is very slightly higher than both the river and the stream to its S, perhaps helping slightly with dampness. An alternative location on the valley base could have been the site of the modern town of Bala, which is at a similar altitude. The town is located between the river to its E and the lake to its W, whereas the fort is located within a large bend of the river (as shown on the 1st ed map), so the river surrounds the fort on its W, S and E sides. Proximity to the river may therefore have taken priority, and perhaps being so surrounded by it was considered more secure; access to the town of Bala location would have been possible from along the N and S shores of the lake and elsewhere, whereas the river would have to be crossed at some point from all sides of the fort except the N. Furthermore, the town is in the shadow of a hill/undulation to its NW, whereas the fort is in a more open situation. In addition, the fort appears to be located as far E as is possible regarding the flood plain (based on the 1st edition map labels) whilst leaving space for extra-mural features and the modern town is located further W, closer to the lake. Another potential location in the valley base could have been the modern village of Llanfor, just to the N of the fort, also at a similar altitude. This however, is at the base of a steep hill/undulation to its N and is not protected by the river. Alternative locations on undulations (ie not on valley base) could have been an undulation to the W of Llanfor village, at the site of 'Lower's Walk' (SH931368), reaching 190m OD. Another possibility is a higher undulation further W, at SH931362, 230m OD. These would have had space for a fort but the character of the locations are different; they are on the edge of the low-lying valley base, with undulating valley extending northwards, they are not so near the river and not as far east.

OS 1st edition comparison: land use is the same in both (improved fields). 1st edition map labels the S section of the near distance band (S of the fort, between the stream and the river) as being 'Liable to Flood'. This area is slightly lower-lying than the fort itself but is nevertheless very near the fort and it is possible that the fort itself could have been prone to floods or dampness. The course of the River Dee has changed since the 1st edition- it extended into the near distance twice to the SW and once to the SE whereas now it does not. The course of the stream remains the same.

Caer Gai site visit notes

On a rise overlooking valley to SW and another smaller, shallower valley to NE. Gentle slope from N-S but the fort is on quite a flat area, especially when compared to the visible surroundings. On a high point but surrounding hills/valleysides are higher. Would have been visible from valley sides. Areas of land surrounding fort are likely suitable for building. Lower areas possibly waterlogged/floodplain.

Not all areas of fort were accessible. On a rise overlooking valley to SW. Good views likely of valley as well as the facing valleysides. Possibly on a rise within a very large valley. Only SW gate accessible. Views from S corner were similar to SW gate although a section of Llyn Tegid was visible (obscured from SW gate by trees and buildings).

Views from fort: near

From SW gate only: descent beyond fort, becoming obscured. Rise within fort, obscured beyond. Much obscured by trees and buildings.

Views from fort: middle

From SW gate only: valley and valley sides to S and SW. Remainder obscured by topography (rise within fort), trees and buildings, although views from the other gates would have probably provided views in these directions.

Views from fort: far

From SW gate only: Hilltops to S and SW. Remainder obscured by topography (rise within fort), trees and buildings although views from the other gates would have probably provided views in these directions.

Caer Gai GIS notes

Near distance topography: Fairly steep slope from the fort's edge or just beyond fort's edge on the NW, W, S and E sides. Fairly flat to the N/NE before land starts to rise in the middle distance. Stream runs into near distance to fort's SE.

Middle distance topography: N, NW and NE- land rises to undulating valley floor (quite high undulations but not as high as the valley sides). Llyn Tegid extends to the E and NE, with lower-lying areas to its NE and SW and fairly steep rises in land just beyond the shores to the NW and SE. The rises to the SE of the lake form part of the valley sides whereas the rises to the NW are not so high and are part of the undulating wide valley floor. To the S of the fort is a low-lying area, to the SW of the lake, possibly prone to dampness. Beyond this, to the S and SE, are the valley sides with undulating upland beyond. To the SW, the valley continues to extend, though undulating and narrower with fairly steep hillsides on each side. A river flows this course. To the west is undulating valley floor and the start of the higher valley sides.

Far distance topography:

Mostly surrounded by upland with some large/wide valleys.

Large chunks of the near distance are obscured where the ground falls away, although possibly visible from towers. Only limited visibility to the N and NE, and most of the lake is obscured. Good visibility of the low-lying areas to the SW of the lake and much of the narrow valley to the SW.

Views from fort: near

The area within the fort itself is visible - some gates cannot see the whole fort area but between them it is visible. The area just beyond the fort is visible; minimum distance beyond the fort is approximately 40m, and it does not reach much further at any point around the fort, apart from to the SE where visibility continues in patches to the edge of the near distance. To the NW, W and S, visibility becomes obscured because of land descending. To the N/NE/E, it becomes obscured

because of a slight rise in land. To the W, NW, NE and some of N, visibility returns at the far edge of the near distance, as the land rises again. The Afon Dyfrdwy runs through the far edge of the near distance in the SE.

Views from fort: middle

N: visibility continues from the near distance band for up to approximately 900m as the land rises. This rise in land blocks view beyond. E: there is patchy visibility immediately beyond the near distance band and then a hill/high undulation becomes visible, obscuring middle distance views beyond and therefore obscuring the N part of the E middle distance view. This means that only the SE corner of the lake and aligning hills beyond are visible from the fort. S: the low-lying area to the SW of the lake, the hillsides beyond and a long stretch of the narrowed continuation of the valley to the SW are mostly visible, with only small patches of these areas obscured. There are also obscured areas beyond the hillsides as they descend beyond their highest points. W: Patchy visibility for the nearer half of the middle distance to the NW. Patchy visibility throughout the middle distance to the SW. W- Small patches of Roman roads (projected/proposed/known etc) visible in the nearer half of the middle distance to the W and NW. NE- part of Roman road visible just beyond the end of the near distance band. Otherwise obscured. S- the two Roman roads running SE and SW are visible for large patches in the nearer half of the middle distance. Two Roman practice camps to the SW (PRNs 2755 and 2756) are visible, although in an area of patchy visibility and therefore their full extents may not have been visible.

1st edition OS map comparison: Low-lying area SW of lake- land use similar on both maps. 1st edition notes that some areas alongside the river Dyfrdwy are liable to flooding, both in the open low-lying area SW of the lake and in the narrower continuation of the river valley. Remainder of middle distance- land use remains very similar on both maps.

Why this location? The hill/high undulation to the NE (SH88423210) blocks the view of the lake from the fort. It could have been an alternative location? It is 245m OD, however, considerably higher than the fort at 200m OD. There is only a small 'level' area at the top, so the fort itself would have been draped over the apex of the hill and not very level if it had been placed on top. The S and E sides (those facing the lake) and probably the W are probably too steep for a fort or extra-mural features. The hill's N slope is more gentle and perhaps could have been a location for a fort,

although its aspect would have been northwards, with views northwards, away from the lake, and not as wide views as those of the current fort location. The hills/undulations to the N and NW of the fort (SH87303265 and SH85453225) are some of the highest points in the wide valley (290m OD and 335m OD) and could therefore have aided views northwards as well as southwards. Although they are high undulations in a wide valley with higher valleysides, they are more than a simple 'rise' in a valley and would not easily provide fast access to nearby roads if the fort was located at one of their highest points. The low-lying area to the SW of the lake provides few even slight rises and may have been considered a flood risk; post-medieval and modern houses are present in parts of this area (including Llanuwchllyn village) but they are prone to flood warnings <https://riverlevels.uk/flood-warning-upper-dee-valley-from-llanuwchllyn-to-llangollen-including-corwen#.XRN89497IPY>. The narrower continuation of the valley to the SW may have been considered too narrow and would have had restricted views. It may also have been considered a flood risk. The lower slopes of the valley side to the S, SW and W of the fort could have accommodated a fort in places, although it would have been in the shadow of the valley sides and, unlike the chosen location, not within the valley base, perhaps indicating the valley base was preferable. Locations to the N of the wide valley would have been within a highly undulating valley base and would not have had such fast access to the lake, perhaps suggesting proximity to the lake was important, even if visibility of it was not. The fort had relocated from the fort at Llanfor, to the NE of the lake, suggesting that military presence to the lake's SW was considered preferable.

Pennal/Cefn Caer GIS notes

The fort is located in a long valley (Dyfi/Dovey). It is in the estuary zone, at a location just before the valley narrows to the fort's E (upstream). A section of the full valley base and large sections of the valley sides (adjoining the visible valley base area) are visible from the fort, looking upstream just before the valley narrows. Little of the valley beyond the narrowing is visible. Large sections of the valley base downstream from the fort are visible until the valley base meanders and the view is restricted by the valley sides. The River Dovey is mostly obscured.

Fort is on the N side of the river, closer to the N range of hills. It is on a section of valley side that projects out into the valley base, with a slight dip between the fort and the rest of the valley sides, almost like an undulation on one side of the valley.

This dip prevents the fort from being immediately adjacent to higher ground. The river runs through the middle distance, the closest point of the river is approximately 135m from the near distance band, which is a little further into the middle distance than many forts. The modern Mastermap digital map and the OS 1st edition map note tidal points along the river here, indicating it is still tidal at this point. Most of the valley base is flat. The 1st ed OS map labels large sections of the valley base as liable to floods, suggesting that it may have been considered too damp to place a fort here. The gently sloping area to the NW of the fort, which includes the modern town of Pennal, would have been less damp but would not have provided steeply sloping descents on three sides of the fort and it would have been further from the River Dovey, although not far from the River Pennal but this is a tributary to the Dovey. Alternative locations on the valley sides downstream from the fort may have been found but these would not have been near the narrowing of the valley sides to the E of the fort.

The fort is on a gentle rise from SW to NE and descends slightly along a central spine to the NW and SE. Similar to Tomen y Mur and Chester.

Near distance topography:

Land descends from the fort on the N, S and W sides. Then the land beyond these slopes is low-lying and quite flat. Stream (Nant Caer) runs past fort to the N. The fort itself rises slightly to the E and this gentle rise continues to the E. 1st ed map: improved fields with marshland and drainage S of fort (as OS Mastermap).

Middle distance topography:

The low lying river valley (River Dovey) runs from the NE to SW, passing the fort's S. The land each side is undulating upland, mostly with quite steep valley sides, although there is a gentler rise to the NW, part of which is occupied by modern Pennal town. The land to the E of the fort continues to rise from the near distance to an undulation, forming part of the undulating upland to the N of the river. The river runs around this undulation. 1st ed map: River Dovey has the same course on both the 1st ed and OS Mastermap maps. The first edition labels that low-lying areas around the River are liable to flood.

Far Near distance topography:

N- continuation of undulating upland. Some wide river valleys leading to the coast, including that of the Afon Dysynni towards the estuary at Tywyn and, further N, the

estuary leading to Barmouth (Afon Mawddach). Some lakes, including Llyn Mwyngil. E- undulating upland, with the wide Dyfi river valley running through, continuing from the middle distance. S- undulating upland. W- the low-lying area of the Dyfi river valley widens considerably to the coast. Undulating upland each side inland. Coastline extends N-S.

Views from forts: near

Combined views- Two areas are obscured from the fort. The first is part of the slope approximately 40m beyond the SW gate. Visibility returns when the ground becomes level. The area between the gate and 40m beyond the gate is visible. The second is beyond the NE gate. Approximately 23m beyond the gate is visible. Then the descent northwards is obscured, including approximately 50m of the flatter/rising area beyond the gate. At approximately 135m from the gate the whole flatter/slightly rising area is obscured. Otherwise, the near distance beyond the fort is visible. A very small section within the fort is obscured.

Views from forts: middle

Combined view: N and NE- good visibility of the steep rise in ground. Obscured beyond. E- The rise in ground to the E of the fort has patchy visibility. This rise/undulation (on the W side of which the fort is placed) forms a 'spur' into the valley base, with fairly steep descents to the N and S. These descents in the middle distance are mostly obscured from the fort, with only one patch of the descent southwards fully visible. The rise is obscured beyond approximately 820m into the middle distance. The valley base to the SE is visible until the valley narrows approximately 500m into the middle distance. Apart from a small sliver of visibility, the valley base is then obscured to the E. The full width of the valley base can be seen from the fort just prior to the narrowing of the valley (with the exception of the River Dovey). The valley sides are mostly visible at this point also. Beyond the valley sides, only patches of high ground can be seen. S, SW and W- the valley base has good visibility to the N of the river and patchy visibility beyond, until it bends to the W approximately 3km into the middle distance, after which it is mostly obscured by the valley sides. The River Dovey is almost completely obscured although large sections of its banks are visible. Valleysides have generally good visibility, with some obscured patches. High points are visible beyond. NW- most of the gently rising area to the NW is visible, with some small obscured patches. Most

of the steeper rises beyond are visible and high points are visible beyond these. The River Pennal, a tributary of the Dovey, is mostly visible.

Views from forts: far

Patches of visibility of higher ground to the SW and small patches of the estuary zone to the SW.

Forden Gaer fieldwork notes

Sited in wide, undulating valley base. Slightly higher than river to S and W but appears to be in one of the lowest points in the valley. Fort would have appeared prominent from valley base and surrounding hillsides.

Valley base possibly would have been damp near the river. Some of the valley sides, as well as valley floor, may have been suitable for building/agriculture.

Near distance topography

Fairly flat area with slight undulations. Gentle slope towards river to S and W beyond fort extent. River itself is now obscured by trees but it may have been visible if trees were absent. Trees obscure some views to N.

Very slight/subtle changes in topography. There is a gentle rise from S to N and also, beyond the fort, a gentle descent to the W. So a gentle descent towards the River Severn to the W and S and a gentle rise to the N. Just beyond the fort to the E is a slight hump which may be associated with a modern road. It is fairly flat beyond that. There are gentle undulations throughout. The River runs through the middle distance, past the W of the fort, turning slightly to the E to run past the S of the fort. The fort is therefore beside a gentle bend/arc in the river.

Middle distance topography

Valley floor (undulating) then valley sides. Valley sides to S are closest. Views greatly obscured by trees.

The wide River Severn valley base runs roughly SW to NE past the W of the fort. Another wide river valley base runs roughly W to E to the E of the fort. The fort is therefore located at the junction of these valley bases. Two narrower valley bases meet the Severn to the W of the fort. Surrounding the valley bases is undulating

land of varying steepness and heights. The modern Montgomery Canal runs roughly parallel with the River Severn, beyond the Severn, past the W of the fort.

Far distance topography

Hilltops in all directions except S, which is obscured by middle distance topography.

Trees obscure some views in all directions.

Continuation of the river valleys. Undulating land surrounding them, including some other valleys. Rivers.

Positioned as far as possible into the SW of the Severn Valley before it narrows.

One section of the full width of the valley base is visible between the fort and this narrowing (which is looking upstream) to the SW (SO190980). Also located where another wide river valley meets the Severn (approaching from the E of the fort). The full width of this tributary valley base to the E is also visible from the fort. Views in this direction were probably even better prior to the building of the railway. Land falls away on three sides and rises on the remaining side, but all very subtle. Descents beyond fort not sufficient to be considered defensive. But may have helped against dampness. River Severn extends into near distance. The course of the River Severn in this area has historically been known to move and the trend in the area of the fort has been a steady move towards the E and N (CPAT Report No. 690 Forden Gaer Environs, Powys p. 8). Good views of hillforts.

Views from fort: near

Some significant differences between views from each gate. River and most of area beyond obscured, otherwise good visibility of near distance. Good visibility of the rise to the N. The hump to the E obscured some of the view eastwards, but this hump may be a modern feature and therefore the view was probably good in this direction. Southwards, the descent towards the river is visible but the river and the area beyond is obscured. Westwards, the descent towards the river is visible but the river is obscured. There is patchy visibility of the area beyond the river. Instances where areas just beyond the fort are obscured from some gates may be caused by the current fort earthworks obscuring the view.

Views from fort: middle

N- only a narrow wedge of the River Severn valley base to the N is visible behind the valley sides to the E of the river. Valley sides to immediate N of fort are visible and high points of undulations beyond are visible. E- valley base (of a tributary river

to the Severn) has good visibility until a railway line and then small patches are visible beyond, until the valley turns to the NE slightly and becomes completely obscured. Prior to the railway the views are likely to have been better. Good views of valley sides until the valley bends. SE- valley sides visible. SW- good views of River Severn valley base immediately to the W and SW of the fort. Views become patchy as the valley extends SW then become obscured beyond a temporary narrowing of the valley. Valley sides visible.

Views from fort: far

High points. Contemporary features- numerous hillforts and enclosures - some of the nearer ones are visible or in patchy visibility.

OS 1st edition map comparison- beyond banks of River Severn to W and NW of the fort are labelled as being liable to flood. Land use in near and mid distances similar to that represented on modern OS Mastermap.

Brompton fieldwork notes

S section of the fort is on sloping ground, descending S towards river/stream. Hedges, vines and trees obscure views, quite badly at some gates. Nevertheless, the remainder of the fort and near distance appears quite flat, although slight rise/hill to NW. S gate is very near stream/river and the water would probably have been visible if trees were not present. Fort appears to be placed in one of the lowest points in the valley, although trees etc block views so this is not certain.

Fort probably dominated views from valley sides and valley floor but not from beyond the rise to the NW. Valley floor is being used for agriculture and housing today. Landowner states that the fields on which the fort is located and the few surrounding it are some of the best for crops in the valley.

Near distance topography:

Fairly flat apart from descent to stream to S and rise of hill/undulation to NW.

Middle distance topography:

Much obscured by trees and hedges but appears to be surrounded by undulating valley floor then valley sides to E, S and W. Hill to NW obscures views beyond.

Far distance topography:

High points visible on all sides but S (obscured by middle distance valley sides).

Views from fort: near

Slight contrasts between gates. Most of the near distance is visible, except the brook and its banks. The higher ground beyond the brook is visible

Views from fort: middle

View from gates mostly similar; S gate has patchy view to S whereas the others have a good views to S. Full valley between fort and S valley sides visible, apart from a small patch behind an undulation (SO24789172) near the valley sides. Patchy visibility of where the two valleys meet to the E of the fort. N- patchy visibility until steep rise of a long ridge (visible) approx. 1.2km into the middle distance. Mostly obscured beyond. E- Patchy visibility of E-W valley base. E-W brook mostly obscured. N-S valley base obscured. Patchy visibility of valley sides and high points beyond. S- Good visibility of valley base and valley sides. One small undulation just before valley sides obscured a small patch of valley floor. Brook in this direction runs through near distance. High points visible beyond valley sides. W- Valley floor mostly obscured. Patches of valley sides and high points beyond are visible

Views from fort: far

Small patches of high points visible to N and SW. Large areas of high ground visible to the E, continuing from the middle distance. S obscured.

Not at the furthest point along the valley (there are other similar spurs to the E and W) but in a good location for full visibility of the valley floor to the S and patchy visibility of the valley floor to the E (where the narrower valley arrives from the N).

OS 1st edition map comparison - land use similar to that shown on modern OS Mastermap digital map. No mention of flooding.

Caersws I GIS notes

On the only plateau beside the lake before the Severn valley narrows and bends southwards to the E of the fort. OS 1st edition map notes that the Severn is liable to flood therefore the valley base may have been avoided.

Near distance topography:

On a slope roughly N to S. The slope is steeper to the S of the fort, and this steeper section bends slightly to the NE beyond the fort's E walls, so it curves around the S of the fort. The slope becomes more gentle closer to the River Severn. The river extends into the near distance to the SE of the fort. The area beyond the river is fairly flat. OS 1st ed map- labels the area by the River Severn to S of fort as liable to flood. Land use is similar to that shown on modern mapping. More houses to the W of the fort. Post-medieval parkland to S of River Severn.

Middle distance topography

Situated as far E as possible before the valley narrows and bends - the fort is on the only plateau that extends into valley floor (i.e. is not part of valley sides) before valley narrows and bends to the E. The fort is located at the head of an 'n' shaped bend in the Severn Valley, with the valley extending to the fort's NE and SW and bending to the SE and S respectively. Two further river valleys meet the Severn to the W of the fort; the wide valley containing the Afon Cerist and Afon Trannon to the fort's SW and the valley containing the Afon Carno to the NW. The latter valley widens as it approaches the Severn. The fort is therefore located at the junction of three large valleys. Hills, some quite steep, surround the valleys and reach over 400m OD to the N and W. The Afon Cerist appears very straight in places - possibly canalised.

Far distance topography

River Severn, running roughly SW-NE. Llyn Clywedog reservoir to W. Hills and rivers. Some wide valleys.

Views from fort: near

Fort interior visible. Rise to N visible. Patchy visibility beyond E gate. Steep descent just beyond the SE, S and SW of the fort obscured. Then: SE and E- gentle slope to river, river (where present) and beyond visible; SW - gentle slope to river, river and beyond river obscured. NW- patchy visibility beyond W gate

Views from fort: middle

N- Rise to N of fort continues to be visible up to top of hill. Then high points beyond obscured. E- Severn Valley floor mostly visible, apart from River Severn which is only visible in small sections. Full width (N-S) of valley floor (apart from the River Severn) visible in a number of places prior to narrowing, most notably between SO04879290 and SO05019136). Visibility of Severn Valley floor becomes patchy as the valley narrows and obscured when it bends to the S. Valley sides visible until bend in valley. High points visible beyond. S- Severn Valley floor visible, only small patches obscured. River Severn mostly obscured. Valley sides and high points beyond visible. SW- bend in Severn Valley towards to S- the visibility of this area becomes patchier as it bends S, although the full Severn Valley base is visible at one stretch between SO02168968 and SO02758938, although the E valley side is not visible at this point. The River Severn is visible at this point. Patches of valley sides and high points beyond are visible. W- WSW the wide valley base containing the Rivers Trannon and Cerist (tributaries to the Severn, although the Trannon runs into the Cerist first) has patchy visibility. The full width of the valley floor is visible at one (narrow) point between SO00409113 and SO00489030. The rivers within this cross-section of the valley are also visible. NW- the floor of the Afon Carno valley, another tributary of the Severn, is obscured, mostly because of a mound/hill between the fort and the valley at SO02229293. Patches of the valley sides are visible. Large patches of the low-lying area where the three valleys meet to the SW of the fort are visible. The rivers here are mostly obscured. Beyond the valley sides, high points are visible

Views from fort: far

N- obscured. E- Small areas of high points visible. S- small areas of high points visible. W - Small sections of Tannon/Cerist valley floor visible. Some high points visible.

Caersws II Fieldwork notes

In village so views obscured in most directions by buildings, trees and hedges. Appears to be valley base location, surrounded by hills/valley sides in the middle and far distances. No access to W gate.

Views from fort: near

Area appears to be fairly flat, perhaps apart from some small undulations. Views of the area seem good, although now restricted by modern features.

Views from fort: middle

Mostly obscured by modern features but appears to be valley base and valley sides. Hill to NW is closer than valley sides and obscured views beyond. Rivers obscured.

Views from fort: far

High points. Mostly obscured by cloud and modern features.

Caersws II GIS notes

Not positioned as far into a valley length as possible (unlike Caersws I) but in the heart of a nodal point where three valleys meet. Good views (can see full width at one point) upstream along the S extension of the Severn Valley (in contrast to Caersws I which has good views of the valley downstream towards the E). Full width of the Cerist/Trannon valley is also possible at one point. The Carno valley is obscured. Good views of the area where the three valleys meet.

Near distance topography:

On a very gentle N-S slope towards the River Severn to the S. To the E the land is flat (perhaps also a very slight N-S slope) and the same to the W, with a few very slight undulations. The River Severn runs through the near distance band to the S and the smaller River Carno, which meets the Severn to the SW, runs through the near distance to the W.

Middle distance topography:

N- remainder of Severn valley floor then valley sides and hills. E- Severn valley and river extend to E before narrowing and turning to SE. S- Severn valley and river extend to the S, directly to S of the fort. SW- valley continuing rivers Cerist and Trannon extends from SW to meet the Severn Valley. NW- Carno River valley extends from NW to meet the Severn valley. Flat area to W of fort where the valleys meet. Hills in between the valleys.

Views from fort: near

Slight contrasts between gates, some caused by railway line and fort defences. Fort interior visible. N- rise beyond fort mostly visible. E- area beyond fort mostly visible. S- descent towards river mostly visible (patch obscured to SE). River Severn obscured. Patchy visibility beyond. W- land beyond fort mostly visible. Small patches of River Carno visible, Patchy visibility beyond. Railway and fort defences prevent views to W from some gates.

Views from fort: middle

Slight differences between gates. Good visibility of the Severn Valley stretching to the S of the fort. Also good visibility of the area where the three valleys meet, to the W of the fort. Combined viewsheds show that the full width of the entrance to the S extension of the Severn valley (S of where it meets the other two valleys) is visible at SO02379048 to SO03299020. Similarly, the entrance to the Cerist/Trannon valley is visible at SO00949171 to SO01669096. The rivers are mostly obscured. Patchy visibility elsewhere. Unlike Caersws I, there is not a full view of the Severn valley to the W of the fort

Views from fort: far

High points visible. Largest visible areas to S and W. Little difference between each gate.

Chester fieldwork notes

On a high area with land descending to E, W and S (and possibly N- view obscured). Generally poor views as the fort is situated within a city.

Near distance topography

Fairly flat area to N. To S, gentle slope then steeper descent towards river (which is not visible due to buildings and likely in middle distance band). Appears to be gentle descents to E and W. Fort itself does not appear to be completely flat, although only gentle slopes within fort.

Middle distance topography

Good views to W over lower-lying land. Possibly the same to the E. Views to N obscured by buildings. Views S obscured by buildings but tree-tops indicate low-lying area.

Far distance topography

Hillsides and hilltops visible to the W. Lower hilltops visible to E. N and S obscured by buildings.

Chester GIS notes

Within the bend of a river, similar to Llanfor and also on a relatively high point. The fort itself is sloping N-S and also slopes westwards and eastwards from its N-S 'spine'. The slope is not as steep as that at Tomen y Mur but the fact that Chester fortress is larger means that it has a similar effect on the views- different gates have significantly different views, especially in the near distance. There are areas within the middle distance which would have provided less of a sloping and 'spinal' location, although perhaps with some slight undulations. The fortress, however, was located within a bend in the River Dee, so the river passed the fortress to the W, S and E, similar to Llanfor fort. This may have been considered useful defensively. Also, if an associated port was indeed important at Chester, having such a large section of the river's banks to hand may have been considered useful. It is perhaps one of the few places in the vicinity where the bend in the river is large enough to accommodate a fortress; the river to the W of the fortress has been canalised in modern times so its route in Roman times is less certain than the river extending past the fortress's E. The fact that the fort is located on rising land may also have been a factor. It is on a relatively high point with land descending away from the fortress in the near distance; not the highest point in the middle distance but the highest point adjacent to the river.

Near distance topography:

The fort is situated on a gentle downwards slope from N to S. The fort is draped over the 'spine' of this hill, so there is also a slight rise along the N-S axis of the fortress and gentle descent from this axis eastwards and westwards within the fort. This descent continues but is even more gentle beyond the fort to the E. It also continues beyond the fort to the W but here it becomes quite steep. Descent continues gently beyond the S gate then gets steeper as it approaches the river. Beyond the fort to the N, the character of the topography within the fort continues.

Middle distance topography:

Very gently undulating land to the N, E and S. Lower-lying, gently undulating land to the W and NW. I expect standing in the landscape, without the current buildings obscuring the view, the middle distance would appear relatively flat. The River Dee runs northwards from the S, past the fort's E, then bends southwards to run westwards past the fort's S, then northwards again past the fortress's W side. It used to continue northwards but has been canalised since the Roman era and now turns W. The fort is therefore located within the 'U' shaped bend in the river (similar to Llanfor). There are small areas of low-lying potential flood plain adjacent to parts of the river to the fortress's SE. Otherwise, there is usually fairly steep descent to the river.

The views from different gates of the fort do differ significantly since the fort is draped over a hill.

Views from fort: near

Most of the area within the fort is visible. There are obscured areas towards the edge of the near distance to the NW, W, SW and SE. The best views beyond the fort are to the S and E.

Views from fort: middle

The River Dee runs N through the S of the middle distance, past the E of the fort, then turns S, then W, past the fortress's S gate then N past its W gate (assumed course). Parts of the areas beside the river to the S and E of the fort appear to be small areas of flood plain. Very few patches of the river and flood plain are visible from the fort, although the areas right next to the fort banks have more visibility. The middle distance is gently undulating, the area to the W being quite low-lying but still undulating. Visibility is therefore patchy as a result of hidden dips. A N-S strip N of the fort, a large area to the SW and an area in the far middle distance to the NE are obscured completely.

Views from fort: far

There is less contrast between the gates for the far distance. Large areas of high ground are visible to the W, SW, S and SE. A band of hills is visible to the E.

OS1 1st edition map comparison: Near and middle distances are much more built-up on modern map. Where rural areas remain, the land-use remains much the same- improved fields or gardens.

Rhyn Park GIS notes

Land does descend away from the fort on three sides but the steep parts of the descents on two of the sides are in the middle distance. The steepest sections of the descents are obscured. The land rises gently beyond the fort to the S. This rise extends slightly into the middle distance. This gentle rise is visible, until the land descends again and becomes obscured in the middle distance. There are no known extra-mural features but there would have been gently descending areas to the N and E of the fort and the gently ascending area to the S that would have been suitable (flat enough) and visible from the fort. The fort overlooks the Ceiniog river valley. There are areas within the valley that are wide enough to accommodate a fort but, although flooding is not mentioned on the 1st ed maps, the area is quite flat and may have been considered at risk of flood. Furthermore, there are no plateaus within the valley base providing descending land on any sides of the fort. It is possible that the valley base may have been visible from fort towers. Limited views of middle distance until higher ground in the W.

The fort is situated on a gently undulating plateau between two bodies of water. The River Ceiniog runs just beyond the near distance. The smaller Morlas Brook runs through the near distance. The River Ceiniog is a large river. It is nevertheless a tributary of the River Dee, and it meets the Dee to the N of the fort in the fort's middle distance. The fort is within gently undulating land, at a point before the steep rise to undulating upland, which begins in the middle distance to the W.

Near distance topography:

The fort itself is on an area of land that is slightly rising to the S, although, depending on the location of the E walls and gate, may have extended into the sloping area to the E, towards Morlas Brook. There is a slight dip beyond the fort to the N but otherwise the land beyond the fort is fairly flat. The land starts to descend steeply to the River Ceiriog at the very far edge of the near distance radius to the NW. To the E, then land descends quite steeply towards Morlas Brook, a tributary of the Ceiriog (meeting the Ceiriog to the N of the fort in the middle distance). There is a slight plateau in the descent to the Brook at SJ30923690 and another further S at SJ30893671. Beyond the narrow brook the land ascends quite steeply then starts to level out. To the S beyond the fort, the land continues to ascend gently. To the W,

the land is quite flat then starts to descend gently towards the river. OS 1st ed map comparison- land use on 1st ed and OS Mastermap the same- improved, some woodland.

Middle distance topography:

The River Ceiniog enters the middle distance from the west, runs eastwards towards the fort then turns to the NW, running past the N of the fort. It meets a bend in the River Dee to the NW of the fort. There are steep descents to the river valleys of both rivers. Both river valleys are fairly wide in places (for example the Ceiniog valley base is 260m wide at one point). The Morlas Brook meets the River Ceiniog to the NE of the fort. The Brook runs roughly N-S past the E of the fort, through the fort's near distance. The Brook is smaller than the Ceiniog but it still has a steep descent to its base. To the E and S of the fort are gentle undulations. To the N, between the rivers, the undulations are steeper and higher. To the W are undulations then a steep rise to undulating upland, extending into the far distance. A modern canal runs through the S and W of the middle distance. OS 1st ed map Denb comparison - low-lying land in vicinity of River Ceiniog - does not mention flooding and they area contains a few mills.

Views from fort: near

Combined views- fort interior (where known) is visible. Fairly flat areas to the N and W and the slightly rising area to the S are mostly visible. The descents each side of the Brook to the E and the Brook itself are obscured. The flattening area beyond the Brook has patchy visibility. To the W, the land gently sloping towards the Ceiniog River has patchy visibility.

Views from fort: middle

Rivers Ceiniog and Dee and Morlas Brook are obscured. Patches of land alongside these are visible in places. N- Small patch of a plateau between the Rivers Ceiniog and Morlas Brook just beyond the near distance extent (and continuing from the visible area of the near distance) is visible. N- patches of land between the two rivers are visible. NW- mostly obscured by a large undulation, the E slopes of which are visible. NE- small patches beyond River Ceiniog visible. E- patchy visibility of rolling undulations up to approximately 1.2km into the middle distance. Then obscured. S- patchy visibility up to 1.5km into middle distance. Then obscured. SW- rise in land extending from near distance continues to be mostly visible for

approximately 200m to the highest point. Then obscured beyond. W- patchy visibility of undulations then good visibility of the steeply rising land beyond.

Views from fort: far

Combined views: NW- a band of high ground is visible running roughly N-S. N- small patches of higher ground are visible. NE, E, SE and S- obscured. SW- small patches just beyond the middle distance extent visible. W- small patches of high ground visible.

Wroxeter fieldwork notes

On a high plateau in a wide, undulating valley. Beside River Severn. Slight rise beyond the fort to the N - so the fort is not quite on the highest point. Plenty of usable space nearby. Hill/valleysides in the mid and far distances, the nearest (visible) of which are to the E and SE, which include the Wrekin.

Good all-round views of undulating valley. Hidden dips. The ground rises to the N beyond the fort, although the view is obscured by trees, hedges and buildings so it is difficult to determine exactly what is happening here. Good views of the Wrekin. The fort itself would have dominated from the valley base and sides - not sure about how it would have dominated from the N.

Views from fort: near

Land undulating tends to slope away from the fort apart from an apparent slight rise to the N (N and E not accessible so cannot easily comment in these directions).

Views from fort: middle

Undulating valley with hidden areas as a result of the undulations. Views of hill/valley sides and tops, obscuring views beyond. Hills to S and E appear closest, although views to N and much of E are restricted (hedges, trees). The Wrekin dominates.

Views from fort: far

Hilltops visible in places through middle distance hills.

Wroxeter GIS notes

Ground falls away on three sides and rises on one side. Also protected by water on two sides. There are few places in this region along the Severn where this would apply. The location of Leighton Roman fort may have been too small for the fortress.

Near distance topography:

River Severn runs roughly N-S past the W of the fortress, passing through the near distance band. Bell Brook runs roughly E-W through the near distance past the N of the fortress, running into the River Severn in the middle distance to the fortress's NW. The land descends towards the brook and the river to the N, NW, W and SW. The land rises gently to the E within the fort and beyond. The descent to the N also starts gently within the fort.

Middle distance topography:

Mostly gently undulating landscape. The River Severn runs past the W of the fortress (through the near distance band) then turns to the E. There are large areas of low-lying land surrounding the river, but also some areas where the land rises quite steeply just beyond the river banks. The River Turn and Cound Brook join the Severn to the N and S of the fortress respectively. To the E of the fortress the land continues to rise from the near distance, then descends to undulations then starts to rise steeply again towards the Wrekin. To the N the land undulates gently until the start of the steep rise to Haughmond Hill. 1st edition OS map- some low-lying areas adjacent to River Severn marked as liable to flood.

Far distance topography:

River Severn runs roughly NE-SW. N and W: gentle undulations, with some particularly high/steep hills (Haughton Hill for example). E- Wrekin and less gentle undulations, although still home to modern towns such as Telford. S- undulations, including river valleys running roughly SW-NE to meet the Severn. To far SW, hills reach 300+m OD.

Views from fort: near

Significant differences between gates. Fortress interior visible. N- descent beyond fortress obscured. Bell Brook and beyond obscured. E- good/patchy visibility of rising area up to 190m beyond fortress. Then obscured. S- good visibility beyond fortress, becoming patchy. W- good/patchy visibility of gentle descent, then steep descent to River Severn and river itself obscured.

Views from fort: middle

Significant differences between gates. Most of the River Severn is obscured. Some of the areas just beyond the river banks are visible, including some of the low-lying areas, especially to the W of the fortress. The River Turn to the N is obscured.

Cound Brook to the S is mostly obscured. N and NW- large areas are visible, with the far sides of undulations obscured. NE- small areas of higher ground visible. E- patches of higher undulations visible, including the hill to which the rise to the E of the fort culminates. SE- small patches visible. SW and W large areas visible, with the far sides of some undulations obscured.

Views from fort: far

Slight differences between gates. N- patchy visibility of high points. E- only the Wrekin is visible. SE- high points of valley sides are visible. Large areas of high ground are visible. W- patchy visibility of higher areas.

Leighton GIS notes

As far along the River Severn as possible before it narrows to the E - shallowest sloping area above valley base with gently slope space immediately beyond fort at a lower altitude than the highest points of the other valley sides to the E before the valley narrows. Full view of valley floor to E in at least one point. Perhaps favoured sloping area (as opposed to placing the whole fort on the plateau to N) because more of the valley floor could be seen from the slope - the N gate, which is on the flat area, has only limited views of the valley floor to the E but does provide the only significant views to the N. The fort therefore has land rising/level to one side and descending beyond the others but the fort also extends into these descending areas.

Near distance topography

The N half of the near distance is quite flat. The S half (and far E section) slopes towards the S (SE in E section). The N section of the fort is in the flat area, the S section on the sloping area. The river does not quite extend into the near distance (OS 1st ed map matches modern OS).

Middle distance topography

Severn Valley runs E-W past the S of the fort. The Wrekin is a large hill to NE. Otherwise undulating lowland. N - continued rise of valley sides and undulating lowland beyond. NE - the Wrekin (highest point in middle distance). E - Severn valley, valley sides and undulating lowland beyond. S - valley floor, river, S valley sides and undulating lowland beyond. W - Severn valley, River Severn, valley sides and undulating lowland beyond.

Far distance topography

N - gently undulating lowland, including Tern valley. E - undulating lowland. S - undulating lowland, including some parallel valleys running SW-NE. W - undulating lowland.

Views from fort: near

Potential features would have had patchy visibility on all sides of the fort.

Views from fort: middle

Similar views from E, S and W gates. N gate has the best views northwards. N - Patchy views of the rise of the valley side to the N, mostly from the N gate. Then undulating lowland beyond is obscured. Good views of the Wrekin, the highest point in the middle distance to the NE. E - good views of the valley floor - full width visible near the fort then visibility of the valley floor reduces further from the fort. Large patches of River Severn visible. Large patches of valley sides visible. Higher undulations beyond visible. S - Large patches of valley floor and River Severn visible. Large patches of S valley sides visible and higher undulations beyond. W - S side of valley floor visible. Small patches of River Severn visible. Large patches of S valley sides visible, small patches of N valley sides visible. Higher undulations beyond visible. Most minor rivers and brooks obscured.

Views from fort: far

Little difference between gates. N - obscured. E - small patches of high ground/hilltops visible. S - hilltops, including a long ridge, visible. W - larger areas of hillsides and hilltops visible.

Pen Llwyn GIS notes

On N side of Rheidol valley, on plateau in valley side. The valley runs roughly SE-NW past the S of the fort. To the W it then bends to the SW and to the E it then bends to the NE, obscuring the views beyond in these directions. The Melindwr valley meets the Rheidol valley on the E side of the fort. Undulating upland surrounds the valley, with other large valleys including the Dovey (to the N) and Ystwyth (to the S) and Teifi (to the SE) within the FAR distance. The Rheidol valley meets the sea to the W in the FAR distance.

Fort placed as far along Rheidol valley as possible before it narrows to the E, assuming the valley floor was not considered an option. Further E the valley sides are considerably steeper. Base of the valley sides further E are too narrow. The Melindwr valley meets the Rheidol valley to the E. There are potential fort locations along the Melindwr valley but perhaps this valley was not under consideration. Placing the fort further E would also take it further from the estuary zone, which may have been a priority.

Near distance topography:

Fort is placed on land sloping downwards towards the SW. The fort is also on a slight dome, so land descends away from fort on N, E and S sides, with an overall slope towards the SW. The Afon Melindwr (tributary of the Rheidol) runs E-W past the S of the fort, to join the Rheidol to the SW, just beyond the NEAR distance. Banks of the Melindwr are steep. The land rises to the NE of the fort, quite steeply in places, and continues beyond the NEAR distance to form the valley sides.

Far distance topography:

The far distance comprises undulating upland, with estuaries, rivers, large valleys (Dovey, Ystwyth and Teifi) smaller valleys and small lakes. The sea takes up a large part of the far distance to the W.

Views from fort: near

N of fort is partially visible. E of fort is visible. S of fort is partially visible. W of fort is partially (mostly) visible.

Views from fort: middle

Most of the Rheidol valley floor is visible (some sections near the N valley sides to the W are obscured) until to the W it bends to the SW and to the E it bends to the

NE, obscuring the views beyond in these directions. The Melindwr valley runs from the NE to meet the Rheidol valley on the E side of the fort. The Melindwr valley floor is obscured until the point where it meets the Rheidol valley. Large sections of the Rheidol valley sides are visible. High hilltops and valley sides are visible beyond. Remaining valleys are rivers in the middle distance are obscured.

Views from fort: far

Mostly obscured. Small sections of hillsides and hilltops are visible.

Trawscoed GIS notes

On most appropriate location (if the valley floor was being avoided) before the valley narrows to the SE. Other locations to the SE are very close to the steeper parts of the valley sides or are considerably higher in altitude than the chosen location.

Fort is currently in an area of parkland. OS 1st edition map - land use and course of the River Ystwyth is similar to modern OS Mastermap.

Near distance topography

Fort is on sloping land in a slight bend in the river. Land rises beyond the fort to the E and descends beyond the other sides of the fort. Main river (Ystwyth) runs through near distance to W of fort. Land rises then plateaus slightly beyond, forming the valley floor. At this point in the valley the valley floor is quite narrow and the valley sides on the far (W) side of the valley start to rise just beyond the near distance.

Middle distance topography

The Ystwyth valley runs roughly N-S to the W of the fort, before turning westwards to the fort's N and eastwards to the fort's S. The valley narrows to the fort's S as it bends eastwards to the point that a fort would be unlikely to have been placed there. Each side of the valley is undulating upland. Some minor rivers meet the Ystwyth.

Far distance topography

Undulating upland. Some large valleys include the Teifi and the Rheidol. The sea takes up much of the W of the far distance. The Afon Ystwyth runs westwards to meet the sea to the W.

Views from fort: near

Main river (Ystwyth) runs through near distance - partially visible. Rising land and descending land beyond the fort is partially visible.

Views from fort: middle

Large areas of the valley floor are visible before it changes direction to the N and S. Large areas of the valley sides are visible. High points beyond are visible

Views from fort: far

Small area of high land to W of fort is visible.

Cae Gaer GIS notes

In a 'gap' in the valley sides of the Afon Tarennig valley, which runs E-W past the N of the fort. Ascent of steep hills/valley sides start in the NEAR distance to the E and W of the fort and just beyond the near distance to the S. There are potential alternative locations along the Tarennig valley to the E, which are adjacent to the river on the lower slopes of the S valley sides (SN841823 area). The advantage of the chosen location could be the streams/rivers on 3 sides - bends in the river to the E wouldn't provide the same cover. Plus the contours show a slight kink to the E, perhaps forming a natural obstacle, although subsequent peat, erosion and forestry may have influenced contours.

The first edition map does not cover this area.

Near distance topography and visibility:

N - narrow descent towards Tarennig valley. Hills rise on each side of the descent, creating a narrow 'corridor' slope towards the river. The corridor slope is partially visible. The hillside to its W is visible. The hillside to its E is partially visible. The valley floor and river Tarennig at the end of the corridor are visible. E- To the E of

the fort is the rise of the lower slopes of a hill which gets steeper as it ascends. The fort is on the lowest slopes of this hill. This rise of hill to E of fort is partially (mostly) visible. SE - the hill to the E extends to the SE and is partially visible. SW - lower slopes of a further hill rising to the S. It is obscured by the hill to the fort's E which protrudes slightly to the SE/S of the fort. Nant Fragwyr-fraith runs SE-NW between the hills to the E and S and is obscured. W - Descent towards Nant Ceiliogyn, which runs S-N to meet the Afon Tarennig to the N. The descent is obscured and Nant Ceiliogyn is obscured to the E of the fort (it becomes visible further N before it meets the river). Beyond the stream the land rises steeply to form the lower slopes of a hill to the W. The rise is visible.

Middle distance topography and visibility:

The Tarennig valley runs roughly W-E past the N of the fort (extending slightly into the NEAR distance). It starts to the W and meets the river Wye to the E in the FAR distance. A fairly small patch of the valley floor is visible to the WNW, N and ENE of the fort. The remainder is blocked by topography - mostly by the hills to the fort's E and W. The N of the Tarennig valley sides are visible slightly further along the E and W of the valley. The sides of the hills to the fort's E and W which face the fort are also visible. The higher part of the hill to the S is also visible. The remainder of the middle distance is undulating upland, with some small river valleys. Only high points are visible.

Far distance topography and visibility:

Undulating upland with some large valleys (Teifi, Ystwyth). Only small section of high ground to NW is visible.

Jay Lane GIS notes

Buckton and Brandon Camp sites are very close (middle distance). Chronology: Brandon Camp (and possibly associated temporary camps), Jay Lane then Buckton.

Near distance topography and visibility

The fort is on a small plateau in the valley side. The NE side of the fort is in the flat area of the plateau but the SW side extends into the slope of the valley, descending to the NW. To the N and NE of the fort the land remains flat then descends slightly before starting to ascend again to form the remainder of the valley side. This area is

partially visible. The start of the re-ascent begins in the MIDDLE distance. The descent bends around the SW half of the fort, so land falls away from the NW, SW and SE sides. The descent beyond the SW wall is the steepest. The descent to the NW and SE is partially visible. The descent to the SW is obscured. The descent levels out to the SW to form the valley floor. The valley floor becomes visible approximately 60m beyond the base of the valley side. The River Clun runs along the valley floor, close to the valley side. The river is close enough to the valley sides to be only partially visible from the fort.

Middle distance topography and visibility

N - Clun valley floor mostly obscured by valley side just to N of fort. Clun valley sides and hilltops beyond are partially visible. E - descent beyond flat area to E of fort is partially visible. The re-ascent to form the remainder of the valley sides is partially visible. The valley sides obscure the undulating land beyond. The modern town of Leintwardine (possible Roman vicus/town) is on the lower slopes of the valley side to the ESE of the fort and is partially visible. SE -The Teme valley extends to the SE. The valley floor is visible, except a section to the SW which is obscured by a protruding part of the valley sides. The valley sides are partially visible. S and W - This is an open area of valley floor, where the rivers Clun and Teme meet, as well as other minor rivers. The Clun arrives from the N and the Teme from the W. Some hills are present in this area; to the S hills project from the S, the E side of which forms the W side of the continuation of Teme valley and the N of which is the location of Brandon Camp. There is another hill just to the N of the river Teme, to the W of the fort. This is Coxall Knoll, the location of a hillfort. It obscures the view along the Teme valley to the W. The E side of the Knoll is visible. The other hills comprise the valley sides. The valley floor is mostly visible. Undulations obscure small patches and the hills and valley sides obscure views beyond. The valley sides are partially visible. The River Clun is mostly obscured to the N of the fort, only becoming visible as it starts to pass the fort's W. The River Teme is mostly visible; it is obscured beyond the Knoll to the W.

Far distance topography and visibility

Undulating upland and lowland with some wide valleys. High points are visible to the N, S and E. Sections of the Clun Valley floor and river are visible to the N.

Sections of the area are not covered by OS 1st edition map. Where present, the land use remains similar to the modern OS Mastermap.

Buckton GIS notes

Jay Lane, Buckton and Brandon Camp are the most likely places (slightly raised, land descending on 1+ sides; Brandon Camp perhaps too high in altitude but it was not an actual fort) for a fort as close to the narrowing of the Teme valley as possible to the SE.

Near distance topography and visibility

NW- gentle rise - partially visible. Gentle descent beyond fort on all other sides, all partially visible. River Teme runs E-W past the S of the fort - partially visible. Gentle rise beyond river - visible.

Middle distance topography and visibility

N- undulating valley floor, Clun valley meets Teme valley in a wide, undulating valley floor area (in which the fort is roughly central) - partially visible then obscured. E - valley floor- mostly visible. Valley sides - partially visible. Undulating upland beyond - obscured. SE- continuation of Teme valley - visible then obscured. Full width of valley seen here at at least one point. S - valley floor - partially visible. Valley sides (including Brandon Camp which extends into valley floor) - partially visible. Undulating upland beyond - high points visible. W - valley floor, which narrows and extends to W (Teme valley). Coxall Knoll, a large hill (hillfort) within the valley floor blocks views along the narrowing valley to the W. Valley sides partially visible then obscured. Undulating upland beyond - high points visible.

Far distance topography and visibility

Undulating upland and lowland with some wide valleys. High points are visible to the N, W, S and E.

Sections of the area are not covered by OS 1st edition map. Where present, the land use remains similar to the modern OS Mastermap.

Llanio fieldwork notes

Possible level area on a valley side but there are so many trees to the W and S in particular that it is difficult to be certain. There appears to be a steep sided valley to the E, between a couple of hills/mountains - possibly the end of a valley, although the valley may continue around the bend/hillside. Closer hills to the N and E are gently rolling, where visible between the hills. There is a flat area just to the E of the fort, potentially boggy in the vicinity of the river. There is a dip in the ground to the N and W, the ground rising again just beyond, although difficult to see through the trees.

Trees obscure much of the view. Hillsides to the E dominate, although possibly simply because they are the easiest to see as a result of the obscuring trees.

Views from fort: near

Flat area to E and dip in ground to N, otherwise obscured by trees.

Views from fort: middle

Hillsides to E, NE and N. NE is difficult to see through the trees so there may be more features present than simply a hillside. W and S are mostly obscured.

Views from fort: far

Mountainsides and valley to E dominate. Difficult to see remainder through the trees.

Llanio GIS notes

The valley narrows to E and to SW of fort. Few likely places elsewhere between the two narrowings that takes advantage of proximity to main river and scarps in topography. Valley sides would be too steep and hill to SW not typical. Full width of the valley is visible prior to narrowings on both sides.

Near distance topography and visibility

On land with a very gentle rise to the NW. The slight rise to the NW is partially visible. Very gentle descent (almost flat) in the other directions is mostly visible. There is a small descending scarp surrounding the outside of the fort to the NE, E and S, which provides the steepest gradient in the near distance. This gives very

small obscured areas. The River Teifi runs N-S past the E of the fort - visible. There is currently a pond to the S of the fort shown on the OS Mastermap but this was not present on the 1st ed map.

Middle distance topography and visibility

The Teifi Valley runs NE-SW through the middle distance. The fort is in a wide section of the valley; the valley narrows to both the NE and SW of the fort. The wide area of the valley is mostly visible, with some small obscured sections. The valley floor soon becomes obscured as it narrows to NE and SW. A large hill is present in the valley floor to the SSE of the fort. From the fort this hill may appear as a valley side but it is not as high as the valley sides proper. The Afon Brefi, a minor river, runs from the valley sides, between the hill and the valley sides and meets the Afon Teifi to the SW of the fort. The hill obscures the view of the valley sides beyond and obscures some of the view to the narrowing valley to the SW. The views of the remaining valley sides are good in the area of the wide valley. They are obscured apart from some high points as the valley narrows to the NE and SW. Undulating upland extends beyond the valley sides - mostly obscured. A roughly parallel valley of the Afon Aeron runs through the middle distance to the NW of the fort. This is obscured. Nant Bryn-maen minor river meets the Teifi in the wide valley floor. This river runs N-S past the W of the fort and is partially visible. Other minor rivers in the middle distance are obscured.

Far distance topography and visibility

The Teifi valley continues in a NE-SW direction. The Roman road (mostly probable line) follows the line of the valley to the SW. The valley floor is obscured. Other larger valleys that extend into the far distance include the Ystwyth to the N and Aeron to the NW, which extends into the middle distance. Both obscured. A section of coastline and sea are present to the W - obscured. The remainder of the far distance is undulating upland and river. Only small areas of high ground to the NW, NE and S are visible.

OS 1st ed map and modern OS Mastermap comparison - land use in near and middle distances similar, more woodland on modern OS. Teifi River line the same.

Pumsaint fieldwork notes

In a relatively flat, low-lying position within a valley. Hills within near-middle distances to N, W and S. Valley appears to extend to the SW. Views to the NE are mostly obscured by trees.

Pumsaint GIS notes

Near distance topography and visibility

The fort sits within the 'Y' shape created by the meeting point of the rivers Twrch and Cothi and their valley floors - the Cothi runs roughly NE-SE and the Twrch joins it from the NNW. The fort is slightly elevated above the valley floors. A short but steep scarp surrounds the fort on the W, S and E sides, prior to the valley floors beyond. To the N/NE there is a gentle rise beyond the fort, then steeper rise of the valley side. The valley side to the W also starts within the NEAR distance. N-NE - gentle rise then steeper rise of valley side - partially visible. E - small steep scarp (descent) - obscured small area. Descent to valley floor - partially visible. Valley floor (which runs NE-SW) - partially visible, becoming obscured further to the NE. Afon Cothi - partially visible, becoming obscured further to the NE. Start of rise of valley sides - visible. S - small steep scarp (descent) - obscured small area. Descent to valley floor - visible. Valley floor; Twrch valley meets Cothi valley, Cothi valley extends to S - visible. Rivers Twrch and Cothi - mostly visible, including the point they meet (1st ed and modern OS courses). W - small steep scarp (descent) - obscured small area. Twrch valley floor (which runs N-S) - visible. Afon Twrch - visible. Start of rise of valley sides - visible.

Middle distance topography and visibility

The Cothi valley runs roughly NNE-SSW past the S of the fort - NNE section of valley, valley sides and river is mostly obscured, SSW section is partially visible. The Twrch valley runs roughly N-S past the W of the fort - partially visible. The two valleys meet to the S of the fort, the two rivers meeting in the fort's NEAR distance. The remainder of the middle distance is undulating upland with minor rivers - some high points visible.

Far distance topography and visibility

Undulating upland with Teifi valley to N and Tywi valley to S. Cothi valley continues from MIDDLE distance. Small areas of high points visible.

OS 1st ed map and OS Mastermap comparison: NEAR and MIDDLE distances - lines of Twrch and Cothi rivers differ slightly. Land use similar.

Llandovery I GIS notes

The fort is on a small ridge/promontory extending from the valley side separating the Tywi and Bran valleys. The two valleys meet just to the S of the fort.

Near distance topography and visibility

The fort is on a small ridge extending from the valley side separating the Tywi and Bran valleys. The ridge extends into the valley floor area where the two valleys meet. The ridge extends out to the SW, rising slightly towards the SW. The fort is draped over the ridge, creating a central spine along the length of the fort. The rise of the ridge beyond the fort to the SW is visible. The descent (towards the valley floor) beyond the rise is obscured. The descent to the NE and then the start of the rise of the hillside proper are partially visible. The ridge descends to the valley floor quite steeply to the NW and SE. These descents are partially visible. Small areas of the valley floor are present in the near distance beyond these descents - they are partially visible. The River Bram runs through the valley floor on the SE side. The route differs slightly on the OS1st edition map from the modern Mastermap but in both cases the routes are partially visible.

Middle distance topography and visibility

The fort is on a small ridge extending from the valley side separating the Tywi and Bran valleys. The Tywi valley descends from the NNW, past the fort's W then turns slightly to run towards the SW. The valley's route from the NNW is mostly obscured, only the area immediately to the fort's W is visible from the fort. The valley's route to the SW is also mostly obscured by the rise of the ridge on which the fort is placed; the area where the Bran valley meets the Tywi valley is visible but only small strips of the valley floor near the valley sides are visible of the Tywi valley's path to the SW. The Afon Tywi is obscured but the banks are partially visible in the sections where the Tywi valley floor is visible. The Bran valley descends from the NNE past the fort's E and meets the Tywi valley to the S of the fort. There are good views of the Bran valley floor from the fort, with the view only becoming gradually reduced further to the NE. The Bran river is partially visible. The remainder of the middle

distance is undulating upland - high points are visible. Minor rivers are mostly obscured.

Far distance topography and visibility

Undulating upland. The Tywi valley is the widest valley in the far distance and continues extending to the SW. A few high points are visible.

OS 1st edition map and modern OS Mastermap comparison - courses of the Tywi and Bran rivers vary slightly. Land use similar. Some views in near and middle distance are obscured by railway but these are only small areas and do not affect overall results

Llandovery II GIS notes

The fort is on a small ridge/promontory extending from the valley side separating the Tywi and Bran valleys. The two valleys meet just to the S of the fort.

Near distance topography and visibility

The fort is on a small ridge extending from the valley side separating the Tywi and Bran valleys. The ridge extends into the valley floor area where the two valleys meet. The ridge extends out to the SW, rising slightly towards the SW. The fort is draped over the ridge, creating a central spine along the length of the fort. It is almost as far to the SW of the ridge as possible before the descent to the valley starts (further SW than Fort 1)- there is a small flat area beyond the SW of the fort before the descent begins. This flat area is partially visible. The gentle descent along the ridge to the NE and then the start of the rise of the hillside proper are partially visible. These descents are partially (mostly) visible. The ridge descends to the valley floor quite steeply to the NW and SE. These descents are partially visible, that to the SE mostly obscured. Small areas of the valley floor are present in the near distance beyond these descents - they are partially visible. The River Bram runs through the valley floor on the SE side. The route differs slightly on the OS1st edition map from the modern Mastermap but in both cases the routes are partially visible.

Middle distance topography and visibility

The fort is on a small ridge extending from the valley side separating the Tywi and Bran valleys. The Tywi valley descends from the NNW, past the fort's W then turns slightly to run towards the SW. The valley's route from the NNW is mostly obscured, only the area immediately to the fort's W is visible from the fort. The valley's route to the SW has good views from the fort (in contrast to Fort 1); it is mostly visible, with undulations causing some obscured patches and the curve of the valley obscuring a wedge to the far SW. The area where the Bran valley meets the Tywi valley is visible. The Afon Tywi is obscured but large sections of the banks are visible in the sections where the Tywi valley floor is visible. The Bran valley descends from the NNE past the fort's E and meets the Tywi valley to the S of the fort. There are good views of the Bran valley floor from the fort, with the view only becoming gradually reduced further to the NE. The Bran river is partially visible. The remainder of the middle distance is undulating upland - high points are visible. Minor rivers are mostly obscured.

Far distance topography and visibility

Undulating upland. The Tywi valley is the widest valley in the far distance and continues extending to the SW. A few high points are visible.

Caerau GIS notes

Medieval motte by SW gate, may have slight influence on viewsheds. OS 1st edition map and OS modern OS Mastermap comparison: land use similar, although there is now slightly more woodland in the middle distance; course of Afon Cammarch differs slightly in places but does not influence the outcome of visibility of the river.

The fort is situated on a relatively low undulation in an area of undulating lowland. Areas of undulating upland begin to the NW and SE within the middle distance. The undulating lowland in between is perhaps too wide to be considered a valley floor. Numerous minor rivers run through the middle distance. The closest river to the fort is the Afon Cammarch, which runs roughly N-S to the E of the fort through the near distance. It is a tributary of the Irfon, which runs through the middle distance.

Near distance topography and visibility

Land descends to the N, E and S of the fort (partially visible) and ascends more gently to the W (partially visible). The Afon Cammarch runs roughly N-S to the E of the fort (partially visible).

Middle distance topography and visibility

A band of undulating lowland runs NE-SW (partially visible - large areas visible but undulations also causing large obscured areas. Best views are to the N and S).

Higher ground starts to the NW and SE (hillsides partially visible then high points visible). Afon Cammarch runs roughly N-S past E of the fort (partially visible). It meets the Afon Irfon (obscured) to the S of the fort. Other rivers (minor) are mostly obscured. The land rising from the near distance to the NW continues to rise in the middle distance to a slightly higher undulation to the NW, obscuring views beyond.

Far distance topography and visibility

Undulating upland and lowland with some valleys, including the Wye valley to the E. The River Irfon joins the Wye valley. High points visible.

Castell Collen GIS notes

Near distance topography and visibility

On a relatively low undulation in a wide, undulating valley. Land descends fairly steeply beyond the fort to the N, E and S (partially visible) and rises to the W (visible). The land within the fort itself slopes gently towards the E. The river Ithon extends into the near distance to the E and S (section to S is obscured, section to E is partially visible). Pentre Brook runs E-W past the N of the fort to meet the river (small section visible). Another stream runs NW-SE past the SW of the fort to meet the river (very small section visible).

Middle distance topography and visibility

On a relatively low undulation in a wide, undulating valley. There are good views of the Ithon valley floor, which runs roughly NE-SW, although undulations cause numerous obscured patches. The River Ithon is partially visible. The valley does not narrow considerably within the middle distance. The valley sides are partially visible, with high points visible beyond. Minor rivers are mostly obscured.

Far distance topography and visibility

Undulating upland and lowland with some valleys, including the Wye. Only high points to N, E, S and SW are visible.

OS 1st edition map - land use in near and middle distances is similar to OS Mastermap. River Ithon course differs slightly but not enough to change outcome of visibility. 1st ed map notes the river is liable to flood in the areas in the near and middle distances (the fort is on a spur elevated above the floodplain so is unlikely to have been impacted).

Hindwell Farm fieldwork notes

View obscured to E and W by valley and N by buildings but appears to be on SE of a wide valley. Area within fort is flat. Hillsides to NW, W and N are on the very far edge of middle distance. Hillsides and hilltops to E and SE are in the middle distance. There is a small rise/hill just to the N/NE of the fort (in near distance). Fort would have been visible from hillsides and valley sides to NW and SE.

The hillsides to the E dominate because they feel quite close to the fort. The small hill to the NE is frustratingly close since it blocks views beyond, although perhaps would not block the view from a tower. The sweep of the hillsides to the W/NW gives the impression of a broad, open valley. These hills seem much further away; the fort is certainly tucked into one side of the valley. Views are mostly obscured to N and S; there is a hilltop to the S visible in the middle distance and hilltops just visible to the N in the mid-far distance, suggesting some views are at least partially restricted beyond middle distance.

View from fort: near

Hill to N obscures views. Trees to N obscure views. Otherwise appears quite flat/undulating.

View from fort: middle

Hillside and hilltops of valleys, where visible. Those to S are closer. Otherwise they are in the mid-far distance. Uncertain what is present between fort and hillside to W due to buildings and trees. Probably undulating valley floor.

View from fort: far

Obscured.

Hindwell Farm GIS notes

Near distance topography and visibility:

Land slopes gently from N-S towards Summergil Brook, which runs E-W through the near distance to the S of the fort. All partially visible. The land starts to rise again to an undulation to the NE of the near distance.

Middle distance topography and visibility:

The valley containing Hindwell Brook, continuing as Summergil Brook runs from the E and expands into a wide valley in the centre and W of the middle distance, with a band of hills forming the valley side beyond. The narrow section to the E is obscured. The wider section is partially visible. The remainder is undulating upland with more brooks. High points are visible. A smaller valley (Back Brook) runs roughly E-W to the S of the fort - obscured. A hill/undulation is located just to the NE of the fort - the rise of the undulation starts in the NEAR distance. The undulation blocks views into the narrower part of the valley to the E. The undulation is higher than the fort. Could it have been an alternative location for the fort? The E side of the undulation is not too steep but it is perhaps too small for fort and vicus and too steep on NW side. Its rise to the NW would not have been a suitable spot for the fort (too steep) and would have obscured some views of the valley to the W, which is partially visible from the actual fort location. The E side of the undulation, however, would have been between two brooks, provided land falling from 3 sides and rising on the 4th, and provided good views of the narrow section of the valley.

Far distance topography and visibility:

Undulating upland with Wye valley to the S and Teme Valley to N. Only small areas of high points visible.

OS 1st edition map and modern OS Mastermap comparison - land use similar - more patches of woodland now. Route of brooks similar.

Clifford GIS notes

Situated in a large bend in the River Wye and Wye valley.

Near distance topography and visibility:

On a very gentle slope, almost flat, descending towards the River Wye to the N. River is in middle distance. The rise is the start of the valley sides. The descent is visible. The ascent is partially visible. A railway (now disused) cuts through the fort. The railway earthworks block the views beyond from each of the gates, affecting possible comparisons between gates.

Middle distance topography and visibility:

Wye Valley runs from SW-NE then, at the location of the fort, turns to the E. The fort is therefore at the point of the bend in the valley. The valley floor to the SW and E is partially visible, with visibility gradually reducing and becoming obscured as distance from the fort increases. Valley sides are partially visible. The valley to the SW narrows, caused by a hill within the valley floor. The possibly later fort of Clyro is located here. The side of the hill facing Clifford fort is visible. High points of the undulating land beyond the valley are visible.

Far distance topography and visibility:

Undulating upland with the Wye valley running in a roughly 'n' shape through the area. Other smaller valleys are present. High points to E, S and W are visible.

OS 1st edition map and modern OS Mastermap comparison - land use similar. Course of River Wye similar. River in middle distance to SW and N of fort is noted as being 'Liable to flood' on 1st edition map.

Clyro fieldwork notes

On a gently undulating plateau in a wide valley. Overlooking river. The ground falls away on all sides, so the fort dominates the valley, being easily visible from the valley floor and surrounding hillsides and hilltops. Plenty of usable space surrounding the fort. Within a long, thin valley, NE to SW. The valley sides on the NW and SE are therefore closer in the middle distance and obscure the views beyond. Hillsides on the NE and SW extend to the far distance.

Generally good all-round views of the valley floor and hillsides. Hidden areas where the valley floor undulates and where hillsides which make up the valley sides overlap. To the SW and NE the valley sides dominate in the middle distance and, apart from one small view to the E, views cannot be seen beyond to the far

distance. Similar situation to the N and S, although the hillsides are further, edging into the far distance, especially to the S. The area of the fort itself is not flat and is at its highest point in the centre (roughly) and therefore obscures the views from the gates through the fort itself (may not have done from towers).

Views from fort: near

Descent of land from fort to valley floor/river. Rise in ground just beyond fort to NW obscures views beyond - small hill really.

Views from fort: middle

Valley sides and, to NE and SW, hilltops.

Views from fort: far

Only visible to NW and SE.

Clyro GIS notes

Near distance topography and visibility:

Land descends on all sides except the SW, where it is flat then starts to rise to an undulation of 120m OD. The descending areas are partially visible, the flat area and rise is visible. On the E the descent reaches the valley floor, running roughly N-S. The River Wye also runs through the near distance. The valley floor and river are partially visible.

Middle distance topography and visibility:

The Wye valley runs SW-NE through the middle distance, with undulating lowland to each side. The fort is on a hill/undulation within the valley floor, the River Wye running past the E of the hill. Large areas of the valley floor are visible to the NE but not to the SW. To the NE very small sections of the River Wye are visible, although large sections of its banks are visible. The river and banks are obscured to the SW. Large sections of valley sides and high points beyond are visible to NE and SW. Small streams/brooks run into the Wye. Some are partially visible.

Far distance topography and visibility:

The Wye Valley runs SW-NE past the fort then turns to the E. Undulating lowland and upland surrounds the valley. High points visible.

OS 1st edition map and OS Mastermap comparison: land use similar. Course of River Wye similar.

Brecon Gaer fieldwork notes

The fort is situated within a greatly undulating landscape. It appears to be within a valley, roughly NW-SE direction, in as much as it is surrounded by higher, overlapping hills, being closer to those to the S and SW and further from those to the N. The fort is perhaps located on the most suitable (flat-ish) area. It is on a slight rise in the valley but it is not at the highest point; there is a rise in land just to the NE (in the near distance) creating a hidden dip beyond. This dip may not have been hidden from view from fort towers. The fort overlooks the river to S and W and there is quite a steep descent to the river just beyond the S and W gates. The middle distance to the E is mostly obscured and it is unclear what the topography is like here until it rises to hillsides. I expect it is undulating fields. SE largely obscured by trees and it is unclear what the topography is like in the near and middle distance here.

Trees and buildings obscure the view significantly in places. The steep descent to the river beyond the fort to the S and W dominates. Also, the hillside to the S and SW feels very close, obscuring views in that direction. Hills to the E and a rise in the ground to the N in mid and near distances respectively obscure views beyond. This fort, therefore, does not have extensive all-round views. Views are good in other directions although mostly limited to middle distances of hillsides. SE largely obscured by trees.

Views from the fort: near

River and hillside to S. River and undulations to W. Obscured and rising land to N. Flat area and hillside to E.

Views from the fort: middle

Hillsides at varying distances within middle distance band. Large areas obscured by trees, buildings, topography. SE is mostly obscured by trees. Undulating valley appears to stretch to the W, although greatly obscured by trees.

Views from the fort: far
Occasional glimpses of hilltops.

Brecon Gaer GIS data

Near distance topography and visibility:

Land descends to N, W and S of the fort and rises to a hill to the E. Descent - partially visible (steepest sections obscured), rise, mostly visible. Fort itself slopes gently and has a slight E-W spine. The River Usk runs E-W past the S of the fort. The River Ysgir runs N-S past the fort's W and meets the Usk in the NEAR distance to the fort's SW. Both rivers are only visible to the SW of the fort. Their meeting point is visible.

Middle distance topography and visibility:

The River Usk/Usk Valley runs roughly E-W past the S of the fort. Large areas of the Usk valley floor to the fort's W are visible. The Usk valley floor to the E is obscured because it narrows and turns slightly. Sections of the River Usk are visible on the W side of the fort. Large areas of valley sides are visible to the W. A small section of the valley sides is visible to the E. The Afon Ysgir runs roughly N-S past the W of the fort. Only a small section of the Ysgir valley and small sections of the river are visible. Sections of valley sides are visible. Undulating lowland surrounds the valleys and high points are visible.

Far distance topography and visibility:

Undulating upland and lowland. Only high points are visible.

OS 1st edition map and OS Mastermap comparison - land use similar, river courses similar.

Llandeilo I fieldwork notes

Situated in a high, undulating area in a wide valley. The forts are not flat but in a fairly level location in an undulating landscape. Higher undulations to the SE and NNW prevent good views of the complete valley but these hills/undulations are too steep and unsuitable for a fort location. The forts do overlook the valley to the NE

well and possibly the SW (obscured by trees) and would no doubt have made a visual impact from the valley and surrounding hills despite some obscured views. Undulations within the fort obscure views but probably not from towers. Trees and undulations within the forts block view of hill to NW from SE of forts.

Hills/undulations prevent all round views in some directions but otherwise there are reasonable views of the valley. These undulations are fairly close and it would be simple to stroll out of the fort and stand on them to look beyond. Trees prevent view to S now. View along valley to NE dominates. Blocked views also dominate - they are frustrating. Would probably be quite good view to S if there were no trees. The location of fort 2 makes me think that the users of fort 2 were more interested in the view to the N/NE than the S.

Views from fort: near

Descent to N. Hill to E. Descent to S then obscured by trees.

Views from fort: middle

NW- view blocked by hill. N- valley floor. E and SE- view mostly blocked. S- valley just visible through trees. W- appears to be mostly undulating valley floor then valley sides, but trees obscure a lot of the view.

Views from fort: far

Hills.

Llandeilo I GIS notes

Near distance topography and visibility:

The fort occupies the crest of a hill, and extends slightly into the E slope of the hill. The ground descends away from the fort on all sides - there is a slight flat area beyond the W side, forming the remainder of the hilltop, before the descent starts. There is also a slight plateau/rise to the S before it continues to descend. The steepest descent is to the S, beyond the slight rise. The descents are partially visible. To the SE, the descending land flattens then starts to rise to another hill. The hillside is visible and obscures the area beyond. There are undulations within the fort. The fort interior is visible.

Middle distance topography and visibility:

The Tywi valley runs SW-NE past the S of the fort. The fort is on the S side of a cluster of hills protruding into the valley floor from the N valley sides. These small hills surround the fort to the W, N and E, blocking some views in these directions; large sections of the valley to the SW and NE are therefore obscured, although they and small sections of the river become visible. A section of the valley to the S of the fort is visible. Valley sides are similarly partially visible. To the N of the fort, the ground descends (partially visible) to an altitude similar to that of the valley floor (obscured) before rising to form the valley sides (partially visible). Hilltops in the undulating landscape are visible beyond the valley sides.

Far distance topography and visibility:

Largest valley is the Tywi running SW-NE. The Loughor valley runs N-S to S of fort. Large patches of the Tywi valley to the NE are visible and small patches to the SW. Otherwise, only high points to N, E, S and W are visible.

OS 1st edition map and OS Mastermap comparison - land use is similar. The course of the River Tywi has altered slightly since the 1st edition map but does not affect the outcome of its visibility from the fort.

Llandeilo II fieldwork notes

As Llandeilo I

Llandeilo II GIS notes

Near distance topography and visibility:

The fort occupies the E side of the crest of a hill, and extends slightly into the E slope of the hill. The ground descends away from the fort on all sides - there is a slight flat area beyond the W side, forming the remainder of the hilltop, before the descent starts. There is also a slight plateau/rise to the S before it continues to descend. The steepest descent is to the S, beyond the slight rise. The descents are partially visible although most of the descent to the S is obscured (by the

plateau/slight rise). The remainder of the crest of the hill is partially visible; the W side becomes obscured as it starts to descent to the W.

Middle and far distance topography and visibility:

As Fort I

Carmarthen fieldwork notes

Built-up area so difficult to see. On a plateau overlooking the river. Overlooks fairly steep descent to river. Appears to be quite a narrow river valley. Between buildings, a hilltop and hillside are visible to the W in the middle distance. The area between the fort and this hilltop is obscured so the topography here is uncertain but could indicate a fairly wide valley with the fort (and modern town) located on a fairly flat plateau within the valley. Uncertain topography in the medium and far distances to the N and S also. Hill to E in middle distance (on far side of river) obscures view beyond.

Very built-up area so only snatches of views are possible. Buildings obscure the views in most directions. River valley dominates to the E. The descent from the fort to the river is quite dramatic - the fort is on a plateau on almost a ridge.

Views from fort: near

Area of the fort itself appears to be quite flat. Then steep descent to river to E.

Views from fort: middle

River valley then hillside and hilltop to E. Hill to E obscures view beyond. Hilltop visible (just) to W. Unsure what is beyond or between.

Views from fort: far

Uncertain in all directions.

Carmarthen GIS notes

Near distance topography and visibility:

The fort is situated on a fairly level area above a steep descent to the River Tywi to the S, E and W (gentler slope to the W and E). The estimated locations of the NE

and SE gates are on the start of the descent. The area to the N of the fort is gently undulating and has a very gentle rise. The River Tywi runs E-W to the S of the fort. The descent is partially visible. The river is obscured. Then gentle rise is partially visible.

Middle distance topography and visibility:

The Tywi River and valley runs E-W past the S of the fort then turns southwards just beyond the W of the fort. A valley connecting the Tywi to the Cwynn valley to the W joins the Tywi valley from the W at the point where the latter turns southwards. The remainder is undulating lowland. Large sections of the Tywi valley are visible. Much of the River Tywi is obscured but longer lengths of its banks are visible. The adjoining valley to the W is partially visible, with the largest visible sections near to where it adjoins the Tywi valley. Large sections of the valley sides are visible and high points are visible beyond.

Far distance topography and visibility:

The Tywi valley and river continues southwards to empty into the sea to the SSW of the fort. Small sections of the valley floor are visible to the E. Otherwise hilltops are visible. The estuary and sea are obscured.

OS 1st ed map and OS Mastermap comparison - the area is now more built-up. The course of the River Tywi is the same. Some areas of the valley floor are labelled as 'Liable to flood' on the 1st ed map. Mastermap notes Mean High and Low Water of the river just S of the fort, indicating it is still tidal here.

Loughor fieldwork notes

Overlooking the river. Appears to be on an 'outcrop' of land into the river, so river is present both to the N and W of the fort. The ground sloped towards the river so the fort itself is not fully flat. The appearance of the fort would have been striking from the river, from the surrounding banks and from surrounding hilltops. Flat area beyond fort to the S (flood plain?). Then hills in middle distance obscure views beyond. View to E is mostly obscured by buildings and trees.

Buildings, trees, walls, road and bridge all prevent good views. The fort slopes towards the river, so views from the N of the fort southwards are generally obscured

by topography. Hills on far bank of river prevent views beyond to NE. Wide views along sweeping river, which dominates.

Views from fort: near

Descent to river. Rise of castle. Otherwise only gentle slopes within fort.

Views from fort: middle

Where visible, river or flat areas. E is mostly obscured. Then hillsides in many directions where visible.

Views from fort: far

Hilltops, if not obscured by hills of middle distance or buildings in near distance.

Loughor GIS notes

Castle mound, earthworks associated with road and railway interfere with viewshed results. Loughor River is at its estuary point - the 'valley floor' in most of the middle distance is taken up with water when the tide is in.

Near distance topography and visibility:

Loughor Estuary/River runs NE-SW past the W of the fort. Land to the W of the fort descends to the estuary. The smaller Afon Lliw runs E-W past the S of the fort. Both rivers are partially visible. Land descending to the rivers from the fort is partially visible. The land to the E of the fort is quite flat, apart from Loughor castle mound to the E and a small hill (of similar size of the castle mound) to the NE. These obscure some of the view to the E. Earthworks associated with the modern road and railway also affect VS results slightly.

Middle distance topography and visibility:

Loughor Estuary runs N-S to S of fort then turns SW just to the W of the fort to join the sea. Large areas of valley floor/estuary visible. The Afon Llan valley runs E-W to SE of fort. It meets the Afon Lliw, running roughly N-S to E of fort. The Lliw continues E-W past the S of the fort (through middle distance) to meet the Loughor. The E-W section of the Lliw and Llan valley have large sections visible. The river is partially visible, with more visibility of its banks. The N-S section of Lliw is obscured. Good views of valley sides. High points of undulating lowland beyond visible.

Far distance topography and visibility:

Loughor valley runs roughly N-S to N of forts and its estuary meets the sea to the fort's SW. Undulating lowland surrounds. High points to the N, E and W are visible. A section of the estuary is visible. Open sea is obscured.

Neath fieldwork notes

Fort located on a mostly flat area within a valley, W/NW side of valley, next to the river to the E. Hills to the W, NW and N in the middle distance feel quite close by (the view of those to the NW are partly obscured so there may be a gap in the hills). The fort would have dominated the valley and surrounding hillsides. It would also have appeared dominant from the river. SW is uncertain due to trees and building obstructions. Slight dip to NW then start of hills. Hills in mid distance - those to W/SW are slightly lower than those to the NW and feel less obtrusive. Plenty of usable land in the valley and on some of the valley sides.

Situated in the modern town of Neath. Buildings and trees obscure the view in all directions. Topography mostly identified from the heights of visible rooftops and treetops. View to NW and SW is uncertain due to buildings and trees.

Views from fort: near

Valley floor. Slight descent to river, where visible.

Views from fort: middle

Hillsides, where visible.

Views from fort: far

Mostly obscured by hillsides, trees and buildings.

Neath GIS notes

Near distance topography and visibility:

The River Neath runs NE-SW through the near distance past the SE of the fort. The fort is on a plateau, slightly higher than the river. The land descends from the plateau towards the river just beyond the fort's extent. The descent causes a 'hidden dip' from the fort, meaning that some sections of the descent and all the river is

obscured but large sections of its banks are visible. The rise in land beyond the river is visible. The fort itself and the land to the W. N and NE is fairly flat, with a few gentle undulations. This area is mostly visible.

Middle distance topography and visibility:

The Neath valley and River Neath run NE-SW past the S of the fort (river runs through the NEAR distance). The valley widens and turns slightly southwards to the SW of the fort as it approaches the sea. The valley narrows to the NE of the fort. The valley floor is undulating. Large areas of the valley are visible, with obscured areas as a result of undulations (some also resulting from modern roads, canals and rail). The valley becomes obscured as it bends to the S. Large sections of the valley sides are visible. The river Neath is obscured but sections of its banks are visible. The Clydach valley and (minor) river run N-S to meet the Neath valley and river to the SW of the fort. Only a small section of the Clydach valley is visible, just N of where it meets the Neath valley. Large sections of the W side of the valley sides are visible. The Clydach river is obscured. High points beyond the valleys are visible.

Far distance topography and visibility:

The Neath river and valley continue to extend to the NE (obscured). To the S they meet the sea (obscured). The Tawe valley runs parallel to the Neath valley to the NW (obscured). The Loughor valley is also present beyond that (obscured). Only high points are visible.

OS 1st ed and OS Mastermap comparison - the area is more built up now. The courses of the rivers Neath and Clydach are similar.

Coelbren GIS notes

Near distance topography and visibility:

The fort is on the side of a low rise in the valley. The fort is placed on the central and E side of the rise's summit and extends into the E descent of the rise. The land therefore descends on the fort's N, E and S sides. It also dips slightly on the W side but soon levels out. The descents on the N, E and S are mostly visible, with small obscured sections. The dip to the W causes a small obscured area but the flat area beyond is visible. The Afon Pyrddin runs NW-SE past the E of the fort. The River

Camnant runs W-E past the S of the fort, joining the Pyrddin in the MIDDLE distance to the SE of the fort. Both rivers are partially visible. Beyond the Camnant to the S of the fort, the land starts to rise to another undulation which is slightly higher than that on which the fort is placed. The undulation's rise is in the NEAR distance, and is visible. Its descent is in the MIDDLE distance. It blocks some views of the MIDDLE distance beyond.

Middle distance topography and visibility:

The Pyrddin valley starts in the MIDDLE distance just to the NW of the fort and runs to the SE, getting narrower to the SE. The wider section of the valley floor is undulating. There are large visible areas of the valley floor in the wider part of the valley. Sections of the River Pyrddin are also visible. Large areas of the valley sides are visible prior to the valley narrowing. The River Neath runs roughly N-S through the MIDDLE distance to the E of the fort (obscured) and the River Pyrddin joins it here (obscured). The Tawe valley and river run roughly NE-SW through the MIDDLE distance to the NW of the fort. A ridge of high ground (forming part of the Pyrddin valley sides) obscures the Tawe from the fort. The source of the Dulais river is in the high ground to the SW of the fort (obscured). Otherwise high points are visible.

Far distance topography and visibility:

Undulating upland. The Neath valley runs NE-SW past the S of the fort. The Tawe runs roughly parallel past the N of the fort. (Both valleys run through the MIDDLE distance). They meet the sea just beyond the FAR distance band. Taf valley to the E and Usk to the N. Only high points to NW, N, E and SE are visible.

OS 1st ed and OS Mastermap comparison: river courses are similar. Land use - the area is now more built-up.

Penydarren GIS notes

Very built-up area. Some contours may have been affected by groundworks.

Near distance topography and visibility:

The fort is on the sloping hill/valley side, descending from NE to SW towards the valley floor. The valley floor itself is in the MIDDLE distance. The fort is on a spur

projecting out slightly from the hillside, causing land to descend beyond three sides of the fort (partially visible). There is a small flatter area beyond the SW gate (visible) before it continues to descend, blocking some views of the descent to the S. A stream, Nant Morlais, runs NE-SW past the SE of the fort (partially visible). Its route may have been altered slightly in recent times. Beyond the stream the valley side projects out again slightly, obscuring some views beyond. The rising land to the N of the fort is undulating, causing some hidden areas.

Middle distance topography and visibility:

The Taf valley and river run NW-SE past the S of the fort. The Taf Fechan river meets the main river (named Taf Fawr at that point) to the NW of the fort. From that point the river is named the Taf. A stretch of the valley to the NW of the fort is quite narrow. It widens just to the fort's NW and continues at a similar width as it continues south-eastwards throughout the MIDDLE distance. Large sections of the wider areas of the valley floor are visible until it bends slightly to the fort's SE and becomes obscured. The narrow section to the NW and the wide section beyond are obscured. Sections of the valley sides are visible, the largest sections on the SW side of the valley. Very small sections of the River Taf are visible but large sections of its banks are visible. High points beyond the valley sides can be seen.

Far distance topography and visibility:

Taf valley continues from the MIDDLE distance. Other larger valleys include the Usk, Ebbw and Neath. High points to S are visible, mostly the Taf valley sides.

OS 1st ed map and OS Mastermap comparison - the area is now more built-up. The course of the Taf is similar. Course of Nant Morlais (stream to SE of fort) differs slightly between maps, and has possibly been canalised in sections on 1st edition, so may not represent the line of Roman era.

Gelligaer I GIS notes

Near distance topography and visibility:

The fort is on a rise between two valleys. It is on the E side of the rise, with ground descending towards the NE. There is a slight curve in the hillside, so that the aspect of the ground to the S of the fort is more to the SE. There are good views of the

sloping ground to the N of the fort. The ground to the SE descends more steeply, and is therefore partly obscured. Sections to the SW are also obscured as the land curves out of site. The rise to the W is visible until it plateaus slightly and becomes obscured.

Middle distance topography and visibility:

The fort is on a rise between the valleys of the Bargod Taf to the W and the Rhymney to the E. Both valleys run roughly NW-SE. There is a section of lower-lying land to the S of the fort (in the middle distance) that connects the two valleys, although their respective rivers do not meet. The continuation of the central rise to the S of the fort, however, obscures this connection. The fort is on the E side of the rise and has views of large sections of the W side of the undulating Rhymney valley. The E side of the valley floor and the Rhymney river are obscured. Large sections of the E side of the valley sides are visible. The Bargod Taf valley and river are obscured by the ascent of the connecting high ground. The Afon Taf also runs through the middle distance (to the W) - obscured. The closest watercourse to the fort is the Nant Cyllia, a minor stream/river, which is partially visible. Large areas of the rise on which the fort is situated are visible. Otherwise hilltops are visible.

Far distance topography and visibility:

Continuation of the valleys from the MIDDLE distance, as well as Ebbw and Llwyd valleys - valley floors and rivers obscured, sections of valley sides visible in E valleys. High points to N, S and SW also visible. Start of estuaries (Taf and Ebbw) to S and SE, with the seashore just beyond the FAR distance band - obscured.

OS 1st edition and OS Mastermap comparison: land use - more built-up now. River courses: Bargod Taf may have changed since OS 1st edition (although sections of 1st ed map are missing). Rhymney and Nant Cyllia are similar.

Caerphilly fieldwork notes

Very poor visibility. Appears to be within an undulating valley. Situated on the S side of the valley as the valley sides appear to be closer to the S. Some undulations in the near distance appear to be slightly higher than the fort itself, and would probably have created hidden dips in the valley floor.

Very low cloud obscuring the views from mid-far distances. Built-up area so buildings also obscured. The castle on the fort site also obscures the view. The fort would probably have been quite striking from valleysides and hilltops surrounding and from most of the valley itself. Undulating valley floor - would have been hidden dips. View to SW obscured in middle distance and beyond by buildings and trees. Topography of near distance valley (undulating/flat) can only be determined by the altitude of visible roofs and buildings.

Views from the fort: near
Modern buildings. Undulating valley.

Views from the fort: middle
Hillsides. Those to S and SE are closer.

Views from the fort: far
Obscured by clouds

Caerphilly GIS notes

Visibility of valley floor in MIDDLE distance is obscured in places by the railway line and more is likely to have been visible at the time of occupation of the fort. Fort in centre of valley/basin. Valley floor to W is more undulating than that to E. Fort itself is on one of these undulations. Central spot between valleys of Rhymney, Nant yr Aber (minor valley) and Taf. Lake in near and mid distance is associated with the castle.

Near distance topography and visibility:

Gentle descent to N and E. Contours to S are fairly flat, although currently under water. Mound of castle to SE. Partially visible. Fairly flat (very gentle ascent) to W - mostly visible.

Middle distance topography and visibility:

The fort is situated on a rise in the undulating base of the Nant Gledyr valley - large sections visible to the E, smaller sections to the W. The Nant Gledyr valley meets the Rhymney valley, which runs N-S then turning E - sections of the Rhymney valley floor partially visible. to the E of the fort. The smaller Nant yr Aber valley meets the Nant Gledyr valley from the NW. The Taf valley is connected to the Nant Gledyr

valley by a stretch of low-lying land - Taf valley obscured. Nant Gledyr river/stream partially visible. Rhymney river obscured but large section of river banks are visible. Nant yr Aber river partially visible, becoming obscured further N as its valley narrows. River Taf obscured. Large sections of valley sides are visible, apart from those of Taf valley. High points visible beyond valleys.

Far distance topography and visibility:

Undulating lowland with some main river and valleys. Estuaries and sea to the SE. High points visible to N, E and W. Low-lying coastal/estuary zones begin just beyond the MIDDLE distance.

OS 1st edition and OS Mastermap comparison - more built-up now. Course of Porset Brook/Nant Gledyr differs slightly to E of fort but does not alter visibility results.

Caergwanaf GIS notes

Near distance topography and visibility:

The fort is on a spur-shaped undulation, extending into the valley from undulations to the S and W. The undulation is a long domed shape and the fort is draped over the crest, creating a fort with a N-S central spine. The land descends within and beyond the fort to the E and W. The steepest sections of the descents are obscured, otherwise the descents are visible (excluding the river). To the N of the fort there is a small fairly flat area (visible) before the descent begins (steepest area obscured). To the S the land starts to rise gently (visible until modern road), although a modern road running E-W disrupts the contours slightly and blocks some views beyond. To the W, beyond the descent, the land starts to rise again to another undulation (visible). The River Ely flows roughly ESE-NNW past the NE of the fort. Small patches of the river are visible but much larger stretches of the river banks are visible.

Middle distance topography and visibility:

The River Ely flows roughly NNW-ESE through the middle distance. The fort overlooks a particularly narrow section of the valley floor, although the undulating land on each side is not high, with the distinction between undulating valley floor and valley sides quite fluid. The valley floor widens again to the NW, where the Clun

river and valley meets the Ely. The valley sides here are steeper, higher and more distinct. Views in the middle distance are quite restricted. To the SE, large sections of the narrow valley floor are visible for approximately 1.2km into the middle distance before the valley beds slightly and becomes obscured. The valley floor starts to widen again to the NW of the fort (the narrow section to the NW is partially visible) but the valley sides limit the view into the wider section so only sections of a sliver of the wide valley floor can be seen. The Clun valley and river to the N and NW are obscured. Most of the River Ely is obscured, although larger sections of its banks are visible. There are good views of the valley sides but these block much of the view beyond and only small sections of hillsides and hilltops are visible beyond.

Far distance topography and visibility:

Undulating lowland with some main rivers and valleys. Estuaries and the sea to the SW, S and SE. Only small sections of high points to the N, NE, E and NW are visible.

OS 1st edition and OS Mastermap comparison - course of River Ely is similar. Land use - the area is now more built-up with a new road to the S. Otherwise land use is similar.

Cardiff GIS notes

Three main data issues with Cardiff II: 1) fort extent and gate locations 2) topography of the fort and land surrounding it 3) the course of the River Taf. Fort extent: S gate known. Remaining gates are from projected/suggested extent of fort (Webster 1981 204; Webster/Marvell 2010, 231), with N, E and W gates located halfway along the fort lengths. Topography: Excavations suggest that originally the site may have descended from the NE down towards the W. It is possible that in the 2nd or 3rd century that this slope may have been terraced along the line of the north-south road which ran through the middle of the first three forts. The area was landscaped and flattened in places by Capability Brown and later by the Burges period (Webster 1981, 210-11). Also, the topography associated with the castle blocks some views to the S. Course of the River Taf: the river has been canalised. Its line at the time of the Roman occupation is uncertain although it is assumed to have run close to the forts although it had moved further S by the time of Sped's map of 1615 (Webster/Marvell 2010, 230). These uncertainties are likely to have affected the outcome of the viewsheds (altitude of gates may have changed and also the topography surrounding the gates may have changed) as well as data

relating to the near and perhaps some of the middle distances. Did not attempt to re-calculate the DTM based on the topography identified in the excavations because only the S section of the fort was excavated and, although the results imply the rest of the fort may have sloped too, the exact topography in the N of the fort in the Roman era is not known and estimating could not guarantee more realistic results. The N, E and W gates locations are both based on a suggested fort extent and on the default state that the gates were located in the centre of each side. Therefore both 'variables' could be inaccurate.

Near distance topography and visibility:

Currently gentle descent to W towards river Taf. Large areas of the descent are visible and small areas of the rise to the E are visible. Views to the N are good. The area within the later castle walls is visible but the raised topography associated with these walls blocks views of the near distance beyond, therefore the remaining area to the SW, S and SE is obscured. The E side of the River Taf extends into the near distance. The river is obscured but its E banks are mostly visible.

Middle distance topography and visibility:

The fort is in the centre of a low-lying, gently undulating area next to the coast (to the S), surrounded by hills to the W, N and E. The largest visible areas of the low-lying land are to the NW of the fort, roughly along the line of the River Taf. The hills extend slightly into the middle distance, so that the hillsides frame the middle distance extent/ view. Large patches of the hillsides are visible. Three main rivers run from the hills, through the low-lying area and into the sea; the Taf, Ely and Rhymey. Very small patches of the River Taf are visible (although its course has changed in places) but larger sections of its banks are visible. The Ely and Rhymey rivers are obscured. The entrances to the Ely and Rhymey valleys extend into the Middle distance but the land surrounding the Taf river had already become low-lying land before reaching the middle distance. Sections of the Ely and Rhymey valley sides are visible but their valley floors are obscured. The coastline to the Bristol Channel runs NE-SW past the S/SE of the fort. The coastline and sea are obscured.

Far distance topography and visibility:

Undulating lowland to the W, N and NE of the fort, with some large valleys including the Taf, Rhymey, Ebbw, Usk and Elai/Ely. The low-lying area in which the fort is situated extends into the Far distance slightly to the N of the fort and there is good

visibility of the hillsides beyond this. Otherwise high points to the W, N and NE are visible. The coastline to the SW and NE is obscured and the sea is also obscured. Another large low-lying area surrounds the Usk estuary to the NE. Caerleon fortress is located in this area, although the fortress itself is beyond the extent of the far distance band. The Usk estuary area is obscured. A small patch of the English coastline beyond the Bristol Channel is present in the far distance band - obscured (although this as well as sections of the Channel is in the line of site that may have been obscured by subsequent earthworks around Cardiff castle).

OS 1st edition map and OS Mastermap comparison - the area is more built-up now. Fort in castle extent and area of parkland on both maps.

Caerleon fieldwork notes

Hill/valley sides to N and S and part of W begin in the middle distance. There is a gap in these hills to the NW; the view is mostly obscured but is perhaps undulating valley until the hills are visible in the far distance. River to the S, near the S gate. Gentle slope from gate then steep descent to river. Slight flat-ish area beyond river then hillside, which obscures views beyond.

Good views of flat-ish valley floor. The open nature of the valley floor dominates, along with the nearer hillsides to the N, S and W. Buildings and trees obscure most views, especially to the N and E.

Views from fort: near

Flat valley floor, apart from to the S where there is the descent to the river. Flat beyond river. E is mostly obscured.

Views from fort: middle

Hillsides which generally block views beyond. Hillsides to the N, S and SW appear closer. Gaps in hillsides to the NW - possibly undulating valley here. E obscured.

Views from fort: far

Hilltops, where visible.

Caerleon GIS notes

Near distance topography and visibility:

On a terrace, projecting from the N valley sides, in the Usk valley floor. The ground descends gently beyond the fortress on the E, S and W to the valley floor. The descents are partially visible. The Usk river runs through the near distance to the S. The river is obscured but large sections of its banks are visible. The flat area beyond the river is mostly visible. The W banks of the Afon Lwyd extend into the near distance. The river Lwyd is obscured but its W bank is visible. The land beyond the fortress to the N/NW rises gently as it approaches the valley side, then the steeper valley side proper starts to ascend just before the middle distance. The rise is mostly visible, and was possibly completely visible in the Roman era; contours associated with a modern road running NE-SW past the N of the fortress cause obscured areas.

Middle distance topography and visibility:

The fortress is on a terrace in the Usk valley. The valley runs NE-SW, then turns southwards to the SW of the fortress. Sections of the Usk valley floor are visible, some sections quite large, before becoming obscured when the valley bends to the S. Small sections of the River Usk are visible, but large sections of its banks are visible. The Lwyd valley runs roughly N-S and meets the Usk valley to the E of the fort. Large sections of the Lwyd valley floor are visible until it bends slightly to the W and becomes obscured. The point where the two valleys meet is mostly visible. Small stretches of the Lwyd river are visible, larger sections of its banks are visible. The banks of the rivers Usk and Lwyd are mostly visible where the two rivers meet. The fortress is in a rough 'U' shape caused by the Usk and the Lwyd rivers. There is good visibility of the valley sides of the Usk and Lwyd, before their changes in direction. A narrower valley, that of Sor Brook, runs roughly N-S to the E of the Lwyd, to meet the Usk. The valley floor is obscured. As the Usk valley turns southwards, it expands to a low-lying area as it approaches the coast. This low-lying area is obscured from the fortress by the Usk valley sides.

Far distance topography and visibility:

Undulating lowland surrounds the fortress in the far distance on the W, N and E sides. The Usk valley runs roughly N-S to the NE of the fort before turning towards the SW just before the start of the middle distance. Some other large valleys present. The coastline runs roughly WSW to ENE past the S of the fortress, with areas of lowland prior to the coastline. The Severn estuary and the line of the

English coast beyond extends into the far distance to the E and SE, so that the full 'corner' of the Bristol channel is present within the far distance band. Only high points to the N, E and W are visible.

OS 1st ed and OS Mastermap comparison: course of River Usk similar. Course of River Lwyd has changed slightly, but does not alter results. Low and high tide marks are noted on the Usk. Land use - the area is now much more built-up.

Usk GIS notes

Near distance topography and visibility:

The fortress is located on the Usk valley floor. The area is flat, although there are slight, small undulations. The valley floor is mostly visible, with numerous small obscured areas caused by the small undulations. The Usk river runs N-S past the W of the fort, turning slightly SE to the SW of the fort. The River Usk is obscured but large sections of its banks are visible. The flat area beyond the river is obscured, perhaps by a high bank on the W of the river which may not have been there to obscure the view during the Roman era. Beyond the flat area, the valley sides begin to rise (visible). The Nant Olwy stream/river runs N-S past the E of the fort. It is obscured in the near distance but sections of its banks are visible. Towards the far edge of the near distance, to the N and E the valley sides start to rise - partially visible. The near distance is therefore mainly flat, apart from the start of the rise of valley sides to the W, N and E, which extend slightly into the near distance. There is a gap between the valley sides to the N and E caused by the mouth of the Olwyn valley (visible), which meets the Usk valley here; the fortress is located in the centre of their meeting point. although their rivers meet in the middle distance to the SE. The fortress has good views of sections of the Usk valley as well as the mouth of the Olwyn valley.

Middle distance topography and visibility:

The Usk valley runs roughly NNE-SWS from the NW towards the fortress then turns southwards to the S of the fort. The Olwy valley runs from the NE to meet the Usk valley at the fortress. The two valleys therefore create a 'Y' shape with the fortress at the centre. Large but dispersed sections of the Usk valley floor are visible. Small sections of the Olwy valley floor are visible but the best views of it are in the NEAR distance. The River Usk is obscured but small sections of its banks are visible.

Small sections of the Nant Olwy and its banks are visible. Sections of the valley sides are visible and high points amongst the undulating landscape beyond.

Far distance topography and visibility:

Undulating lowland with some large valleys. The Usk valley meanders roughly N-S through the area. It bends just beyond the middle distance extent to both the N and S. Southwards, it opens out to a low-lying area along the coastline. The River Usk empties into the sea/Bristol Channel. Only high points to the NW, NE and S are visible.

OS 1st edition and OS Mastermap comparison: course of River Usk similar. Course of Nant Olwyn differs slightly but does not affect results. Land use - more built-up now. No mention of area as being liable to flood.

Kingsholm GIS notes

Near distance topography and visibility:

Near distance is very gentle descent to NW towards current River Twyver and former course of Severn. Flat area beyond river. Gentle undulations (and possibly subsequent landscaping) cause some obscured areas. Former course of River Severn is visible.

Middle distance topography and visibility:

Undulating low-lying valley wide floor with higher undulations/hills to E, S and W. The Severn valley is wide at this point and the valley sides, which are not dramatically steep or high, start in the far distance band. Low-lying undulating valley floor is partially visible, with some fairly large obscured areas. River Severn (former course) is partially visible, although I have not found data on its former course for the whole of the middle distance. The river is tidal in this area. The high undulations/hillsides are visible on the sides facing the fortress and obscure views beyond.

Far distance topography and visibility:

The Severn valley runs roughly NE-SW. Undulating lowland surrounds it. These undulations probably appear as rolling low hills. River Severn starts to broaden as it

approaches the sea to the SW. Sea lies beyond the far distance. Valley sides and high points beyond are visible.

OS 1st edition map and OS Mastermap comparison: The area is now more built-up. Part of the fortress area appears to have been parkland on the 1st ed map.

Gloucester GIS notes

Near distance topography and visibility:

The 15m MASL contour surrounds the fortress on 3 sides (N, W and S) and the land descends gently away to 10m MASL in these directions. The fortress therefore occupies a slight platform. To the E the land rises very gently towards 20m OD; the 20m contour is within the MIDDLE distance. Within the fortress the land is domed slightly, reaching 20m OD at the peak of the dome. The descending and ascending areas are mostly visible, with small obscured areas. The former course of the Severn, where known, is partially visible.

Middle distance topography and visibility:

Undulating low-lying valley wide floor with higher undulations/hills to E, S and W. The Severn valley is wide at this point and the valley sides, which are not dramatically steep or high, start in the far distance band. Low-lying undulating valley floor is partially visible, with most of the valley floor visible near the fort, and visibility reducing further from the fortress. River Severn (former course) is partially visible, although I have not found data on its former course for the whole of the middle distance. The river is tidal in this area. The high undulations/hillsides are visible on the sides facing the fortress and obscure views beyond.

Far distance topography and visibility:

The Severn valley runs roughly NE-SW. Undulating lowland surrounds it. These undulations probably appear as rolling low hills. River Severn starts to broaden as it approaches the sea to the SW. Sea lies beyond the far distance. Valley sides and high points beyond are visible. Small sections of valley floor to NE are visible, including a small section of the River Severn.

OS 1st edition and OS Mastermap comparison: similar, more built-up now.

Pen Llystyn GIS notes

The viewsheds are based on contours surveyed after the quarry was begun and therefore may not reflect the Roman era views accurately.

On a rise (reaching 125m OD on modern contours) in a low-lying area to the E of the Llyn peninsula. Not in a valley exactly, but in a large low-lying area between the mountains of Snowdonia to the E and the hills/mountains of the Llyn Peninsula to the W. It may appear like a valley on the ground but the lower-lying area expands beyond the fort to the S towards the sea. The low-lying area also continues to the sea to the N, although here it is narrower and does not expand until closer to the coast. The fort appears to be at one of the few suitable points N along the low-lying area before the gap between the hills to the E and W narrows slightly and bends towards the NW (SH470471). A potential alternative location could have been slightly to the NW at SH470461. There is a plateau reaching 150m OD here with land descending on 3 sides. The descents however are not as steep as those of the chosen location and it is not as close to the river. Furthermore, this location is in the shadow of two significant hills to the W. The fort could also have been located in one of the flatter areas of the gently rising and undulating land to the E and W of the river/lowest-lying area (dependent on line of coast in Roman era). This would take the fort further from the river and, although there are locations where land could have descended on three sides, the descents would not have been as steep as those of the chosen location. The fort therefore may be blocking/monitoring a useful passageway N-S, past the Llyn Peninsula to the W and the highlands to the E and between the coasts to the N and S of the peninsula. The fort location has been the site of a quarry since the 1950s, therefore the modern contours may not match those of the pre-quarry era. Some survey and excavations took place prior to the quarry.

Near distance topography:

Land slopes away from the fort on three sides, and rises gently on the E side. River runs through the near distance band, extending out of the band temporarily to the W as it bends. The fort area surrounding the fort is apparently marshy on three sides and therefore unsuitable for geophysics and presumably settlement, although the quarry may have altered the drainage situation (Hopewell 2005, 237).

Middle distance topography:

N: Land descends towards NW beyond the fort towards the river. Then low-lying area of river. E- slight dip beyond fort then start of gentle rise beyond fort to the E. S- gentle slope beyond fort then steeper slope then gentler slope towards the S. W- steep slope beyond fort towards bend in river then fairly flat area within river bend and river itself. Currently slight descent towards the S within the fort but this is based on modern contours, post-quarry.

Far distance topography:

N- the undulating low-lying land extends northwards, and narrows between the higher land to the E and W then widens again slightly further NW. E- gentle undulating rise to the E then steeper rise to higher ground. Undulating lowland which gradually expands to the SE and SW. W- gentle rise to the W then steeper rise to undulating higher ground. Afon Dwyfach runs roughly N-S past the fort. Some tributaries and other rivers are also present but further from the fort.

Views from fort: near

Views of the low-lying area to the N of the fort, before the area narrows, are better than those to the S, suggesting that views to the N were considered more important. Two sections of the full width of the low-lying area can be seen to the N. The low-lying area expands to the S of the fort and the complete expanse is not visible from the fort. It also appears that the fort was situated in the most N suitable location prior to the narrowing of the low-lying area, indicating that the fort was located to monitor movement through the low-lying area. There are good views, with some obscured sections, of the hillsides to the E and W, which block most of the views beyond, except particularly high patches.

Views from fort: middle

N- Small area immediately beyond fort visible then obscured as descent to NW steepens. Then visible as slope levels out towards the river. Large sections of the river and/or the areas each side of the river are obscured. Land beyond is visible. E- dip beyond fort to the E, SE and NE is obscured. Then visibility returns as the land rises. S- Gentle slope just beyond fort is visible. Land becomes obscured as slope steepens. Gentle slope beyond is also obscured. W- patchy visibility within annexe. Then: NW- patchy visibility of steep descent towards river, then gentler slope towards river visible, river itself and area of banks mostly obscured, area beyond river visible. SW- obscured.

Views from fort: far

N- Good views of the low-lying area N of the fort, with some obscured patches. There is a section where the full width of the low-lying area is visible, approximately SH46654554 to 48344547. Also similar visible section slightly N. Views of low-lying area reduce significantly beyond the narrow section further N. Good views of hillsides, with some obscured sections, Hills block most views beyond. E- rise of land beyond fort continues to be visible for approximately 240m into the middle distance. Then patchy visibility of rising land. Obscured beyond highest point. S- patchy visibility of low-lying area. River obscured. Large areas to SE and SE obscured. W- gentle then steeper rises of hills to W visible, obscured beyond.

Appendix XI Definitions

Visibility

Visible	Whole feature is completely visible
Partially visible	Some of the feature is visible
Obscured	The whole feature is obscured

Topography types

Bay	An area of sea that protrudes inland.
Closest watercourse	The watercourse that runs closest to the fort.
Estuary	The area where a river widens and meets the sea.
Hill	A rise in ground below 600 MASL.
Hillside	The side of a hill, usually sloping.
Hilltops	The highest point(s) of a hill.
Isolated hill	A hill within a valley floor which is not an extension of the valley sides.
Large lake	A lake covering 40 acres or more.
Main river	The river reaches the sea or an estuary.
Main valley	The valley in which a fort is situated.
Mountain	A rise in ground over 600 MASL.
Mountainside	The side of a mountain, usually sloping.
Mountaintops	The highest point(s) of a mountain.
Mouth of valley/valley mouth	The point where a valley opens into an area of undulating upland or lowland.
Plateau	A level area of land that is raised slightly above the surrounding land.
Ridge	A long, narrow raised area.
River	Large watercourse, usually labelled 'river' or 'afon' on the modern OS maps.
Spur	An area of ground, often sloping, that extends from a hillside or mountainside.
Stream	A narrow watercourse that is not labelled as a 'river/afon' on the modern OS maps. Usually labelled 'brook', 'stream' or 'nant'.
Tributary	A watercourse that feeds into a larger watercourse.
Undulating lowland.	Low ground (below 300 MASL) with undulations too small and/or shallow to be defined as valleys.
Undulating upland	High ground (above 300 MASL at two or more points) with undulations too small and/or shallow to be defined as valleys.
Valley	An area of low-lying land, usually elongated, between hills or mountains.
Valley floor	The bottom or base of a valley.
Valley sides	The rising land/hillsides each side of the valley floor.
Watercourse	A body of running water, such as a river, stream or brook.

Topography types of fort interiors

Central spine	Descending on either side of a central line.
Domed	One high point, descending on all sides from the high point.
Flat	No gradient.
Sloping	The land has one or various gradients.
Sloping and central spine.	The central line is at a gradient.
Sloping and domed.	One side of the dome's descent is of a shallower gradient than the opposite side, giving the impression of a bulge or swelling in sloping land.

Statuses of Roman roads

Each of the Welsh Archaeological Trusts defined the status of Roman roads in the area as part of a pan-Wales project.

Gwynedd, Clwyd-Powys and Glamorgan-Gwent Archaeological Trusts Roman road status descriptions (Hopewell 2007)	
Known	Extant earthwork or as well-recorded buried feature. Shown as solid lines on OS strip maps.
Proposed	Conjectural sections either linking known segments or as hypothetical road alignments for which there is some physical evidence. Shown as dashed lines on OS strip maps, and where evidence is reasonably convincing
Predicted	Virtually no substantive evidence for a road other than someone's belief and/or conjectural road alignment with no known traces. Where the authenticity of a road is in significant doubt this is the highest level of status that can be achieved.
Discounted	Where a road has subsequently been disproved by a reliable authority or where an alternative line has now been accepted

Dyfed Archaeological Trust Roman road status descriptions (Schlee 2005)	
Certain	Attributed to segments of road for which there is direct evidence in the form of excavated remains, surviving earthworks, cropmarks or parchmarks. Most of this data is derived from cropmarks plotted from aerial photographs, although some is derived from cartographic sources and fieldwork and survey.
Probable	Where justifiable, 'certain' road segments are connected by 'probable' segments. These are intended to indicate the most likely course of the road. The course of 'probable' segments is usually simply a straight line between two 'certain' road segments, but may incorporate trackways or field boundaries that are on the same line, or may curve to respect contours or other landscape features where appropriate.
Suggested	Suggested routes are those that have been suggested or proposed by researchers, but for which there is no direct evidence. Some of these routes have now been discredited, or superseded by routes for which there is good evidence. Other suggested routes remain as possibilities in the absence of evidence to the contrary, or any alternative route suggestions. '

Site types

Definitions are taken from the Monument Type Thesaurus from the Forum on Information Standards in Heritage (www4) unless stated otherwise.

Amphitheatre	An oval or circular structure with seats rising in tiers around a central open space. Used for religious ceremonies, entertainment, training and armed combat contests.
<i>Canabae</i>	Civilian settlements outside a Roman fort [usually referred to as the settlements outside legionary fortresses].
Enclosure	An area of land enclosed by a boundary ditch, bank, wall, palisade or other similar barrier. Use specific type where known.
Fort (auxiliary)	A permanent Roman fort enclosed by a number of ditches and ramparts, used to house a garrison of auxiliaries. Forts are usually rectangular in shape with rounded corners. At least one gateway is present within each wall. Evidence for permanent buildings, such as barracks, can be found within forts. Their size varies depending on the garrison for which they were built. (Johnson 1983, 31-33; www4)
Fortlet	A fortified Roman site, usually under 1 hectare in area, often defended by a rampart, one or two ditches and a gate. Fortlet garrisons will probably have been a detachment from a nearby fort. (Burnham and Davies 2010, 71; www4)
Hillfort	A hilltop enclosure bounded by one or more substantial banks, ramparts and ditches.
Hut circle	A round house indicated by the presence of a low, roughly circular bank of turf, earth or stone, which formed the base of the walls. Characteristic of the later prehistoric period. Where several occur together use HUT CIRCLE SETTLEMENT
Hut circle settlement	A settlement consisting of several hut circles, either grouped together or dispersed. Characteristic of the later prehistoric period. Use specific forms where supported by the available evidence. For isolated hut circles use HUT CIRCLE.
Legionary fortress	A large, fortified permanent Roman military base, made of timber and stone, surrounded by a rampart and ditches.
<i>Limes</i>	Generic term for Roman frontier (Breeze 2011, 6).
<i>Mansio</i>	A type of Roman lodging house, frequently sited near the town [or fort] gate (www4). Their specific functions have been debated, and overnight accommodation for travellers by the imperial post or private inns for example have been proposed (Breeze and Dobson 2000, 203).
Marching camp	A temporary camp, enclosed by a single shallow ditch and rampart, frequently with <i>clavicula</i> or <i>titulum</i> defences to protect entrances. Due to their temporary nature, evidence for permanent structures are not usually found

	within camps. Types of camp found in the study area include marching camps, which were to house troops temporarily while on campaign or travelling, and practice camps, which are thought to have been constructed as part of training exercises. (Davies, J.L. and Jones, R.H. 2006, 6-7; www4).
Parade ground	A place where military personnel parade, practice marching, assemble or muster for a march or any other special purpose.
Settlement	A small concentration of dwellings.
<i>Vicus</i>	A district, suburb or quarter of a town or village adjacent to a fort.
Workshop	A building or room used for small scale manufacture

Appendix XII Site visit form

Fort Name		Central NGR		PRN		NPRN	
Date		Time		Name of visitor		Height of visitor	

Visibility	<i>Good Medium Poor</i>	Reason for medium/poor visibility:
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Geographic setting	Basic description (<i>e.g. valley bottom</i>)
Detailed description, incl. land around fort (flat, usable,) water, slope, appearance in landscape etc.	

Views from fort All round views? What obscures the view? What dominates? General impressions. Link to sketch.
General
Near
Medium
Far

Fort:

Location Point 1:

Photographs:

Distance band	Direction	What is visible?	Is the view only partially visible?	Is the view obscured completely?	What is obscuring the view?	What is your altitude compared to what is visible? (H, S, L, U)
Near	N					
	E					
	S					
	W					
Medium	N					
	E					
	S					
	W					
Far	N					
	E					
	S					
	W					

Fort:

Location Point 2:

Photographs:

Distance band	Direction	What is visible?	Is the view only partially visible?	Is the view obscured completely?	What is obscuring the view?	What is your altitude compared to what is visible? (H, S, L, U)
Near	N					
	E					
	S					
	W					
Medium	N					
	E					
	S					
	W					
Far	N					
	E					
	S					
	W					

Fort:
Location Point 3:
Photographs:

Distance band	Direction	What is visible?	Is the view only partially visible?	Is the view obscured completely?	What is obscuring the view?	What is your altitude compared to what is visible? (H, S, L, U)
Near	N					
	E					
	S					
	W					
Medium	N					
	E					
	S					
	W					
Far	N					
	E					
	S					
	W					

Fort:
Location Point 4:
Photographs:

Distance band	Direction	What is visible?	Is the view only partially visible?	Is the view obscured completely?	What is obscuring the view?	What is your altitude compared to what is visible? (H, S, L, U)
Near	N					
	E					
	S					
	W					
Medium	N					
	E					
	S					
	W					
Far	N					
	E					
	S					
	W					

Appendix XIII Figures

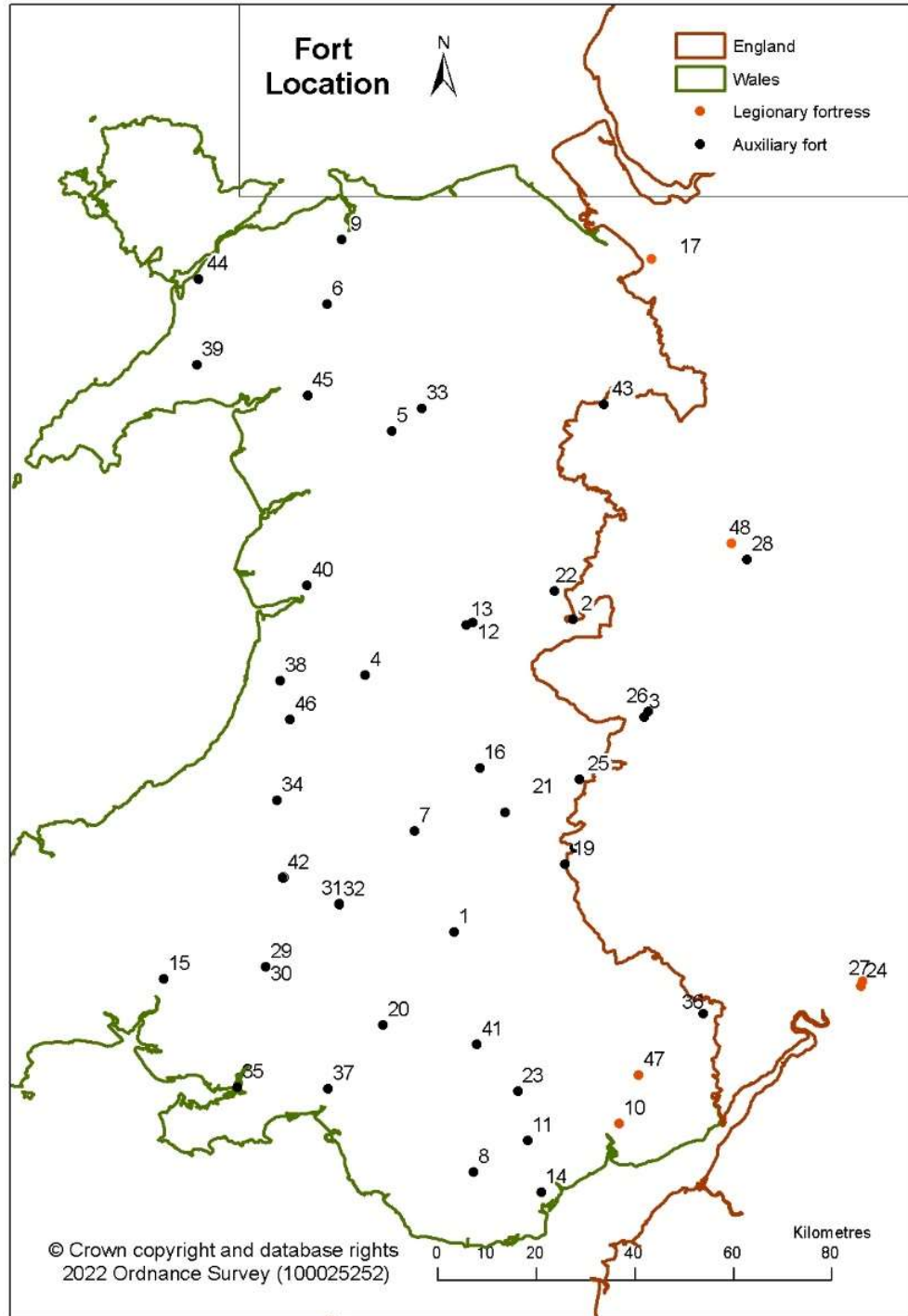


Figure 1 Fort locations

Fort number	Fort name
1	Brecon Gaer
2	Brompton
3	Buckton
4	Cae Gaer
5	Caer Gai
6	Caer Llugwy
7	Caerau (Beulah)
8	Caergwanaf
9	Caerhun
10	Caerleon
11	Caerphilly
12	Caersws I
13	Caersws II
14	Cardiff II
15	Carmarthen
16	Castell Collen
17	Chester
18	Clifford
19	Clyro
20	Coelbren
21	Colwyn Castle
22	Forden Gaer
23	Gelligaer
24	Gloucester
25	Hindwell Farm
26	Jay Lane
27	Kingsholm
28	Leighton
29	Llandeilo I
30	Llandeilo II
31	Llandovery I
32	Llandovery II
33	Llanfor
34	Llanio
35	Loughor
36	Monmouth
37	Neath 2
38	Pen Llwyn
39	Pen Llystyn
40	Pennal/Cefn Caer
41	Penydarren
42	Pumsaint
43	Rhyn Park
44	Segontium
45	Tomen y Mur
46	Trawscoed
47	Usk
48	Wroxeter

Figure 2 Fort locations in relation to the terrain of the study area

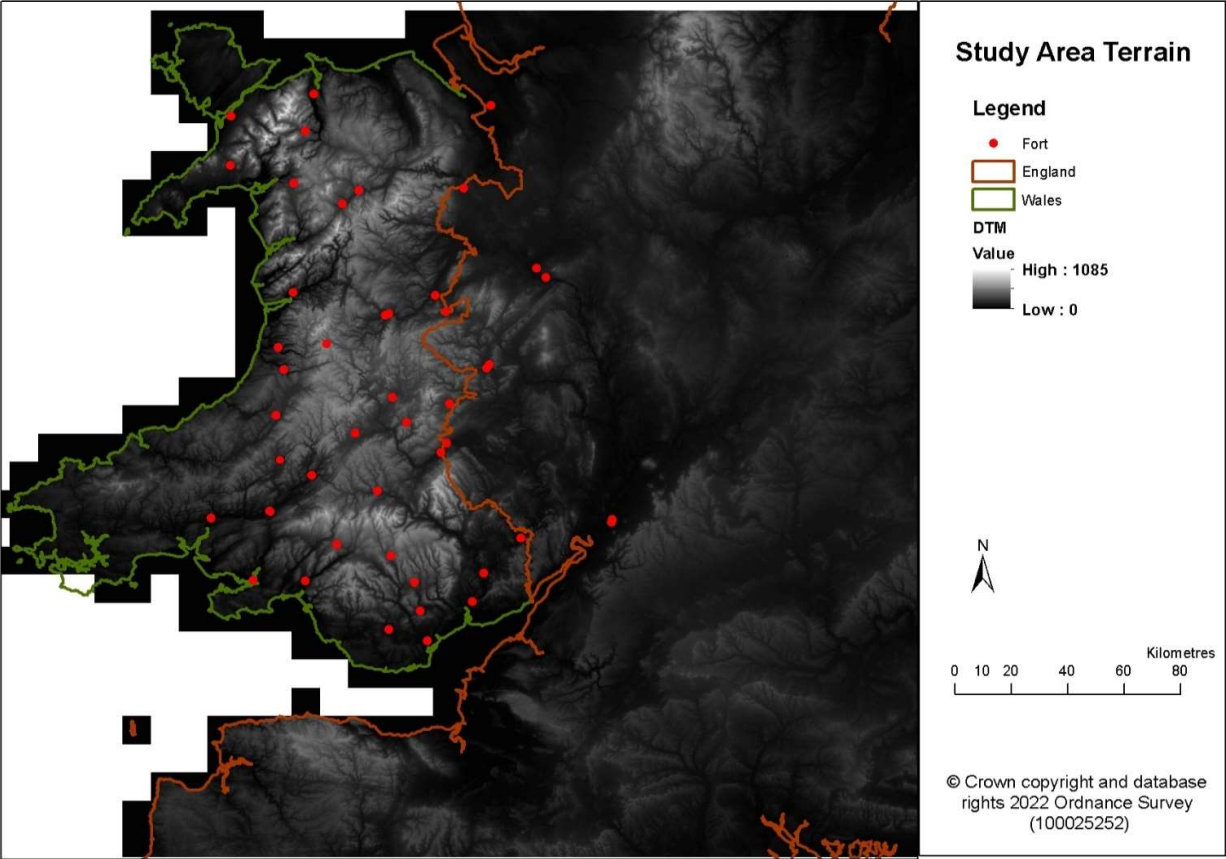


Figure 3 Fort location in relation to Roman road data provided by the Welsh Archaeological Trusts

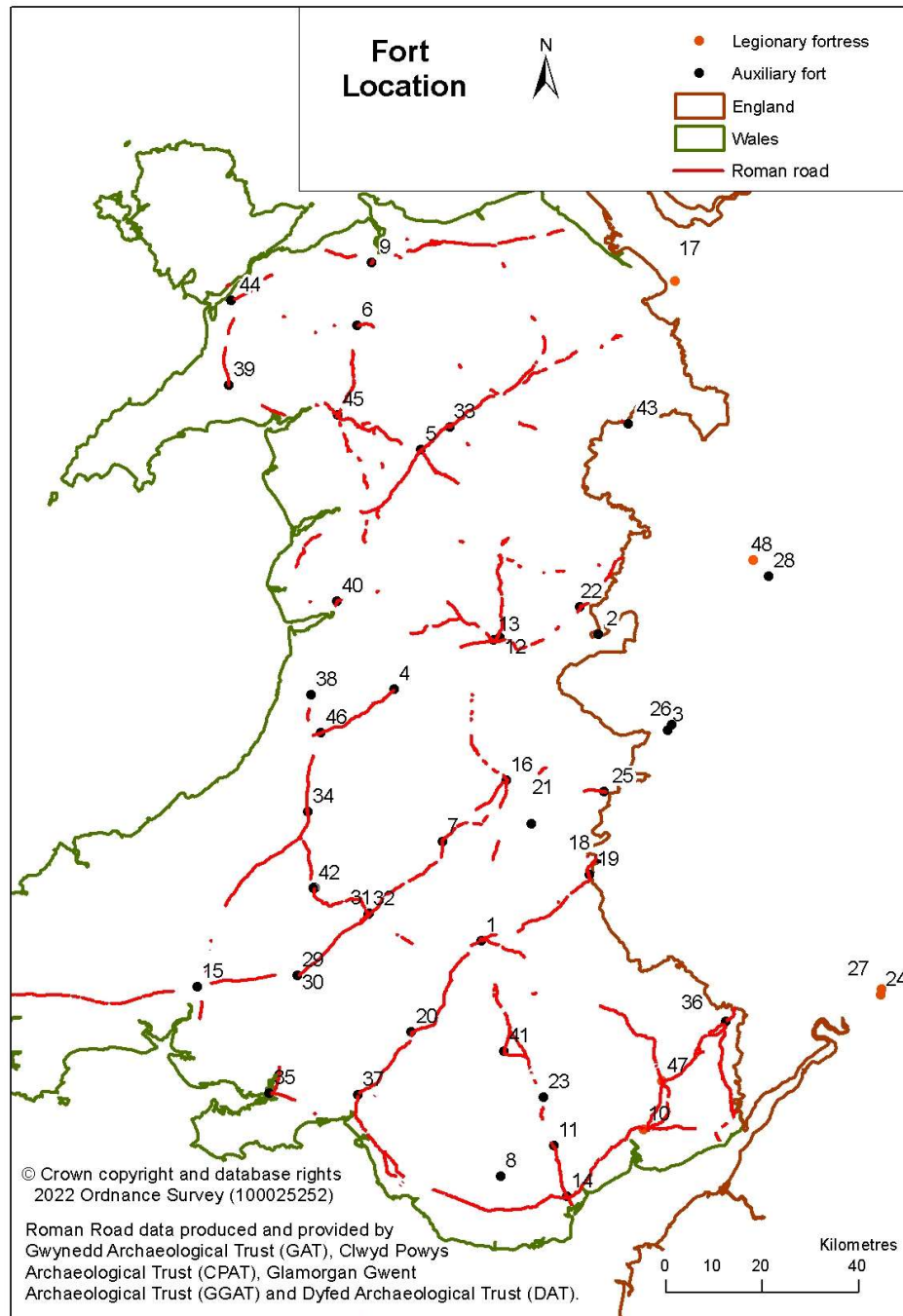


Figure 4 Fort location in relation to Roman roads and watercourses

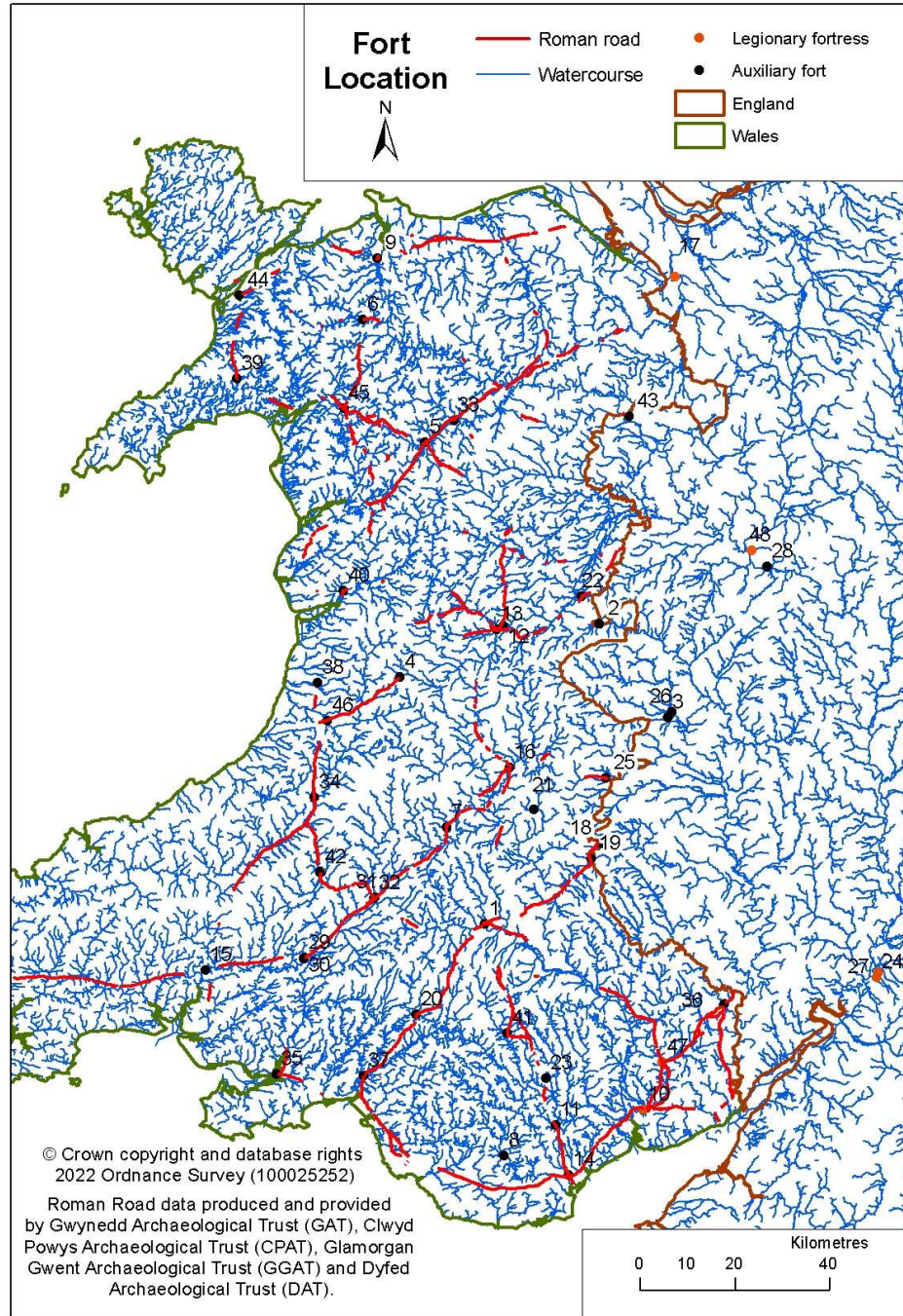


Figure 5 Brecon Gaer near distance

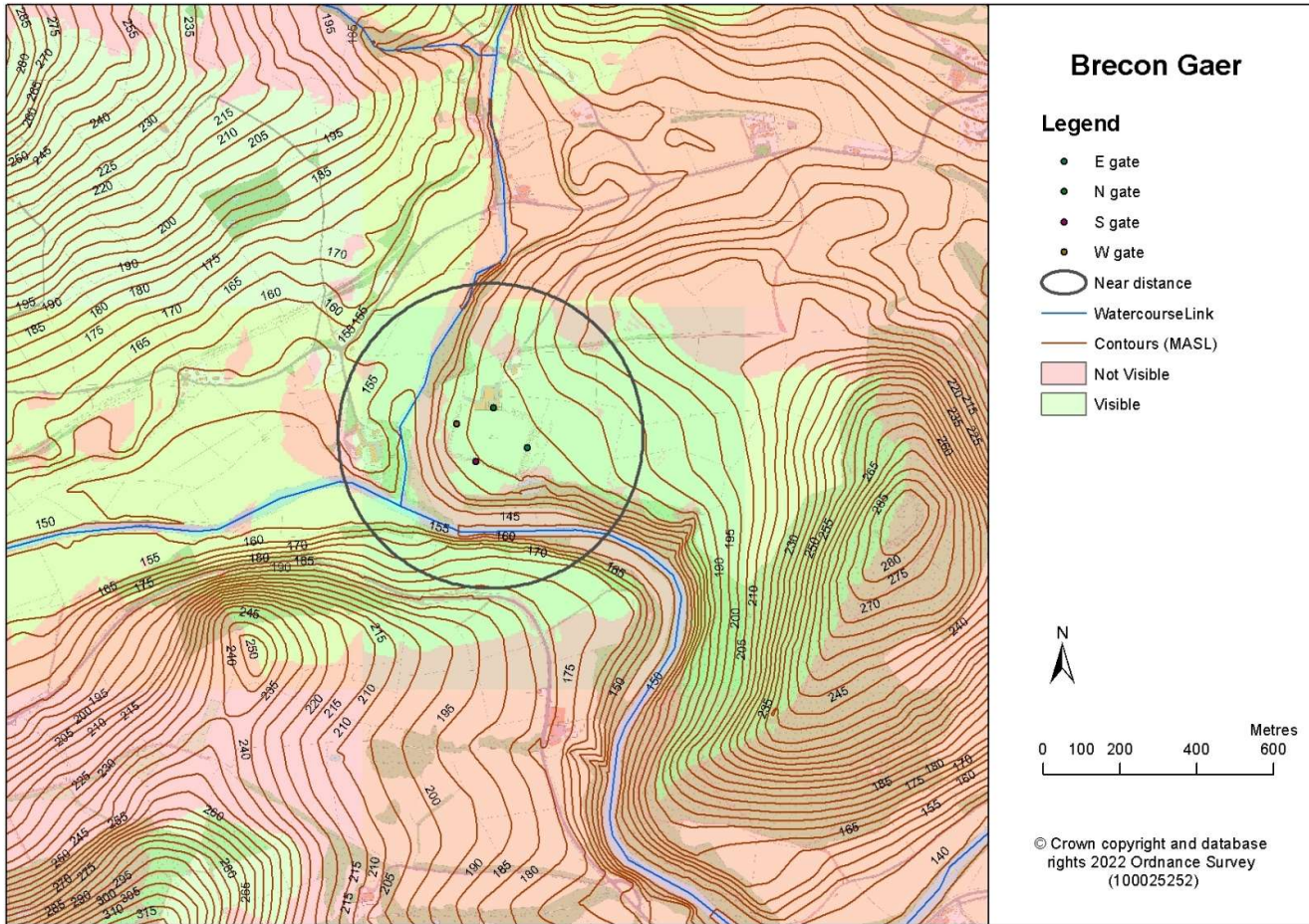


Figure 6 Brecon Gaer middle distance

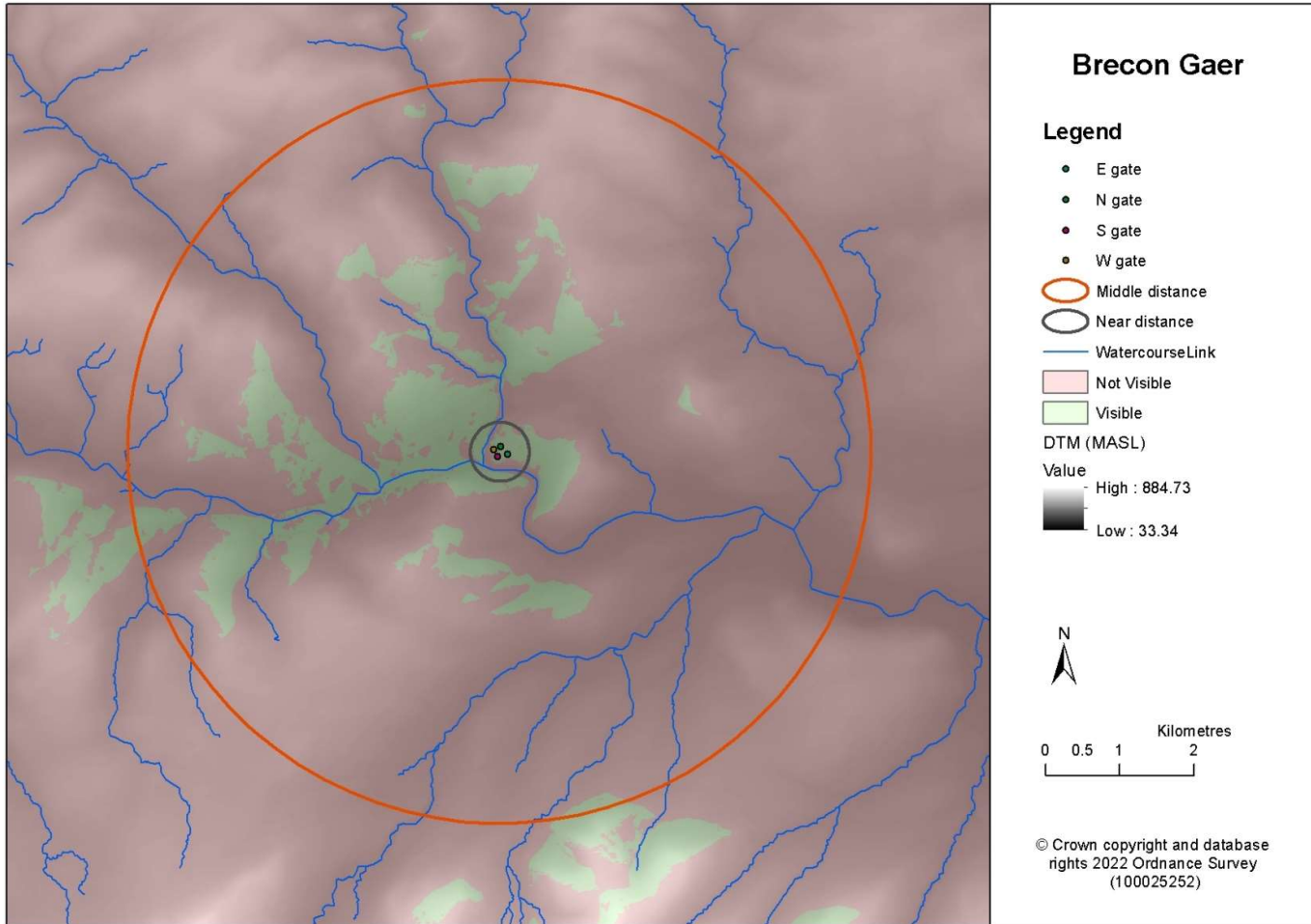


Figure 7 Brecon Gaer far distance

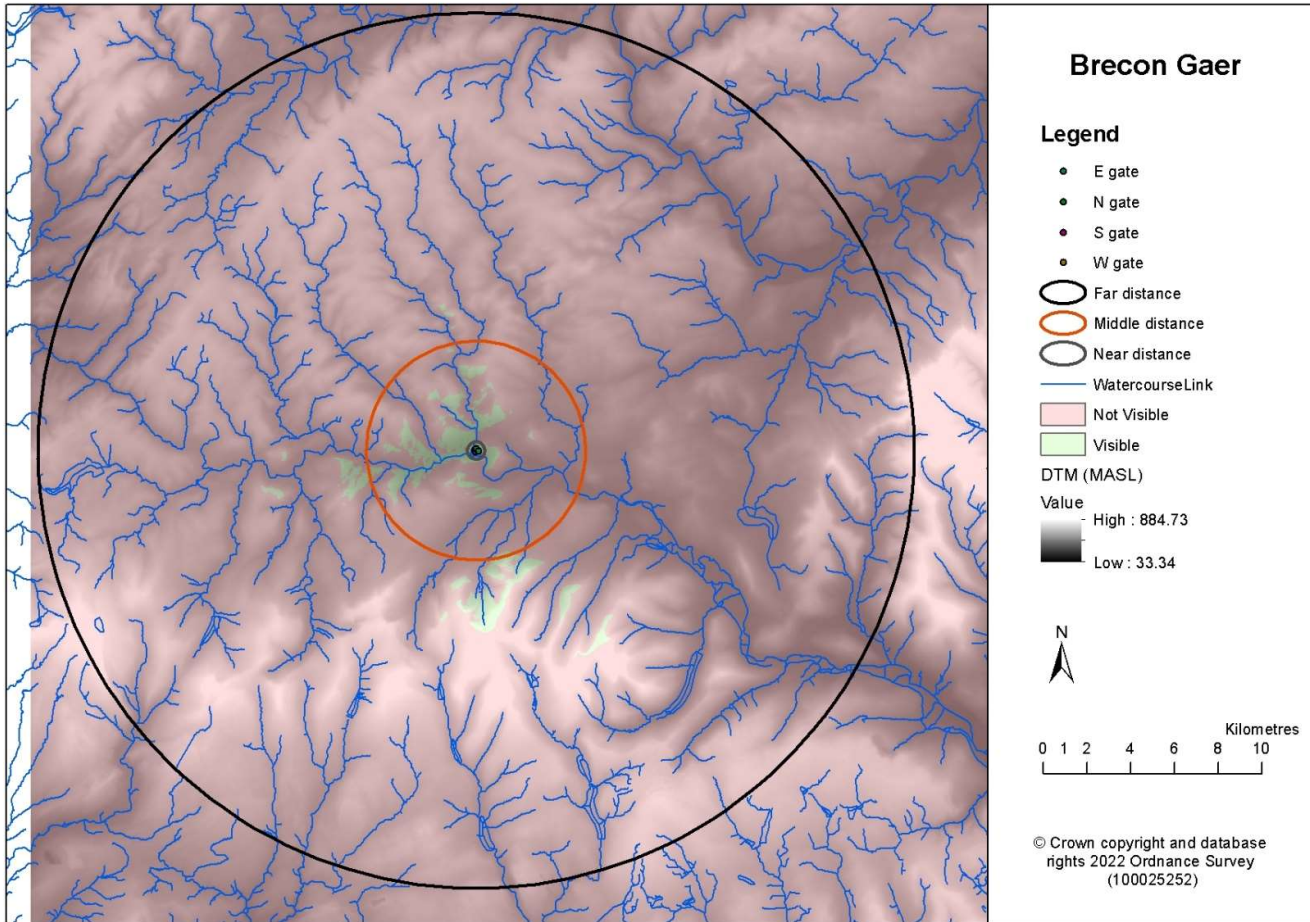


Figure 8 Brompton near distance

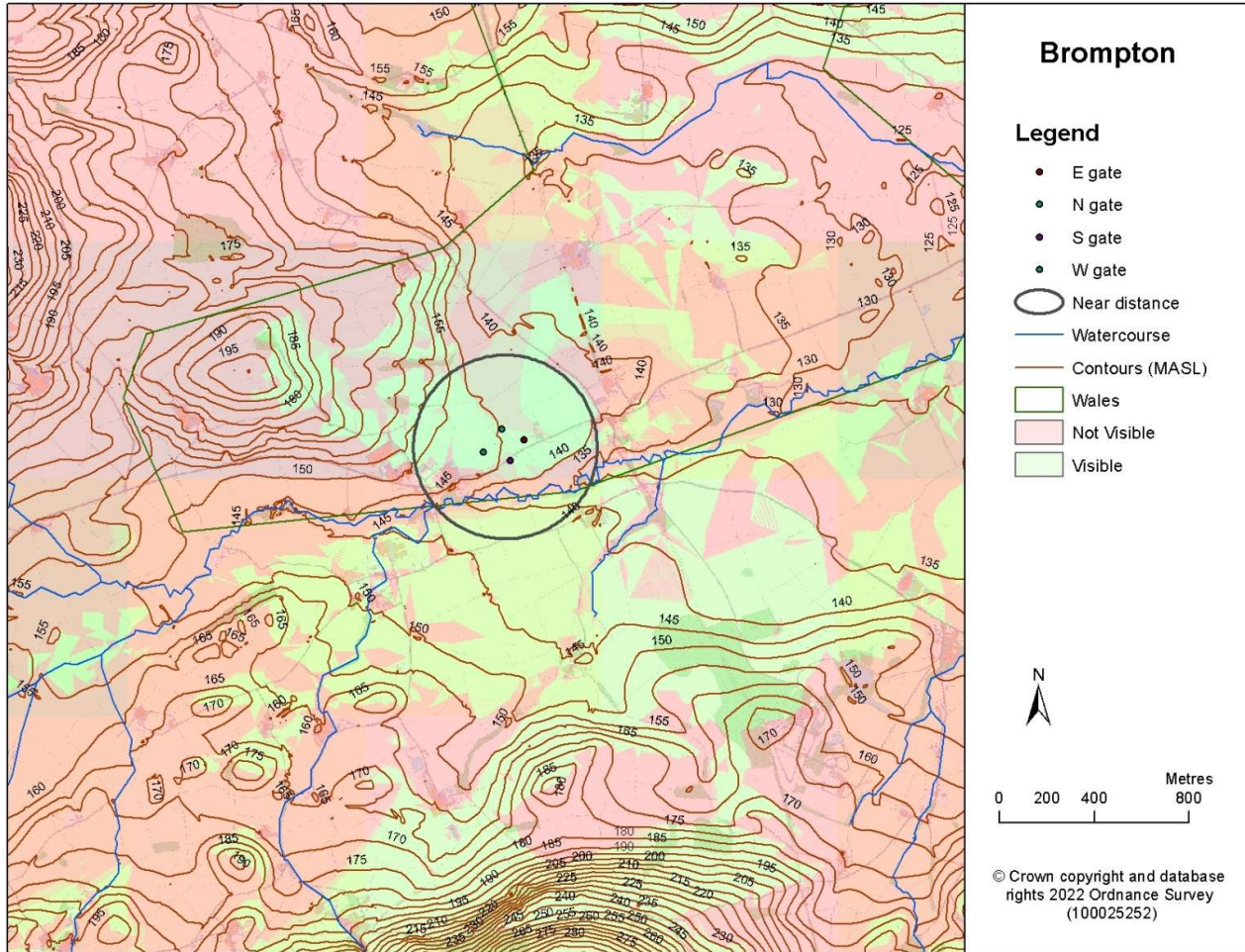


Figure 9 Brompton middle distance

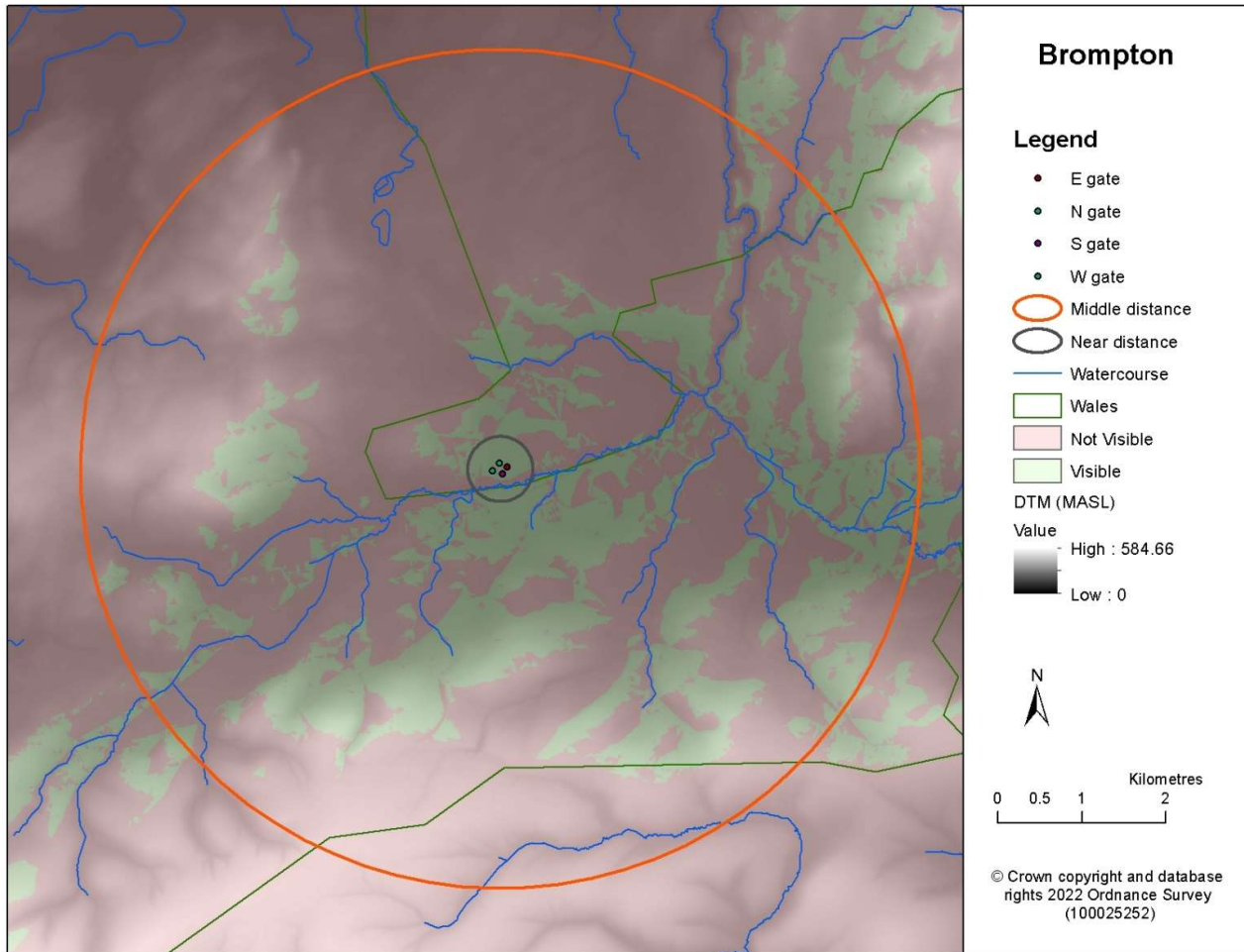


Figure 10 Brompton far distance

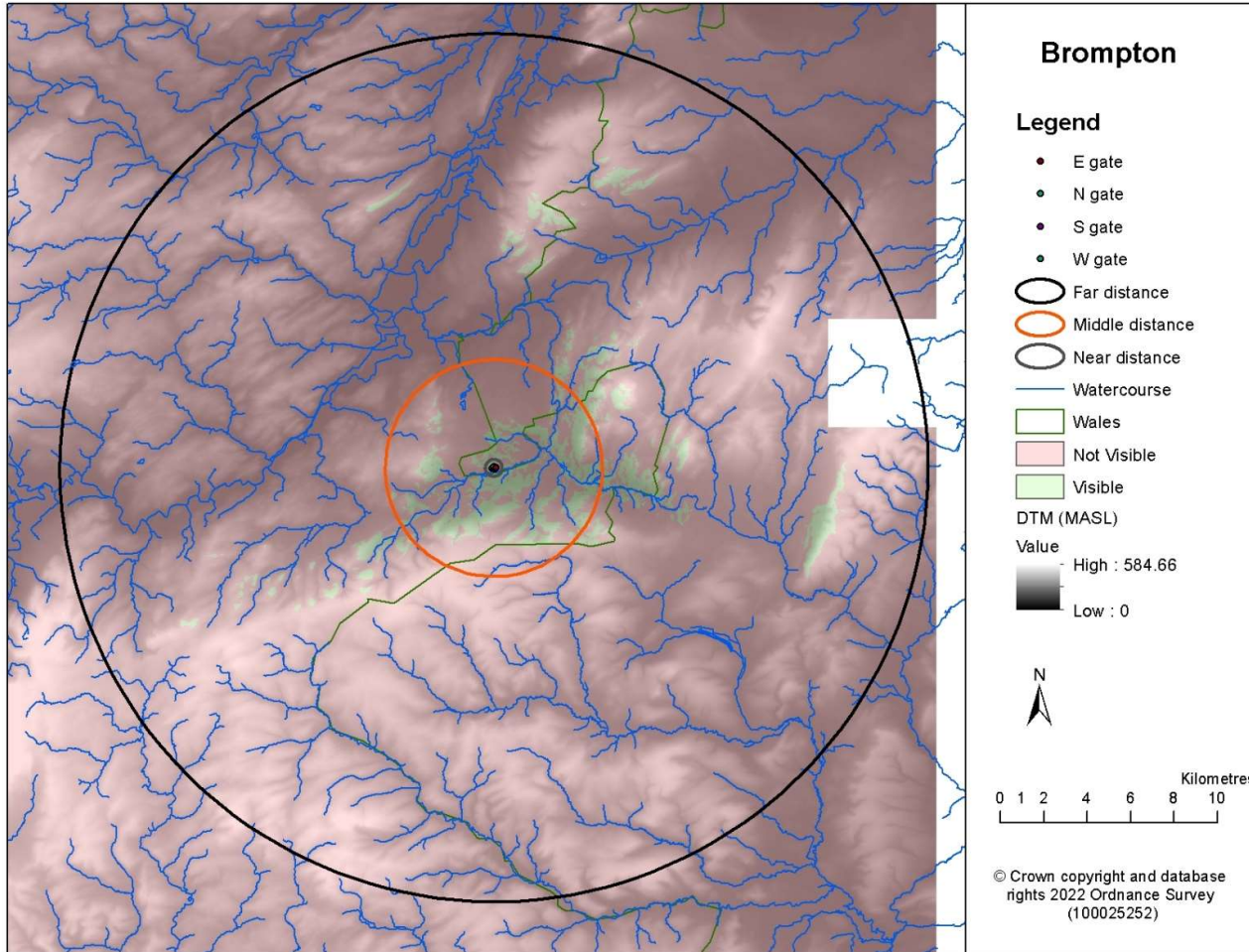


Figure 11 Buckton near distance

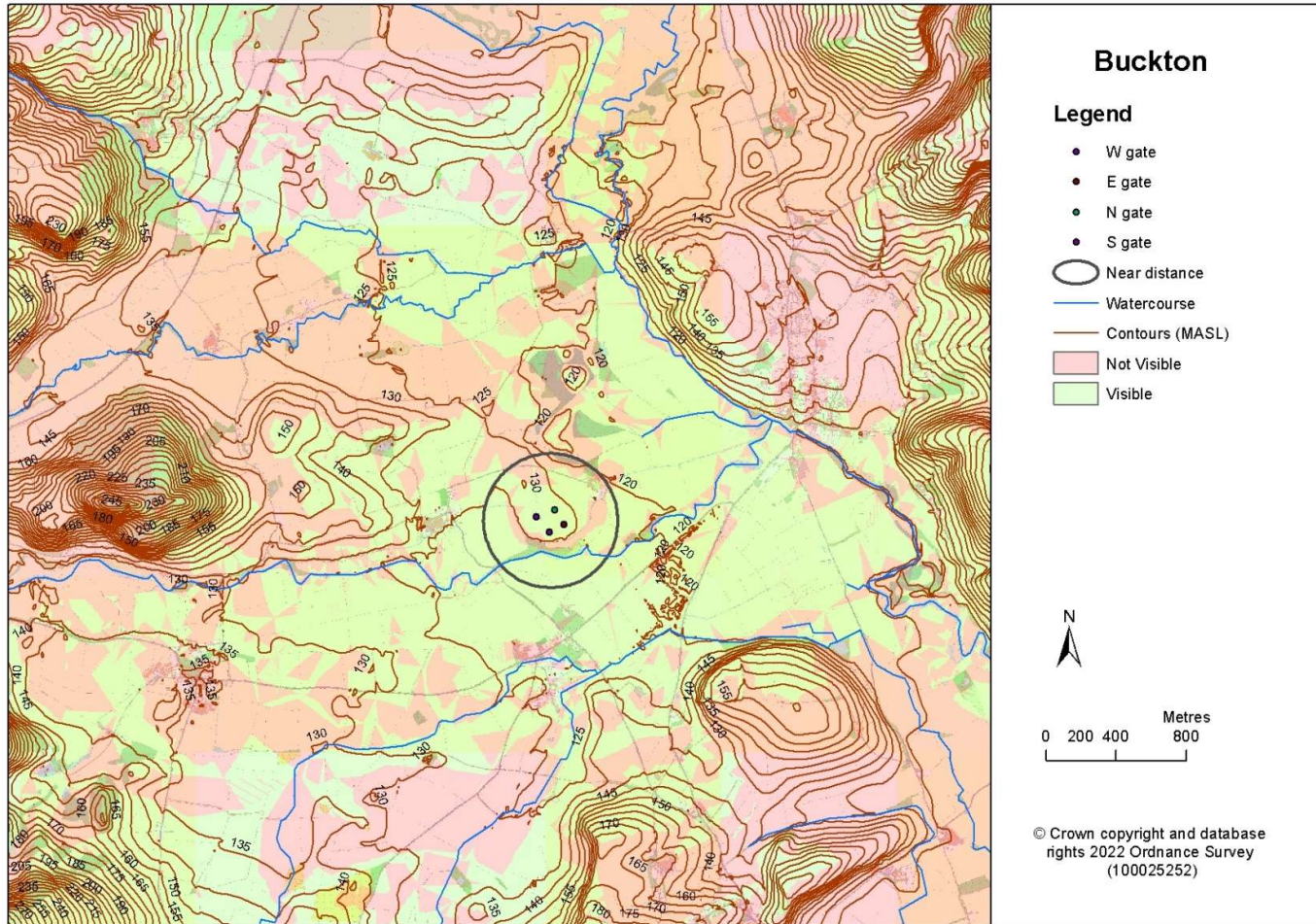


Figure 12 Buckton middle distance

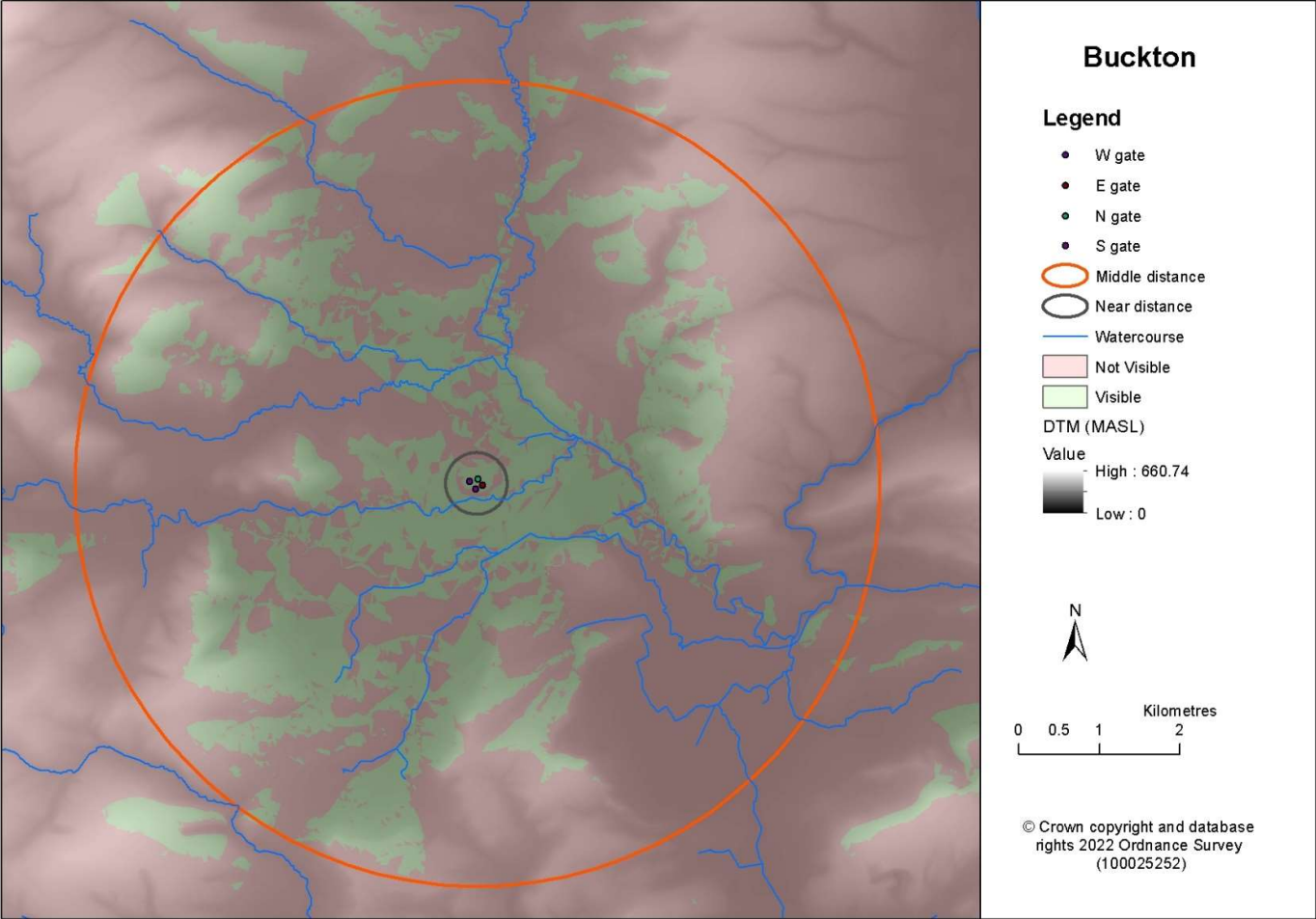


Figure 13 Buckton far distance

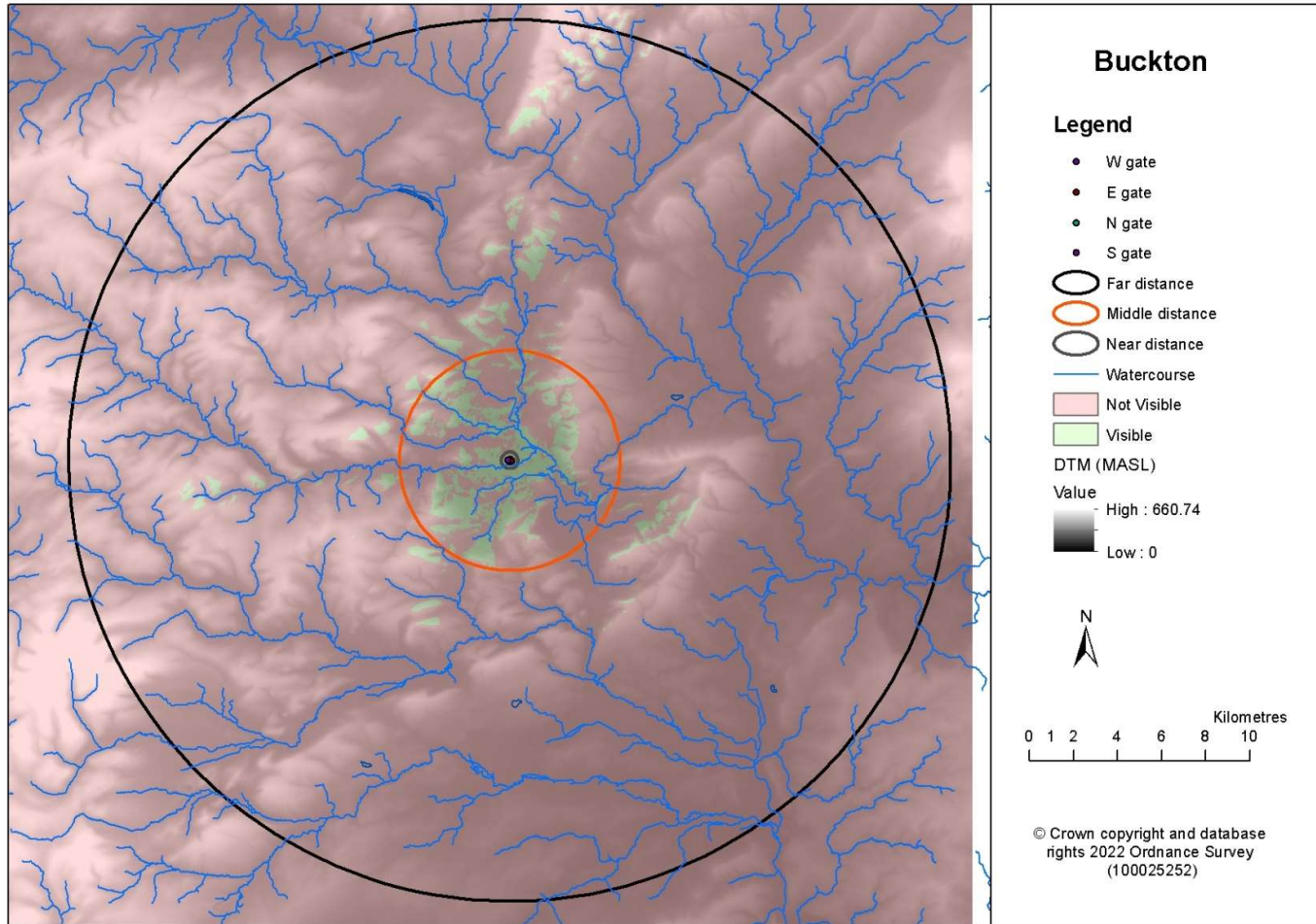


Figure 14 Cae Gaer near distance

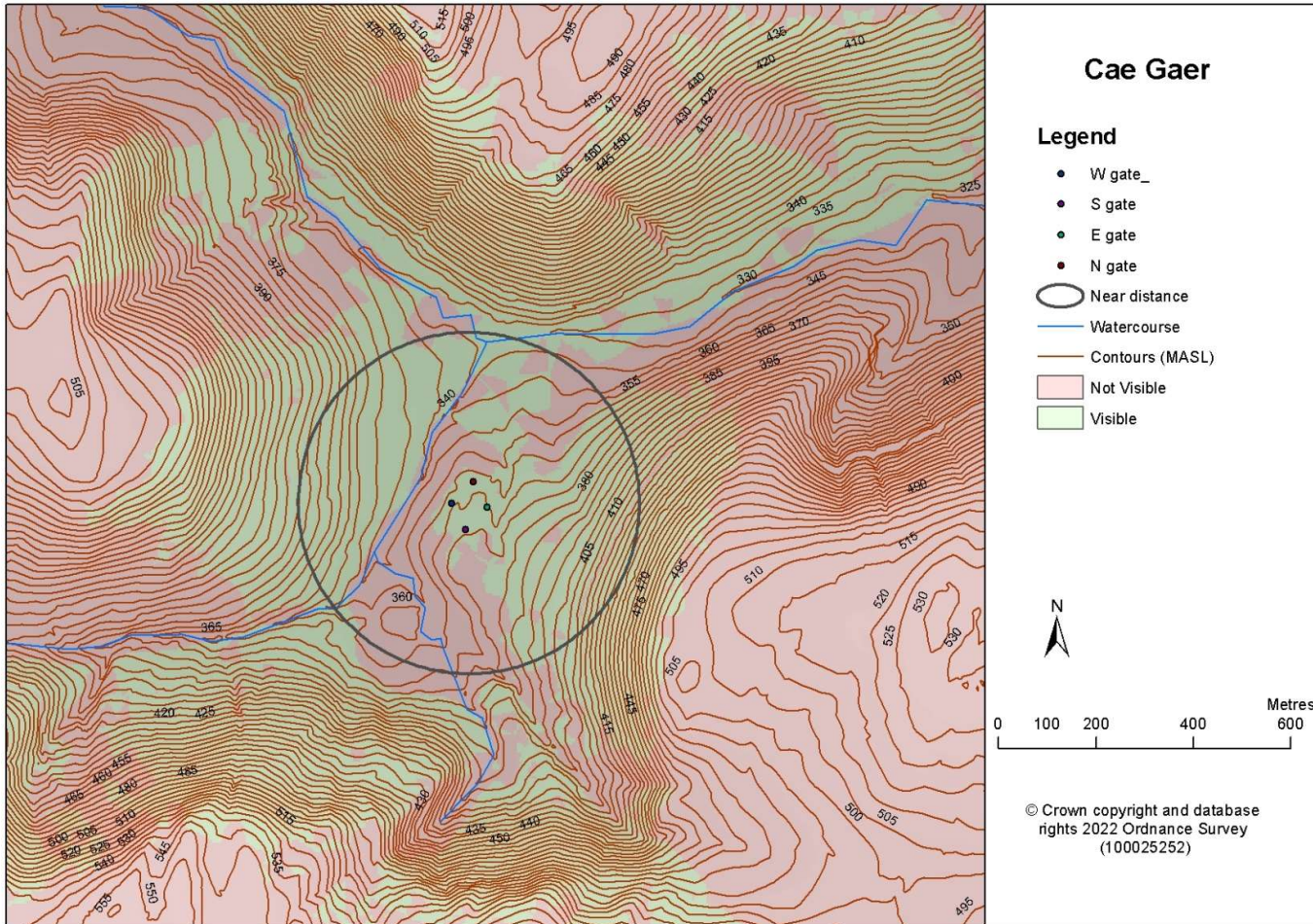


Figure 15 Cae Gaer middle distance

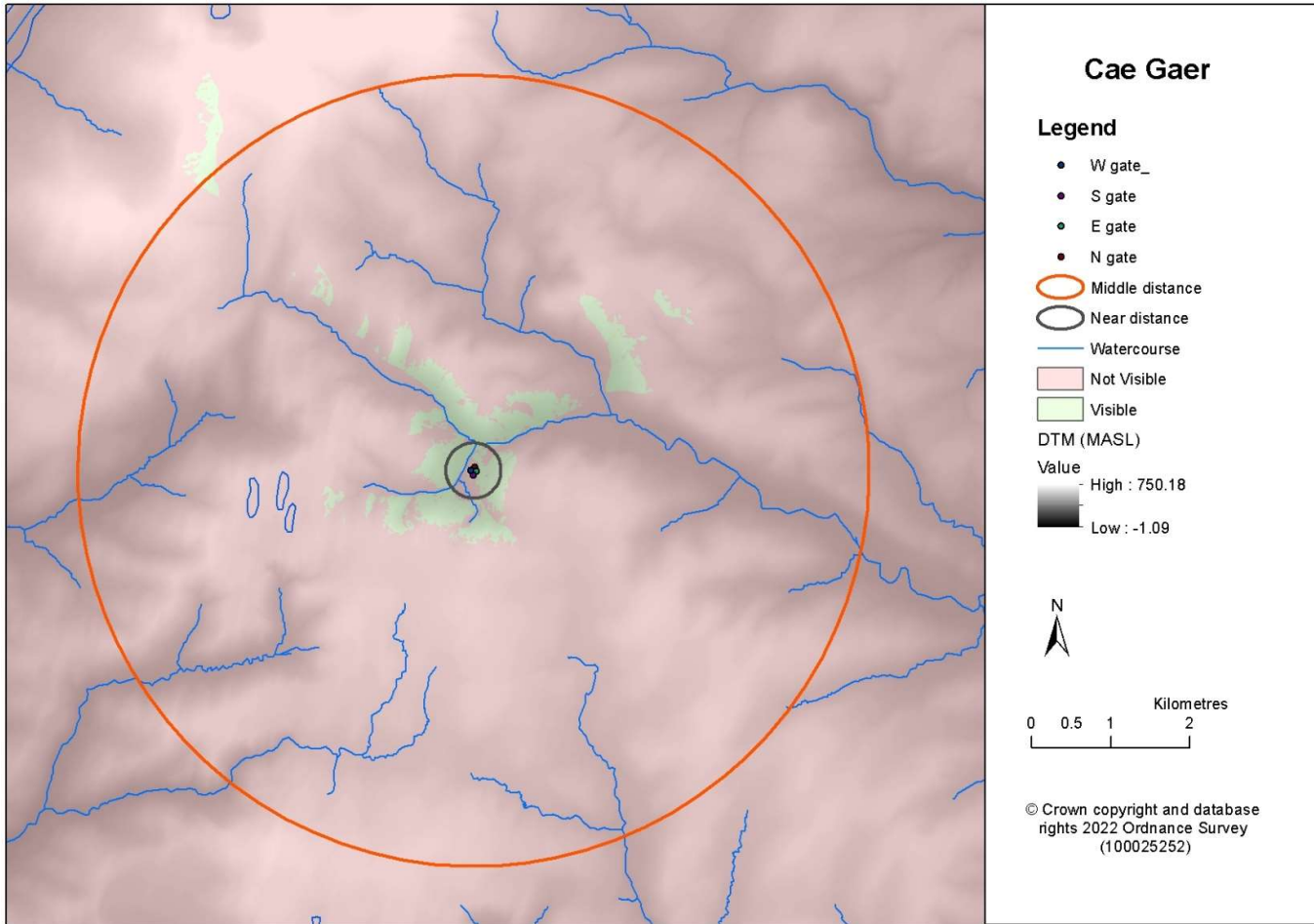


Figure 16 Cae Gaer far distance

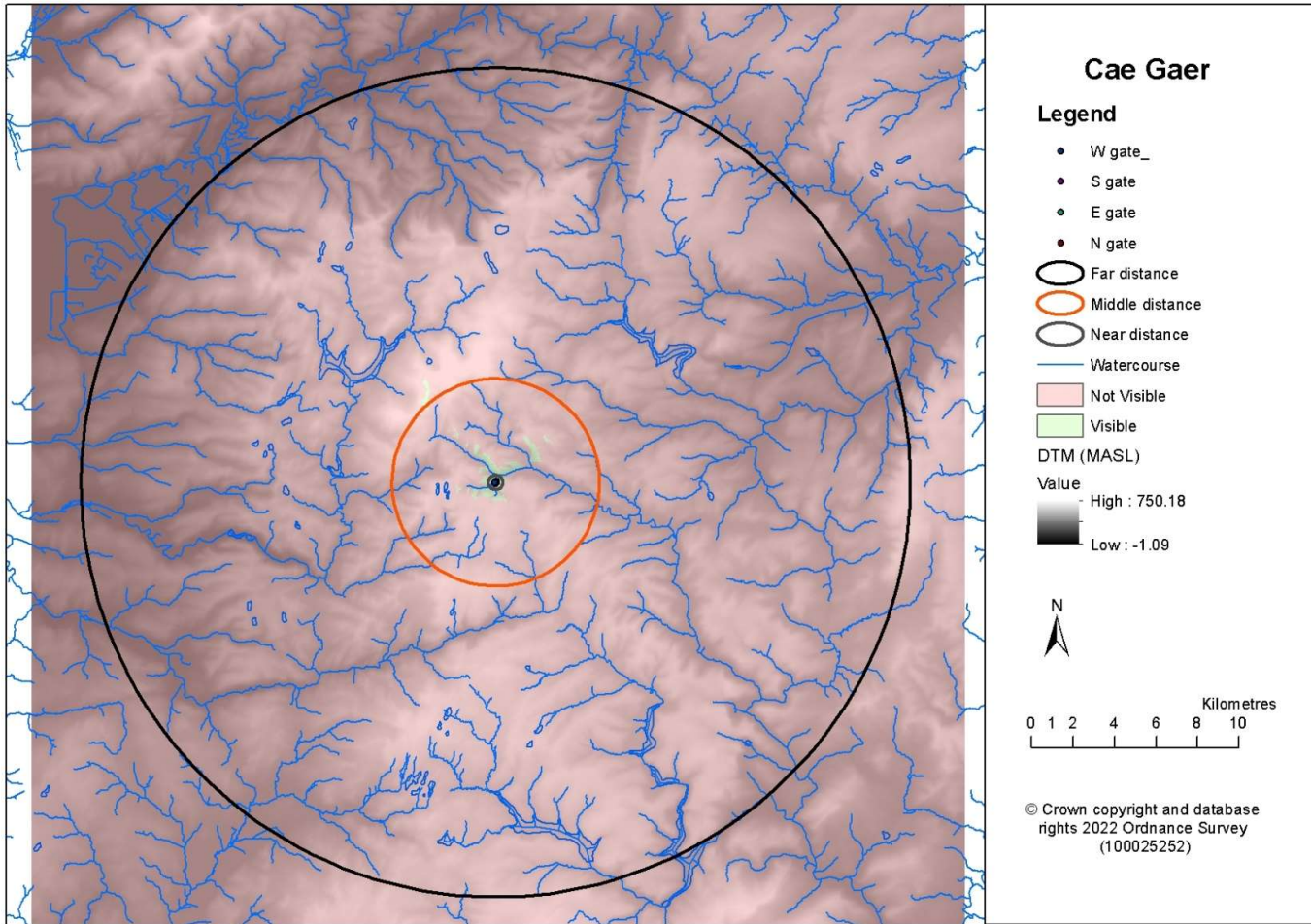


Figure 17 Caer Gai near distance

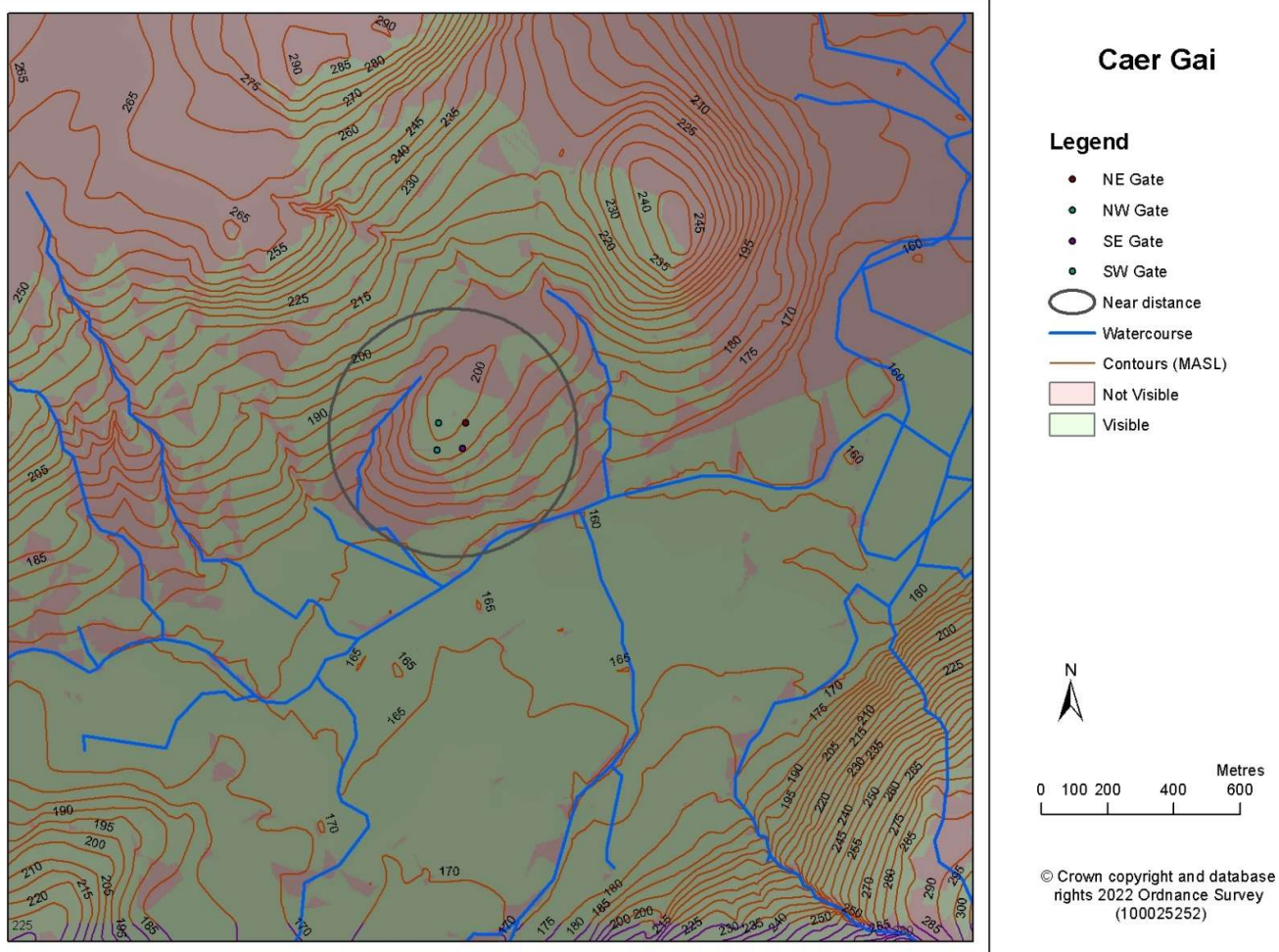


Figure 18 Caer Gai middle distance

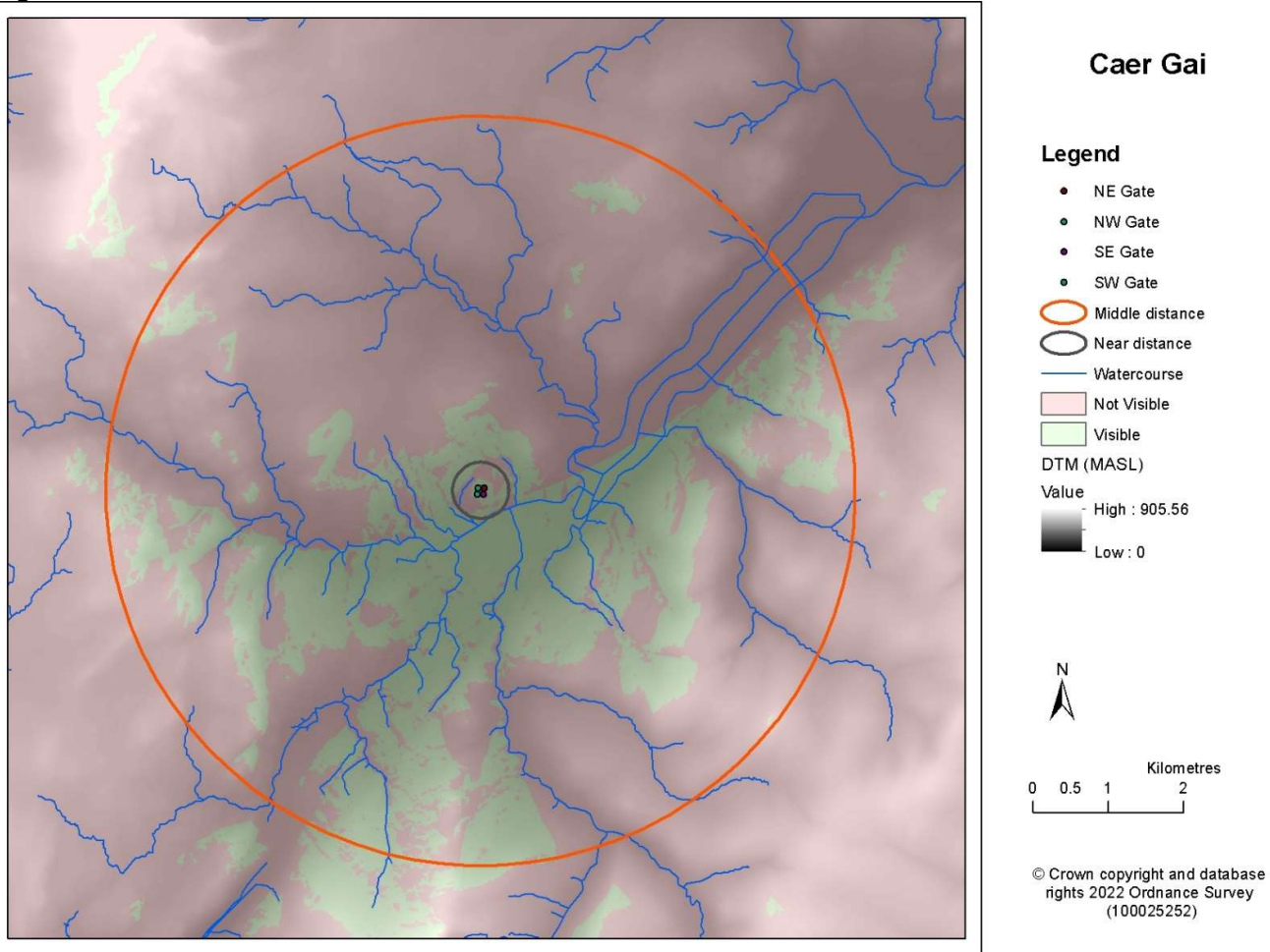


Figure 19 Caer Gai far distance

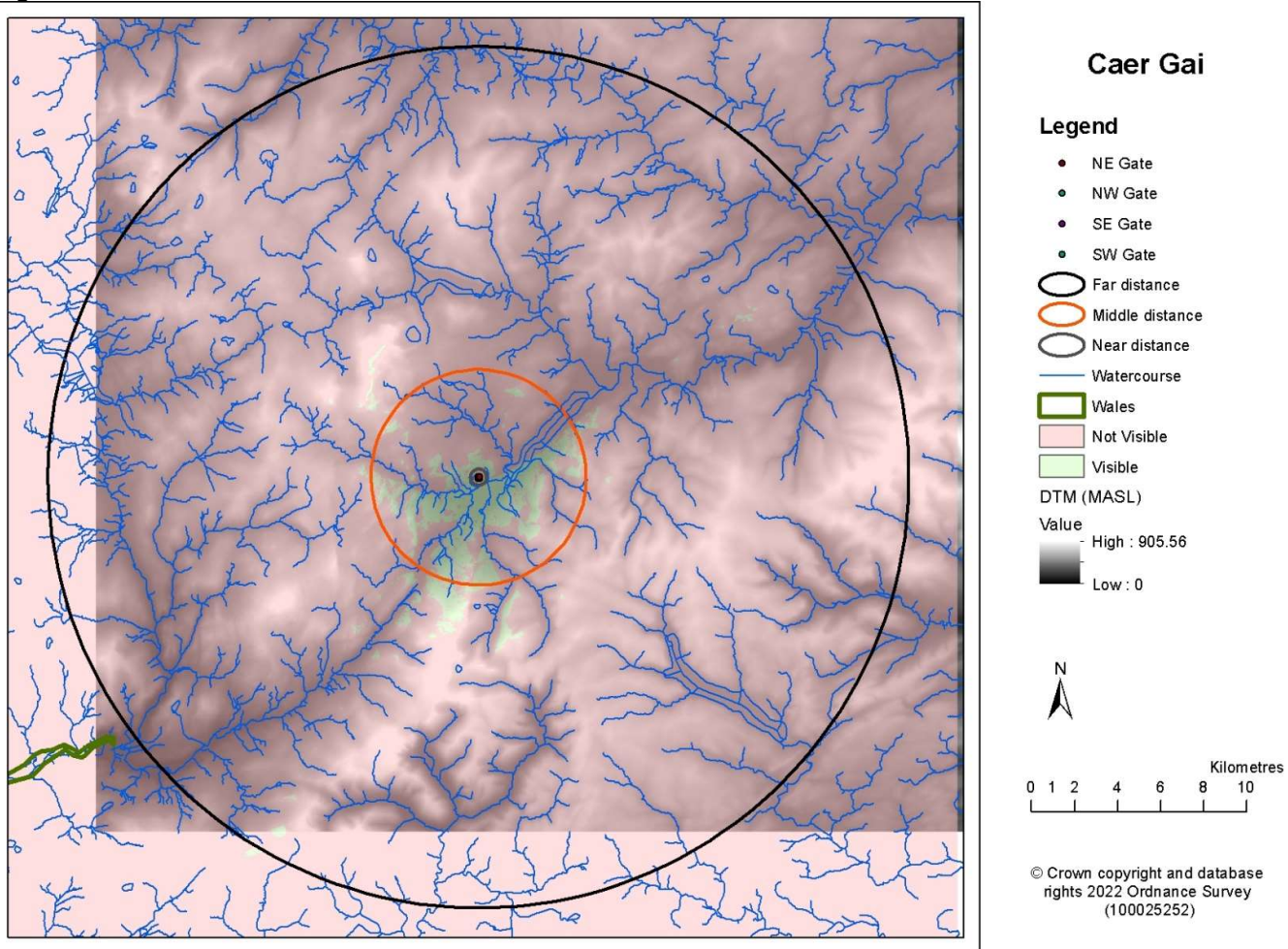


Figure 20 Caer Llugwy near distance

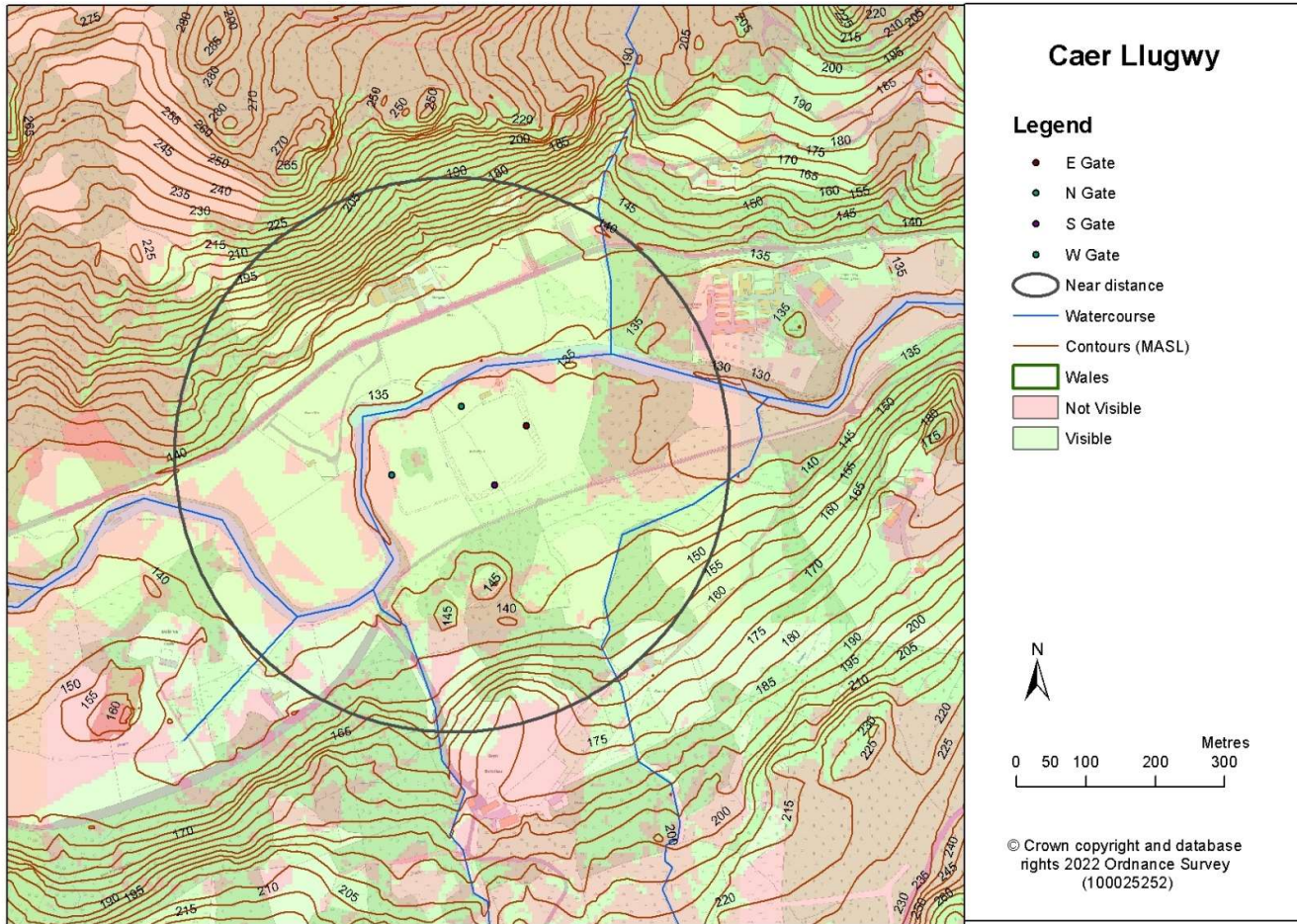


Figure 21 Caer Llugwy middle distance

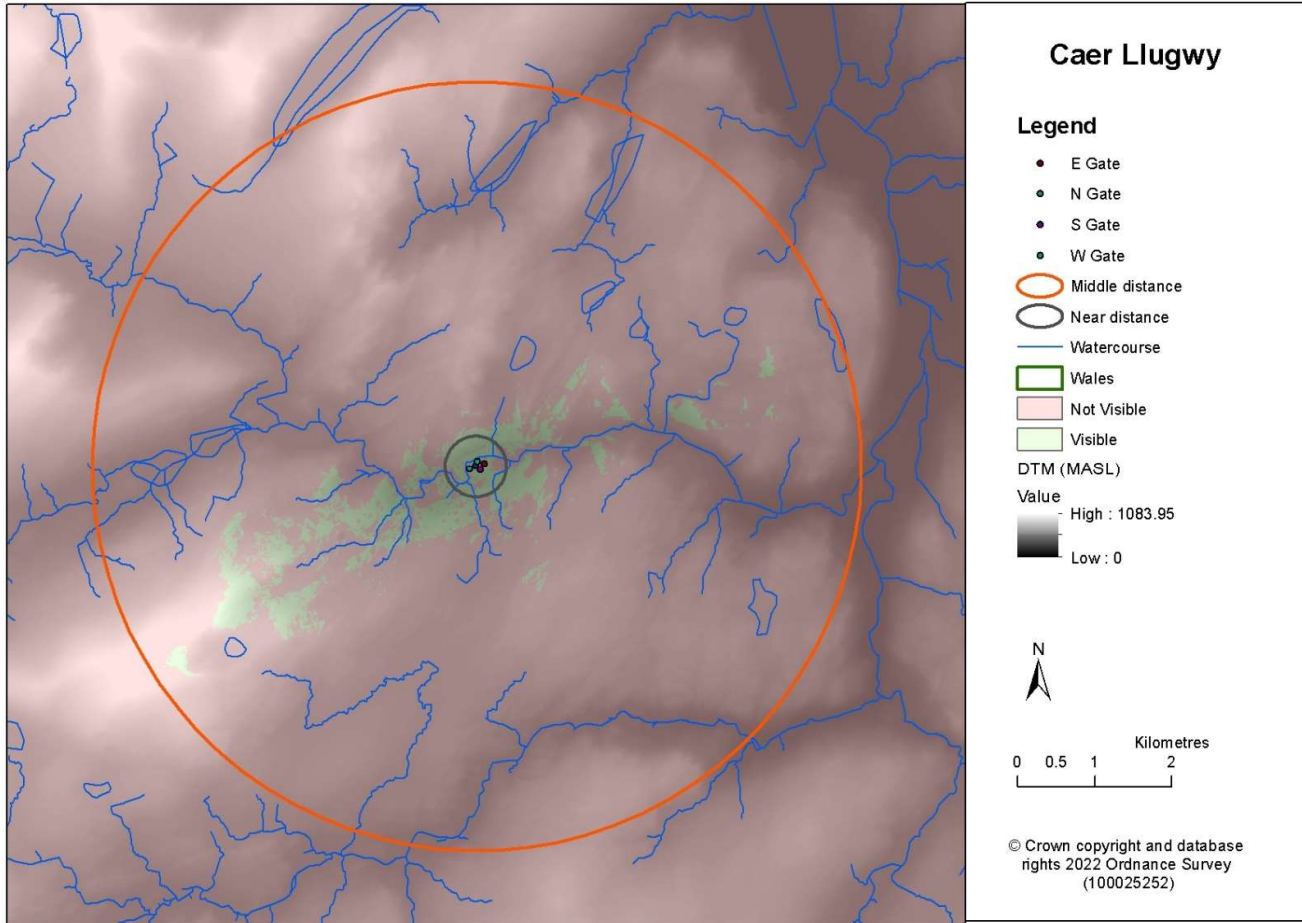


Figure 22 Caer Llugwy far distance

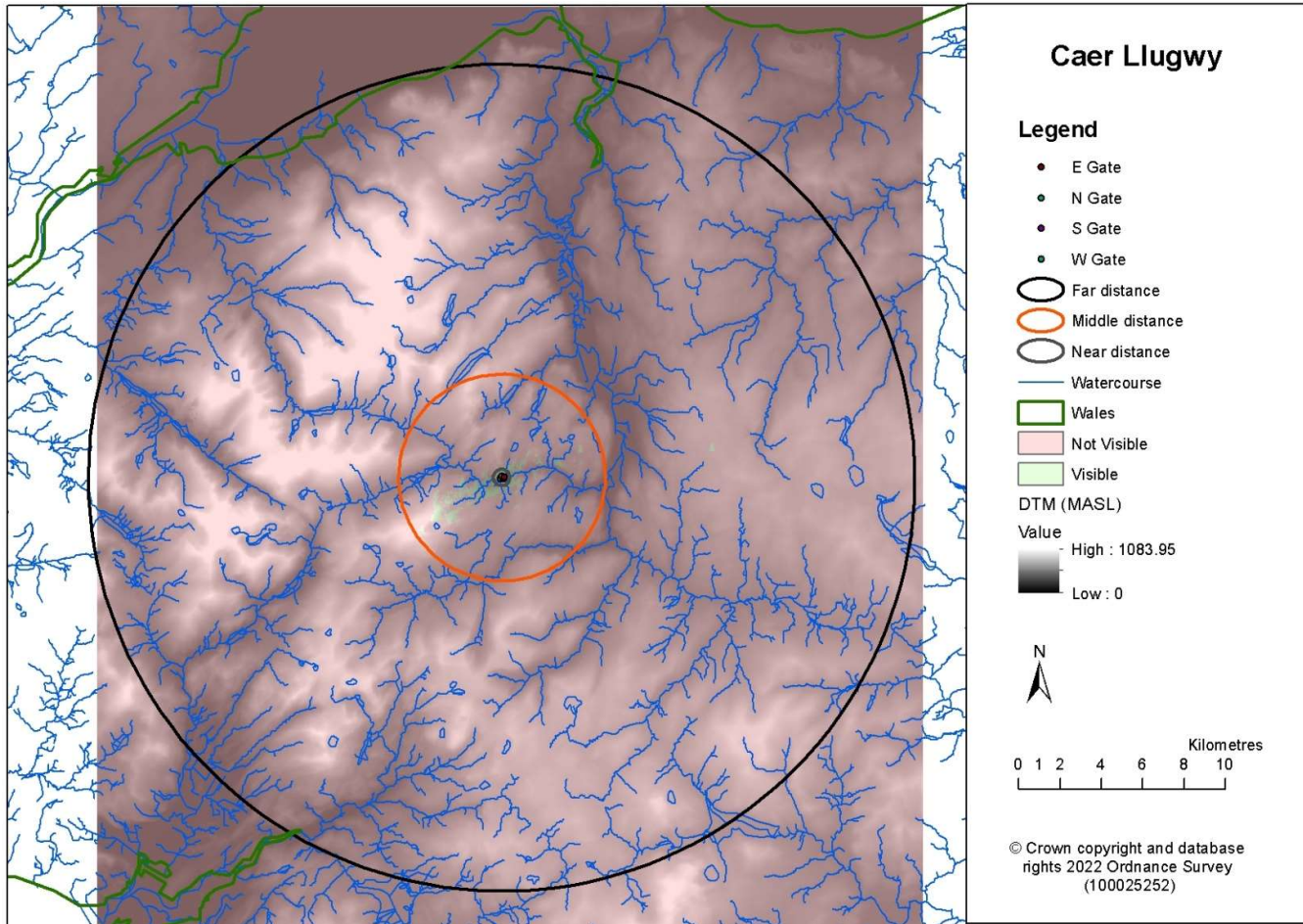


Figure 23 Caerau near distance

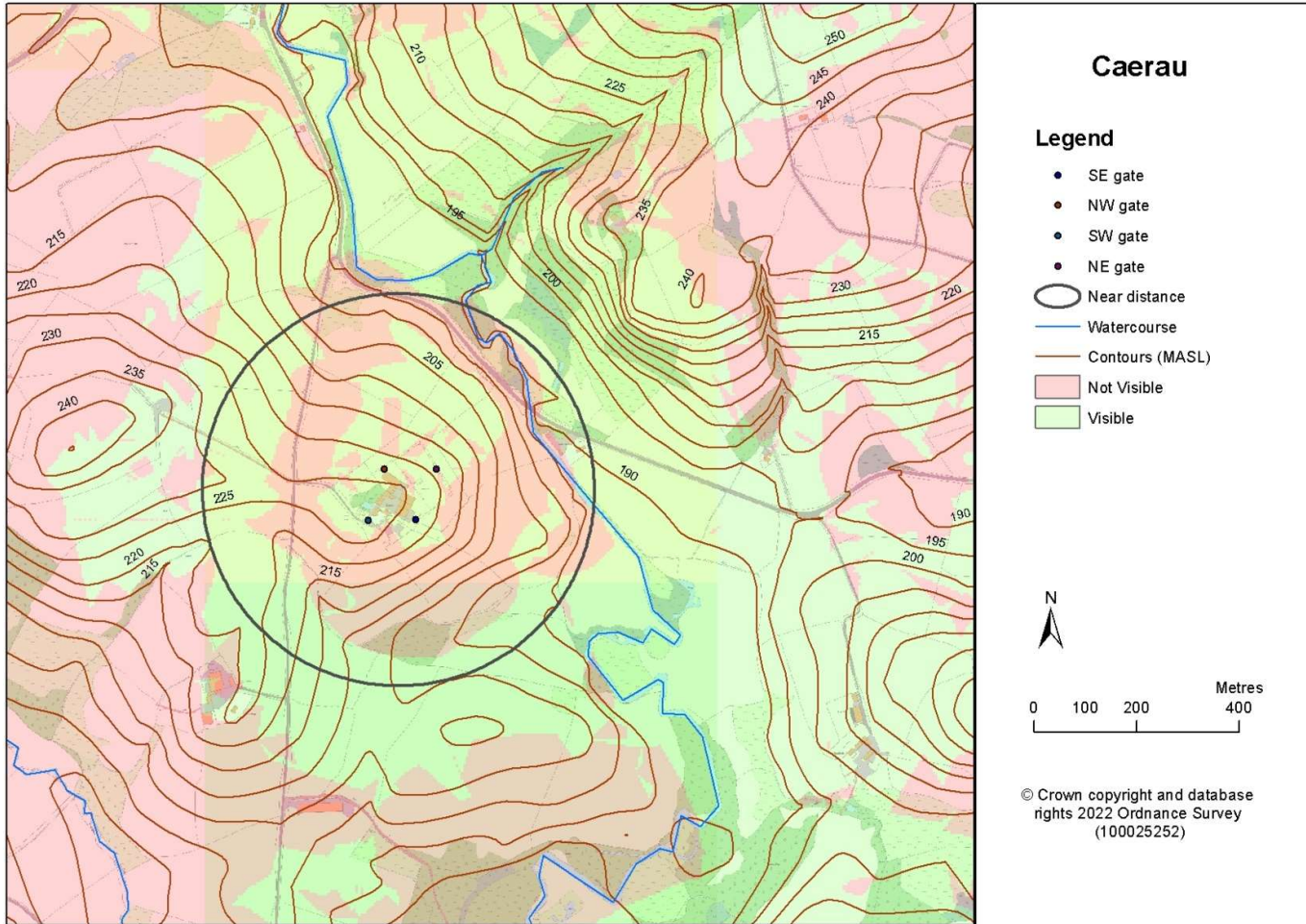


Figure 24 Caerau middle distance

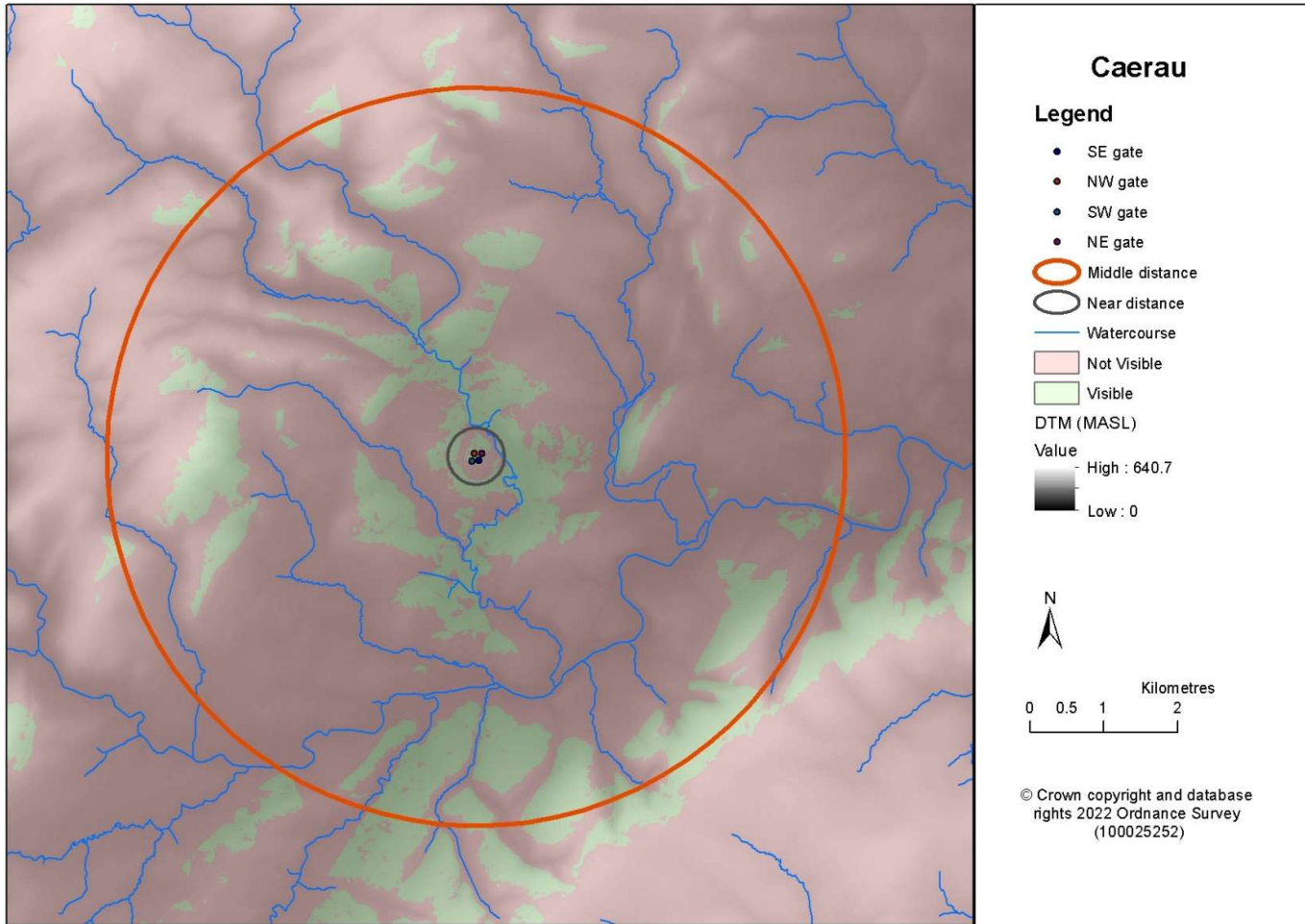


Figure 25 Caerau far distance

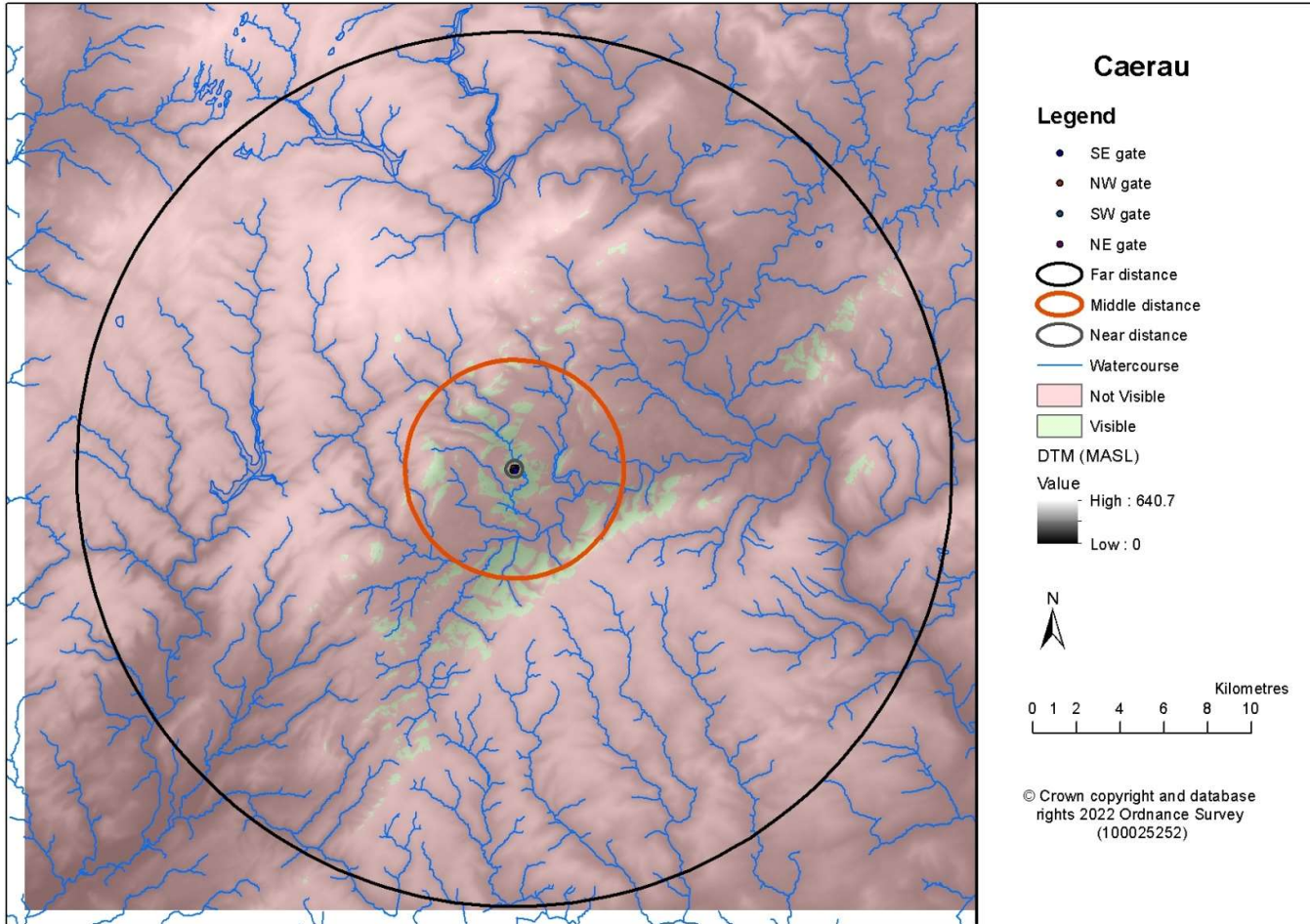


Figure 26 Caergwanaf near distance

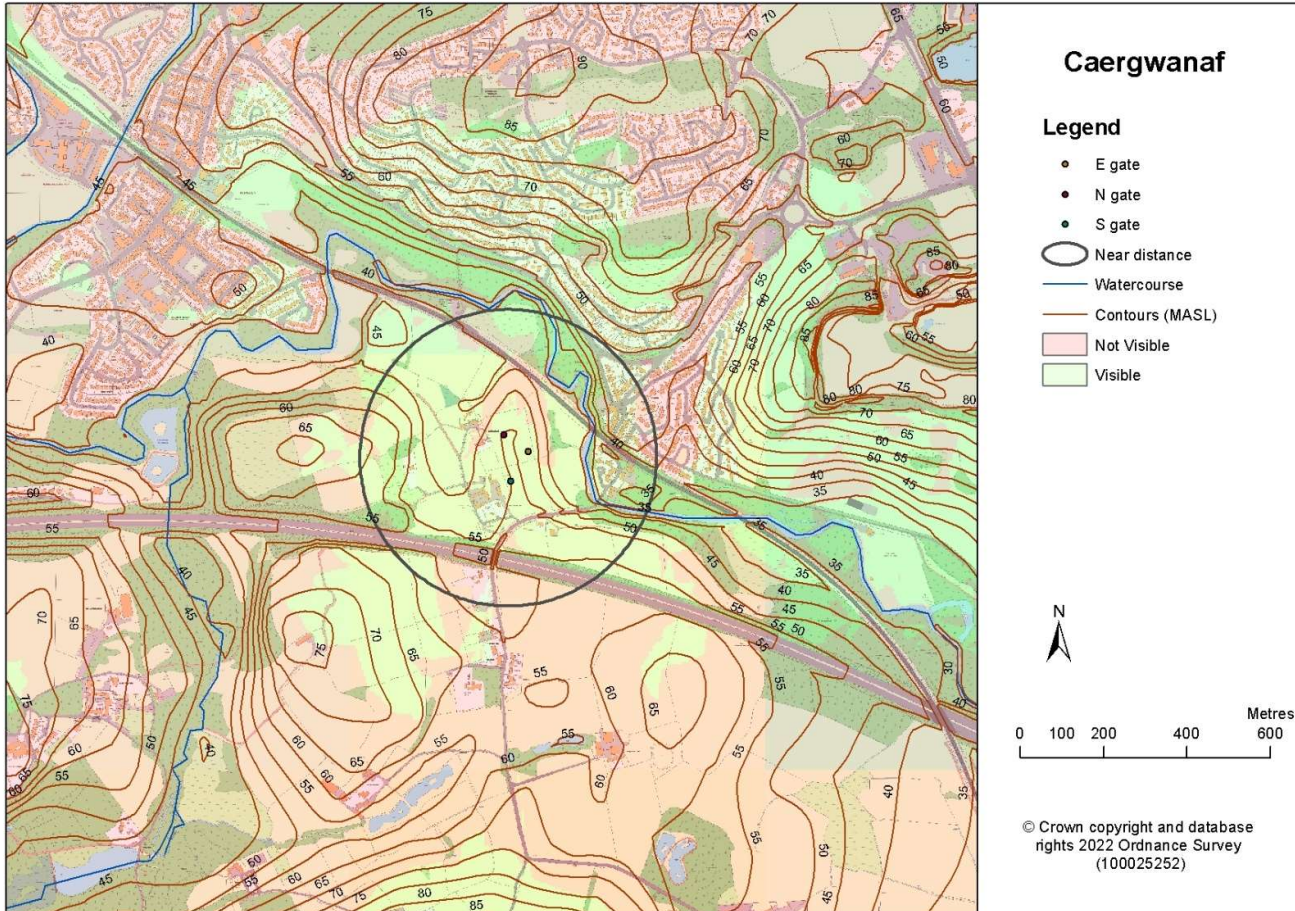


Figure 27 Caergwanaf middle distance

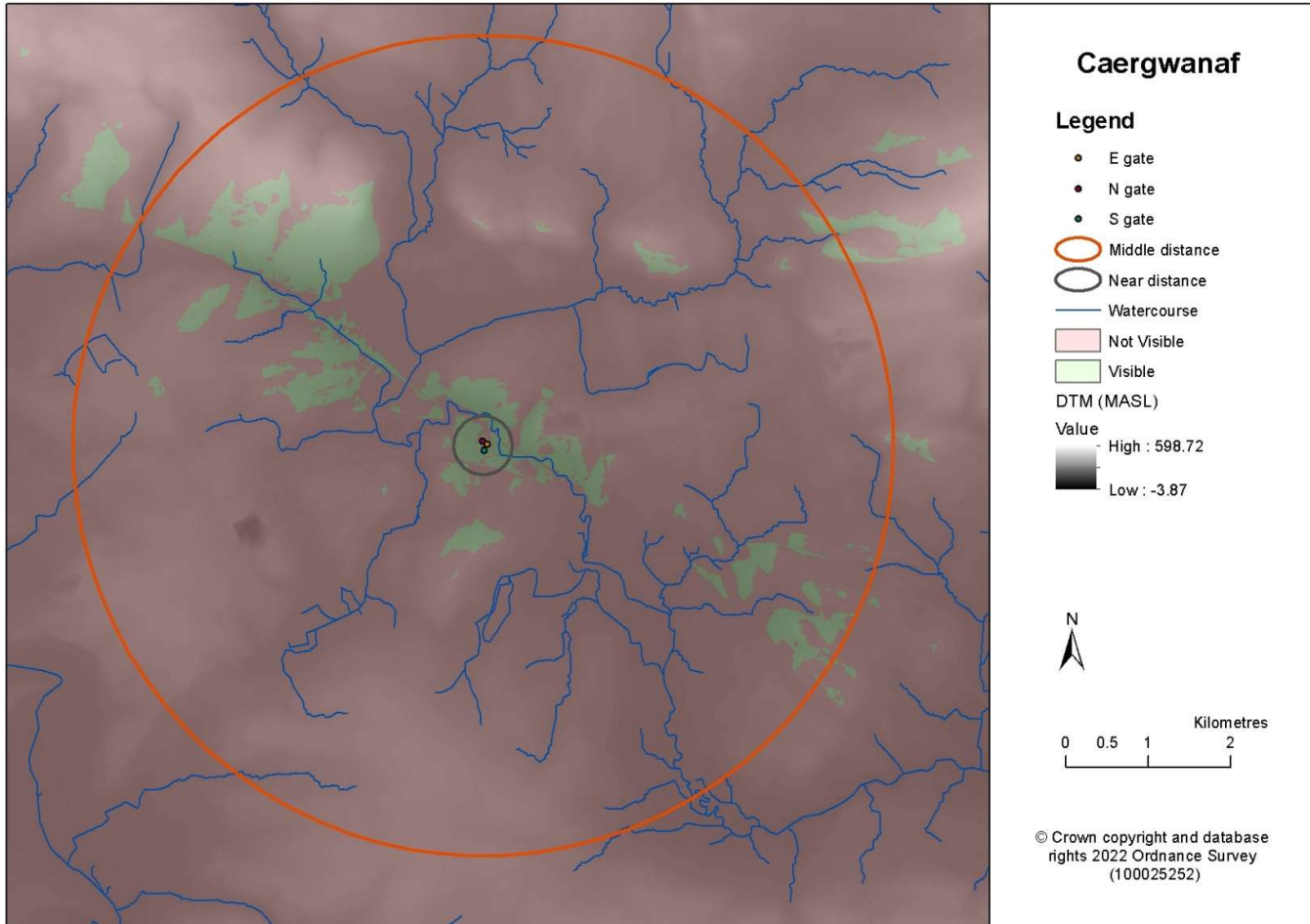


Figure28 Caergwanaf far distance

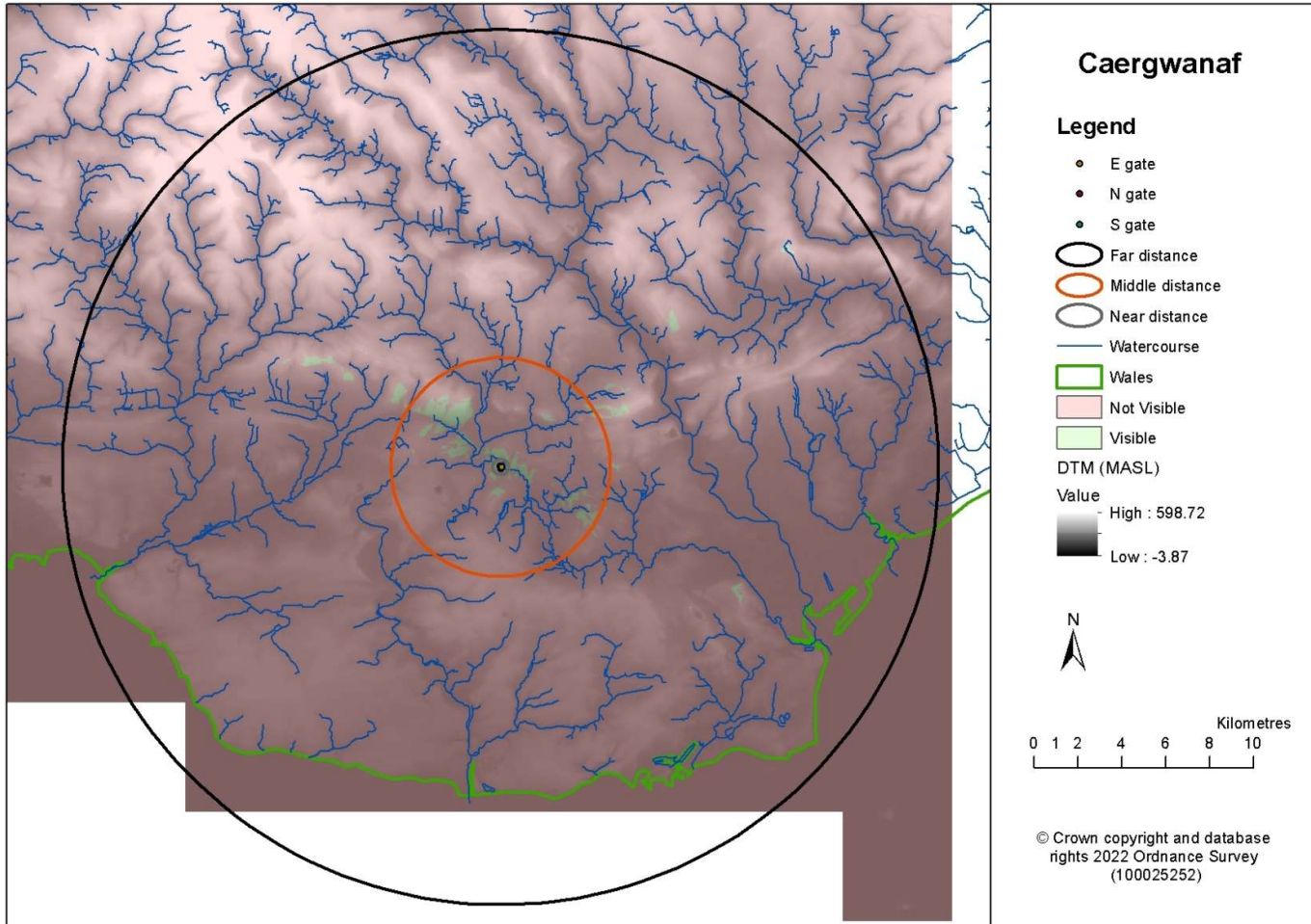


Figure 29 Caerhun near distance

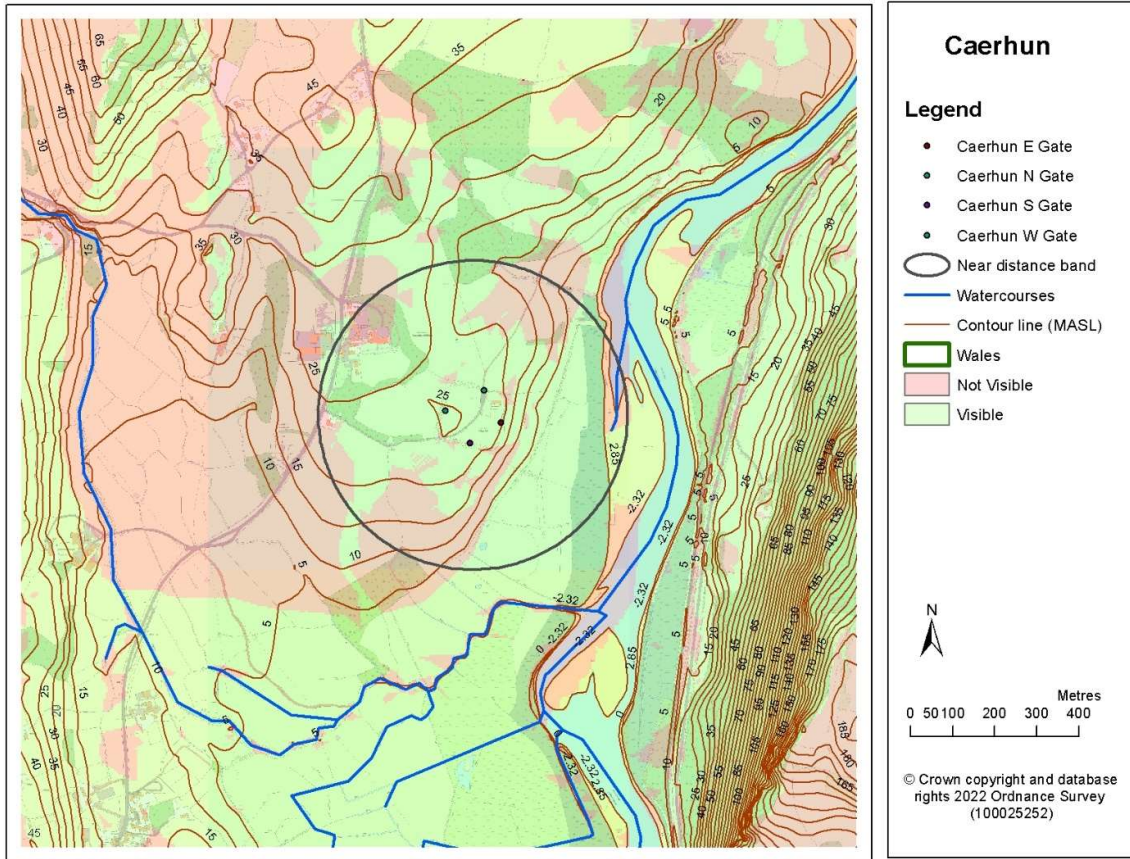


Figure 30 Caerhun middle distance

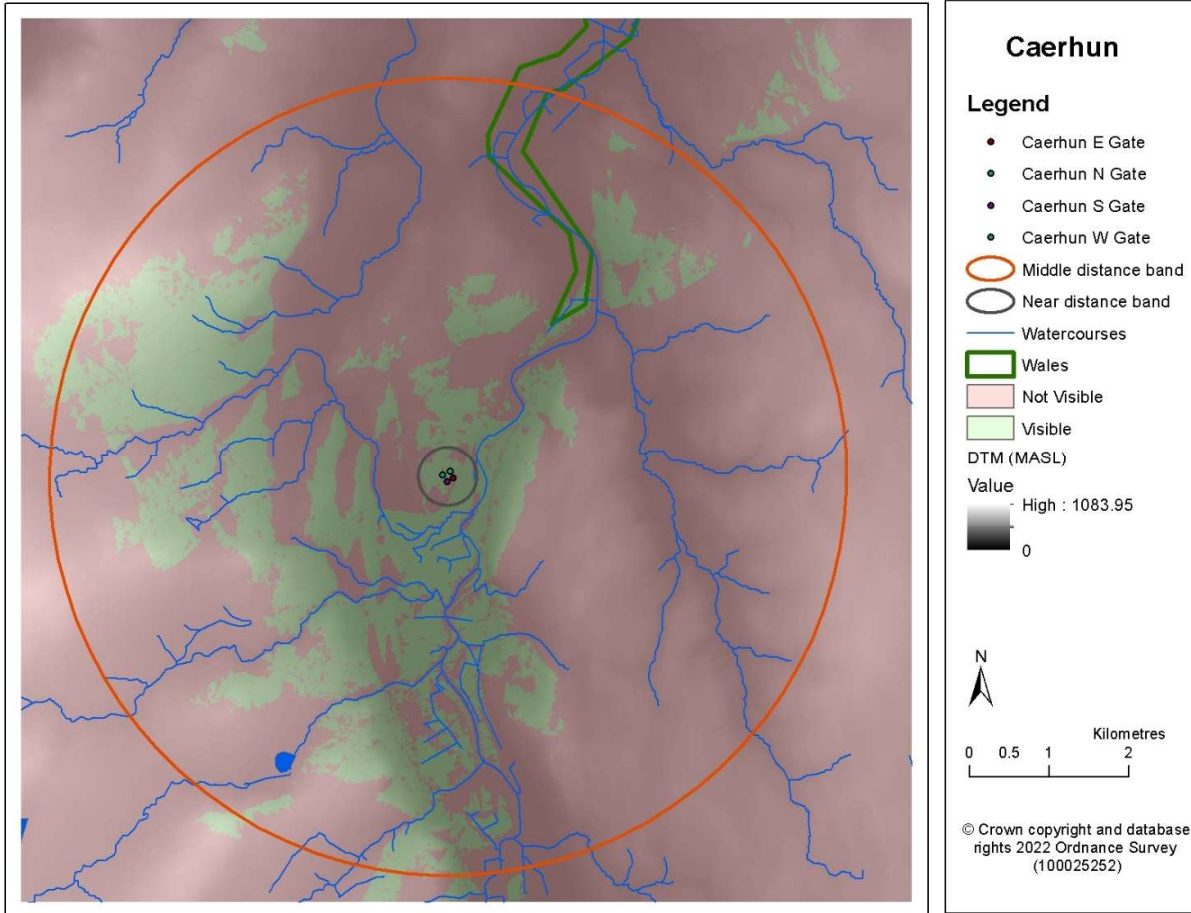


Figure 31 Caerhun far distance

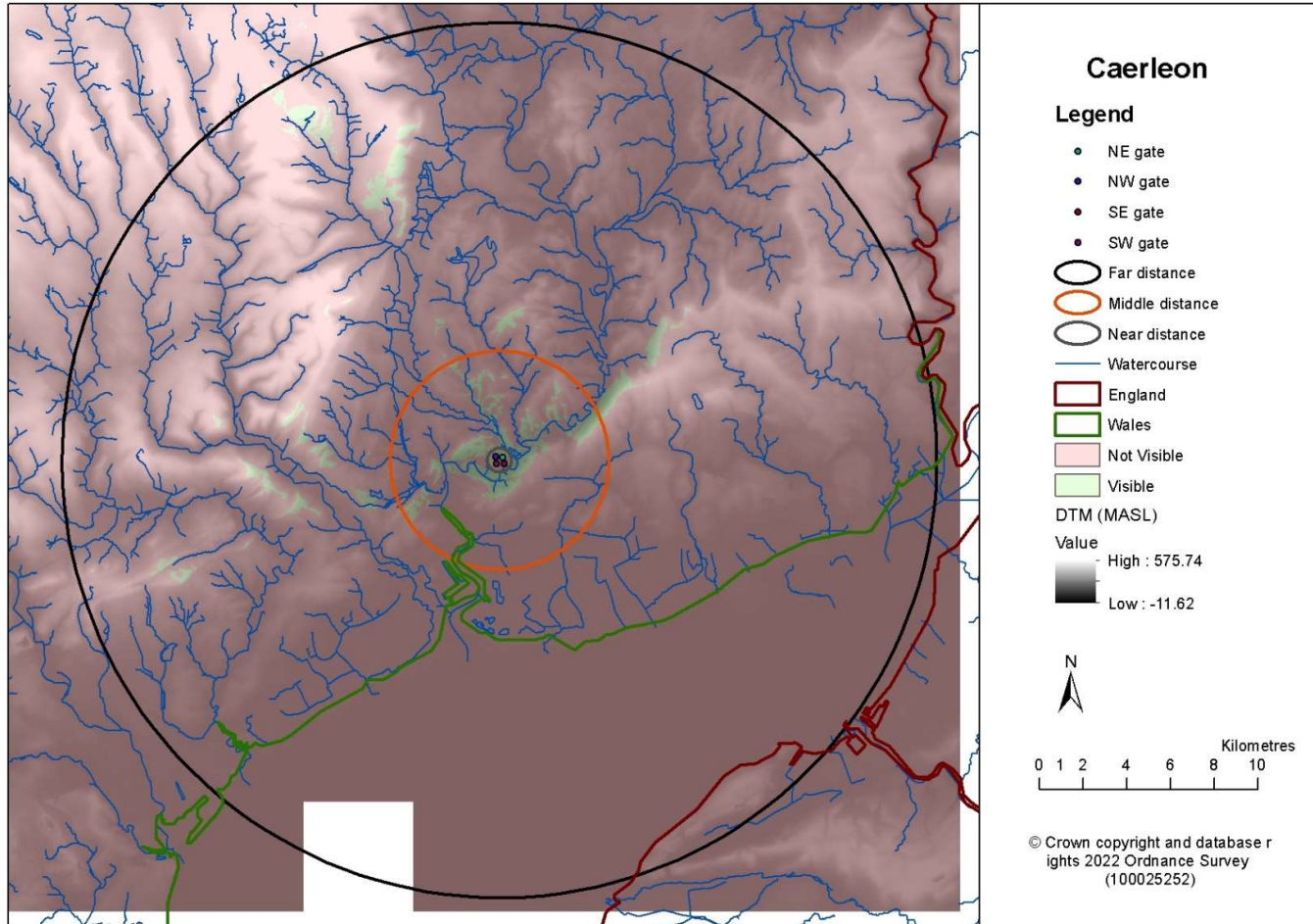


Figure 32 Caerleon near distance

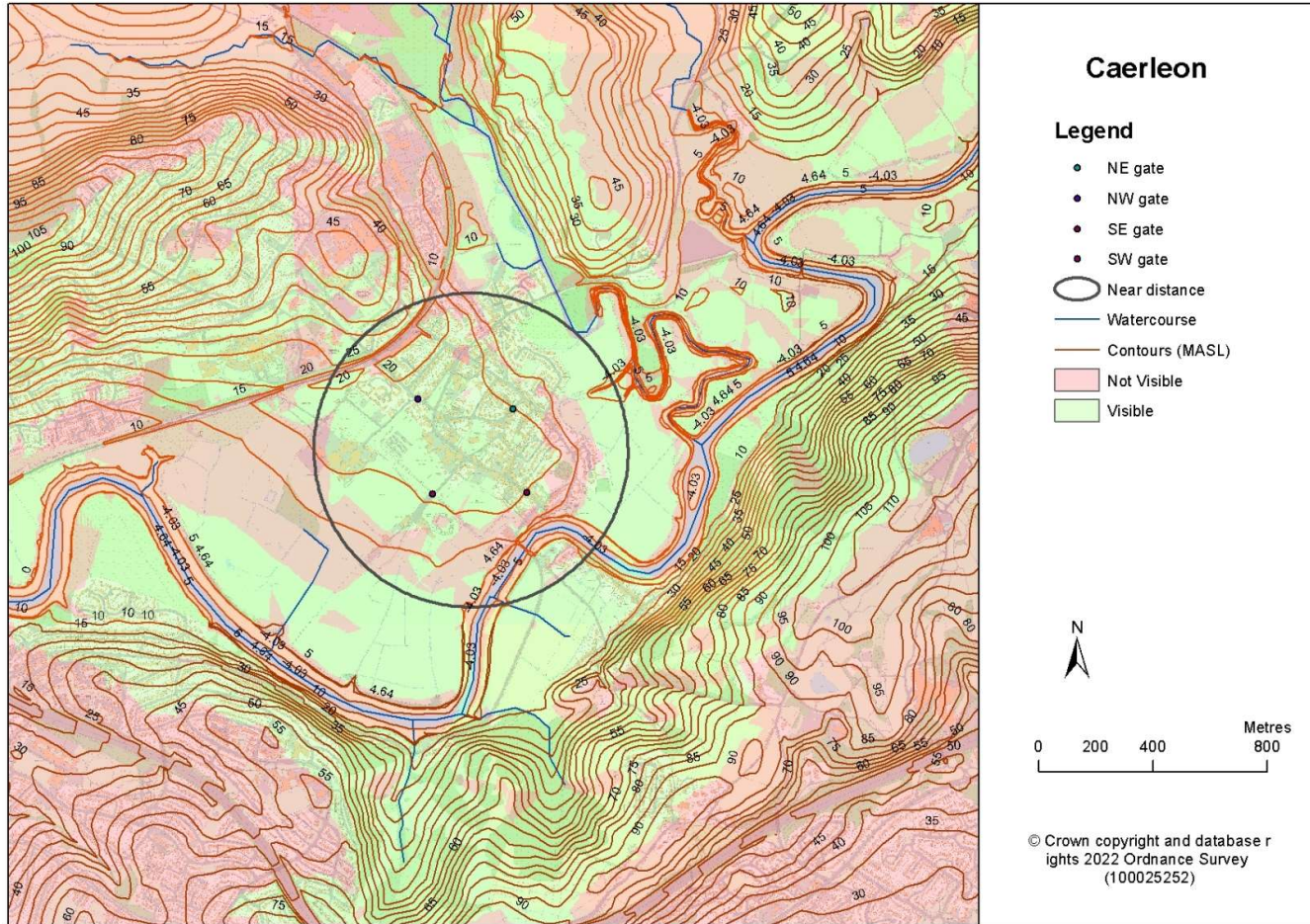


Figure 33 Caerleon middle distance

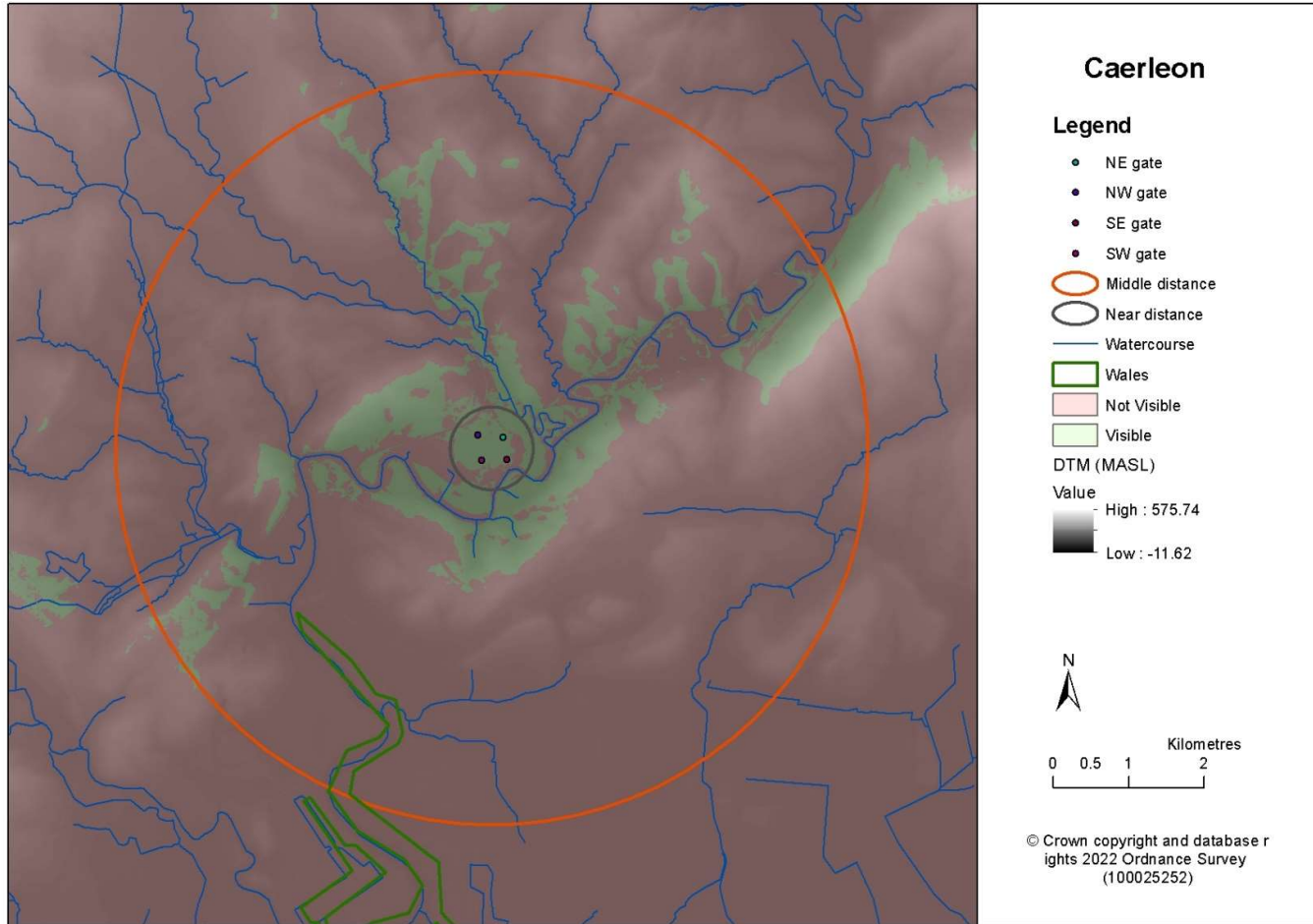


Figure 34 Caerleon far distance

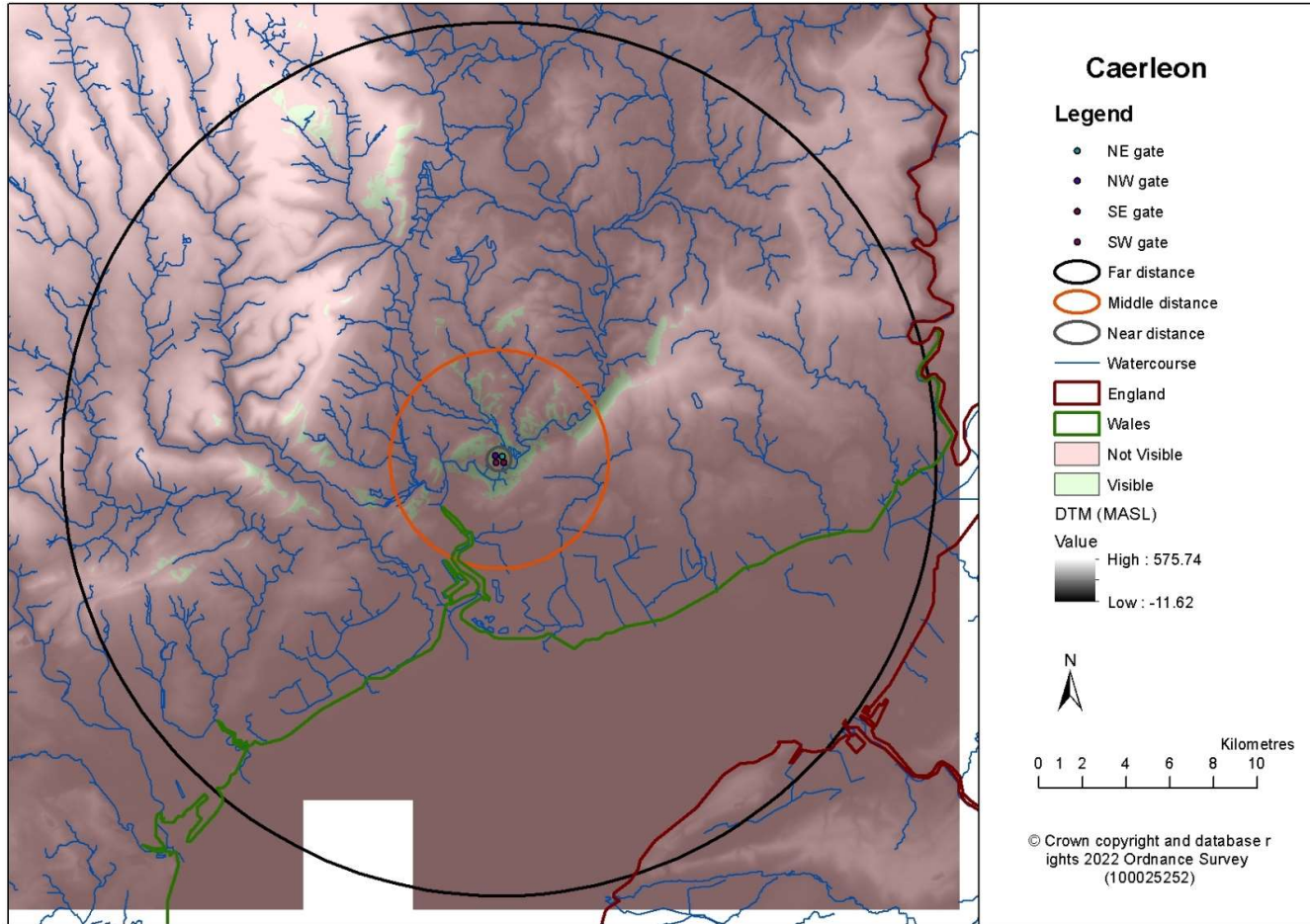


Figure 35 Caerphilly near distance

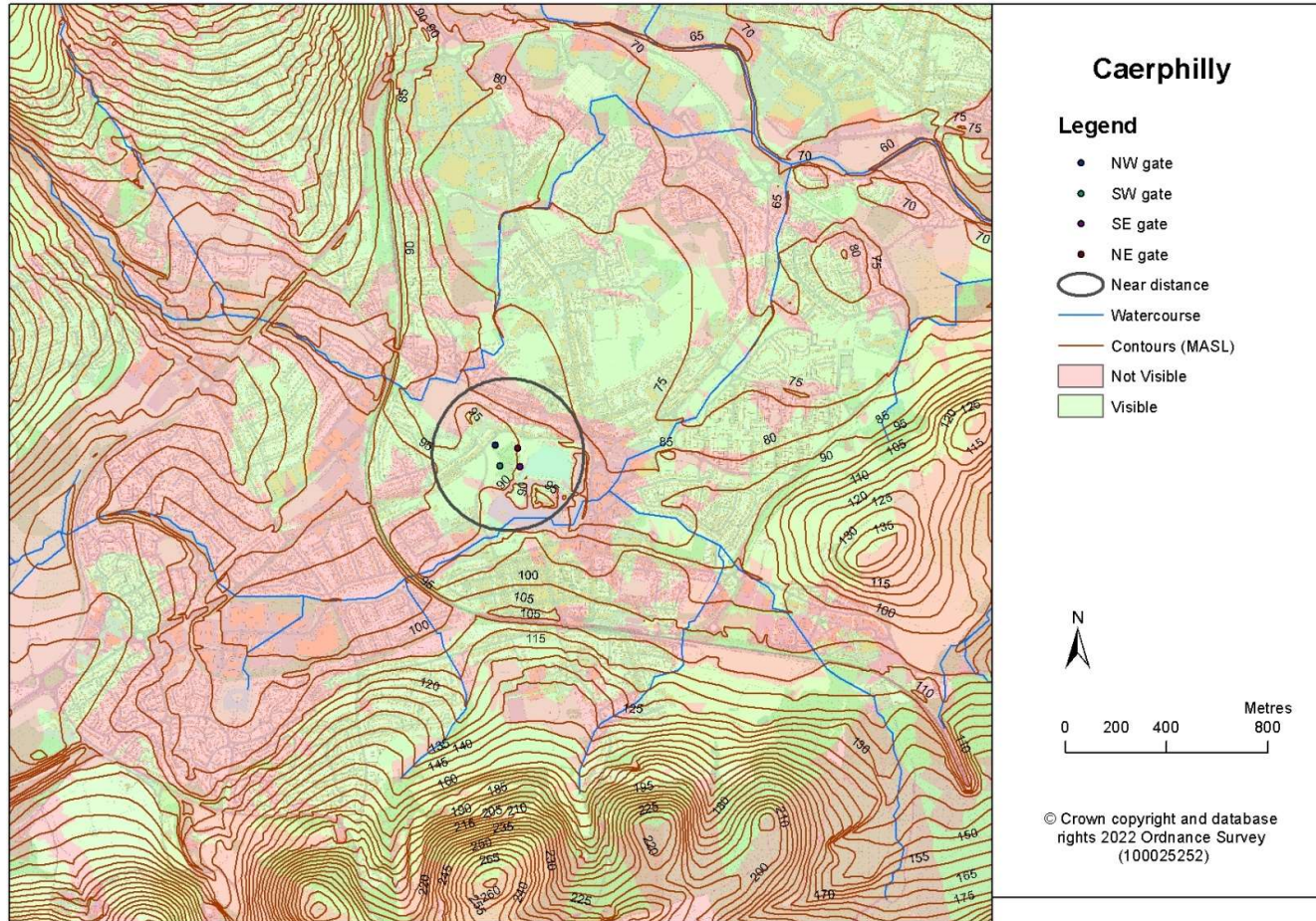


Figure 36 Caerphilly middle distance

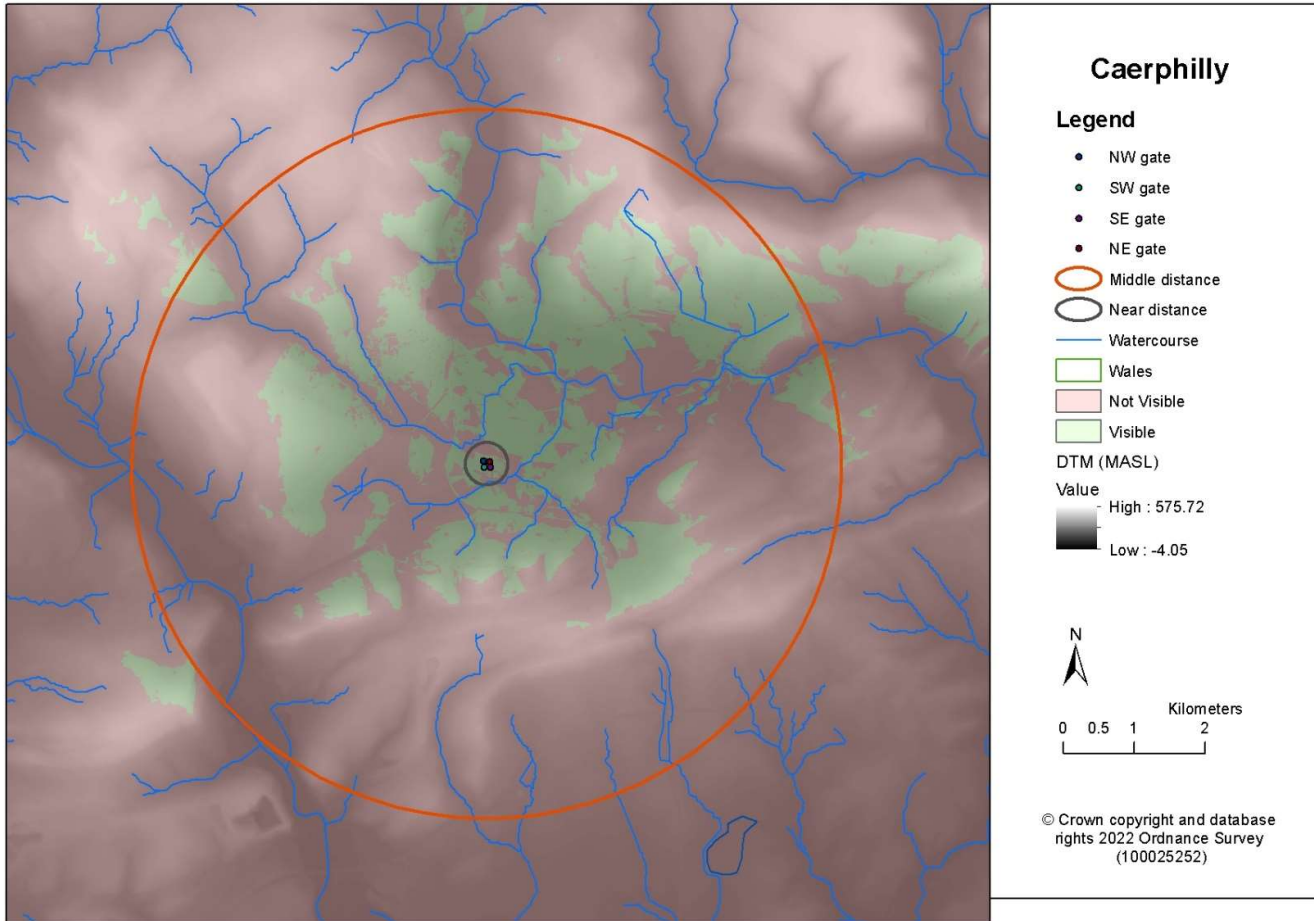


Figure 37 Caerphilly far distance

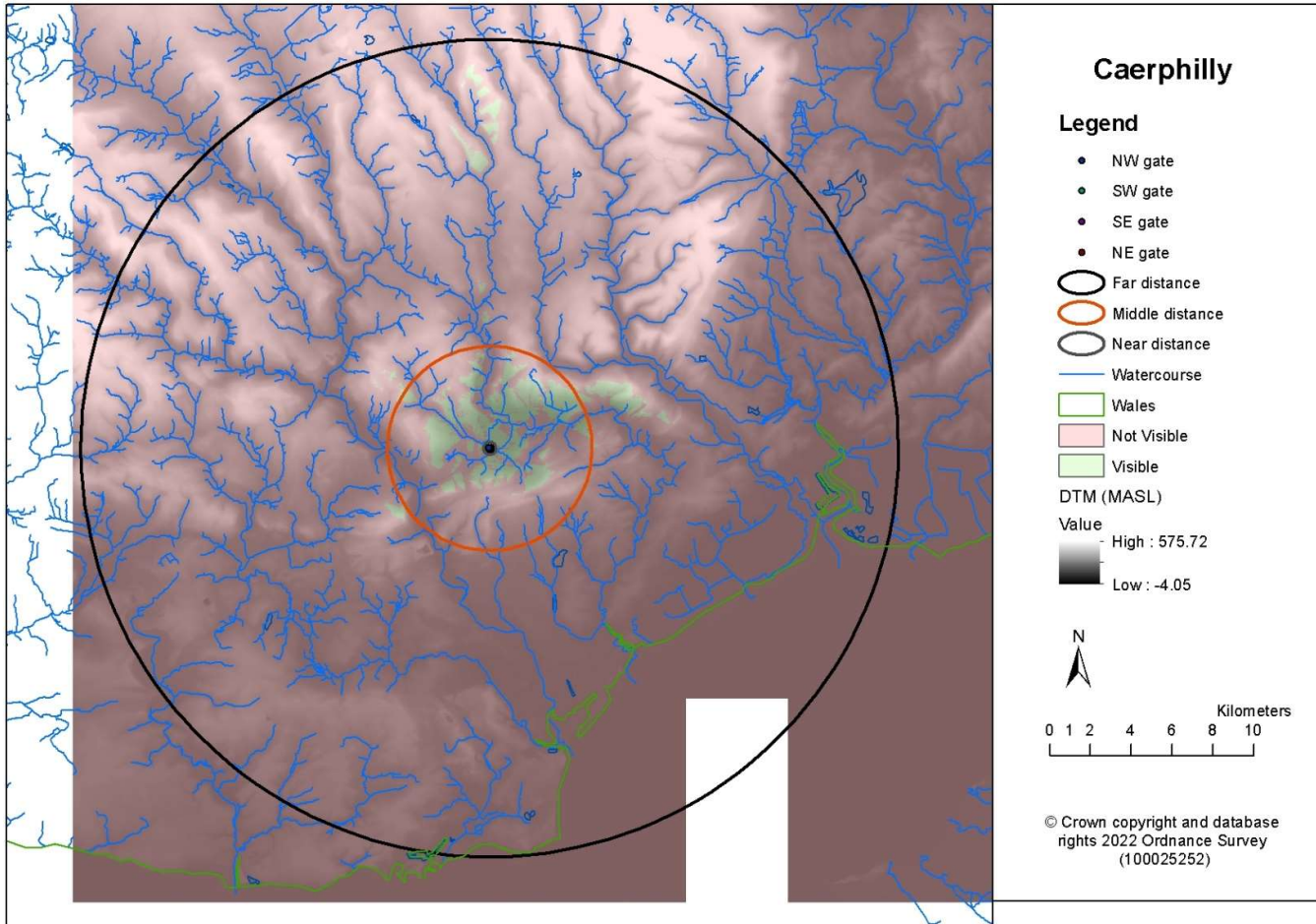


Figure 38 Caersws I near distance

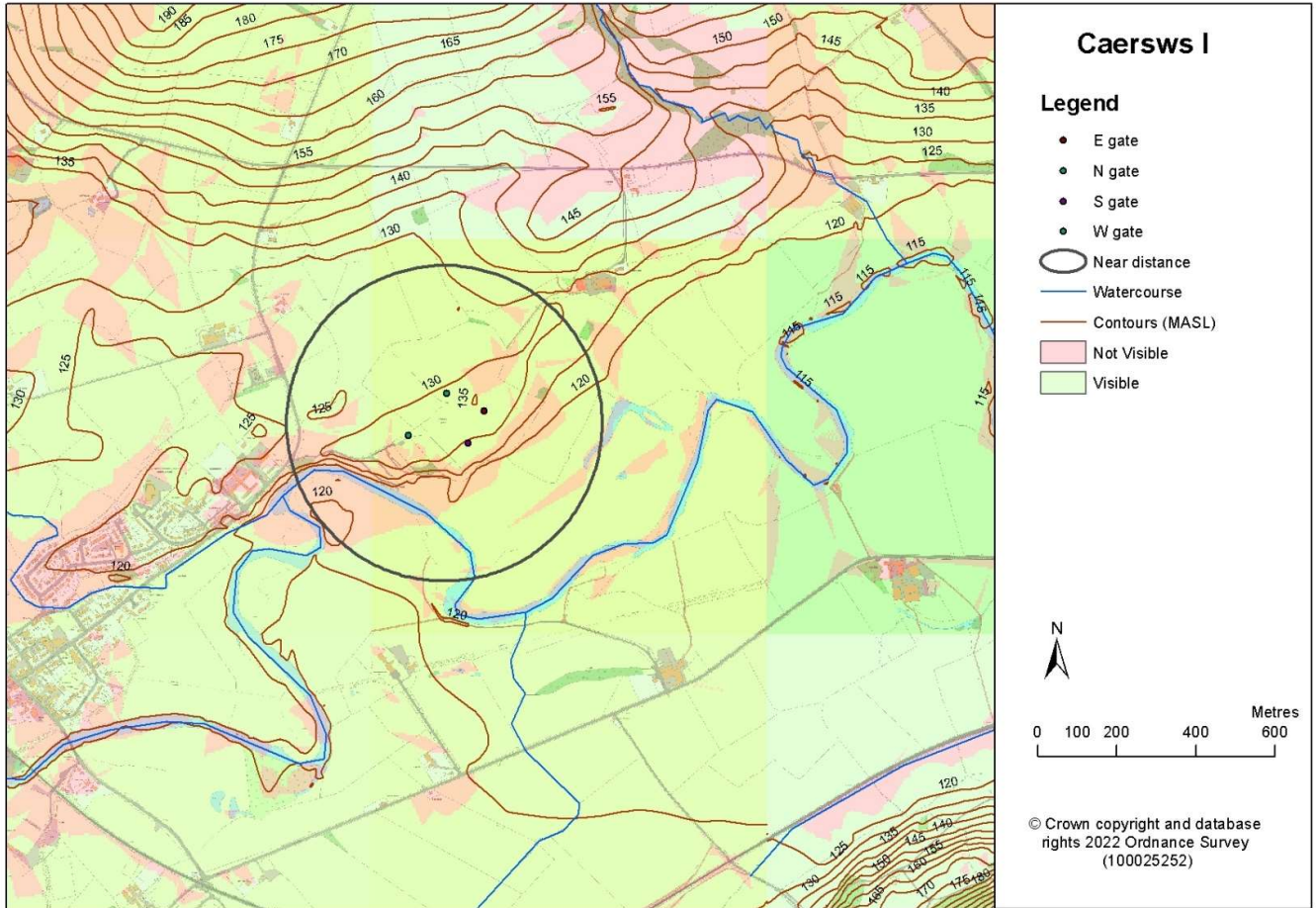


Figure 39 Caersws I middle distance

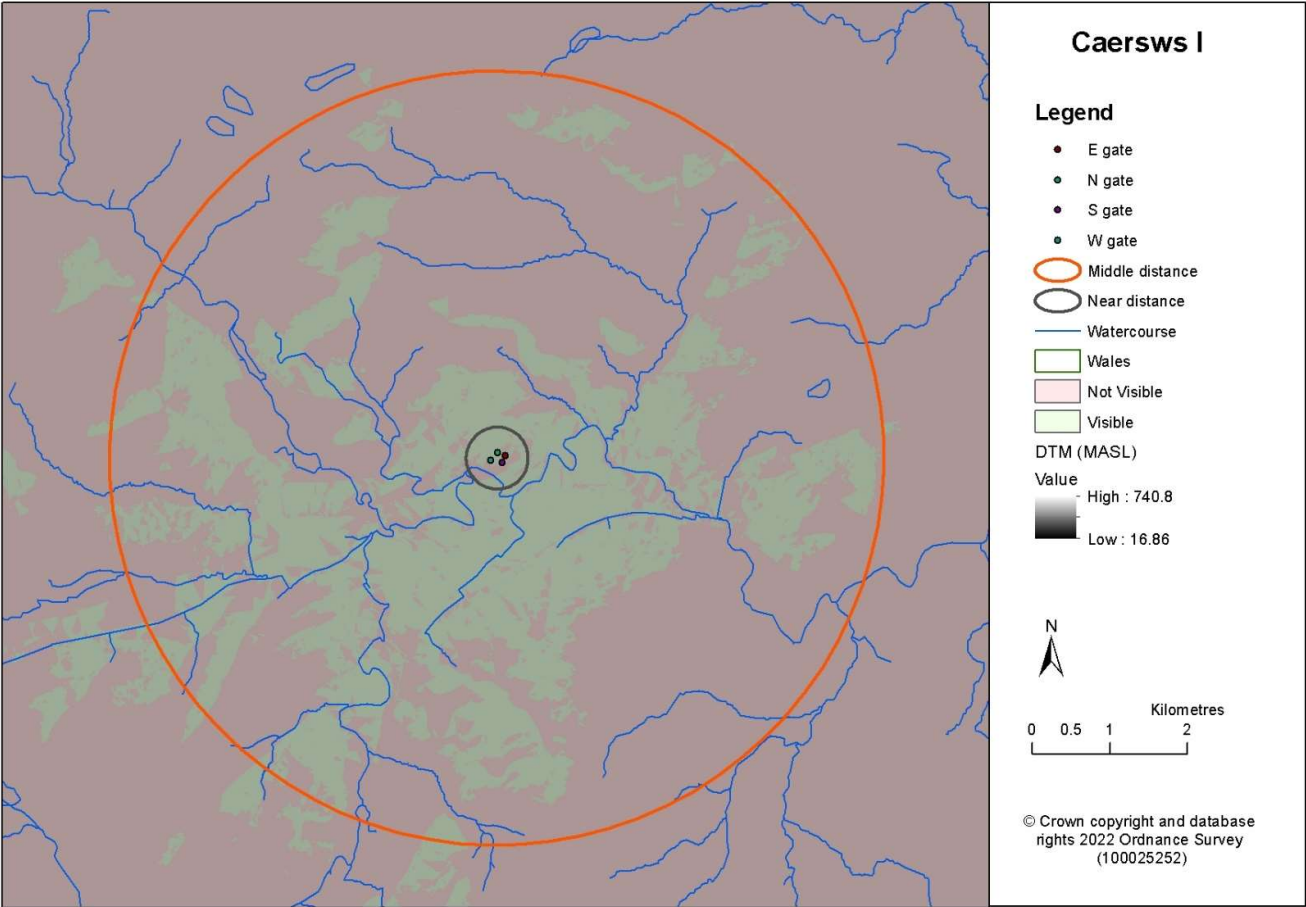


Figure 40 Caersws I far distance

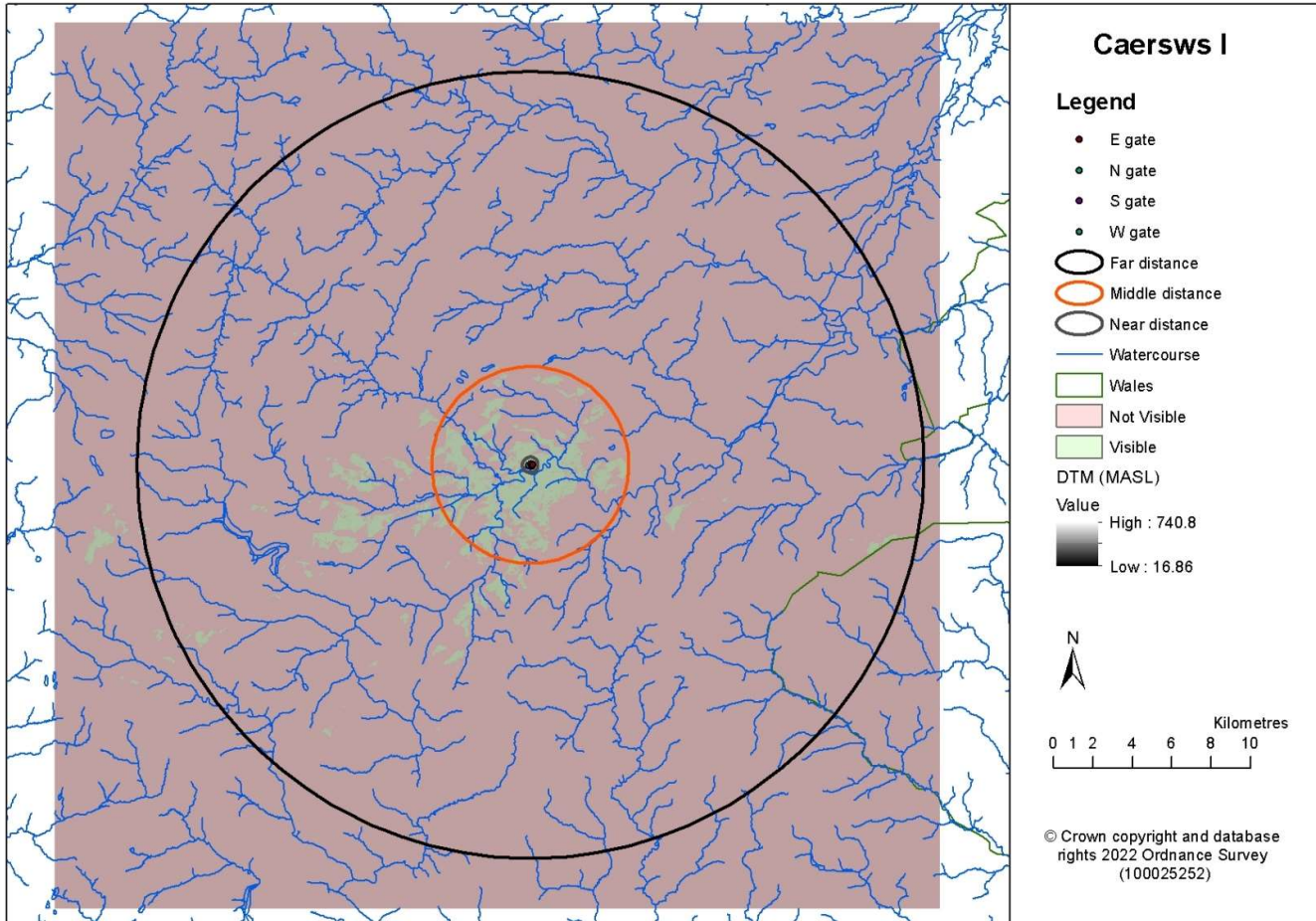


Figure 41 Caersws II near distance

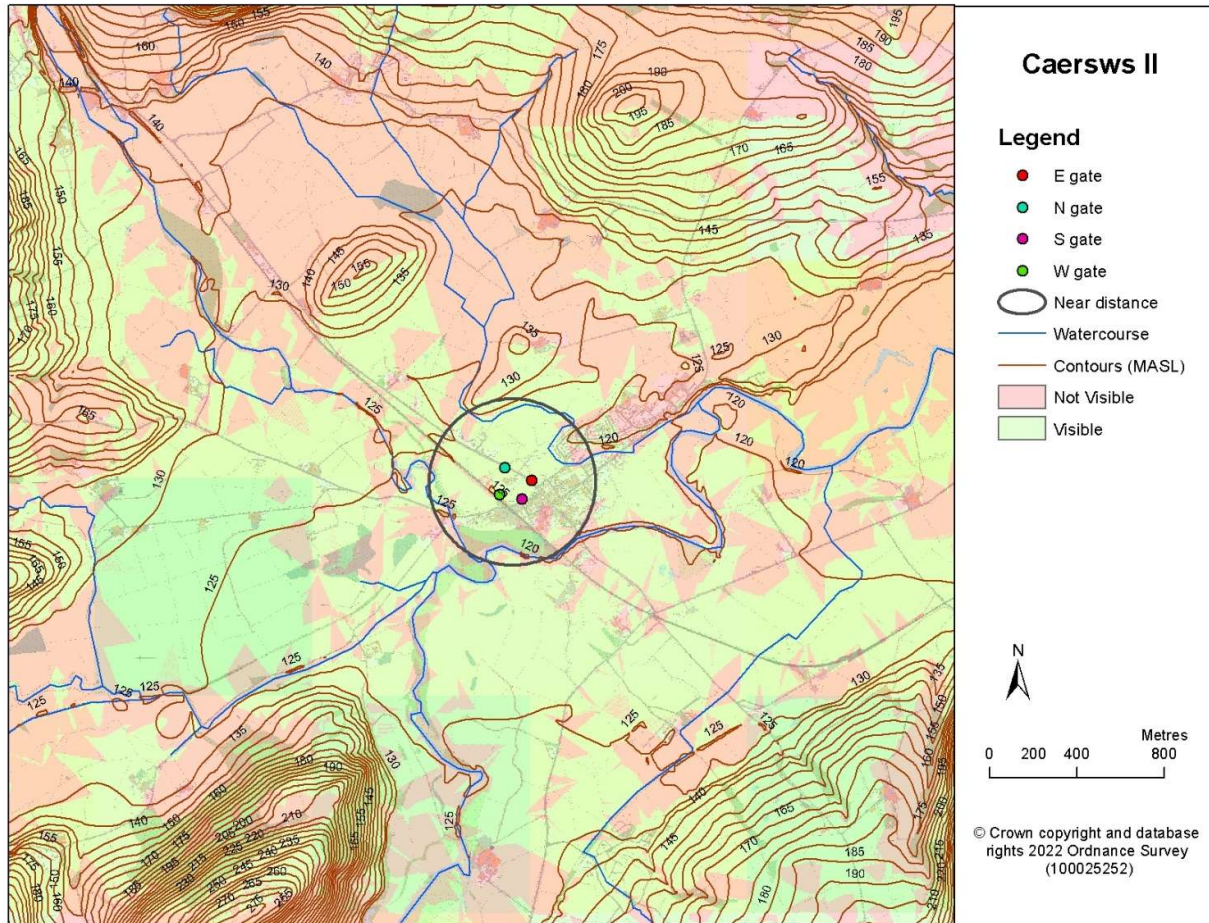


Figure 42 Caersws II middle distance

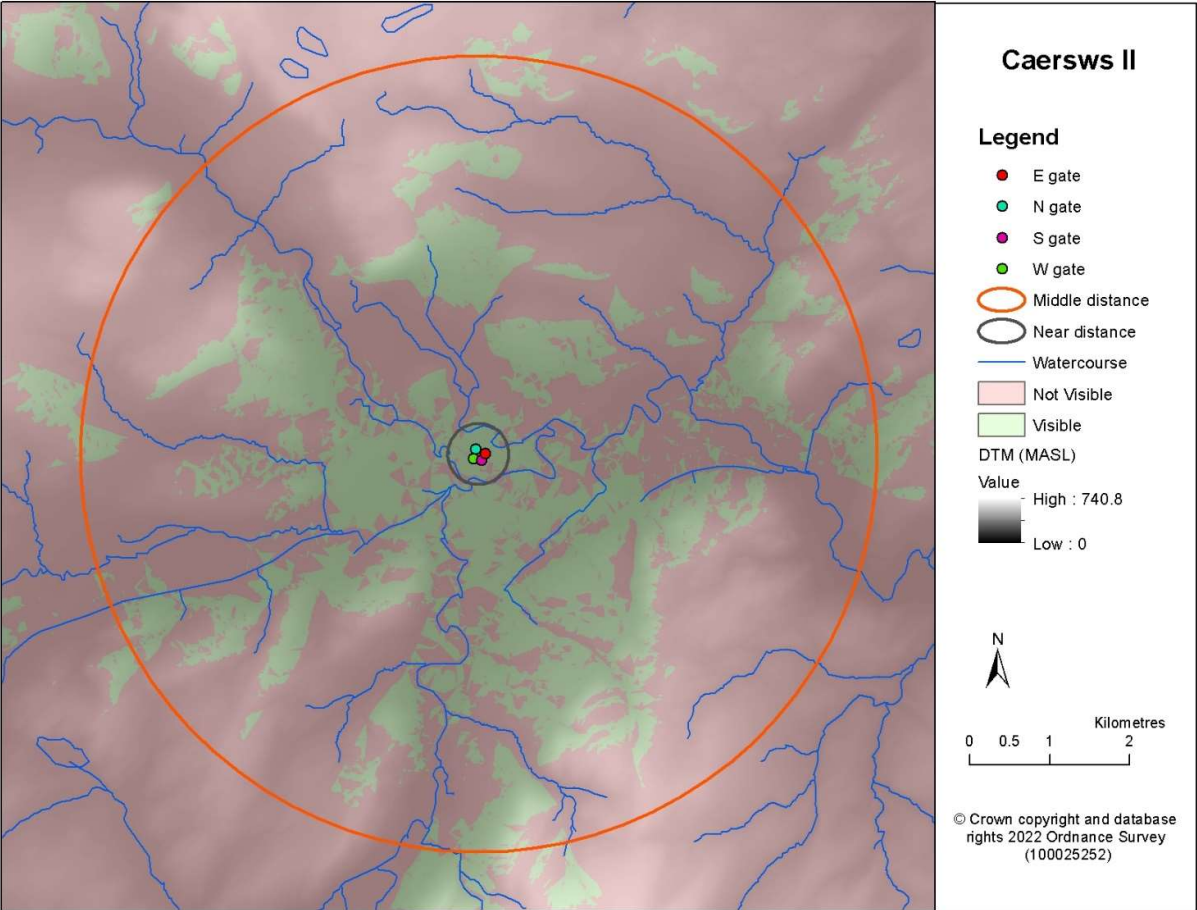


Figure 43 Caersws II far distance

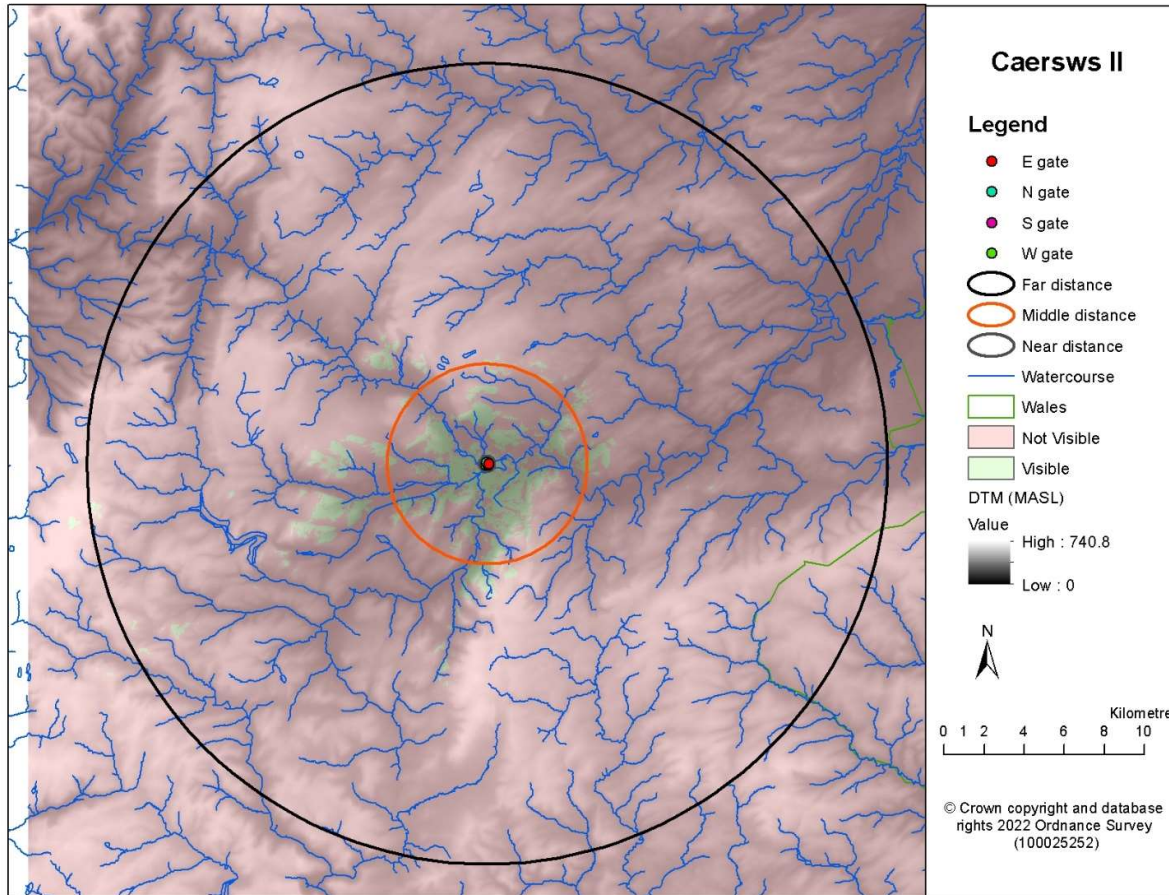


Figure 44 Cardiff near distance

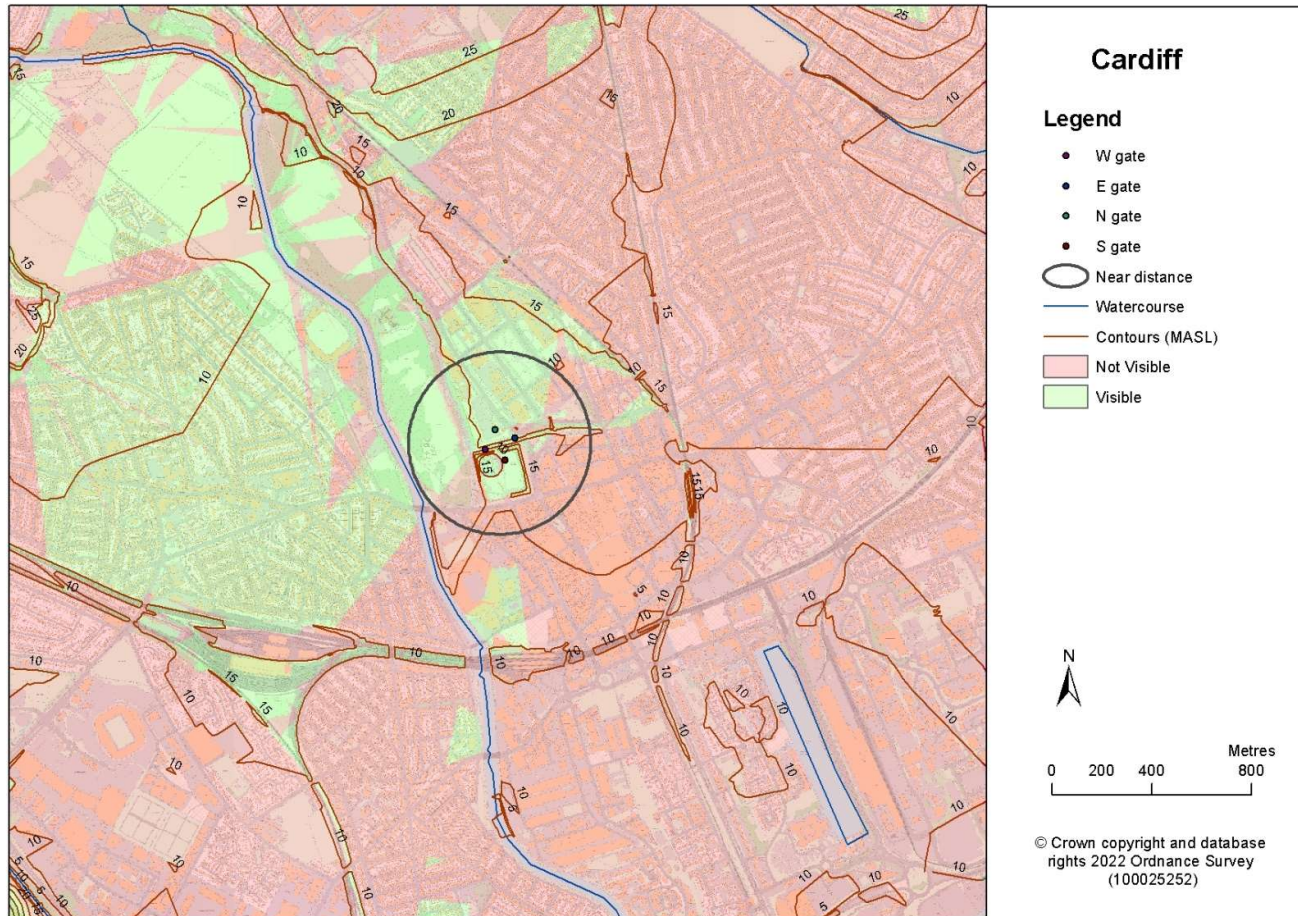


Figure 45 Cardiff middle distance

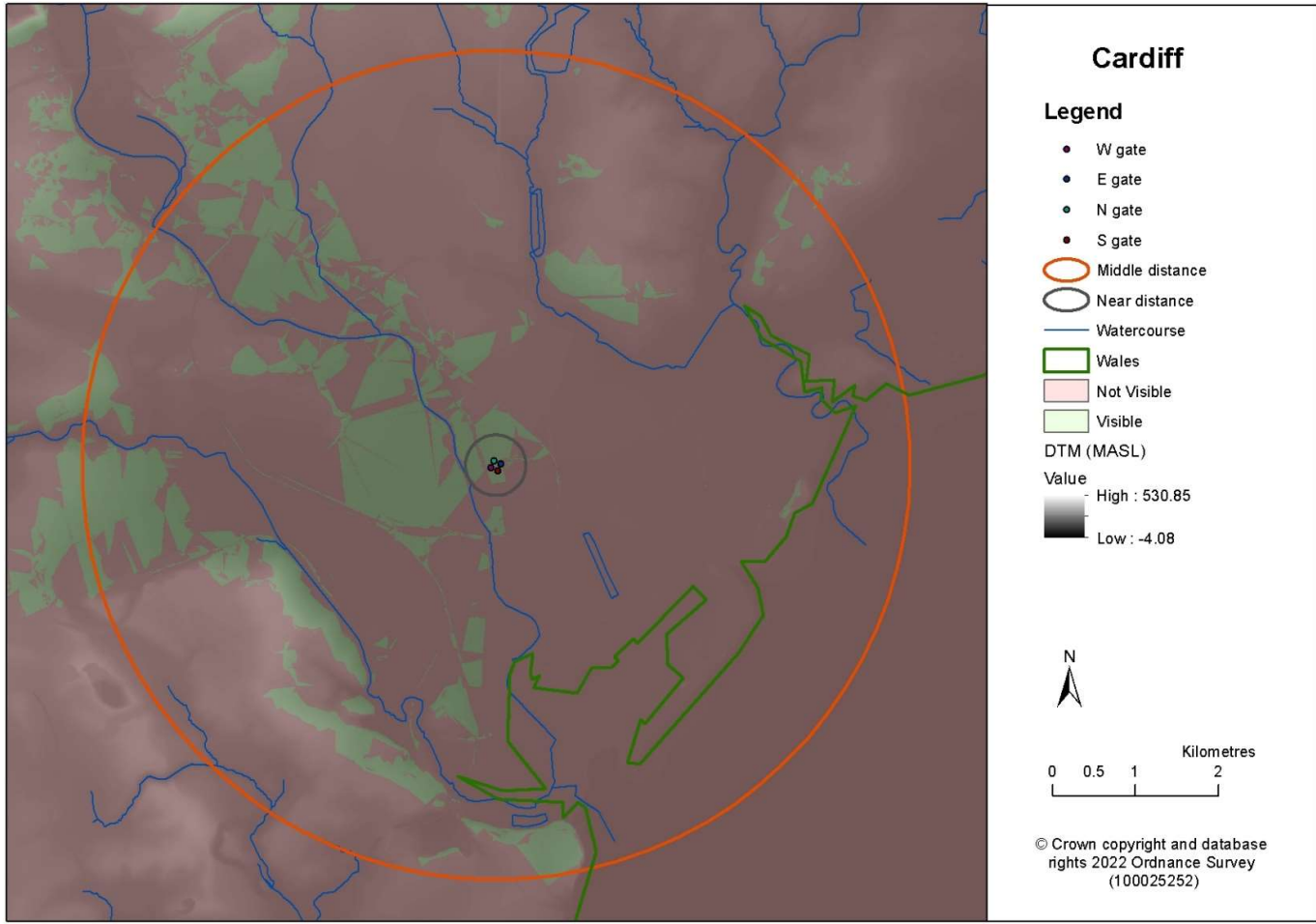


Figure 46 Cardiff far distance

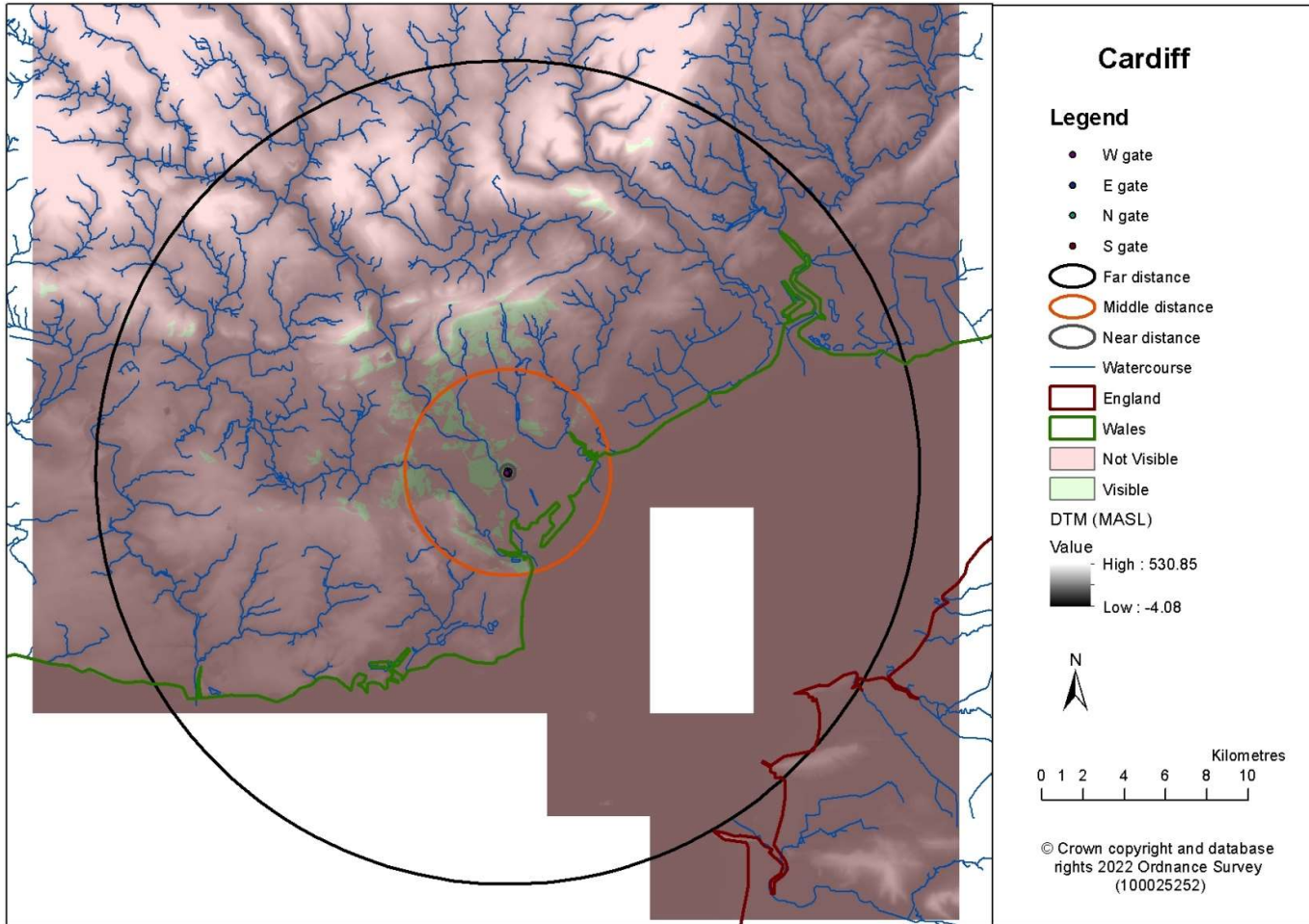


Figure 47 Carmarthen near distance

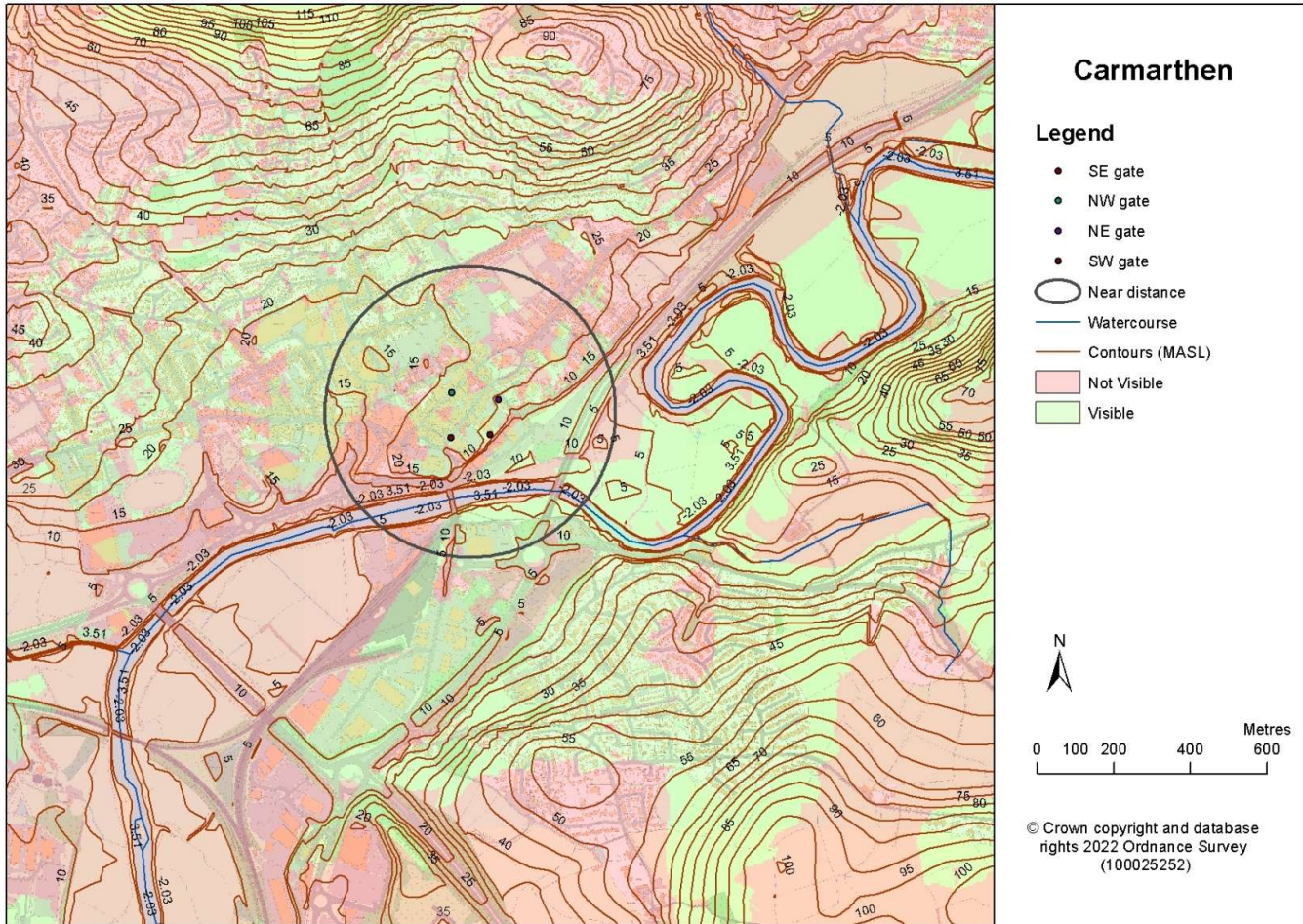


Figure 48 Carmarthen middle distance

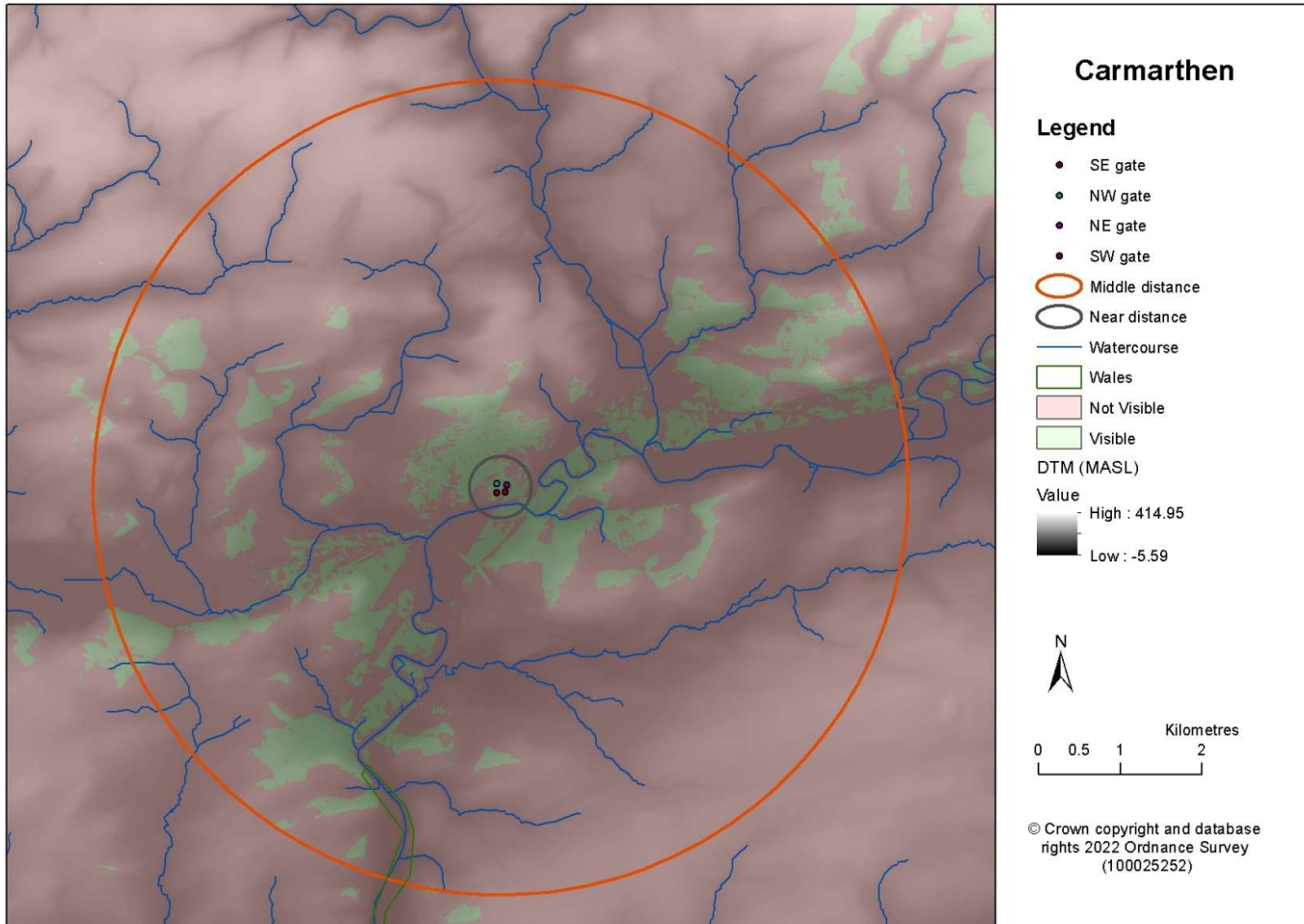


Figure 49 Carmarthen far distance

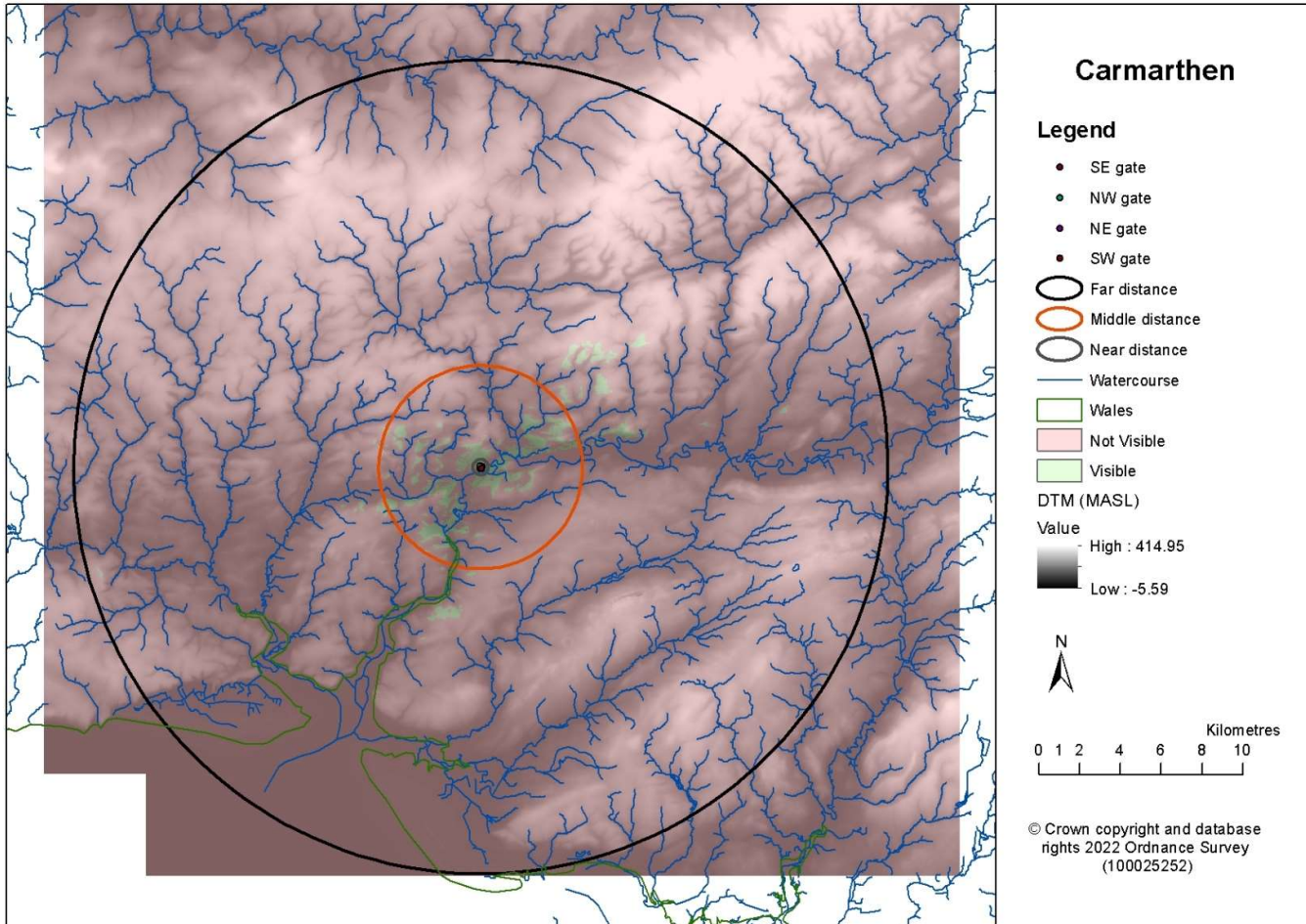


Figure 50 Castell Collen near distance

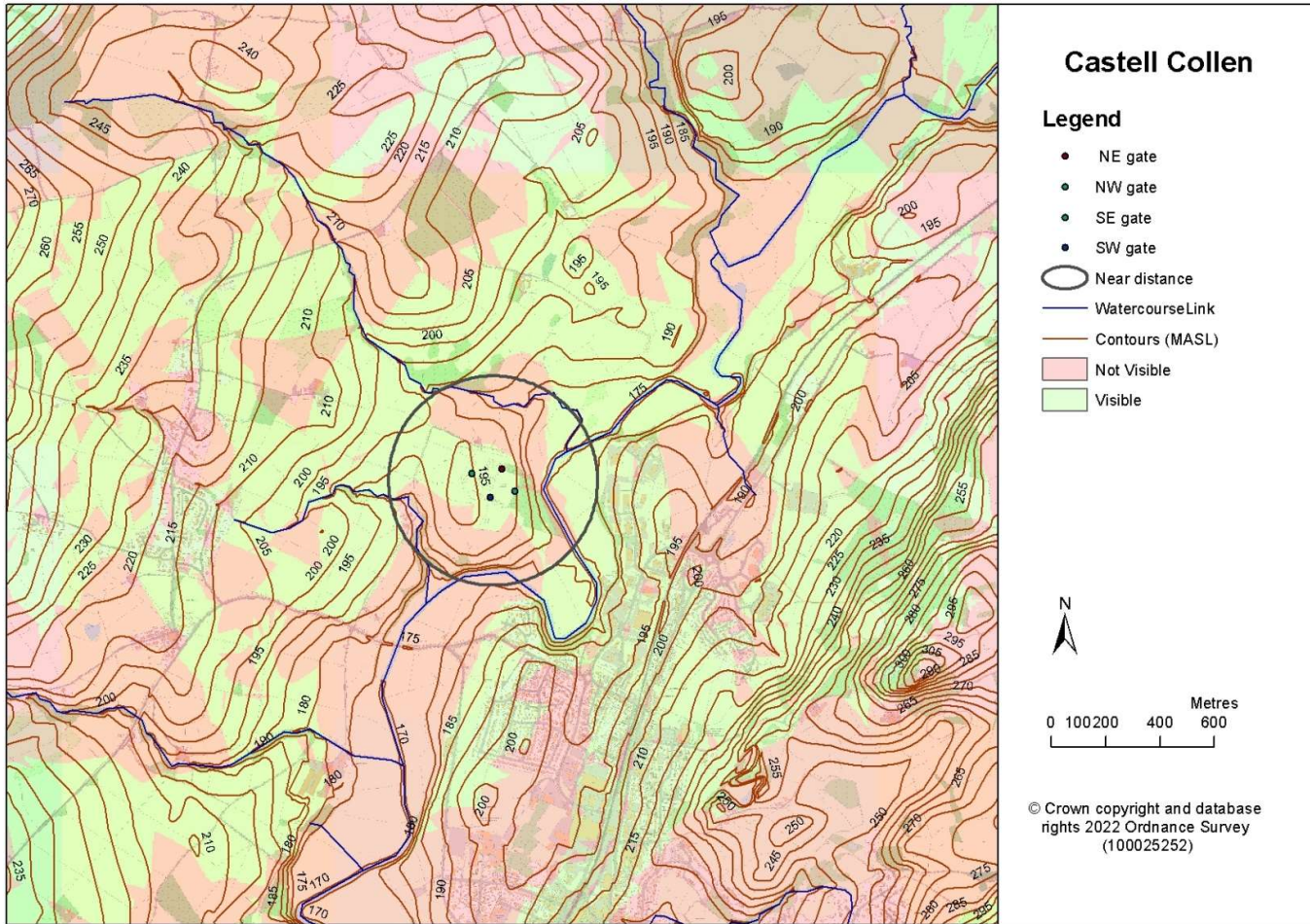


Figure 51 Castell Collen middle distance

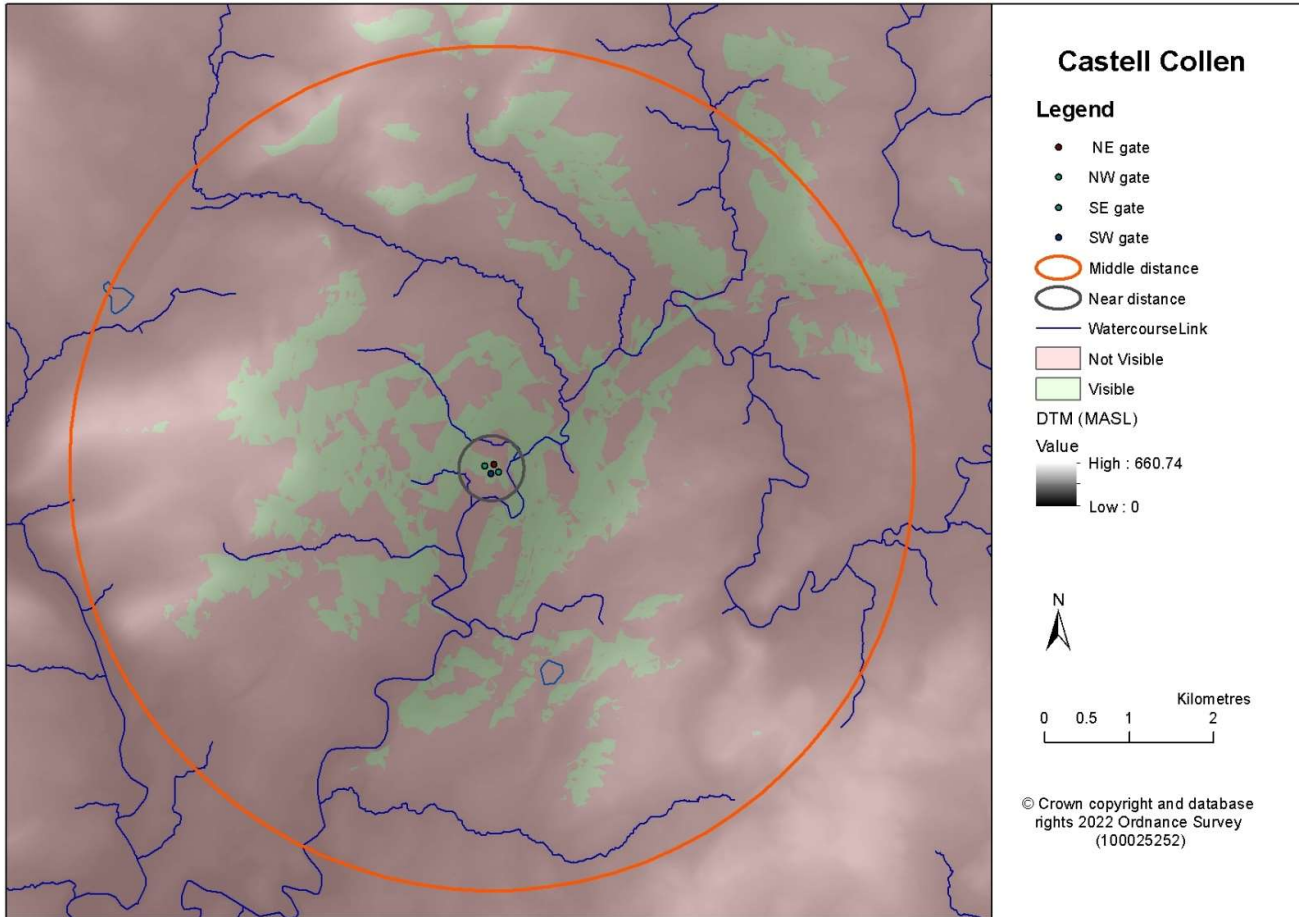


Figure 52 Castell Collen far distance

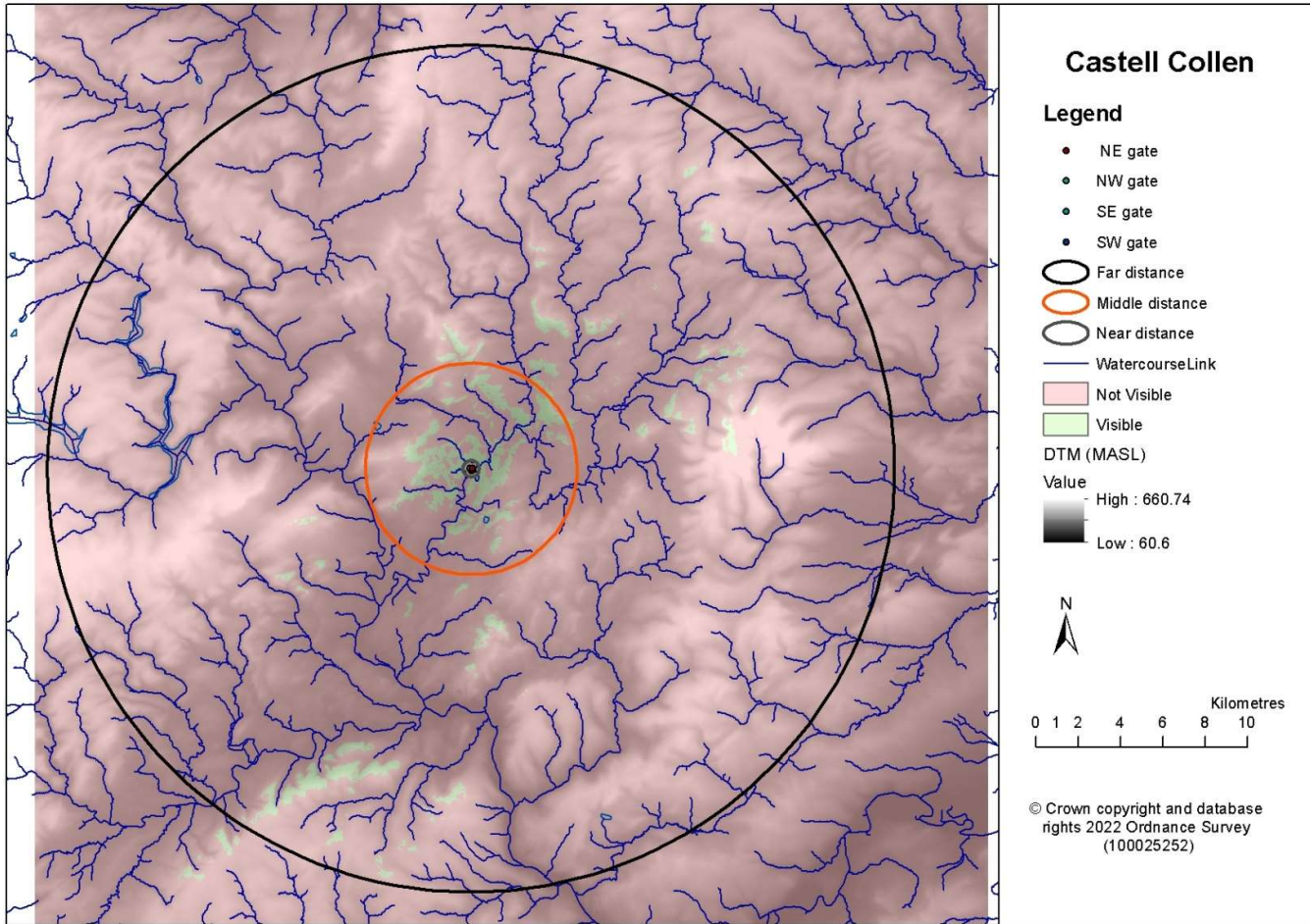


Figure 53 Chester near distance

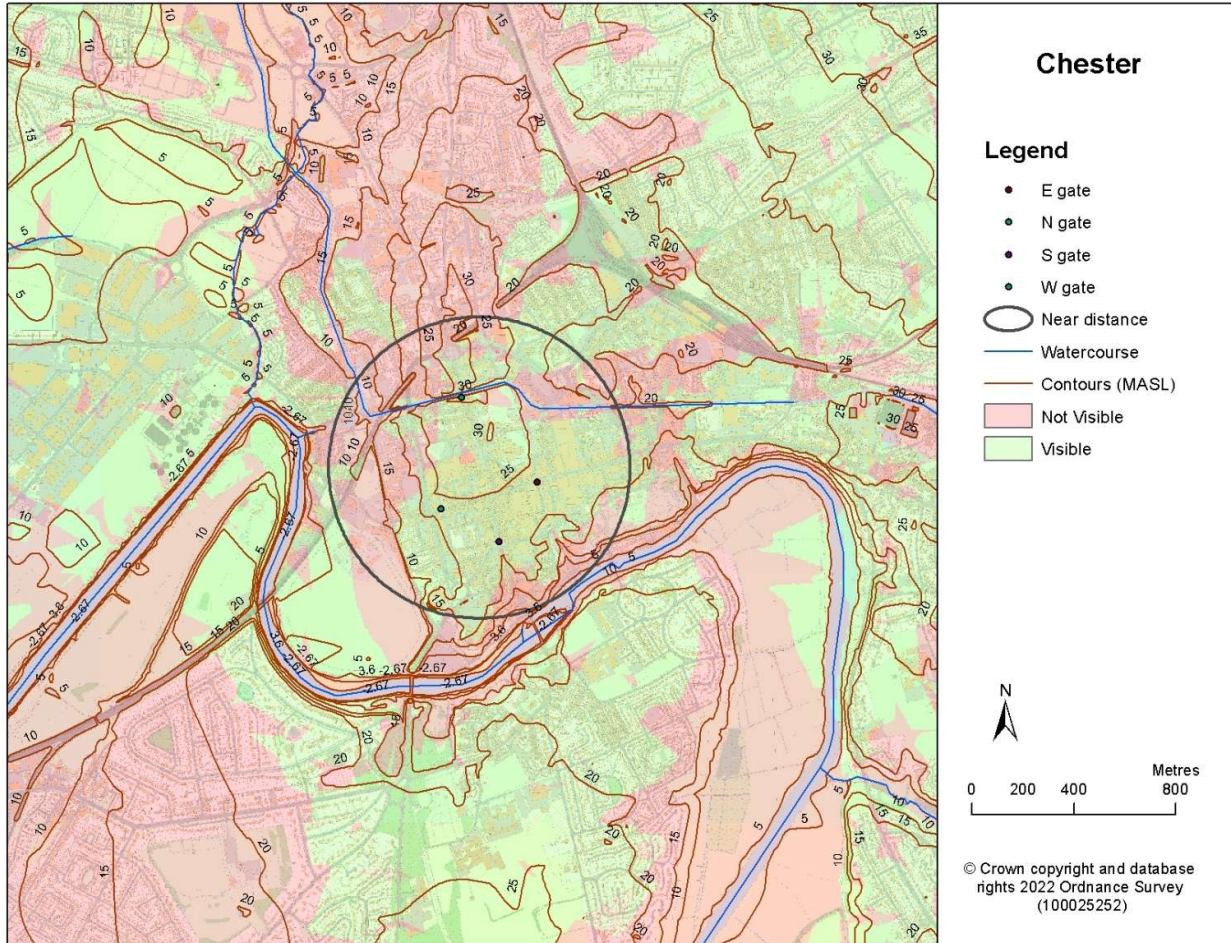


Figure 54 Chester middle distance

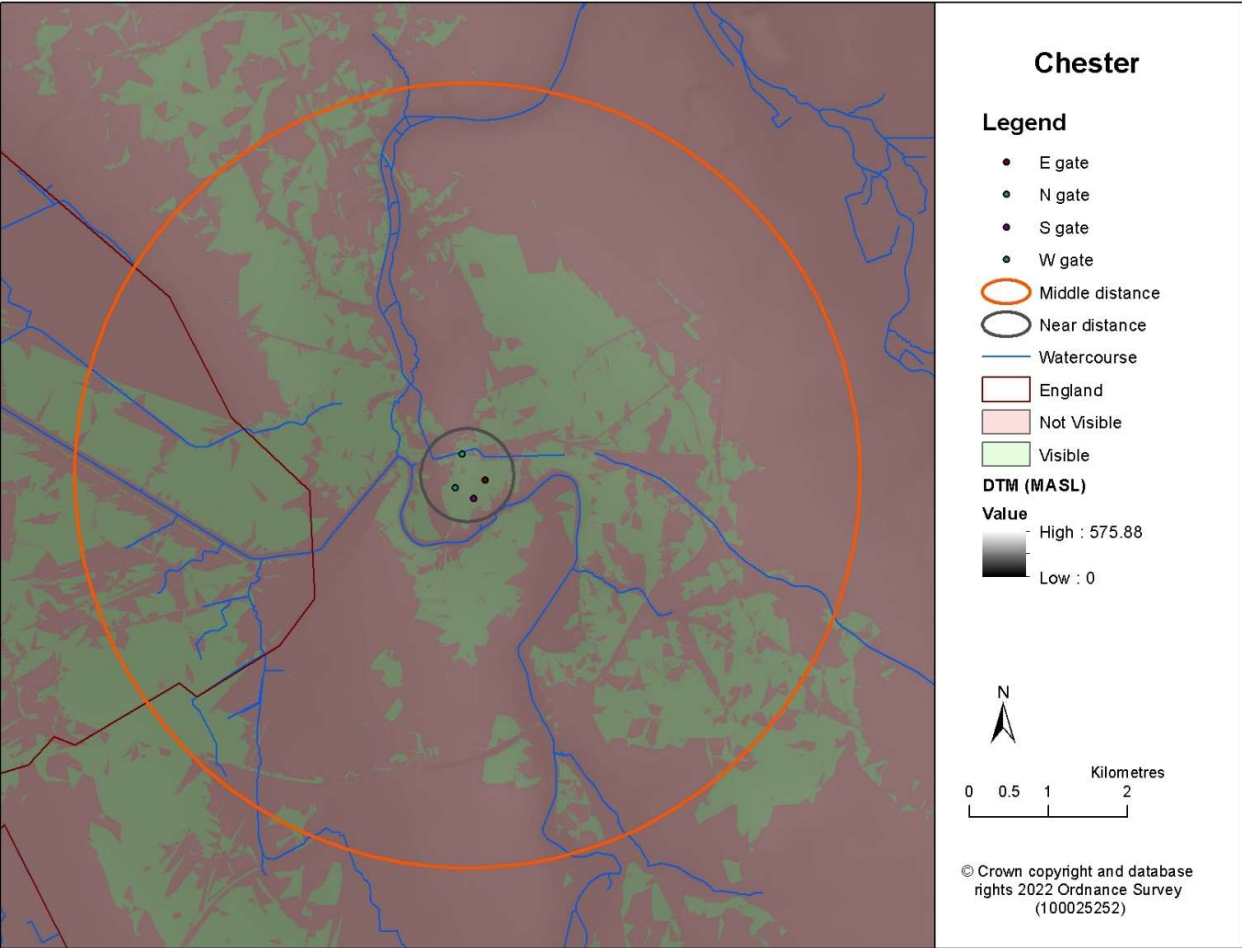


Figure 55 Chester far distance

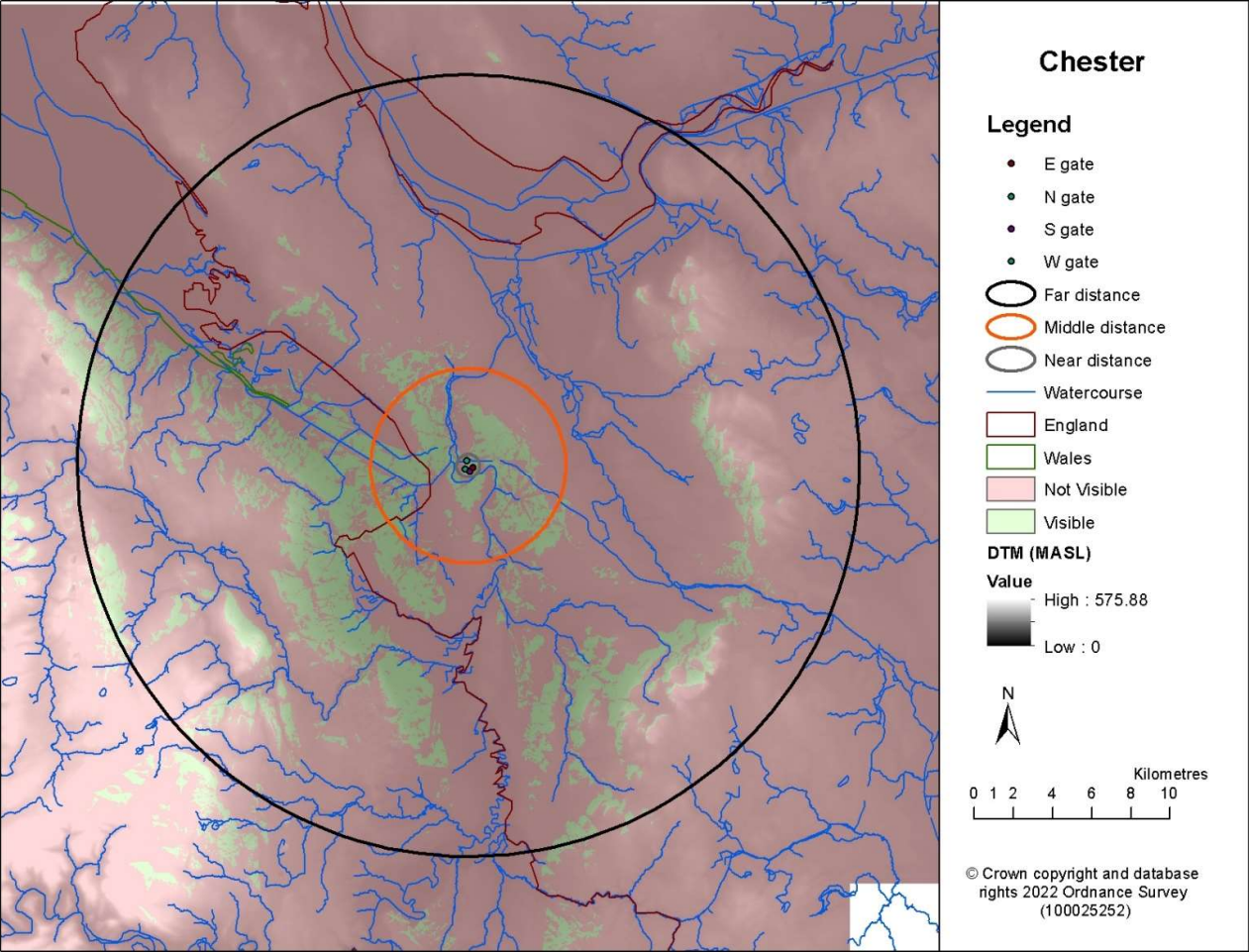


Figure 56 Clifford near distance

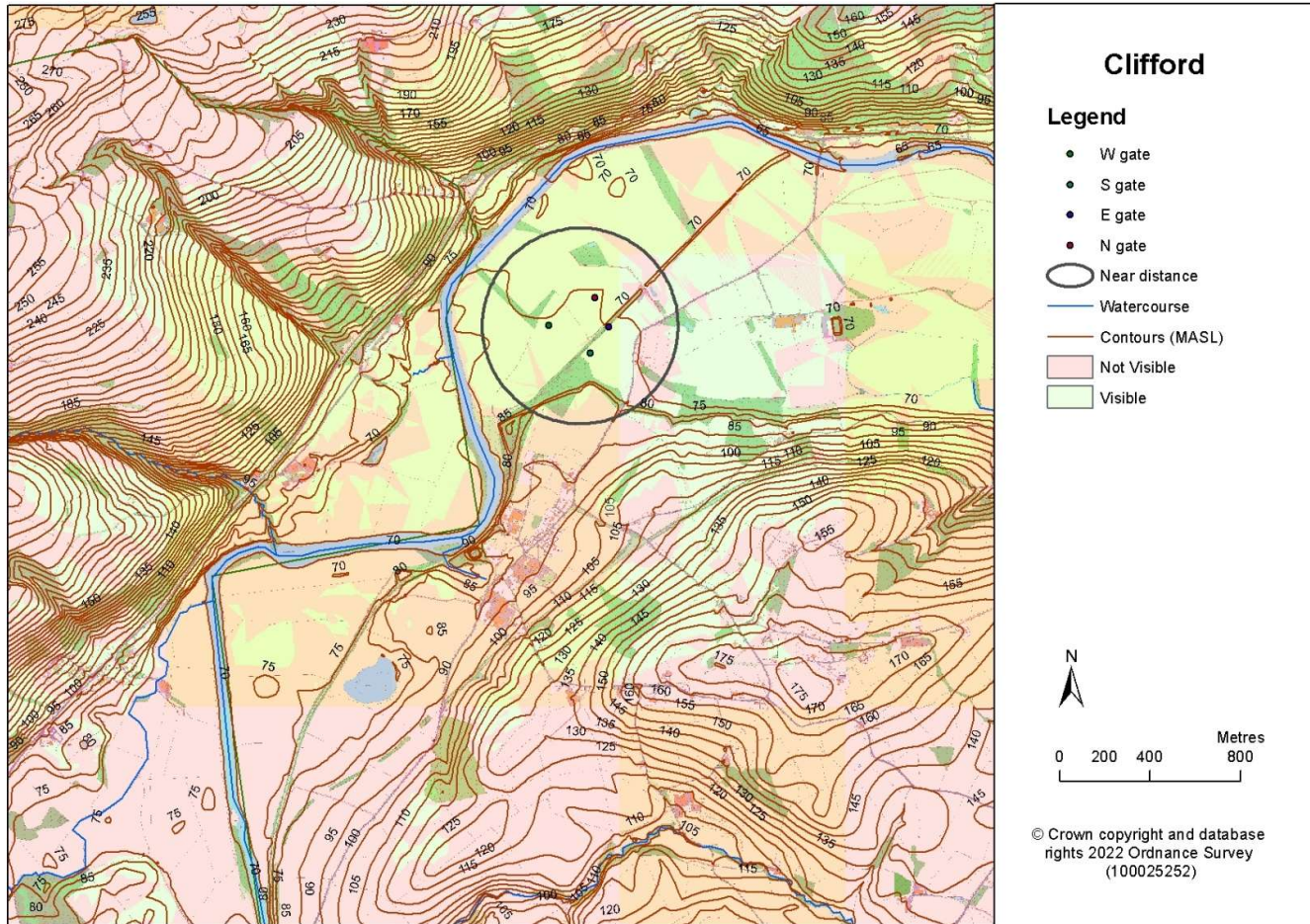


Figure 57 Clifford middle distance

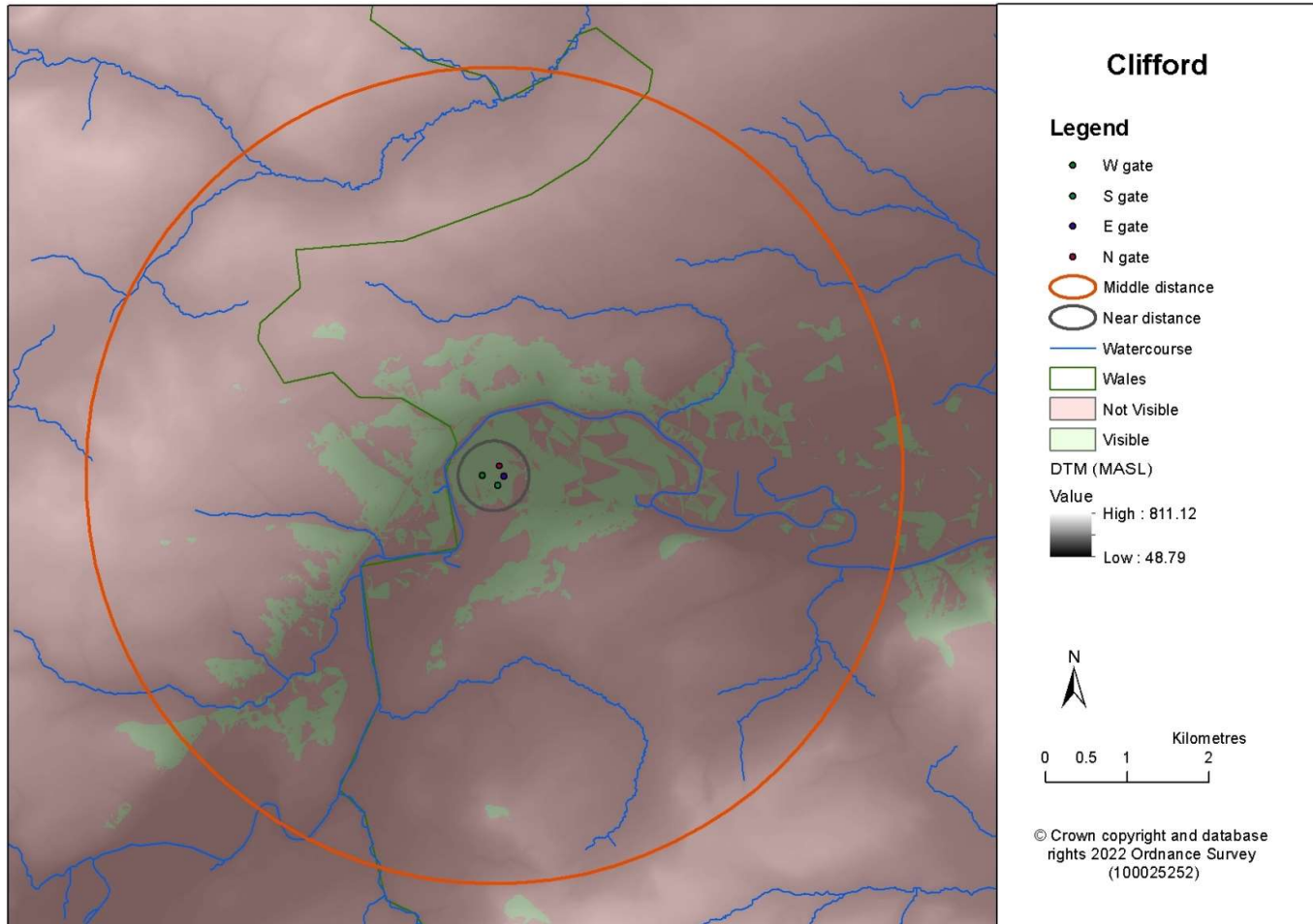


Figure 58 Clifford far distance

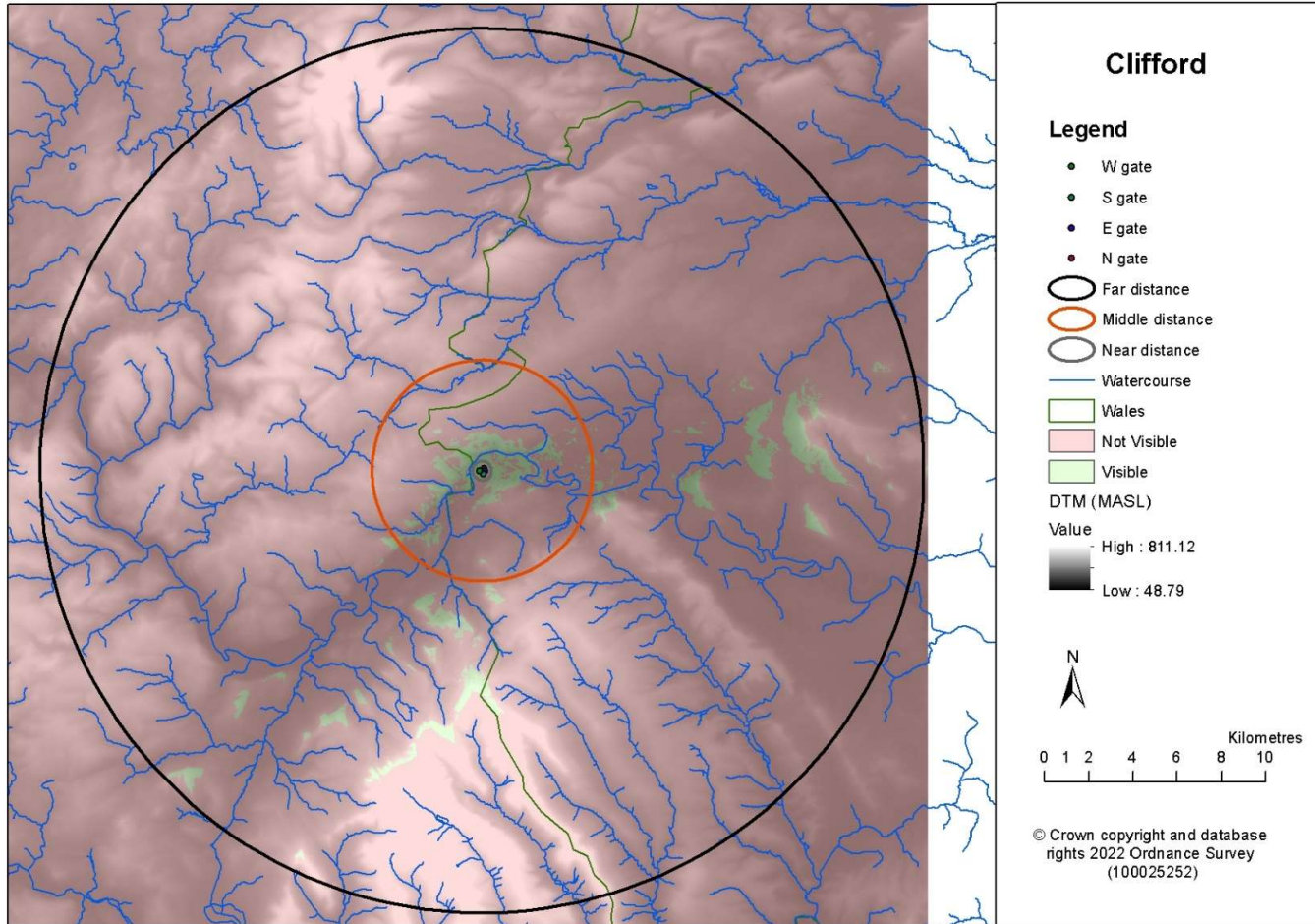


Figure 59 Clyro near distance

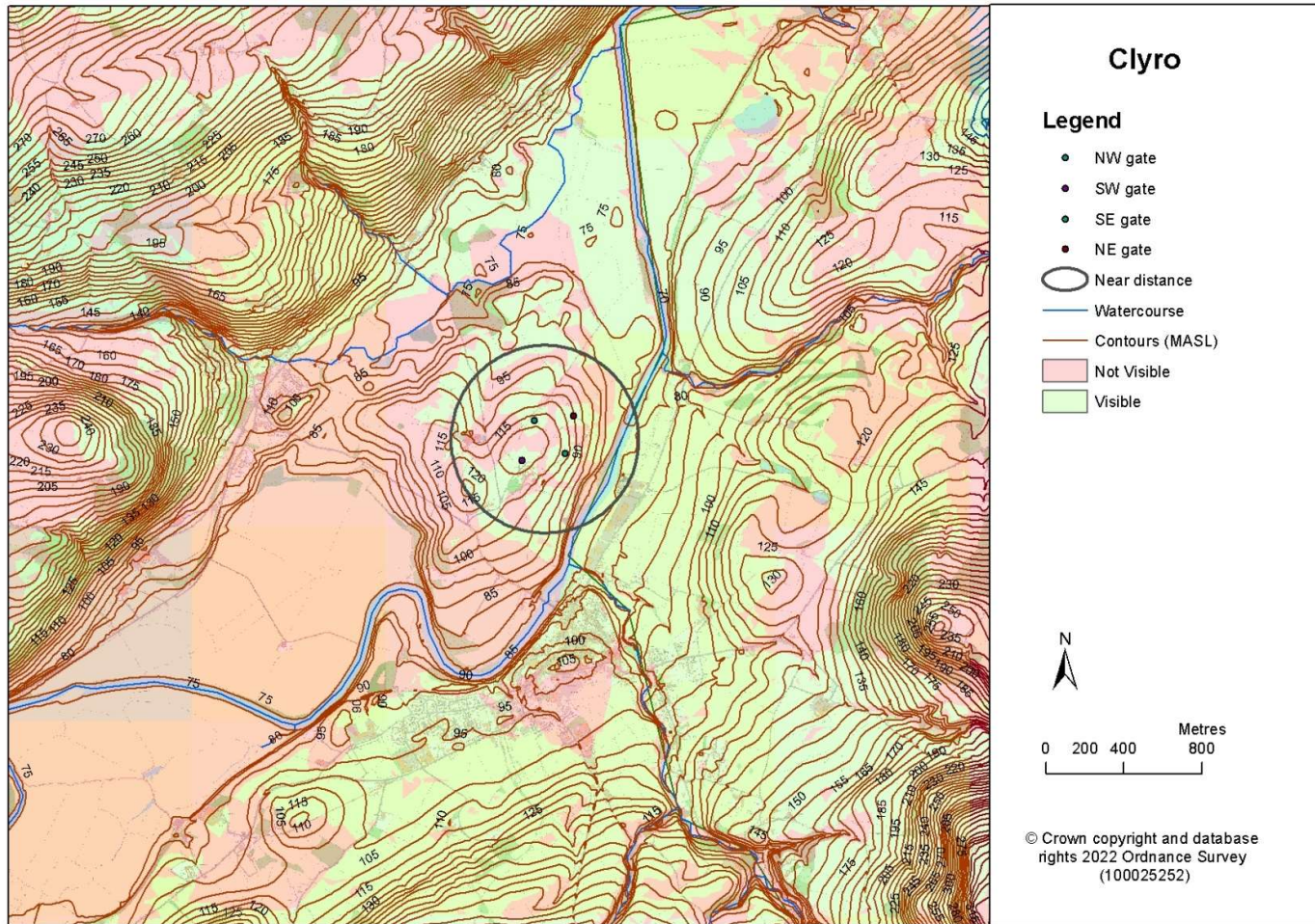


Figure 60 Clyro middle distance

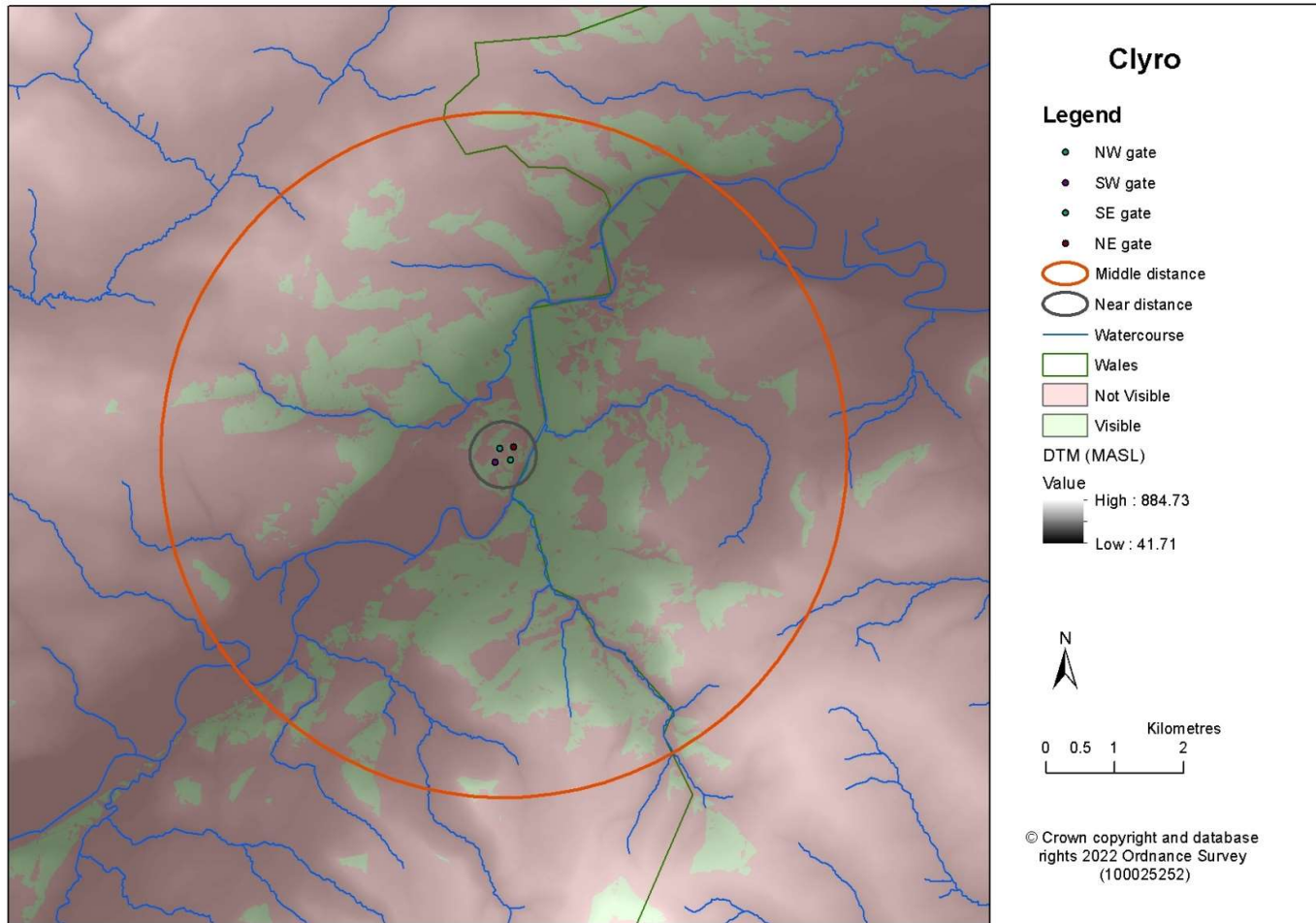


Figure 61 Clyro far distance

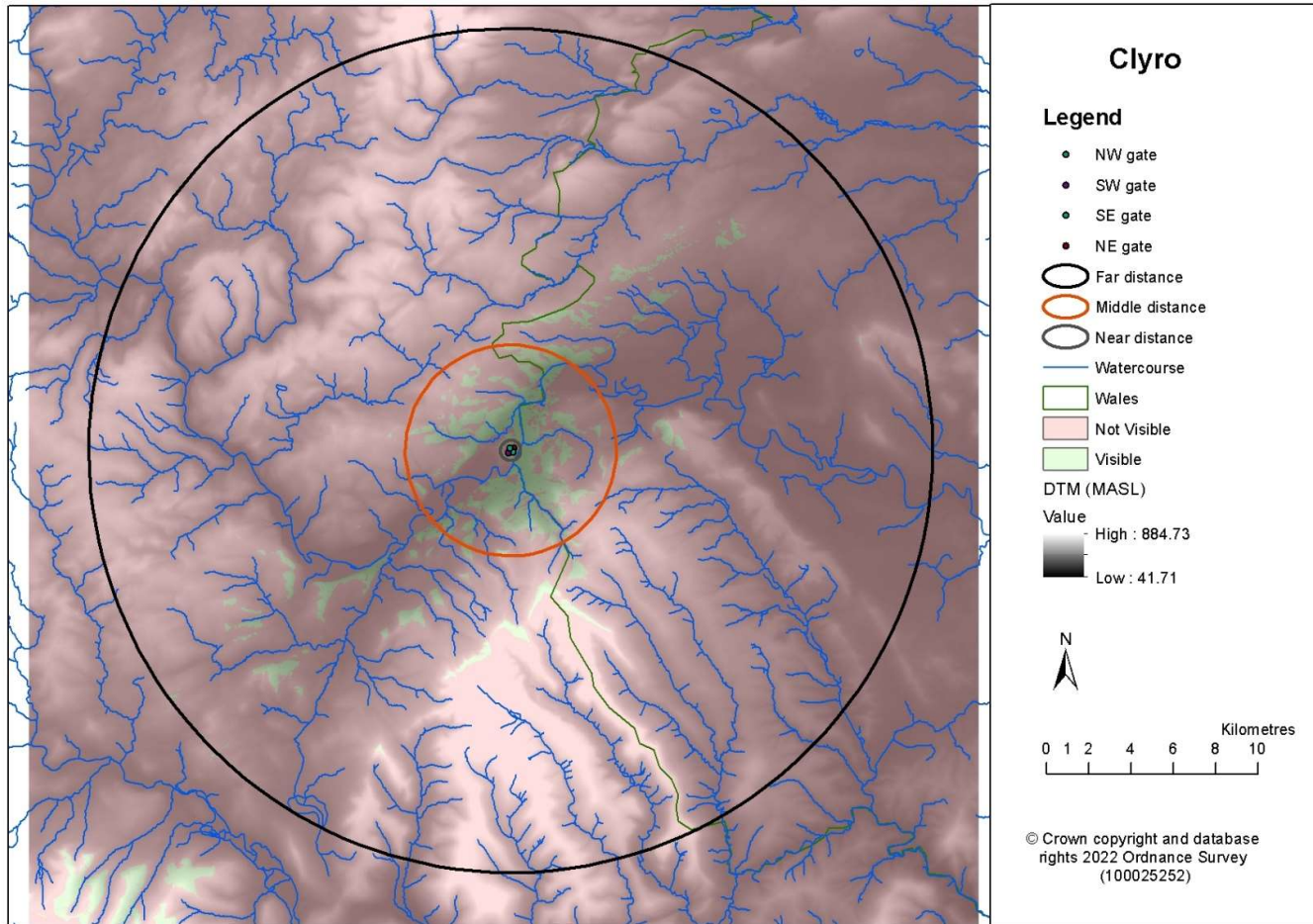


Figure 62 Coelbren near distance

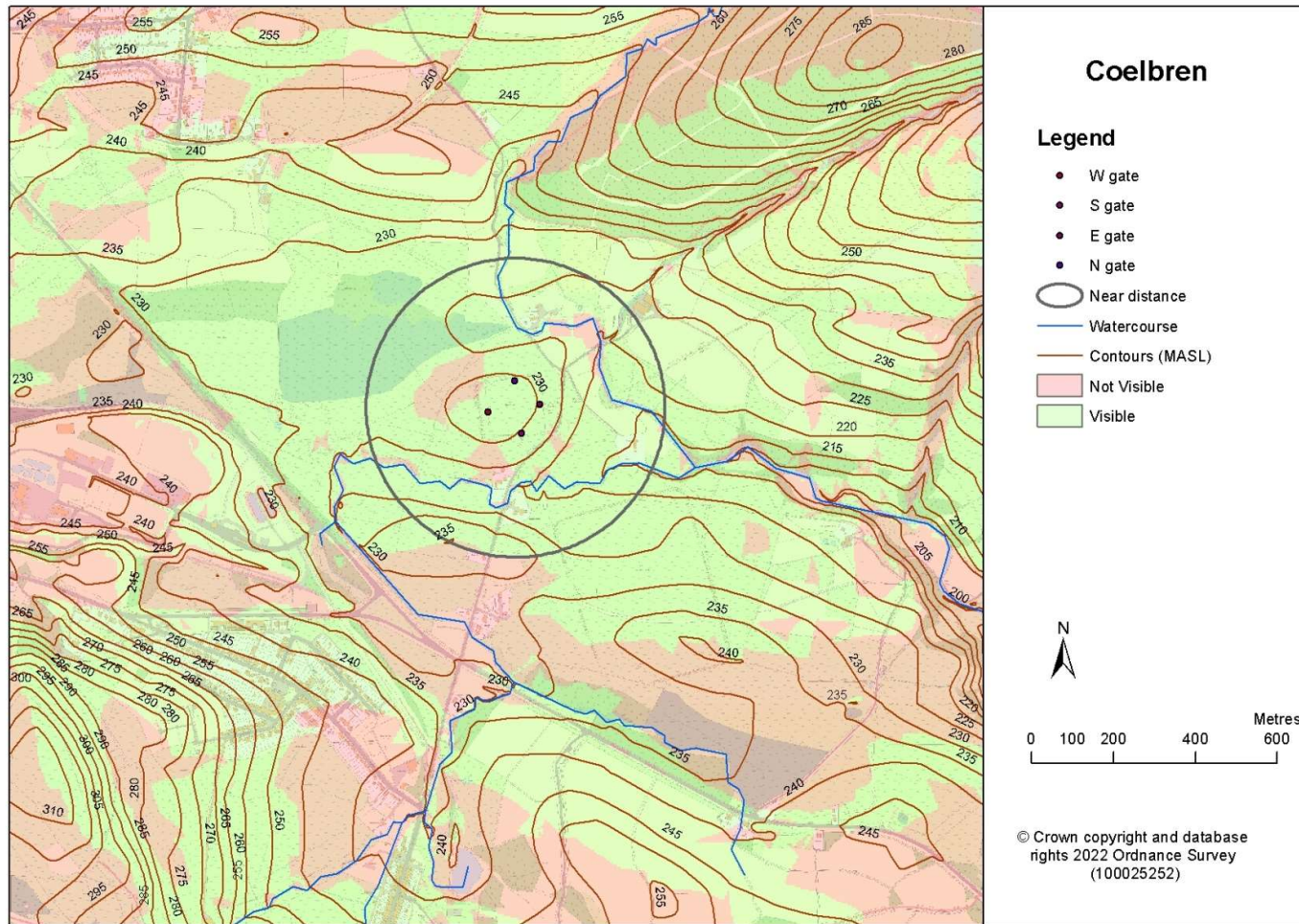


Figure 63 Coelbren middle distance

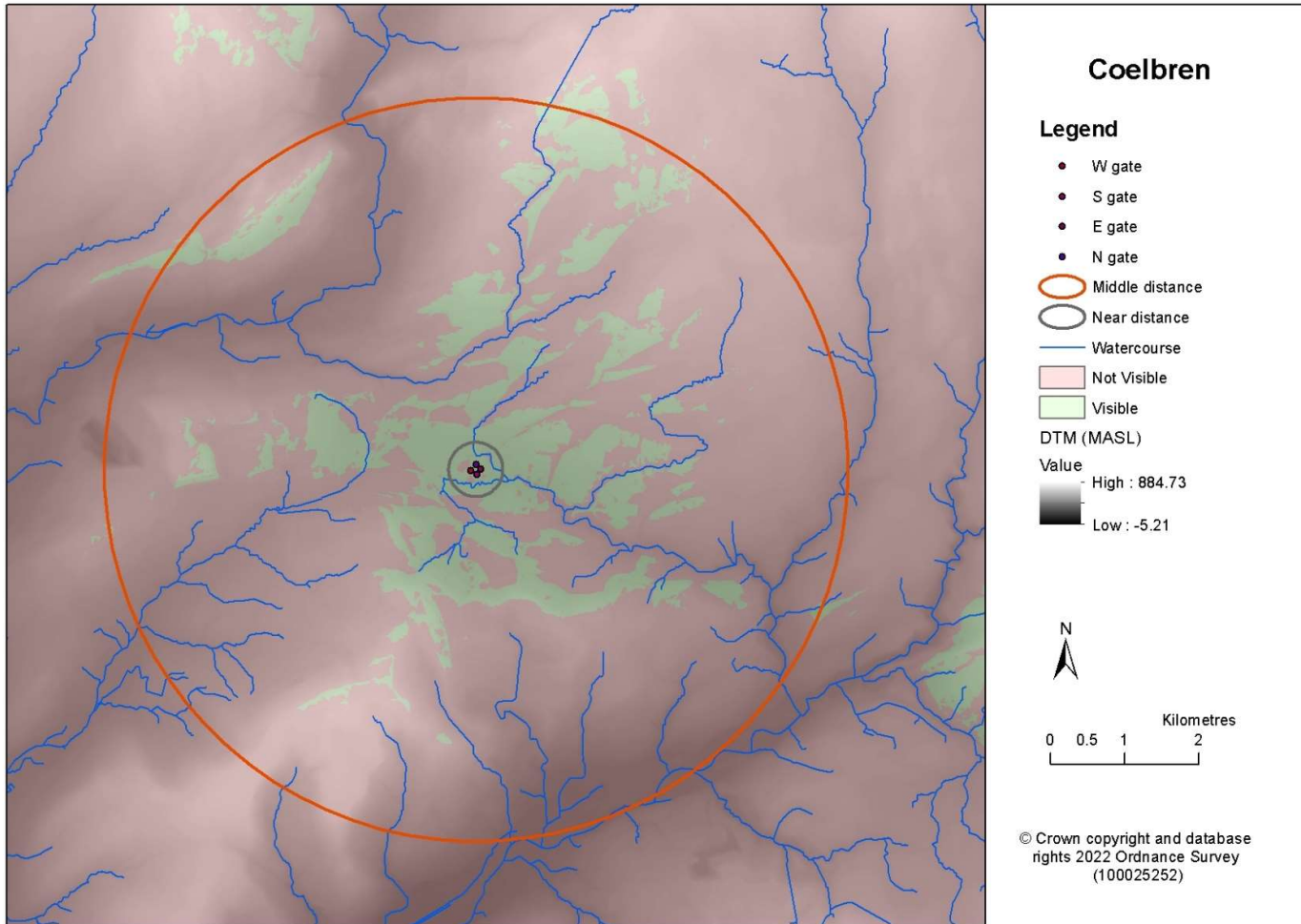


Figure 64 Coelbren far distance

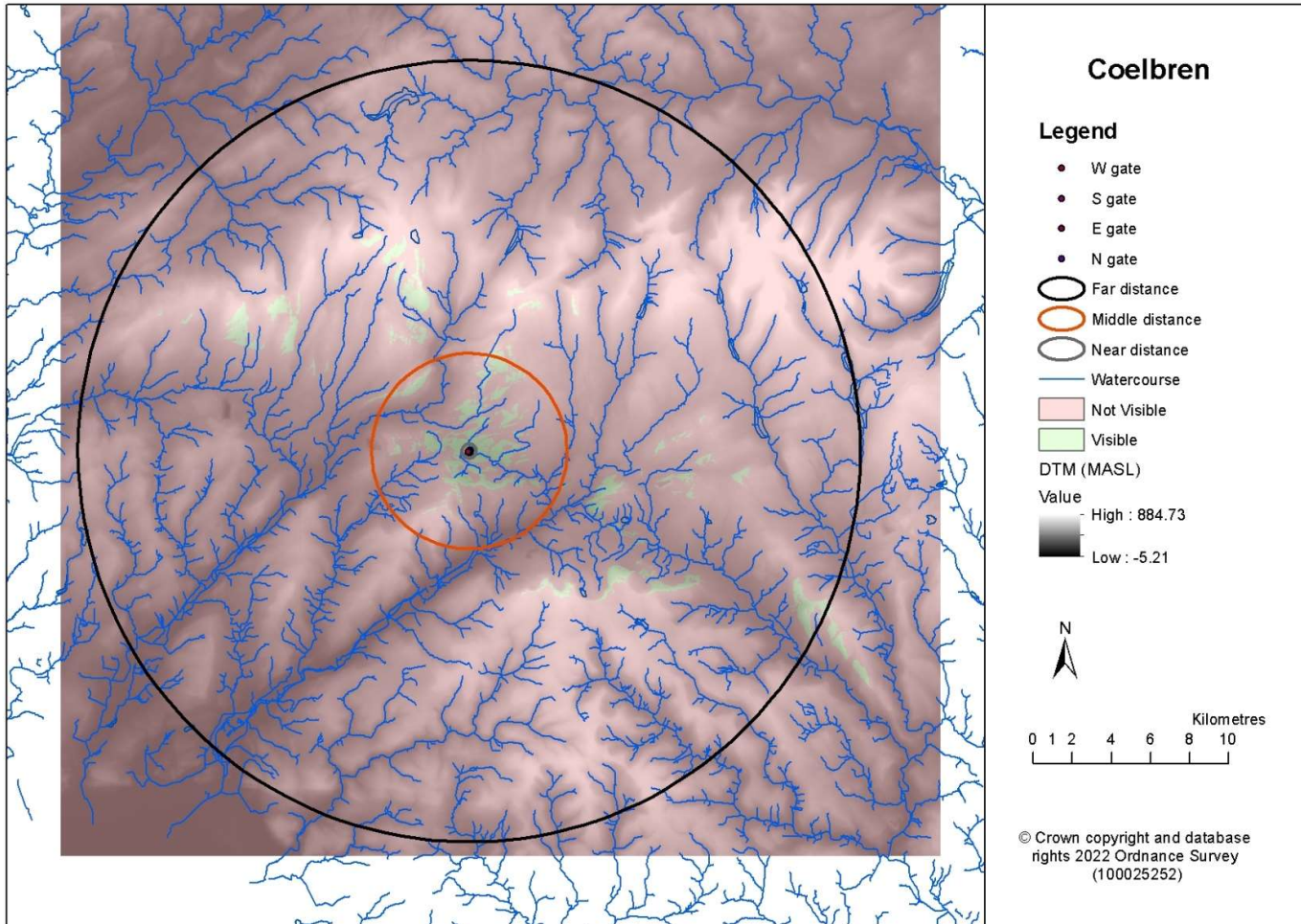


Figure 65 Colwyn Castle near distance

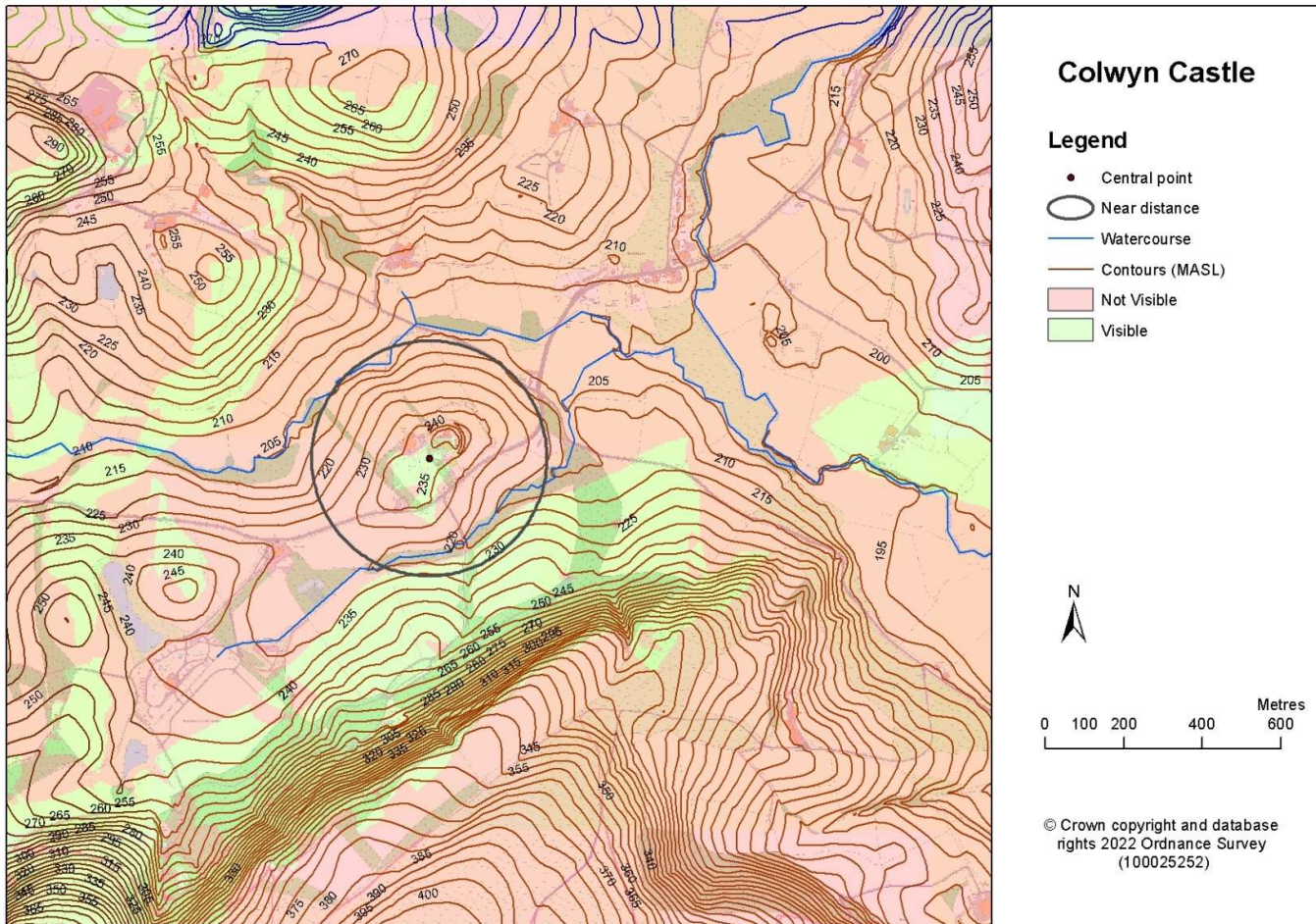


Figure 66 Colwyn Castle middle distance

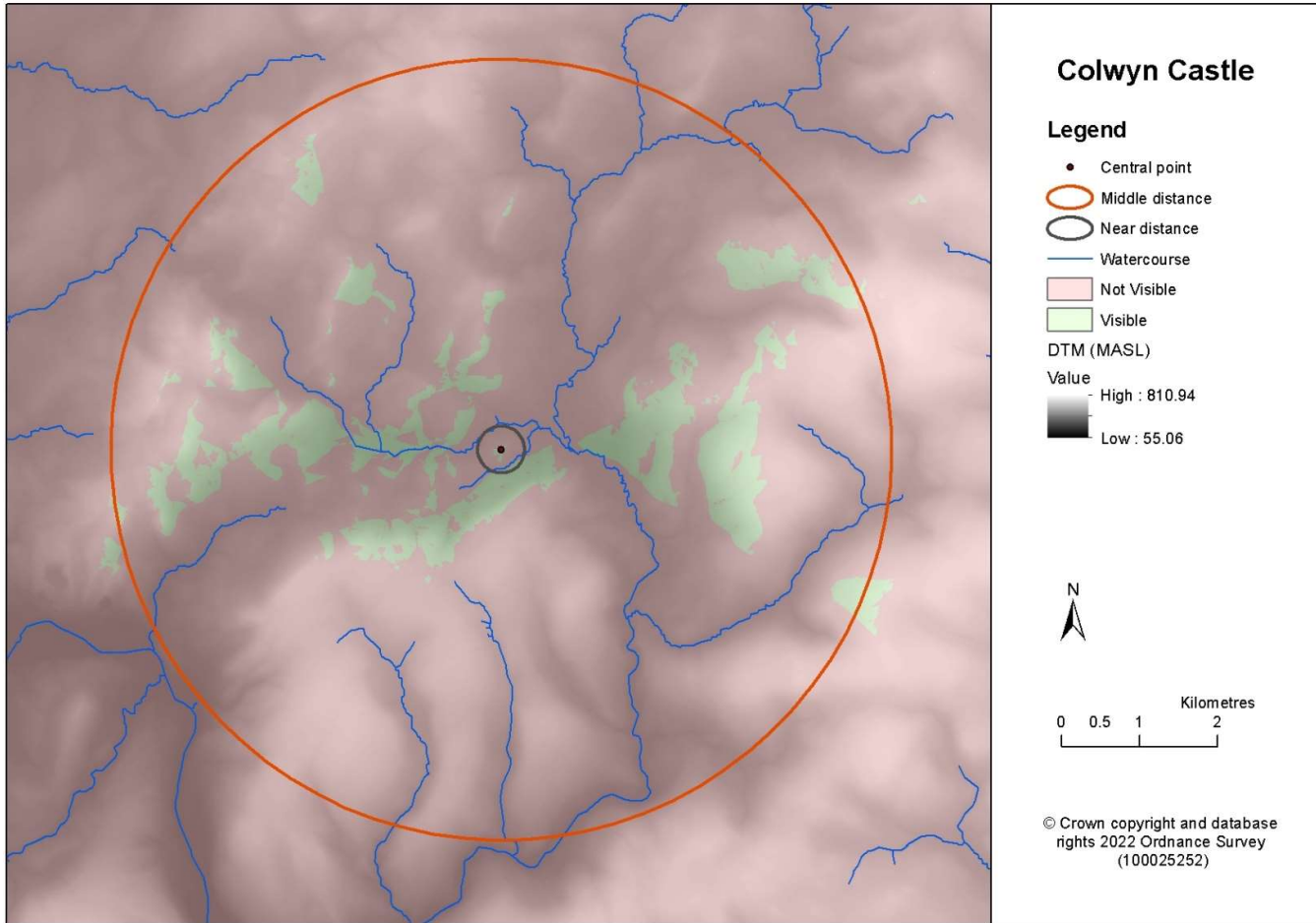


Figure 67 Colwyn Castle far distance

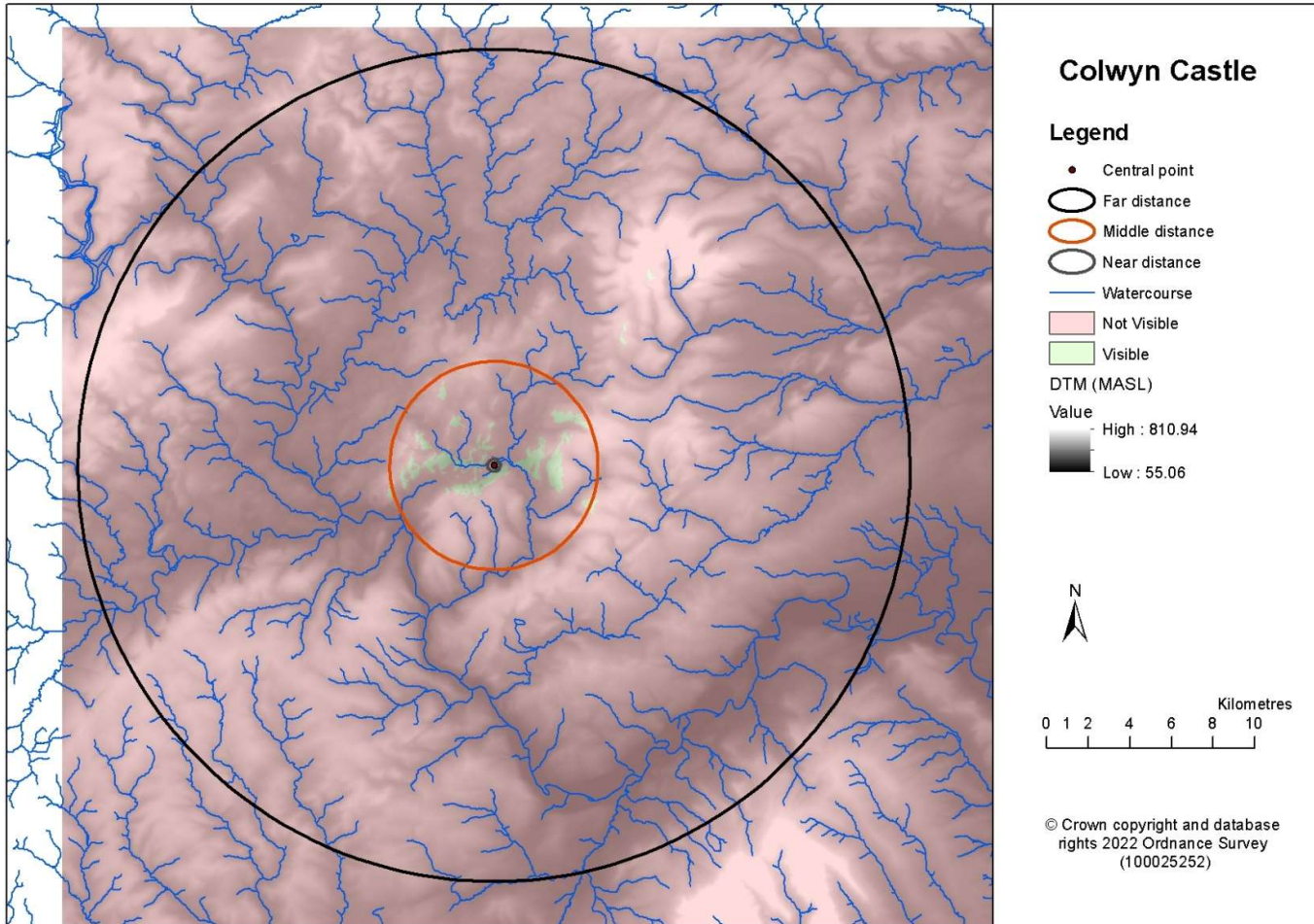


Figure 68 Forden Gaer near distance

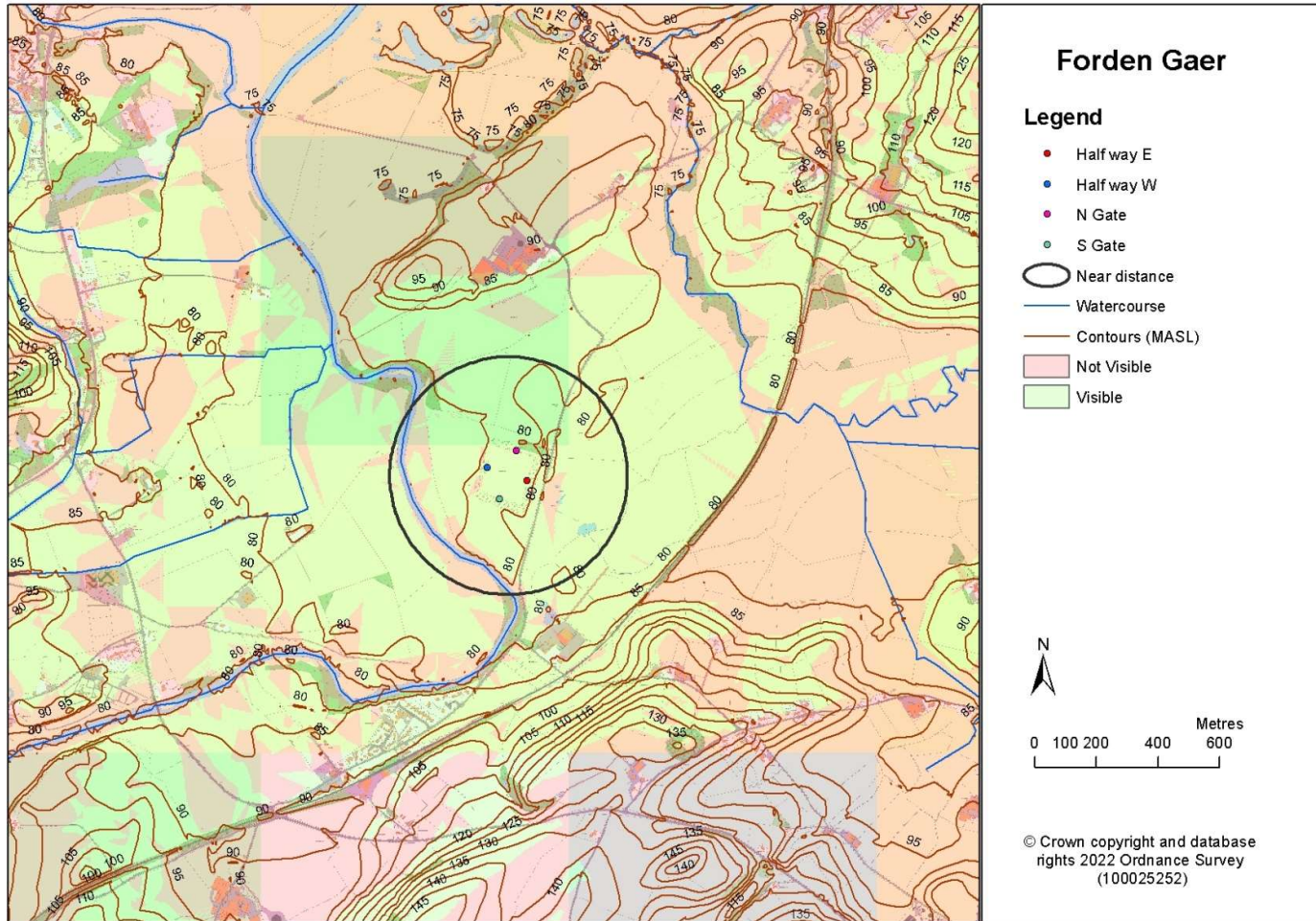


Figure 69 Forden Gaer middle distance

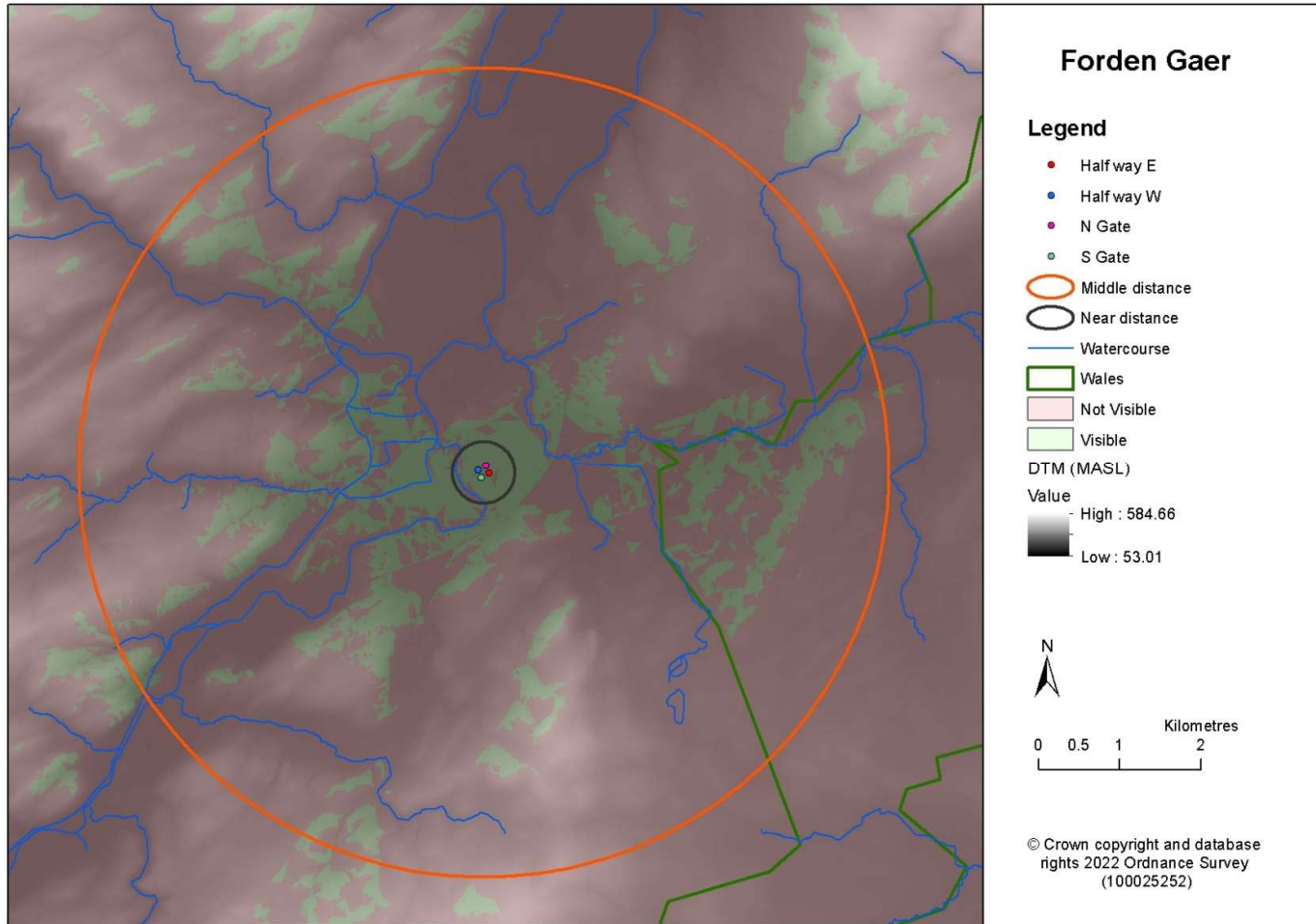


Figure 70 Forden Gaer far distance

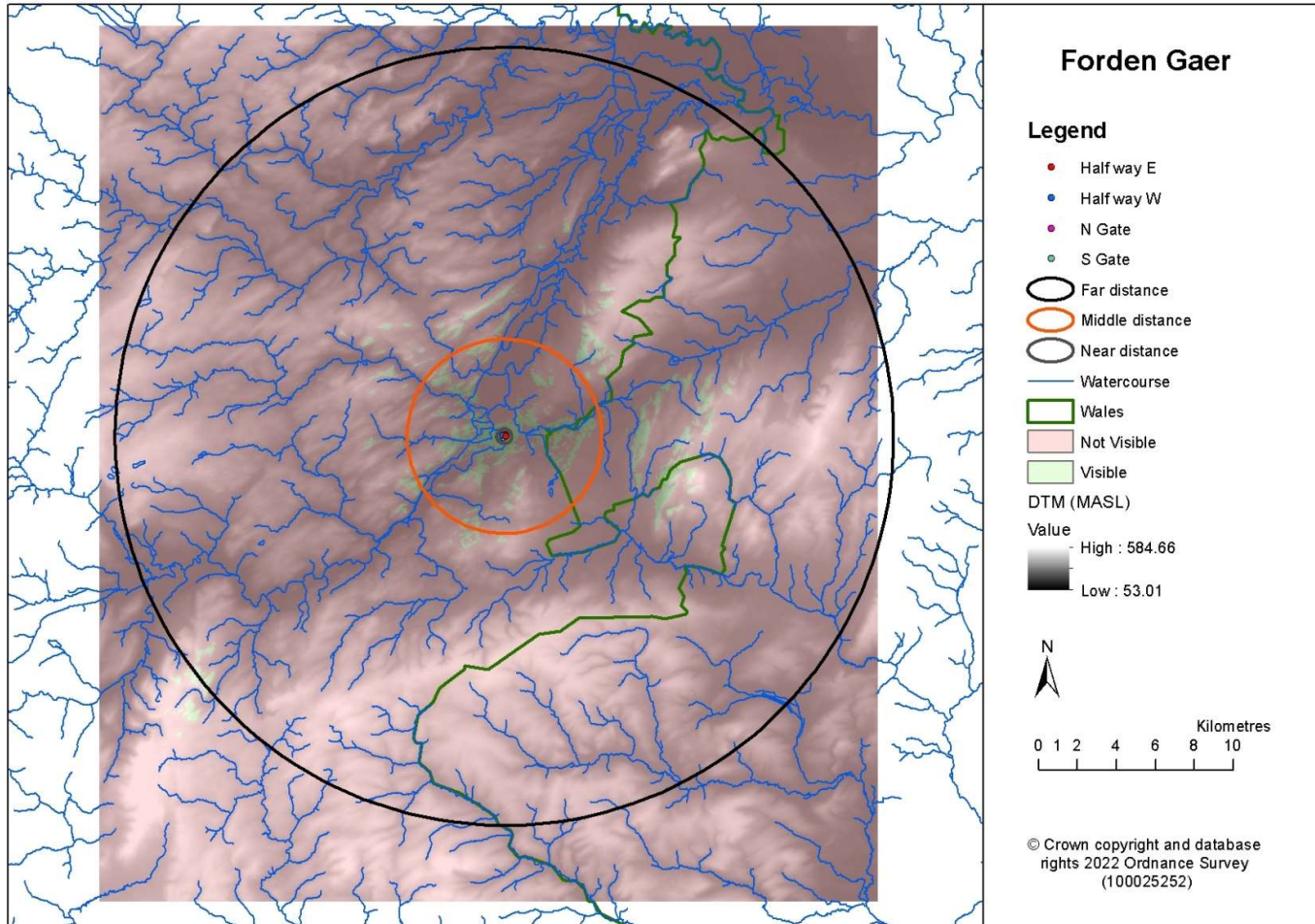


Figure 71 Gelligaer near distance

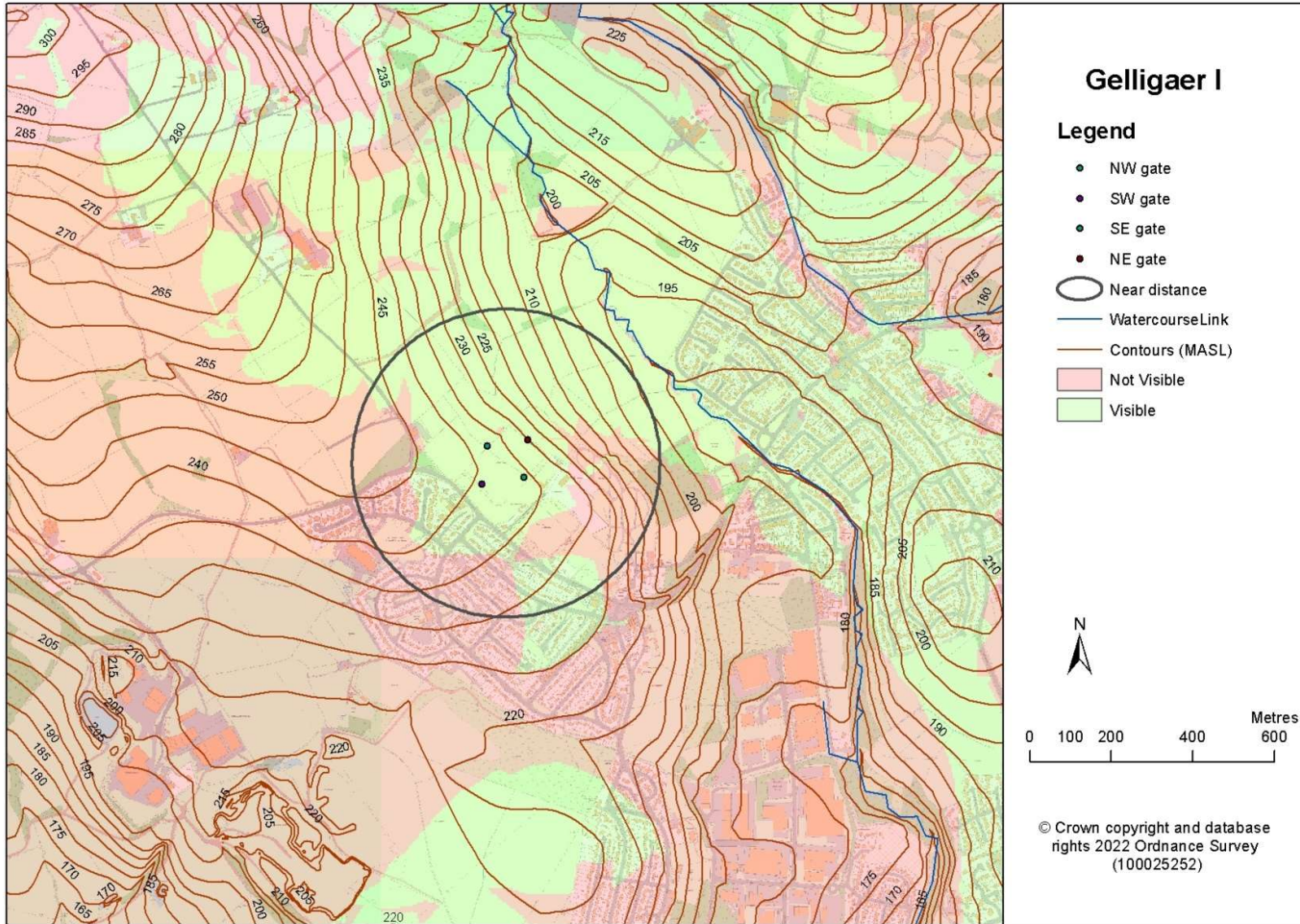


Figure 72 Gelligaer middle distance

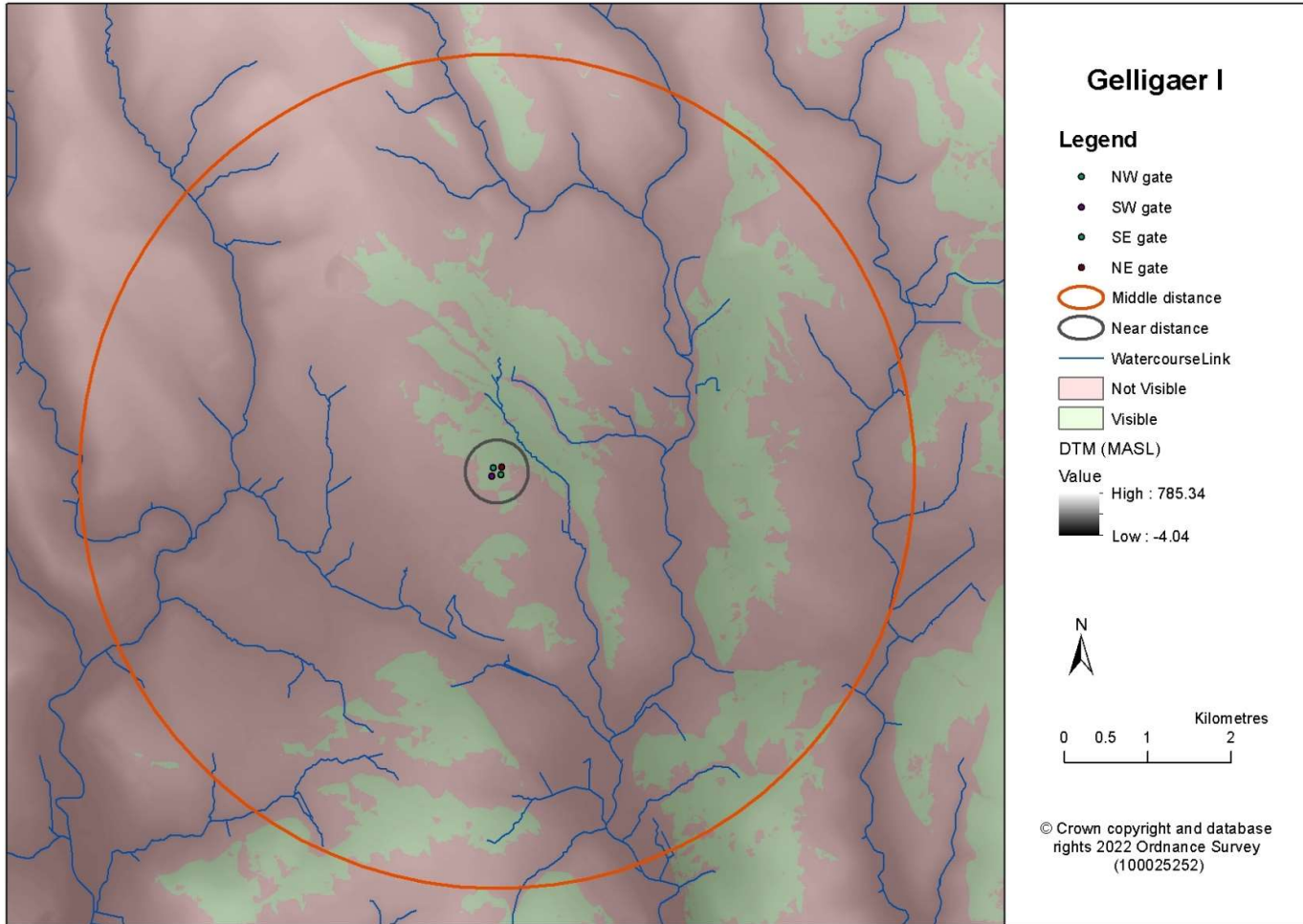


Figure 73 Gelligaer far distance

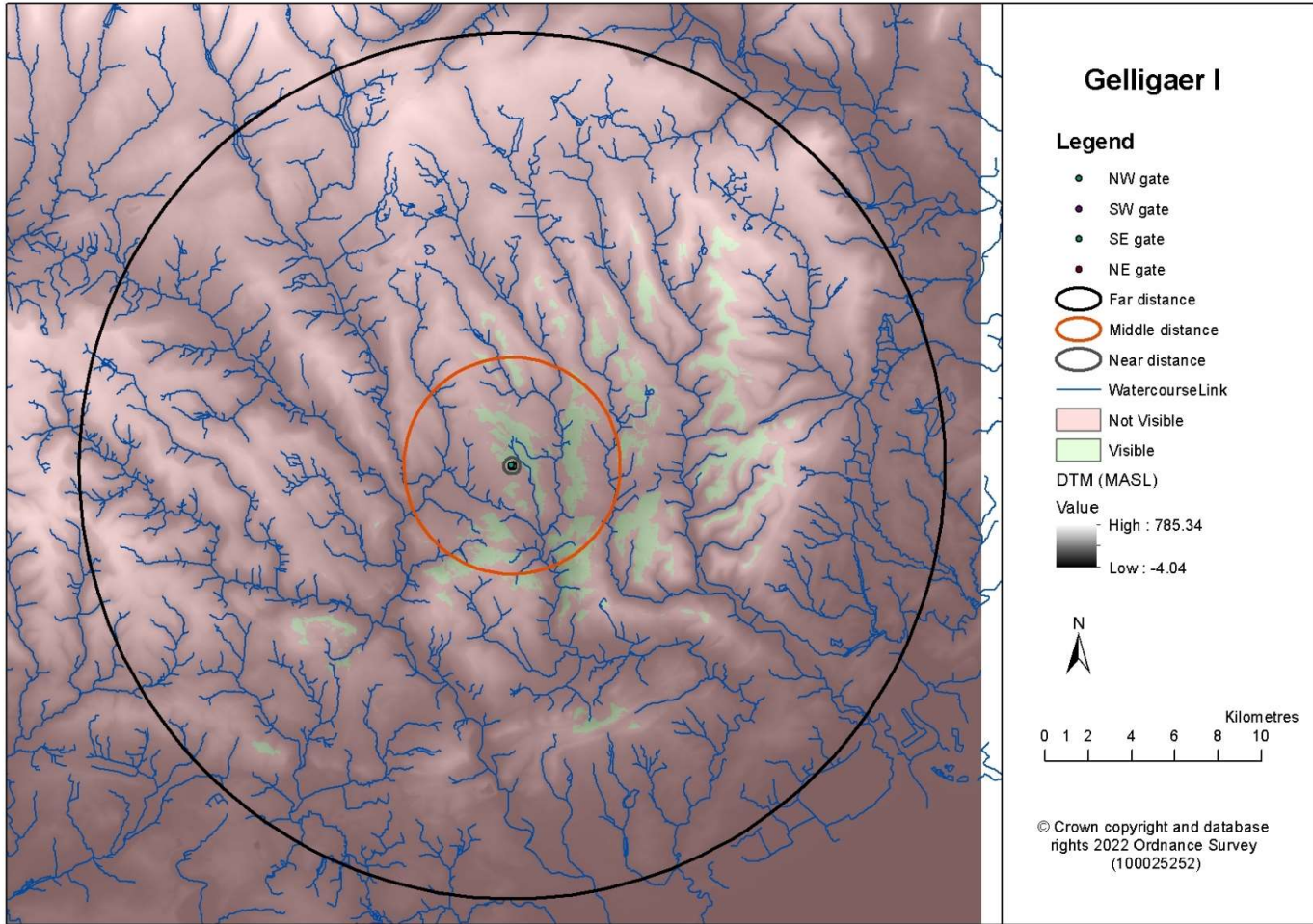


Figure 74 Gloucester near distance

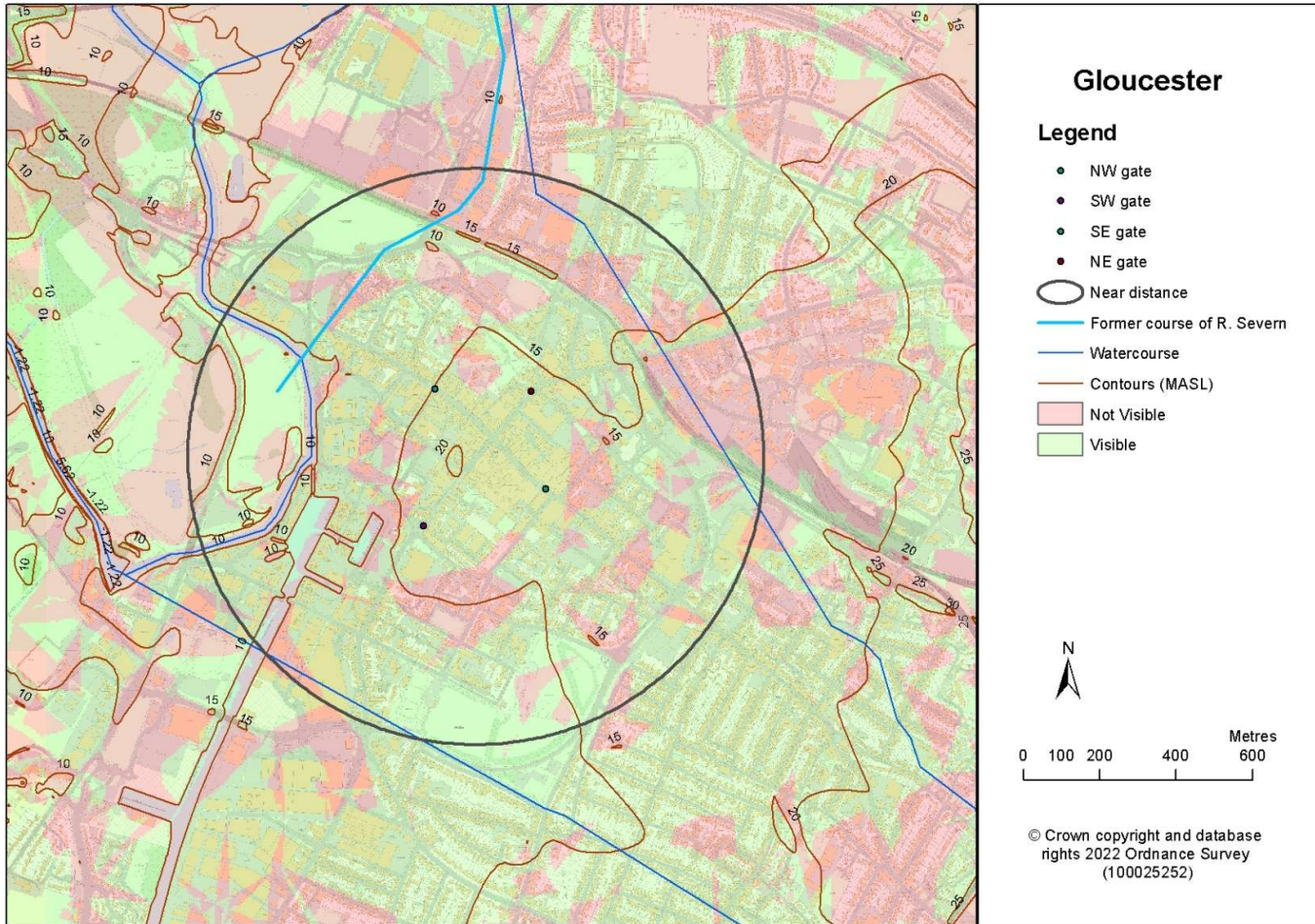


Figure 75 Gloucester middle distance

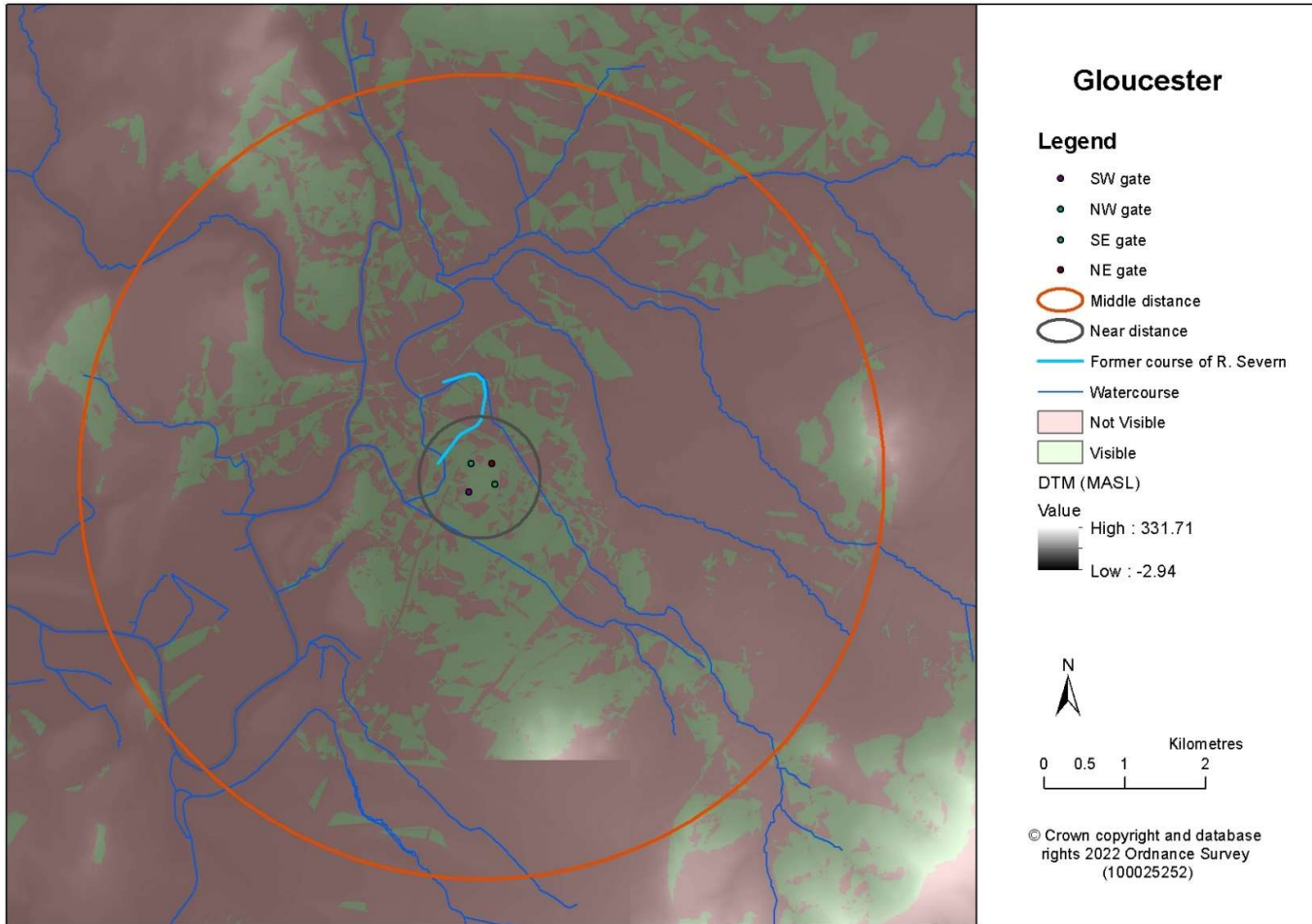


Figure 76 Gloucester far distance

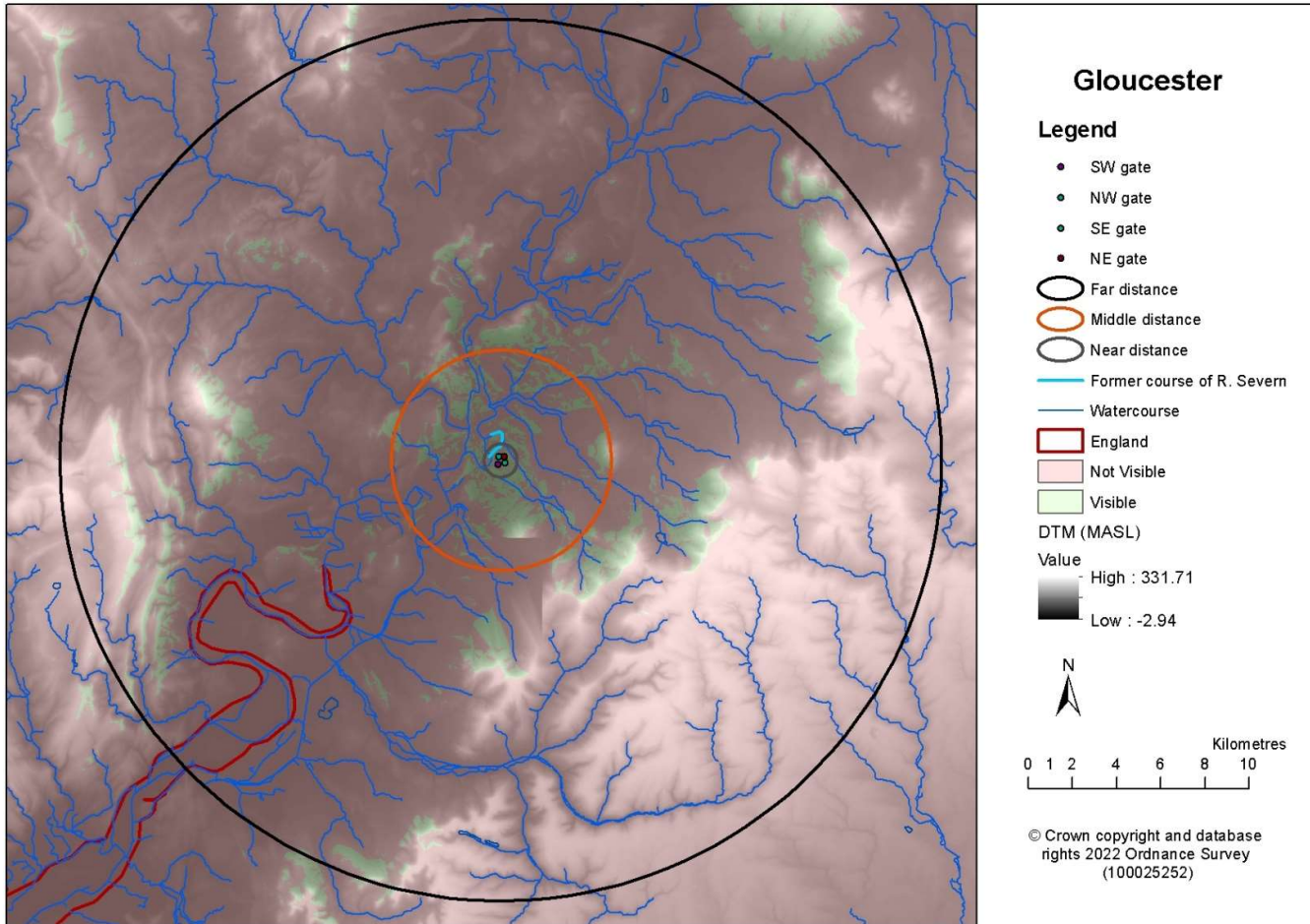


Figure 77 Hindwell Farm near distance

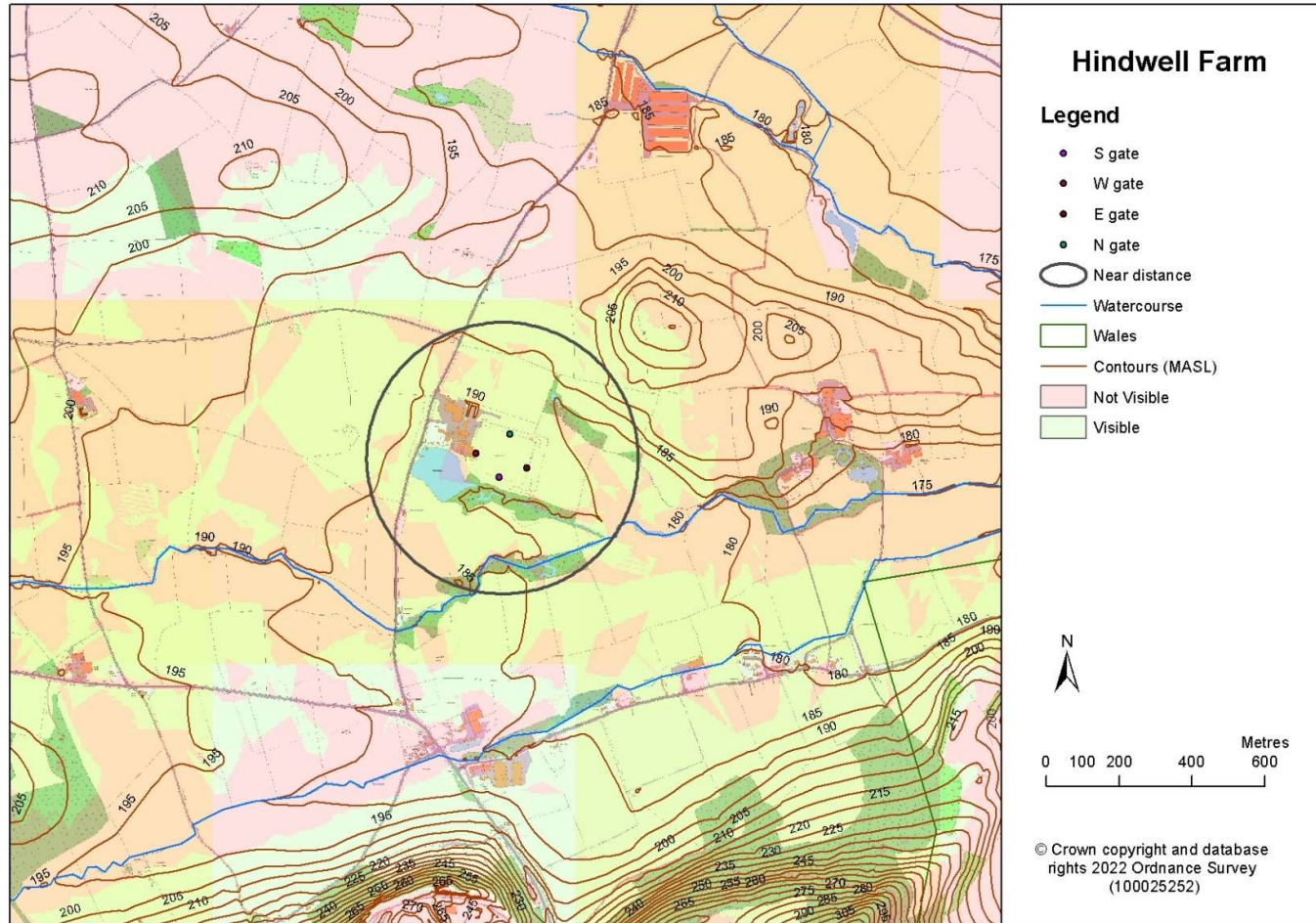


Figure 78 Hindwell Farm middle distance

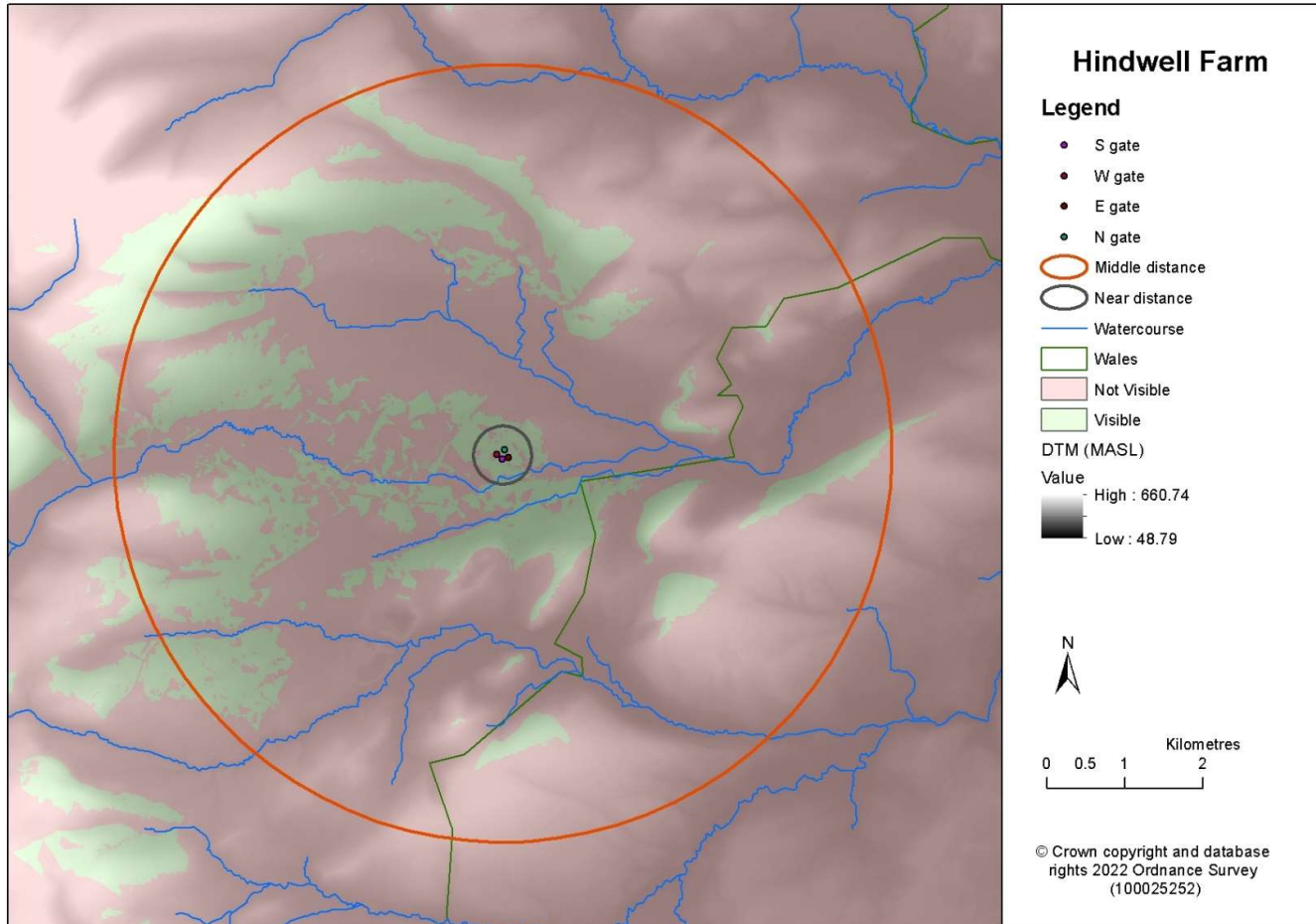


Figure 79 Hindwell Farm far distance

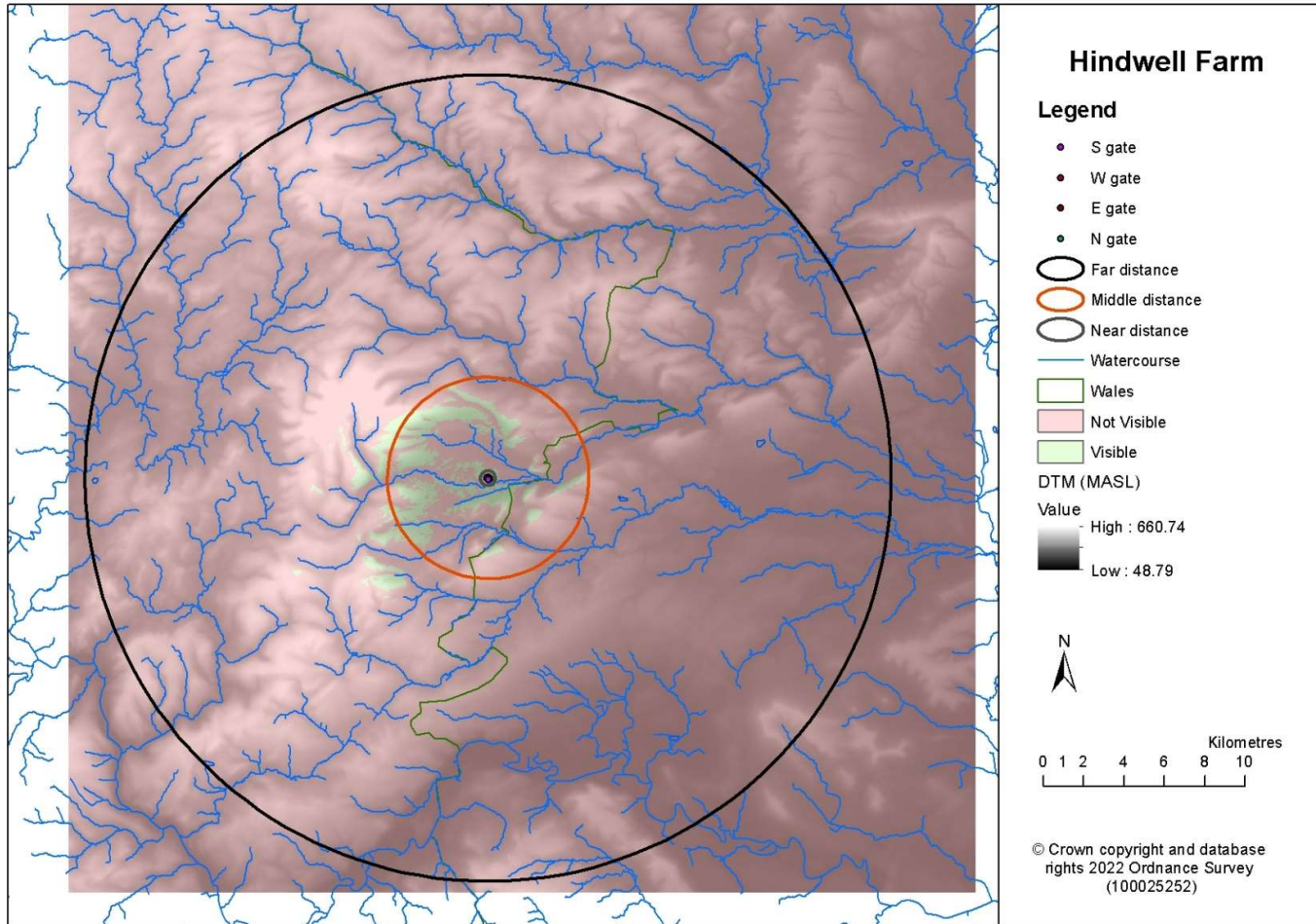


Figure 80 Jay Lane near distance

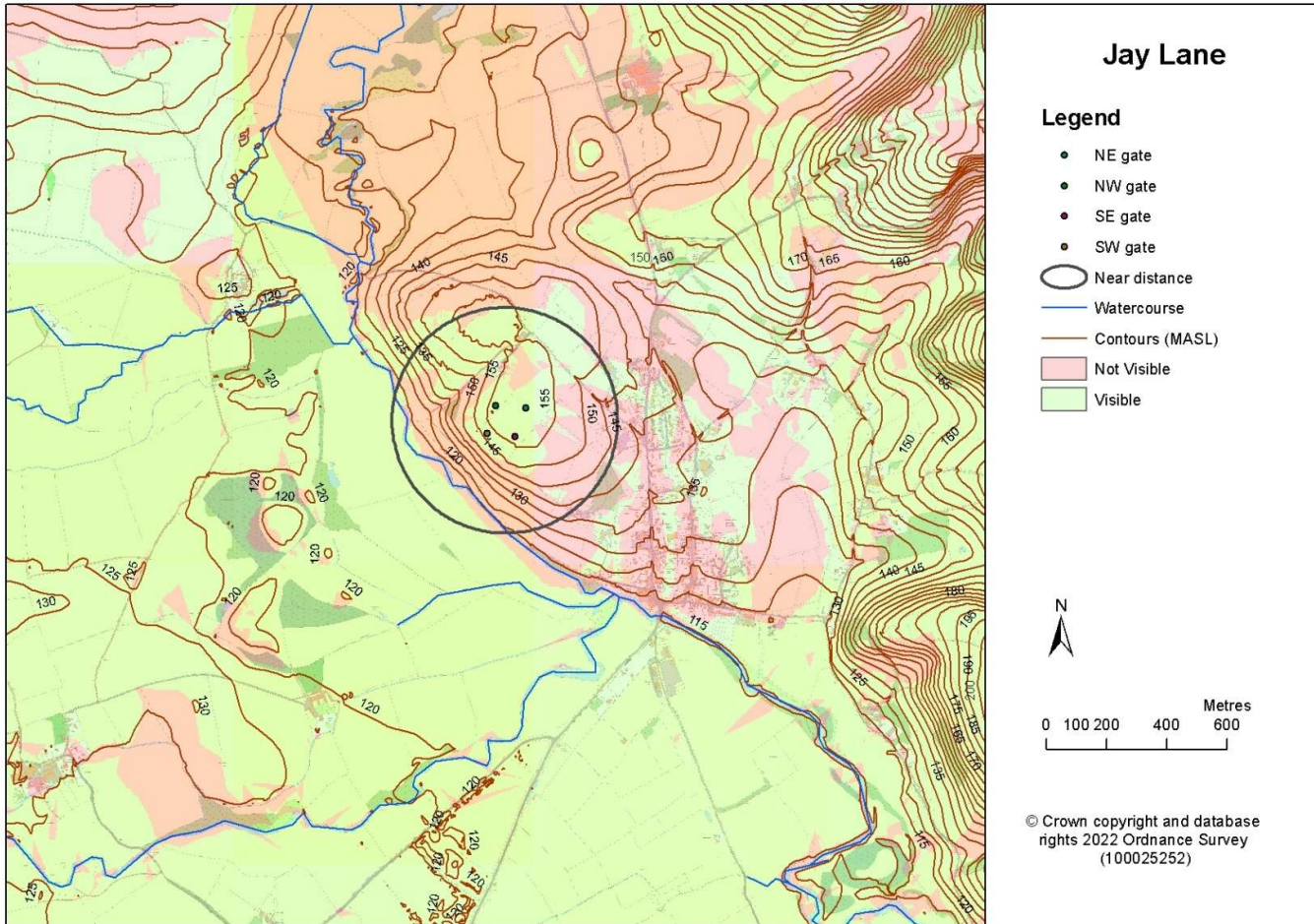


Figure 81 Jay Lane middle distance

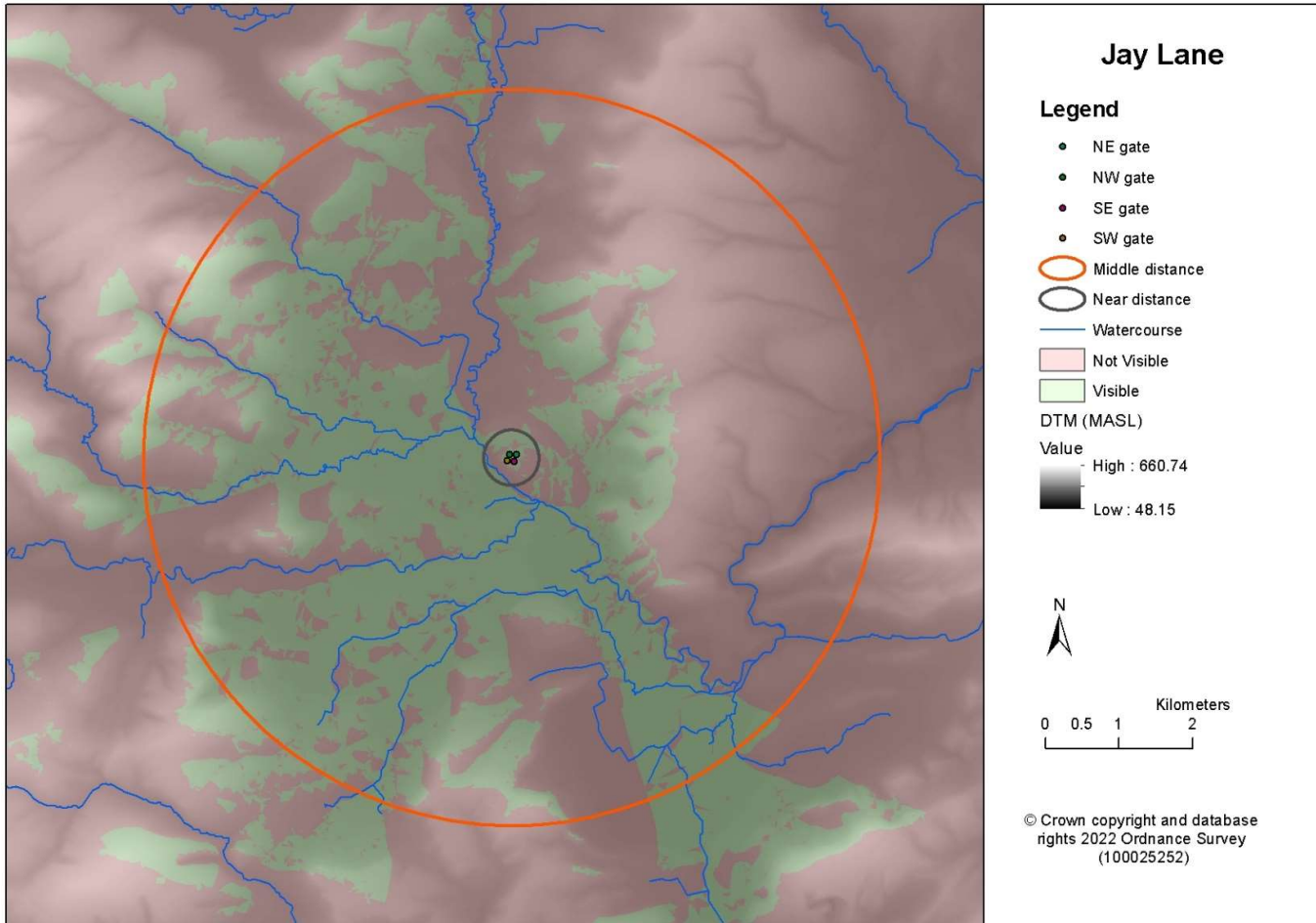


Figure 82 Jay Lane far distance

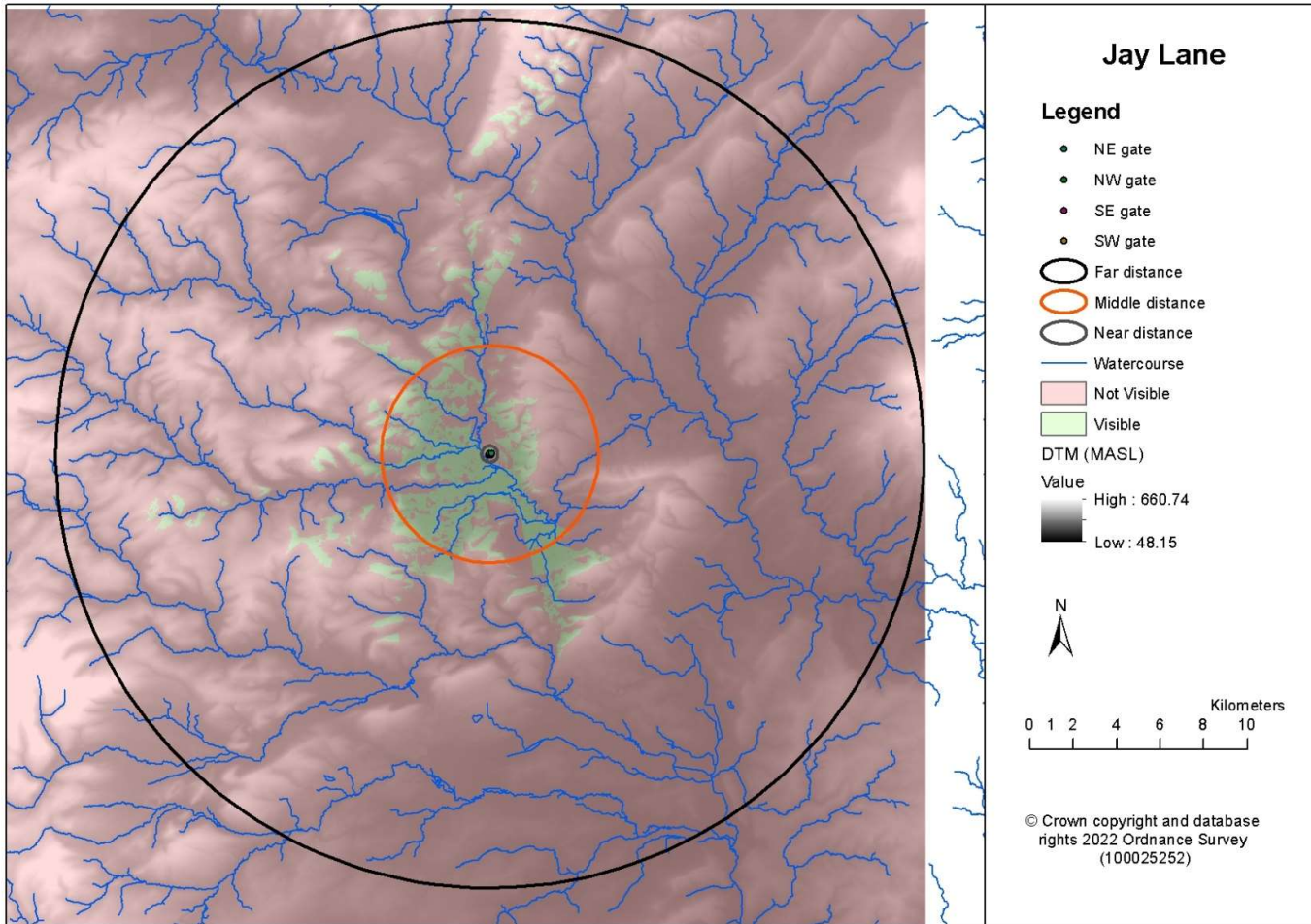


Figure 83 Kingsholm near distance

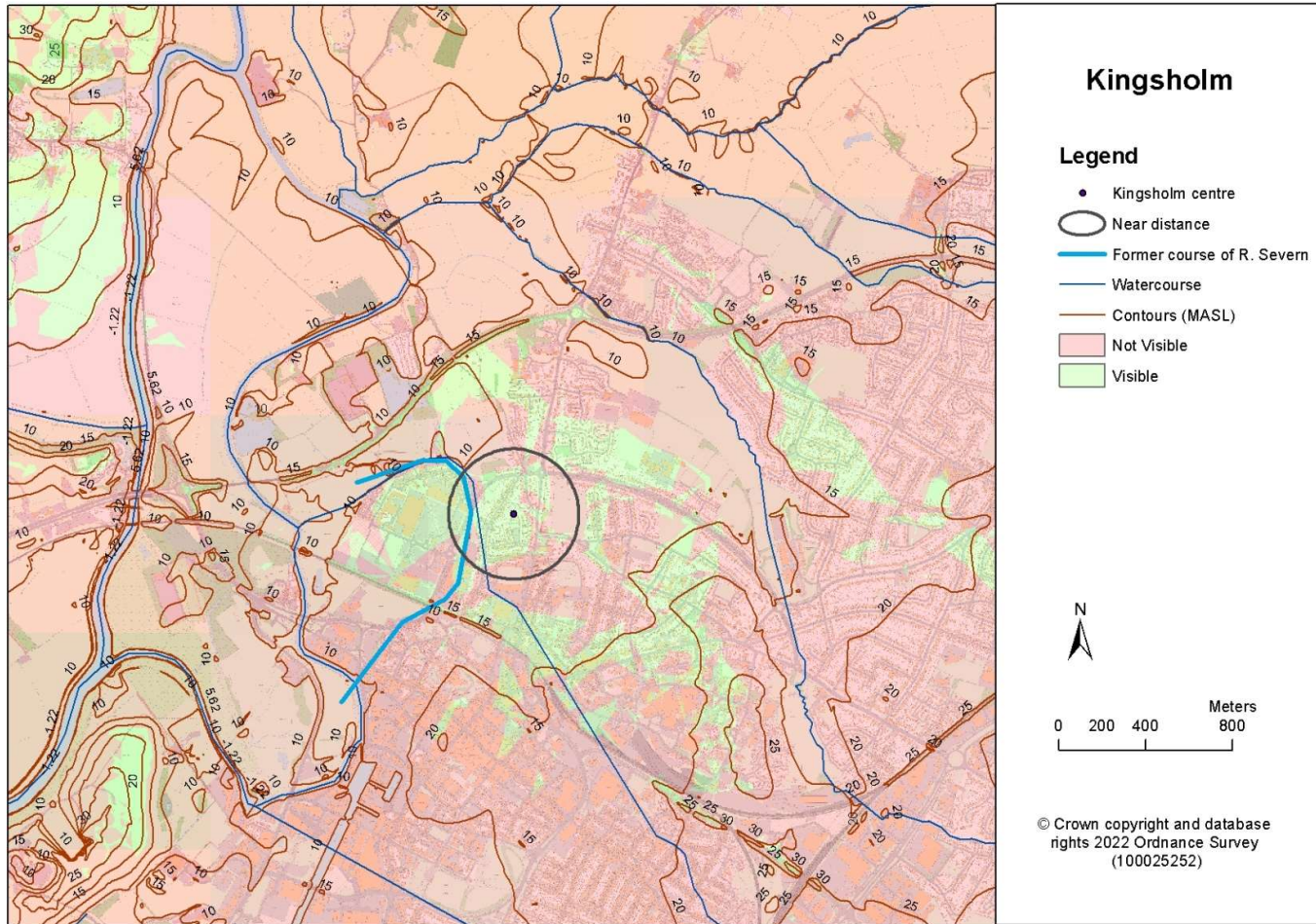


Figure 84 Kingsholm middle distance

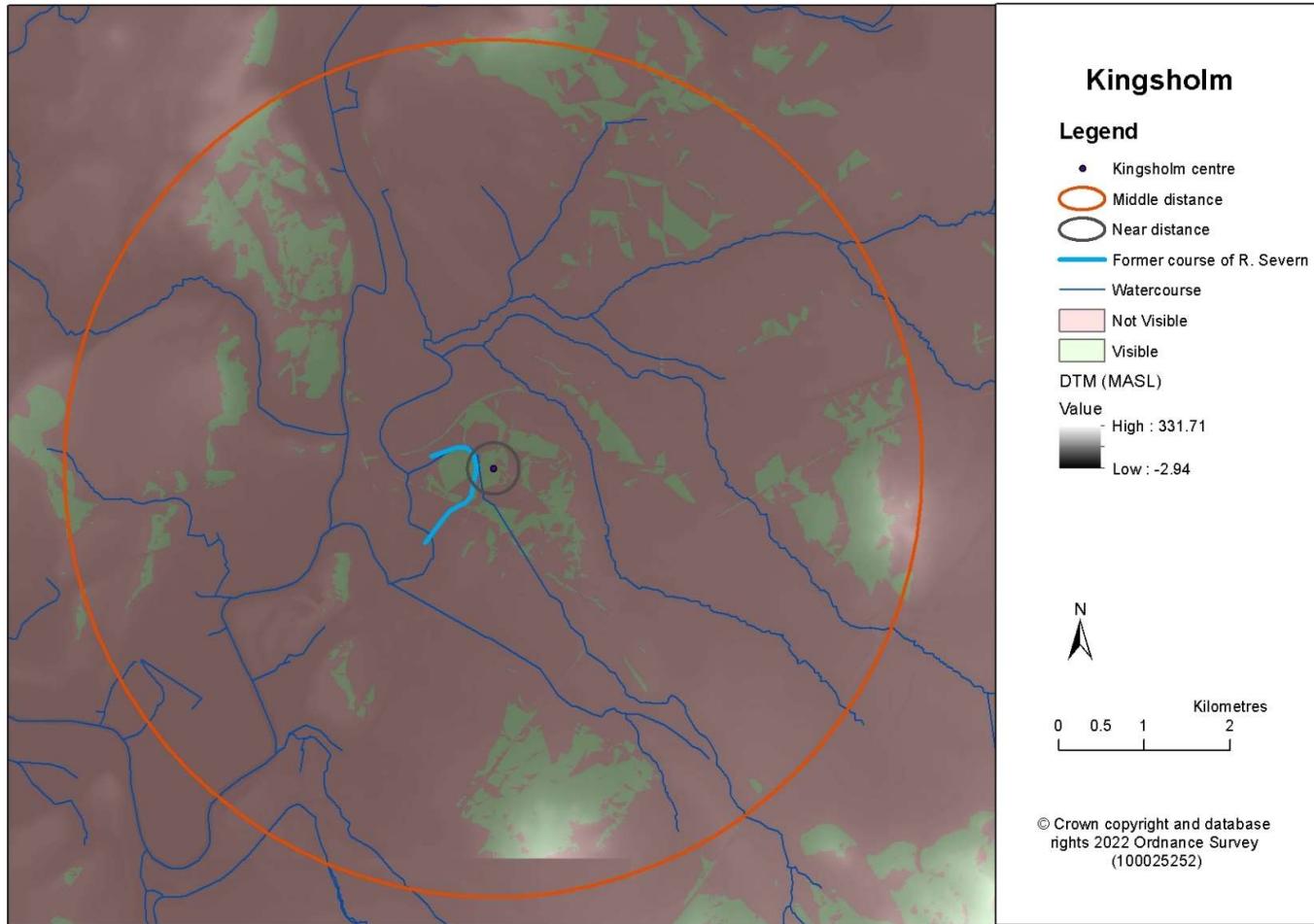


Figure 85 Kingsholm far distance

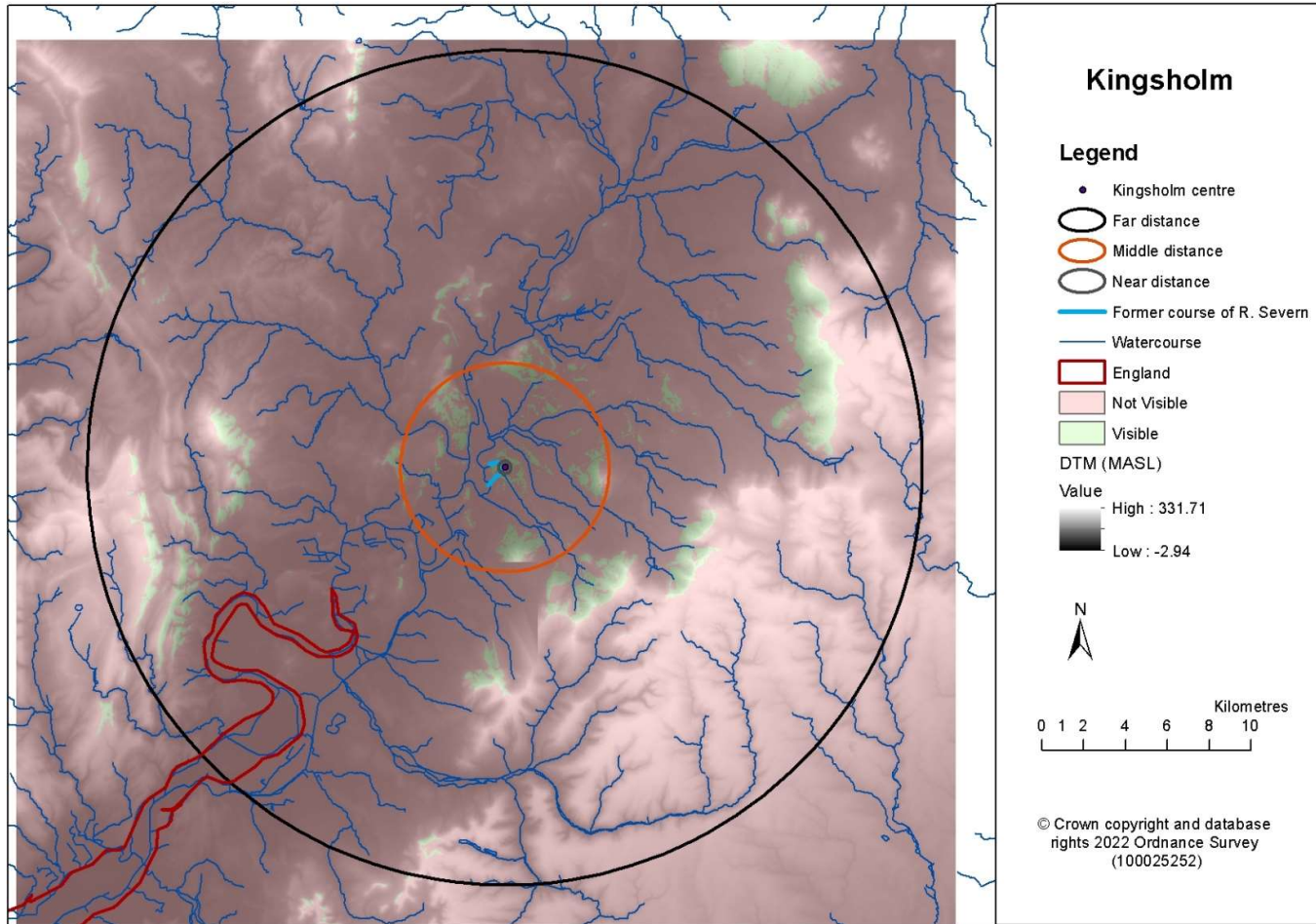


Figure 86 Leighton near distance

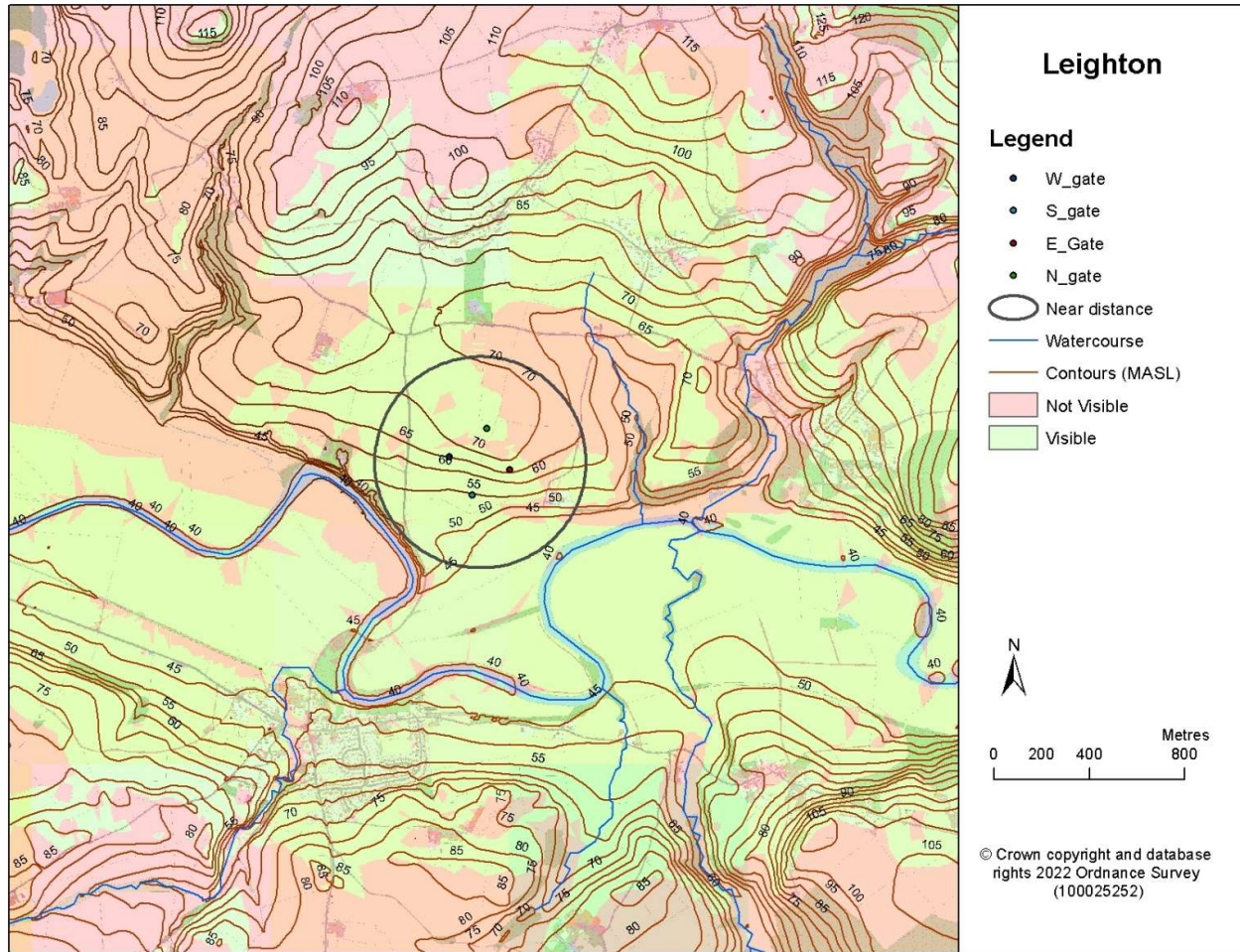


Figure 87 Leighton middle distance

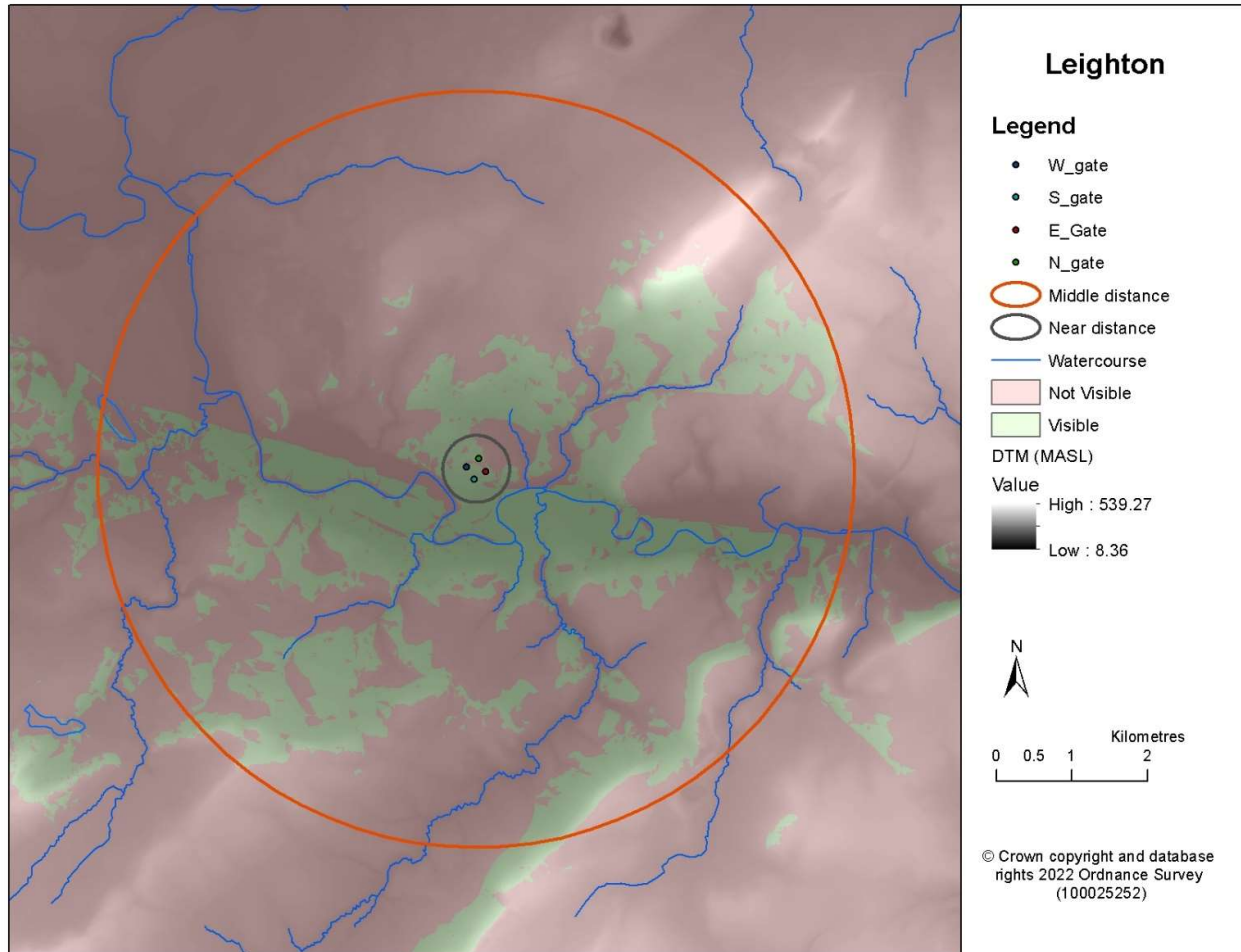


Figure 88 Leighton far distance

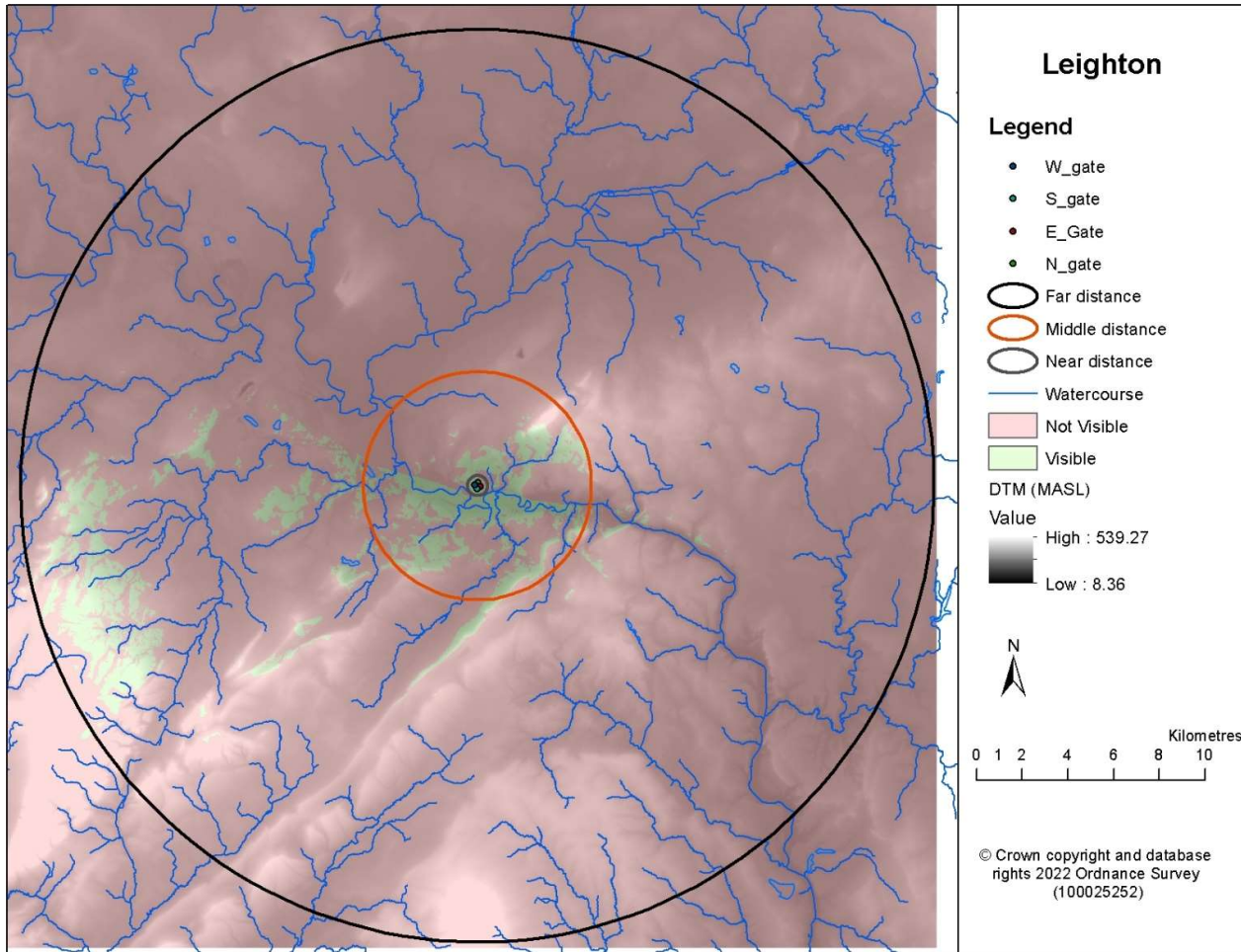


Figure 89 Llandeilo I near distance

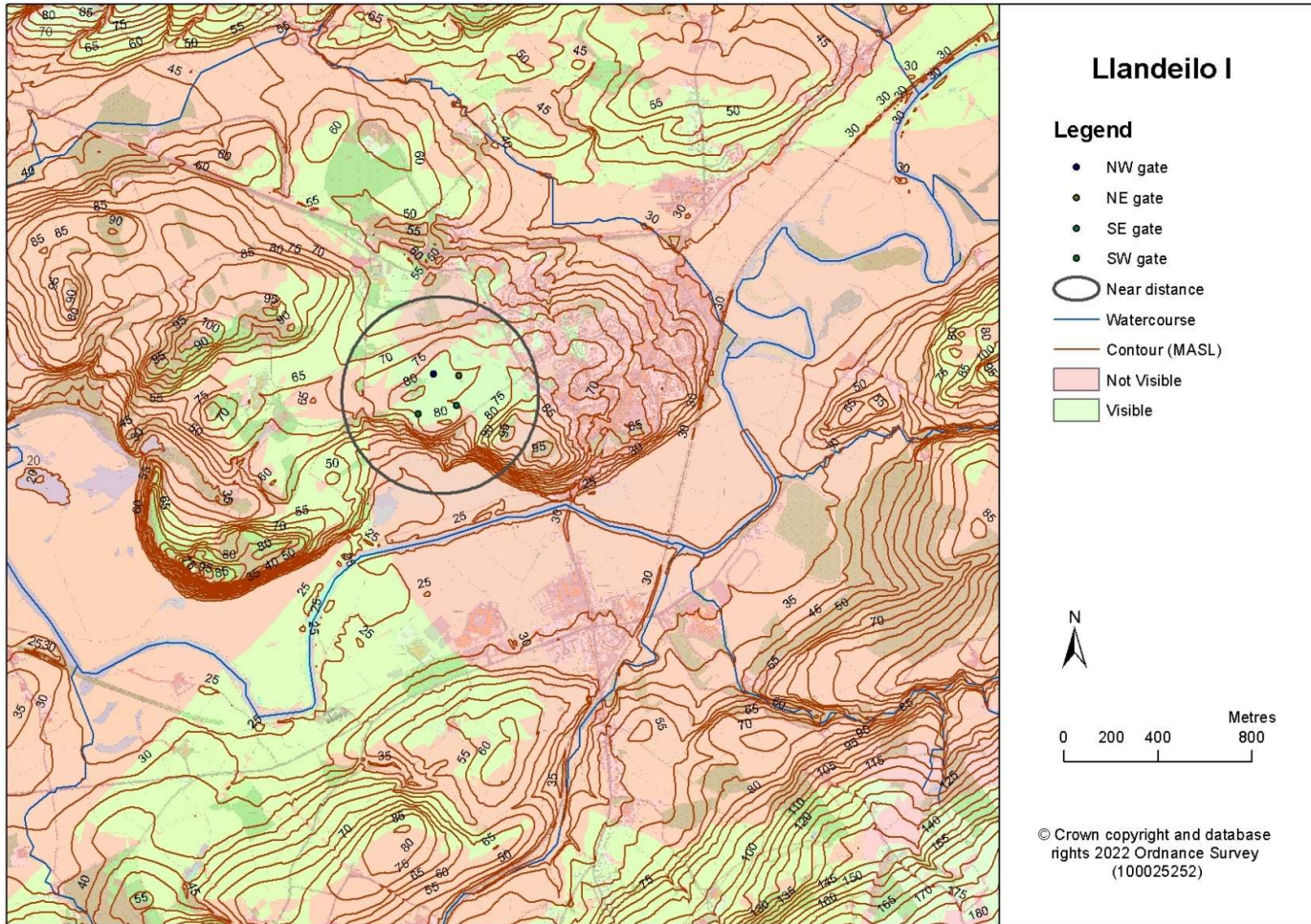


Figure 90 Llandeilo I middle distance

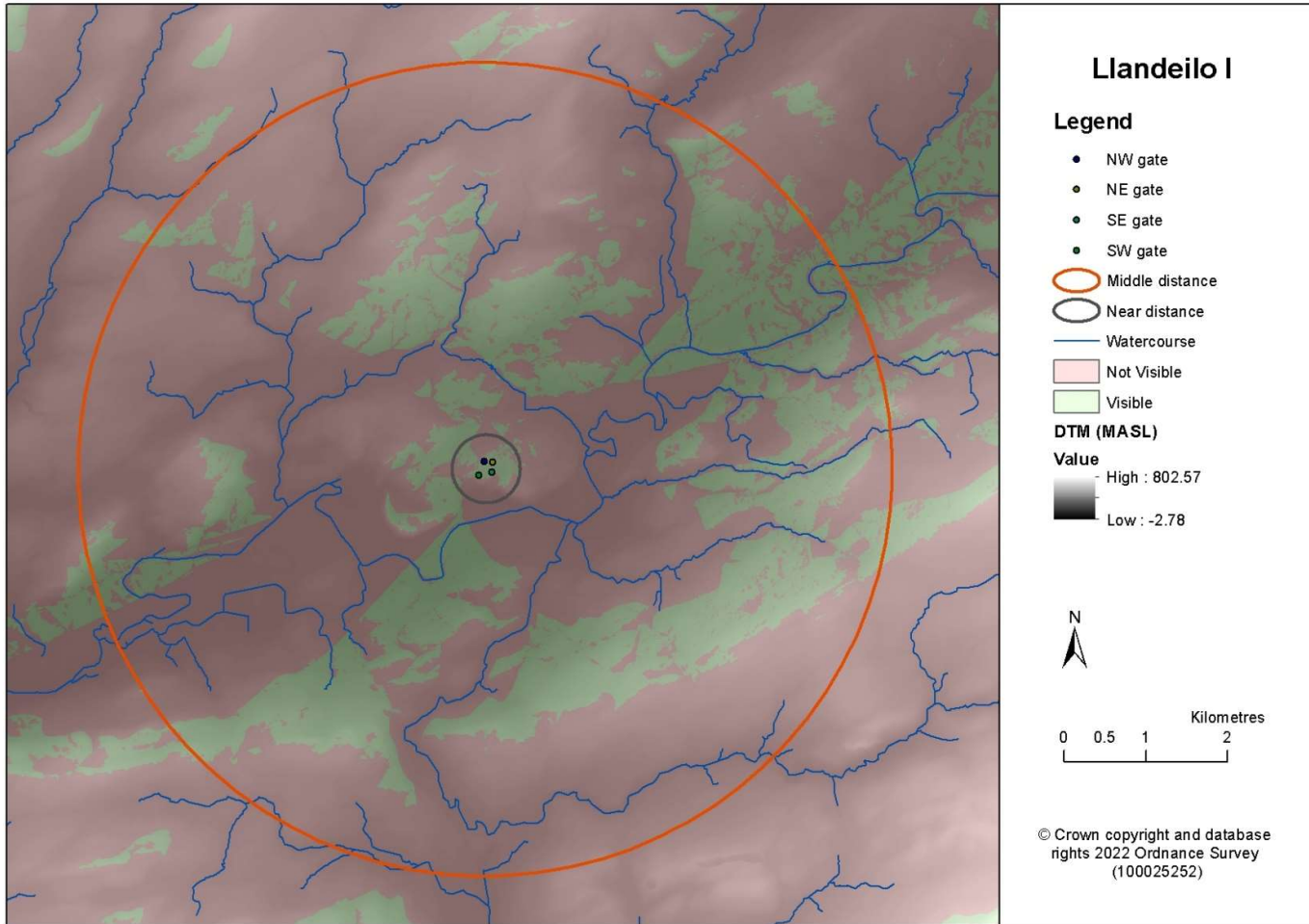


Figure 91 Llandeilo I far distance

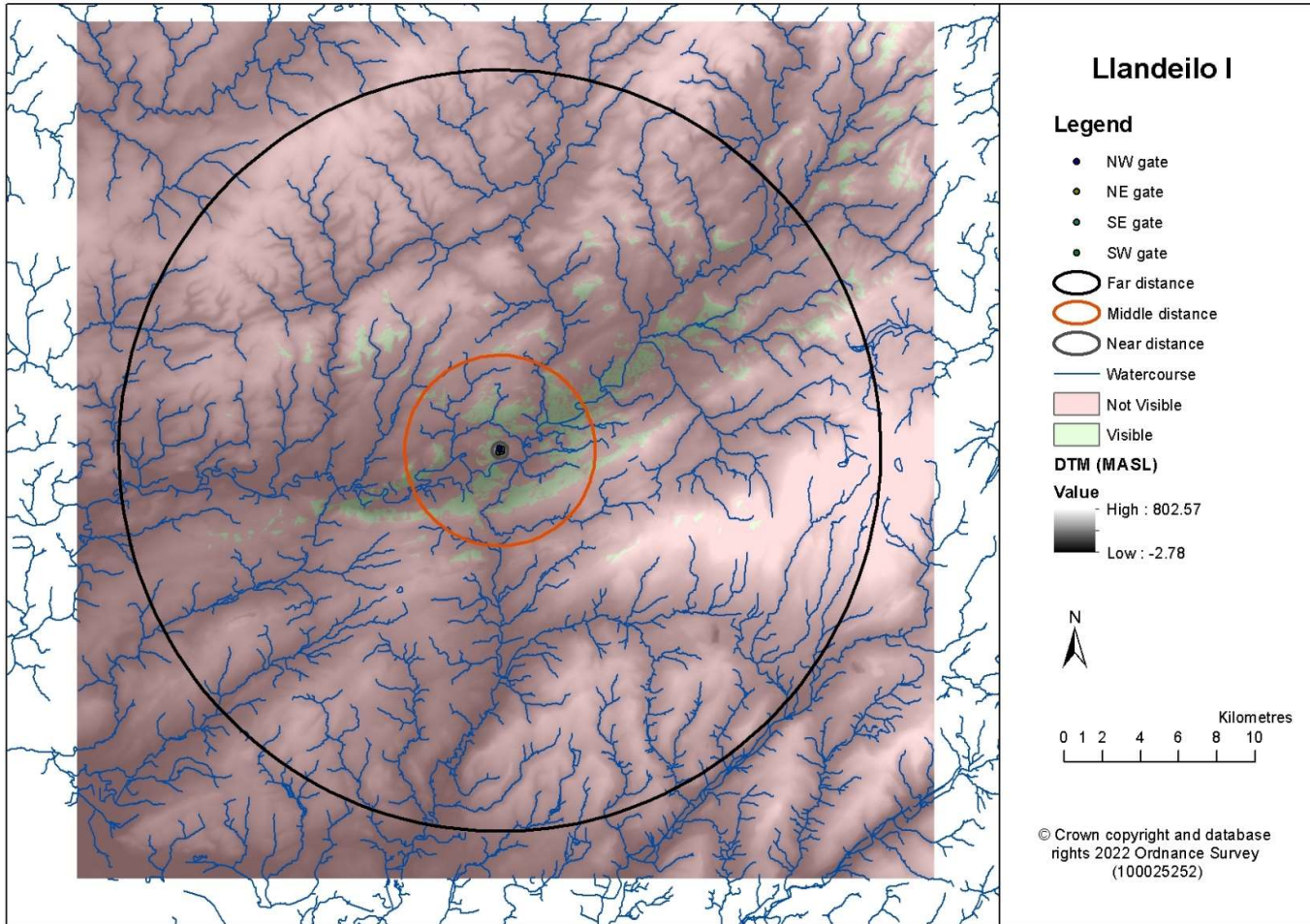


Figure 92 Llandeilo II near distance

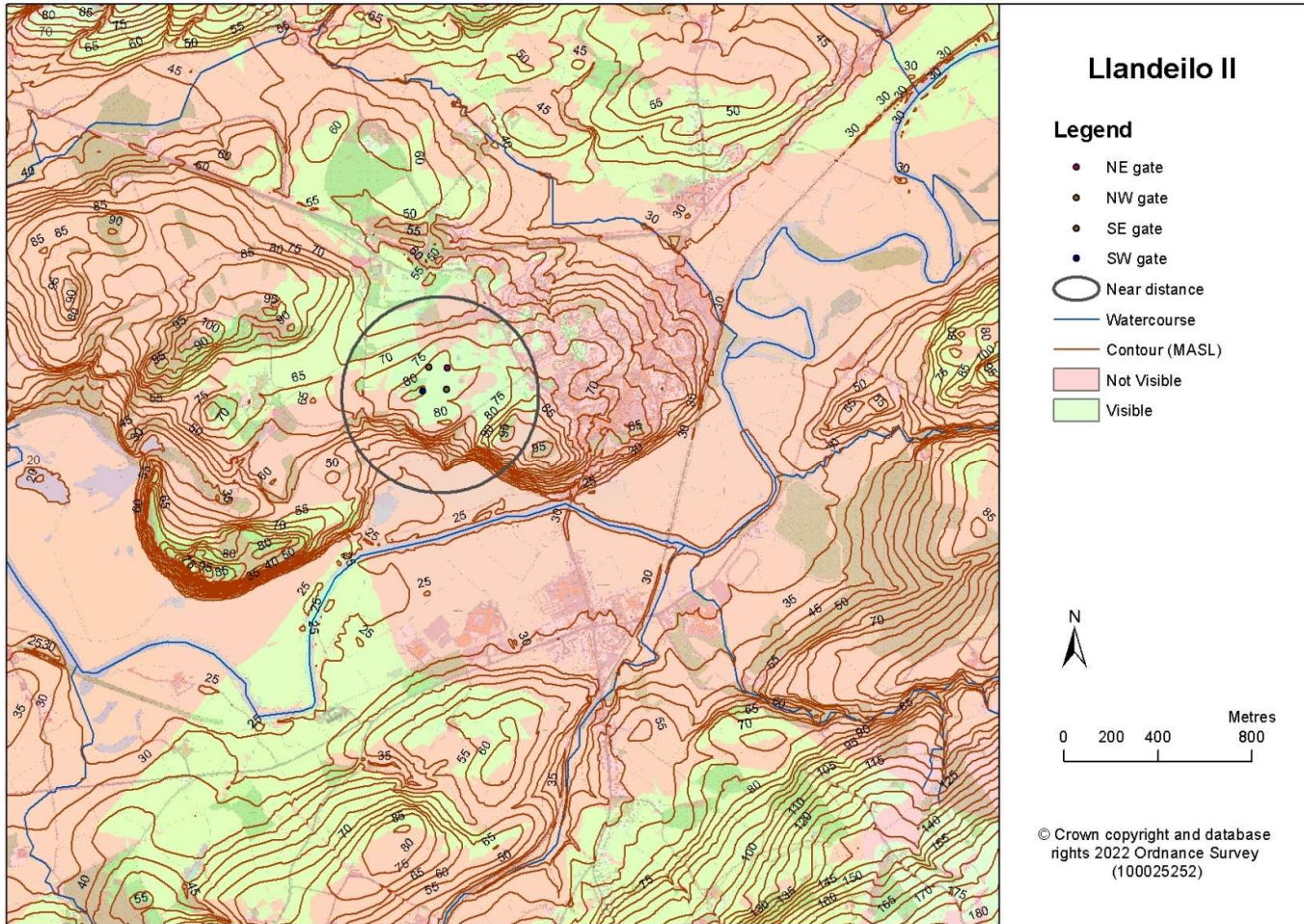


Figure 93 Llandeilo II middle distance

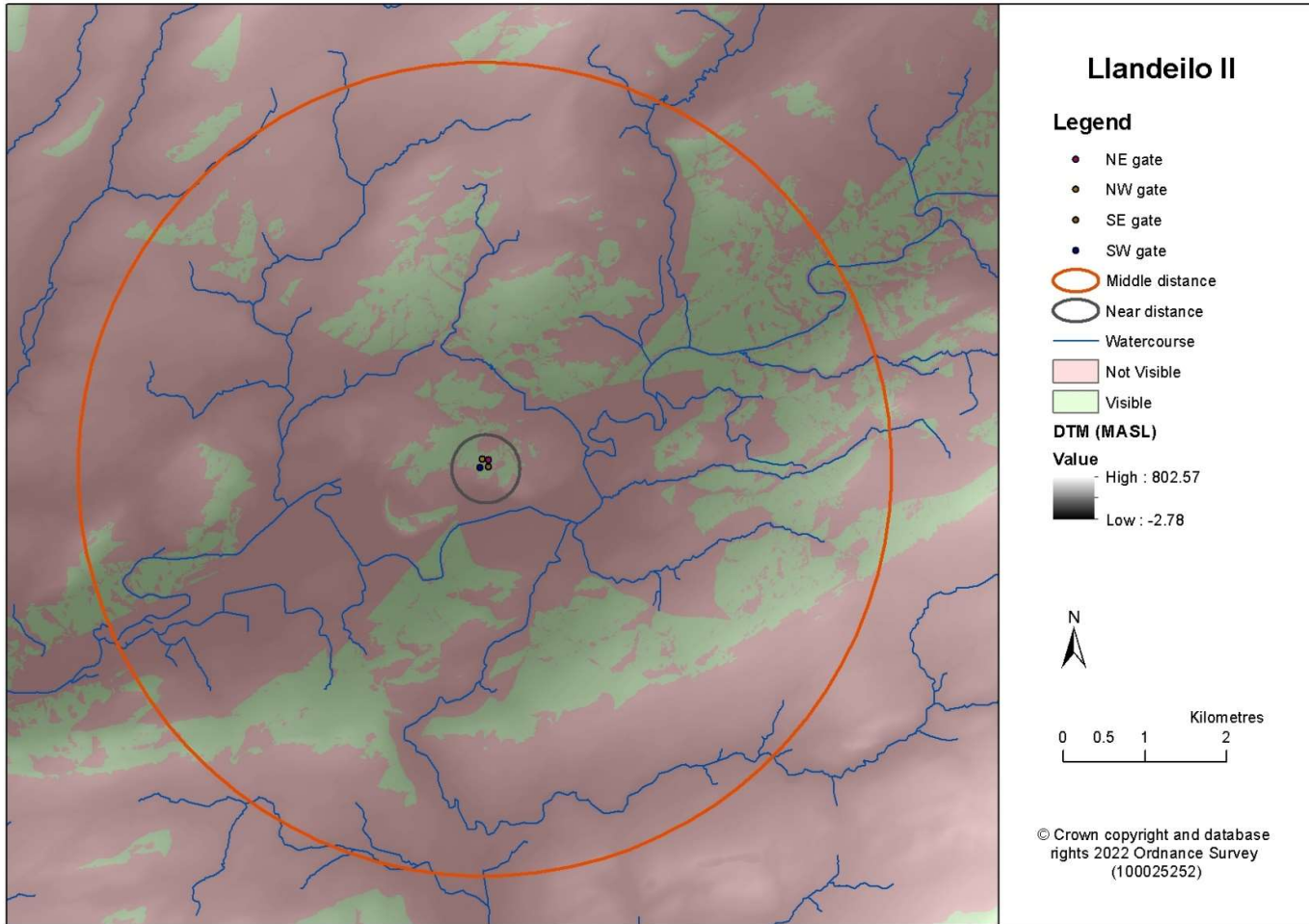


Figure 94 Llandeilo II far distance

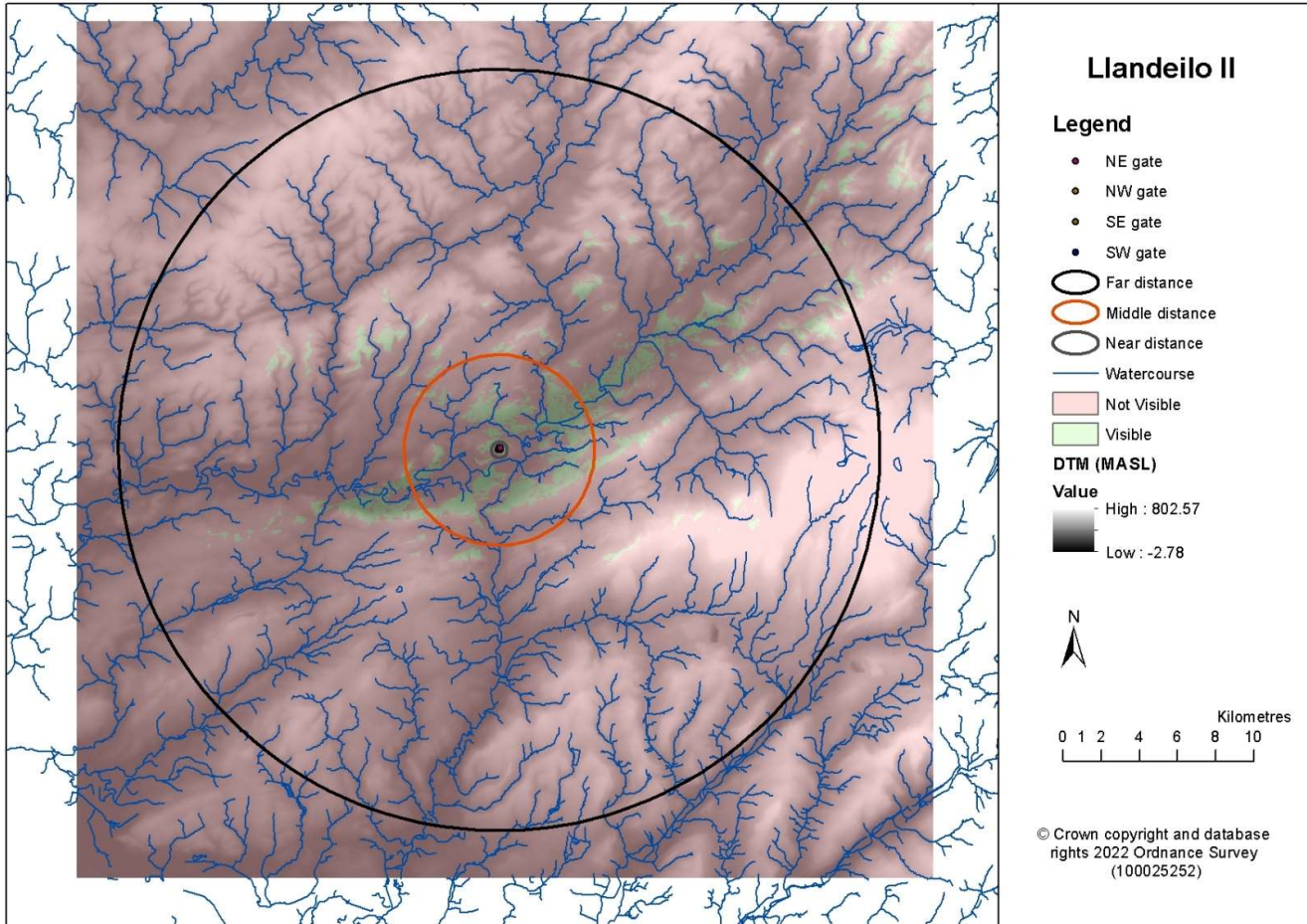


Figure 95 Llandovery I near distance

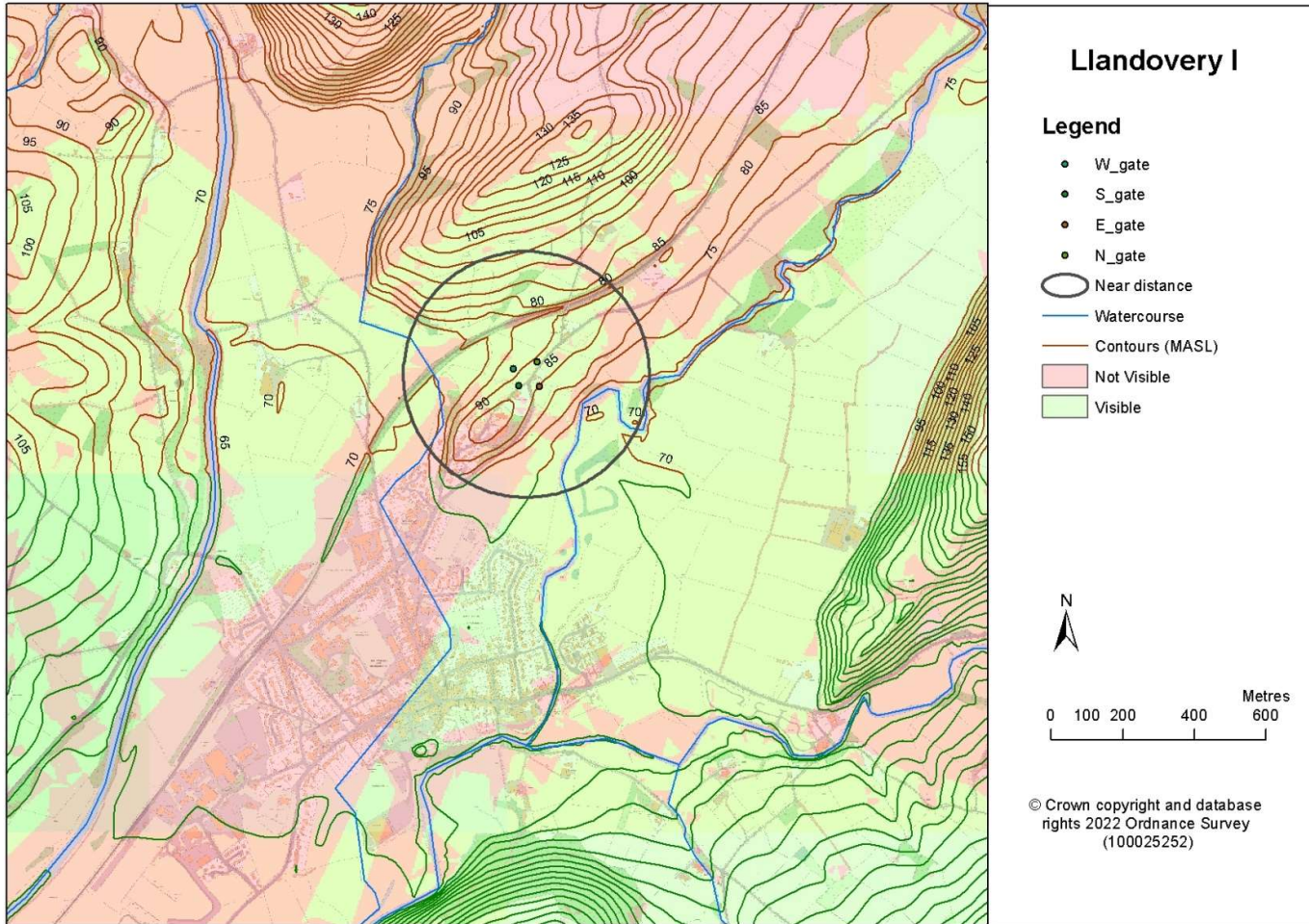


Figure 96 Llandovery I middle distance

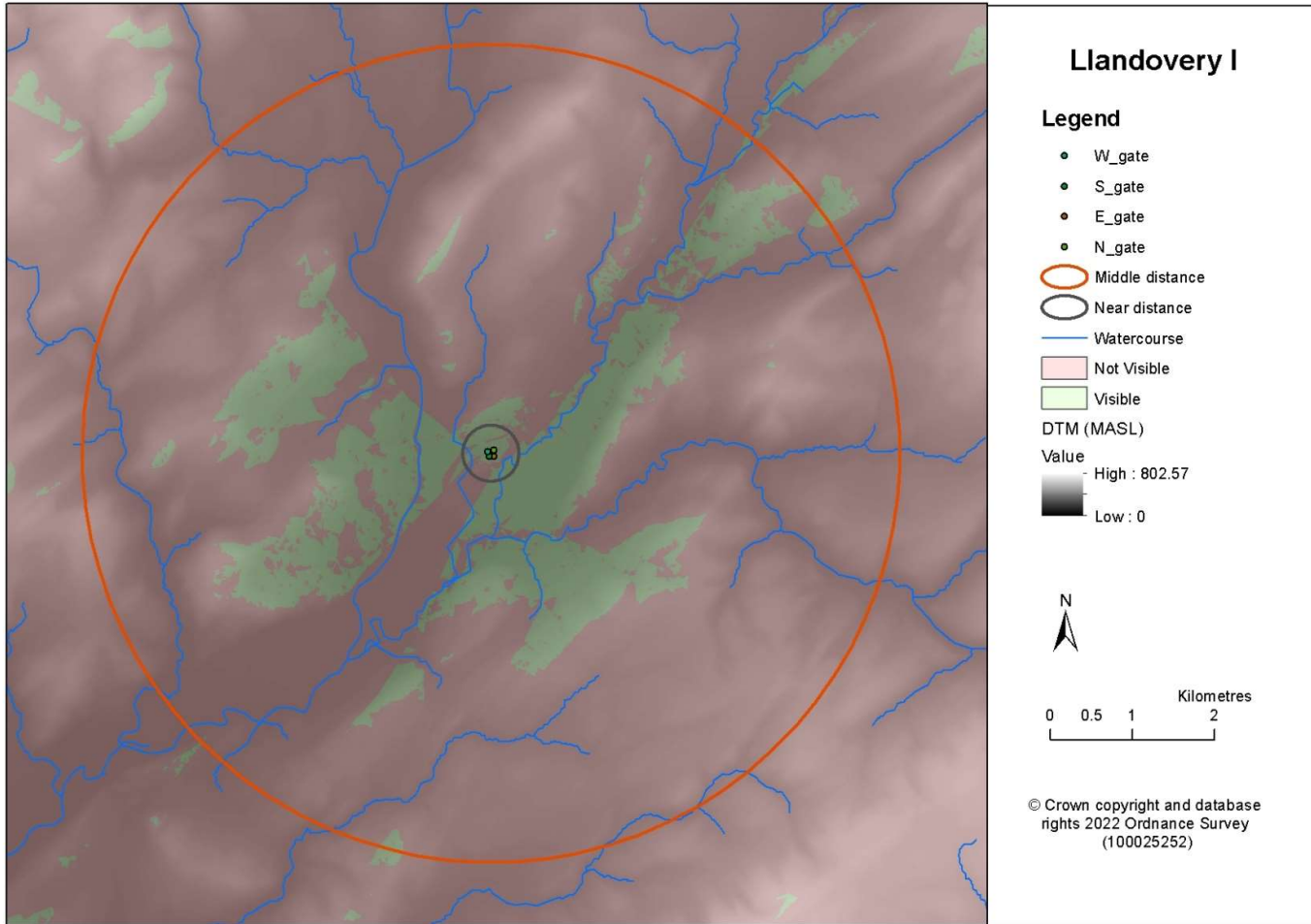


Figure 97 Llandovery I far distance

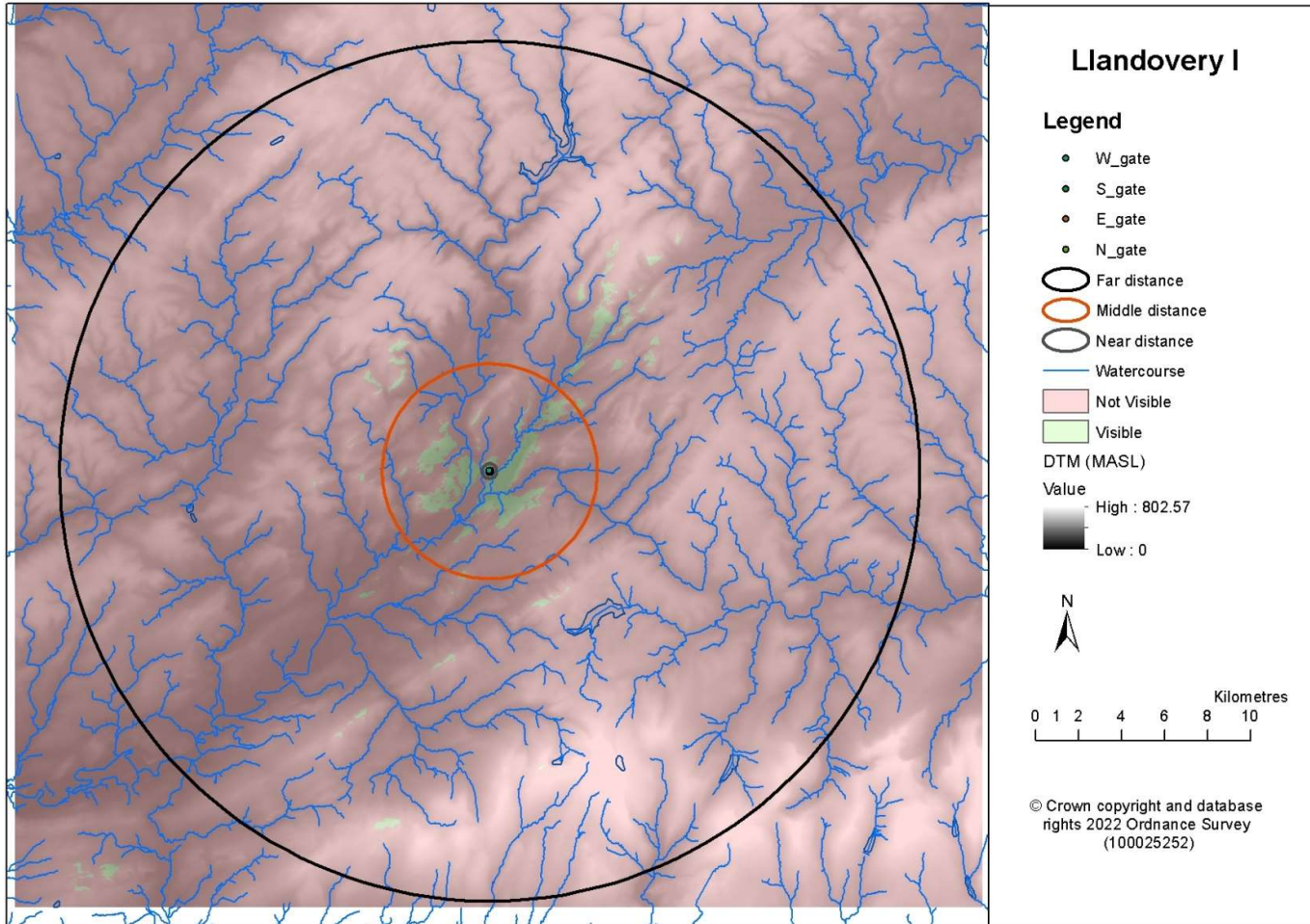


Figure 98 Llandovery II near distance

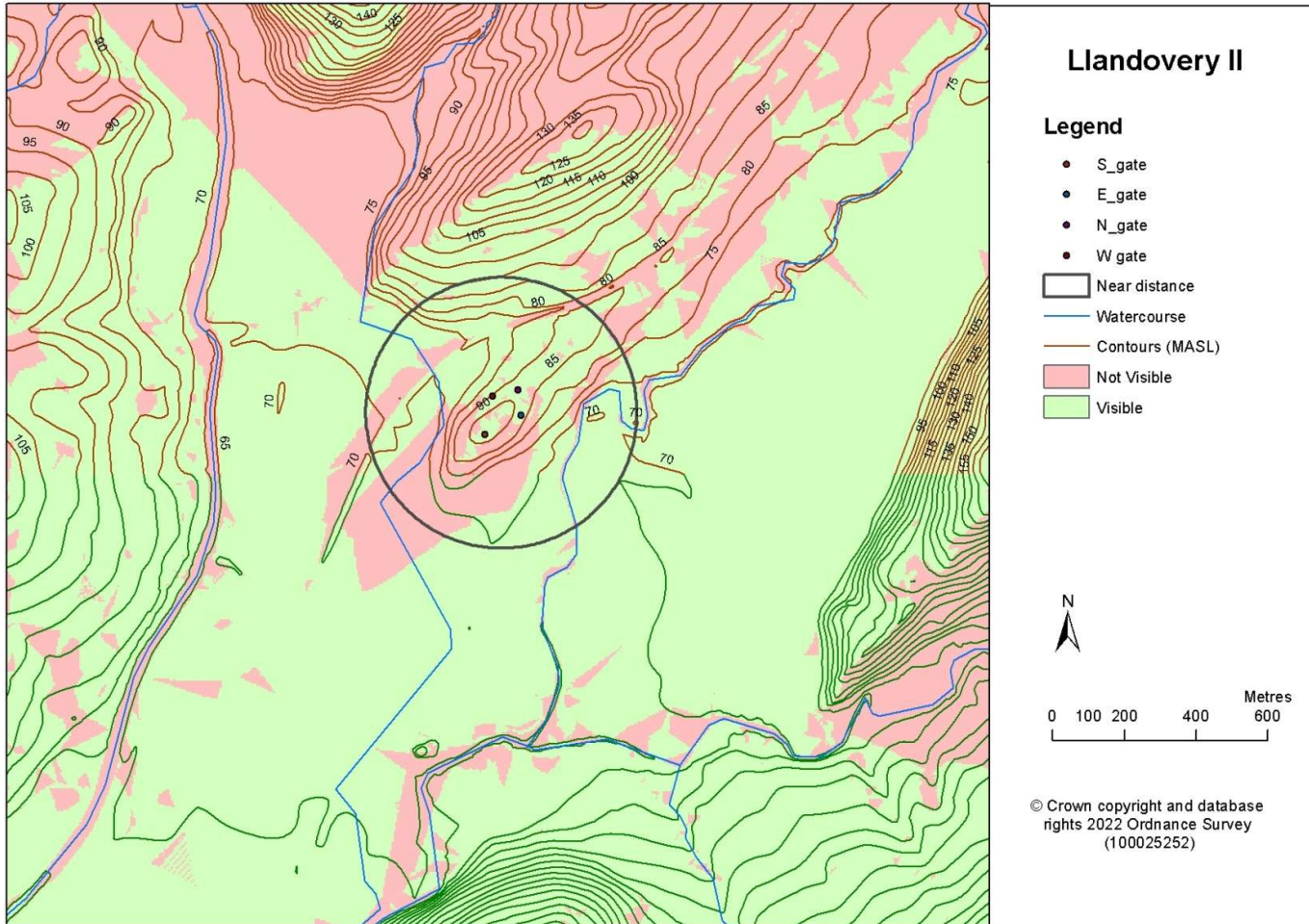


Figure 99 Llandovery II middle distance

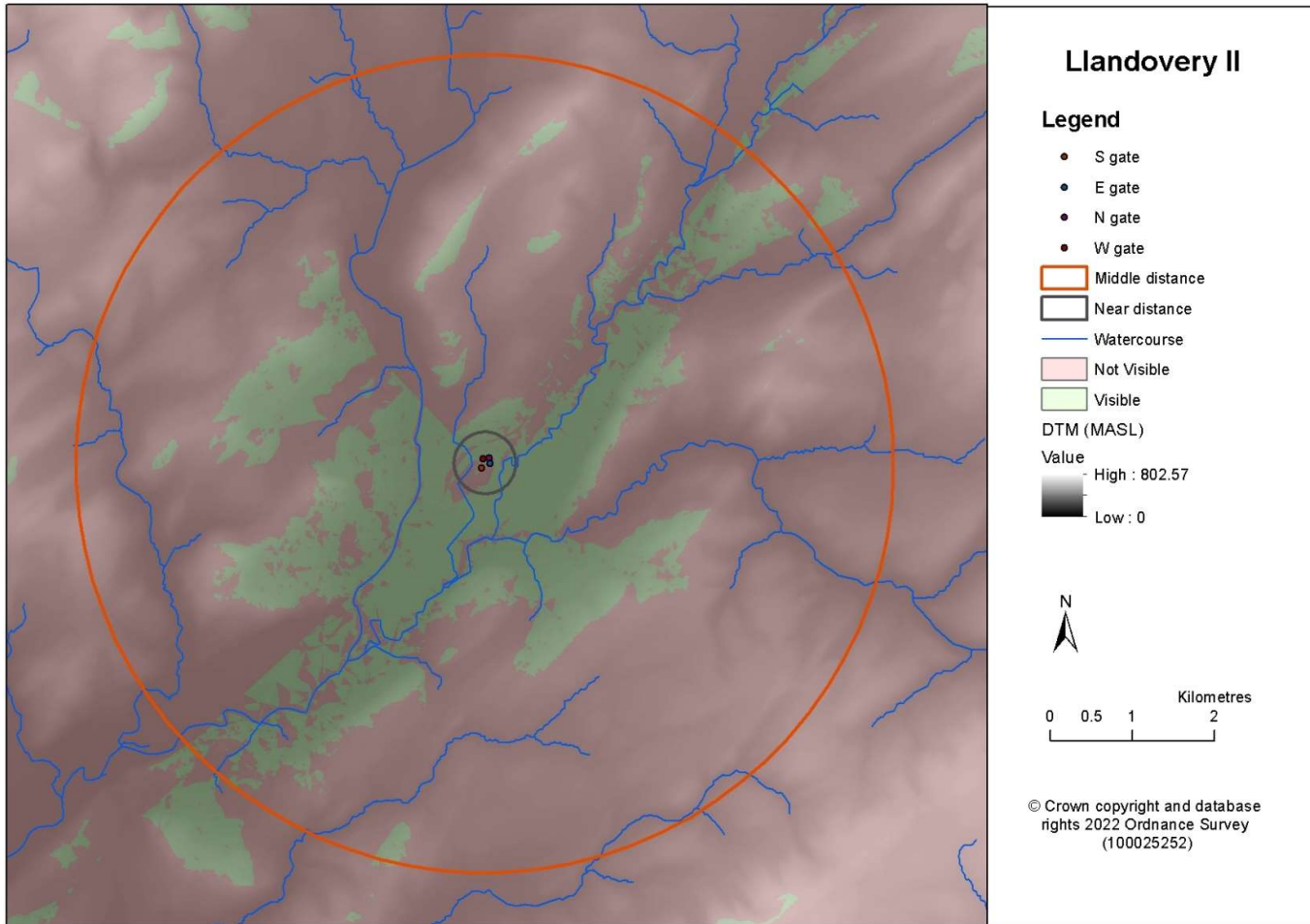


Figure 100 Llandovery II far distance

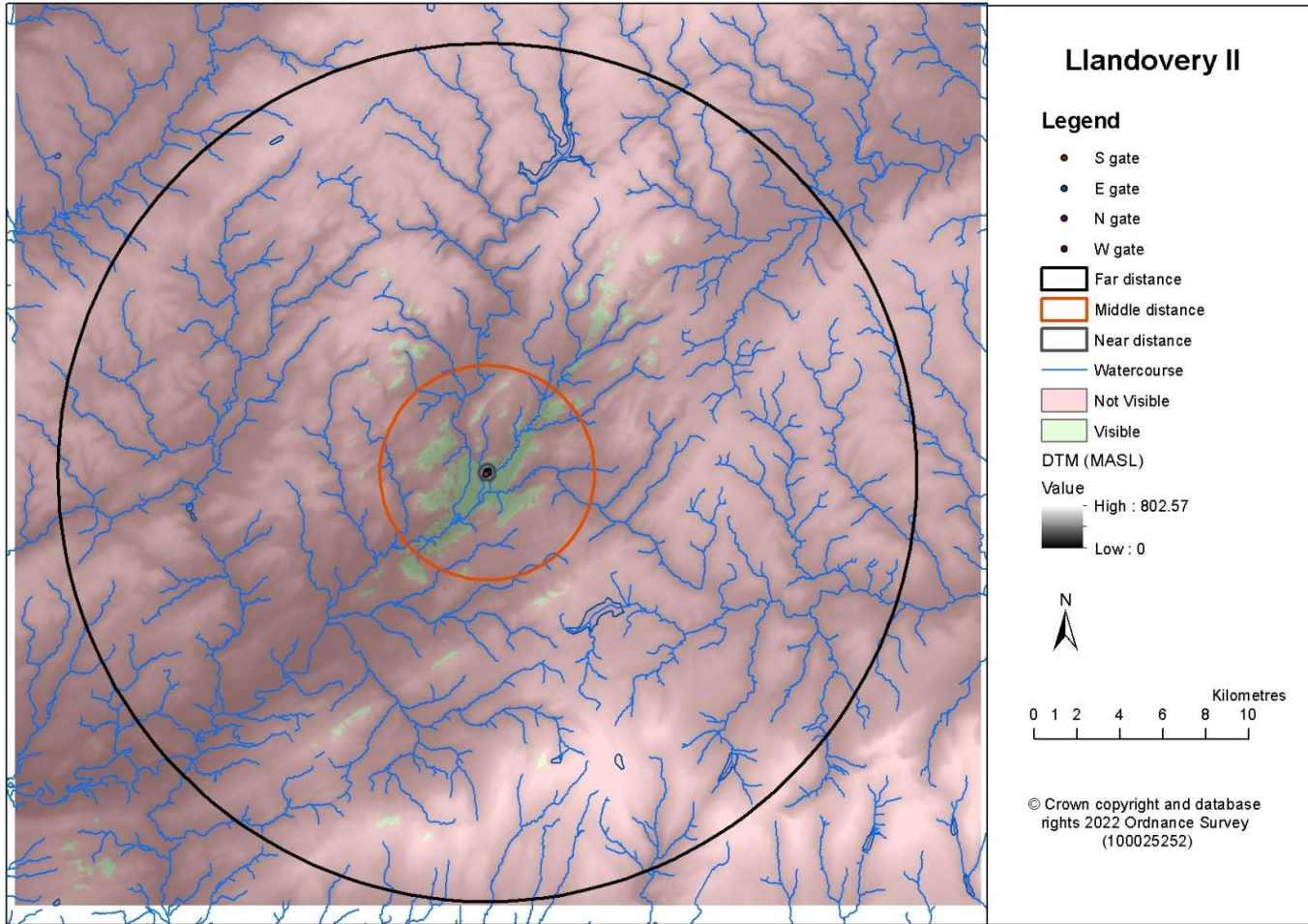


Figure 101 Llanfor near distance

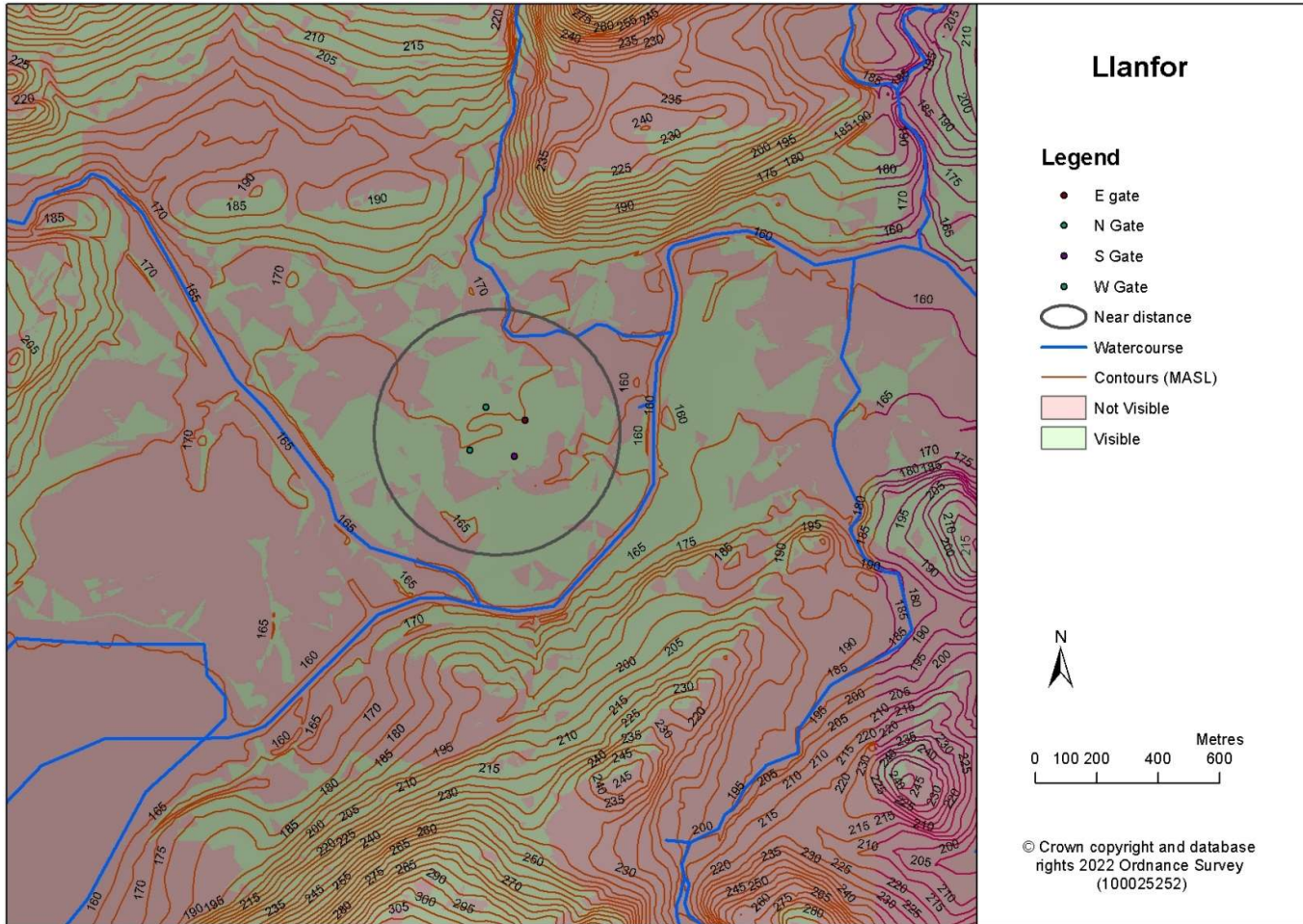


Figure 102 Llanfor middle distance

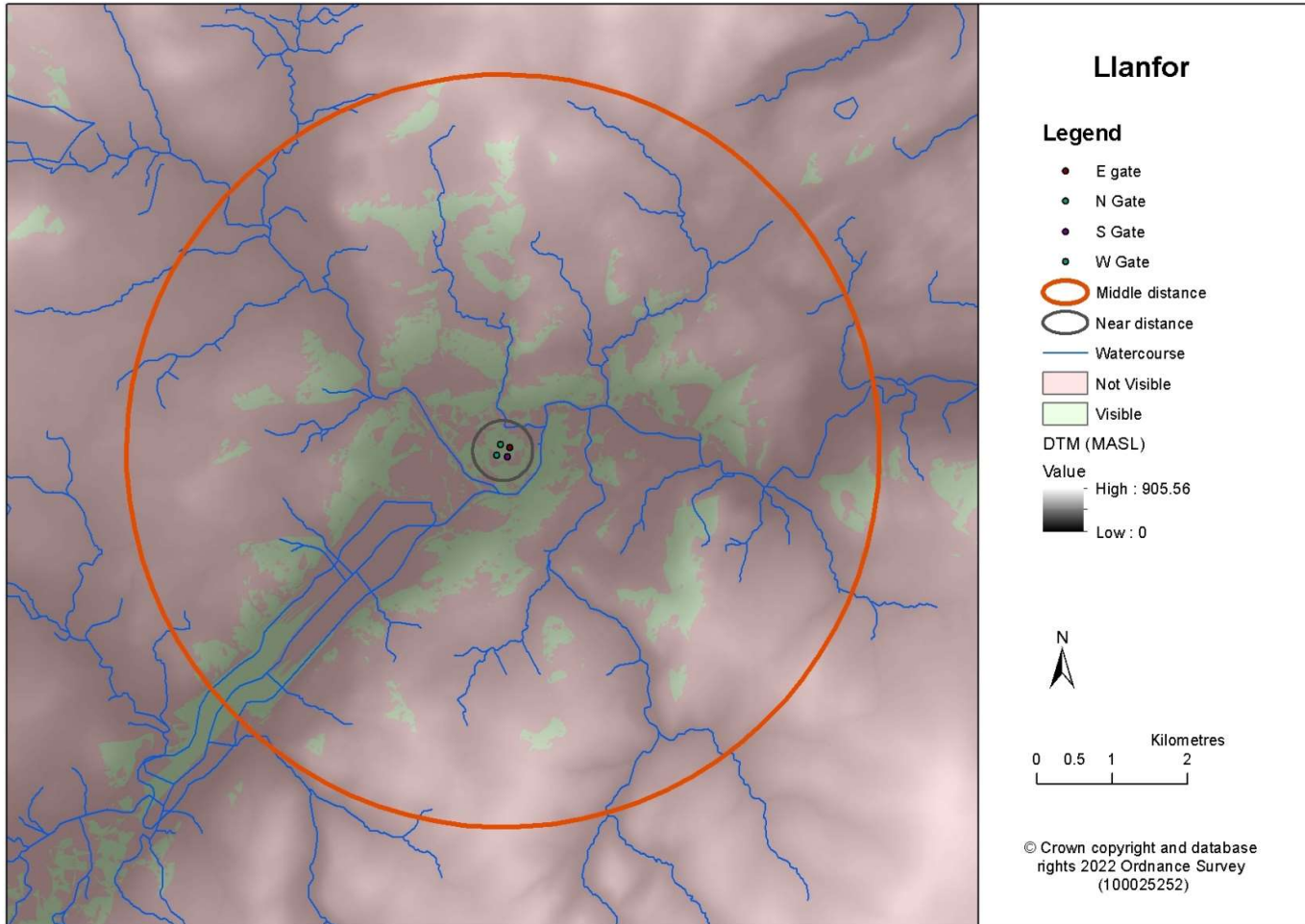


Figure 103 Llanfor far distance

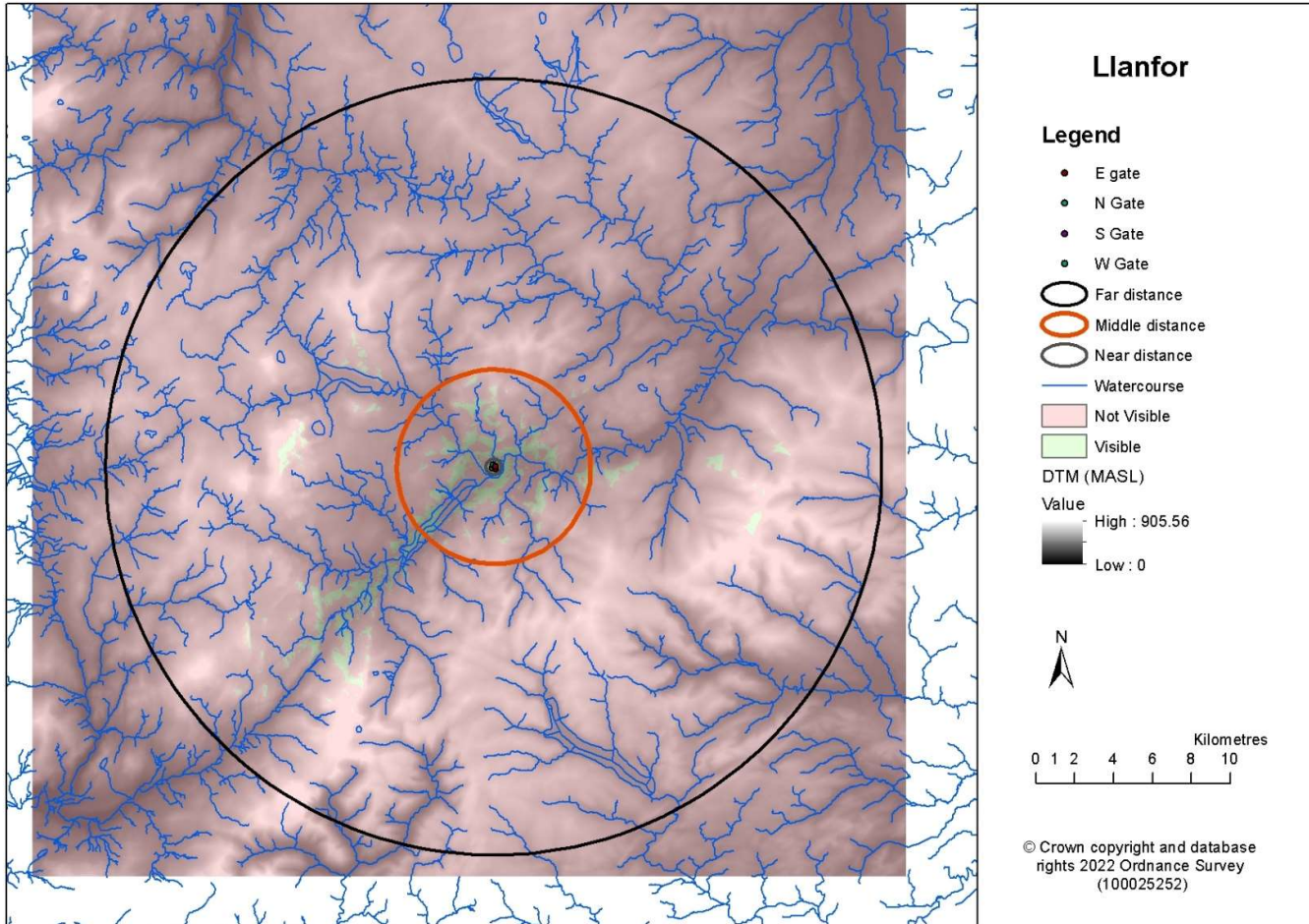


Figure 104 Llanio near distance

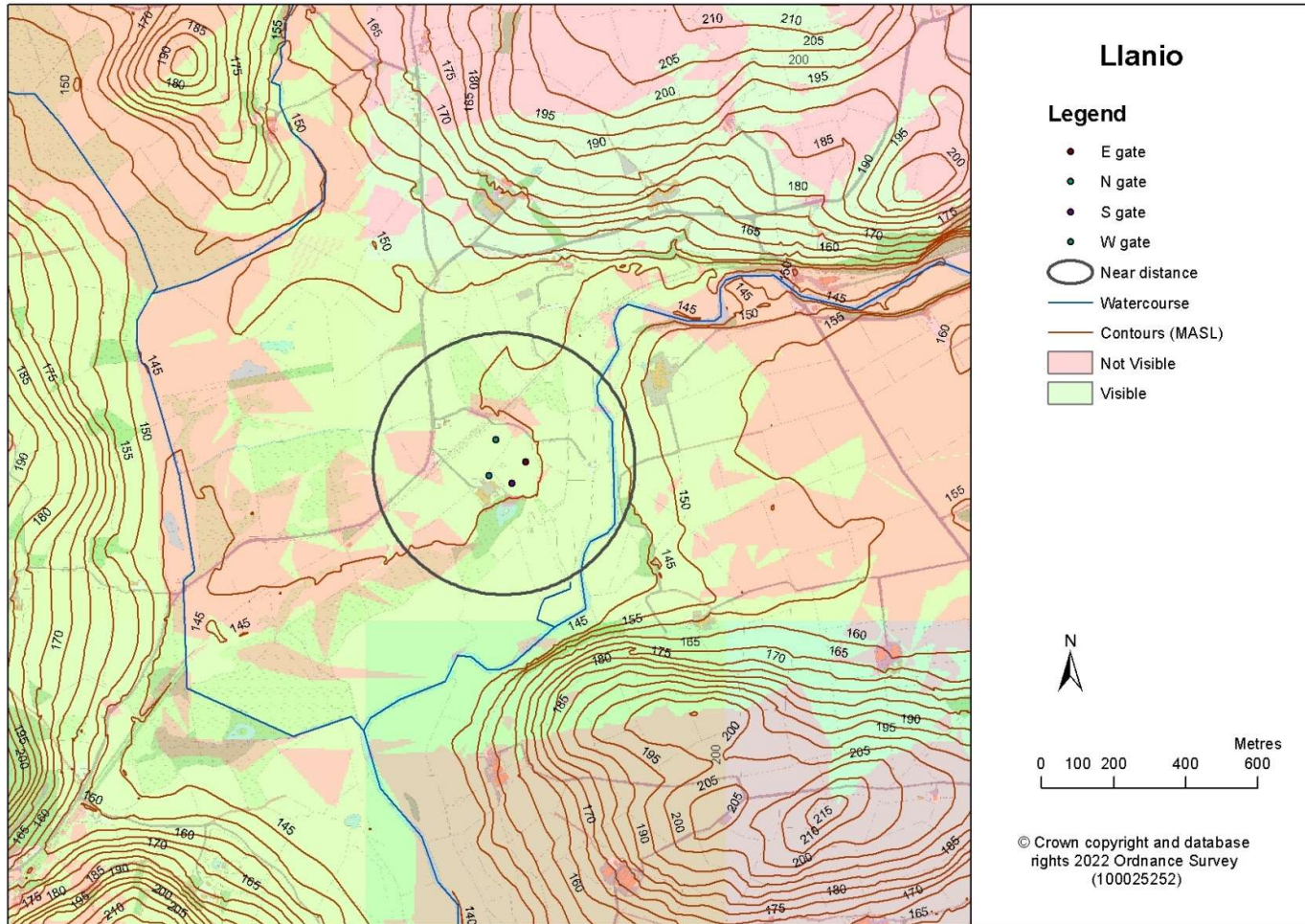


Figure 105 Llanio middle distance

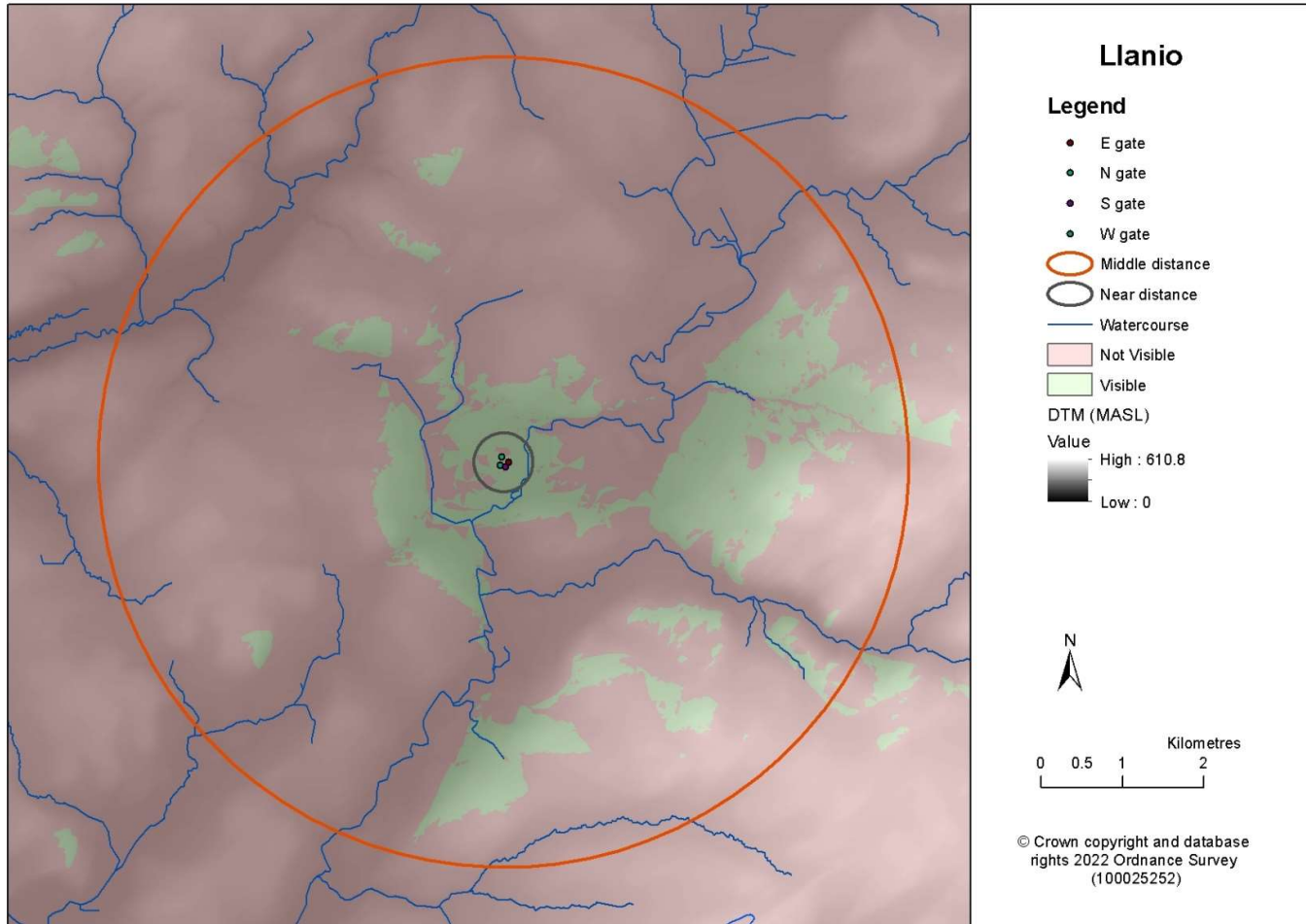


Figure 106 Llanio far distance

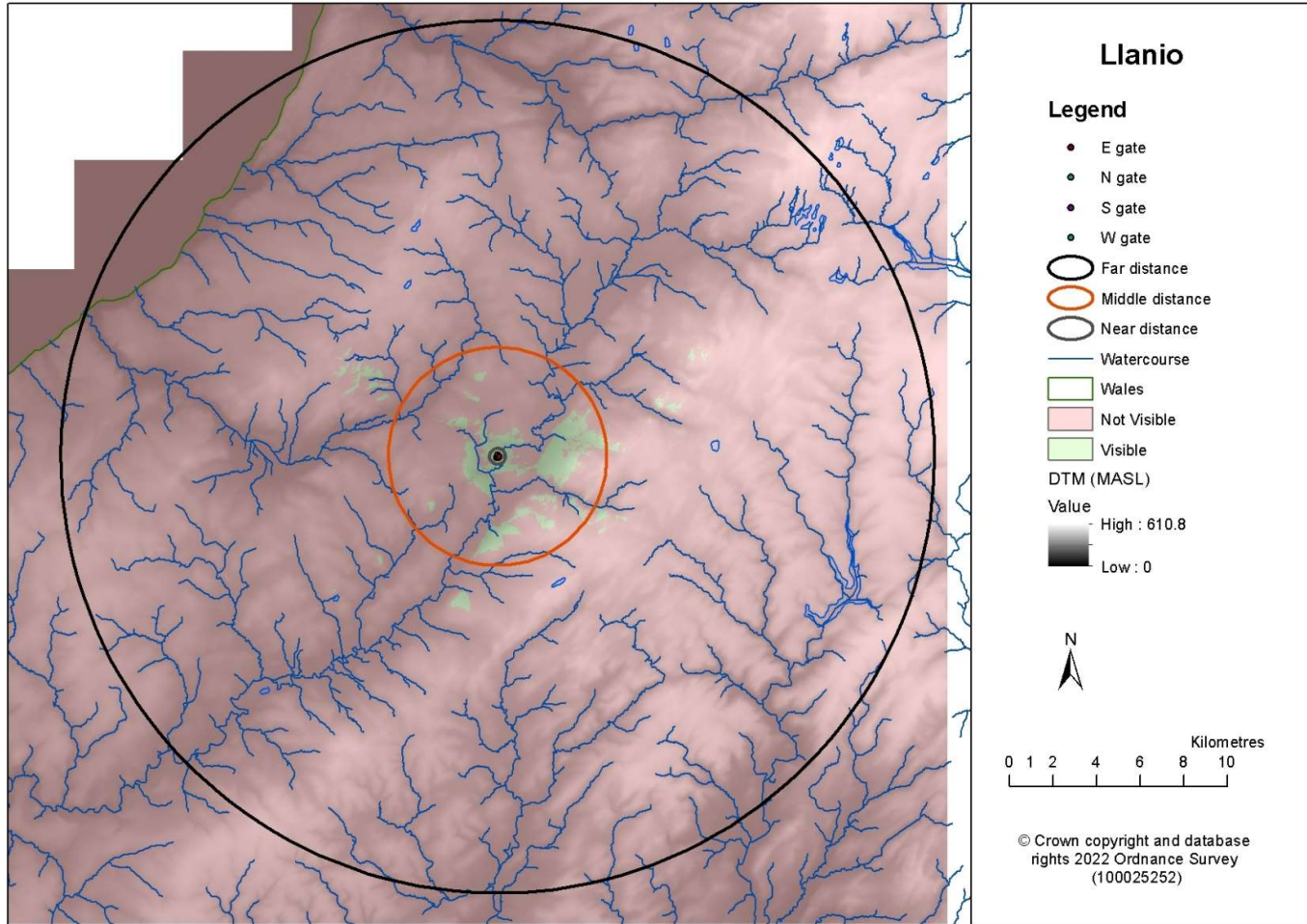


Figure 107 Loughor near distance

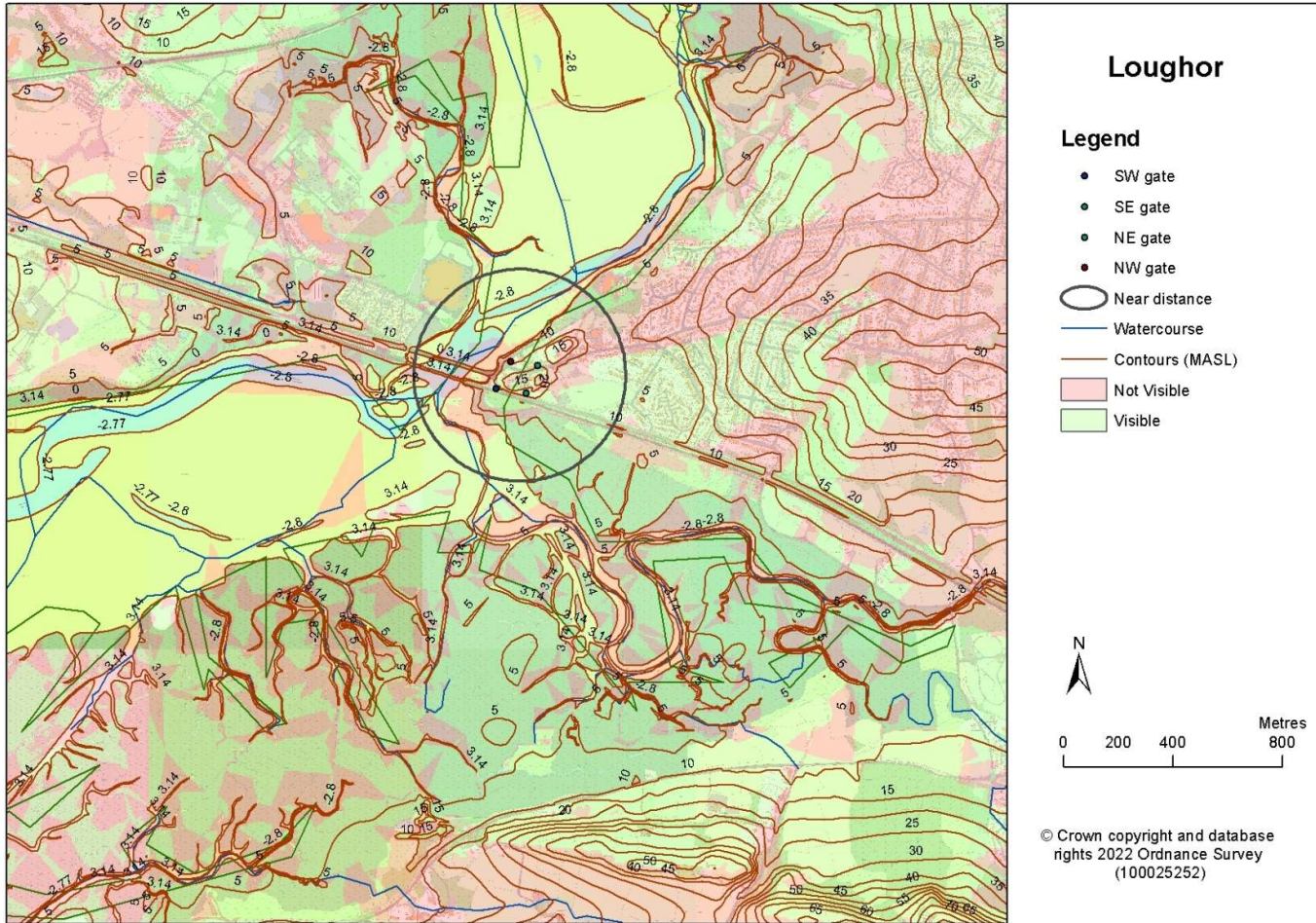


Figure 108 Loughor middle distance

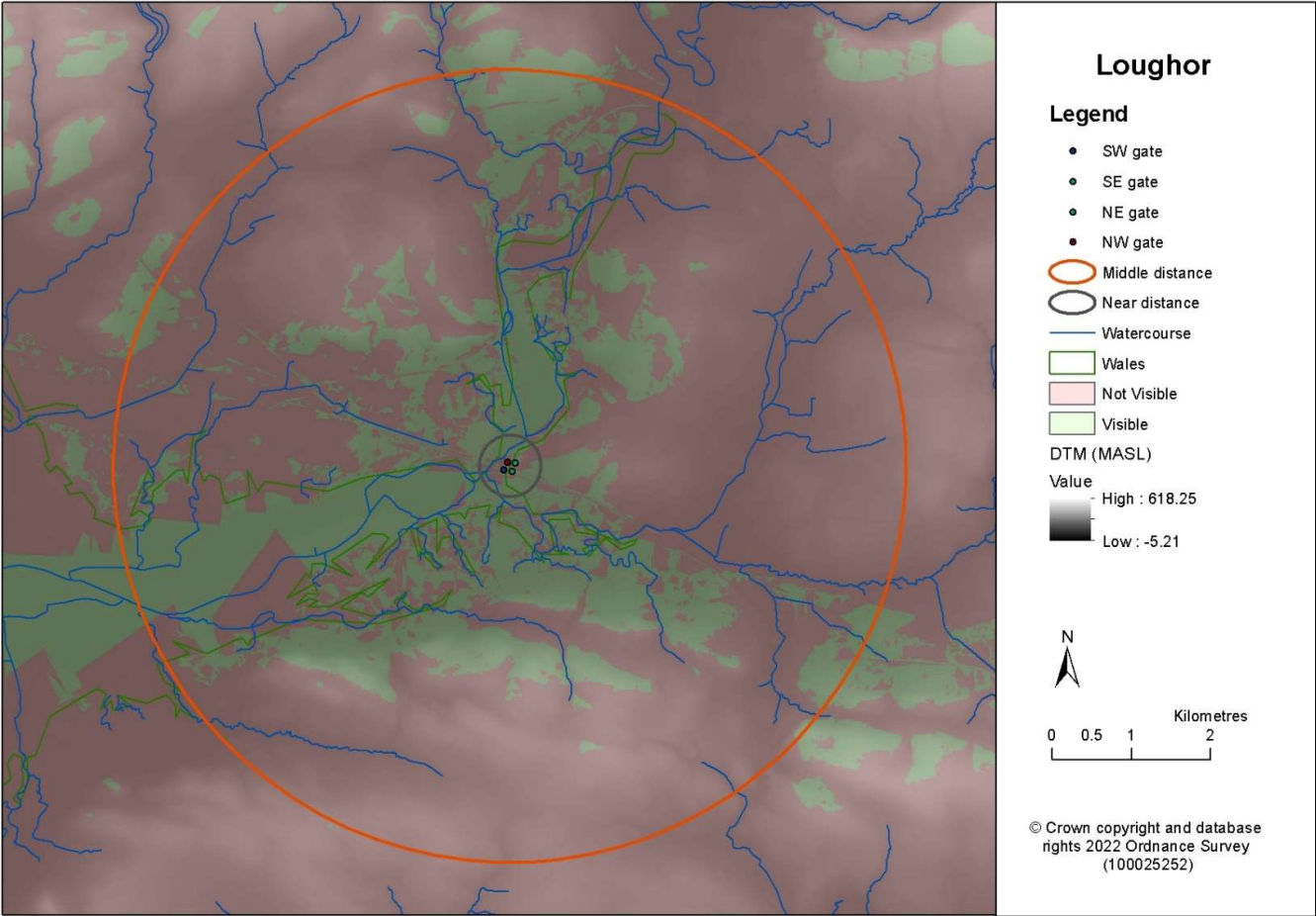


Figure 109 Loughor far distance

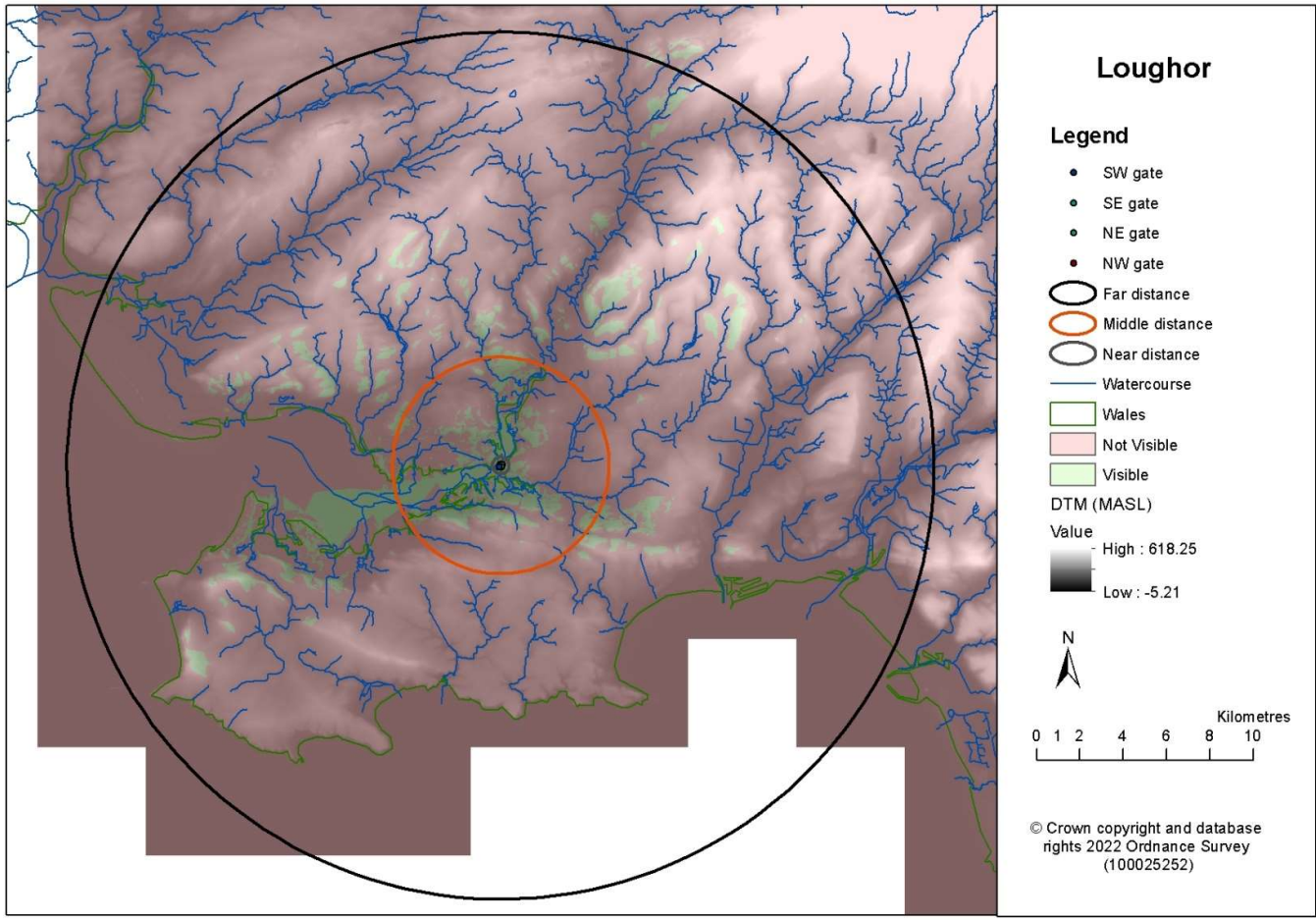


Figure 110 Monmouth near distance

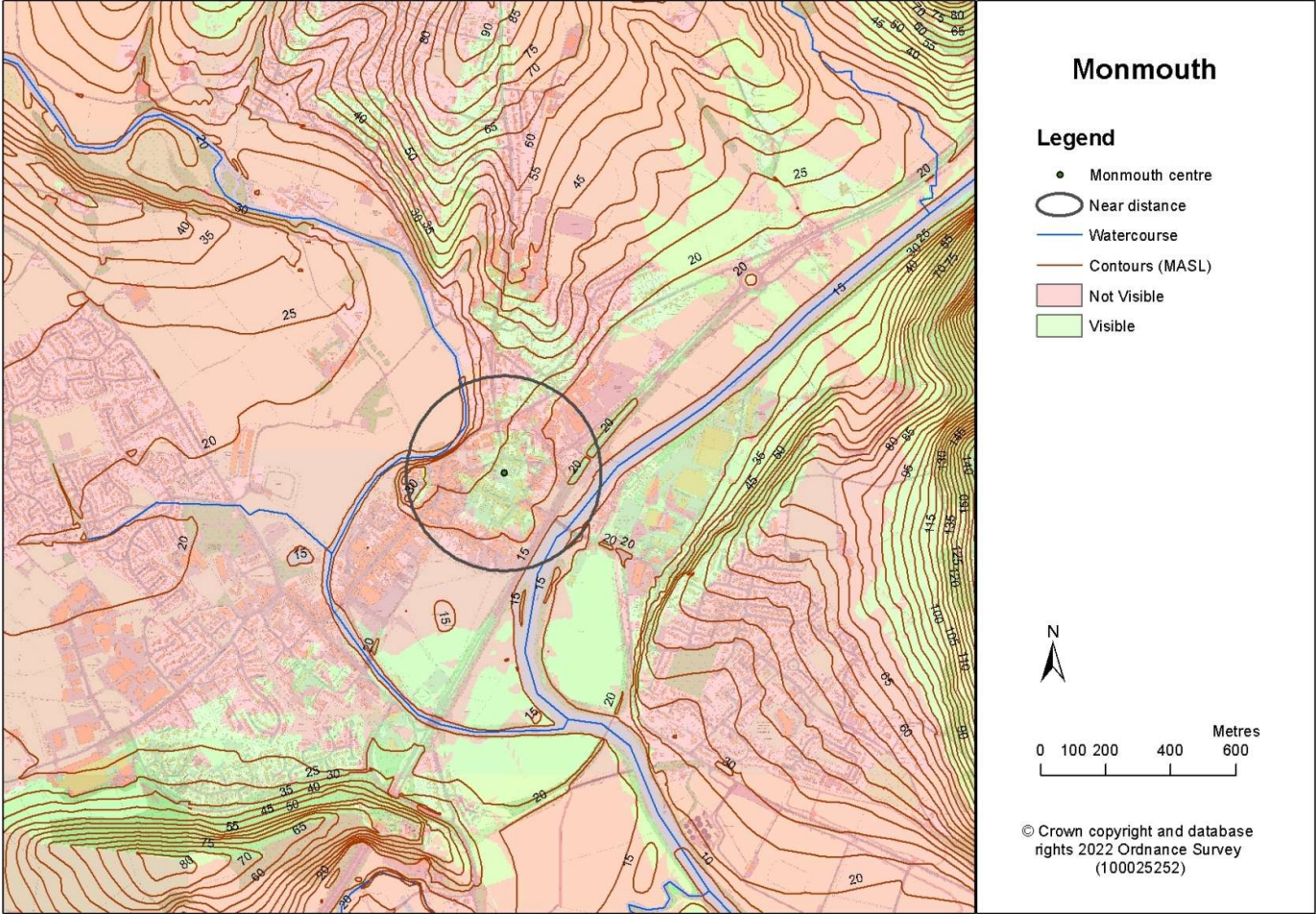


Figure 111 Monmouth middle distance

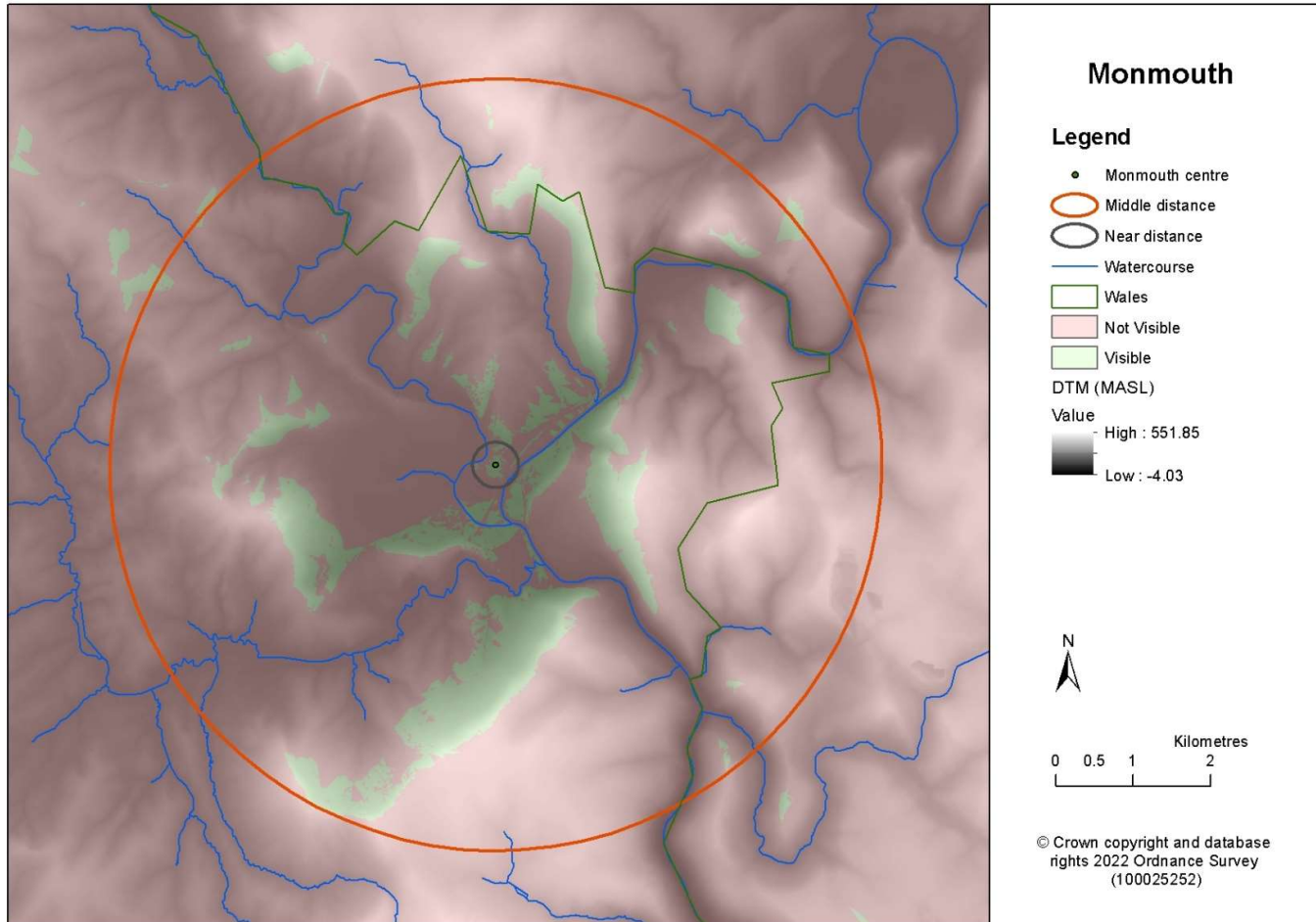


Figure 112 Monmouth far distance

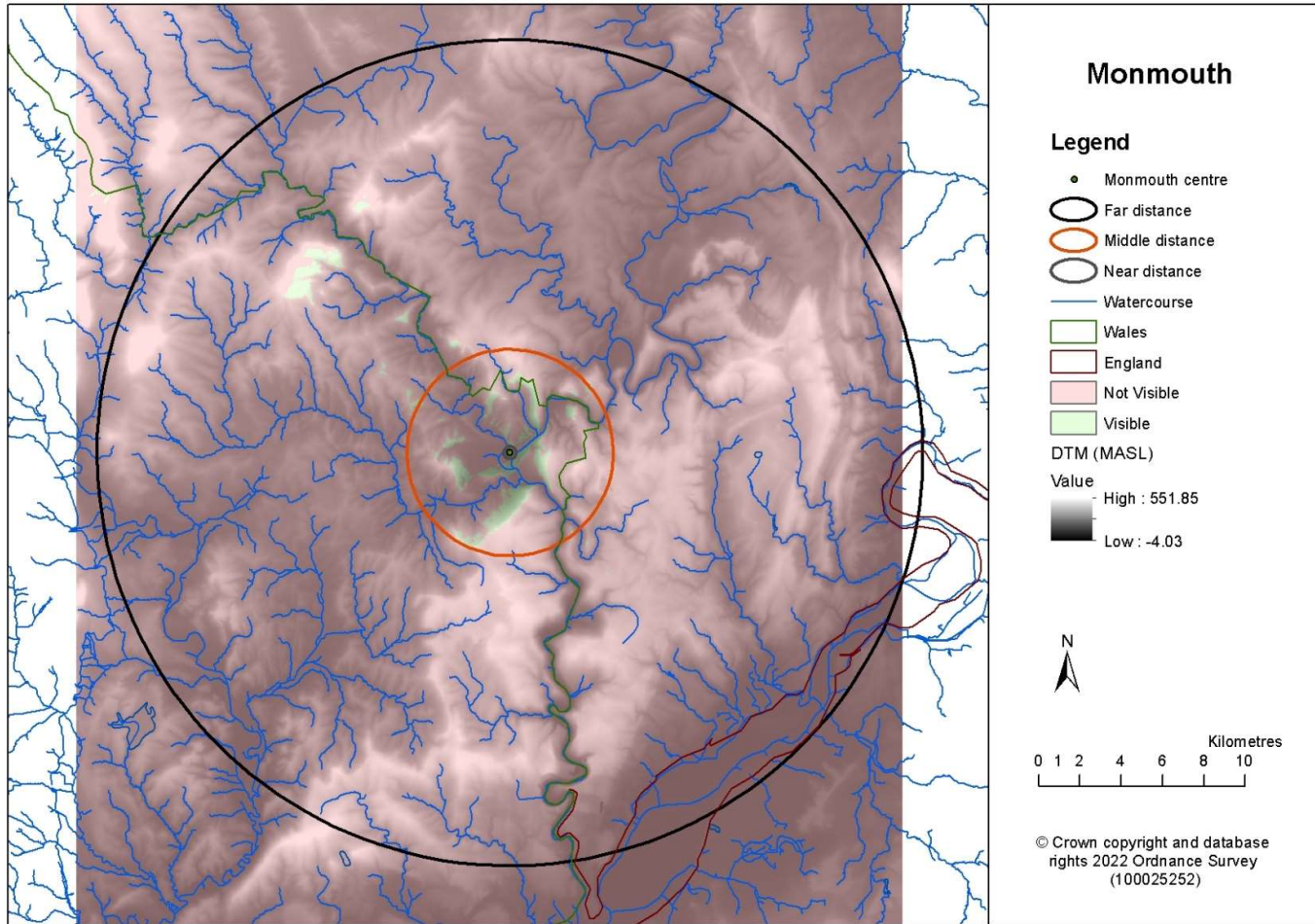


Figure 113 Neath near distance

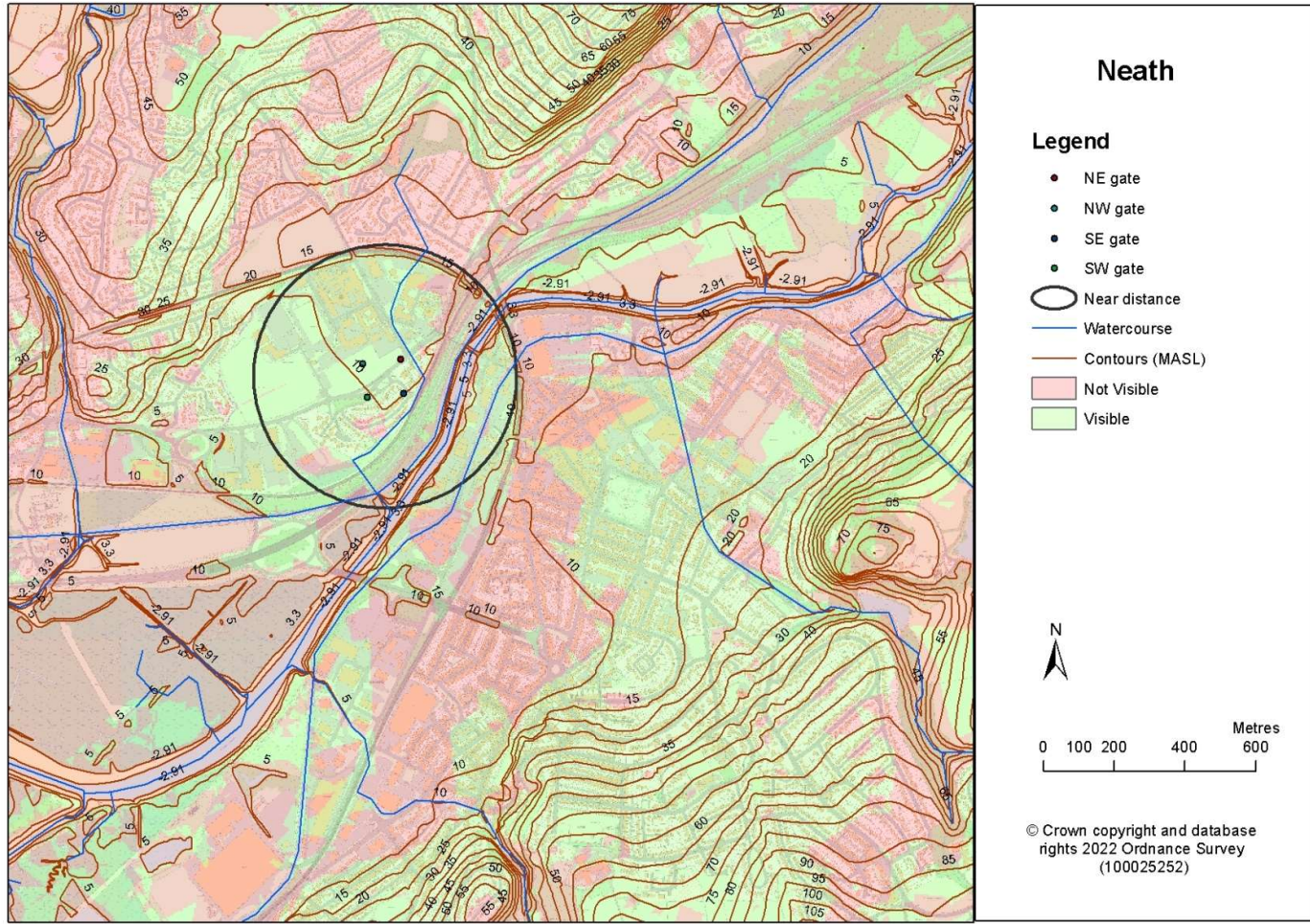


Figure 114 Neath middle distance

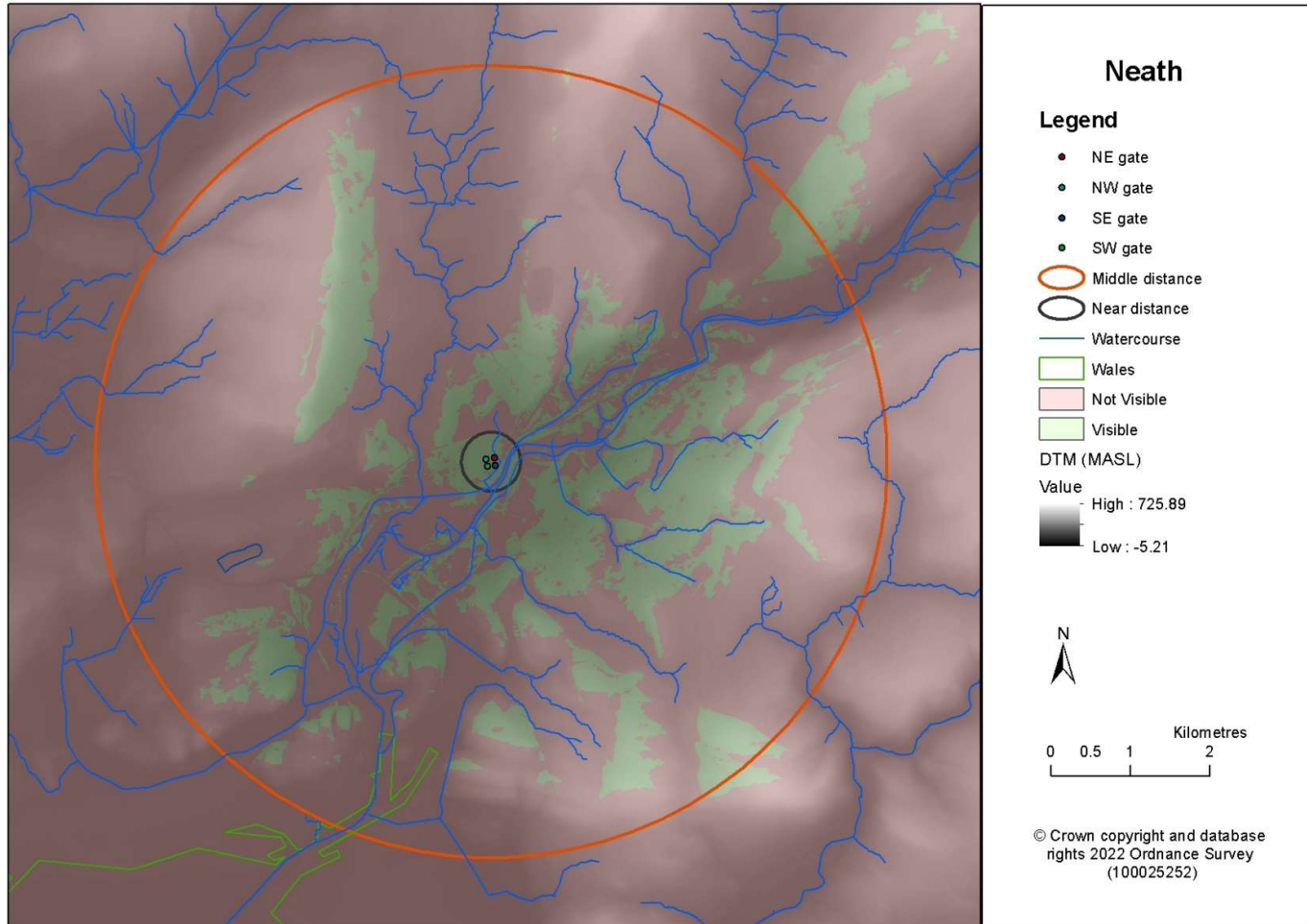


Figure 115 Neath far distance

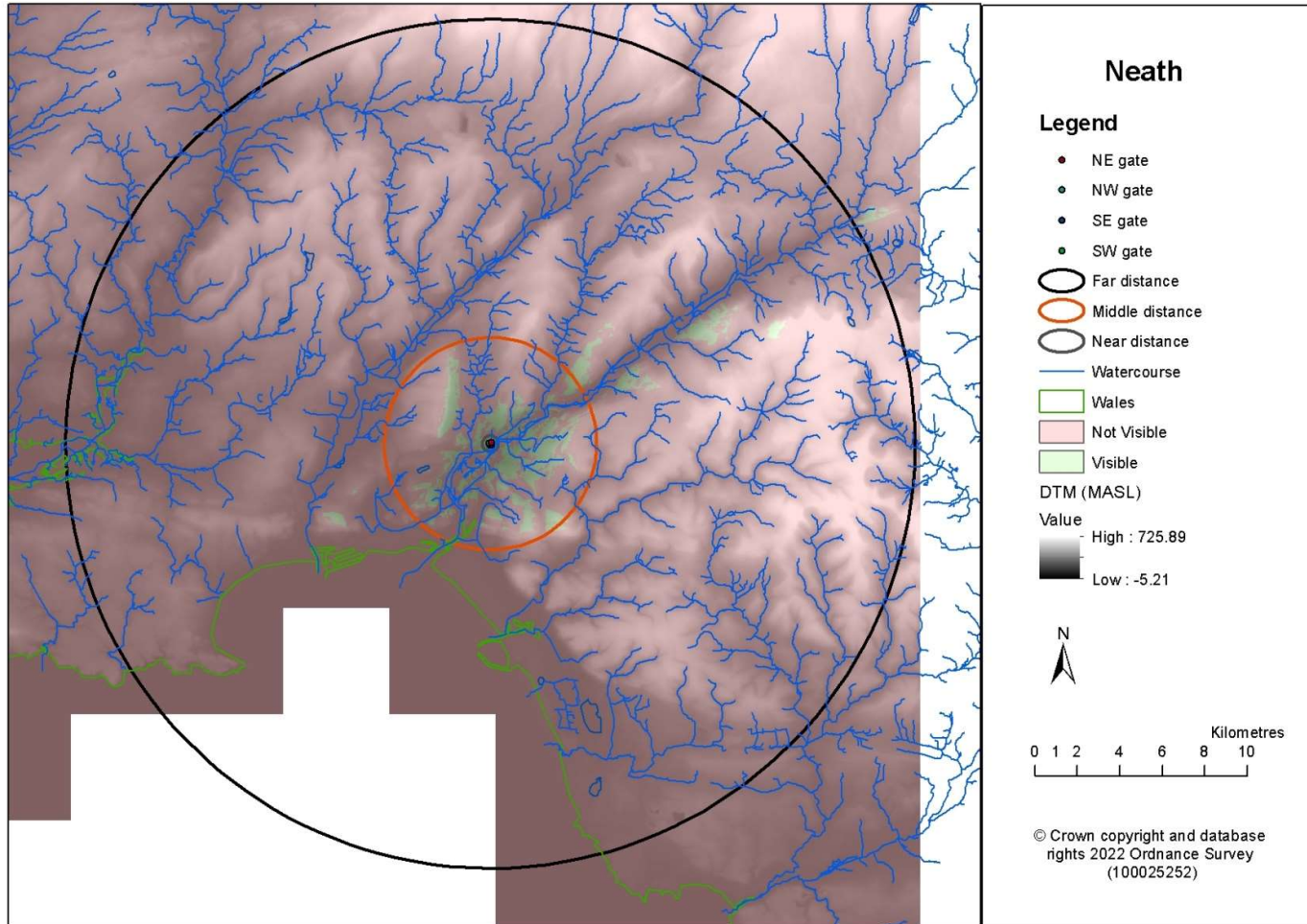


Figure 116 Pen Llwyn near distance

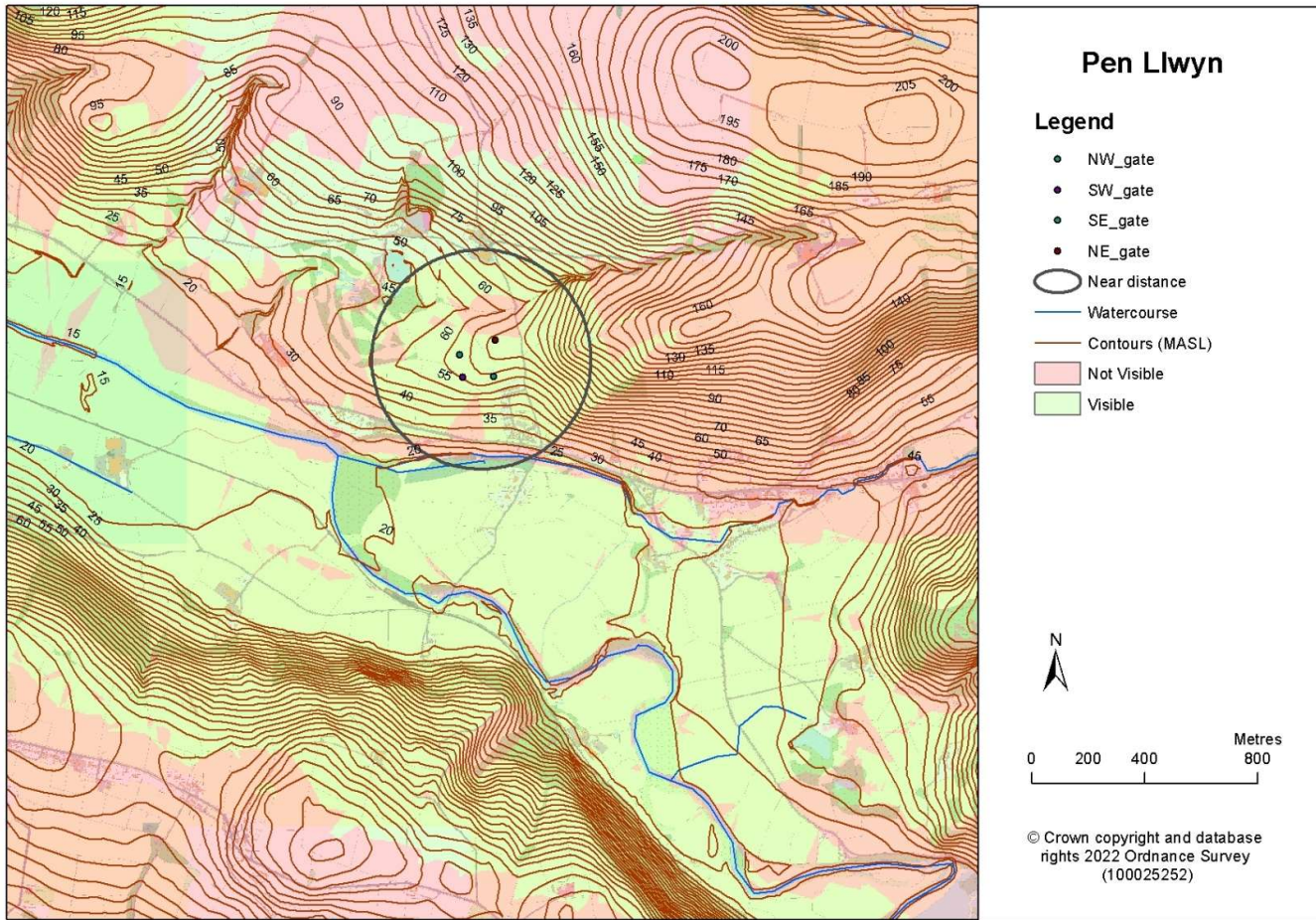


Figure 117 Pen Llwyn middle distance

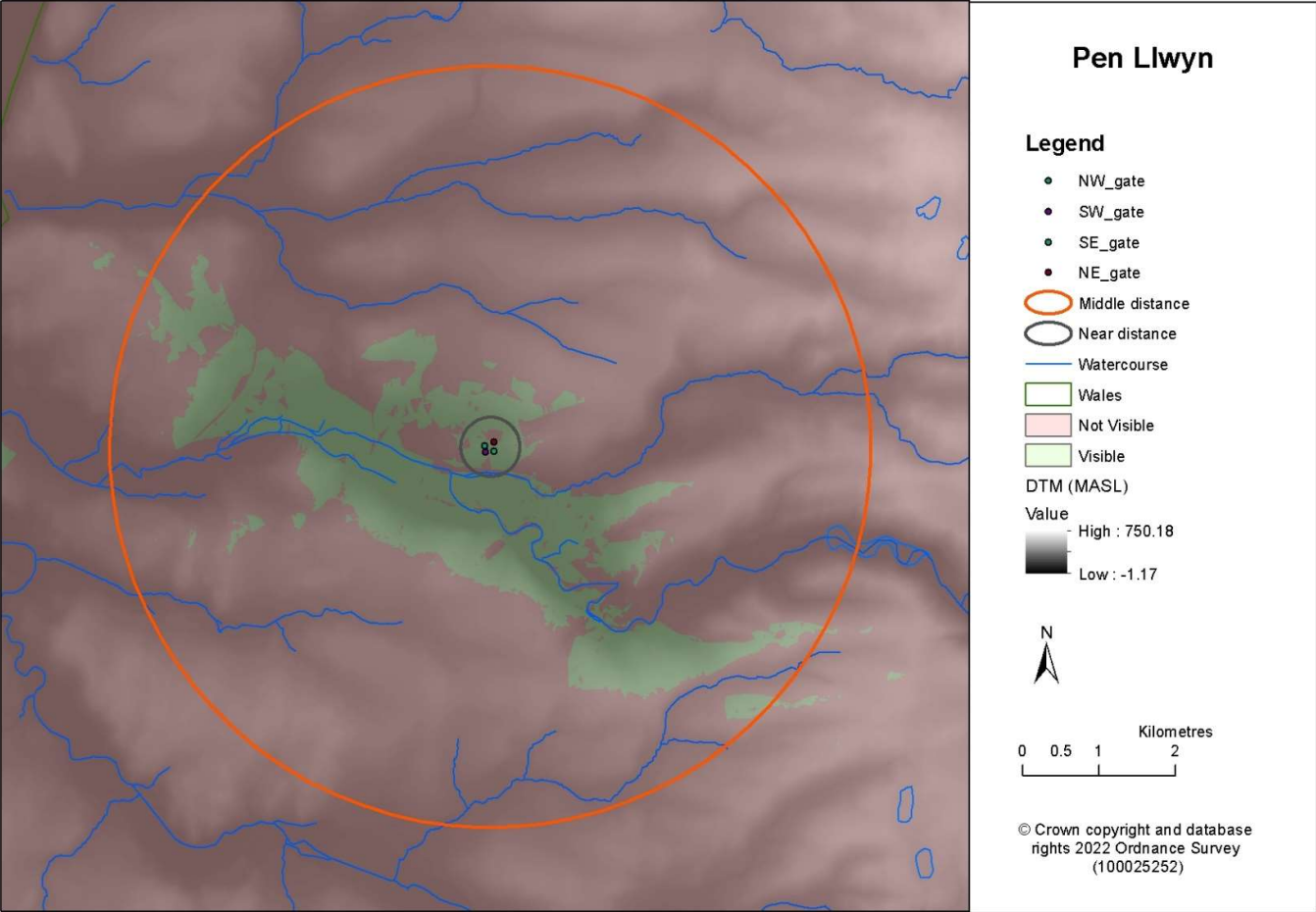


Figure 118 Pen Llwyn far distance

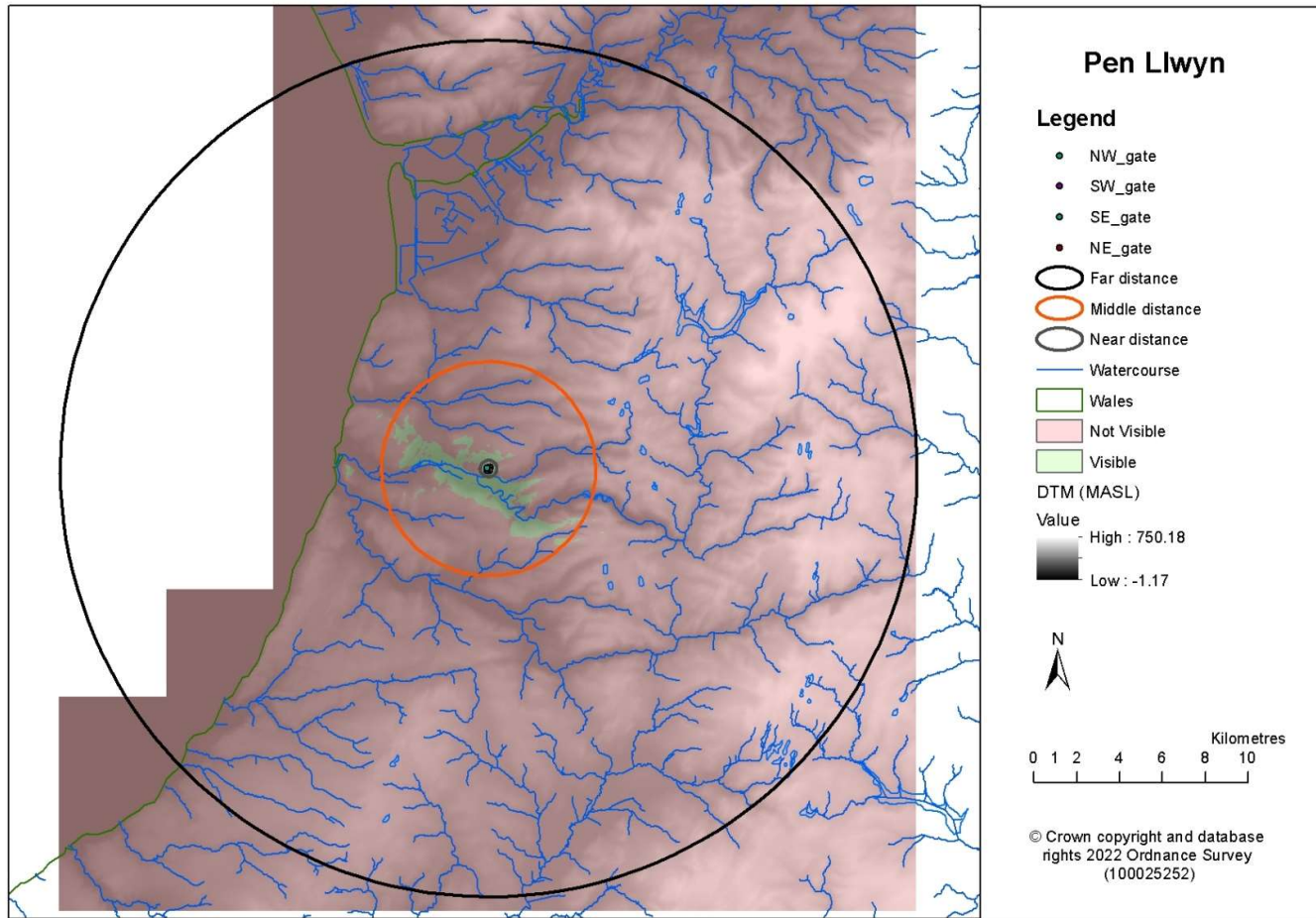


Figure 119 Pen Llystyn near distance

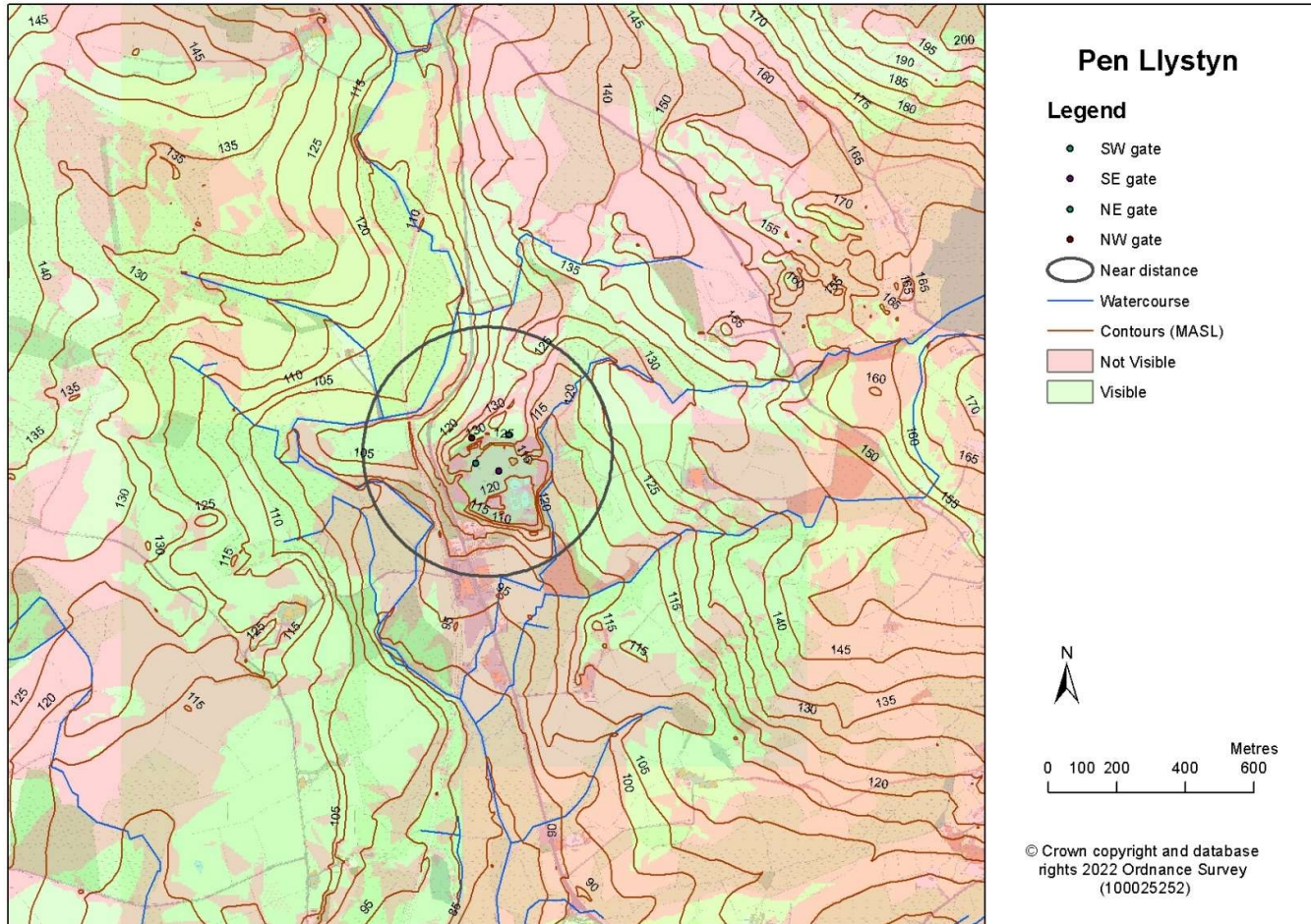


Figure 120 Pen Llystyn middle distance

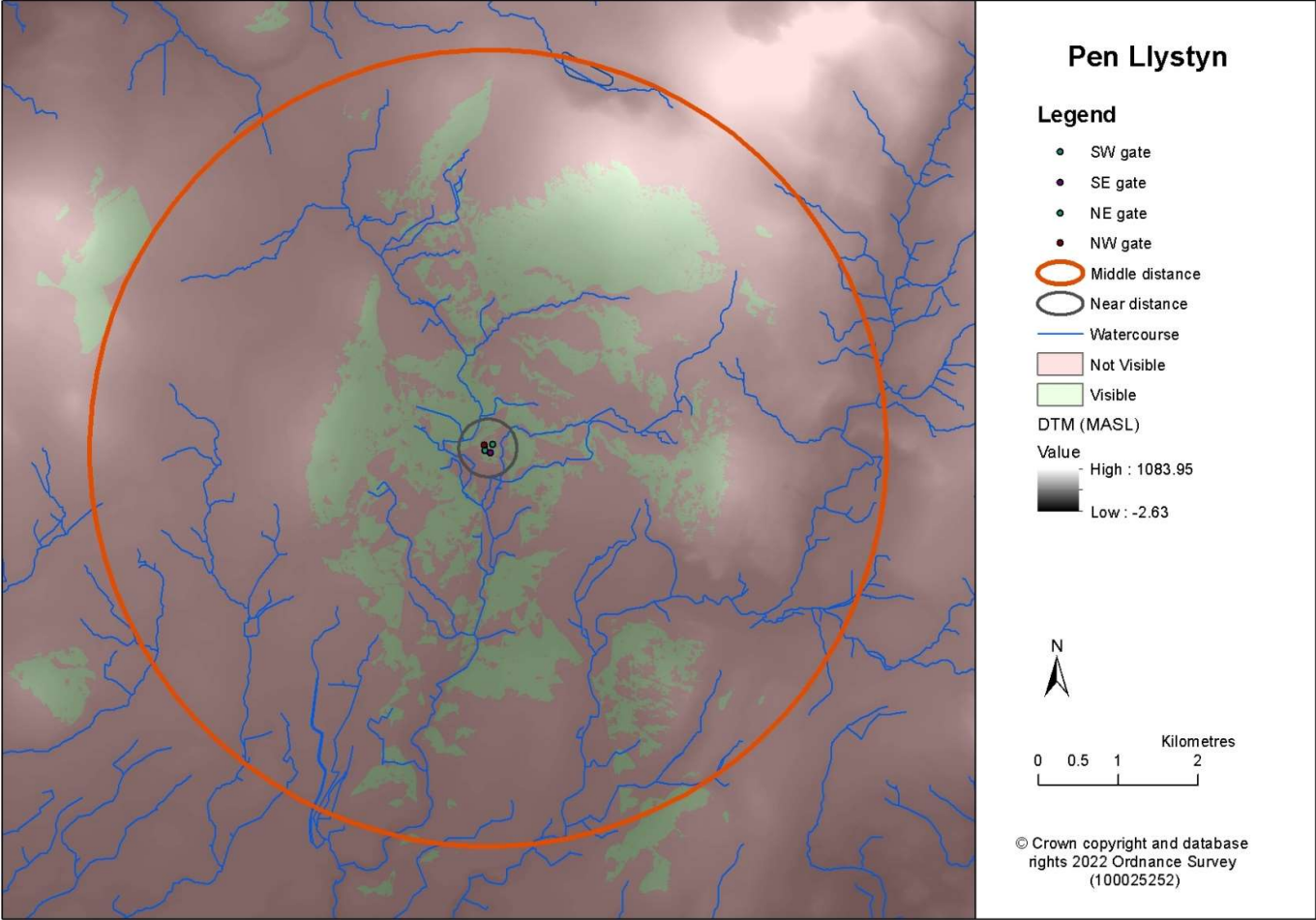


Figure 121 Pen Llystyn far distance

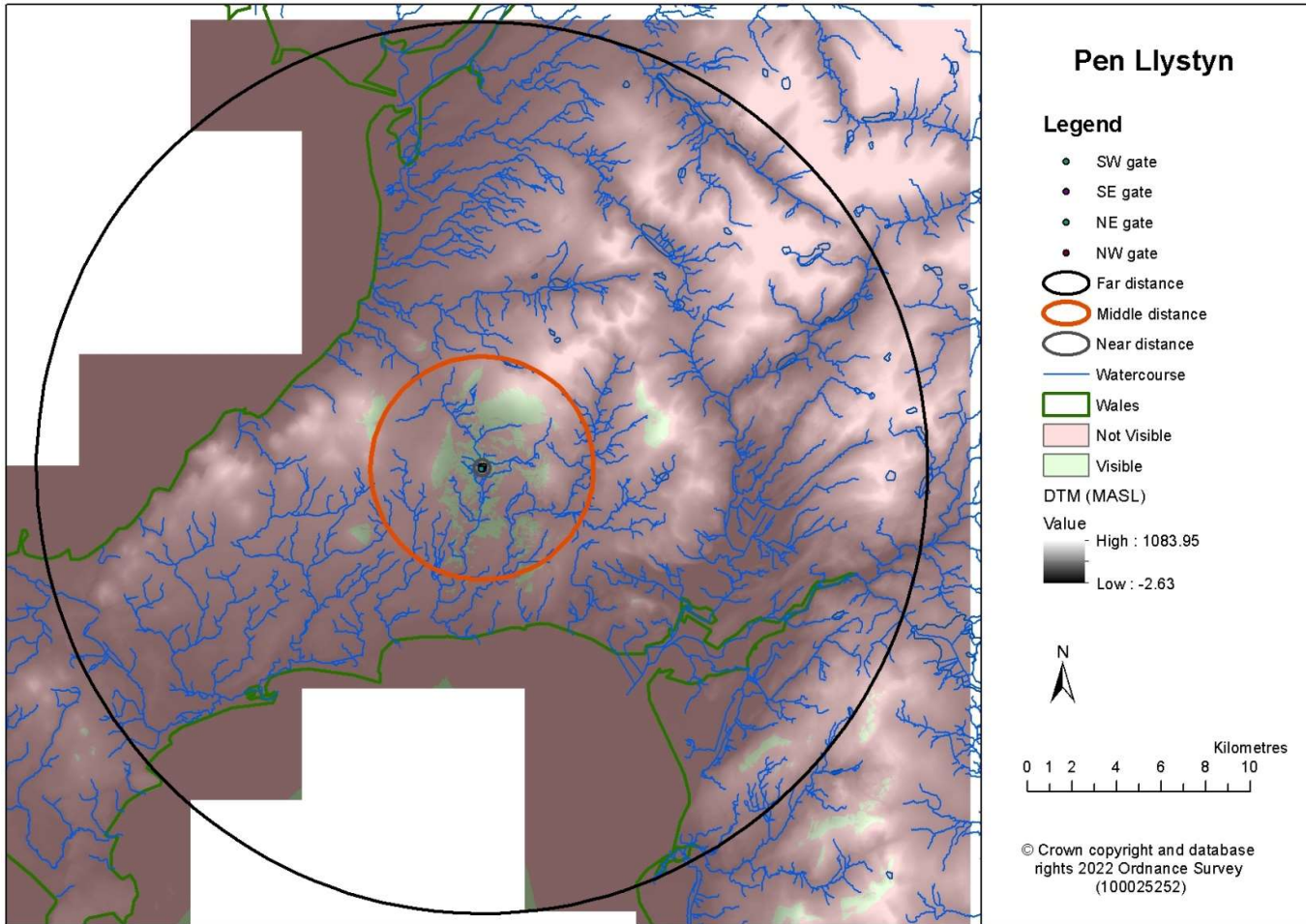


Figure 122 Pennal/Cefn Caer near distance

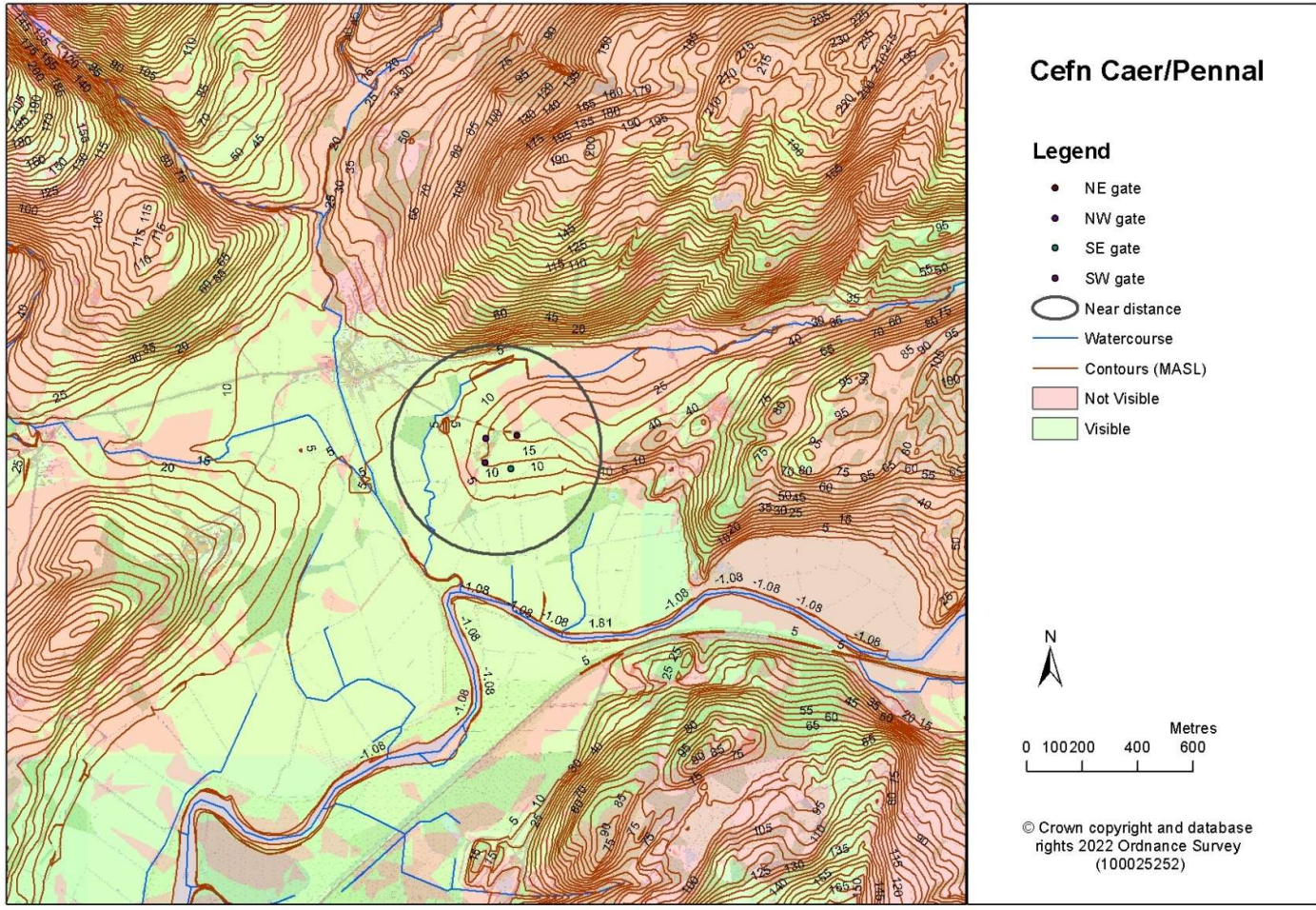


Figure 123 Pennal/Cefn Caer middle distance

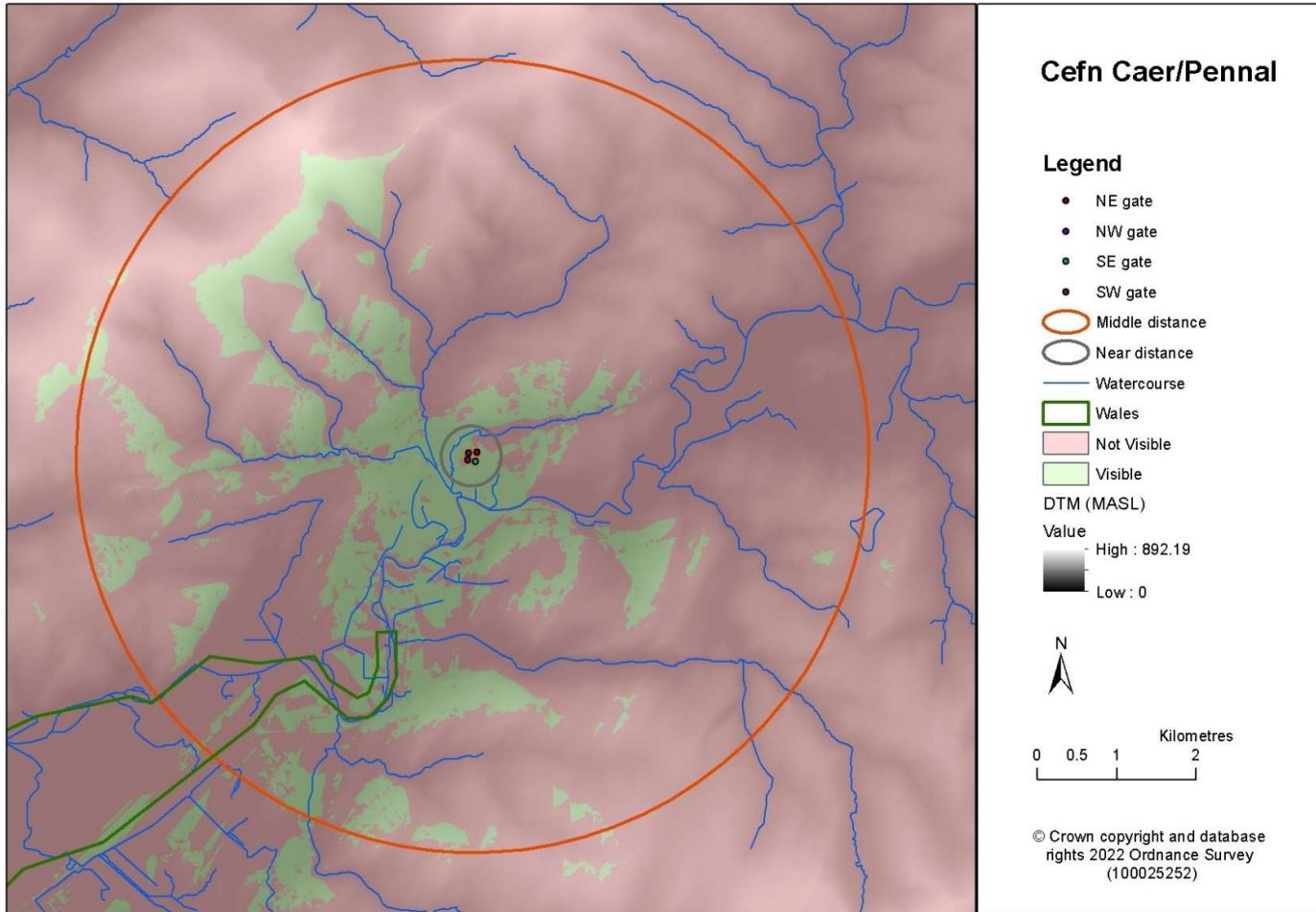


Figure 124 Pennal/Cefn Caer far distance

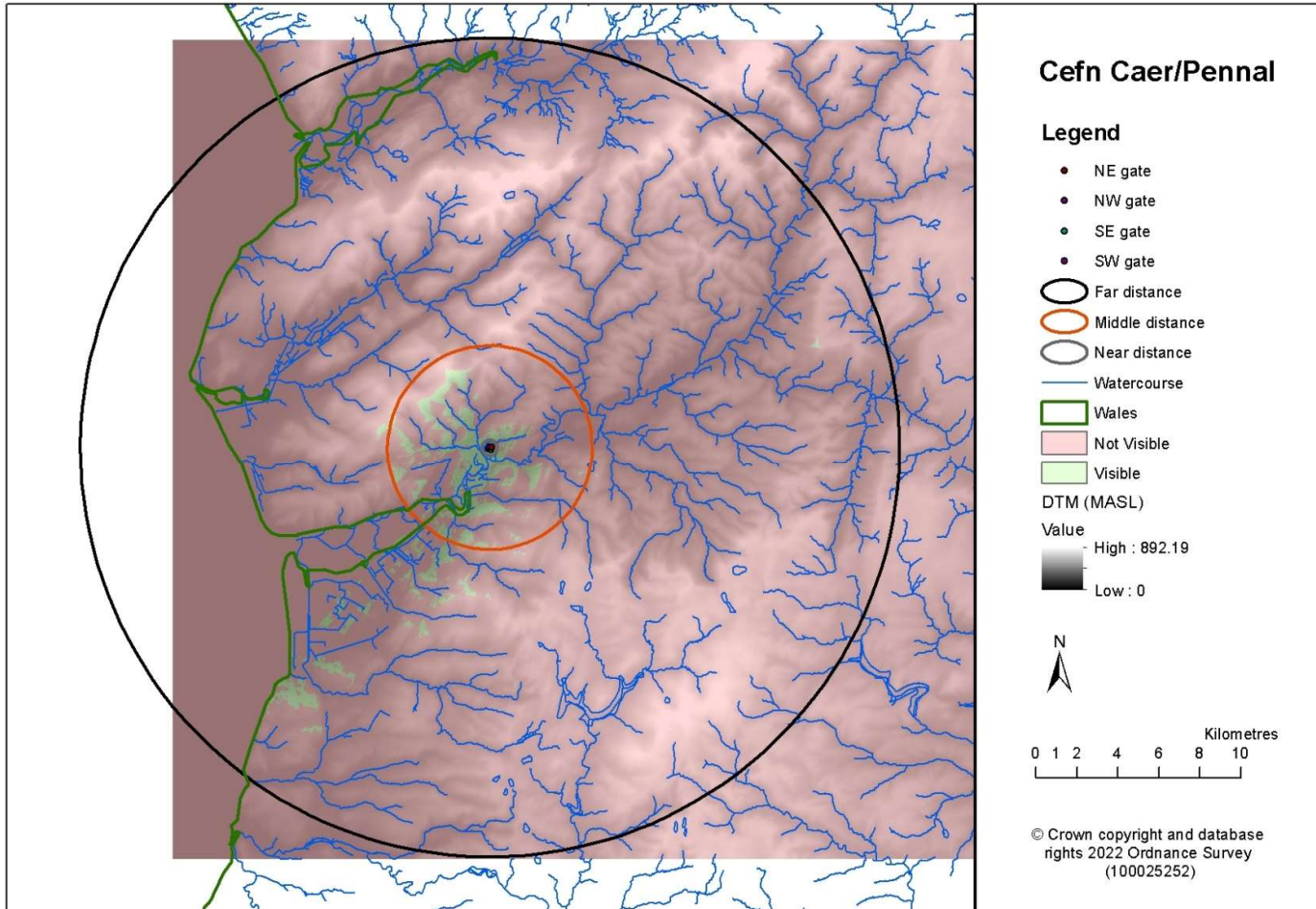


Figure 125 Penydarren near distance

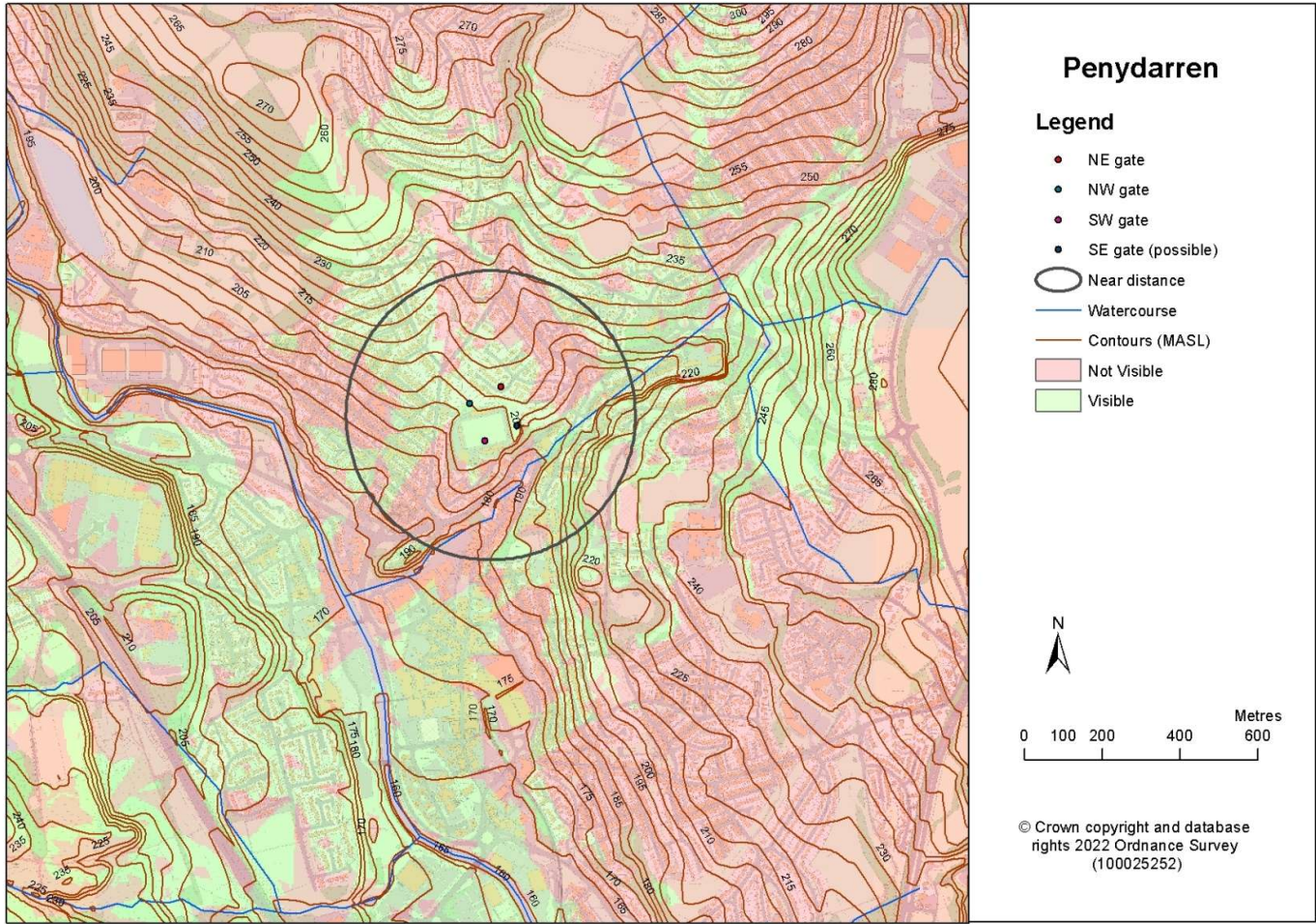


Figure 126 Penydarren middle distance

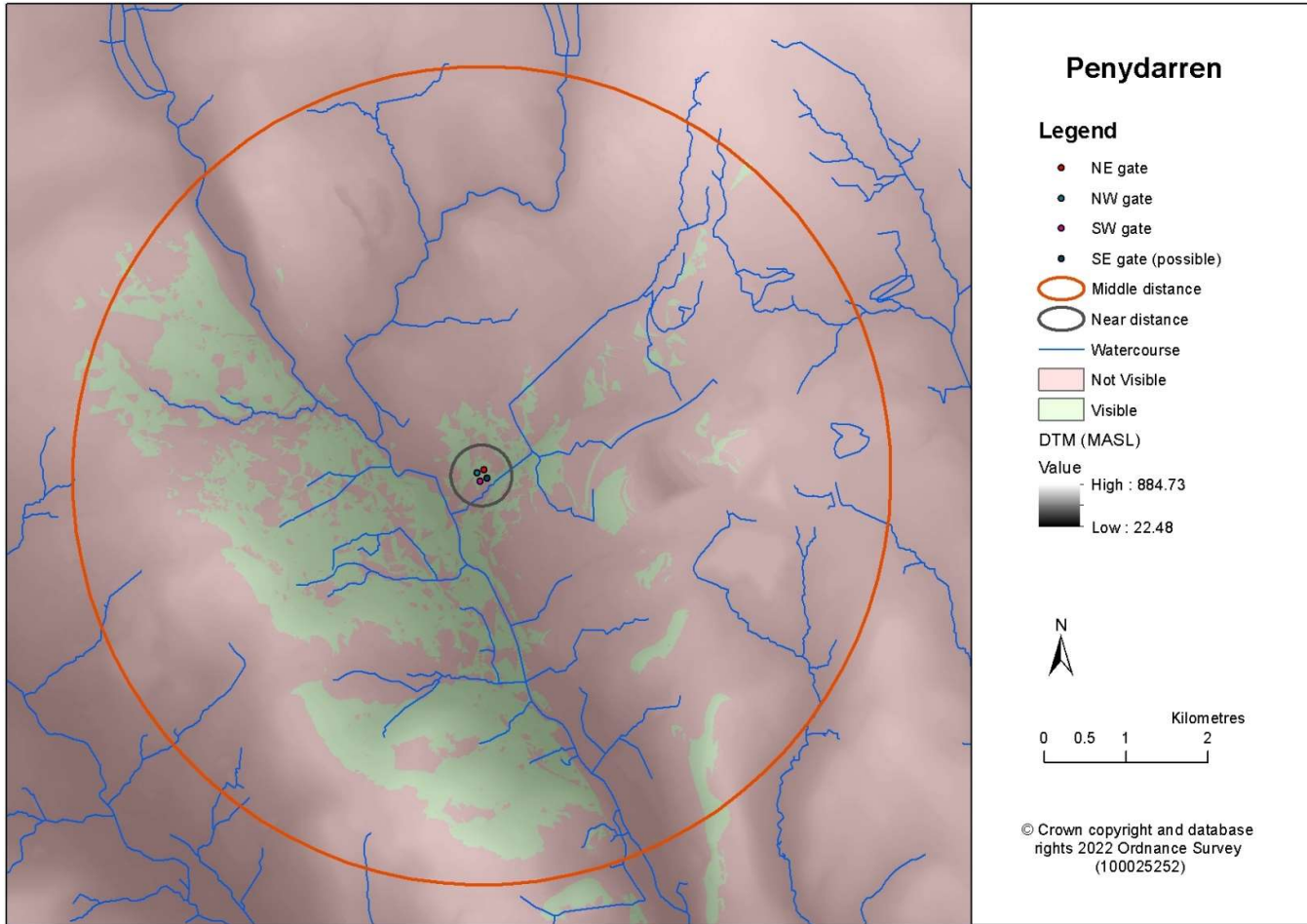


Figure 127 Penydarren far distance

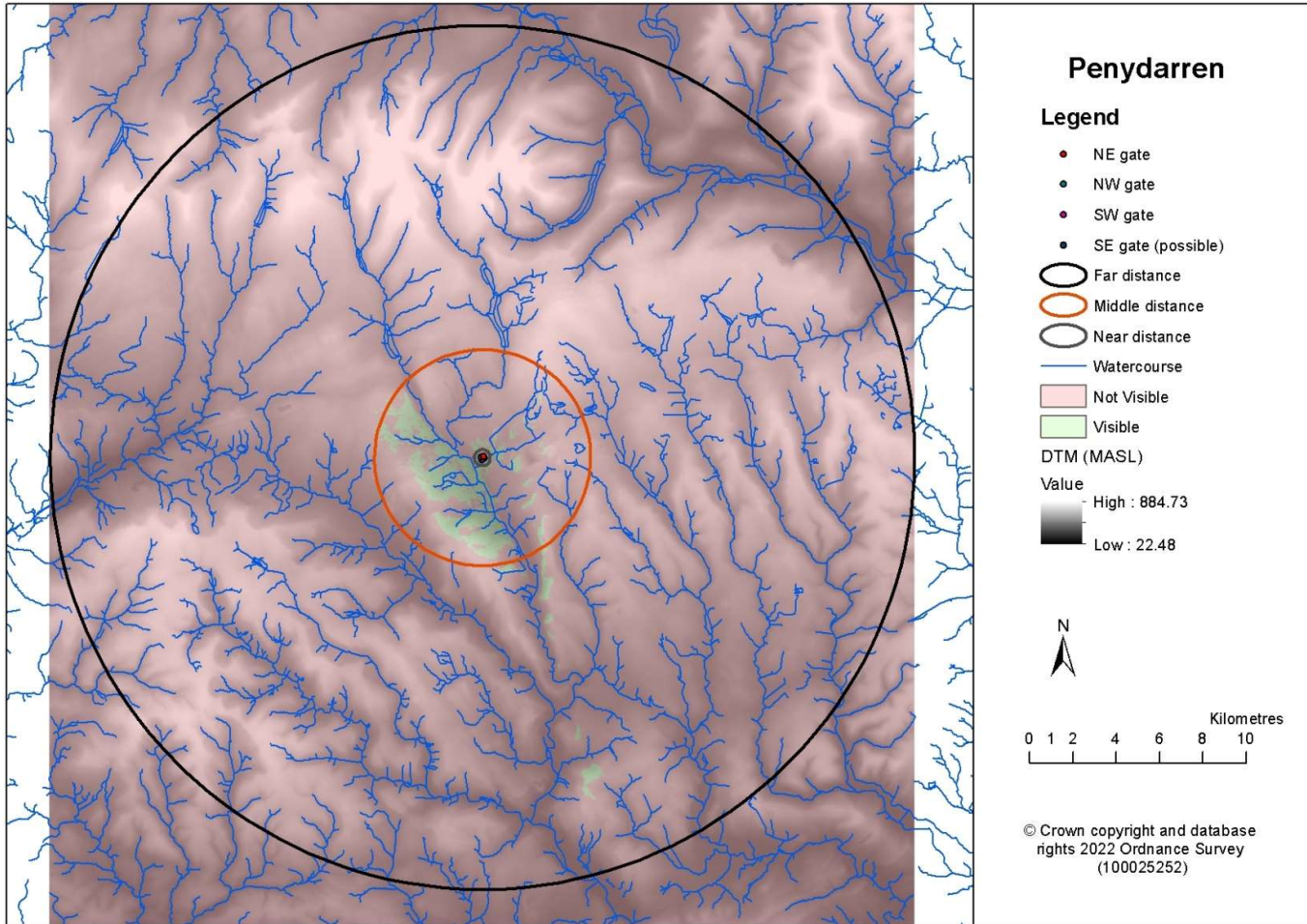


Figure 128 Pumsaint near distance

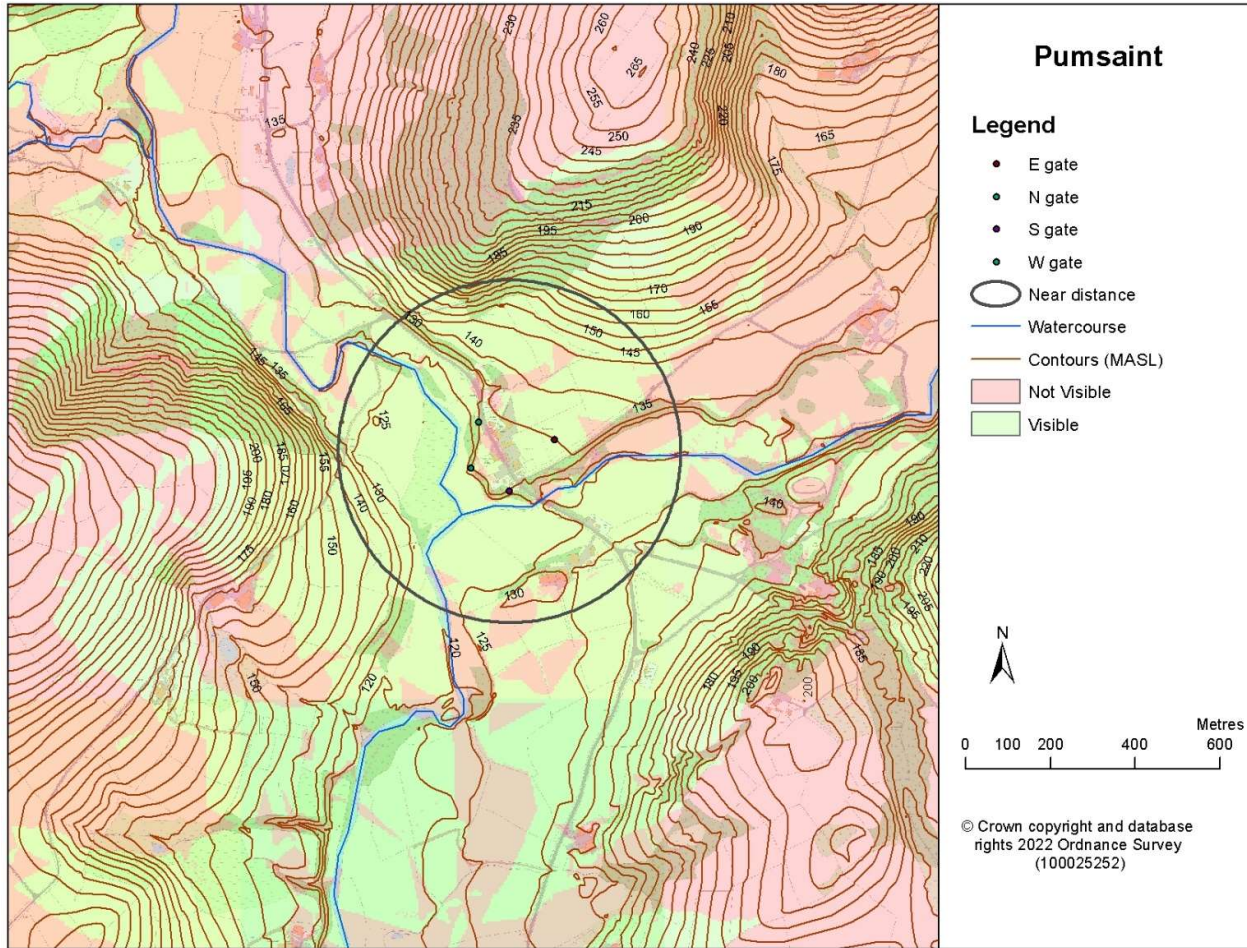


Figure 129 Pumsaint middle distance

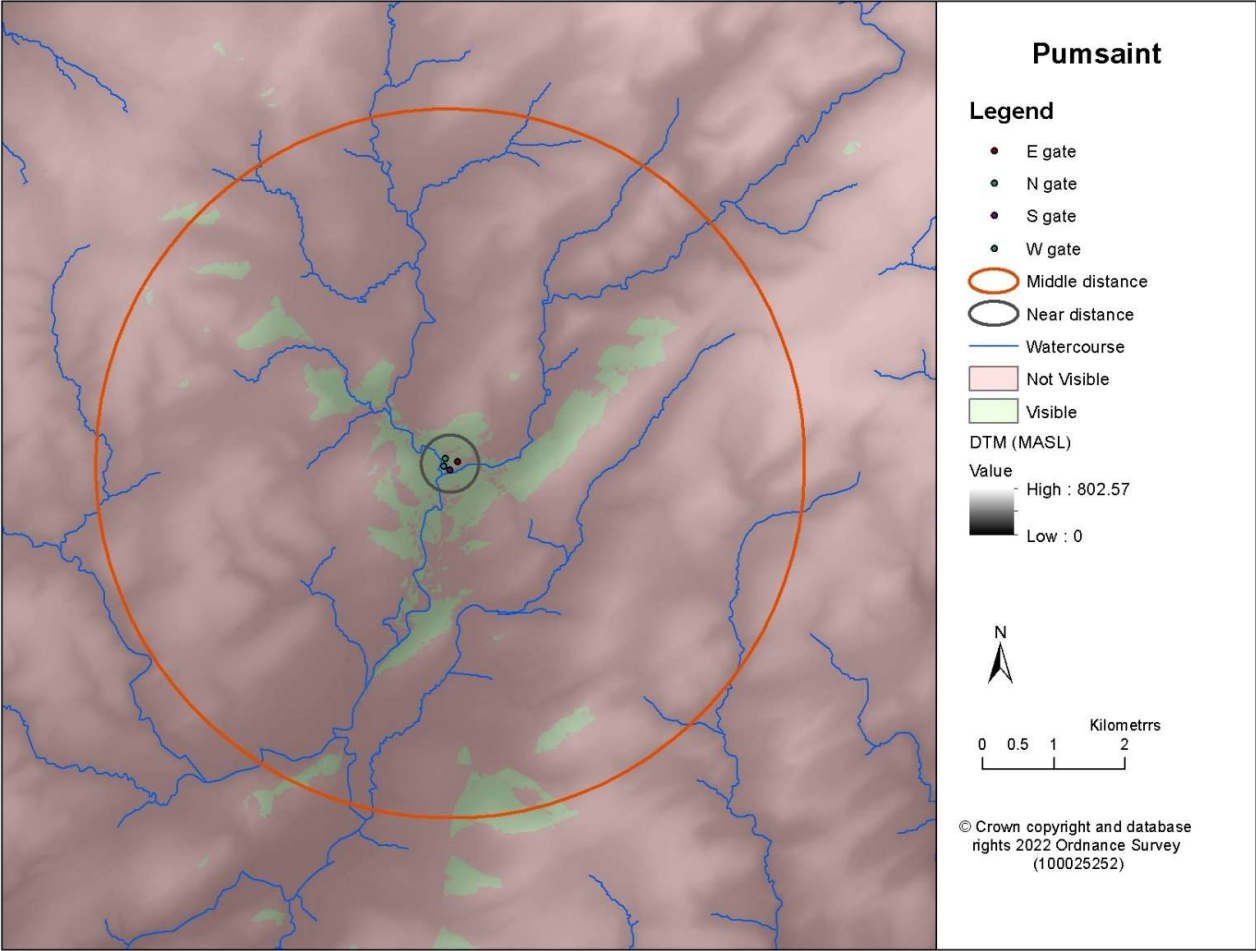


Figure 130 Pumsaint far distance

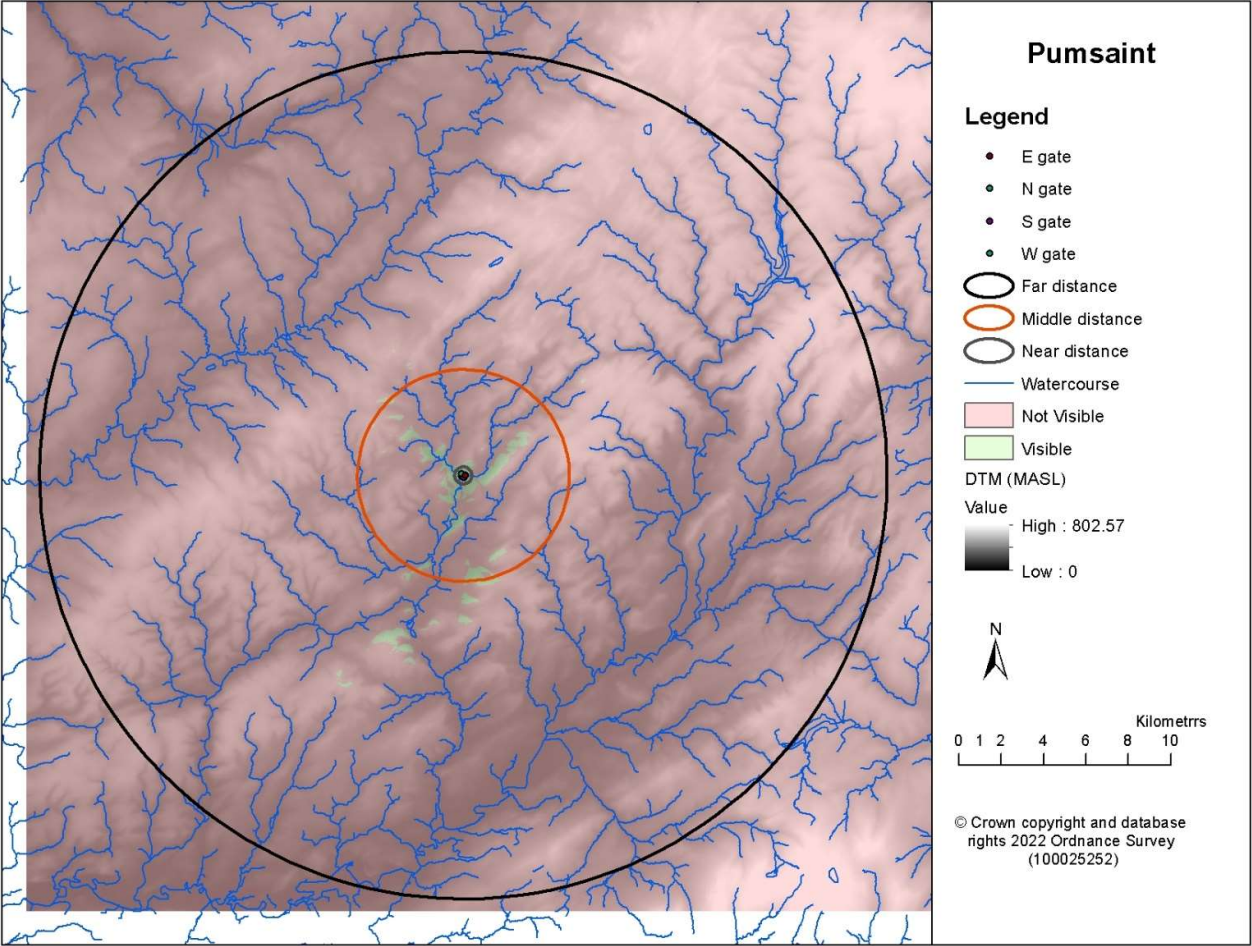


Figure 131 Rhyn Park near distance

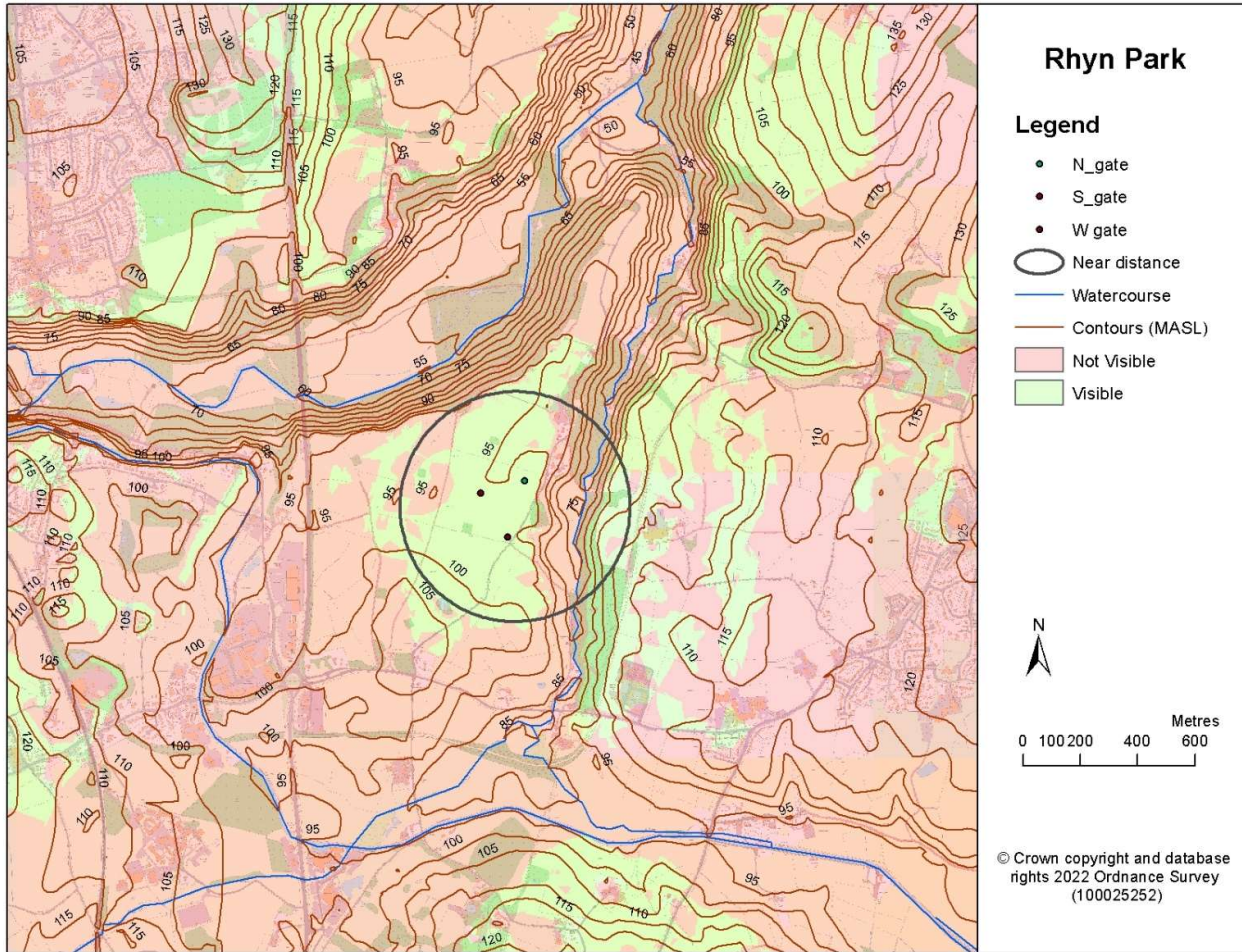


Figure 132 Rhyn Park middle distance

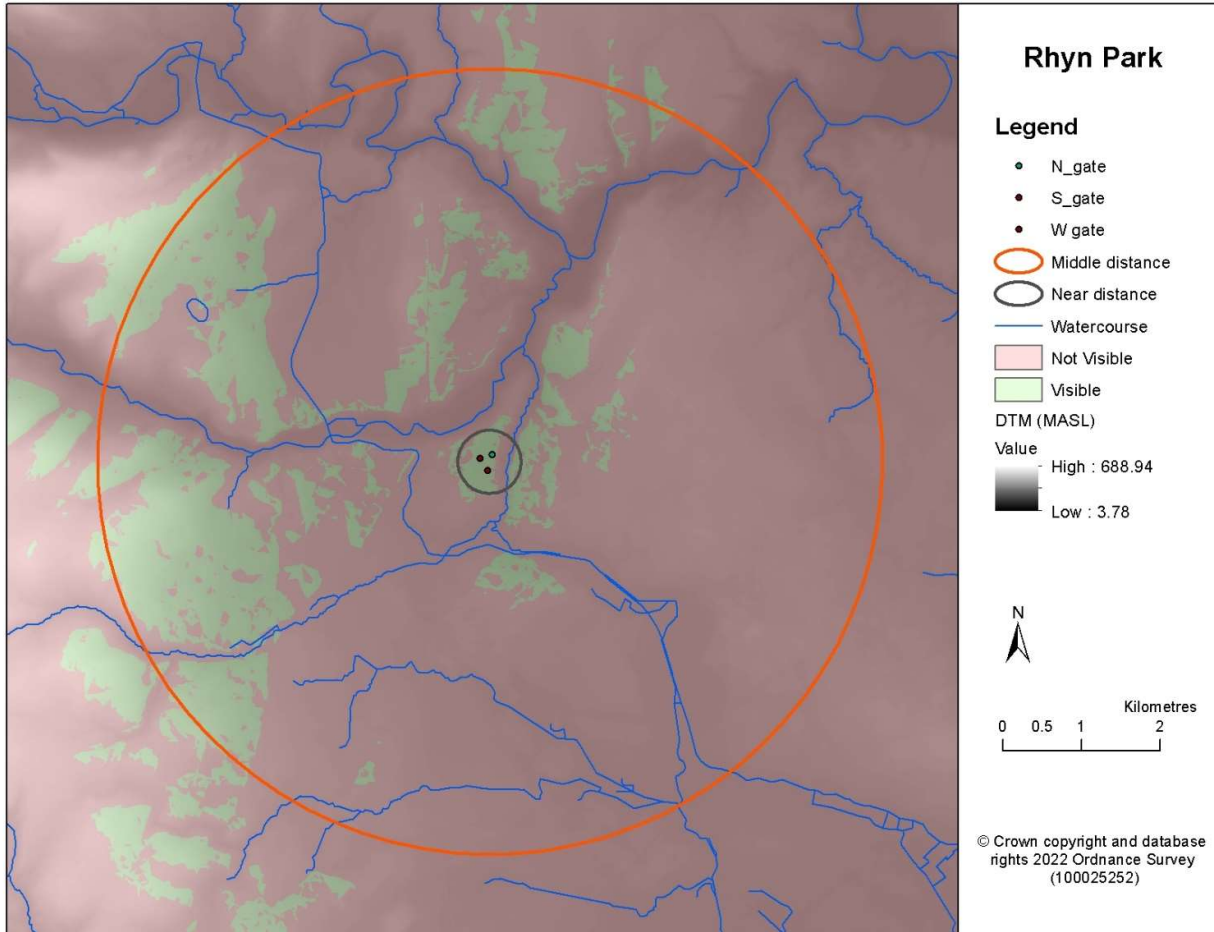


Figure 133 Rhyn Park far distance

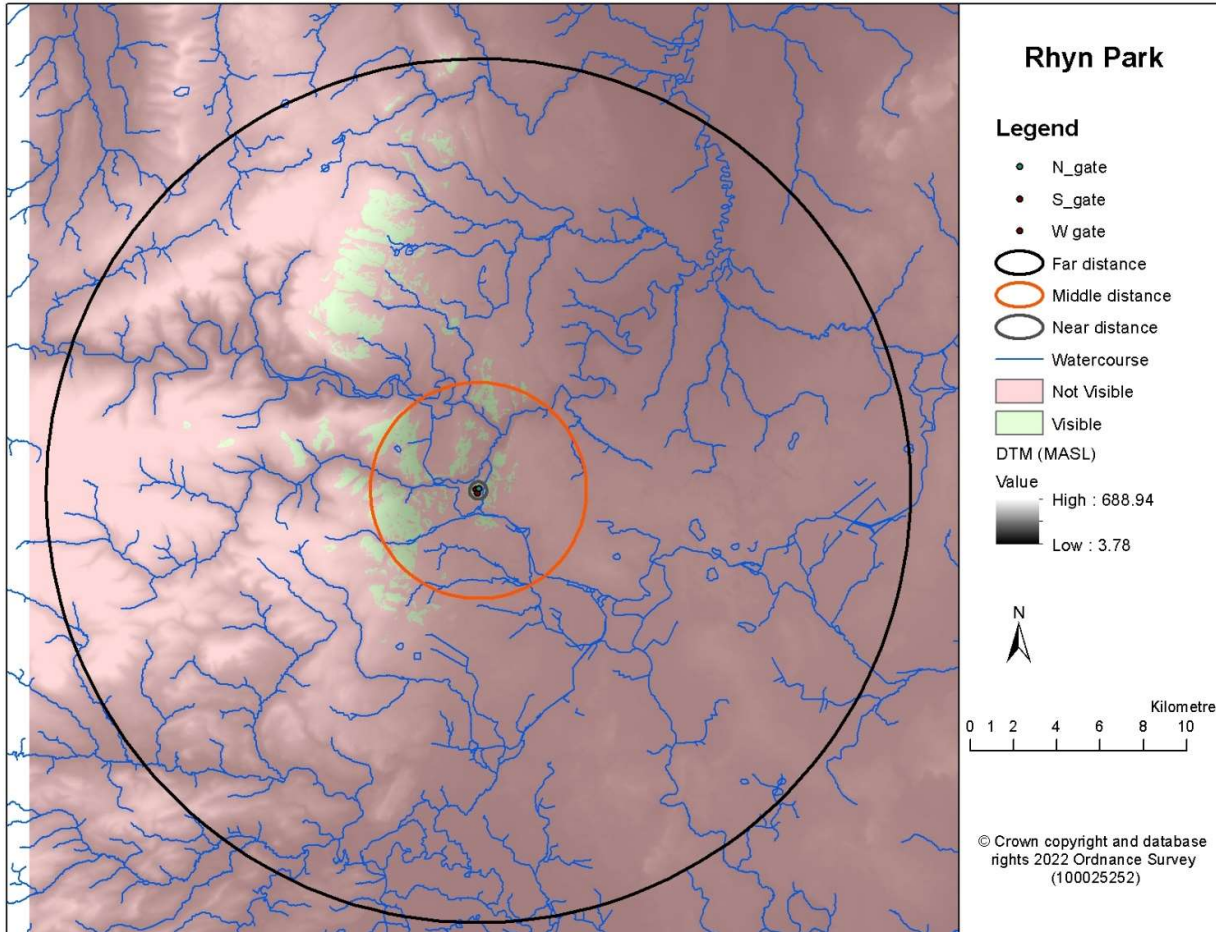
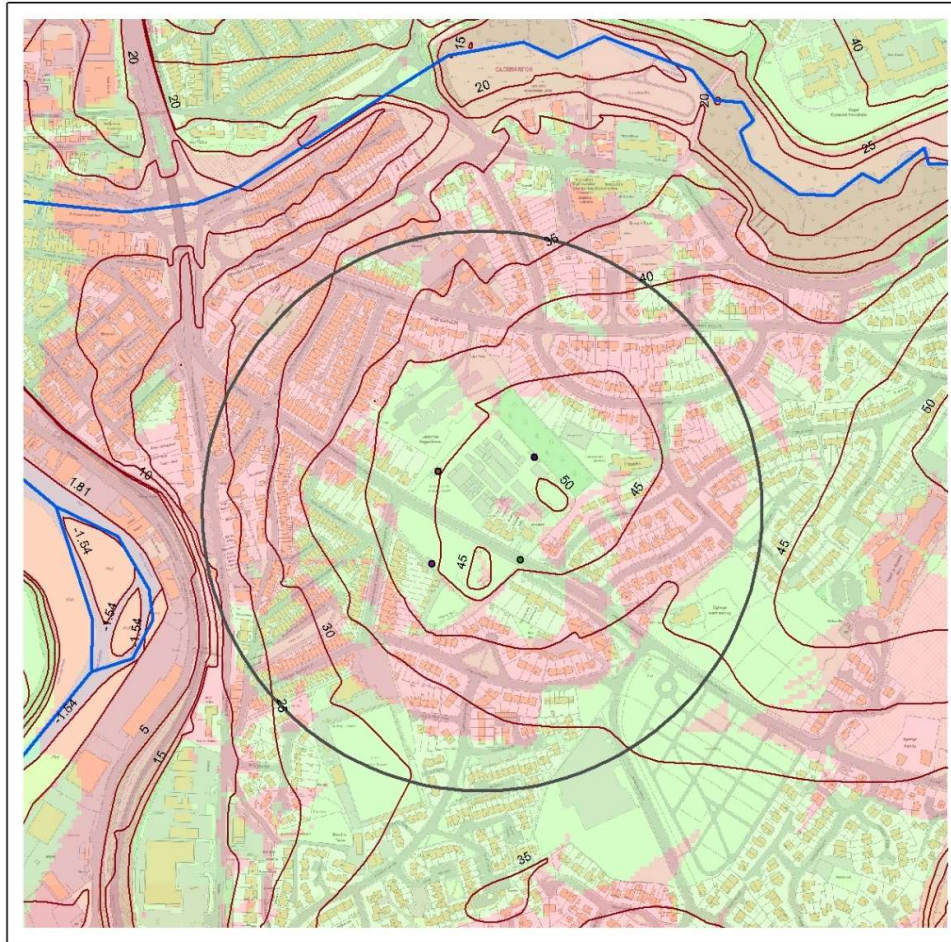


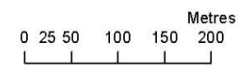
Figure 134 Segontium near distance



Segontium

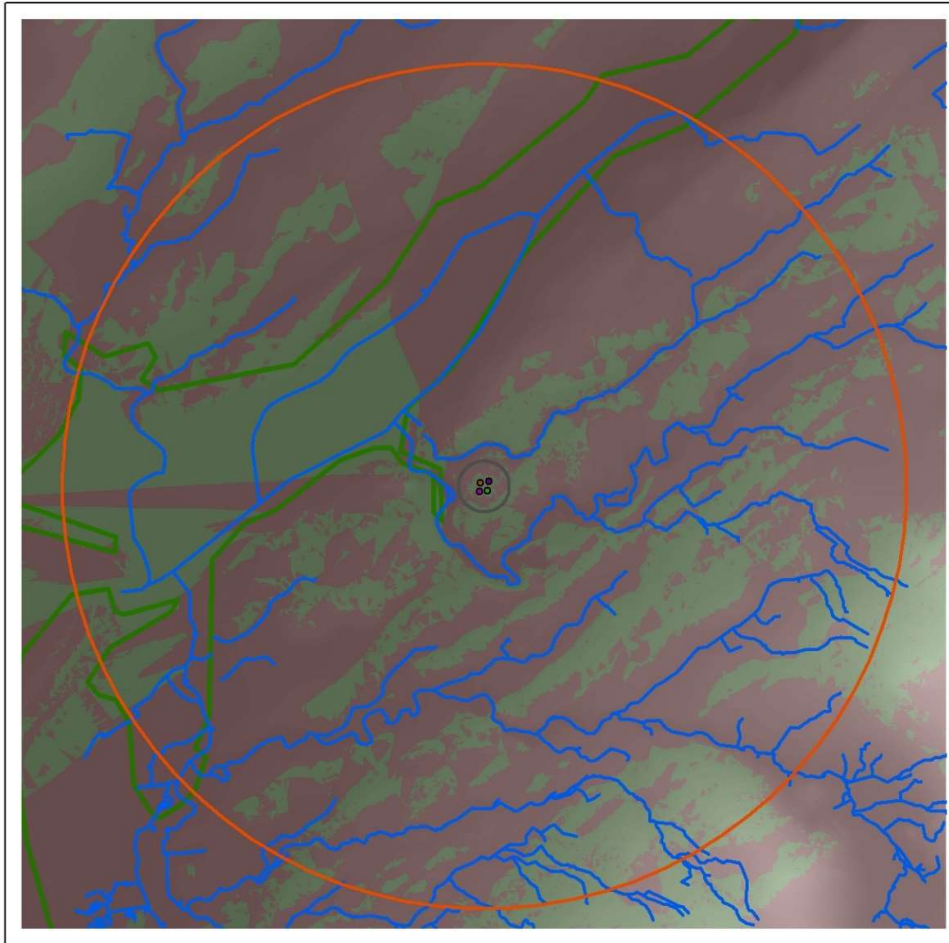
Legend

- NE Gate
- NW Gate
- SE Gate
- SW Gate
- Near distance
- Middle distance
- Watercourse
- Contours (MASL)
- Visible
- Not Visible



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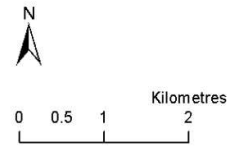
Figure 135 Segontium middle distance



Segontium

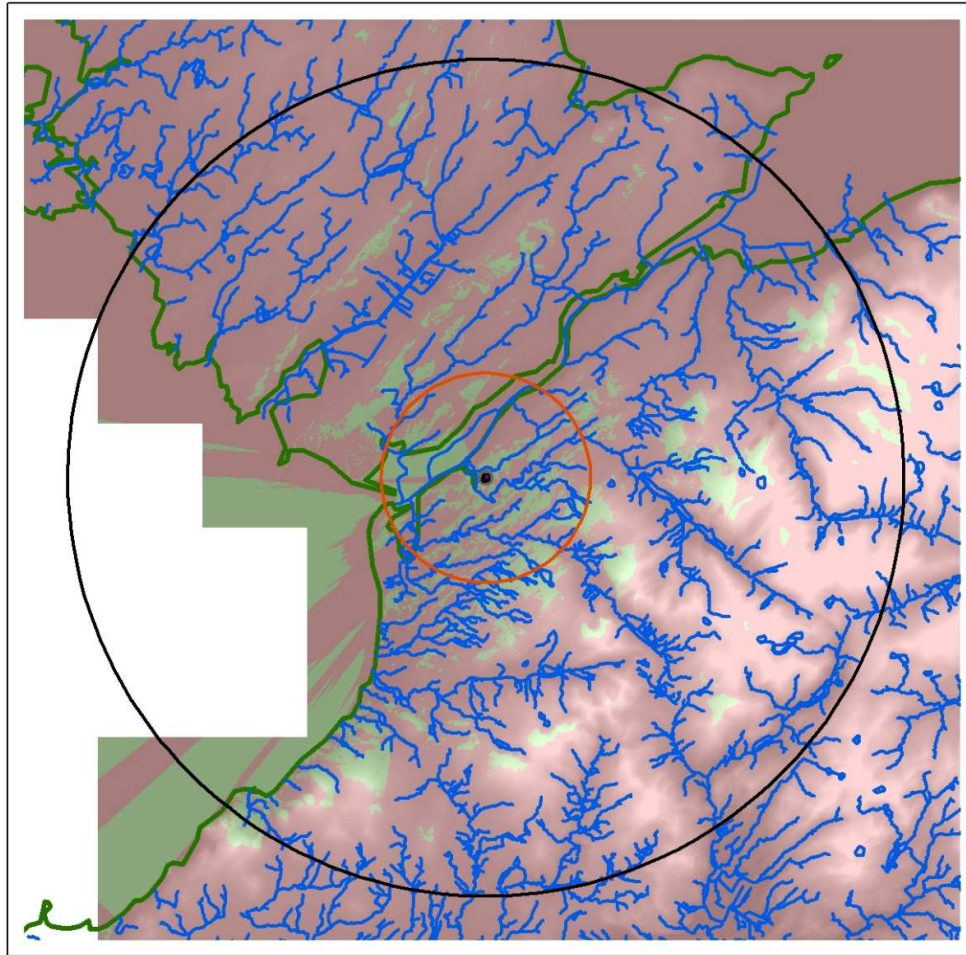
Legend

- NE Gate
 - NW Gate
 - SE Gate
 - SW Gate
 - Near distance
 - Middle distance
 - Watercourse
 - Wales
 - Not Visible
 - Visible
- DTM
Value
High : 1083.95
Low : 0



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Figure 136 Segontium far distance



Segontium

Legend

- NE Gate
- NW Gate
- SE Gate
- SW Gate
- Near distance
- Middle distance
- Far distance
- Watercourse
- ▭ Wales
- ▭ Not Visible
- ▭ Visible

DTM
Value
High : 1083.95
Low : 0

N

Kilometres
0 1 2 4 6 8 10

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Figure 137 Tomen y Mur near distance

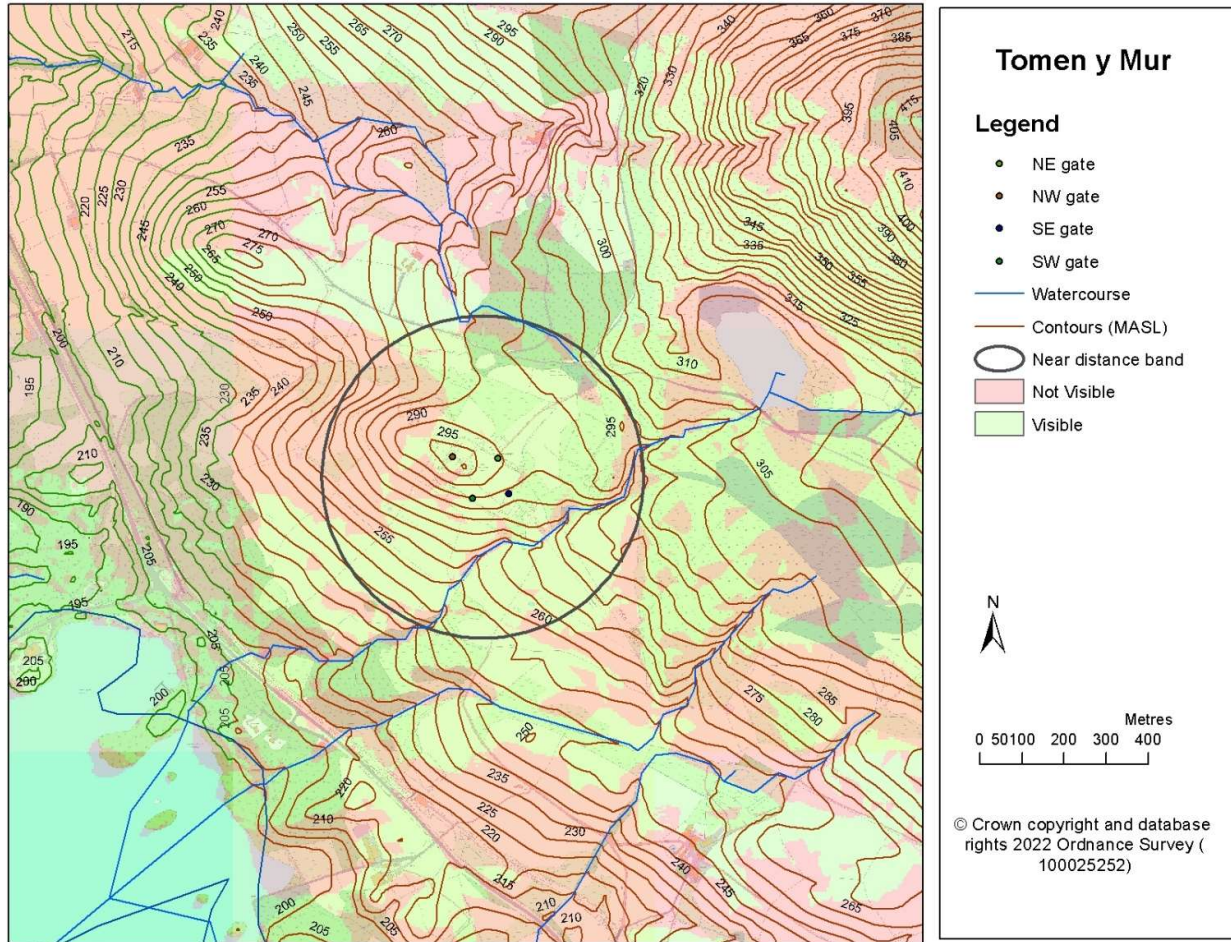


Figure 138 Tomen y Mur middle distance

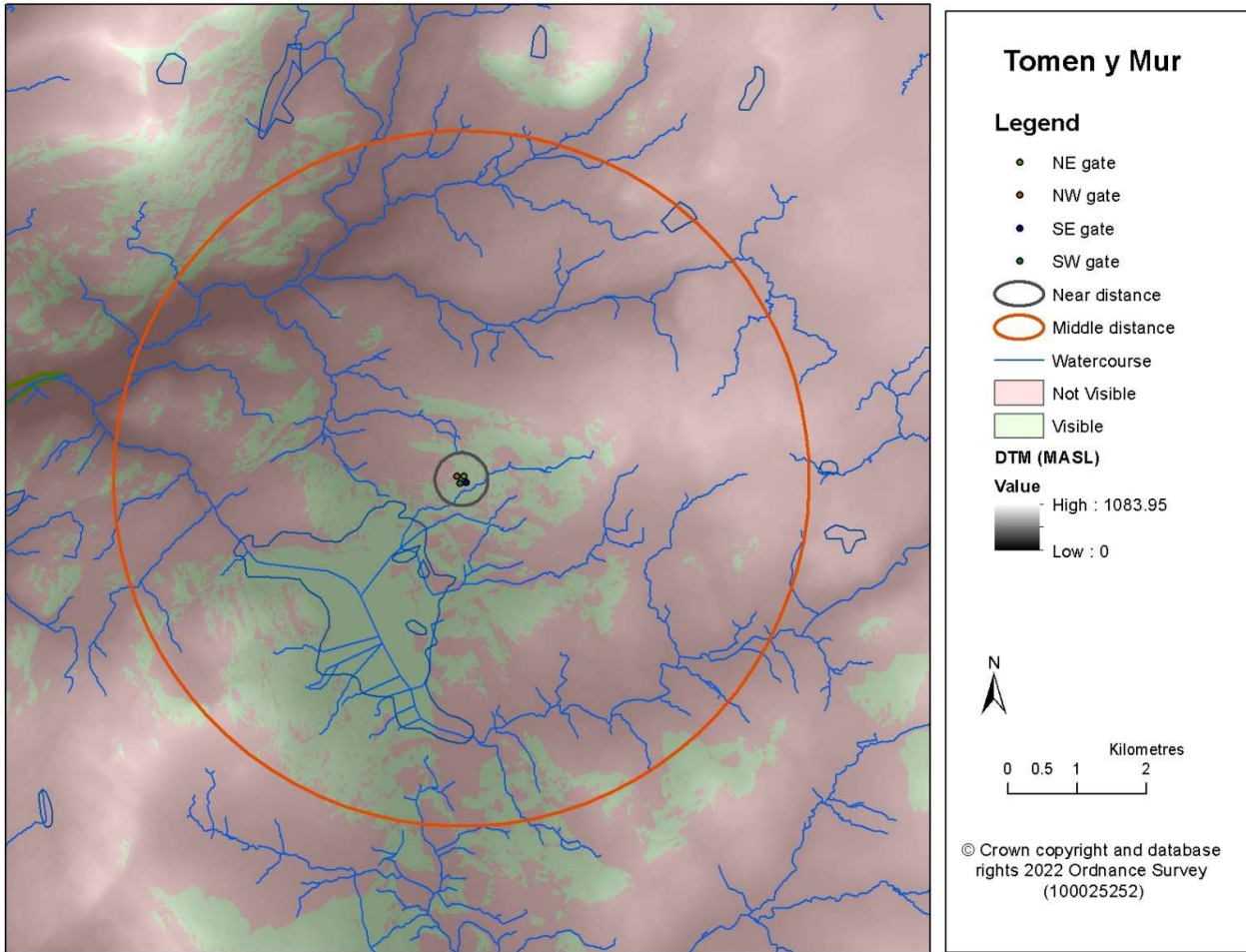


Figure 139 Tomen y Mur far distance

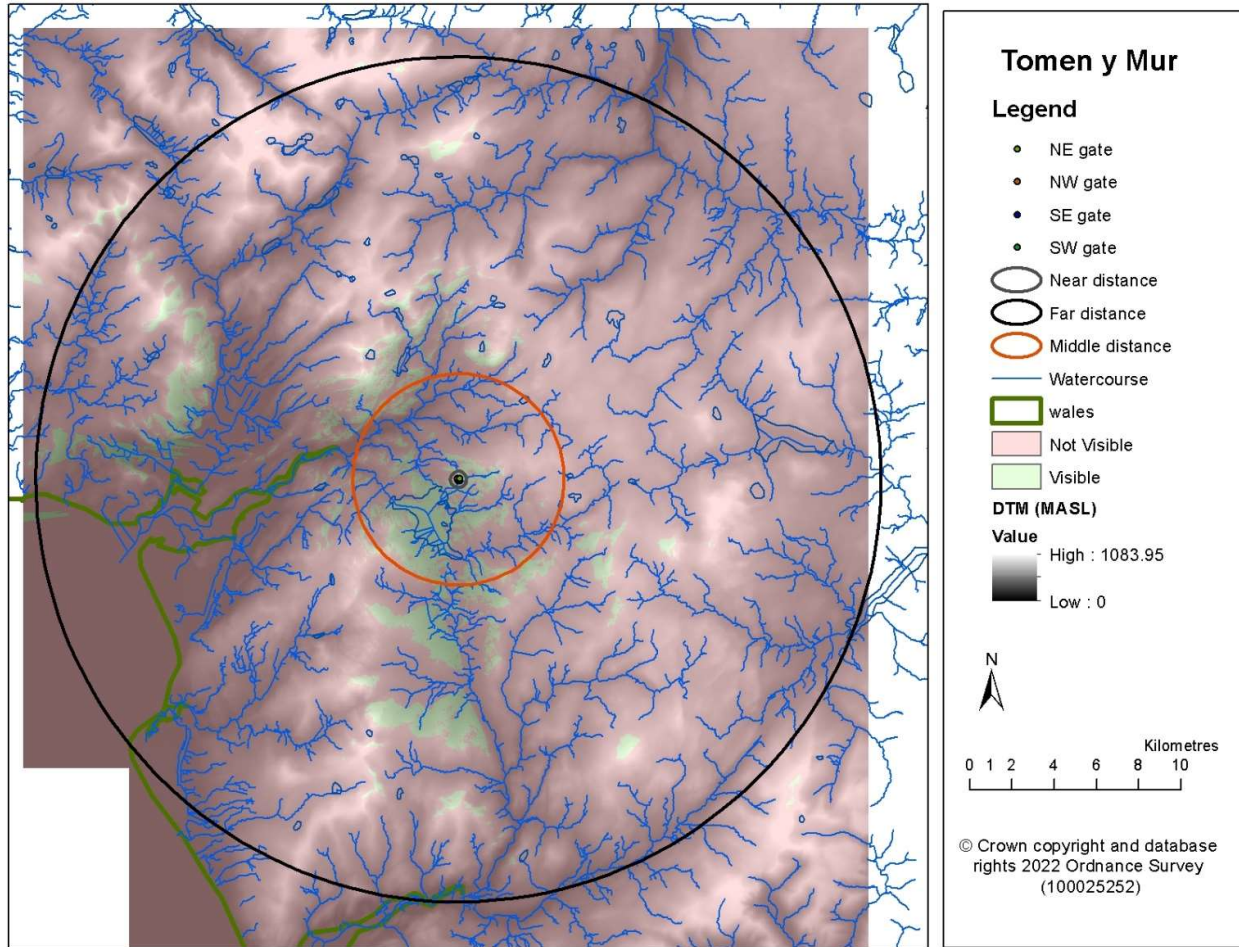


Figure 140 Trawscoed near distance

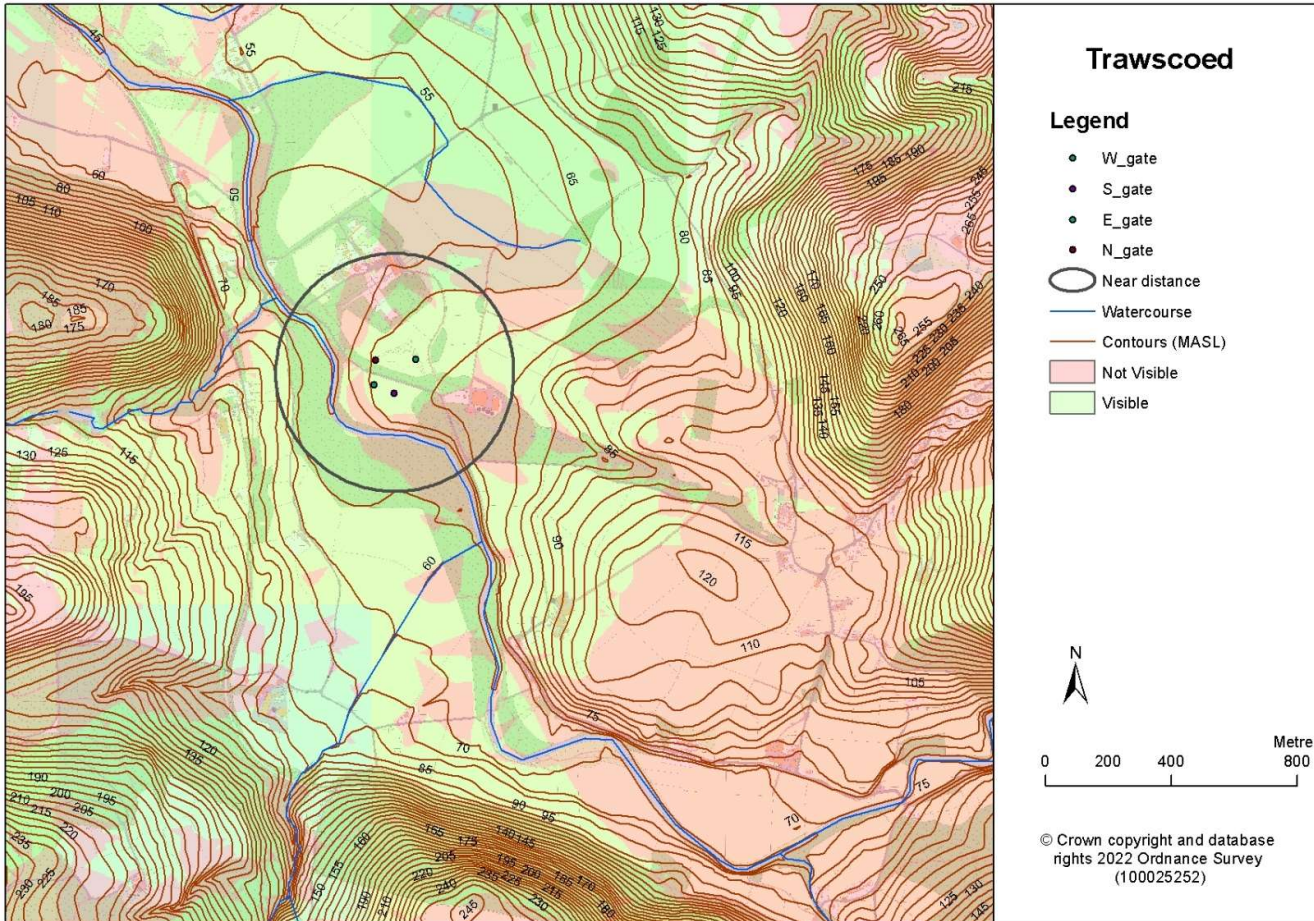


Figure 141 Trawascoed middle distance

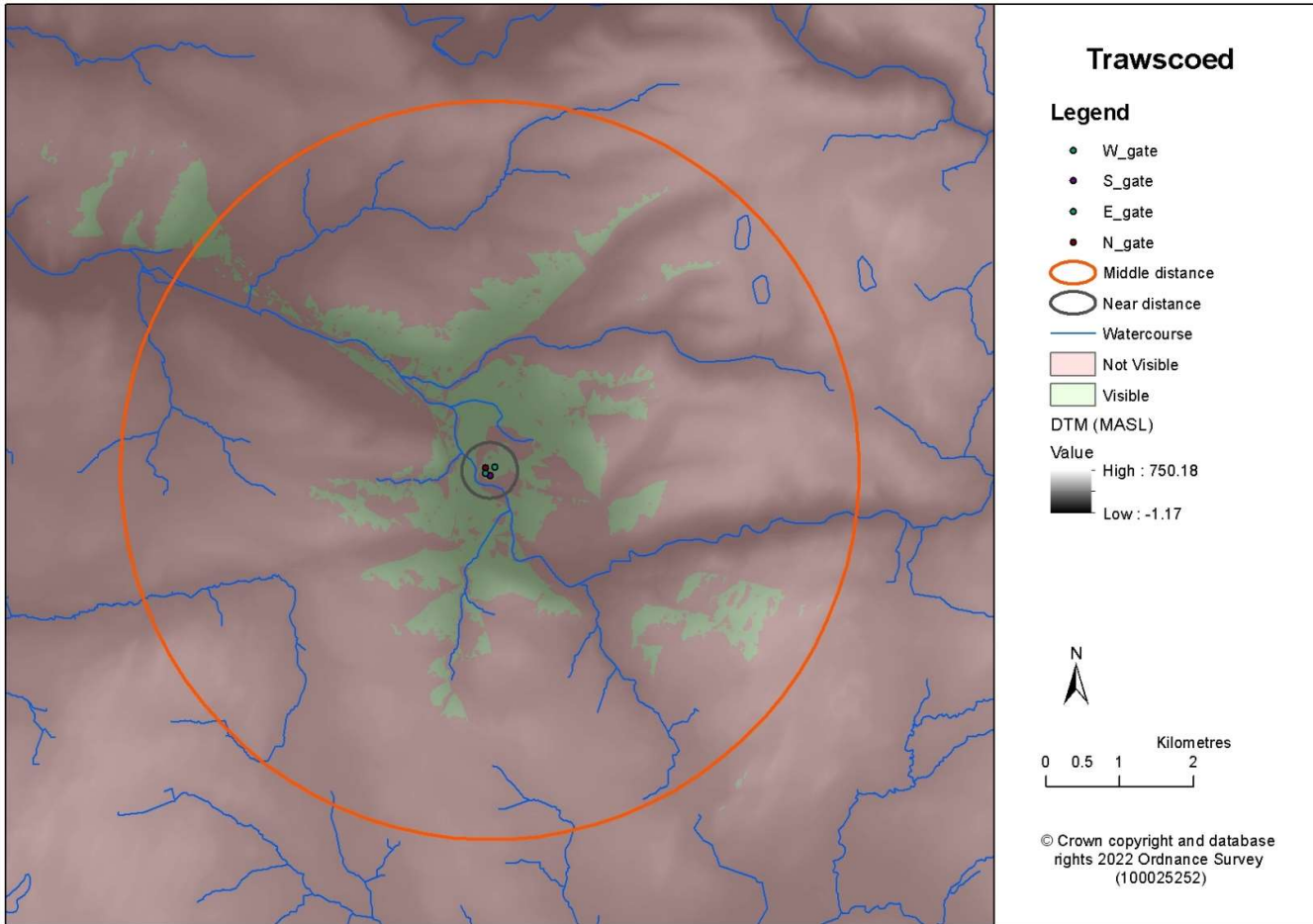


Figure 142 Trawscoed far distance

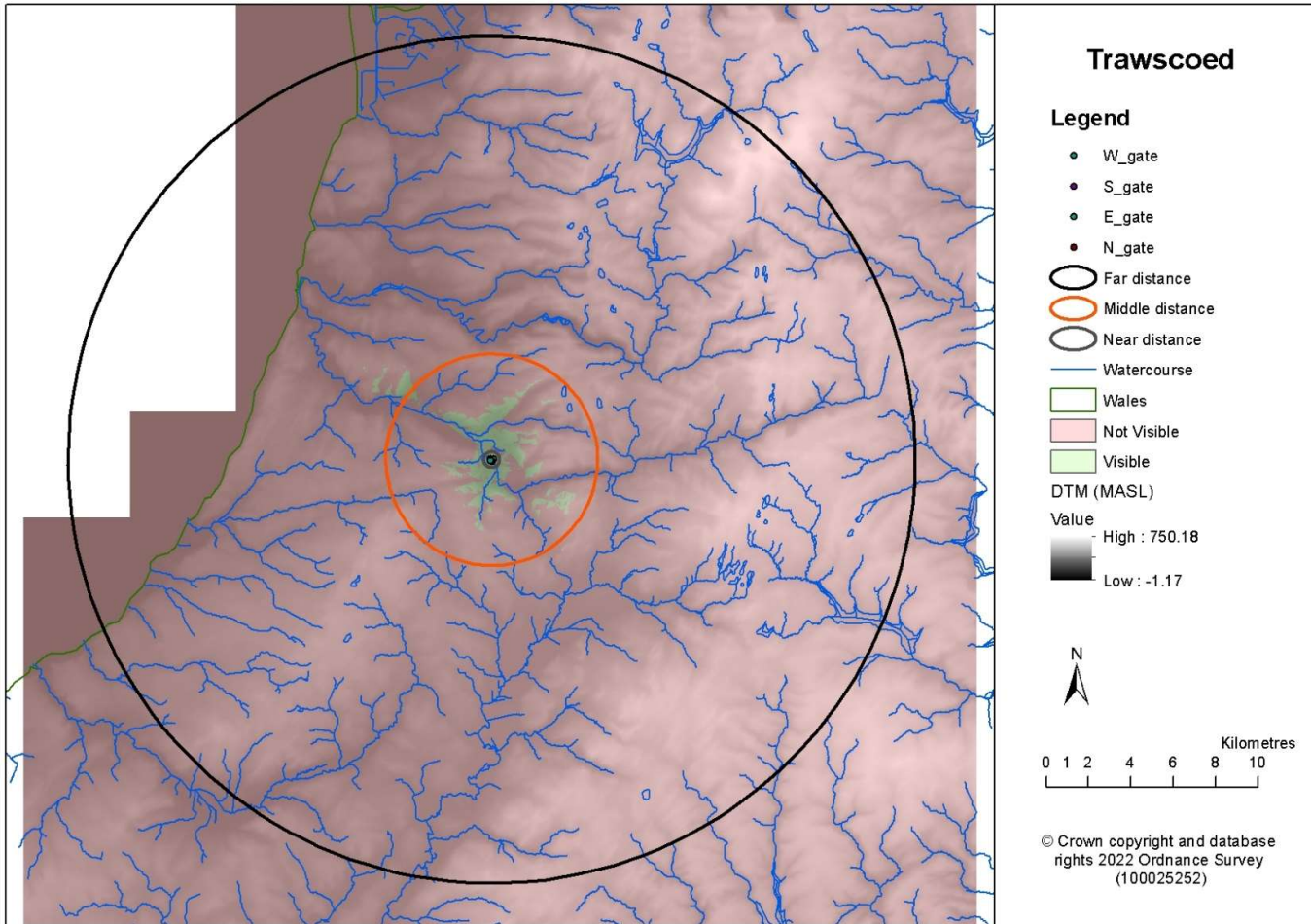


Figure 143 Usk near distance

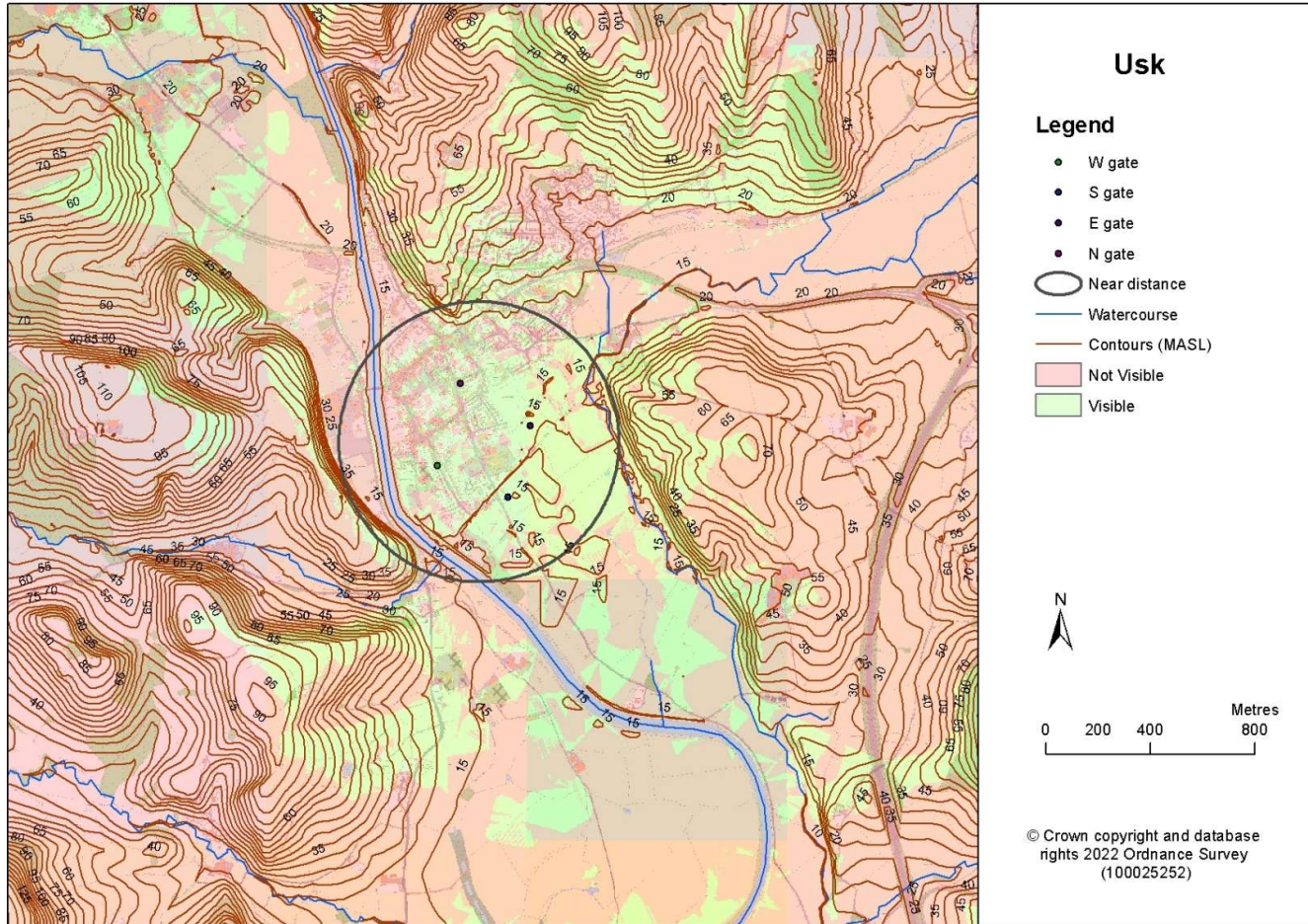


Figure 144 Usk middle distance

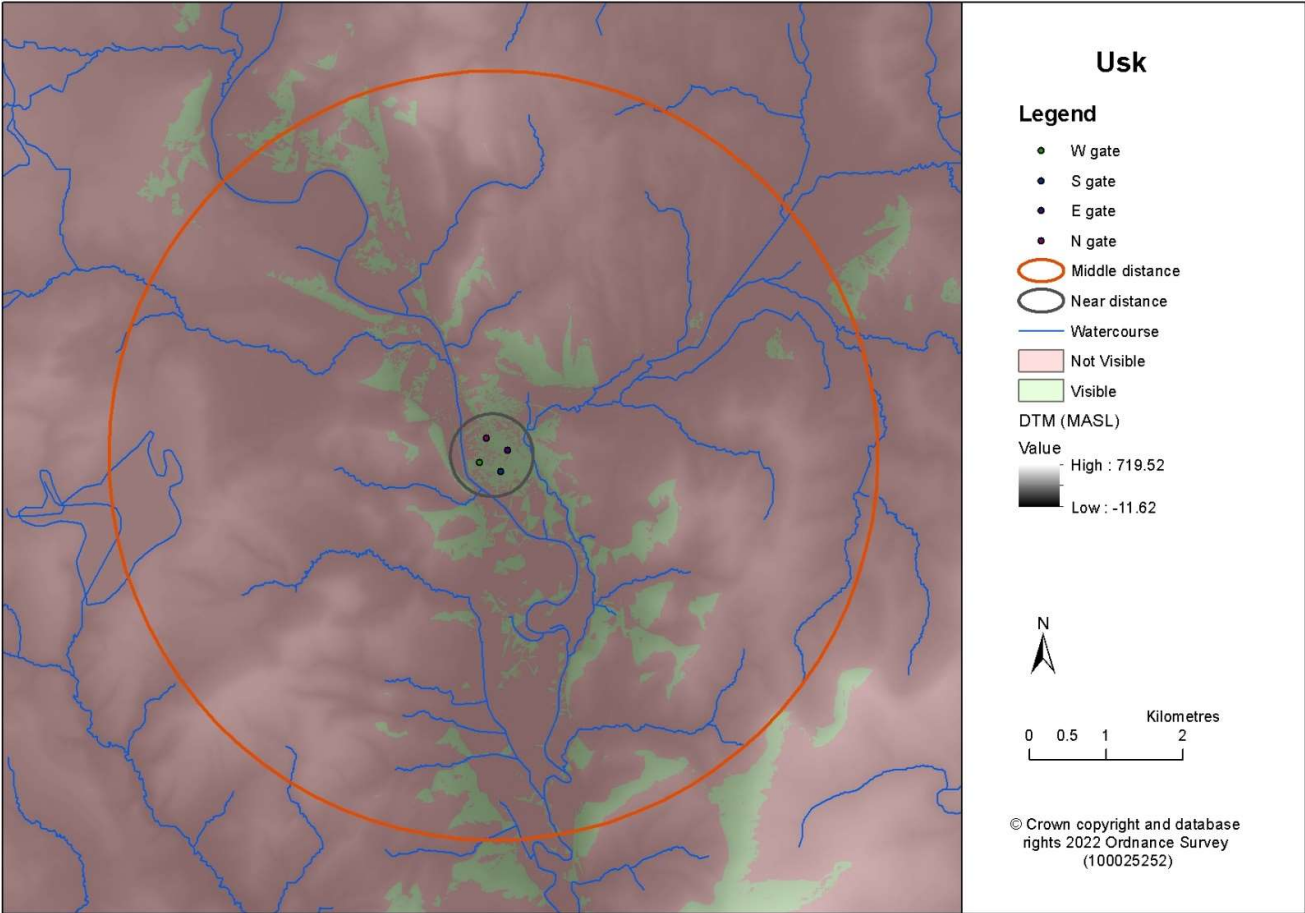


Figure 145 Usk far distance

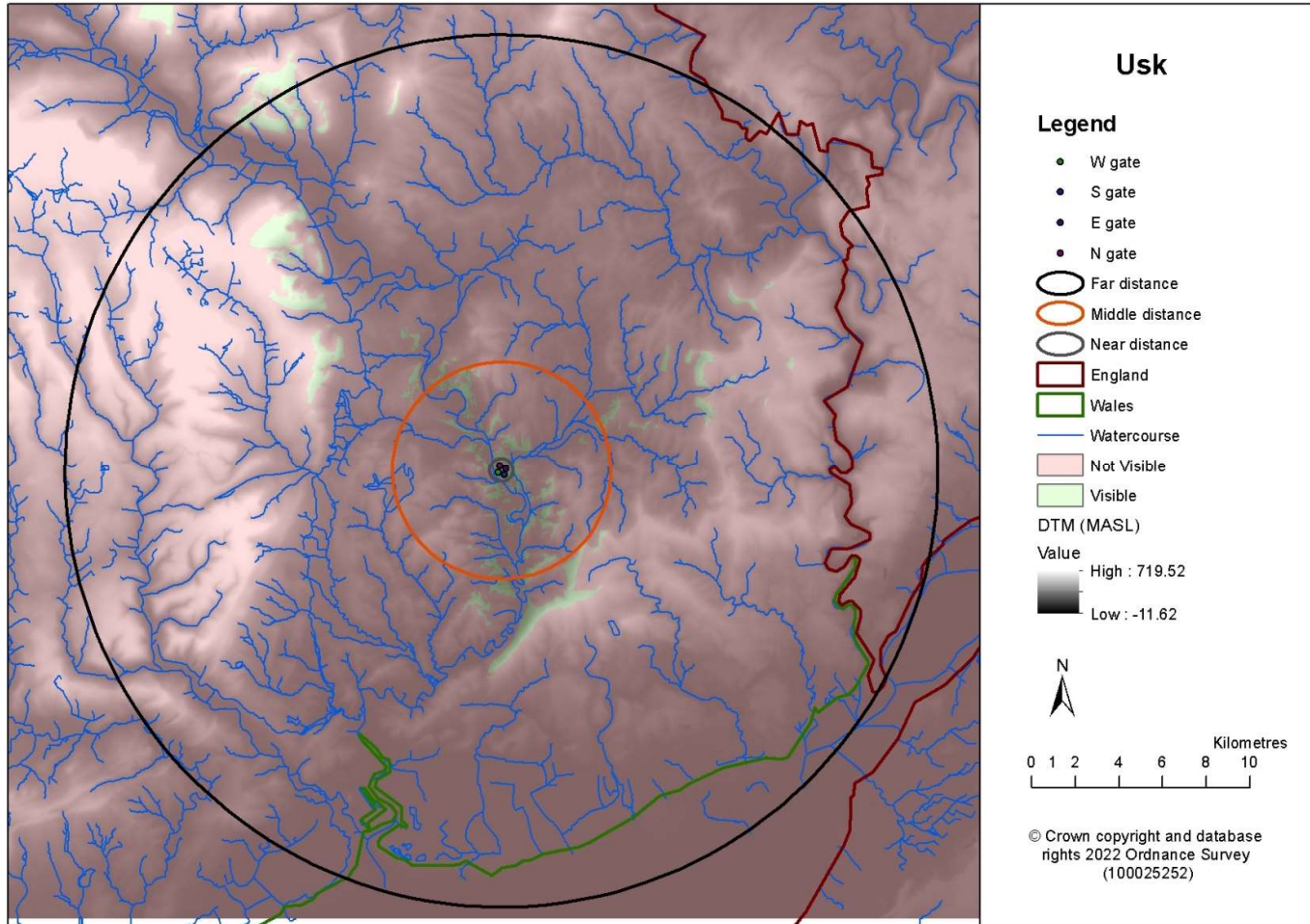


Figure 146 Wroxeter near distance

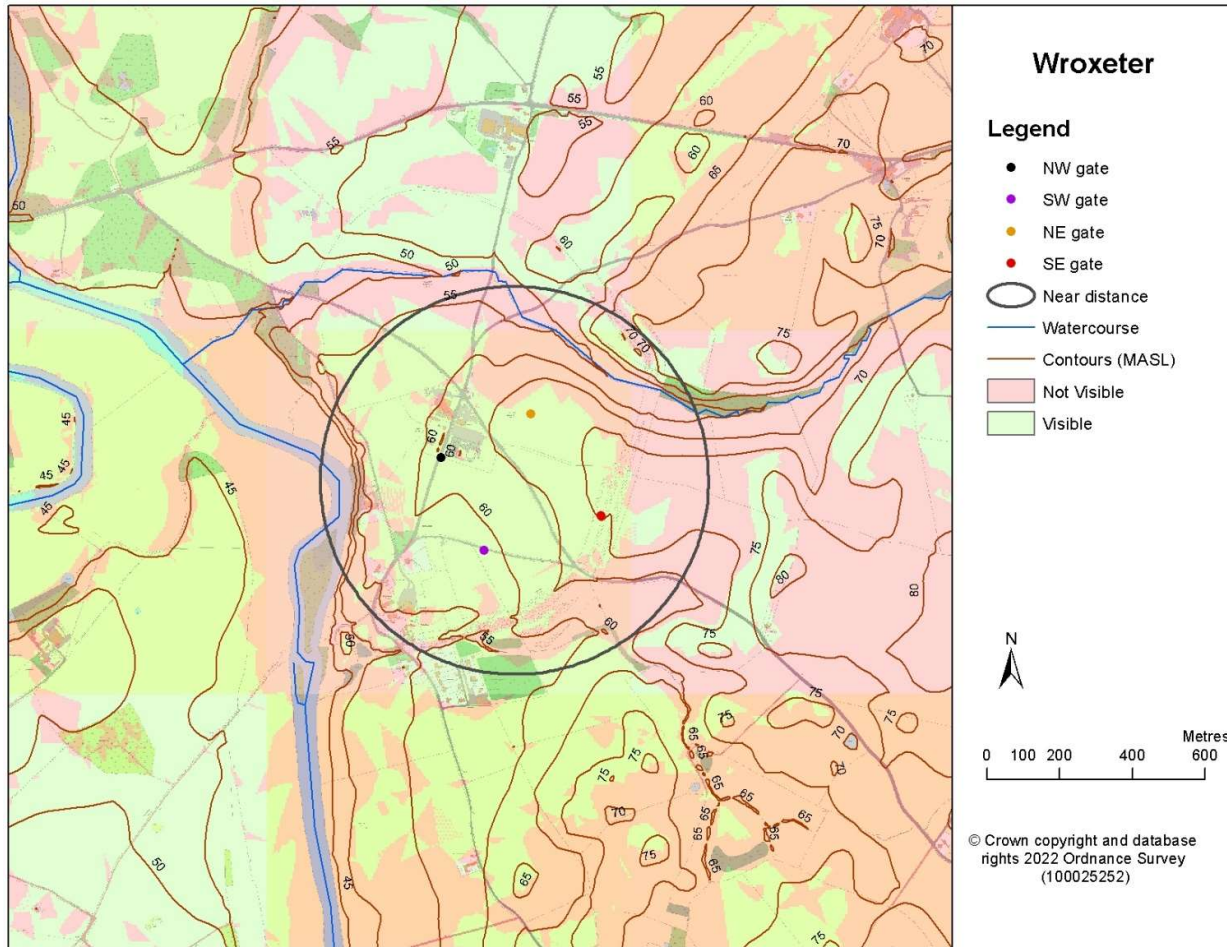


Figure 147 Wroxeter middle distance

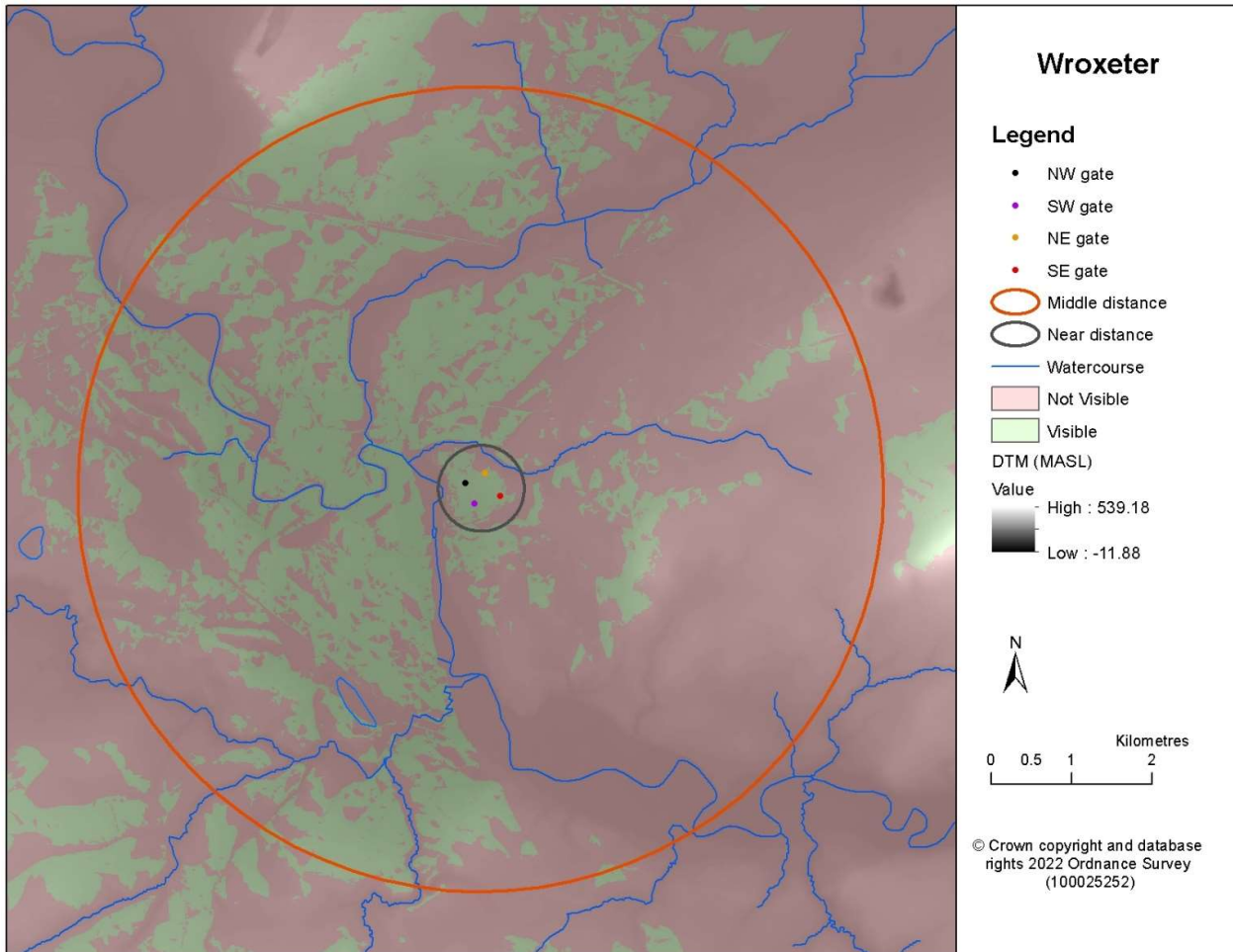


Figure 148 Wroxeter far distance

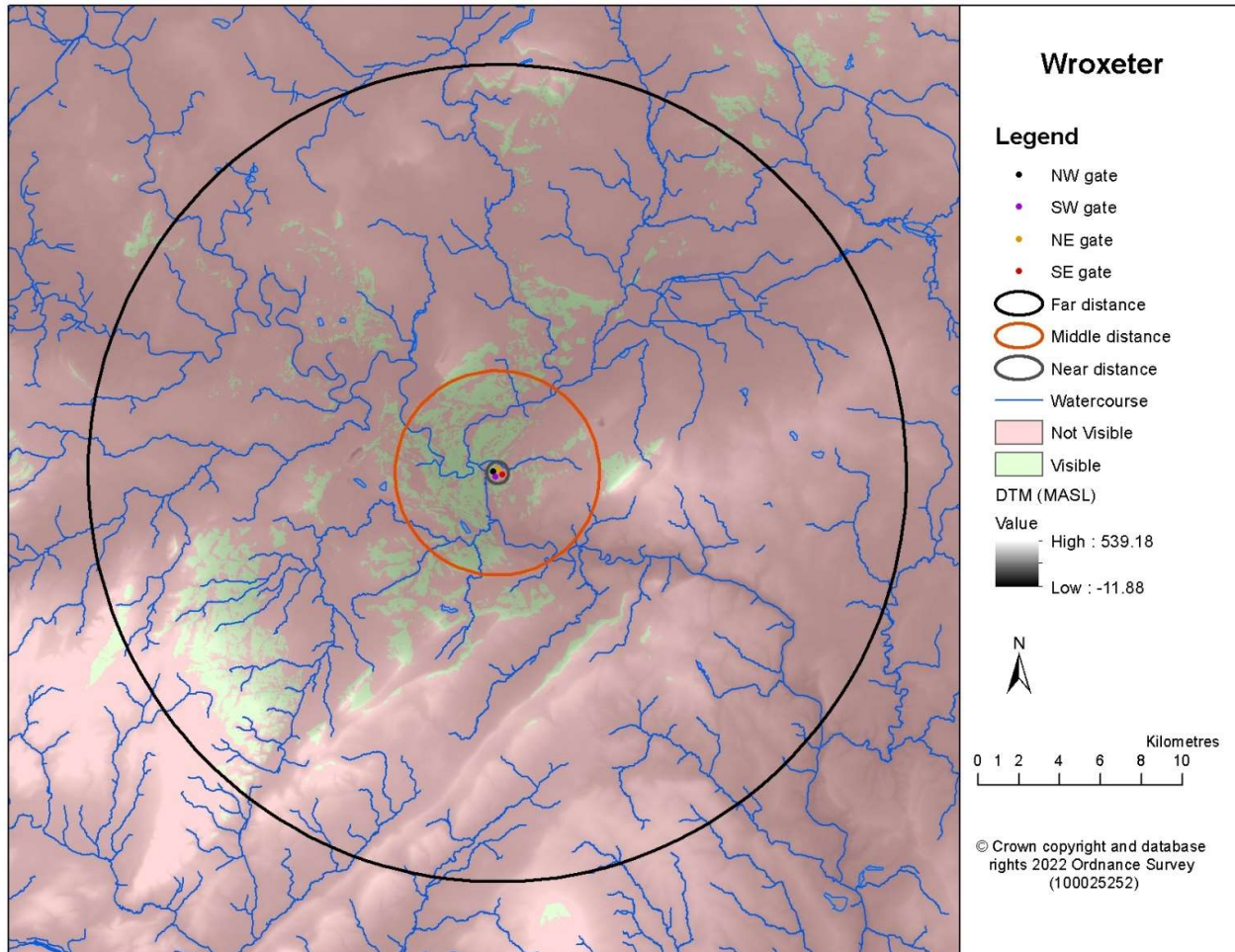


Figure 149 Viewshed from Tomen-y-Mur fort's north-east gate

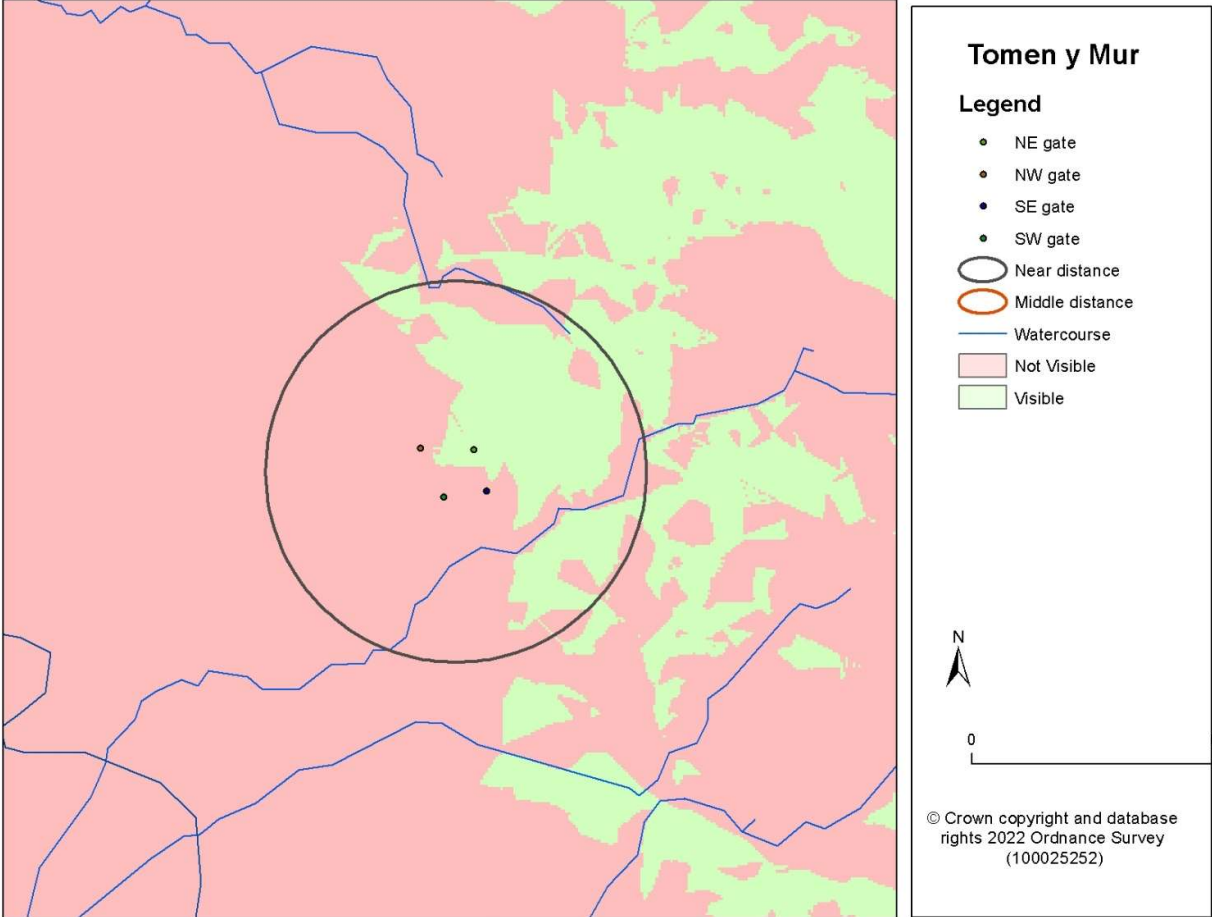


Figure 150 Viewshed from Tomen-y-Mur fort's north-west gate

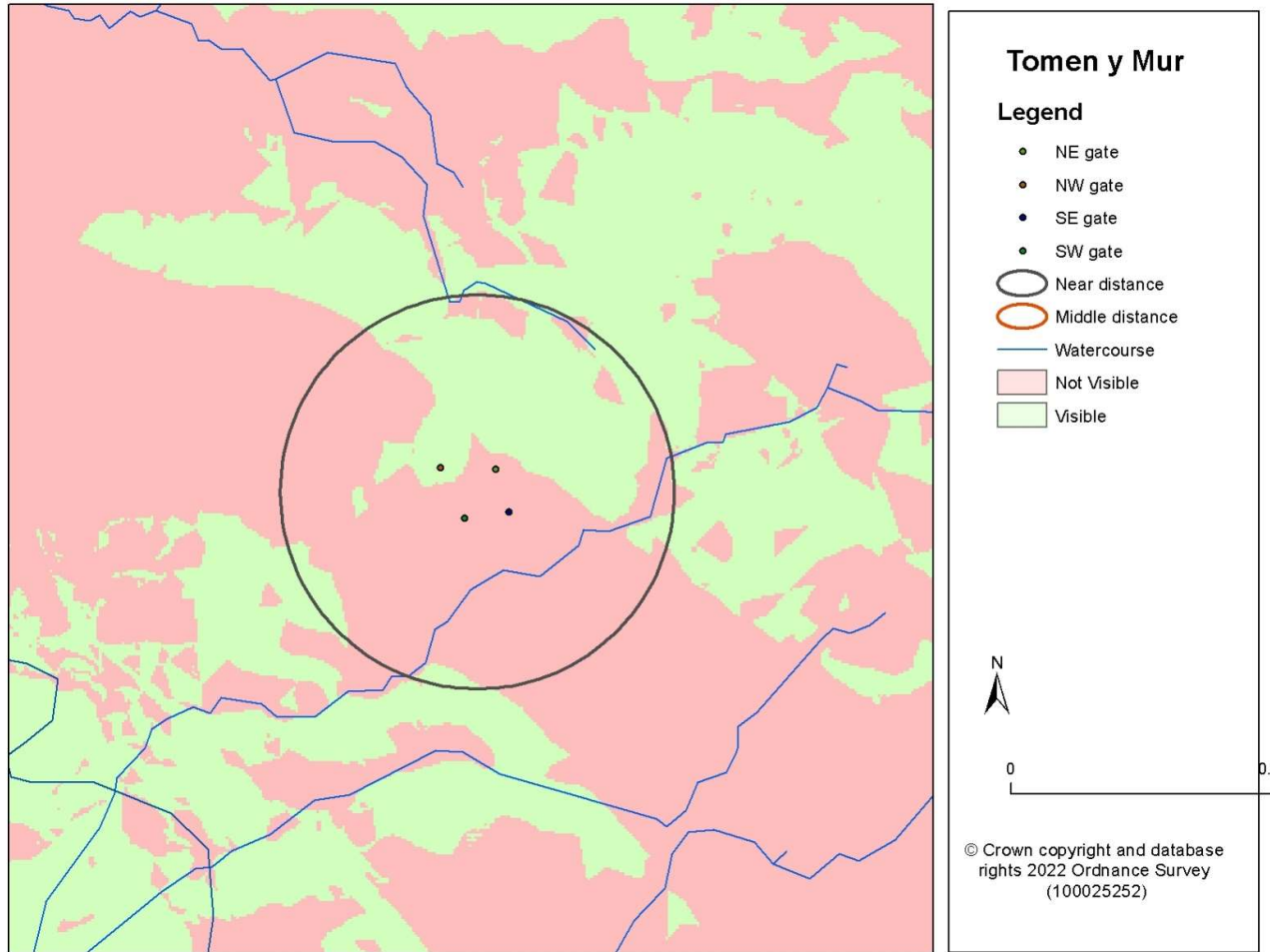


Figure 151 Viewshed from Tomen-y-Mur fort's south-east gate

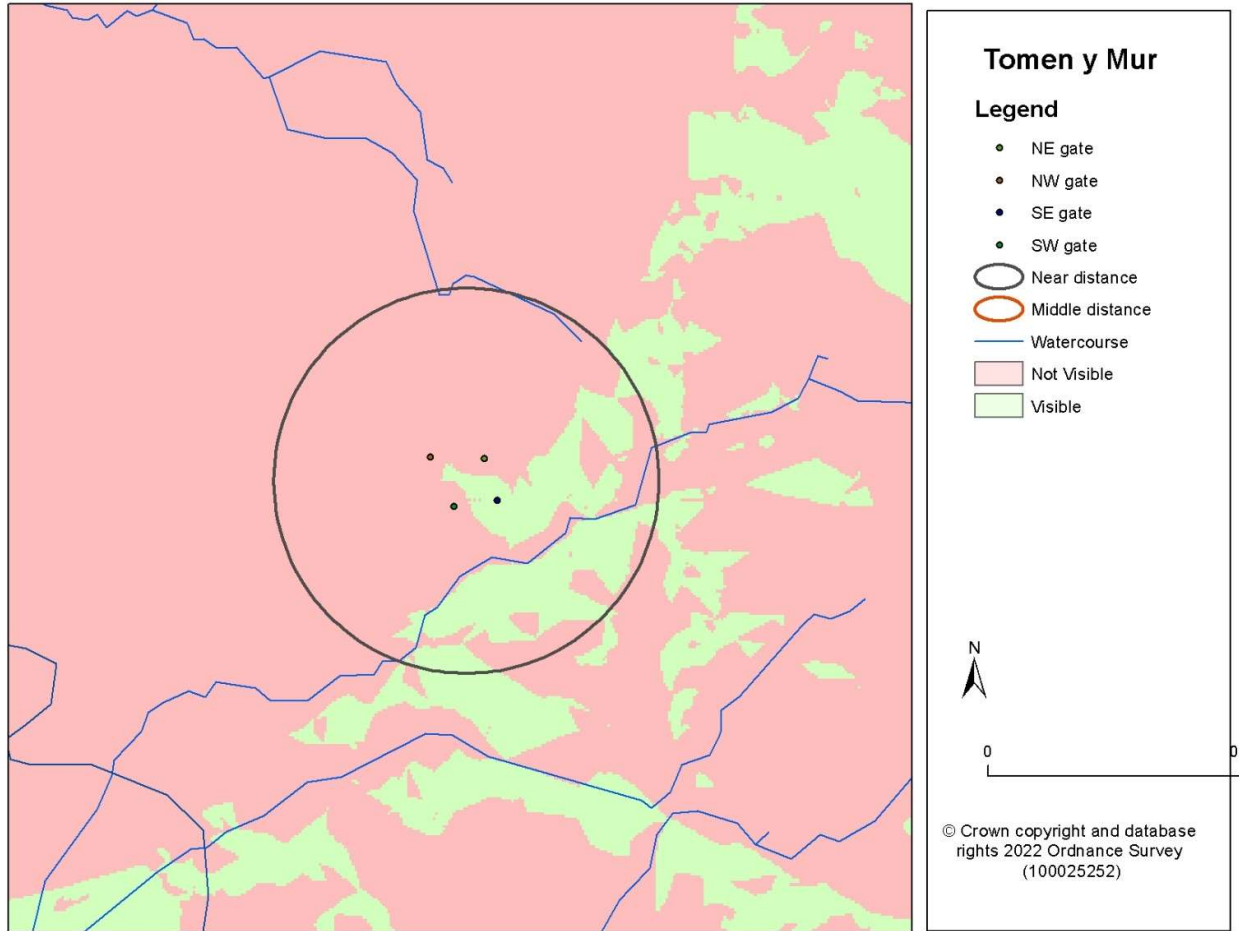


Figure 152 Viewshed from Tomen-y-Mur fort's south-west gate

