A GIS-based analysis of hillfort location and morphology

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Abstract

Moving away from the highly regionalised and constrained purely humanistic and empirical studies of hillfort location and morphology, this study is a multi-regional GIS-based analysis of the form and siting of several groups of hillforts across Britain.

Hillforts in Dartmoor, Aberdeenshire, The Gower and Warminster are assessed, four regions that are topographically diverse. The highly varied topography of these regions also tests the GIS-basis of this study, another important intrinsic aspect of this novel research. GIS-based analysis has never before been applied to a study of hillfort location and morphology to this degree and, as with any innovative methodology its worth has to be tested and assessed.

The thesis demonstrates that GIS-based analysis, when combined with field visits, provides a fundamental insight into the possible influences of hillfort location and morphology, which fieldwork alone will never be able to do. The GIS-based analysis developed here focuses largely upon examining degrees of movement and visibility. Unlike other GIS-based analyses of movement and visibility this integrates the two to examine visual pathways across landscapes to further investigate the visual qualities of hillforts within the various test areas.

The study demonstrates that GIS-based analysis when combined with fieldwork can be affectively applied to qualitative based questions surrounding hillfort location and morphology. The overall results of this analysis had some relatively predictable results whilst there were some very surprising cases. A large number of entrances were placed within the most accessible area, however in the case of Battlesbury there was evidence for the complete disregard to accessibility within the orientation of its northwestern entrance. There were also numerous examples of the placement of a site's

most prominent morphological components in correlation with the blind pathways. In these cases sites were orientated to encourage an element of surprise upon the approaching travellers.

Preface

This DPhil thesis resulted from a three-year fully-funded AHRC studentship as part of The Atlas of Hillforts in Britain and Ireland project. From the outset the thesis was designed to investigate hillforts on a landscape scale through GIS-based analysis to complement the foci of the Atlas project.

This thesis would not have been possible without being in receipt of the AHRC funding consequently I thank both Professor Gary Lock and Professor Ian Ralston for selecting me to join the Atlas project as a DPhil student. Furthermore, I thank them for their continued support and guidance throughout these three years. I also thank the remainder of the Atlas Project (Paula Levick, Strat Halliday and Ian Brown) for their support over the years. I would also like to express my gratitude to John Pouncett who has spent many hours providing me with support for my GIS-based analysis.

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List of Contents

Volume 1

Chapter 3: Ceredigion 64

Volume 2

Chapter 6: The Gower 356

Chapter 9: GIS approaches and British hillforts- lessons learnt and future prospects 542

List of references 551

Appendix (Site plans) 568

List of Figures

List of Tables

Chapter1

Setting the scene: An introduction to hillfort studies and their influence on a GIS-based analysis of hillfort location and morphology

Introduction

This study tests the applicability and effectiveness of applying GIS-based analytical techniques within investigations into the morphology and topographical location of a sample of hillforts in Britain. This chapter sets out the context of the study by discussing past approaches to hillforts. The discussion begins by detailing past interpretations surrounding the appearance of hillforts. This is followed by an examination of hillforts in terms of Central Place Theory, typological classifications and their positions within the landscape. The background discussion concludes through the identification of the key influences, approaches and aims of this research.

This work is part of the Atlas of Hillforts in Britain and Ireland Project one aspect of which focuses on assessing concepts of regionality within hillforts across England, Wales, Scotland, Northern Ireland and Ireland (2015). As will be explained in greater detail in the section on methodology, this work does not attempt to identify patterns of location which can be categorised as 'national', i.e. typical of Scotland or Wales, as the samples used are small and not representative of the variability between hillforts within any one country. Rather, it utilises the testing of a methodology within a variety of test areas (again, detailed in the Methodology) as an opportunity to explore the characteristics of topographical setting and the morphological characteristics of hillforts. This enables assessment as to whether there are similarities and differences which may be meaningful within the wider context of hillforts and their surrounding landscape.

Interpretations of the appearance of hillforts

Immigration

Early hillfort studies focused upon interpreting individual site function and origins. The political climate at the beginning of the twentieth century greatly influenced the directions taken within hillfort studies. This can be seen in Hawkes' work, he saw hillforts as the result of conflict due to threats from Celtic immigration (1931). Hawkes believed that hillforts protected 'country folk …. [and] their stock' (1931, 76). His work was influenced by classical literature as he talked a lot about the movement of tribes and showed that such detailed information could only be retrieved from such writings (*ibid* 1931). It is now generally accepted that these writings focused upon military and political subjects (James & Rigby 1997, 4-5), they formed militaristic propaganda. Hawkes used these writings together with the archaeological evidence as opposed to interpreting the evidence alone.

Four decades later, Hogg analysed the distribution of hillforts along the Welsh coast and argued that their size, form and shape failed to display a clear sense of identity (1972). However, he suggested that their distribution may reflect the spread of people arriving at various points along the coast of Wales (*ibid* 1972, 12). Similarly, Chitty assessed the location and date of objects within the Welsh Marches to investigate how and when the people that constructed the hillforts within this landscape came into the area (1937). Both Hogg and Chitty analysed the archaeological evidence alone. By taking into account the distribution and form of various types of sites and material culture they were able to begin to question its wider social implications. This approach was motivated by the foci of contemporary studies which focused upon the assessment of population movement, this is explored below.

Political and social instability: defence or display?

With the decline of interpretations based on population movements new reasons for the appearance and development of hillforts were suggested. For example, Simpson maintained the belief that during the time of hillfort construction there was a mass movement of people. She saw this as an invasion which caused the natives to construct hillforts as a defensive mechanism (1964). However, climate deterioration between the Bronze Age and Iron Age exacerbated land deterioration (Champion 1999, 103), consequently good land was sought after and there was a need to define space (Moore 2007, 274).

Some interpretations revolved around stronger feelings of insecurity and suggested that hillforts actually originated from the need for defence. Their origins were interpreted as a response to a defensive need and their defensive function defined the site (Sutton 1966). Similarly Dyer saw hillforts as a military construction which offered the "best protection possible to its inhabitants" (1992, 5).

For some, morphology was seen to define the defensive function of hillforts. In this respect the interpretations imply that hillforts were a design that was based upon a functional need, a design that was enforced upon an area as a result of external stimulation. For example, Hogg's definition of hillforts was based upon sites which had "substantial defences, usually on high ground and probably built between about 1000 B.C. and A.D. 700" (1979, 1).The topographic and defensive definition of hillforts was also supported by Bray and Tramp who defined a hillfort as a " fortified hilltop" (1970, 104). Bowden's interpretation of hillforts suggests that the name, form and location of these sites suggest that they are by definition a defended place (2011, 2). Fox also argued that the form of a hillfort's enclosing earthworks gave the site a defensive function, in particular she argued that the sites with widely spaced ramparts were defensive (1961).

On the contrary other scholars saw the location of hillforts to aid and in some cases define their function. For example, Avery believed that hillforts were distinguished by their height advantage over those who approached them; consequently he argued that the term 'hillfort' should only be used for sites with this advantage (1976, 4). This view was long standing, for example, Anderson also took location into account but he saw hillforts as an adaptation of an already elevated, defensive location (1883, 271). Similarly Harding in the most recent account of hillforts noted that they may have been 'tactically' positioned to take advantage of naturally defended and visually commanding positions which are also located close to resources (2012, 15).

The defensive interpretation of hillfort function was not adopted by everyone, however very early on in Irish hillfort studies Westropp argued that the enclosing banks and ditches of 'Celtic forts' were a "passive defence for these houses, and was only raised against a sudden attack, not against undermining, battering or other siege work" (1896/1901, 638). Similarly, Crawford and Keiller argued that the enclosing earthworks at sites such as Hod Hill "were designed to repel invaders, not to stand a siege" (1928, 8). This interpretation was maintained by Bowden and McOmish who highlighted that during the Iron Age there were underlying tensions that meant that there may have been militaristic motivations, but sites were developed to repel aggression (1987). They also argued that hillforts formed centres for a 'detached elite' and enabled them to legitimise their place within the social system as opposed to offering a safe place (*ibid* 1987).

However, Lock argued that interpretations which relate to the appearance and maintenance of hillforts need to move away from giving the impression of a period of endemic warfare (2011). He based his interpretation on the fact that there is limited evidence for warfare across Britain, although he admits that hillforts may still have resulted from feelings of insecurity (*ibid*, 2011). Instead, based upon the rise in defining communities through enclosure, Lock argues that cosmological threats were seen to risk the cohesion of the social group (*ibid* 2011). Activities and places were created to enhance and protect social cohesion, an example of such an activity could be the maintenance of agricultural land and the construction and maintenance of hillforts (*ibid*, 2011).

Similarly, Fox recognised that hillforts were used in times of peace (1961). During these times the morphology of the enclosing earthworks had a social and ceremonial function as they provided “an approach of dignity to the principal enclosure” (Fox 1961 45-46). Cunliffe saw the definition and form of hillforts to have changed over time in relation to defensive need (1971). According to Cunliffe the gates to these structures were initially designed to impress whilst by the first century BC they formed a defensive function (1971, 66).

However, Westropp had much earlier argued that the enclosing works to a hillfort were an accessory and not a necessity (1896/1901, 638). The non-defensive interpretation of banks and ditches has increasingly been adopted by researchers. For example Harding has argued that multivallation was not necessarily evidence for hillfort development, it may have been used as a status symbol to impress (2012, 13). Hillforts were not necessarily defensive, similarly the expenditure upon enclosing works was not always directly proportional to the defensive need to enclose (*ibid* 2012 13). Hamilton and Manley also argued that the enhancement of hillforts and the delineation of space outside of them was an indicator of competition between hillforts rather than defensive (2001).

A non-utilitarian interpretation of hillfort enclosure was also put forward by

Hingley who argued that their banks and ditches potentially distinguished insiders from outsiders so that they were about inclusion and exclusion (1990). This interpretation was also reflected within Richard Bradley's work which saw hillforts to be public monuments (2005). Harding also acknowledged that hillforts may have been positioned to be visually prominent (2012, 15), as also argued by Sharples (2010) and Cunliffe (2006). The creation of such visually prominent and consequently at least visually public monuments could have been in an attempt to legitimise the status and/or social position (Parker Pearson 1984, 71) of those that were within the site. Kelly argues that there should be a dichotomy between "public and restricted performance sites" (2015, 27), however in the case of hillforts the writer wishes to investigate whether this is visibly the case. The process by which the visibility of the enclosing works of hillforts compared to their interiors provides an insight into the public and/or private nature of hillforts is explored later in this thesis.

A central place

Although there was a great deal of variation within interpretations as to why and how hillforts began to be constructed within Britain and Ireland, these sites were predominantly interpreted as 'central places' i.e. they served a wider, dispersed community. However, the interpretations of the extent and role of a central place have varied greatly. As a place for community activities, interpretations took into account that their central place function may have varied over time. For example Collis argued that these sites were evidence for the centralisation of defence (Collis 1994a, 34; Collis 1994b, 131) and redistribution (*ibid* 1994b, 131). Similarly, Köhler saw hillforts as defence for a community, these positions were also advantageous to locate resources (1995, 165).

Interpretations of hillforts as central places went beyond them being a place which satisfied a practical and functional need towards more of a place of social interaction. For example, in the 19th century, Westropp's interpretation of the forts in Ireland focused upon them as places of assembly such as a church or a place of worship; however he also postulated that they could have been cattle enclosures (1896/1901, 637). Much later, Harding amongst others, also saw hillforts as places of assembly for ritual or social purposes (2012, 282). "The hillfort created an obvious and visible site and was also a focus of communal action which bound people together" (Barclay et al. 2003, 250). As Sharples argued, the construction of enclosures such as hillforts defined the relationships of the people that were involved within this process (2010). The construction of hillforts was a change in itself, a change of site form; which was inevitably caused by change. Community is spatially defined (Lock and Gosden 2005, 133), in this case they were potentially defined, on one level, by the walls of the hillfort. These communities arose from "historically embedded relationships and are nurtured through encountering and reacting to new situations and people" (*ibid* 2005, 133).

Approaches to hillfort research

Landscape analysis- systems theory

Central Place Theory was introduced by Christaller in 1933 (Ullman 2005) and was popular in archaeology during the 1970s. It worked upon the basis of a "functional interdependence between a town and the surrounding rural area" (King 1984, 29).This form of economic modelling was used by Clarke to assess the distribution of sites surrounding Cadbury hillfort in Somerset (1972). Through modelling the settlement pattern Clarke postulated the existence of a landscape scale site hierarchy. With Cadbury as the central place surrounded by a series of dependent settlements and farmsteads (*ibid*, 1972). Also on a hierarchical basis, Cunliffe saw hillforts as home to ruling elite (1972; 1978). On a socio-economic basis Cunliffe also postulated that the elite also lived in the 'large farmsteads of Little Woodbury type' and those that they ruled over brought surplus to the hillforts which acted as redistribution centres and areas for group gatherings (*ibid* 1978, 333).

Still in the 1970s, Hogg recognised the difficulty in the definition of territories with such a limited number of sites that were positioned in clearly defined land units, thus testing quantitative methods of calculating territories (1971). The most popular was Thiessen Polygons, which modelled site territories and weighted distances between the hillforts and their territorial boundaries (*ibid*, 1971). The use of a model is not a realistic means of defining a territory, if territories did exist within the Iron Age they would not have been calculated through the use of models. The land units associated with hillforts for example could have been defined by the land's ability to provide that community with the resources that they needed, Cunliffe defined this as a "zone of exploitation" (1991, 24).

Regardless of their unrealistic expectations the application of Thiessen Polygons to hillfort research encouraged the equating of enclosure size with that of territories (*ibid*, 1971). Enclosure size was further equated with importance by Williams who argued that the size of a site reflected its importance (1988) and that size was a direct reflection of the amount of surplus which came from the surrounding landscape. This surplus, and subsequently the size of the site was affected by the quality and the type of land within the settlement zone (*ibid*, 1988). The correlation of site size with site importance was earlier argued by Clarke who stated that within a 'fully developed, Celtic settlement hierarchy' the largest sites (opidda) provided the highest order goods and services (1972, 864). Equating a site hierarchy with a social hierarchy became influential in Cunliffe's later interpretation of hillforts and enclosures based on his work at Danebury, Hampshire. Here he argued that the size, siting and complexity of hillforts implied that they were built under coercion, to set them aside from other settlements as the construction of such a site would have needed a large group of people (1972; 1978; 1991).

Systems Theory also had a big influence upon hillfort studies in the 1970s. This suggested that to understand an object or a site, an understanding of the cultural system within which it sits needs to be established (Clarke 1978). This is a “unit system in which all the cultural information is a stabilized but constantly changing network of intercommunicating attributes forming a complex whole- a dynamic system” (*ibid*, 1978, 42). The need to understand systems through a series of single sites was suggested by Hodges’ who recognised that to be able to identify the trade networks of hillforts within Ireland there needed to be more excavations (1975).

Systems Theory influenced research programmes, at Danebury for example, in order to question the ‘system’ and the site’s function Cunliffe employed a large sampling strategy (Cunliffe 1984; Cunliffe and Poole 1991). Within the first series of excavations (1969-1978) focus was put upon sampling as much of the site as possible to establish a site function and construction sequence (*ibid*, 1984). The excavation was accompanied by an aerial photographic interpretation of the landscape around Danebury; this depicted the pattern of settlement (Palmer 1984). Subsequent seasons of excavations (1979-1988) at Danebury continued the extensive process of sampling to establish a site chronology (Cunliffe and Poole, 1991). This earlier work provided the basis to understanding Danebury’s function within its wider landscape context. Danebury is one of the country’s most extensively excavated hillforts and provides a dataset where questions of functionality could be feasibly answered. Cunliffe acknowledged this potential and continued to try to establish the function of Danebury within his latter Danebury Environs publication where he also aimed "to forward our knowledge of the organization of the landscape in the first millennium BC" (2000, 14)

Although there has been an extensive investment into the investigation of Danebury and its landscape, Cunliffe acknowledges that any 'system' in one area was not necessarily the same as in another (2001). Regardless of whether scholars acknowledged the potential for cross-regional variation in social systems, the designing of research projects to investigate system mechanics as opposed to questioning their existence immediately implies that systems were indeed in place. This also imposes a system and rigidity upon the archaeological record that may not have existed within the past.

The role of enclosures within a hillfort system, is there a difference?

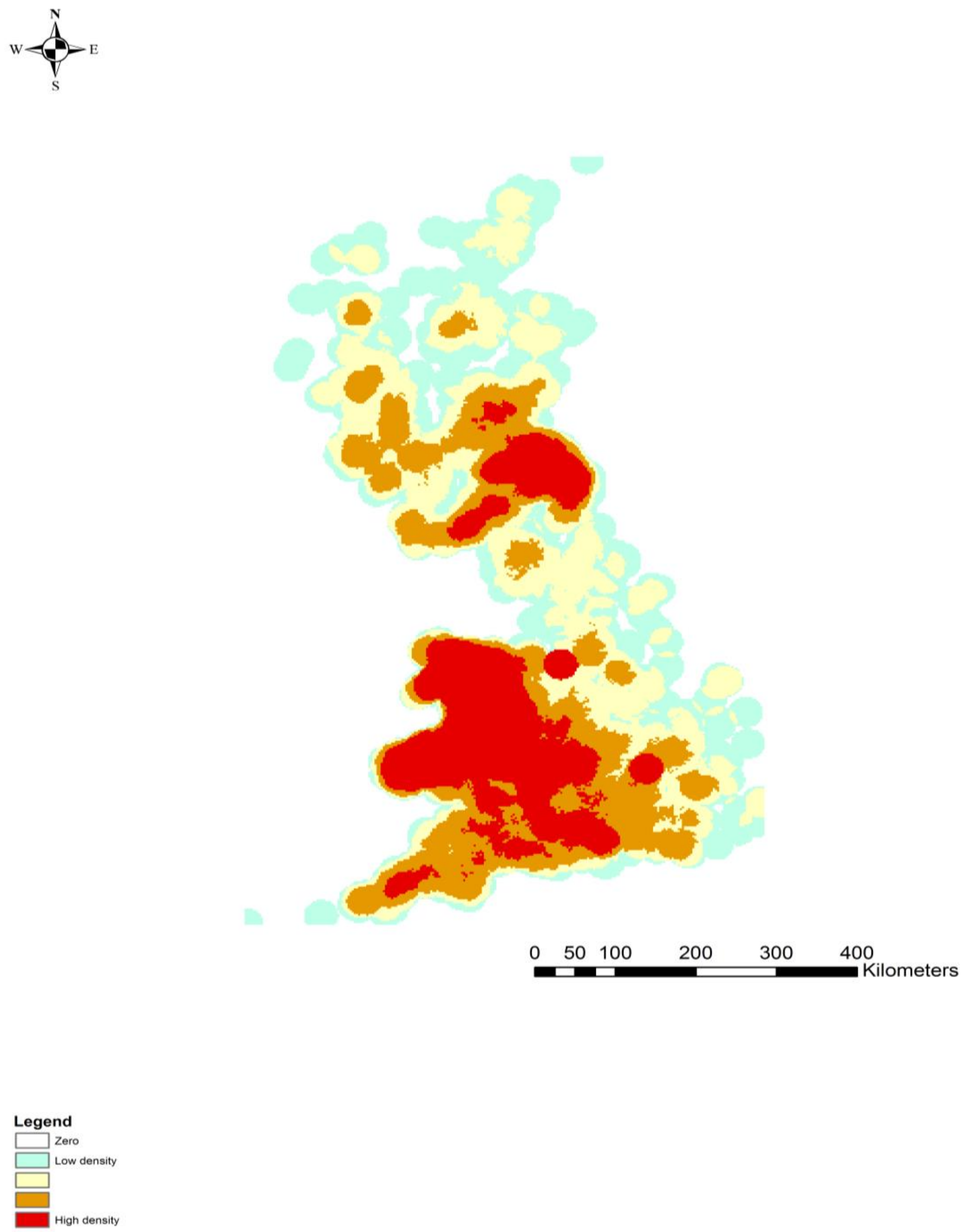
Central Place Theory influenced the socio-economic interpretation of hillforts as a comparison to other enclosures. Cunliffe saw hillforts as a level of social organisation that was above a farmstead or a hamlet that were potentially separate phenomenae (1991, 312). Cunliffe also argued that the presence of these substantially 'different' sites created social difference (1991, 312), similarly Champion believed that hillforts were a means to social differentiation due to their economic role (1994, 133). According to Stanford, hillforts were a different class to enclosures because of the density of buildings and the types of houses that were in them (1971, 48).

These interpretations imply that enclosures were of a lesser social status or of a lesser social function than hillforts, although this has subsequently been argued against. Some areas lack hillforts entirely, these are visible in Figure 1, the absence of hillforts within these areas implies that hillforts per se did not have a fundamental role in social organisation or social activities that could not be undertaken elsewhere. This is supported by both Harding and Hill who noted that there is no evidence for any specialist activities having taken place in hillforts which did not in enclosures (Hill 1996, 99; Harding 2004, 295).

McOmish has suggested that the difference between hillforts and enclosures was that the latter had a greater longevity of use and were less disrupted than the former (1989, 108-109). Enclosures have been more disturbed by modern agricultural practices as they tend to be located in lowland areas where this activity is at its highest, whereas the majority of hillforts are located in uplands and are less susceptible to damage.

Bradley argued for a continuum of enclosure which meant that small enclosures could still be interpreted as hillforts (2007, 247). The idea of a continuum of enclosure was maintained by Wigley who saw indications for the evolution of enclosure techniques from the simplest enclosure to the more complex and impressive hillfort (2007). These interpretations were related to an increase in the investigation of site morphologies.

Figure 1. Map of distribution density of hillforts in Britain (Atlas of Hillforts in Britain and Ireland Project 2013; EngLaID 2013)



Typologies and classification systems

In the Nineteenth Century Anderson assigned very broad typologies to Scottish hillforts; these were based upon whether or not they were of stone or earth construction

(1883). However, they came to be increasingly classed on a cultural basis. For example, the map of Southern Iron Age Britain was based upon geographical location and cultural affinities which had been gleamed from material culture derived from excavations (Rivet 1961, 30-31). Similarly Piggott developed a classification of Scottish hillforts based on the cultural affinities of who constructed them (1966).

Chitty's map of the Iron Age B south-western culture plotted 'camps' based upon their entrance type (1938). Chitty's map typified the increasing focus upon hillfort typologies, for example, although the map of Southern Iron Age Britain was primarily based upon Iron Age cultures it also plotted the size and vallation of the hillforts (Rivet, 1961). The vallation categories were divided into multivallate and univallate whilst site size was categorised as: under 3 acres, 3-15 acres and 15+ acres (*ibid*, 1961).

Broadly based typological discussions continued in Scotland into the 20th century with RCAHMS separating the forts of Berwick regionally as opposed to morphologically (1909). This edition was revised in 1915, here the sites within the 'defensive constructions' section were now classified on a morphological and locational basis with the classifications of (1915):

- *Cliff or escarpment forts*
- *Promontory forts*
- *Contour forts of regular geometrical plan*
- *Small enclosures with possibly a domestic character.*
- *Brochs.*
- *Motes.*
- *Large enclosures partially excavated in the interior.*

Forde Johnston also morphologically and locationally defined hillforts (1976), identifying seven types for location;

- *Hill-top situations*
- *Promontory and semi-contour situations ("sites in which there is an easy, or relatively easy approach on one side, the other three sides being defended either completely or in part by nature"),*
- *promontory and semi-contour situations (" the approach to the site is on a front which accounts for roughly half the circuit")*
- *ridge-top situations ("embraces sites in which there is an easy or relatively easy approach on two sides")*
- *cliff-edge and plateau-edge situations ("there is a level, or at least an easy, approach on three sides with natural defences only on the fourth side")*
- *Hill-slope situations*
- *plateau and low-lying situations*

Based on morphology he produced eleven site types:

- Type I- single enclosure site of 2-12ha, with single banks and ditches and a simple gap or inturned entrance
- Type II- single enclosure site with stronger defences than Type I (size and/or 2 banks and ditches), inturned or entrance cut through defences
- Type III-single enclosure site up to 20ha, strong multivallate defences and elaborate entrance
- Type IV-Very large singe enclosure 23ha+, univallate and multivallate
- Type V- small single enclosure site (less than 2ha), simple defences, simple entrance and many sites are circular in plan
- Type VI- small single enclosure site, multivallate (up to 4 banks and ditches)
- Type VII- Coastal promontory forts
- Type VIII- Small multiple enclosure site, simple entrance
- Type IX- Very large multiple enclosure site, simple entrance
- Type X- Standard size multiple enclosure site, with univallate/multivallate

defences, entrances same as I and II

- Type XI- Multiple enclosure sites with enclosures physical separate

RCHAMS in 1915 and Forde-Johnston based their typological series upon physical evidence as opposed to enforcing an interpretive classification. Forde-Johnston also detailed the regions where the site types occurred, defining Type I- IV and Type X-XI as the Wessex tradition and the remainder the Western tradition (*ibid*, 1976).This demonstrates that the concept of 'culture' and cultural groups still had an influence within archaeological research even when the focus of the work changed.

In Wales and the Marches the distribution map of hillforts and defended enclosures emphasised site size. Simpson for example defined classes as over 15 acres, 3-15 acres and 3 acres (1964). Similarly, Hogg mapped the hillforts within south-west Britain (including Wales), south-east Britain and northern Britain (including Scotland) based upon size but also using their vallation type, for example whether or not they were multivallate or south-western type (1975).

The typological definition of hillforts based on their banks and ditches has been prominent across Ireland from an early date. Westropp's study of Irish forts initially focused upon their architectural features although he later arranged them into regions to avoid focusing upon the more impressive sites, subsequently he arranged them into types (1896/1901). Looking at Westropp's site types, ringforts seems to be the only class which could include hillforts, he divided them by size; 'typical' and 'large' sites (1896/1901). His other classes of site included 'the walled islands' which were marsh and lake forts, and rectilinear forts which were later in date than the curvilinear walled structures of the Bronze Age. According to Westropp the second most important site type is the cliff/ promontory fort whose defence relied upon cliffs or slopes and his final class of sites was motes (both simple and complex) (1896/1901). Much later Raftery compiled a classification system which was based upon the character of enclosing earthworks (1972). This included 3 classes, class 1 comprised of sites with a single line of defence; class 2 had two or more lines, and class 3 were inland promontory forts (*ibid*, 1972).

Instead of basing typology on the number of banks and ditches, Fox used the form of the banks and ditches particularly their spacing; she distinguished them on the basis of whether they had closely spaced or widely spaced ramparts (1961). Like the map of southern Britain, Fox contextualised her discussion of hillfort morphologies with pottery typologies leading her to imply that the hillforts had cultural affiliations (1961). This idea of cultural regionality was continued by Feachem who also explored hillfort typologies spatially through their morphology (1966).

Although the basis of typologies moved away from a primarily cultural one there was still a strong sense that some had a social interpretation applied to them. For example, in the 1967 RCAHMS survey of Peeblesshire functional meaning was implied within the typological series with site types such as 'homesteads'(1967). The typological series comprised:

- *Unenclosed Platform Settlements*
- *Palisaded Works*
- *Homesteads and Settlements with Timber Houses*
- *Forts*
- *Dun*
- *Settlements with Stone Houses, and Field-systems.*
- *Scooped homesteads and scooped settlements*

The application of social interpretation upon typological systems continued with the 1994 RCAHMS survey of south-east Perth (1994). In this instance the interpretive impact was not to the same extent as in other examples as the majority of the classes were based upon physical form, the only interpretive category was ‘fortifications’:

- *Unenclosed circular buildings*
- *Enclosed crescents*
- *Palisaded sites*
- *Fortifications*
- *Enclosures*
- *Interrupted ring-ditches*
- *Souterrains*
- *Cropmarks of rectangular buildings*

However, the concept of typologies was not adopted or agreed with by every scholar. Individually hillforts do not have a uniform morphology particularly the number of banks and ditches, for example Pen y Bannau in Ceredigion is univallate on all sides apart from its north-eastern side which is multivallate. Consequently the distribution maps that are based upon vallation sequence are a very broad generalisation of hillfort typologies that does not reflect reality. This was highlighted by Bedwin who stated that the “blanket term ‘hillfort’, is probably more of a hindrance than a help” (1984, 47). Harding also argued that classification systems imply regularity in design and function that may never have been intended (2012, 14).

Recent views typified by Driver have moved away from typologies and have examined the variability of hillfort morphology in Wales on a site by site basis (2005a; 2005b; 2007; 2013). Driver’s views are explored and expanded upon later in this thesis. However, as a generalisation Driver examined hillforts in relation to the topography by assessing whether or not the hillfort morphology adhered to the topography, or whether a design was enforced upon the landscape. At Castell Grogwynion, for example, Driver found that in order to implement a straight façade the northern terrace had to be cut through the bedrock (2005b, 97; 2013, 132). To test this further Driver examined and compared how individual sites responded to topographical situations. In the majority of cases Driver found that the hillforts did not follow the principal of least effort as might be expected (*ibid* 2013, 133).

Driver also investigated the degree to which morphological components to these sites were functional or symbolic (2005a; 2013). He found that topography could be utilised to falsify an image. For example, it was found that the impression of the banks which enclose a hillfort could be accentuated and falsified by the slope and form of the land on which it was constructed. In some cases the nature of enclosing banks and ditches and entrances went beyond satisfying a functional need towards a symbolic accessory.

Driver's assessment of hillfort morphologies required that the hillforts were broken down into their core architectural components (2005a; 2013). This allowed him to study the morphological variation within and between sites, he was no longer reliant upon static site typologies (*ibid* 2005a; *ibid* 2013). The breakdown of sites into their core components allowed the analysis of patterns across his study area in order to question whether or not they exhibited evidence of regionality (*ibid* 2005a; *ibid* 2013).

He also studied the variable morphology of the hillforts in relation to the dynamic landscape in which they sit. This landscape was defined as one of movement and visibility (*ibid* 2005a; *ibid* 2013). He accounted for how the morphology of a site varied across its circuit in relation to the location of routeways, topographical features and contemporary sites (*ibid* 2005a; *ibid* 2013). This enabled him to investigate what influenced site location and form, for example solely the terrain or were they designed to portray a particular image by disproportionately allocating resources within a particular area of the site (*ibid* 2005a;

ibid 2007; *ibid* 2013). This approach was suggested by Cunliffe as a means of gaining a finer understanding of these sites (2006).

Landscape analysis- hillfort location

As shown above the idea of hillforts within a socio-economic hierarchy imposed upon the wider landscape context was prominent within hillfort studies in the 1960s and 70s. However, in recent years the physical position and the 'experiencing' of hillforts within the landscape have come to be more central to hillfort studies. This humanistic approach to hillforts is primarily based upon movement and visibility and investigates how these factors may have informed social relations within a landscape setting. An early example is Avery's analysis of the location of Cashel na Veen. Here he argues that its location afforded high visual accessibility both to and from the site (1991/1992).

Hamilton and Manley investigated the function of hillforts in south-east England by examining the correlation between their location and morphology (Hamilton and Manley, 2001). This was chronologically contextualised through an examination of the sites within their landscape context (*ibid* 2001). This chronological approach was used to investigate changes in ideology and argued that the construction of hillforts was an expression of social and cultural meaning (*ibid* 2001). They found that the hillforts which dated from the late Bronze Age and into the early Iron Age were located on the edge of topographical land units, but had long distance views. This led them to argue that these sites were not central places, but served to connect people and landscapes (*ibid* 2001). This was enhanced by analyses of the site morphologies, which showed that the sites of this period were simple but with few morphological and locational similarities (*ibid* 2001) whereas Middle Iron Age sites were more elaborate and their interiors were visible from outside of the sites (*ibid*

2001). Hamilton and Manley's study suggested that hillforts within south-east England were located to promote access to information (2001). Initially they were placed to have maximum visual accessibility to the surrounding landscape, later they were positioned to be highly visible from the landscape itself (*ibid* 2001).

Contextualised studies of hillfort location have moved beyond a chronological basis towards an assessment of material culture. For example, Driver investigated the directionality of movement within the landscape in relation to hillfort location and morphology by looking at the origin and distribution of material culture such as small finds like pottery (2005a). Chitty had also approached movement in a similar way for the Welsh Marches to answer questions of how and when people came into the area (1937). However, I would argue that the reliance upon interpreting object location and movement as the delineation of group areas and directions of movement is questionable. It is not known whether or not these objects came directly from the source to the hillforts, or if they had been curated and circulated for some time prior to their final deposition. If this was the case then Driver's and Chitty's directions of movement were not direct.

Driver also related his analysis of movement within the landscape to the visibility of hillfort interiors and the core components of their morphologies such as ramparts and entrances (2005a). This approach aided his investigation of image and function compared to symbolic interpretations. The relationship between hillfort morphology, movement and topography had previously been examined by Mytum and Webster at Carn Alw (1989). Mytum also modelled the land before, during and after hillfort construction to assess variation in earthwork form and to investigate the changing view of the site on arrival and approach (1996).

Some of Driver's key observations and ideas were introduced earlier in this chapter. The first of which was the investigation of the physical relationship between hillfort location and morphology (2005a and 2013). The investigation and relevance of this relationship resonated throughout the remainder of Driver's key discussion, the second element of which was image (functional Vs symbolic). This was claimed to be when a hillfort portrayed an impression of strength and prowess (i.e. increased number of banks and ditches, elaborate entrance) within an area of high visibility or where there was a lot of passing traffic. This was defined as symbolic as opposed to functional because the physicality of the site's architectural components went above and beyond their functional need. The portrayal of an image was also seen as front/rear symbolism were although superficially some hillforts appeared to be complete, they were not morphologically homogenous. They portrayed a public front and a private interior/rear, for example when one side of a site had a greater number of banks and ditches than the others. In military functionalist terms the greatest number of banks and ditches may have been placed within an area where the hillfort was more susceptible to attack. It could be argued that this occurrence would be symbolic if the banks were most numerous where the land was steeply sloping and/or highly visible from neighbouring and contemporary hillforts.

Image was also discussed by Driver within the concept he termed "a correct path of movement" (2013, 137). This was previously approached by Parker Pearson and Richards at the Bronze Age enclosure of Springfield Lyons where a 'correct' path was found that kept refuse and cooking activities out of sight (1994). Driver found that in some cases, direct pathways into sites were obstructed by site morphologies, for example at Pen Dinas Elerch and Castell Grogwynion where bastions created such an obstruction. The act of obstructing direct access and routing people along particular pathways may have lengthened entry into these sites to enhance feelings of anticipation. In some cases the routing of people in particular directions may have heightened their experience of coming across certain aspects of a site; routeways may have been designed to both impress and conceal.

These earlier investigations of hillfort location and morphology are a fundamental influence to the approach that is adopted within this study. The following section details how past approaches will be enhanced and moved forward.

The enhancement of earlier approaches to hillforts within the landscape

As discussed above, recent studies have investigated the morphology and location of hillforts to tackle issues of social organisation and identity. Hillforts are not a uniform entity that can be explained through typologies (Driver 2005a; Driver 2007; Driver 2013). The current focus on questioning the use of hillfort typologies is primarily based upon non-GIS, topographical and fieldwork analysis generally applied to individual areas. To develop upon this approach, and to concur with the extent of the Atlas of Hillforts in Britain and Ireland project, this study examines a series of areas which are spread across the project area. The large scale of this thesis meant that the interpretation of the data is on multiple levels, beginning with individual sites, then moving on to test areas; these are then compared and contrasted across regions of Britain and Ireland. The multi-scale analysis and interpretation of this study enables a broader understanding of hillforts which has never been possible before due to the constraints of small study areas and the barriers of modern administrative boundaries.

The large scale of this thesis is enhanced and enabled by its predominantly GIS-based approach as this allows for the effective analysis of large volumes of data. Since the early 1990's GIS has been used within archaeology. GIS is a "data management tool and … a methodology in its own right" (Chapman 2006, 9). It was slow to diffuse within archaeology in the UK (Harris and Lock 1990). However, archaeologists who were closely associated with the planning process came to be increasingly aware of GIS applications used by planning authorities (*ibid* 1990, 36). GIS permits "much greater flexibility… [in] structuring… raw data and … [enables] both map-based and quantitative approaches" (*ibid* 1990, 47). Allowing one to display and analyse large quantities of both spatial and thematic data (*ibid* 1990, 47).

As GIS came to be increasingly adopted by archaeologists, it began to be integrated within current quantitative analyses. In particular it was frequently used in predictive modelling (Wescott and Brandon 2000; Connolly and Lake 2006, 34-35). It was also used to model movement and visibility within landscapes in relation to archaeological sites (Connolly and Lake 2006).

This thesis harnesses GIS' ability to store, display and analyse multiple types of data to encourage the further interrogation of the data and results in the future. It also encourages the application of similar studies to other regions in order to enhance our understanding of the hillforts in Britain and Ireland. This study will create a body of data that will continue to increase over time and as new methodologies are developed they can be applied to an existing dataset. This would not have been as possible with the earlier non-GIS based studies of visibility such as Renfrew's analysis of visibility from tombs on Orkney where he had to stand on top of them all in one day to note what could be seen

(1979). The reliability of this work was based upon the drawing and mapping capabilities of Renfrew, and as Fleming highlighted, such studies are often very difficult to go back to and investigate due to human drawing error (1999).

To avoid issues of human drawing error and to manage large quantities of data this study's analysis is primarily GIS-based. However, the results from this analysis are qualitatively enhanced by field visits and site photography. This demonstrates how the visual and physical prominence of each site is affected by movement and distance by taking photographs of the hillforts from varying distances and directions. The combination of GIS-based analysis and fieldwork has been applied to other landscape projects, for example, Arbour used GIS-based analysis both pre- and post-fieldwork to test the reliability of the field work and the accuracy of viewshed calculations (2011). Similarly within the Lismore Landscape Project where a combination of photography and viewshed analysis was used to investigate the visibility from a site (Redhouse, Anderson et al. 2002).This creates a realistic visualisation and basis for analysis and interpretation because these photographs are taken within a real environment with real weather and real vegetation which can all effect visibility.

Hamilton and Manley assessed visibility both to and from hillforts and unlike many visibility studies they explored directions of visibility and depicted it in pie-charts (2001). This depiction is not as clear as it would be by using GIS such as ArcGIS viewshed analysis. Pie-charts do not inform the reader of the extent of visibility, neither can they determine which areas are visible, for example if a particular hill is visible or not. This is all possible when using GIS-based techniques such as Viewshed Analysis which is now often reported (Field and Smith 2008; Dorling and Wigley 2012). However, the use of

Viewshed Analysis within these papers is based upon binary viewsheds which simply depict whether something is visible or not. As it will be shown later in this thesis visibility is not definitive and it is affected by distance, atmospheric and environmental conditions.

Moves in this direction have been made by Ruestes as she believed that visibility and distance affected and informed socio-economic relations (2008). Instead of relying upon the limitations of a binary viewshed, bands of visibility as defined by the effect of distance upon visual clarity were applied to the results of the viewshed analysis (*ibid* 2008). The viewshed analysis results were then investigated to examine how the site's ability to have visual control varied although she failed to clarify how one could gain such control (*ibid* 2008).

Whilst this study uses GIS-based analysis to question the archaeological record it also questions the effectiveness of using this software as a tool to answer these questions. The questions under consideration are Driver's key conclusions of the relationship between topography and morphology, image and correct pathways (2005a and 2013). The first of which is assessed with the analysis of LiDAR imagery, aerial photographs, site plans and DTMs. This analysis helps to examine the physical relationship between the topography and the morphology of the hillforts, to assess how the latter adheres to the former. The degree to which the form of the land is utilised within the construction of the hillfort is also examined to identify whether or not the form of the landscape in conjunction to the morphology of the hillfort was used to manipulate images of the hillfort.

The concept of image is developed further within this study, just as within Driver's work the idea of utilitarian vs symbolic is tackled. In particular the spatial allocation of resources such as material, time and people in relation to the hillfort morphology is investigated. In some cases emphasis has been put upon one side, for example the side which faces an area of a large degree of human traffic or where it is highly visible from the surrounding landscape. This element of hillfort morphology is assessed through a combination of cost surface, viewshed and fieldwork analyses. This combination enables the examination of the access to and visual qualities of the hillfort alongside an analysis of morphology.

Movement is also a key feature within Driver's third element, that of 'correct pathways' (2005a and 2013). Here entrance morphology and the positioning of other features such as outworks or bastions affected movement to and through the hillfort. Although Driver based his correct pathways upon hillfort morphology, they could also be based on a least cost pathway. This project aims to investigate whether correct pathways as defined by both slope and visibility existed at these sites correlate with entrance-ways or other particular morphological components such as the most extensively enclosed area.

The analytical process within the investigation of 'correct pathways' is a two stage process within this study and is explained in more detail in the next chapter. Firstly, the methodology is applied to a group of hillforts within Driver's study area to examine how effective his non GIS based conclusions were compared to those reached from this GIS based analysis. This also aims to question Driver's concept of a correct pathway, For example whether or not the non-extant pathways (slope-based or visual pathways) correlated with a hillfort's entrances or earthworks. This approach was inspired by the work of Lee and Stucky and Lock and colleagues who saw visibility as a highly influential factor in pathways (Lee and Stucky 1998; Lock et al. 2014) by integrating visibility with movement through Cost Surface Analysis. This approach has not been applied to hillforts and it shows great potential for the investigation of movement and visibility in relation to hillfort morphology at a scale that has never been used before, i.e. the human scale.

Individually visibility and access analysis have been factored into site analysis to varying degrees for some time, for example as described above, Hamilton and Manley argued that through analysing the chronological variation of the visibility of hillforts one could understand their changing role (1997; 2001). However, they failed to take into consideration that with distance visual clarity decays. The work presented here incorporates visual decay through distance within its analysis by using bands of visibility. Such banded visibility was used within Ruestes' analyses of Iberian hillforts (2008), as described above. The difference here is that the visibility of the hillforts from the bands as well as the visibility from the hillforts is used to achieve a fuller understanding of visual variability within the wider landscape context.

This analysis of visibility enables one to question the degree to which the hillforts were integrated into the wider landscape, for example how a site 'affords' the act of being seen (Gibson 1979; Wheatley and Gillings 2000). This is manifested through 'strategies of visibility' such as monument construction" (Wheatley and Gillings 2000) and it is these which are under investigation within this thesis. Strategies of visibility bring hillforts into being within a person's world (Ingold 2000, 21). However, by integrating movement with visibility as here through Cost Surface Analysis this study acknowledges the importance of movement in peoples' effective engagement with the landscape (Ingold 2000, 55; Ingold 2011).

People "know as they go, as they journey through the world along paths of travel" (Ingold 2011, 154). Consequently by investigating the visual qualities of pathways this study has the opportunity to identify areas where the landscape afforded people the opportunity to obtain visual information about their surroundings. The process by which this study investigates both the strategies of visibility, and knowledge acquisition through wayfaring (Ingold 2011) is explained in detail within Chapter 2. However, as Barrett suggested, events and activities such as site construction all occur as a result of peoples' ability to interpret situations with their understanding of the past and the present (1999, 24). Consequently, this study assesses the evidence for hillfort morphology and location through a contextualised assessment of their wider landscape context, the method by which this is undertaken is also detailed in Chapter 2.

Chapter 1 highlighted the theoretical underpinnings and influences to the approach within this thesis which set the scene for the study. Chapter 2 subsequently develops upon this introduction to introduce the methodology used as well as highlighting the fundamental research questions asked and how the methodology is used to answer them.

Chapter 2

Methodology and research questions

The principal focus of this research is to test how effective Geographical Information Systems (GIS) are to investigate and compare the various influences on hillfort location and morphology. The key influences focused upon are topography, visibility and physical accessibility investigated through the application of Cost Surface and Viewshed Analysis. The intention is to explore and assess the three key elements of Driver's study of hillforts in Ceredigion (2005a; 2013) in which he identified and analysed:

- the use of image
- correct pathways
- the physical relationship between hillfort morphology and landscape topography

The significance of the application of GIS based analysis to hillfort location and morphology

To outline, reinforce, and test these three core elements of Driver's study, this work applies the GIS-based methodology developed here to a subset of the hillforts which were within Driver's study area (Chapter 3). By testing Driver's conclusions against a GIS-based analysis it will be shown whether if Driver utilised GIS, he would have drawn different conclusions or whether GIS supports and enhances his observations. GIS is able to assess to what extent distance and direction affected the visibility of different architectural aspects of the sites and how that related to their image. Through the use of GIS the concept of a correct pathway can also be analysed further, to investigate to what extent these extant pathways such as entranceways and known routeways correspond with visual and slope based pathways. These non-extant visual and slope based pathways can also be investigated further using GIS, by investigating their correlation with architectural components of the sites.

The significance of a multi-regional approach to hillfort location and morphology

Whilst there has not been a GIS based analysis of hillfort location and morphology, Chapter 1 also highlighted that there has not been a multi-regional approach to hillfort location and morphology in recent times. Both Driver, and Hamilton and Manley's individual studies focused upon small regions and there was little, if any in-depth comparison made with other areas (Driver 2005a; Driver 2013; Hamilton and Manley 1997; Hamilton and Manley 2001). It is impossible to effectively assess the morphology and location of every hillfort within Britain and Ireland consequently it was decided that this study would be based upon a series of widely spaced test areas. Even though this study only uses a small subset of Britain and Ireland's hillforts, its multiple-area approach has produced a large quantity of data that can only be effectively managed and analysed within a GIS.

Initial methodological stages: Test area selection and the acquisition of a DTM

Test area sampling

During this project's developmental stages multiple means of deciding upon test areas were investigated. The first of which was to select areas purely based upon topography as topography is undeniably a highly influential factor in the location of hillforts. Consequently by identifying topographically variable and similar locations the writer is able to examine how these locations influenced site morphologies. This method encountered problems from the outset, the most significant being data acquisition. Although digital topographical data is available for Scotland, Wales and England but not for Ireland, it is in different formats. Topography is also locally highly variable, therefore classifying areas by topography across all countries would be complex and ineffective so this method was not considered suitable within the time frame available.

Random sampling was investigated in which a homogenous grid would be placed over the distribution map of the total hillfort population of Britain and Ireland and a process of random selection would then be used to select test areas. This was decided against because the aim of a random sample is that it is 'representative' of a total population with "the part …stand[ing] for, or represent[ing], the whole" (Orton 2000, 14). The aim of this research is not to use the test areas to represent the entire hillfort population, for example using it to predict where architectural features would occur at hillforts within different regions. Rather the aim is to investigate whether movement and/or visibility influenced the location and morphology of the test area hillforts alone and to assess differences between areas. In fact this study investigates whether or not a GIS-based methodology is capable of answering qualitative questions about the location and morphology of individual hillforts.

It was decided that the process of test area selection would be multi-phase. This study's primary geographic focus is Britain, consequently it is important to select from the entire hillfort population and to sample areas with differing degrees of hillfort activity, as represented by hillfort density. Producing the density map required the collation of point data for all of the hillforts across Britain and Ireland into one shapefile which was then input into the point density tool in ArcGIS. Areas of differing densities were subsequently visually selected from the distribution map.

Once areas of different densities were selected, the underlying topography was also examined. To effectively test the methodology it was important to have a series of topographically different areas, this variation could be both within and between test areas. The topographical characteristics of the test areas was qualitatively investigated through an examination of the Digital Terrain Models, and an assessment of the distribution of watercourses and hillforts within these regions.

As a final step, closer examination of these topographically and distributionally variable test areas required further inspections of their hillforts themselves specifically their morphologies to ensure that the groups of sites chosen were morphologically variable. This would ensure that the methodology was tested to its maximum.

The acquisition of Digital Terrain models

A GIS-based study's foundations lie within the acquisition and effective use of a Digital Terrain Model (DTM) prior to the application of any analytical technique. The DTMs for the test areas were retrieved from EDINA Digimap (in dxf format). This is a PROFILE DTM which comprises 10m grids of height points derived from the PROFILE contour data (Ordnance Survey 2012). For PROFILE contours, vertical values are recorded every 5m generally and every 10m in mountain and moorland areas (*ibid* 2012).

To counteract small residual errors within the construction of the DTM the common edge between the DXF tiles is blended (*ibid* 2012). However, Ordnance Survey note that if the data was provided at different times blending would not have taken place, and there may be small differences in the height along the adjoining edges of tiles (2012). For this work some data was retrieved at different times consequently there may be very slight differences within height data, however, having assessed the DTMs the effect was negligible. It was noticed however that in the Aberdeenshire test area a portion of the DTM is poorly blended as the tiles are relatively prominent although this was not caused by requesting data on different days. Even so it is not likely that this would have greatly influenced the results of the GIS-based analysis, as this erroneous area is predominantly a central lowland region between areas of uplands.

Ideally the DTM would have been based upon LiDAR data retrieved from Geomatics as this is at a much finer resolution (Environment Agency 2015). However, there was no data available for the Aberdeenshire test area and in some cases those areas that had LiDAR data had incomplete datasets which would have had detrimental effects on the results of GIS-based Cost Surface Analysis. Similarly, higher resolution DTMs often run the risk of having an increased number of artefacts. These are introduced through high intensity processing and would influence the results of GIS based analysis, consequently it would have to be used with caution.

Another consideration is that the test areas within this study are also large, spanning beyond 9km around any one site. This would have required a large quantity of LiDAR data to be obtained and processed thus substantially increasing the time taken to undertake analysis. Consequently subsets of the test areas (apart from Aberdeenshire) were analysed with a LiDAR based DTM to investigate the differing affect that DTM resolution had upon the results of the GIS-based analysis. These DTMs came in ASCII files in various resolutions from 50cm to 2m. This data was straight off the shelf from Geomatics, further processing was not undertaken. It was felt that this was not needed because the LiDAR data was studied alongside aerial photographs, site plans and site visits. The combination of multiple data types counteracts the effect that any defects in the LiDAR data would have on subsequent interpretations. The difference in the results of large scale GIS-based analysis between the two DTMs was minimal thus the study was able proceed with confidence in the use of the DIGIMAP derived DTM as the basis of the friction surface for analysis.

Despite this it was decided that throughout the thesis the results of the LiDAR based analysis would be displayed alongside those from the Ordnance Survey DTM based friction surfaces. This shows the similarities and differences between the results to enable a fully informed interpretation of the results. LiDAR was the only friction surface which was used to investigate the differing degrees of visibility to the architectural components of the hillforts. Whilst the cell size of the PROFILE DTM was sufficient for the large scale GIS-based analysis, it was too great to depict the finer detail for the analysis of the architectural components to the sites. However, due to the large size of the Ceredigion test area, LiDAR was only used to investigate the contradicting results of Driver's observations with the results of GIS-based viewshed analysis, specifically in relation to the intervisibility between Gaer Fawr and Pen Dinas.

This chapter began by detailing the rationale for test area selection and aspects of the underlying DTM used for analysis. It now progresses by highlighting the fundamental research questions to be addressed and how they are answered.

Approaches

Site morphology in relation to topography

A key aspect of Driver's work was the examination of how the morphology of hillforts related to the topography of their location (2005a; 2013) thus allowing his study to investigate whether or not topography aided the construction of the site. Additionally, one can investigate how the morphological variation of the site, for example the number of banks and ditches which enclose it, relate to the lie of the land that it is situated on.

Method of investigation

To gain a detailed understanding of site morphology's in relation to the topography the PROFILE DTM was not sufficient enough consequently the LiDAR data was used. This LiDAR was processed into a hillshade model. This process has been identified by many to greatly effect data interpretation (Kokalj et al. 2013; Opitz 2013; Opitz and Cowley 2013). Hillshade modelling helped to gain a better understanding of the morphology of sites and to identify specific aspects, particularly:

- Form and extent of enclosing earthworks
- Presence of quarry scoops
- Location of interior features such as barrows, enclosures/annexes

In order to create a hillshade model of the LiDAR data the Ascii files were initially converted to rasters which were then mosaicked into a single raster and converted into a float file which was then transferred from ArcGIS to Landserf (Wood 2009). Within Landserf, the shaded relief model was constructed and the azimuth, aspect bias and sun elevation angle were gradually modified to enhance the visibility of features within the model. However, it was later found that hillshade modelling in ArcMAP was much more effective than that in Landserf. The images from this process had a finer degree of clarity and brought out features which were not visible within the Landserf processed images and these, alongside the DTM, formed a basis for further analysis focusing on visibility and movement. Site plans, where available, are located within the Appendix. The site plans for the Aberdeenshire test hillforts are within the main body text of Chapter 5 due to the lack of available LiDAR data.

Once an understanding of the morphology of the sites was established the core architectural components of the site were marked out by creating a polyline along the peaks of the banks. The original height of these banks especially is an unknown, neither is it known whether they had any additional palisades on top of the core bank. Any additional height could have affected the visibility of their interior, consequently, tests were undertaken to investigate how inner bank height affected the visibility of selected hillforts from neighbouring hillforts. The inner bank was used as a test case as this is usually the biggest. The tests were applied to two sites of different character: the North enclosure on Hardings Down which is a hillslope enclosure with an area of 0.2ha (Figure 2) in relation to its neighbour The Bulwark, and Scratchbury which encloses 17ha (Figure 3) in relation to its neighbour Cley Hill. The resolution of the PROFILE DTM meant that the cell size was too large to use it effectively as a DTM; consequently this investigation relied upon the availability and use of LiDAR data. Although height was added to the compacted bank surface, the width that was added was determined by the resolution of the DTM. Heights of 1m, 1.5m and 5m's were added to the known height of the bank. 1m was chosen as a minimal starter height. 1.5m was chosen as it was postulated that the height of any additional breastwork would not be much higher than an individual's chest height (Ian Ralston pers comm). Consequently, as the project uses a height of 1.7m for an individual, the chest height is 1.5m. 5m was also chosen as this took into account an additional, pre-erosion bank height and an additional palisade.

Figures 2 and 3 illustrate the variable affect that the addition of height to the inner bank of these enclosures had upon the visibility of the sites' interior and shows a generally limited effect. Its primary influence on the larger site of Scratchbury was upon the visual magnitude of the visible areas (the number of observer points which can see the site) (Figure 3). Its effect on the smaller site was greater (Figure 2). However, the visual magnitude of this site was very low prior to the addition of height to the bank, consequently the changes in the visibility of areas of this site was from low visibility to not visible.

Figure 2. Result of investigations into the effect that inner bank height has upon the visibility of Hardings Down North enclosure from The Bulwark (© Environment Agency copyright and/or database right 2015. All rights reserved.)

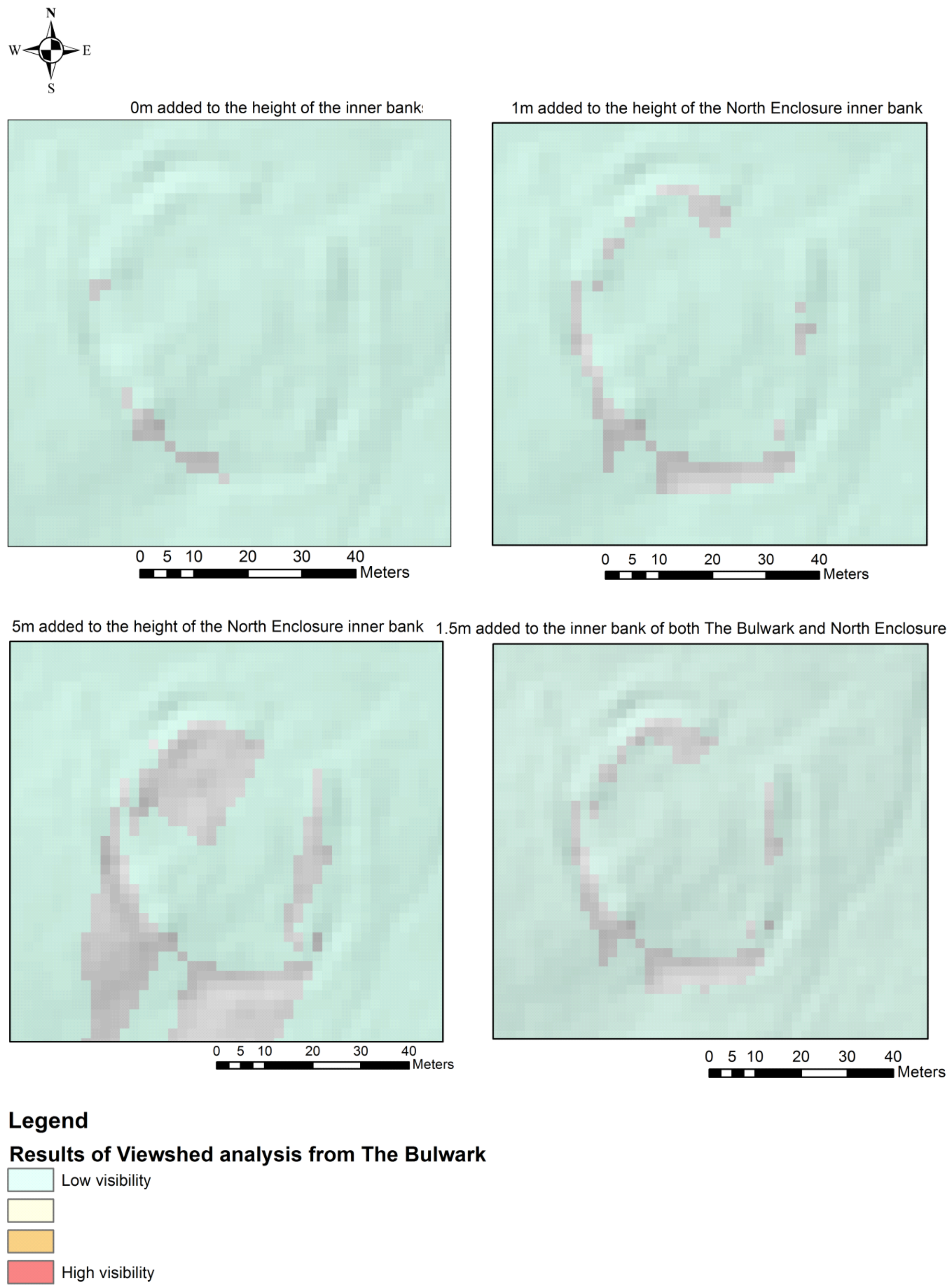
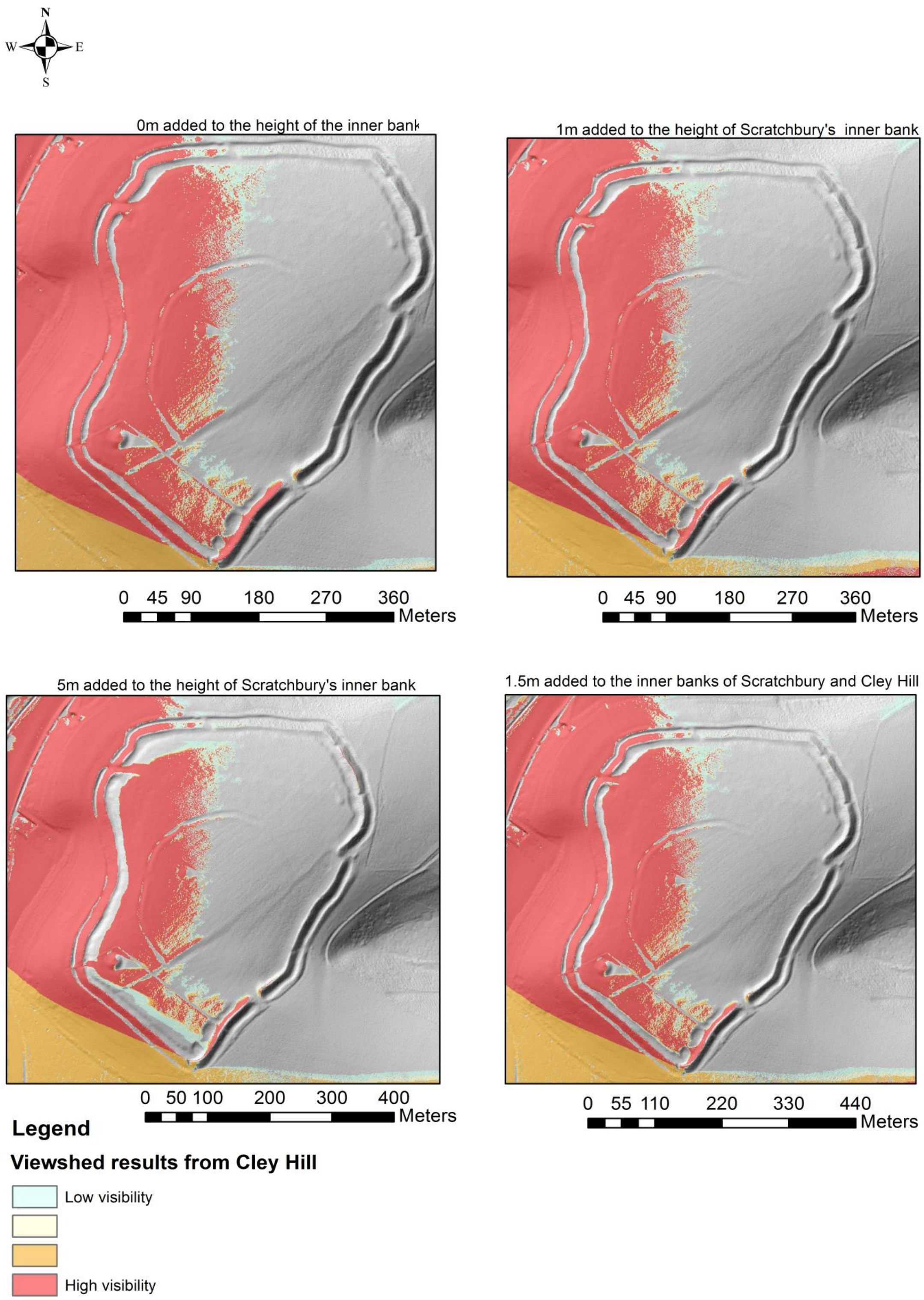


Figure 3. Result of investigations into the effect that inner bank height has upon the visibility of Scratchbury from Cley Hill (© Environment Agency copyright and/or database right 2015. All rights reserved.)



Visibility

Earlier methods of investigation

Visibility has featured in hillfort studies for some time with Driver (2005a and 2013) and Hamilton and Manley (2001 and 1997) undertaking non GIS-based visibility analysis.

Visibility studies have often been identified to enable researchers to develop a better understanding of past social networks. For example Jerpåsen acknowledged the potential importance of applying GIS based analysis to applications of the Archaeological Landscape Analysis by Visual Methods methodology (2009). This method involves investigating landscapes as ‘Landscape Rooms’ and it has the potential of providing a methodology to phenomenological research (2009). Brughmans, Keay and Earle used a combination of site visits, line of site calculations and a statistical network simulation modelling technique known as exponential random graph modelling to investigate visibility networks over time in Iron Age and Roman Southern Spain (2015). This study represented sites through single observation points which they openly stated was problematic, however the nature of the sites that they were investigating meant that it was problematic to define their true extent with multiple points within a site polygon as this was not known. It is much easier to define the extent of hillforts within this study as they are primarily defined by enclosing banks. Brughmans, Keay and Earle also emphasised the importance of combining GIS based analysis with field visits because the paucity of their DEM meant that there were instances where the GIS was not picking up lines of sight that were visible in the field (2015).

Further studies of past visual networks include Marsh and Schreiber’s investigation of the positioning of imperial sites within the Wari Empire (2015). This study investigated the visibility of the landscape from known sites compared to from random locations (2015). They challenged the null hypothesis by identifying that imperial sites were positioned within locations that have a greater degree of visibility to the surrounding landscape than random locations (*ibid* 2015). Visibility investigations of known sites compared to random locations was also employed in relation to chullpas, which were found to be located within highly visible and highly elevated (Bongers et al 2012). Mitcham undertook GIS based analysis to investigate how defensible Hampshire hillforts actually were (2002). This investigation was based upon the belief that a site could have a defensive role if:

*It was on the steepest slopes

*It had good views of the immediate surroundings

*Its interior was not visible

By investigating the results of viewshed analysis and the analysis of slope maps Mitcham identified that not all of her study hillforts were defensible (2002).

However, visual relationships are affected by distance and this has been factored into multiple GIS based studies. For example, Carme Ruestes factored in distance into her investigations of visual control from sites within Iberia through undertaking banded viewshed analysis (2008). Similarly, Wheatley and Gillings emphasised the importance of undertaking viewsheds both to and from sites as opposed to wrongly assuming visual reciprocity by only undertaking viewsheds from sites (2000, 7-8). They argued that as the distance of views in relation to viewer height increases the visual reciprocity between views to and from a point increases (*ibid* 2000, 8) and, therefore, it is important to factor in distance to viewshed analysis (*ibid* 2000). They did this by overlaying the viewshed results with a binary euclidean distance calculation (*ibid* 2000). Llobera also incorporated distance into viewshed analysis by investigating whether visibility within different topographical areas differed due to being in the foreground, middle ground or background (2003). Similarly by examining views of the Ridgeway hillforts from short and long distances, Bell and Lock investigated whether they were positioned to guide people along points of the route (2000).

The effect of distance on visibility, particularly clarity of vision has been influential within viewshed analysis since recognition of the work of Higuchi (1983) who argued that short, middle and long distance views affected visual clarity. This was based upon the visibility of trees, short distance was interpreted to be sixty times the size of the object and you could achieve a steady gaze upon an individual tree (1983, 14). Mid- and long distance varied with the type of tree with the transition from mid to long distance visibility occurring at the point where individual trees could not be distinguished (*ibid* 1983, 15). His work also integrated the effect of topography on visibility; this is highly applicable to the study of the visibility of hillforts (*ibid* 1983, 15). Much later, Ogburn investigated the visibility of cultural objects within landscapes (2006). This methodology was an adaptation of Fisher's fuzzy viewsheds, here Ogburn took into account target size alongside visual acuity (2006).

Current focus of the investigation

The current work develops these earlier GIS-based approaches to visibility with the aim of answering the following questions:

- What was the degree of visibility from the hillfort? Were there long distance or short distance views?
- How visible was the interior of the hillforts from other hillforts? Was one area

of the hillfort more visible than others? How does that relate to the morphology of the hillfort?

Method of investigation

Viewshed analysis was undertaken from the hillforts to analyse how much visual access these sites (how much those within the hillfort could see from inside of it) had of their surrounding landscape. The visibility of the hillforts from the landscape was also analysed to establish from where the hillforts were visible. This was calculated both through a visual dominance grid and from undertaking viewgrids (explained below) from the buffers (1km, 3km, 6km and 9km) which surround the site. This enables the assessment of the extent that the hillforts were visible within these landscapes which also represents the site's visual magnitude.

Through the calculation of visual magnitude this study examines how many times a particular part of a site was seen and from where. This is similar to the work of Llobera who calculated the visual magnitude of areas to see whether or not topography and location, for example valley side, upland/lowland or ridge, afforded homogeneity or heterogeneity to visualscapes (2003).

Directionality has also become influential within visibility studies. Through his qualitative analysis Driver argued that there was evidence for directionality within hillfort morphology as manifested by the portrayal of particular images in particular directions (2005a; 2013). Wheatley and Gillings argued that GIS-based viewshed analysis could be enhanced by taking into account the directionality of visibility using the overlay of an aspect raster of the terrain surface (2000). Within this thesis, directionality is explored through a GIS examination of the differing visual magnitude of different aspects to the site.

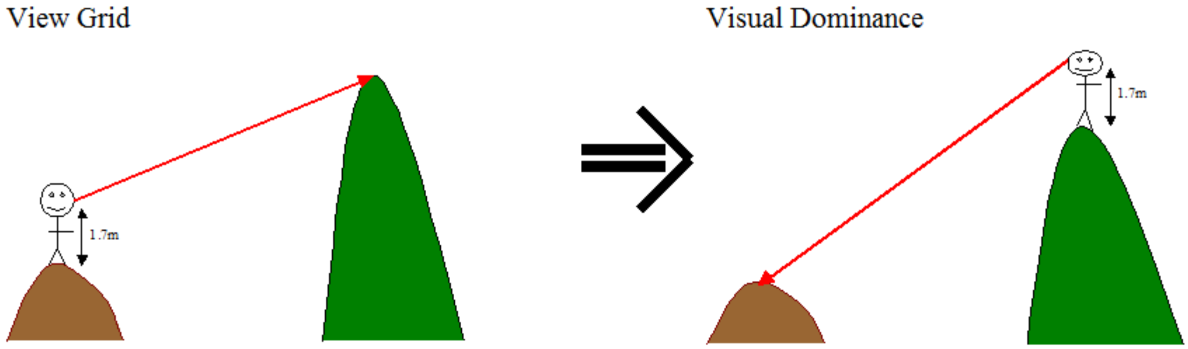
This allows the identification of the variable visibility of sites and how that related to their morphologies. It establishes whether there is quantifiable evidence for the portrayal of particular images from particular directions, for example that of strength which could be portrayed through multiple prominent banks which are within the site's most visible area.

Whilst GIS-based analysis will be the basis for directionality it will also be combined with field visits. These will involve analysing the degree and nature of visibility from the hillforts by taking photographs and field notes at the cardinal points. Photographs were also taken of the hillfort from varying distances and directions within the landscape to illustrate how the image and clarity of the hillfort differs through movement, distance and direction.

<u>The basis of viewshed calculations</u>

The viewshed analysis within this study is based upon the calculation of Visual Dominance and View Grids (Lock et al. 2014). Visual Dominance calculates the view to a point, the resultant viewshed depicts the areas within the landscape that a point is visible from (Figure 4). A view grid calculates the view from a point with the resultant viewshed depicting the areas that are visible from a point (Figure 4). Both VD and VG are calculated using the Viewshed Analysis tool in ArcMAP, with each using modified values of OFFSETA and OFFSETB. OFFSET depicts the vertical distance above the observation point for example the height of the observer (Esri 2012). OFFSETA is the vertical offset of the height of the observer, whilst OFFSETB is the vertical offset of the height of the target. This works on the basis of visual reciprocity. A height of 1.7m is used for the observer value because osteological evidence from the Iron Age has indicated that this was the average height of a man (Chapman 2006, 85).

Figure 4. Schematic explanation of VG compared to VD.



View Grid (Looking out of the hillfort): View Dominance (Looking into the hillfort):

OFFSETA- 1.7 OFFSETA- 0

OFFSETB- 0 OFFSETB-1.7

For each series of viewshed calculations corrections were applied to allow for earth curvature. Kormann and Lock have shown the effect of applying a curvature with refraction algorithm to a DEM for viewshed analysis (2013.). They found that earth curvature coupled with refraction had its greatest affect beyond 9km where the percentage change of using a standard viewshed compared to applying curvature and refraction was 16% (*ibid* n.d.). As this thesis primarily worked upon distances within a 9km radius it was decided that this algorithm would not be applied to the test areas in question but the standard ArcGIS routine for curvature refraction would suffice.

<u>Visual distances</u>

Distance was factored into the current research by creating a series of buffers around the sites, based upon Ruestes' work on Iberian hillforts (2008). She utilised bands of visibility that were set at 1km, 3km and 6km arguing that an increase in distance led to a decrease in visual clarity. At up to 1km, Ruestes saw visual clarity to be perfect, whilst at over 6km although there was still visibility it was not always possible to determine what was being looked at (*ibid* 2008, 368). Based on this it was decided to use buffers at distances of 1km, 3km, 6km and 9km from the centre of the hillfort enclosure. An extra 9km buffer from Ruestes' group was chosen so that there was a known cap on the visual distances which was measurable as Ruestes' completed her definition of visual distances ambiguously at over 6km. Points were placed every 500m along the circumference of these buffers and viewsheds were generated from each of them.

The degree to which visual clarity is affected by distance in the field was also investigated allowing a better understanding of the visual properties within the buffers from the outset. The plan and scope for this investigation was based upon the visibility of an individual (5ft 5 (the author)) from the buffer zones. The scope was affected by development within the modern landscape resulting in visual clarity only being investigated from the 1km and 3km radius (Figures 5 and 6). The trial investigation was undertaken at Bratton Camp, on Bratton Down which is on the outskirts of the Warminster test area.

This found that there was a difference between the visual clarity that was achieved with the naked eye and that which was depicted within a photograph. From the 1km radius I am visible and by zooming in on the photograph a blurred feature to the left of me is visible (my dog) (Figure 5). It was very difficult to see me from the 3km radius (Figure 6). This study allowed the author to identify that visual clarity of the enclosing works to sites was potentially good at 1km and to a lesser extent at 3km, however visual clarity to individual people was very poor. As this study's focus is upon the visibility of a site's enclosing works and not the people within it, this experiment was a very useful test.

There is very little variation in the visibility of the enclosing works of this hillfort with those that follow the line of the topography not clearly discernible from the 1km and 3km radii. The enclosing works which cut across the hilltop are visually prominent and clearly discernible from both the 1km and 3km radii. This demonstrates the influence that the physical relationship of the hillfort's architectural components with the topography has upon the site's visual prominence.

Figure 5. View to Bratton camp from 1km

The image originally presented here cannot be made freely available via ORA because of copyright.

Figure 6. View to Bratton camp from 3km

The image originally presented here cannot be made freely available via ORA because of copyright.

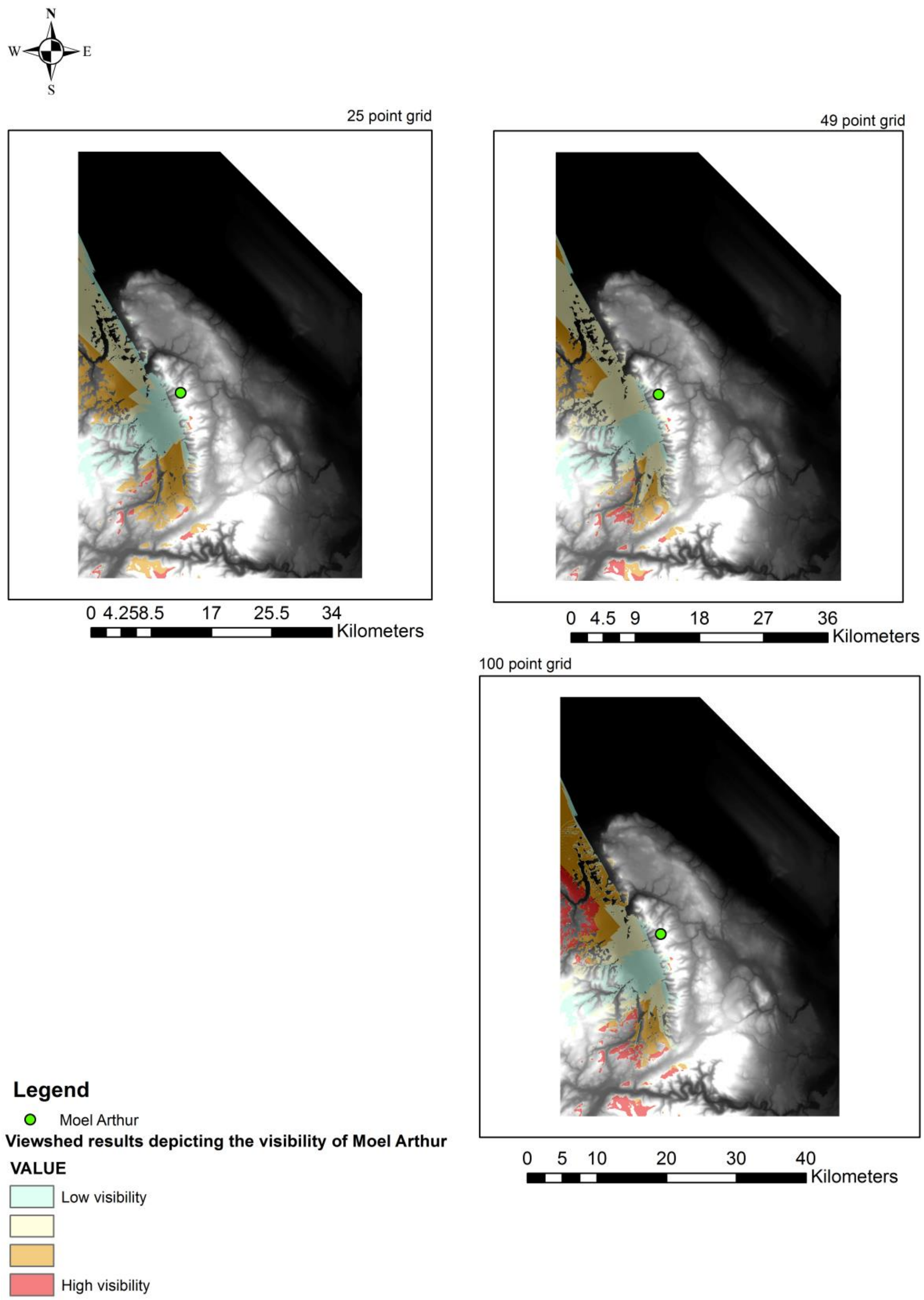
Multiple point viewsheds

To rigorously examine the visual relationships within a landscape this study moves away from single point to point viewsheds towards a multiple-point approach. This was inspired by the work of Tabik and colleagues who questioned the reliability of single point viewsheds and encouraged the computation of viewsheds across large areas (2013). Consequently, instead of investigating the visibility of the hillforts via a Visual Dominance calculation (or from the hillforts when calculating a View Grid) towards a single point this thesis opts for a grid of points which were placed over the interior of each hillfort using the Fishnet tool within ArcMap. This comprises of 49 points (7 by 7). A 49 point grid was decided upon following the experimentation with multiple grids of different sizes (25, 49, and 100 (Figure 7)), this experiment was based upon a Visual Dominance calculation. The results from this analysis indicated that the grid size only affected the number of points in the hillfort which were visible and not from where they were visible.

The irregular shape of some hillforts compared to the square-shaped point grids meant that in some instances the grids extended slightly beyond the hillfort perimeter. This does not hinder the nature of the results. Although the hillfort interior was defined by the enclosing works, the land immediately beyond these earthworks was still important as activity associated with the hillfort would have taken place there; consequently it is also important to understand the visual relationships within these areas.

The study also develops the multiple-point viewshed approach by investigating the visibility of sites from their buffer radii. This involved placing points every 500m along the buffers and undertaking viewsheds (VG- Looking out) from each point.

Figure 7. Comparison of the effectiveness of 25, 49 and 100 grid point viewsheds, depicting the visual magnitude of Moel Arthur (© Crown Copyright/database right 2006. An Ordnance Survey/EDINA supplied service)



The visual representation and management of viewshed results

This viewshed analyses created a large amount of data and to effectively analyse this and examine the visual magnitude of these sites the display of the data had to be modified using the Classification tool within ArcMAP. This was used to exclude values of 0 and to organise the data into four classes as defined by a quantile interval so that the cumulative viewshed was organised into percentiles, (1-25 low visibility 75-100 high visibility). This enabled easy comparison of visual magnitude values within and between sites. As this study is highly visual it was recognised that the effective use of colour as a means of communication was paramount. Colour has the ability to enable a reader to instinctively read images (i.e. hot reds are high values and cool blues lower values (Figure 7). This concept is based upon the work of Bertin who argued that the use of the three primary colours enables one to "differentiate meaningful values that the eye would only be able to distinguish with difficulty otherwise" (1981, 223).

Movement

Earlier methods of investigation

Movement to and from hillforts has also factored into landscape based hillfort studies, Driver, for example, experientially analysed the accessibility of hillforts from the surrounding landscape and their visibility from routeways (2005a and Driver 2013). As with earlier visibility investigations, earlier GIS based investigations of movement within landscapes have been used to investigate cultural interaction and social networks. However the approaches of these studies have varied in a number of ways.

The degree to which landscapes afforded movement have been investigated. Cost Surface Analysis has been used to investigate the terrain's influence upon movement along the ridgeway in Oxfordshire (Bell and Lock 2000). Llobera and others studied the physical accessibility of hillforts by investigating topographically afforded mobility networks (2011). Similarly, whilst Howey did not conduct cost surface analysis she examined the permeability of a landscape in North Michigan (2015). This study investigated how a landscape enabled cultural processes by looking at it as a continuous space as opposed to a series of points through permeability modelling.

Taliaferro, Schriever and Shackley utilised slope based cost surface analysis to investigate trade networks in Mimbres New Mexico (2010). This study constructed least cost pathways between consumption sites and the sources of obsidian to investigate social interaction within the landscape through movement and obsidian procurement (2010). Investigations of resource procurement through GIS based analysis have also factored in travel time (McCoy et al. 2011). Hazell and Brodie undertook cost surface analysis based upon a friction surface of a slope gradient and area avoidance to investigate megalithic transportation routeways (2012).

However, GIS based studies have increasingly investigated the accessibility of whole landscapes. For example the ‘from everywhere to everywhere’ model was used by White and Barber to examine how the routes of least cost pathways based upon topography and land cover compared to known precolumbian and early colonial movement corridors (2012). Similarly, Nolan and Cook undertook cost surface analysis between focal sites and sites with artefactual and faunal evidence that were indicative of later prehistoric activity, alongside the computation of ‘control paths’ (2012). The ‘control paths’ were designed to travel between the focal sites and every 5km directional zone within 40km (*ibid* 2012). This enabled them to gain a general picture of potential areas of movement which were not reliant upon the limitations of the archaeological record (2012).

Güimil-Fariña and Parcero-Oubiña did not utilise the 'from everywhere to everywhere' model, instead they investigated why roads were positioned where they were (2015). They examined the coincidence of least cost pathways with known Roman roads and milestones with the aim to support their hypothesis. This hypothesis was based upon the idea that Roman roads would have been positioned where movement required the least amount of effort (*ibid* 2015). Similarly, Symonds and Ling attempted to develop an understanding of social practice within a landscape through an analysis of artefact distribution (2002). They investigated travel time along Roman roads and rivers between places of pottery production and consumption in Lincolnshire (2002). The approaches detailed within this brief synopsis highlight the importance of relating GIS generated pathways with known sites, topographical features and areas of activity which was a fundamental influence to this methodology which is detailed below.

Current focus of the investigation

Cost Surface Analysis is used here at multiple levels to answer the following questions:

- How physically accessible were the hillforts?
- How did the orientation of least cost paths relate to the morphology of the banks, ditches and entrances of the hillforts?

The key aim of this work is to examine how the pathways enter or exit the hillforts and how that relates to the morphology of the site. This allows the investigation of how morphological variation related to physical accessibility. For example, were the entrances placed in the most accessible aspect of the site and did the most prominent and numerous banks that enclose the site face its most accessible area?

Method of investigation

The least cost pathways calculated here went between the hillforts and other hillforts and the buffer areas. The computation of least cost pathways between the hillforts and their radii aligns the study with those such as White and Barber (2012), and Nolan and Cook (2012) who explore general patterns of movement and accessibility on a landscape scale. Cost surface analysis was based upon anisotropic cost surfaces, which take directionality of movement into account. Directionality is an important factor within cost surface analysis as all movement has direction and moving down a 20^0 slope is not equivalent in cost to moving up a 20^0 slope (Bell and Lock 2000, 89). The simplest cost surface analysis used here was defined by slope which is considered to be movement's most influential factor; it dictates the type of movement which may have taken place within a landscape. It dictates whether only foot traffic or whether carts and goods could travel along particular routes. This study utilises the TAN (Slope)/TAN (1^0) equation (ibid 2000, 89) which is based upon "the ratio of the tangents of the slope angles… [as opposed to] using the angle of slope itself" (*ibid* 2000, 88). This takes into account that cost does not increase linearly with the increase in slope, and also that people may walk across slope tangents as opposed to directly following them (*ibid*, 2000).

The entire process for the creation of the friction surface and the generation of least cost pathways was applied to both the PROFILE and LiDAR DTMs. To create the slope based friction surface a slope degree surface was calculated using the slope tool within ArcGIS. This output was then processed in Raster Calculator using the following equation to create Bell and Lock's slope based friction surface:

Tan (("Slope_deg" x *math.pi) / 180) / 0.01745*

To undertake anisotropic cost surface analysis this friction surface was applied to the Path Distance tool which used both linear horizontal and vertical factors in order to calculate the Cost Distance and Back Link rasters. These were then input into the cost path tool to calculate the resultant least cost pathway.

To expand on the use of slope based cost surface analysis, least cost pathways were calculated from each buffer point to the hillforts, as well as between the hillforts (Hillfort to hillfort movement, both to and from them). These pathways were then reclassified and summed to calculate the frequency of the pathways within areas of interest. Due to the numbers involved with the buffer pathways in particular, this process was automated within Model Builder through a model which was created by the author.

Whilst the primary focus of this study is at the site scale, to reinforce the significance of any site based morphological correlations with pathways and to increase the likelihood of these pathways being 'real' they also had to be investigated on a landscape scale. The landscape scale analysis involved the study of the pathways in relation to the topography and activity which was contemporary with the hillforts. Such correlations also suggest that the GIS-based 'correct pathways' also related to topographically defined 'correct pathways' thus increasing the likelihood that these may have been a through route at the time that the hillforts were in use.

Least cost pathways were also related to the distribution of known sites and areas of activity within the landscape. Any such correlations would imply that these areas were places of significance at the time that the hillforts were in use as there is evidence that people travelled through them and occupied them. By moving around and within these areas, the landscape and the sites within them became visible and consequently came into “being in that person’s world” (Ingold 2000, 21).

To investigate these correlations the HER records were categorised as described below. A search request was sent to all of the relevant HER offices asking for all of the Prehistoric (Palaeolithic to Iron Age) and undated records. To enable easy comparison and integration of the datasets, categories were created for the data which were used for each test area.

The categories were:

- Earthworks- sites which are listed as a bank, ditch, reave, linear bank and ditch. It was important to include these within the landscape as they were the result of collective labour and may have been influenced by, and influenced, the nearby hillforts.
- Funerary- round barrows, long barrows and cists. These sites are often found within and near to hillforts and it is important to investigate this physical relationship and the influence that these earlier sites had upon the morphology and location of hillforts.
- Agriculture- sites listed as fields or field systems, earthworks or cropmarks. This category is important as they were the result of periodic episodes of collective labour that was potentially influenced by hillforts or influenced hillfort location.
- Occupation - this category comprised of sites listed as unenclosed and enclosed settlements that were of prehistoric date. It was important for these sites to be included as they were potentially in use at the same time as hillforts.
- Finds- The distribution of finds was also investigated to identify possible areas of activity.

Movement **AND** visibility

Earlier methods of investigation

Investigations of the defensibility of sites have identified the importance of visibility and accessibility. For example Sakaguchi, Morin and Dickie used a combination of least cost pathways and viewshed analysis to explore the defensibility of large prehistoric sites in the mid-fraser region on the Canadian plateau (2010). Similarly, Hudson's landscape scale space syntax study applied cost surface and viewshed analysis to the investigation of social organisation and settlement patterns (2012). These factors were explored by investigating the openness and accessibility of prehistoric pueblo habitation sites (*ibid* 2012).

Kirst and Brown used a combination of cost surface analysis and viewshed analysis to predict caribou migration routes and to identify suitable hunting locations (1994). Doyle, Garriston and Houston also utilised a combination of cost surface analysis and viewshed to investigate the possible effect of exchange routes on settlement locations in the Southern Maya lowlands (2012). In this case Cost Surface Analysis was used to identify the least effort route through the landscape and viewshed analysis was subsequently used to investigate the visibility of these routes and how that may reflect territoriality (*ibid* 2012).

Chapman investigated what was believed to be a route between two enclosures on Sutton Common (2000). In particular he investigated the changing visibility of morphological aspects to these enclosures by undertaking viewshed analysis at set points along the route. Three years later he used a similar methodology to investigate the position and morphology of Rudston 'Cursus A' through a combination of cumulative viewshed and cost surface analysis (2003).

Chapman's approach alongside others previously highlighted within this chapter illustrate that GIS based studies have increasingly studied visibility and movement in relation to both hillfort and non-hillfort sites. However, these two factors also potentially had an influence over each other. For example, navigation through a landscape may have been influenced by what could or could not be seen, this has not been explored in relation to hillforts until now. This approach develops upon the work of Lee and Stucky who argued that visibility affected movement, they examined movement through the landscape according to varying degrees of visibility (1998; Lock et al. 2014). Visibility was used as the sole cost factor within their cost surface analysis (Lee and Stucky 1998; Lock et al. 2014.), however here it is integrated with slope. This study also does not use the exact pathways as those that were used within the earlier works. To avoid any confusion the pathways were given completely different names, these are: blind and visible pathways. The definition of these is detailed later in the chapter.

<u>Current focus of the investigation</u>

Visibility was integrated with movement within this thesis to investigate how the different visually categorised pathways relate to site morphologies thus allowing a more detailed examination of the visual qualities of sites. For example, by calculating blind and visible pathways the study is able to identify areas within the landscape where sites are most visible to approaching traffic, or to identify places in the landscape where approaching traffic has least visibility of the hillfort enclosures. In particular the following questions were asked:

- Were the most prominent architectural components placed to face where approaching traffic is most visible?
- Were the most prominent architectural components placed to face where approaching traffic has least visibility of the upcoming hillfort?

- How do the visual pathways relate to the entrance/s of hillforts?
- Do the visual pathways coincide with any topographical and/or archaeological features within the wider landscape, which could be contemporary with hillfort activity?

Method of investigation

The initial weighting of the visual least cost pathways was to factor visibility 40% to slope 60%. However, after initial results it was decided to increase the weighting to draw out the visual factor more and weight this at 60% of the cost within the friction surface. At a later stage within the thesis the question was raised as to how the weighting of these friction surfaces influenced the overall route of the least cost pathways. This led to the creation of multiple friction surfaces with the visibility: slope weighting as follows: 60:40, 25:75 and 100:0. These friction surfaces were used within cost surface analysis which was based upon the PROFILE DTM. To reduce on processing time but to also allow for the comparison of the results from the PROFILE DTM and the LiDAR based DTM , a LiDAR based friction surface for the 100% visual pathways was also used within the Cost Surface Analysis.

To decrease the processing time for the calculation of the multiple weighted least cost pathways a model (created by John Pouncett) was used to automate the process. This used the specifications which had already been applied to the non-automated calculations of least cost pathways.

The blind paths followed a route where the origin and destination were least visible from the pathway. This path is based on the sum of the Visual Dominance grids for the origin and destination (VDa + VDb) (Figure 8).

Figure 8. Calculating the blind pathway friction surface

VDa

1	1	0
1	1	1
0	1	1

+

VDb

0	1	0
1	1	0
0	0	1

=

Cumulative viewshed

1	2	0
2	2	1
0	1	2

Put simply the results of the cumulative viewshed influence on the cost surface analysis is as follows:

0-No penalty for locations which cannot see a or b.

1-Low penalty for locations which can see a or b.

2-High penalty for locations which can see a and b

Visible pathways are those paths that follow a route most visible from a or b, the friction surface is based on the inverted view grids (Figure 9).

Figure 9. Calculating the visible pathway friction surface

VGa

1	1	0
1	1	1
0	1	1

+

VGb

0	1	0
1	1	0
0	0	1

=

Cumulative viewshed

1	2	0
2	2	1
0	1	2

→

Inverted cumulative viewshed

1	0	2
0	0	1
2	1	0

The inverted cumulative viewshed results influence the cost surface analysis as follows:

0- No penalty for locations which are seen from both a and b

1-Low penalty for location which are seen by either a or b

2-High penalty for locations not seen by a or b

To combine both the slope based and visible friction surfaces they had to be individually standardised, based on:

(Friction surface - min (Friction surface)) / (max (Friction surface) - (min (Friction surface))

The standardised friction surfaces were then combined and weighted, for example a 60:40 weighting for the visible pathway meant that the friction surfaces were combined as follows:

(0.6*Standardised Visible friction surface) + (0.4*Standardised Slope)

The resultant combined friction surface was then used as the friction surface for the Path Distance tool. As with the slope based least cost pathways, linear horizontal and vertical factors were applied within this tool. The least cost pathway was then calculated using the Cost Path tool.

The least cost pathways were subsequently reclassified using the Reclassify tool and were then summed using the Cell Statistics tool. This enabled a more detailed investigation of the frequency of the correlation of blind and visible pathways with features of interest including the morphological components of the hillforts, and topographical and archaeological features within the wider landscape.

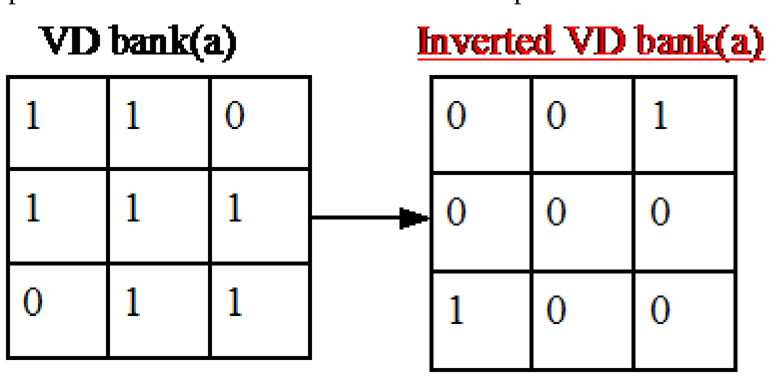
<u>The application of cost surface analysis to the investigation of the visibility of different architectural components to hillforts</u>

Cost Surface Analysis can also be used to investigate the visual image/s of hillforts based upon the use of the inverted VD grids for the individual architectural components

(Figure 10). These VD grids are constructed by undertaking viewshed analysis every 1m along the components, primarily the enclosing banks of the sites (the DTM which is used within this analysis is the LiDAR DTM only). For every architectural component (e.g. bank) a cumulative viewshed is constructed which forms the basis of the friction surface for the cost surface analysis. Unlike the blind and visible friction surfaces, the friction surface for the VD of the different architectural components were not integrated with a slope based friction surface as the primary focus here was to identify where the individual components were most visible from, and not their actual physical accessibility. However, the cost surface calculations followed the same principle of the blind, visible and slope based least cost pathways as linear horizontal and vertical factors were applied within the Path Distance tool.

For each morphological element, a least cost pathway was created which depicts the route through the landscape from which the element is most visible (i.e. the most number of points are visible). This aids the examination of the site's 'image' for example whether it portrayed a whole or fragmented image towards the surrounding landscape. If a whole image was portrayed then all of the paths for each component would follow the same route.

Figure 10. Explanation of the friction surface for calculating a routeway where architectural components are most visible within the landscape.



The basic principle of this cost surface analysis is:

0-No penalty for a location which can see a point

1-Penalty for a location which cannot see a point

As with the blind and visible pathways the friction surface's effect on the route of the pathway is that the higher the value the higher the penalty. As this visual dominance grid was inverted, this pathway follows the route where the most points are visible as they have the lowest penalty. Although these examples were based upon single point viewsheds, the principle is still the same with multiple points.

Conclusion

With Chapter 1, this chapter has provided both the theoretical and methodological underpinnings to this thesis. It has highlighted the research questions and detailed the methodological steps which were taken to answer them. Chapter 3 develops upon these first introductory chapters by examining Driver's Ceredigion study area with GIS based analysis. This explores Driver's key ideas of 'image', 'correct pathways' and the 'physical relationship between morphology and topography' more closely to cement the foundations of this research before moving on to apply the methodology to other areas. Chapter 3 also sees the application of the GIS based methodology to some of Driver's sites to investigate the impact that GIS based analysis has upon non-GIS based results.

Chapter 3
Assessing Driver: Ceredigion

Introduction

Chapter one highlighted the underlying importance and influence that Toby Driver's study of hillfort morphology and location in Ceredigion had upon the approach which is adopted within this GIS-based analysis (Driver 2005a; Driver 2007; Driver 2013). Driver's work structures the discussion and core investigations of this piece of research by focusing on his three principle conclusions and observations, which were:

*the interplay between hillfort morphology and topography

*Image

*Correct pathways

(2013)

As these are the basis of this investigation it is important to understand what defines them, both in the case of Driver's non-GIS based analysis and through the application of the GIS-based methodology. This understanding could only be achieved by going back to the sites which Driver initially analysed. It was not realistic to investigate the whole of Driver's study area, consequently a subset of sites was chosen. This chapter also offers the first test of the methodology by testing the effectiveness of the GIS-based analysis compared to the non-GIS based analysis (i.e. Driver's observations).

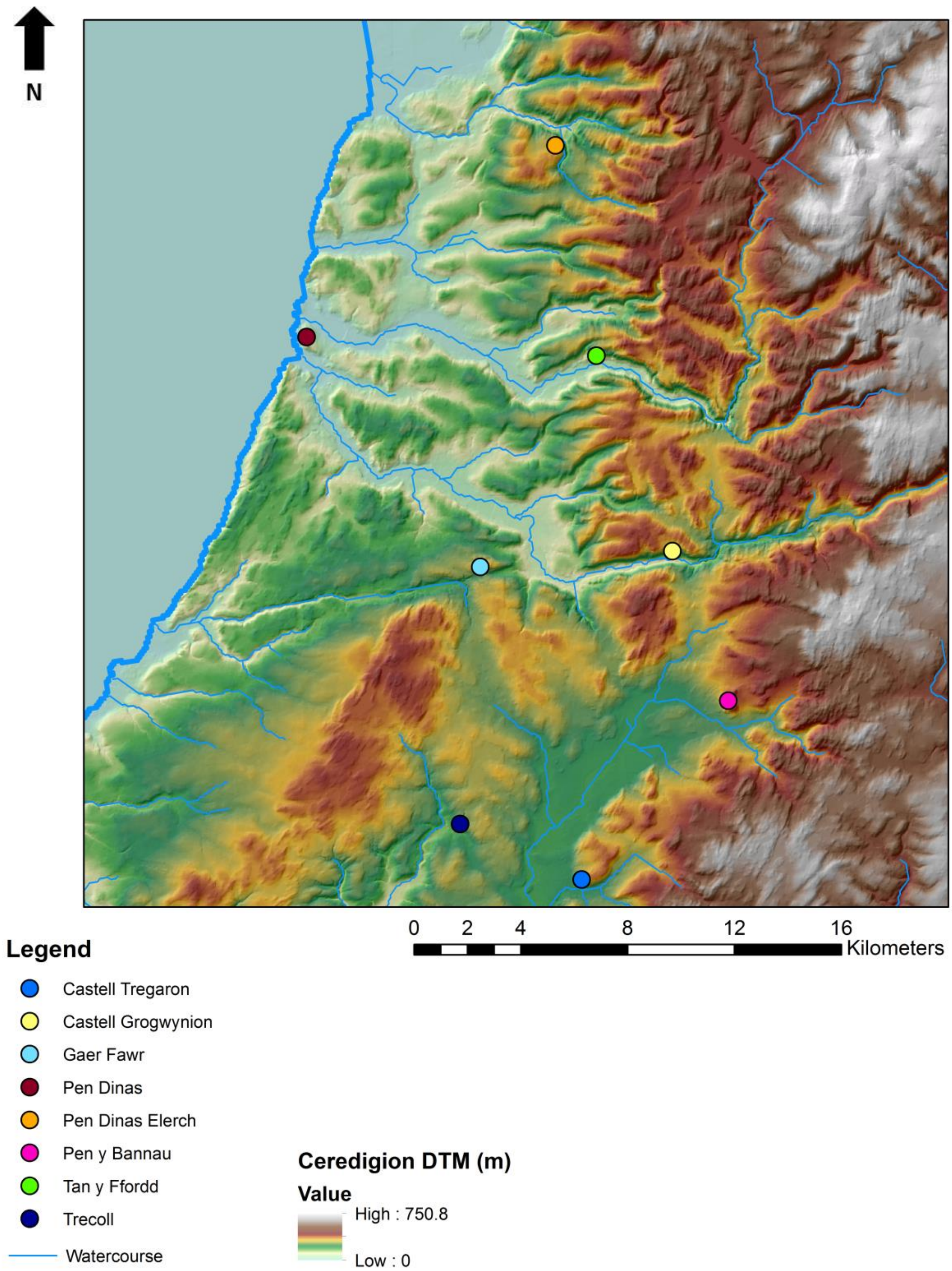
This chapter, as with subsequent analysis chapters, examines sites on an individual basis by describing what is known of them to this day and then continues through the analysis of the interplay between topography and site morphology, image, and correct pathways. Each site discussion concludes with an overview of the results for the site-based analysis. The chapter concludes with a discussion of the effectiveness of the methodology for each test area and the overall implications of the results.

Data

The subset under investigation here comprises eight of the sites which Driver argues exhibit the Pen Dinas and Cors Caron façade schemes (2013, 145 +147, Figure 11). The Pen Dinas Façade scheme involves sites which are set along a precipitous edge that forms the site's longest side (*ibid* 2013, 130). On the long opposing side there are a series of widely spaced terraces, which do not promote direct access (*ibid* 2013, 130). Access is gained through an entrance which is situated on the narrow end of the ridge (*ibid* 2013, 130). These entrances employ 'exotic' technology through the use of stone lined passages, bastions and bridges (*ibid* 2013, 130). The Cors Caron sites are sited around prominent outcrops and ridges and also have very few artificial defences (*ibid* 2013, 131). The artificial defences that do exist are situated on the narrow end of the promontory /ridge, and block direct access to the site's entrance (*ibid* 2013, 131). These defences are also steep and close set (*ibid* 2013, 131).

For the sites which were discussed here LiDAR data was retrieved although the resolution varied greatly between 50cm resolution and 2m resolution.

Figure 11. Distribution map of Chapter 3's Ceredigion study hillforts on the Ordnance Survey PROFILE DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)



Analysis

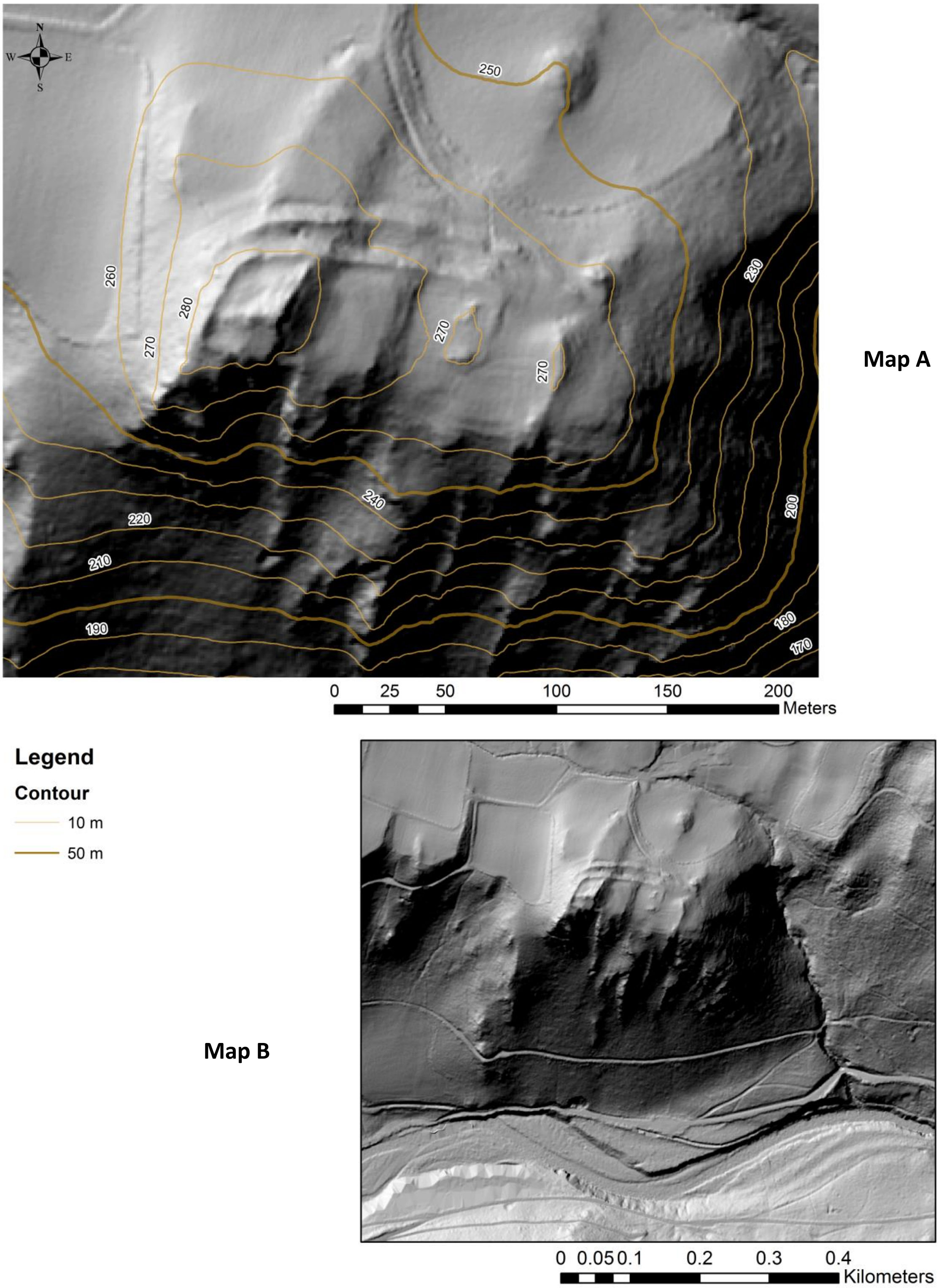
Castell Grogwynion

Site introduction

This site is situated on the precipitous northern edge of the Ystwyth Gorge near Pontrhydgroes (Driver 2013, 102) and measures 170m east-west by 100m north-south (Driver 2014). It is arranged into a series of compartments, and it is argued that the compartment which encloses the western outcrop is the initial phase (*ibid* 2014; Figure 12). Castell Grogwynion has three entrances, the main one is situated in the north-eastern corner and is defined by a freestanding walled bastion which is physically combined with an annexe to form an entrance arrangement (*ibid* 2014). The two remaining entrances are less elaborate and are situated in the north and north-west.

It can be seen on Figure 12 that the site's position on the precipitous edge of the Ystwyth Gorge delineates its southern and western edges. To the north, the enclosing earthworks cut across the lie of the land and are more numerous and prominent. They create a prominent spatial division between the hillfort and the adjacent land. This forms the site's northern terraced façade, however, the surface topography and the sub-surface geology inevitably made the construction of this very difficult (Driver 2013, 102).

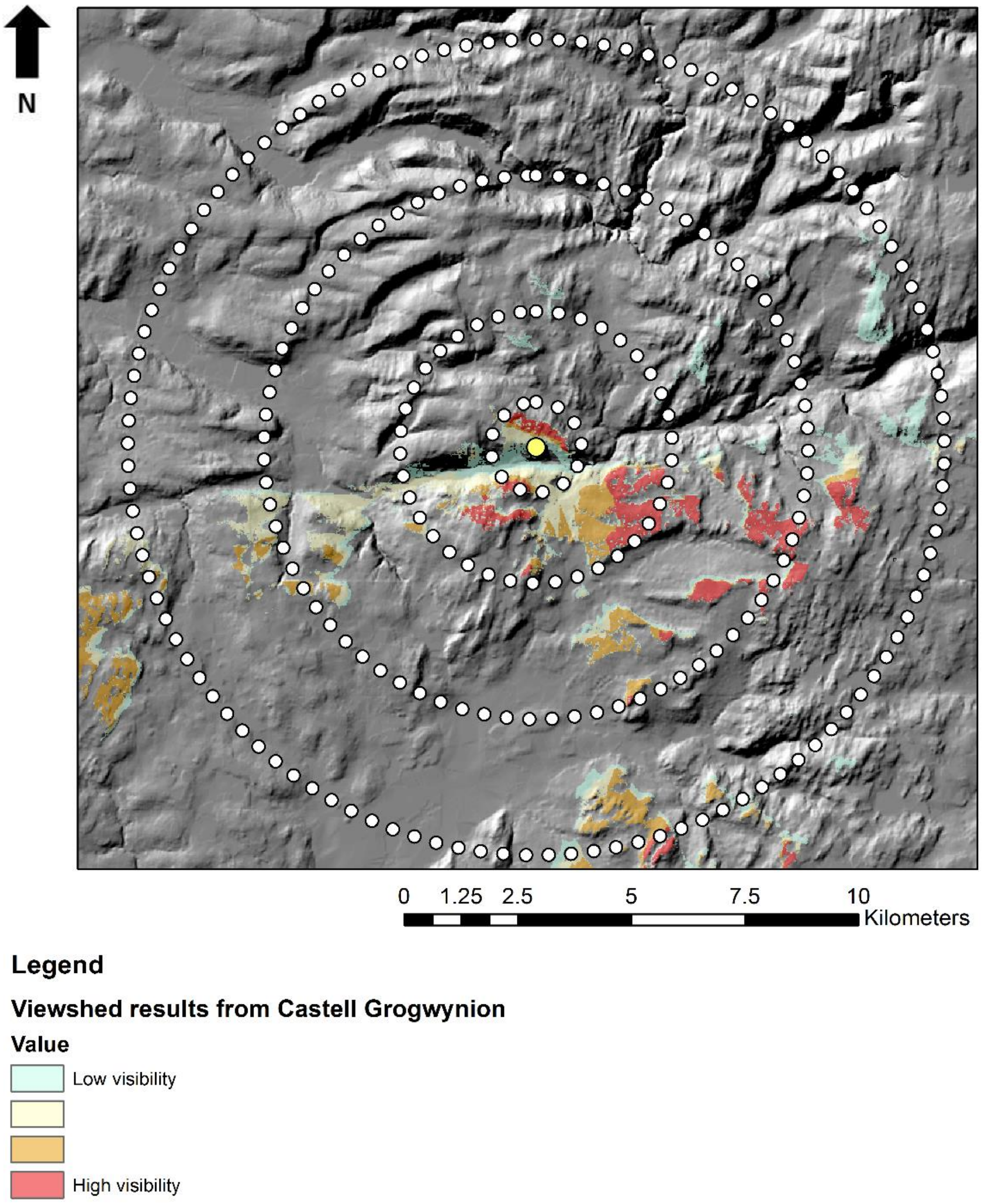
Figure 12. 1m resolution LiDAR hillshade models of Castell Grogwynion and its immediate environs. Map A focuses on the site and is overlain by contours, Map B depicts its topographical environs



Physical relationship of the hillfort morphology and location with the landscape topography

The location of this site influences the degree to which those inside the site were able to see its environs. Visibility to the surrounding landscape varies as distance from the site increases (Figure 13). For example, the majority of the 1km buffer area can be seen, however, visibility decreases at the 3km radius, as it is mainly limited to the southern half of this radial area. Visibility becomes more scattered towards the 6km radius because it is confined to the west and south-east. The scattered nature of the visibility from the site increases at the 9km radius as it is confined to the east, west, and north.

Figure 13. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Castell Grogwynion as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Image

As mentioned earlier, the western outcrop forms one of several ‘compartments’ within this site; however it does not enclose habitable space. Driver argues that this served a monumental function because it is the most visually imposing aspect (2013, 124). The site itself is not readily visible when it is approached from its ‘natural’ approach in the north and north-west; however the western outcrop becomes visible within the small valley on the landward side of the site (*ibid* 2013, 124). The visibility of the western outcrop and not of the lower fort gives the false impression when approaching that the outcrop forms the entirety of the site (*ibid* 2013, 124).

The impression that the western outcrop is highly visible is not supported by the GIS-based visual analysis. The south-eastern corner of the outcrop constitutes one of the most highly visible aspects of the site (Figure 14). The fact that this outcrop cuts across the remainder of the site and topography, and that it sits higher, means that it is visually prominent as was demonstrated by Driver’s field observations.

Viewshed analysis found that the site is of varying visibility from the surrounding landscape, increasing as distance from the site increases. For example, from the 1km radius the site’s southern area is the most consistently visible aspect as it has the highest visual magnitude (Figure 14). From the 3km radius the majority of the site’s interior is visible but it is of lower visibility than from the 1km radius (Figure 14). The northern banks are of a lower visibility than the remainder of the site, however, the north-western corner of these earthworks is not visible at all. This sector of the enclosure is also not visible from the 6km radius (Figure 14) where the overall visibility of the site is much less than from the 1km and 3km radii as the enclosure only has a visual magnitude within the 49th percentile and below. The southern aspect is its most visible area from the 6km radius. The visual magnitude of the entire site increases from the 9km radius and the site's central southern line is of the highest visibility (Figure 14).

The site is poorly visible from the surrounding hillforts as it is only visible from Pen y Bannau (Figure 15) situated c.6km to the south-east. From Pen y Bannau, the visible areas all fall into the relatively high visibility range; however, the site's enclosing earthworks are of limited visibility. Although the viewshed analysis suggests that Castell Grogwynion is of high visibility from Pen y Bannau, the distance between the sites inevitably meant that visual clarity was poor, as shown by Ruestes analysis of the decay of visual clarity with distance. Using Ruestes bands of visibility, at 6km visibility is possible however it is sometimes not possible to determine what is being looked at (2008).

Figure 14. Results of viewshed analysis from the radii towards Castell Grogwynion depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

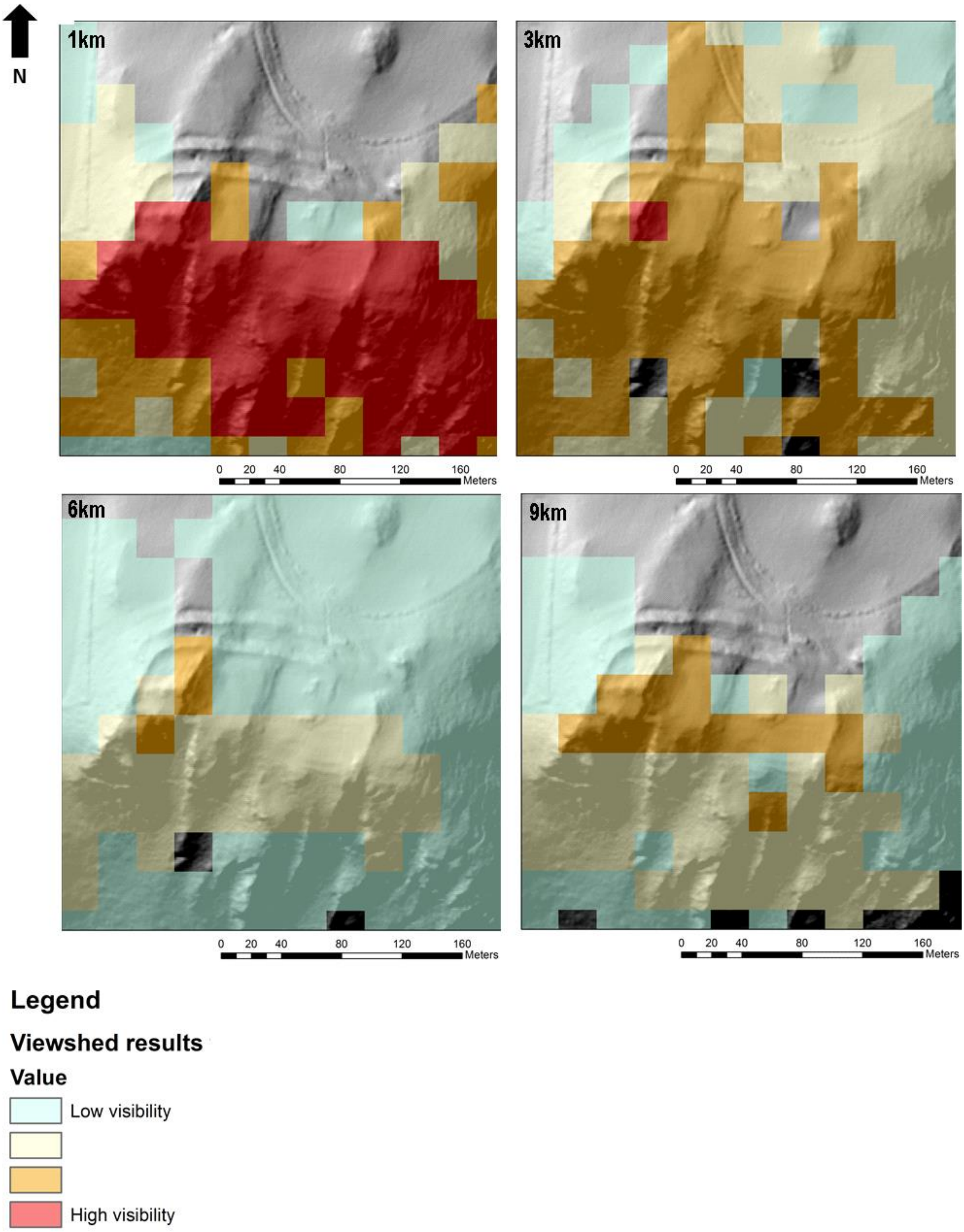
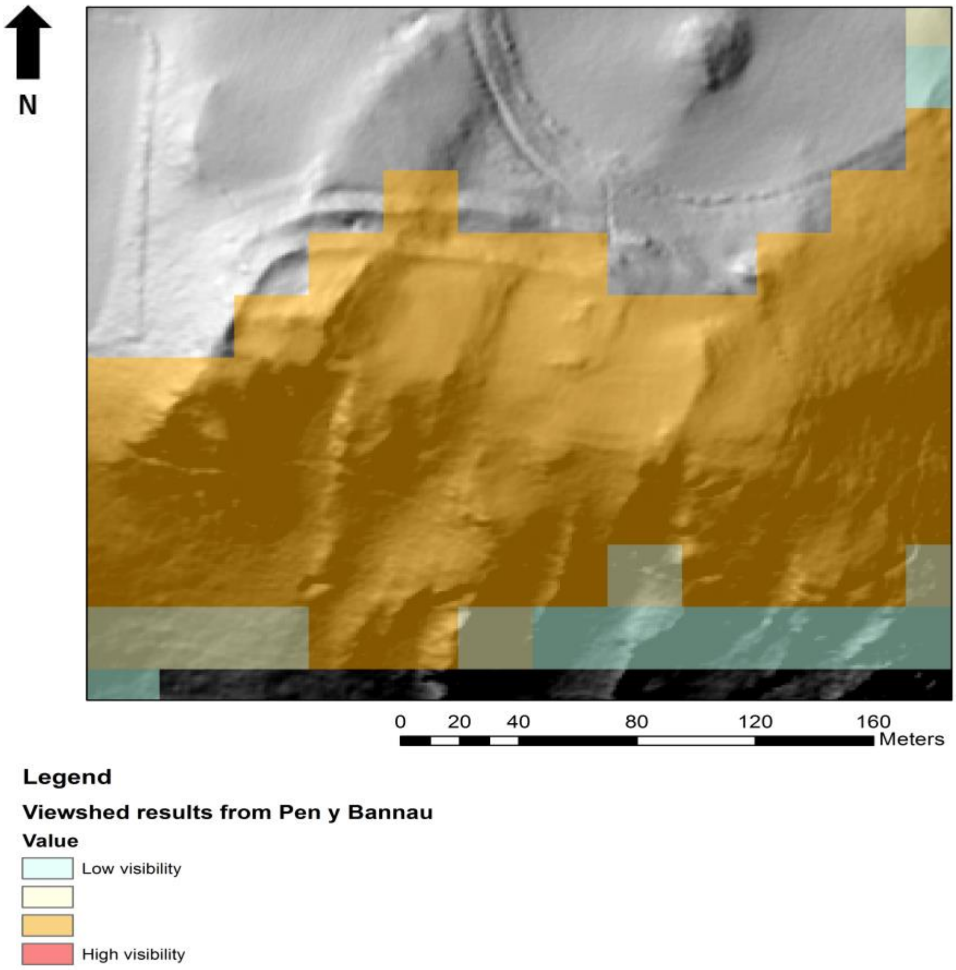


Figure 15. Visibility of Castell Grogwynion from Pen y Bannau based upon the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Correct pathways

The northern entrance to Castell Grogwynion is situated within the site's most accessible aspect in terms of slope as 250 of the 257 slope based pathways interact with this area (Figure 16). None of the slope-based least cost pathways utilise what Driver argues to be the site's main gate in the north-east where Driver also postulated that there was a morphologically based correct pathway into this site although not supported by the results from cost surface analysis (2013, 74-75). According to Driver, one ought to approach the site along its northern side and pass southwards along the western side of the bastion, to then make a U-turn at the annexe into the site's interior through the entrance (*ibid* 2013, 74-75) (Figure 17).

The visual based least cost pathways also fail to coincide with Driver's morphologically defined correct pathway in the north-east. Cost surface analysis found that although the northern aspect of the site is one of its least visible components, it corresponds with 11 out of 42 visible pathways. This coincidence implies that this northern façade alongside the northern entrance was in an area where the site had maximum visibility to those that were approaching the site, and that it was easily accessible.

Similarly, although the viewshed analysis found that the site's southern aspect is most visible from the surrounding landscape; cost surface analysis demonstrates that the site as a whole is poorly visible upon approach from this area. Even though the southern aspect of the site is of high visibility from the 1km radius, it is poorly visible from within its immediate environs (less than 1km away) because it corresponds strongly with 32 of the 47 blind pathways (Figure 19). This poor visibility is caused by the steep valley side which the site backs onto. Five blind pathways also enter/exit this site by using the area to the north and north-west thus corroborating Driver's observation that the site was not readily visible from these directions (2013, 124).

The pathways do not strongly interact with known archaeological activity within the area.

Figure 16. Results of slope based cost surface analysis to and from Castell Grogwynion. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

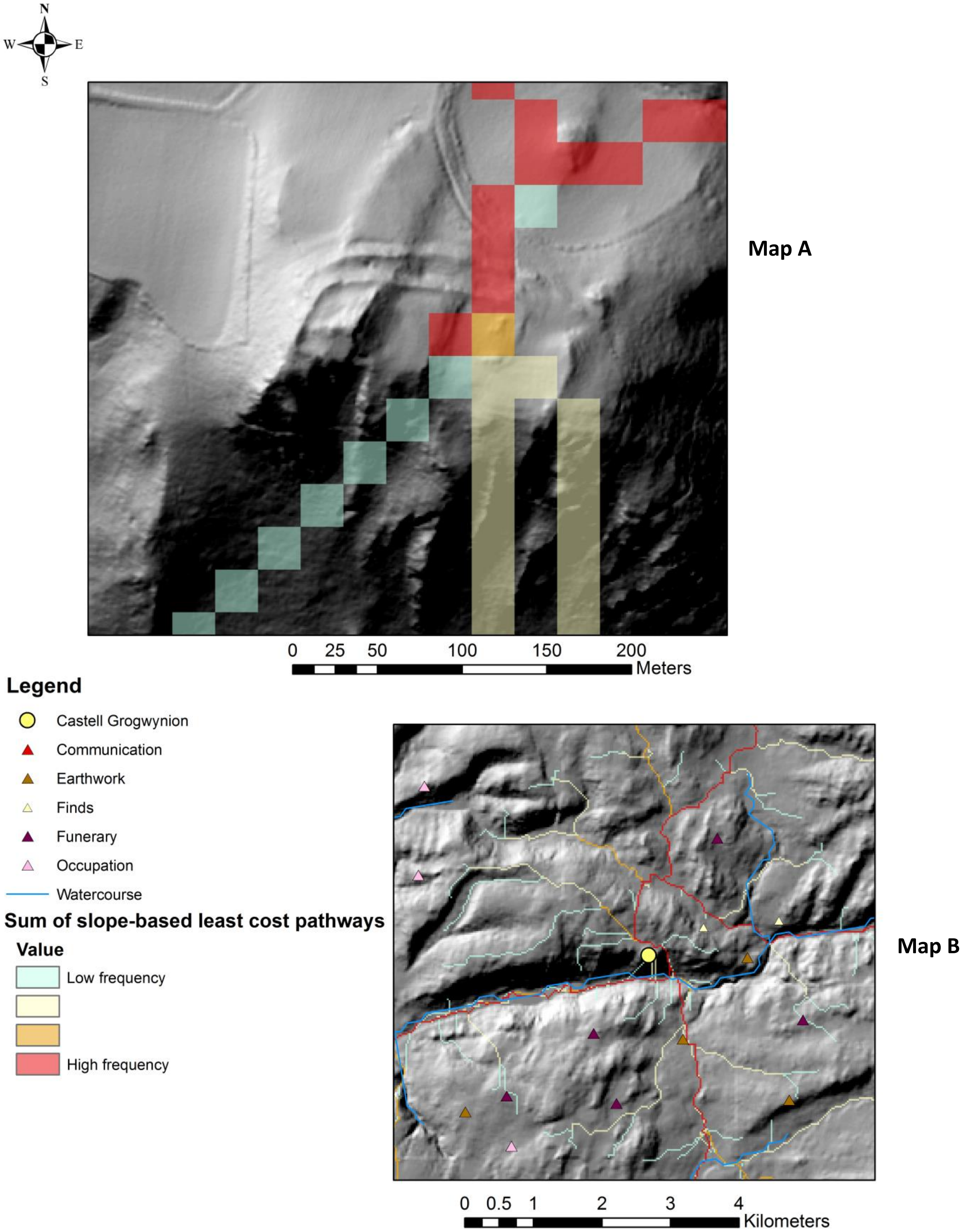


Figure 17. A morphologically induced correct pathway at Castell Grogwynion (Driver 2013; © Environment Agency copyright and/or database right 2013. All rights reserved)

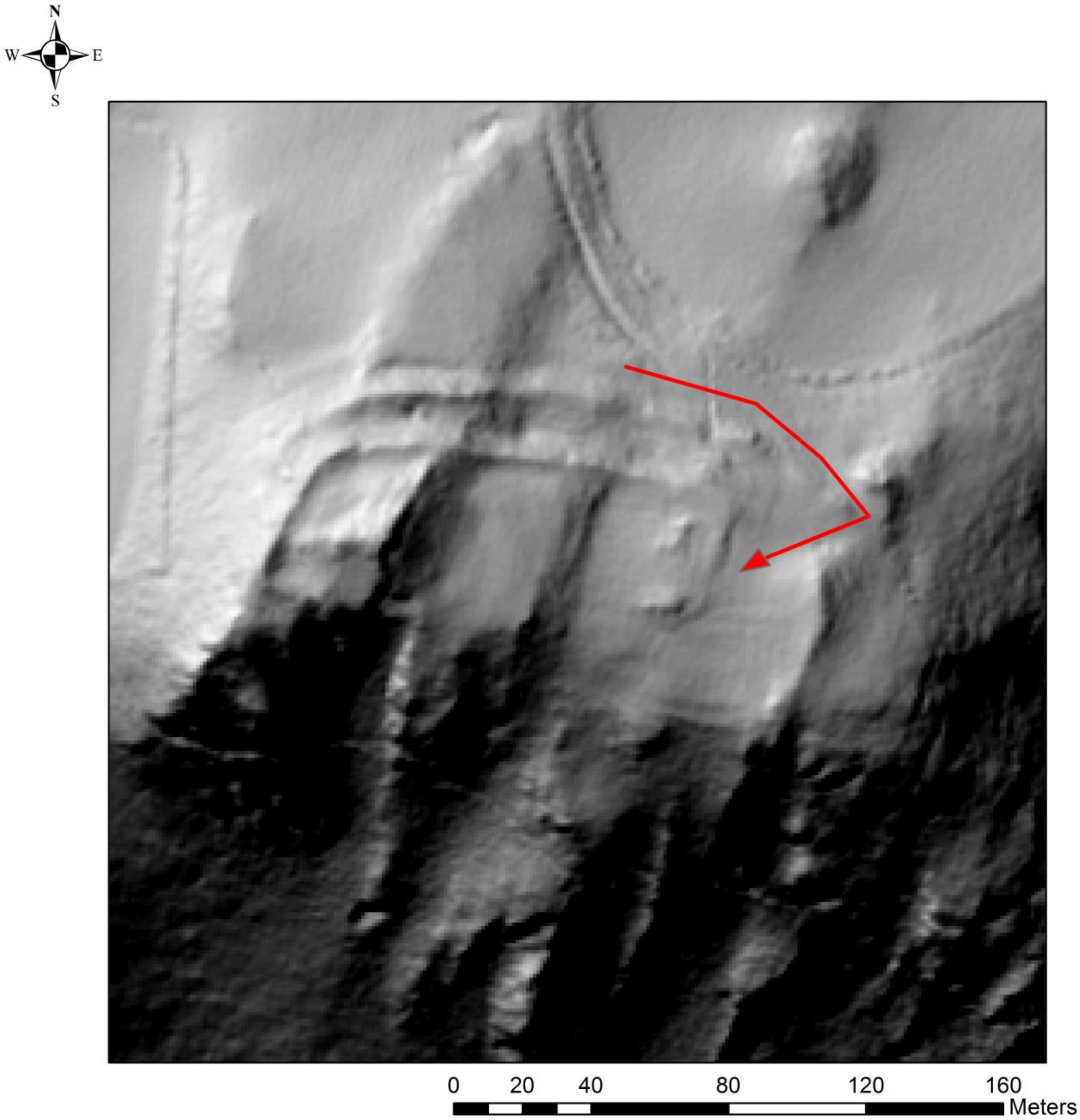


Figure 18. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Castell Grogwynion. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

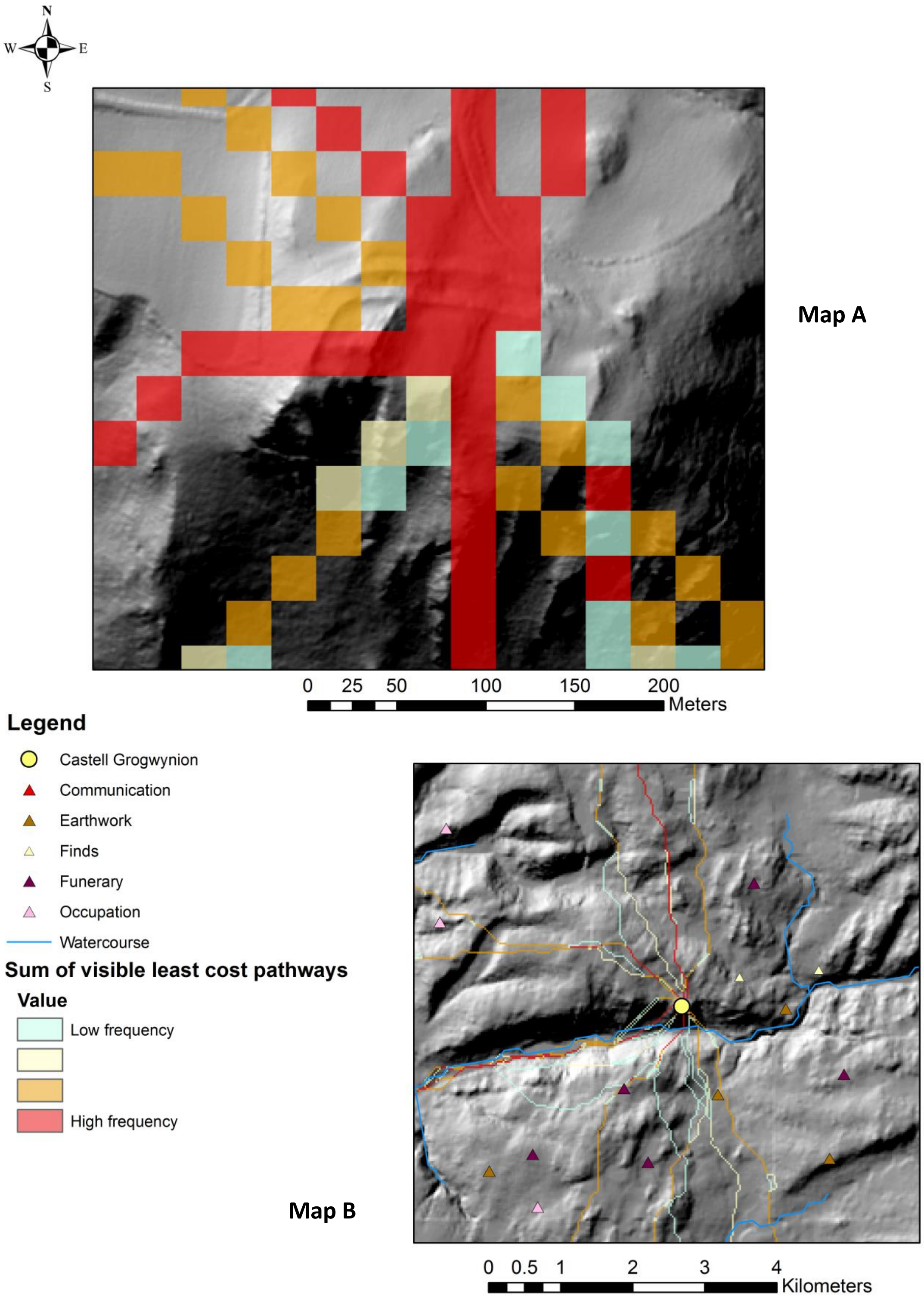


Figure 19. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Castell Grogwynion. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

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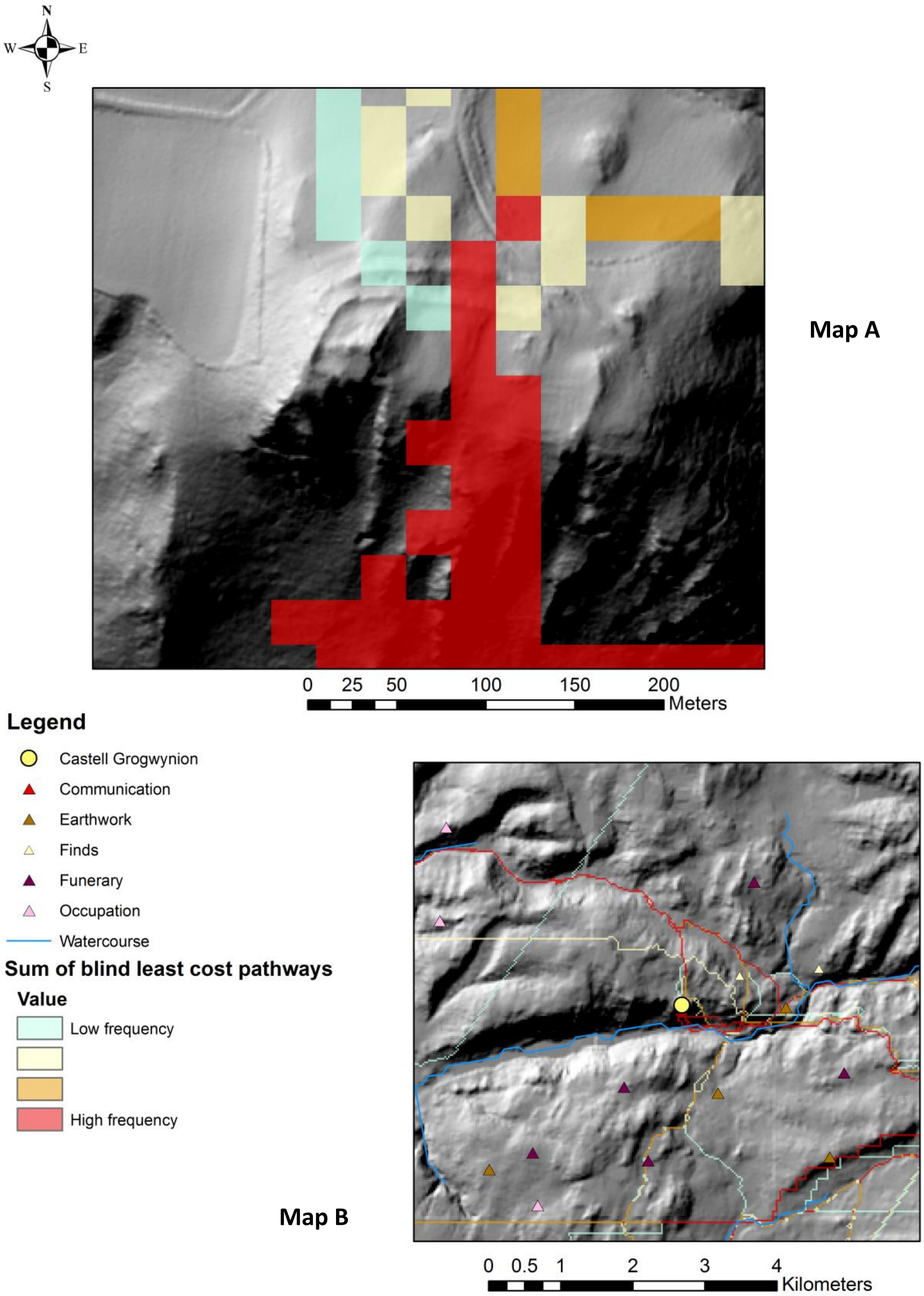


Concluding site summary

The gorge edge position of Castell Grogwynion is highly influential in both the construction and experiencing of this hillfort as it defines the southern limits of the site's perimeter. It also decreased the amount of effort and the cost put into constructing the site as the escarpment formed a natural barrier. This position also influences the visual accessibility of the surrounding landscape from the site with the slope of the land from the escarpment creating a directional force in terms of visibility towards the south. This is reciprocated in terms of the visibility towards the site as its southern aspect is more consistently visible than the remainder of the site.

Castell Grogwynion comprises several compartments that do not enclose usable space, which led Driver to argue that they served a monumental function (2013, 124). According to Driver the most significant monumental aspect of the site is the western outcrop as he believed that it is the most visible part of the site when approaching from the north (2013, 124). This interpretation was not supported by the results of GIS based viewshed analysis. This demonstrates how the visual and physical prominence of an architectural component of a site can exaggerate interpretations of ACTUAL visibility. The position of this outcrop in relation to the hillfort enclosure draws the eye of the observer; it does not make it quantitatively more visible than the remaining less prominent aspects of the site.

Viewshed analysis found that the naturally defended southern aspect of the site is more visible than the highly enclosed northern aspect. Consequently, the effort which was put into construction was not proportional to the wider visual impact of the site's various architectural components. The effort involved in the construction of the northern façade may have been influenced by the high accessibility of this side of the site because it strongly coincides with the slope based least cost pathways. A façade by definition is the front face of a site and this façade, although inconvenient to construct, was designed to influence the first impressions of the people who were approaching from its most approachable area, and not its most visible aspect. This evidence supports Driver's concept of image. Castell Grogwynion portrayed an image of strength and complexity within an area which was presumably exposed to a lot of traffic.

Traffic was also encouraged into the site at this area as cost surface analysis showed a strong correlation of slope based pathways with the northern entrance. The existence of the northern entrance alongside two others, which do not relate to any of the slope based or visual pathways implies that this entrance may have acted as a 'service' type entrance, which was more practical than the elaborate north-eastern entrance. The northeastern entrance may have served more of a ceremonial function. The ceremonial/processional type of function for the north-eastern entrance was implied by Driver in terms of his morphologically based correct pathway (2013, 74-75).

Castell Grogwynion's northern area also strongly coincides with the visible pathways which travel to and from it thus demonstrating that approaching and leaving the site from the north was likely to be both the easiest and most visible routeway. The extensive enclosing earthworks within this northern area face an area where people could see who was approaching and it is also likely to have been a route into the site which was chosen by many due to its ease of access. This evidence further supports the idea that the northern façade is evidence for the manipulation of the site's image towards an area that the builders could see people travelling within. Similarly, although the southern aspect of the site was found by viewshed analysis to be the most visible area, cost surface analysis found that as one neared the site from the area immediately surrounding it (<1km), its visibility is very poor. This is due to the fact that the blind pathways strongly correspond with this southern area. These results demonstrate that the visual qualities of Castell Grogwynion are highly variable according to different parts of the site. The viewshed results depicted a very general picture of its visual qualities, whereas cost surface analysis picked out the finer detail which was influenced by the site's surrounding micro landscapes (<1km).

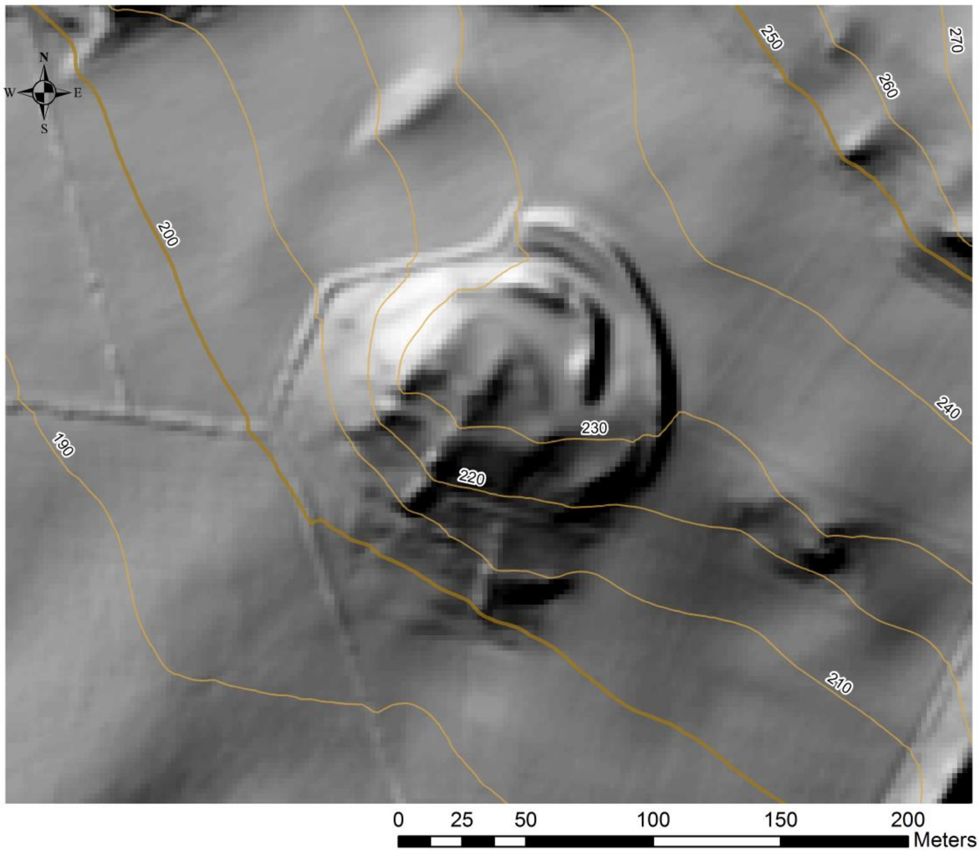
Castell Tregaron

Site introduction

Located on a flat topped rocky promontory, Castell Tregaron is surrounded by two banks on its north-eastern side (Driver 2013, 104; Driver 2005a, 277) (Figure 20). The entrance is situated in the east and obstructed by the outer rampart to the north-eastern façade; consequently it can only be approached by travelling under the southern end of this rampart (RCAHMW 2004). The fact that the outer rampart obscures the entrance led Driver to suggest that this was of a later phase to both the entrance and the inner rampart (2005a, 277).

The site's interior consists of several potential occupation areas situated immediately behind the inner rampart and below the outcrop (RCAHMW 2004). The outcrop also has several plateaus on its southern side which could be house sites (*ibid* 2004).

Figure 20. 2m resolution LiDAR hillshade models of Castell Tregaron and its immediate environs. Map A focuses on the site and is overlain by contours, Map B depicts its topographical environs



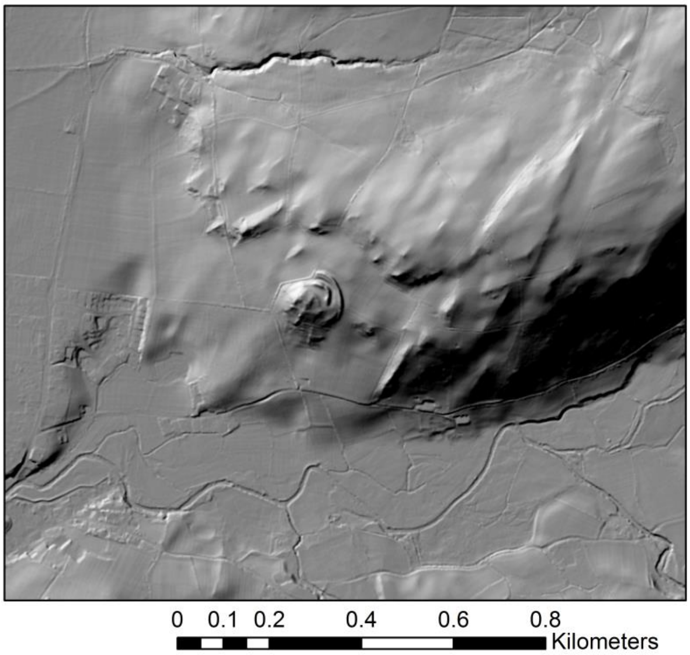
Map A

Legend

Contour

10 m

50 m



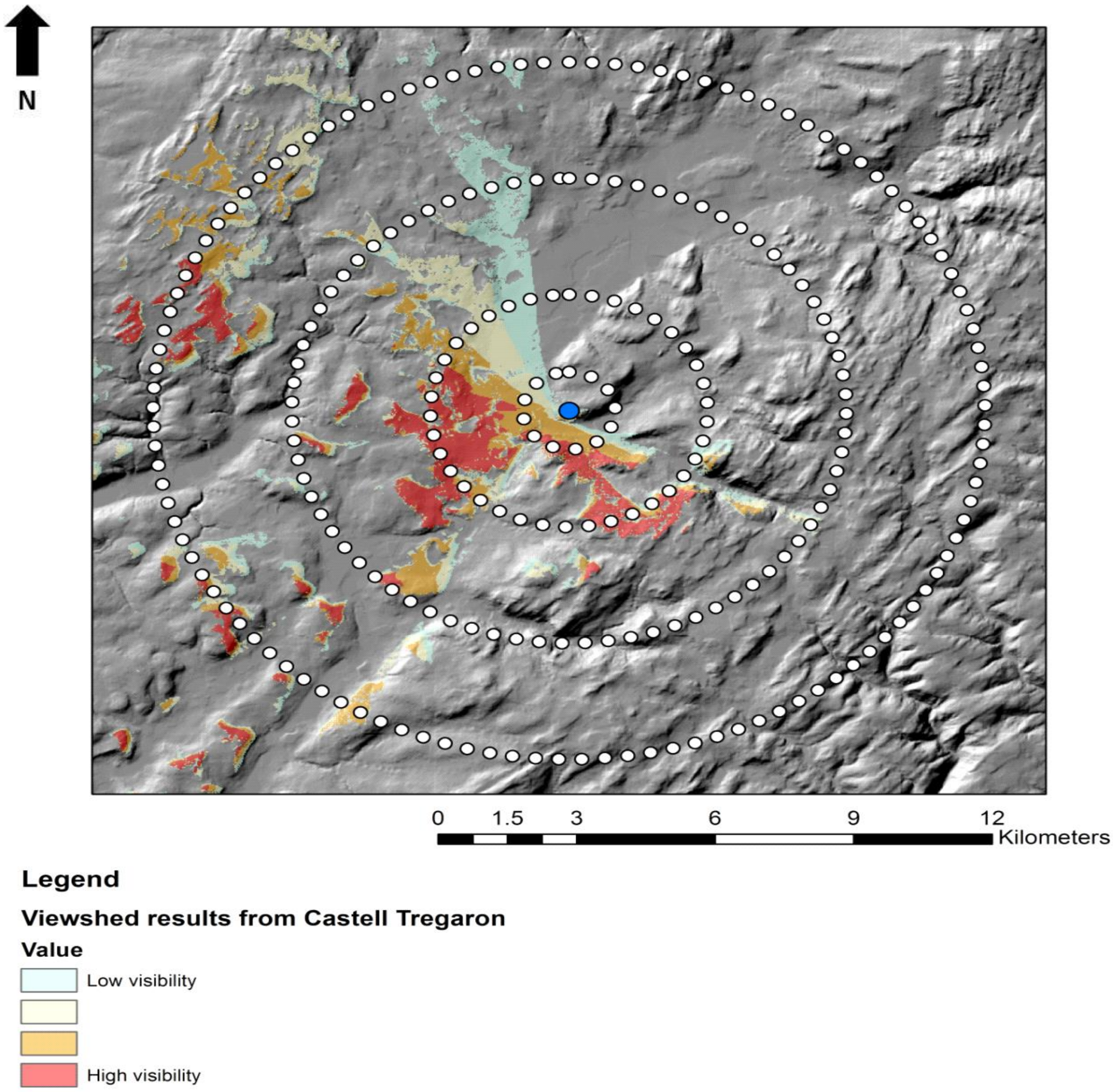
Map B

Physical relationship of the hillfort morphology and location with the landscape topography

The form and extent of Castell Tregaron is defined by the rocky outcrop with topographical definition emphasised on its southern and south-western, where the enclosing banks hug the line of the contours. The north-eastern enclosing banks are very prominent and form a barrier between the site's outcrop and the surrounding landscape. These face a 'blind' hillside, where there is limited visibility beyond it while the remainder of the site faces open downland (Driver 2013, 110).

Castell Tregaron's position strongly influences its visibility of the surrounding landscape thus supporting Driver's observation that to the north-east there was a blind hillside. For example, to the 1km radius visibility is largely confined to the north-west, west, south and south-east (Figure 21). To the 3km radius visibility increases to the west, north-west and aspects of the south-east and becomes restricted in the 6km radius to the north-west, south-west and scatterings to the south-east and west. Visibility is increasingly scattered to the south-west and north-west in the 9km radius.

Figure 21. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Castell Tregaron as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service).

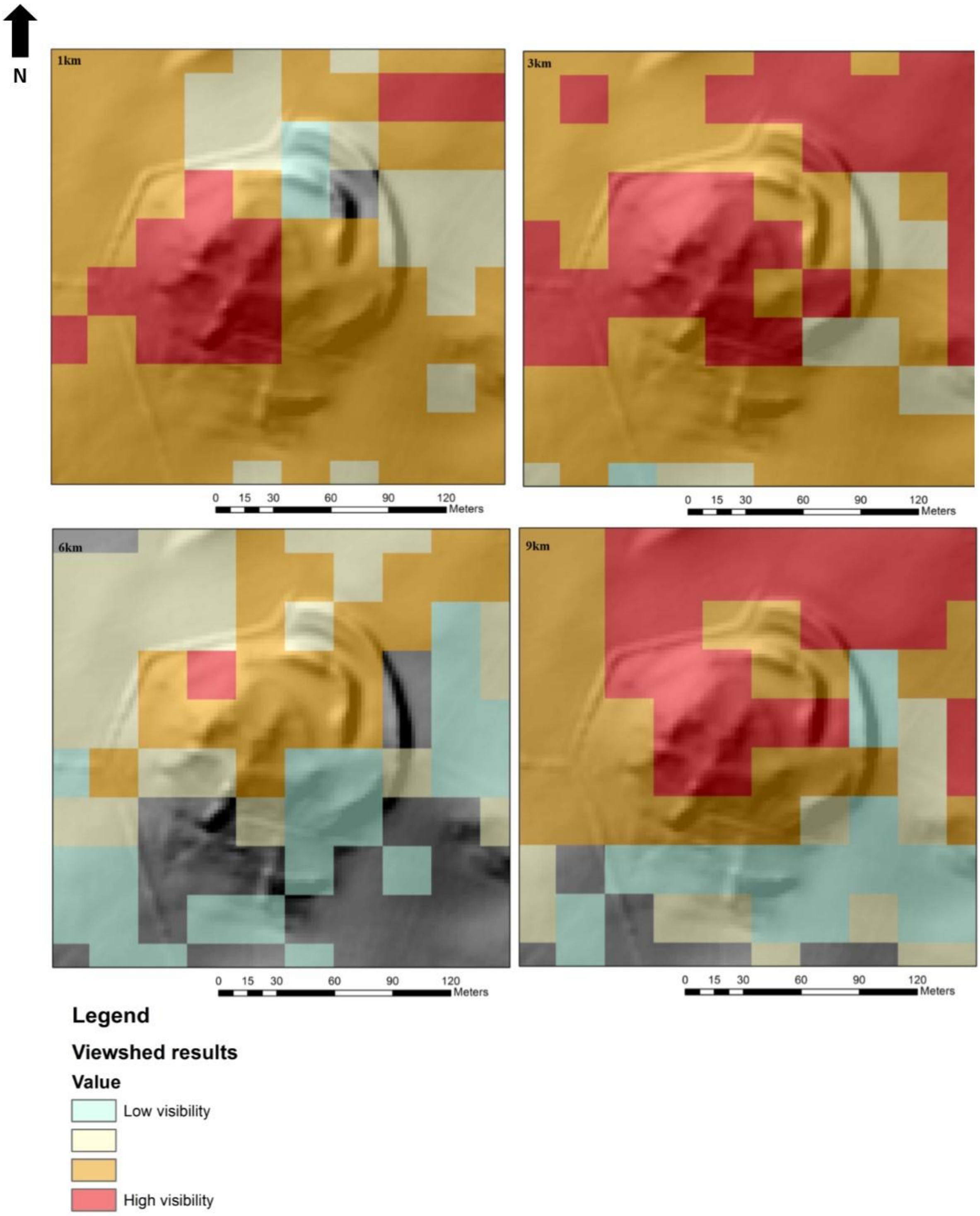


Image

The north-eastern façade of Castell Tregaron constituted the 'back' side of the site whilst the remainder is visible from the surrounding open downland (Driver 2013, 116). Driver noted that the site's interior is visible from the land just to the north-east and further that 'few hillfort façades in Wales present such an impressive and uncompromising architectural statement' (2013, 87). Although the northeastern bank increases the physical and symbolic prominence of the site, GIS-based viewshed analysis failed to confirm that this aspect of the site is its most visible part. For example, from the 1km radius the majority of the site is visible, and it is generally of moderate visibility, but the north-eastern corner of the site is one of its least visible aspects (Figure 22). From the 3km radius the visual magnitude of the different aspects of the site is highly variable with the highest being the north-western aspect of the site's interior (Figure 22). This area, along with the centre of the interior, and aspects of the eastern banks also has the highest visual magnitude from the 6km radius (Figure 22). The overall visual magnitude of the site increases from the 9km radius but the central area of the site's interior and a very small sector of the outer bank remain the most visible aspect (Figure 22).

Castell Tregaron is not visible from the neighbouring hillforts within this test area.

Figure 22. Results of viewshed analysis from the radii towards Castell Tregaron depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Correct pathways

This site is situated to the east of, and overlooks the overland route and valley junction of the rivers Berwyn and Groes with the Teifi. GIS-based cost surface analysis does not coincide with these influential routeways. Driver also argued that a north-eastern approach was a fundamental route to the site (2013, 116) although again, a limited number of least cost pathways approach the site from this direction. Cost surface analysis indicates that the south-eastern entrance was placed in the site's most accessible area in terms of slope as 246 of the 258 slope based pathways converge on this area (Figure 23). This reinforces Driver's point that the addition of the outer bank would have inhibited entry into the site not just because entry into the entrance was made more difficult but it meant that people had to approach via a less accessible route.

Cost surface analysis supports the viewshed analysis in that the site's northern aspect is of poor visibility from the surrounding landscape as the majority of the blind pathways use this aspect of the site (Figure 24). This indicates that this façade was constructed to face an area which predominantly had poor visibility of the site. There was only a very small area to the north-east which is indirectly indicated to have visibility to the site due to the lack of blind pathways there. While this supports Driver's observation (2013, 87), the strong correlation of blind pathways with the north-western and eastern ends of this façade demonstrates that the effort applied into its construction was not proportional to its impact. This façade distorts the site's immediate image of strength by giving the impression of a highly 'fortified' site. There is no distinct correlation of visible pathways with any single aspect of the site (Figure 25).

Figure 23. Results of slope based cost surface analysis to and from Castell Tregaron. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

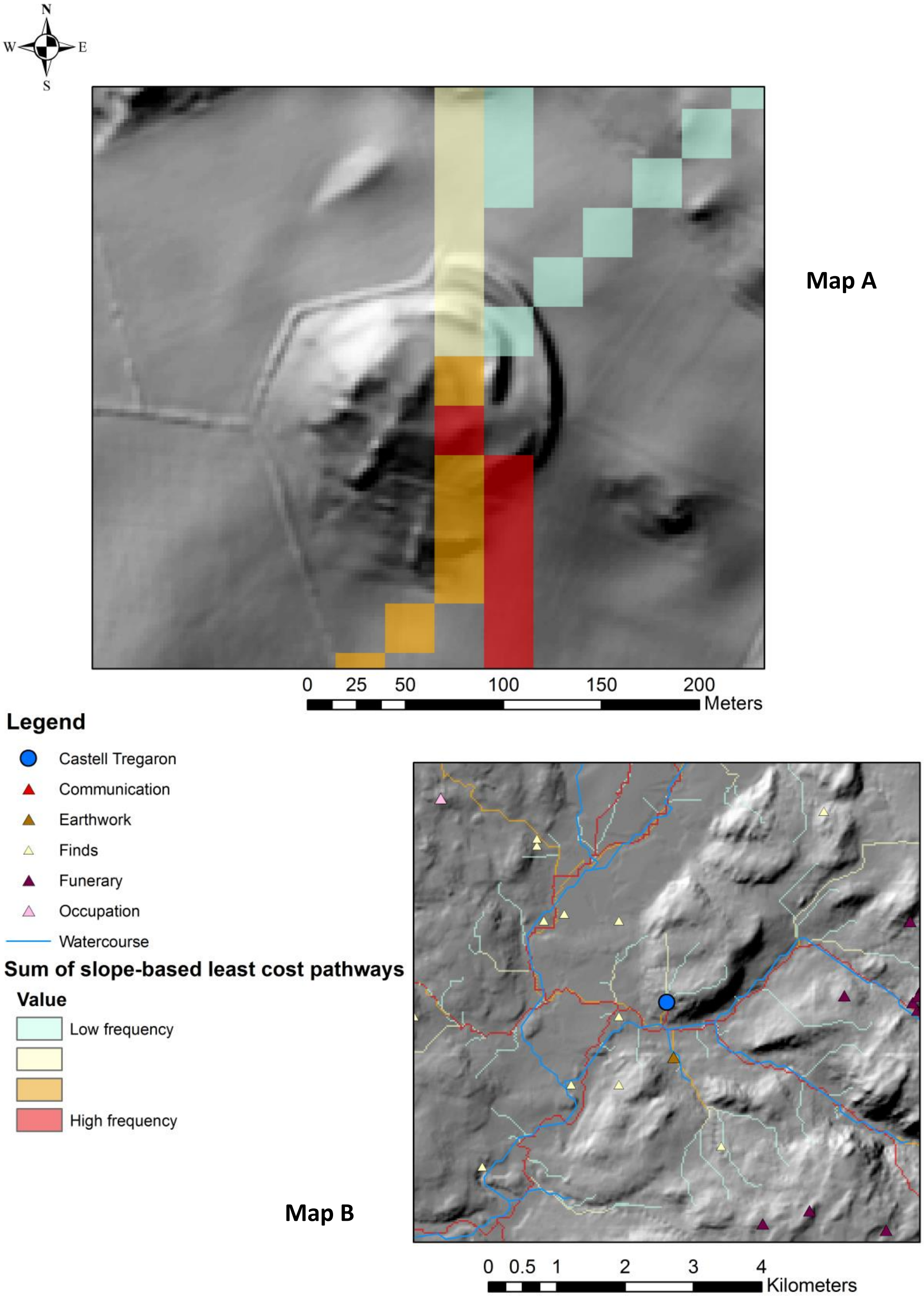


Figure 24. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Castell Tregaron. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

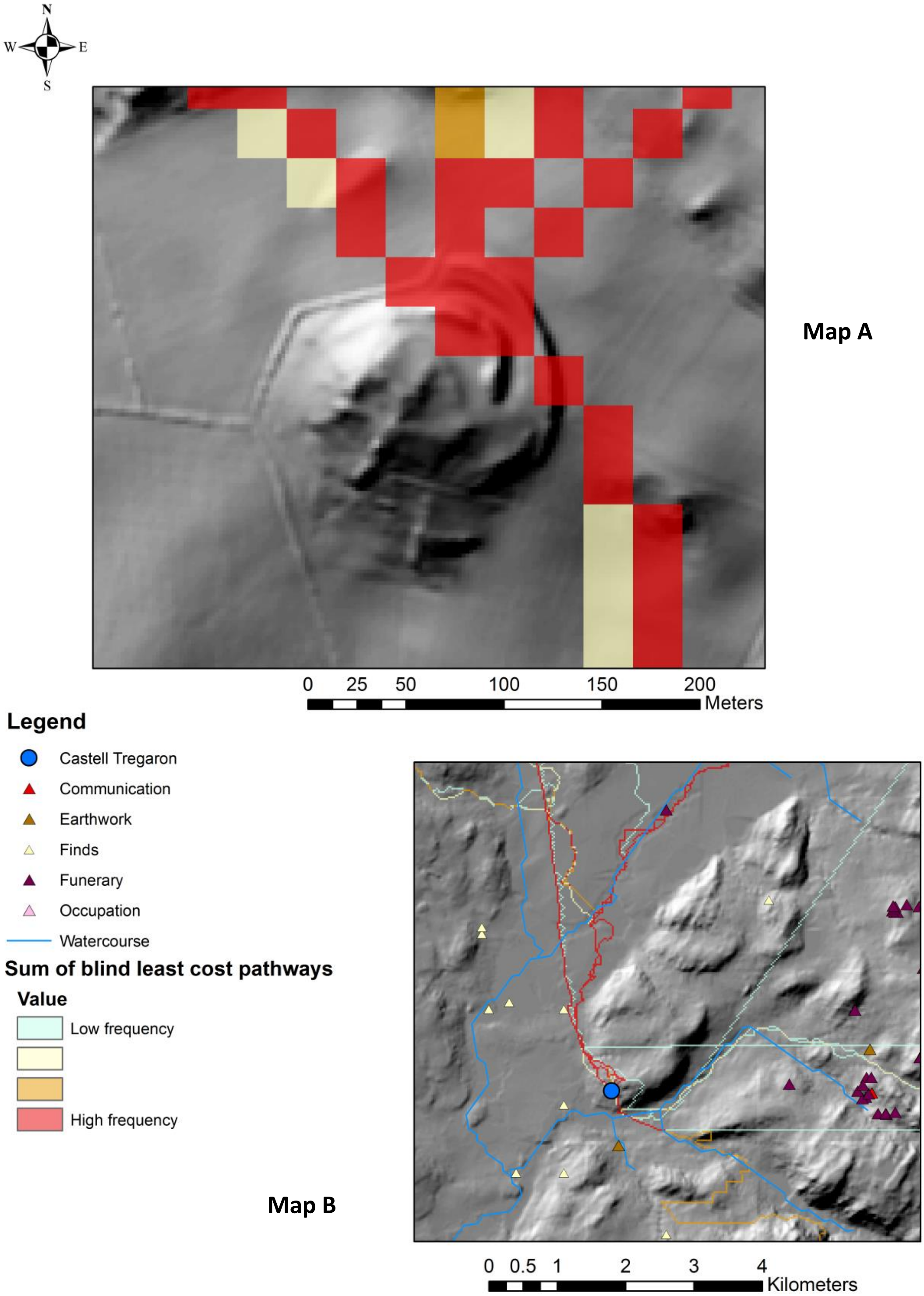
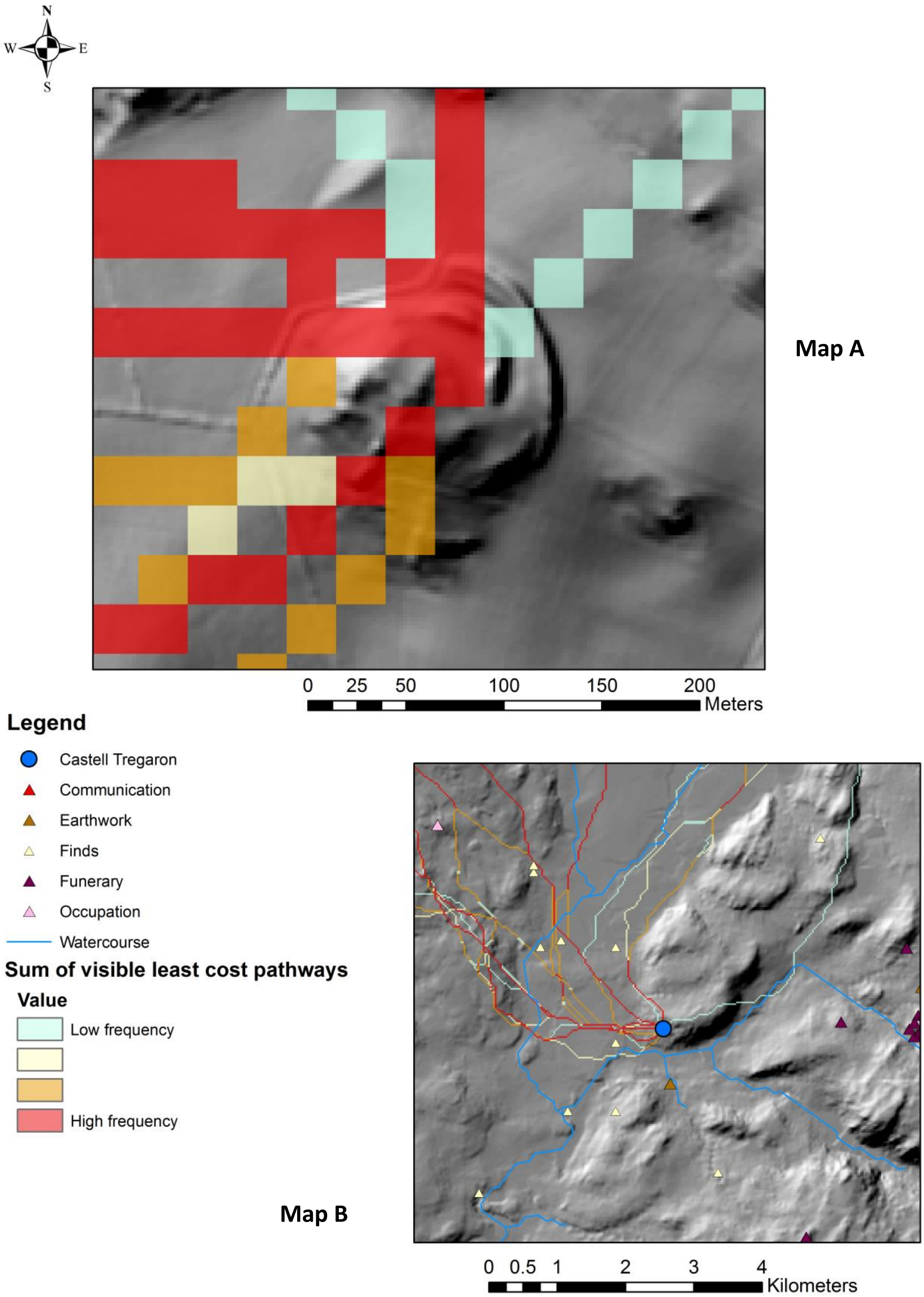


Figure 25. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Castell Tregaron. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)



The pathways do not strongly intersect with known archaeological activity within the area.

Concluding site summary

Castell Tregaron largely adheres to, but is constrained by the rocky outcrop on which it is situated with the only architectural component of the site constructed beyond this outcrop being the outer north-eastern bank. This increases the physical prominence of the site, but it is not its most visible. The landscape to the north-east is also of limited visibility as supported by both viewshed and cost surface analysis. The latter in particular highlighted that there was a high correlation of blind pathways with this area, this indicates that the façade faces an area which has limited visibility of the site. The façade distorts the image of the site as it is the result of the disproportionate allocation of resources to create an image of strength within a focused area as opposed to around the whole site. This demonstrates that GIS-based analysis, in this case, supports the concept of image.

A limited number of least cost pathways approach from Driver's prominent northeasterly direction (2013, 116) and if this was an influential route, it was not influenced by factors such as visibility or slope. Instead cost surface analysis found that the majority of slope based least cost pathways enter the site close to the eastern entrance. This demonstrates that the morphological correct pathway as defined by the entrance also coincides with the GIS based correct path of movement.

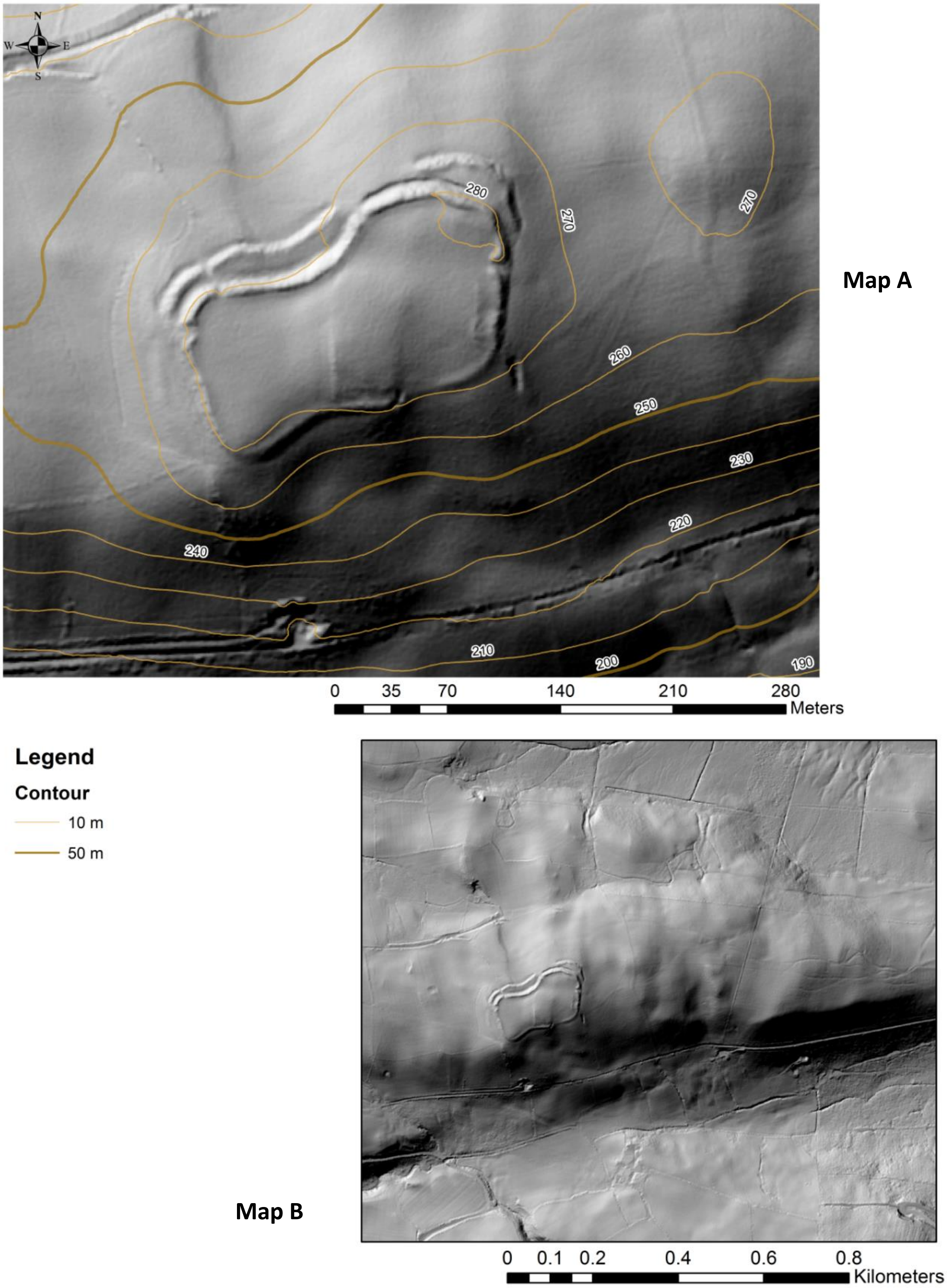
Gaer Fawr

Site introduction

Gaer Fawr is situated on the summit of a steep east-west ridge that overlooks the Trawsgoed Basin to the east. The site measures 265m north-south by 120m east-west (Driver 2012) and is enclosed by a bivallate rampart in the north-east (*ibid* 2012) (Figure 26) with the remaining sides enclosed by a singular rampart which consists of shale, rubble, and clay with traces of stone revetment (*ibid* 2012). On the site's western side, the enclosing bank is least prominent and scarp like (*ibid* 2012).

The site has two entrances with the main one on the eastern side (Driver 2013, 96) which is in-turned and surrounded by two bastions on the east and west (*ibid* 2013, 96). The western entrance is smaller and less elaborate.

Figure 26. 2m resolution LiDAR hillshade models of Gaer Fawr and its immediate environs. Map A focuses on the site and is overlain by contours, Map B depicts its topographical environs

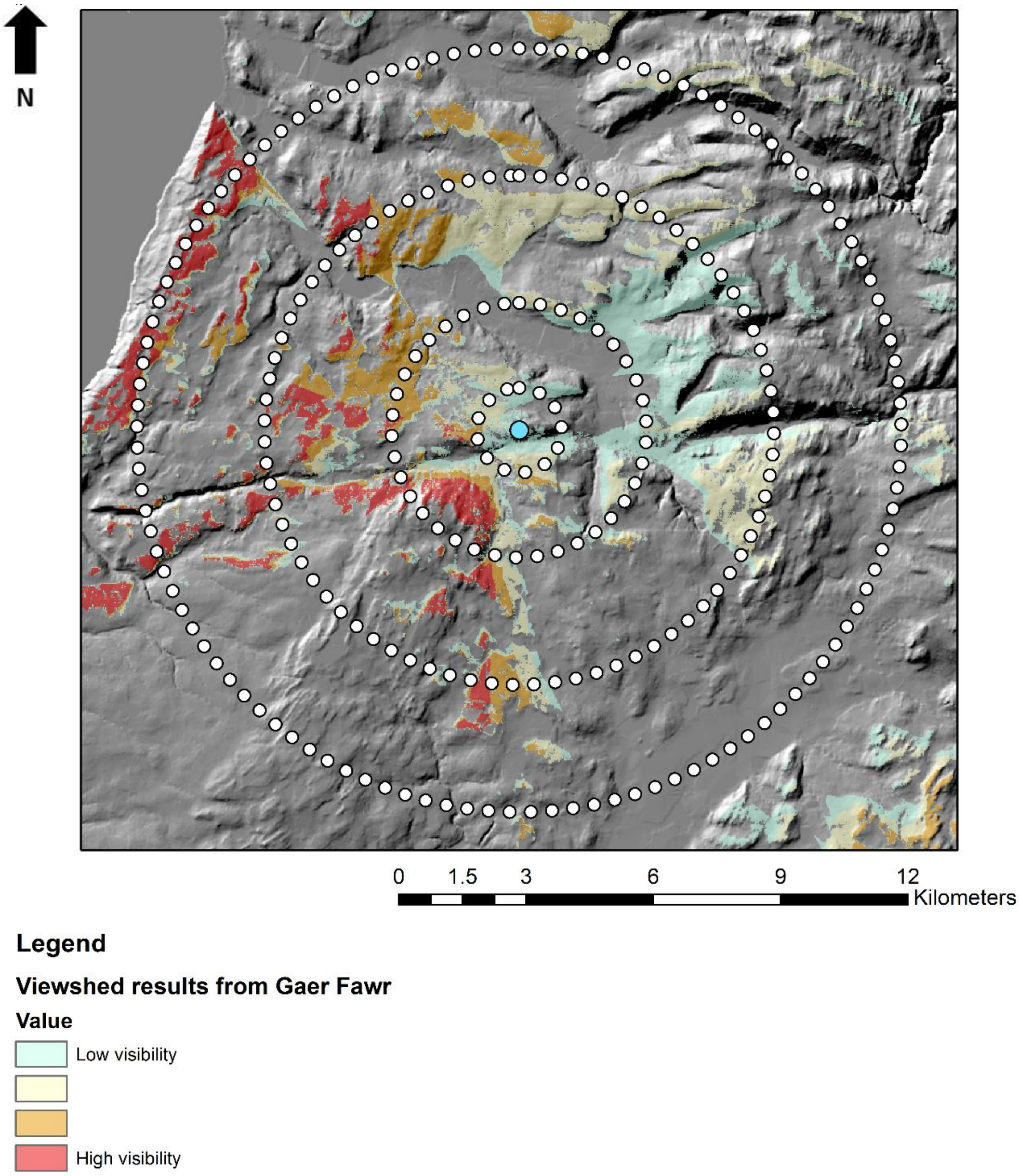


Physical relationship of the hillfort morphology and location with the landscape topography

The majority of Gaer Fawr's morphology largely concurs with the topography (Figure 26). The only aspect of the site which cuts across the ridge are the eastern defences within the northern corner deflecting to take in the summit of the hilltop.

Gaer Fawr's location promotes all round visibility of the surrounding landscape at varying distances, for example, a large proportion of the 1km radius is visible apart from the north-eastern corner (Figure 27).The visibility towards the west, north-west, south and south-west increases to the 3km radius, the south-east corner is also visible but to a lesser extent. To the 6km radius the visible spread increases as scattered areas of the northern half of the radius along with the west, east and south are now visible. There is still a high degree of visibility to the west and north-west in the 9km radius, however, with discreet areas to the north, north-east and south.

Figure 27. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Gaer Fawr as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)



Image

As the site's longest side, the northern aspect forms a terraced façade although as a whole, the site is highly visible from the surrounding landscape. There is not one distinctly more visible aspect of the site's morphology than others with the variation demonstrated both with distance and area. However, from the 1km radius, the banks which enclose the site are its most visible component (Figure 28), being of high visibility compared to the interior, which is of lower visibility but with highly variable values of visual magnitude. From the 3km radius the overall visual magnitude and the actual visible area increases as the majority of the site is of high visibility (Figure 28), this continues from the 6m radius (Figure 28), however from the 9km radius only the northern and south-western area of the site is of high visibility (Figure 28). The remainder of the site is of low visibility, or not visible.

Situated 10.5 km to the south-east of Gaer Fawr is Pen Dinas and Driver argues that Gaer Fawr is the only hillfort within the area which is not intervisible with this site (Driver 2005a, 271; Driver 2013, 96). This lack of a visual relationship between the two led him to argue that Gaer Fawr 'commanded a substantially independent territory' (Driver 2005a, 271; Driver 2013, 96). However, the results of GIS-based viewshed analysis from both the Profile DTM and LiDAR based DTM found that these two sites are intervisible (Figure 29). In terms of this test area, Pen Dinas is the only hillfort which can see Gaer Fawr.

Figure 28. Results of viewshed analysis from the radii towards Gaer Fawr depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

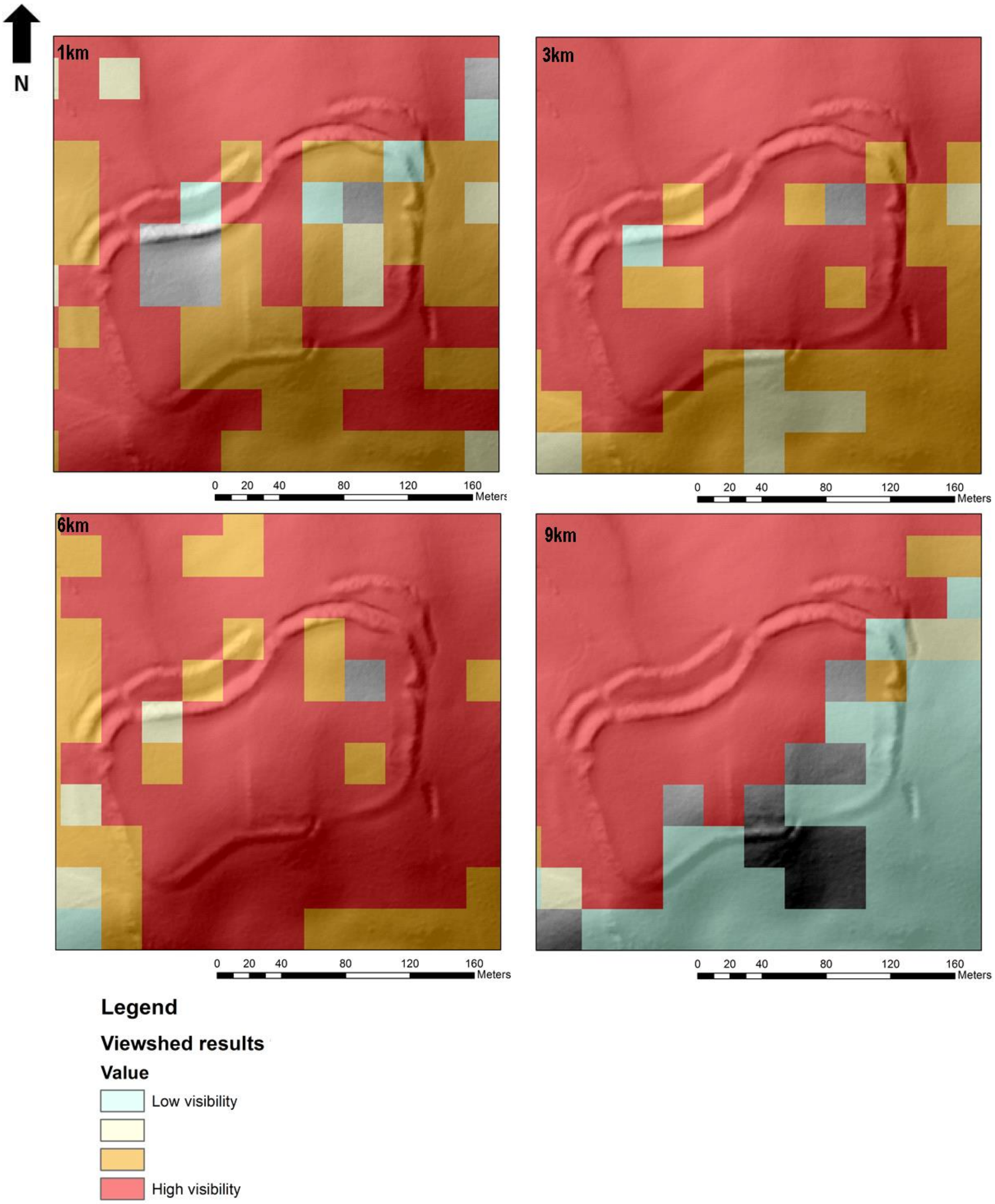
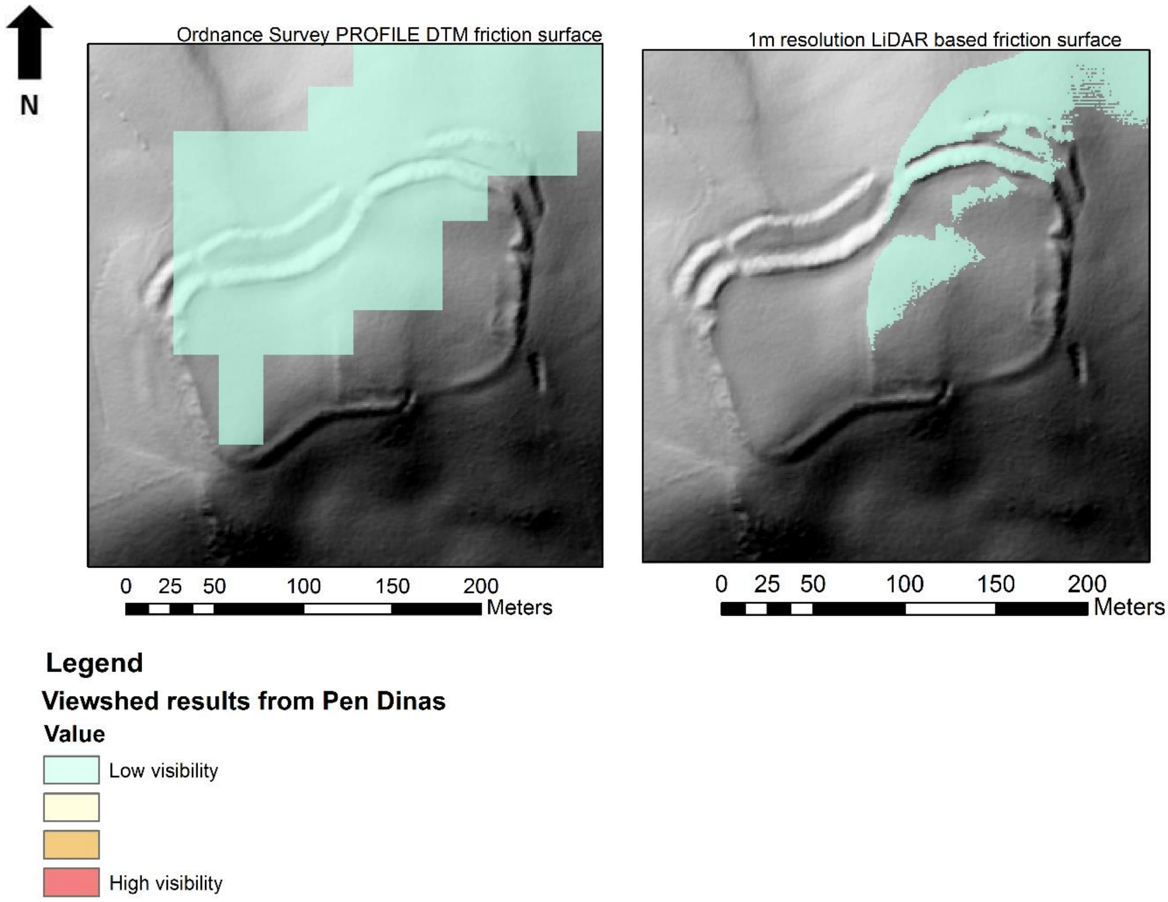
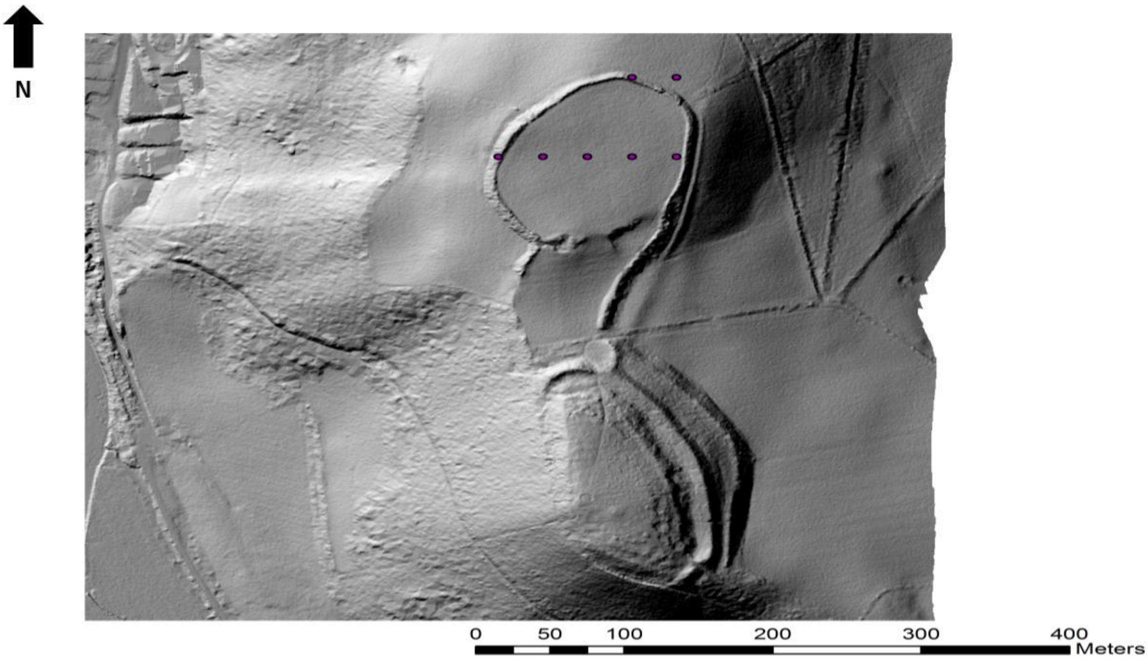


Figure 29. Visibility of Gaer Fawr from Pen Dinas according to both the Ordnance Survey PROFILE DTM and the LiDAR DTM (© Environment Agency copyright and/or database right 2013. All rights reserved; © Natural Resources Wales 2015; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Even though the results of viewshed analysis indicates that Gaer Fawr can be seen at Pen Dinas, according to the Profile DTM viewshed analysis only seven of the points within the Pen Dinas grid can see this site (Figure 30). These points are focused in the north fort. It was not possible to visit the area due to access restrictions to Gaer Fawr. However, it is highly likely that the variation in the viewshed results to the results of Driver's observations is due to the placement of the points in comparison to where Driver was stood. A point placed in the 'wrong' position or Driver having stood in the 'wrong' position inevitably meant that observations would differ. This emphasises the importance of using both viewshed analysis and field visits to come to balanced conclusions.

Figure 30. Distribution of points at Pen Dinas which could see Gaer Fawr (© Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Correct pathways

According to the results of cost surface analysis, the easiest way to enter or exit Gaer Fawr is via the western entrance where 130 of the 256 slope-based pathways converged (Figure 31). Paths are incised into this hilltop from the Trawsgoed Lowlands in the east, however they are not strongly supported by the results of Cost Surface Analysis. Only one slope-based, six blind and one visible least cost pathway corresponds with an easterly approach to the site. The cost surface analysis does however strongly support Driver's observation that the north-western aspect of the site is also highly accessible. This is used by modern foot traffic and it is the second most accessible aspect of the site (after Driver 2013, 95) as 103 slope paths interact closely with the break in this area.

There is also a strong correlation of the visual pathways with the entrances to Gaer Fawr, although the results suggest that the visual qualities of these entrances are contradictory. For example, the eastern entrance area corresponds strongly with the blind pathways as 20 of the 42 least cost pathways use this area (Figure 32) and the western entrance has a high correlation with the visible pathways as 9 out of 42 use this area (Figure 33). The contrasting entry points of the visible and blind pathways, and their correlation with the eastern and western entrances suggests that the eastern entrance is in an area where the site is least visible upon approach compared to the western entrance which is most accessible and where it is most visible to those approaching the site.

The pathways do not strongly coincide with known archaeological activity within the area.

Figure 31. Results of slope based cost surface analysis to and from Gaer Fawr. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

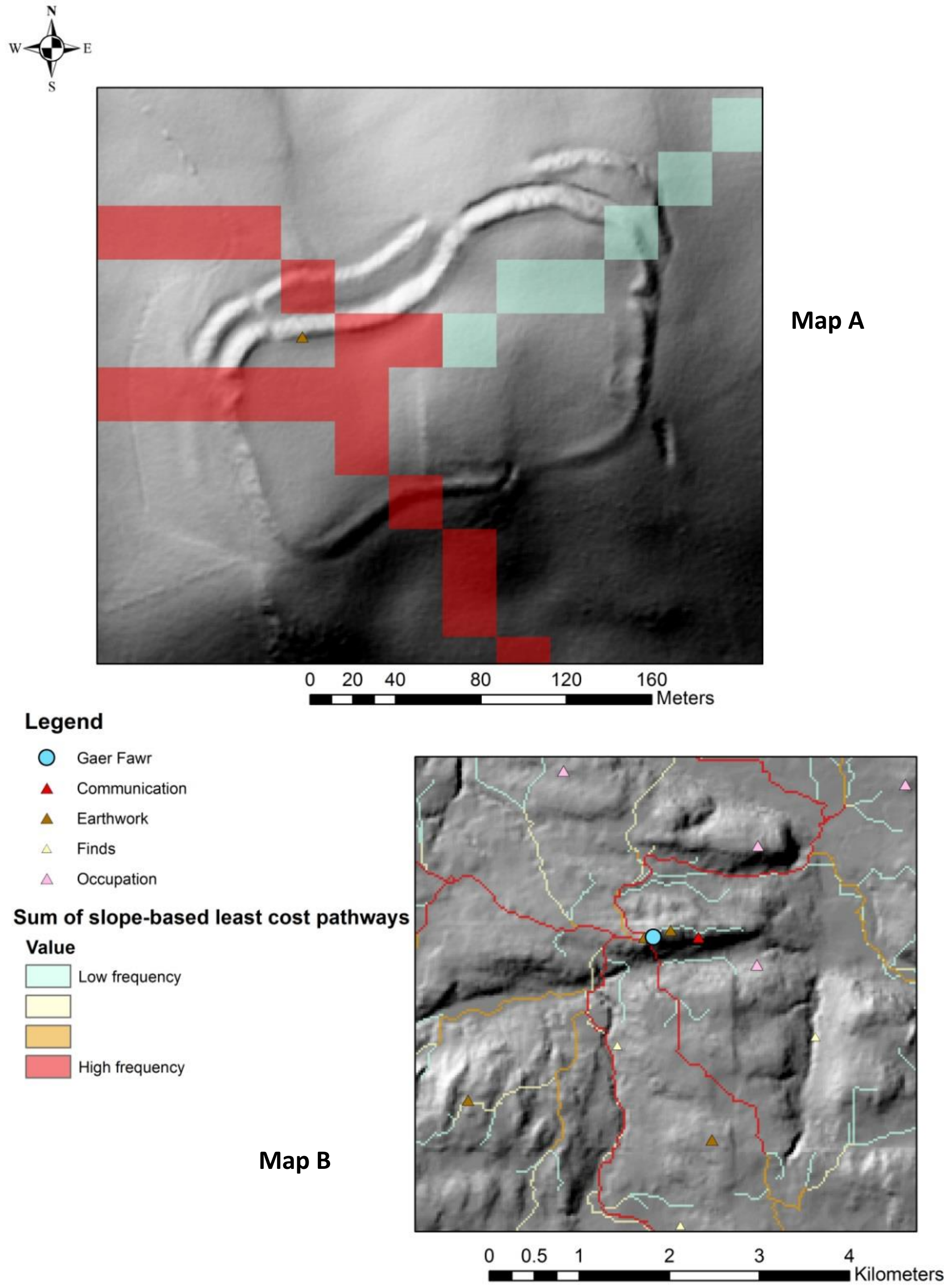


Figure 32. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Gaer Fawr. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007).

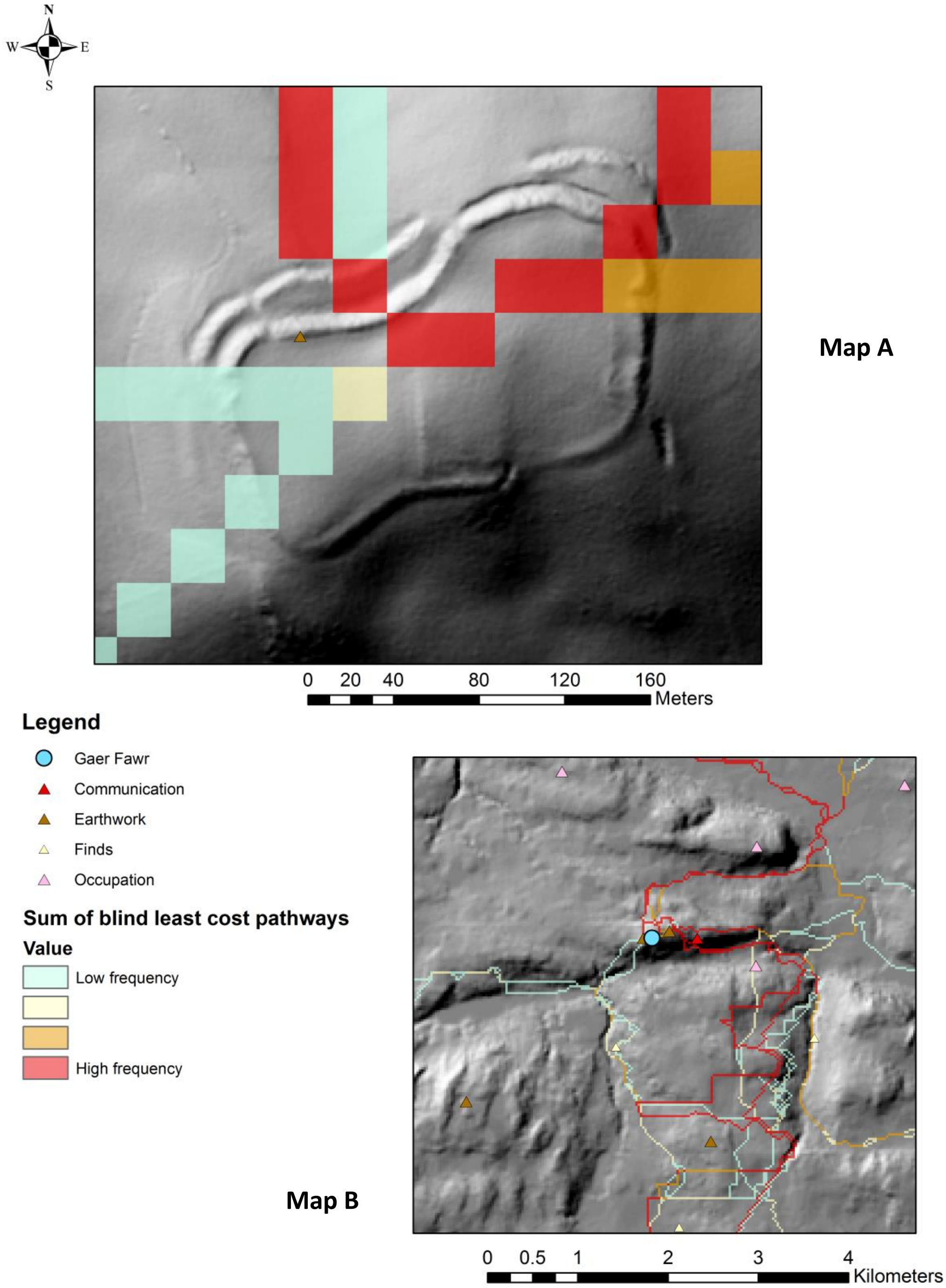


Figure 33. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Gaer Fawr. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

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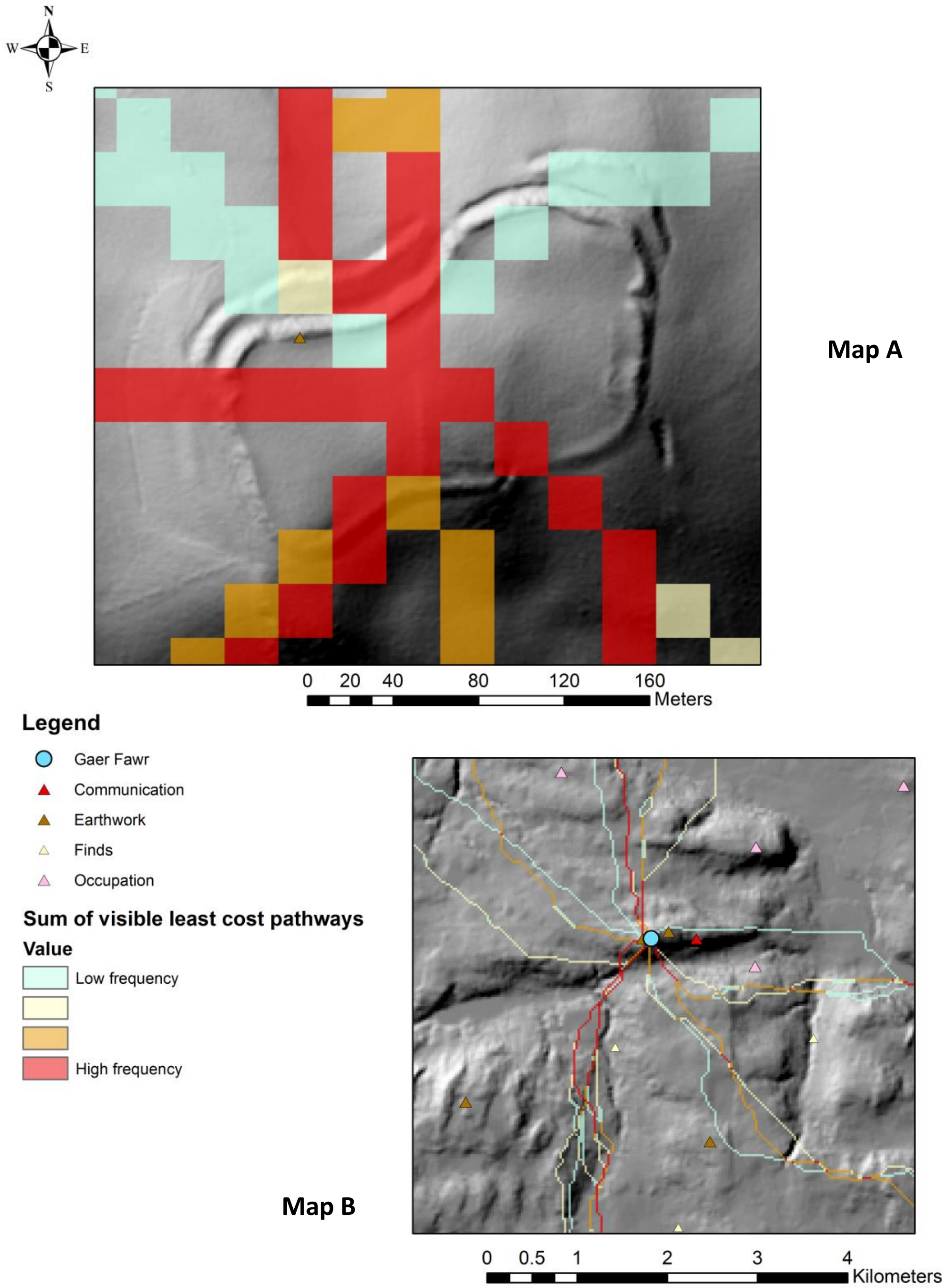


Concluding site summary

Gaer Fawr's morphology relates closely to the topography. Driver postulated that Gaer Fawr’s role within its wider landscape context was territorial and his belief that Gaer Fawr and Pen Dinas are not intervisible led him to argue that they were part of mutually exclusive territories (Driver 2005a, 271; Driver 2013, 96). However, the results of the viewshed analysis found that Pen Dinas and Gaer Fawr are intervisible.

Viewshed analysis demonstrated that Gaer Fawr’s location promotes good all round visibility of the surrounding landscape with the site itself also being visible from its environs. Even though there is a good overall degree of visual accessibility to this site, the visual magnitude of the visible areas is very variable with no areas which are distinctly more visible than others.

In terms of approaches to the site, cost surface analysis demonstrated that several pathways coincide with the eastern and western entrances. The former strongly coincides with the blind pathways whilst the latter with the majority of slope-based and visible pathways. Although the majority of the pathways do not intersect with the braided trackways, which are visible on the hilltop, a number do come from an easterly direction.

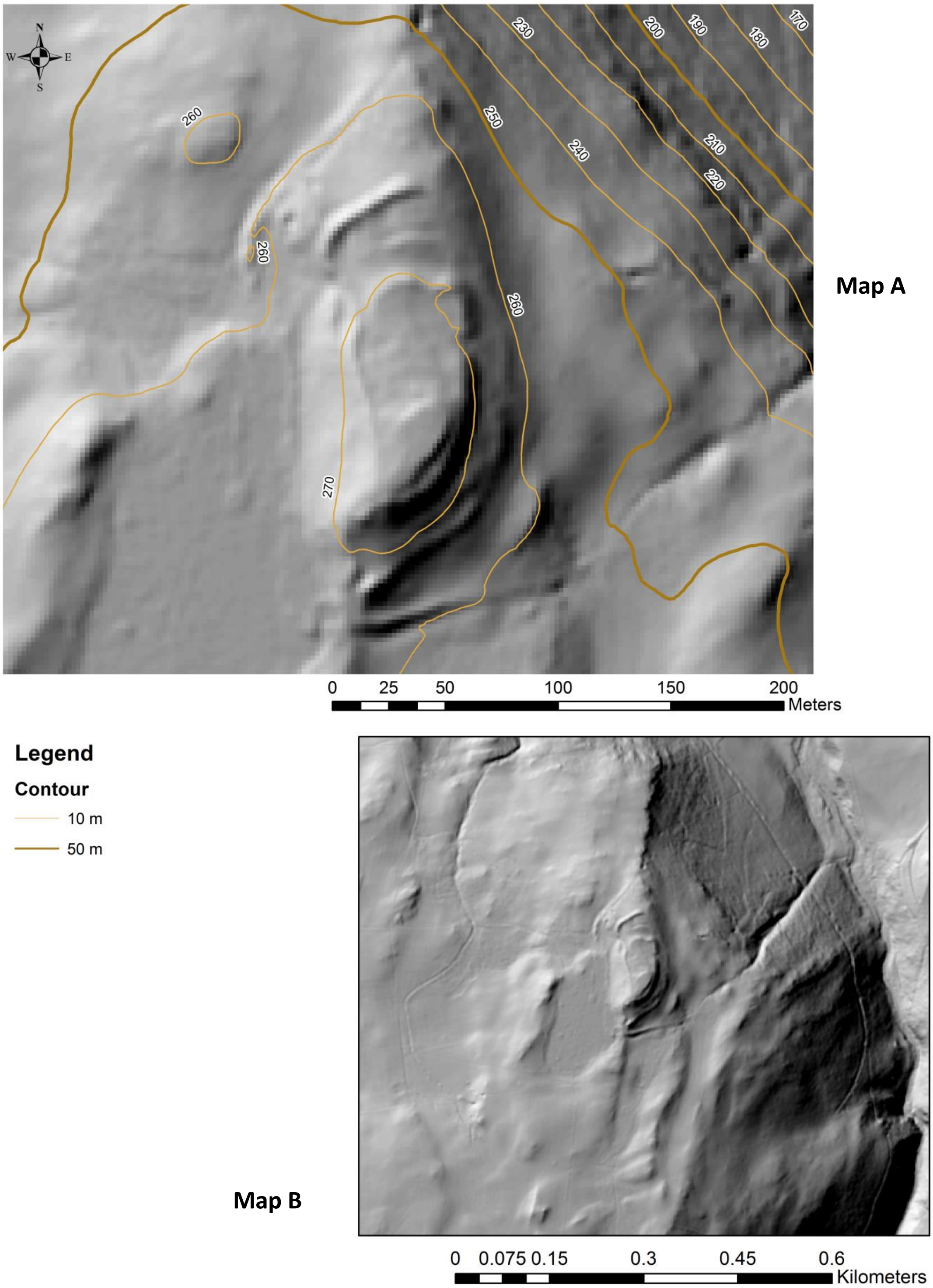
The positioning of the entrances almost directly opposite one and other, and with each of them correlating with completely different pathways, hints that those who constructed Gaer Fawr were very aware of the visual characteristics of this landscape. Toward the east where the site is least visible from approaching traffic the entrance is most elaborate, whereas to the west where the approaching traffic is most visible it is less elaborate. This is a demonstration of how site morphology can be used to portray a particular image from a particular direction, being influenced by knowledge of movement and visibility within the site's environs.

Pen Dinas Elerch

Site introduction

This site is situated on an outcrop on the eastern edge of Banc Mynydd Gorddu and encloses an area which measures 200m north to south by 70m east to west (RCAHMW 2012). The main entrance to the site is situated at the southern tip (Driver 2005a, 273; Driver 2013, 118) (Figure 34), and it opens out onto a 'causeway' that gives access to the site from boggy ground (RCAHMW 2012). Another entrance at the site's north-western corner, has a bastion on its southern side (*ibid* 2012).

Figure 34. 2m resolution LiDAR hillshade models of Pen Dinas Elerch and its immediate environs. Map A focuses on the site and is overlain by contours, Map B depicts its topographical environs (© Environment Agency copyright and/or database right 2013. All rights reserved; Dyfed Archaeological Trust 2014)



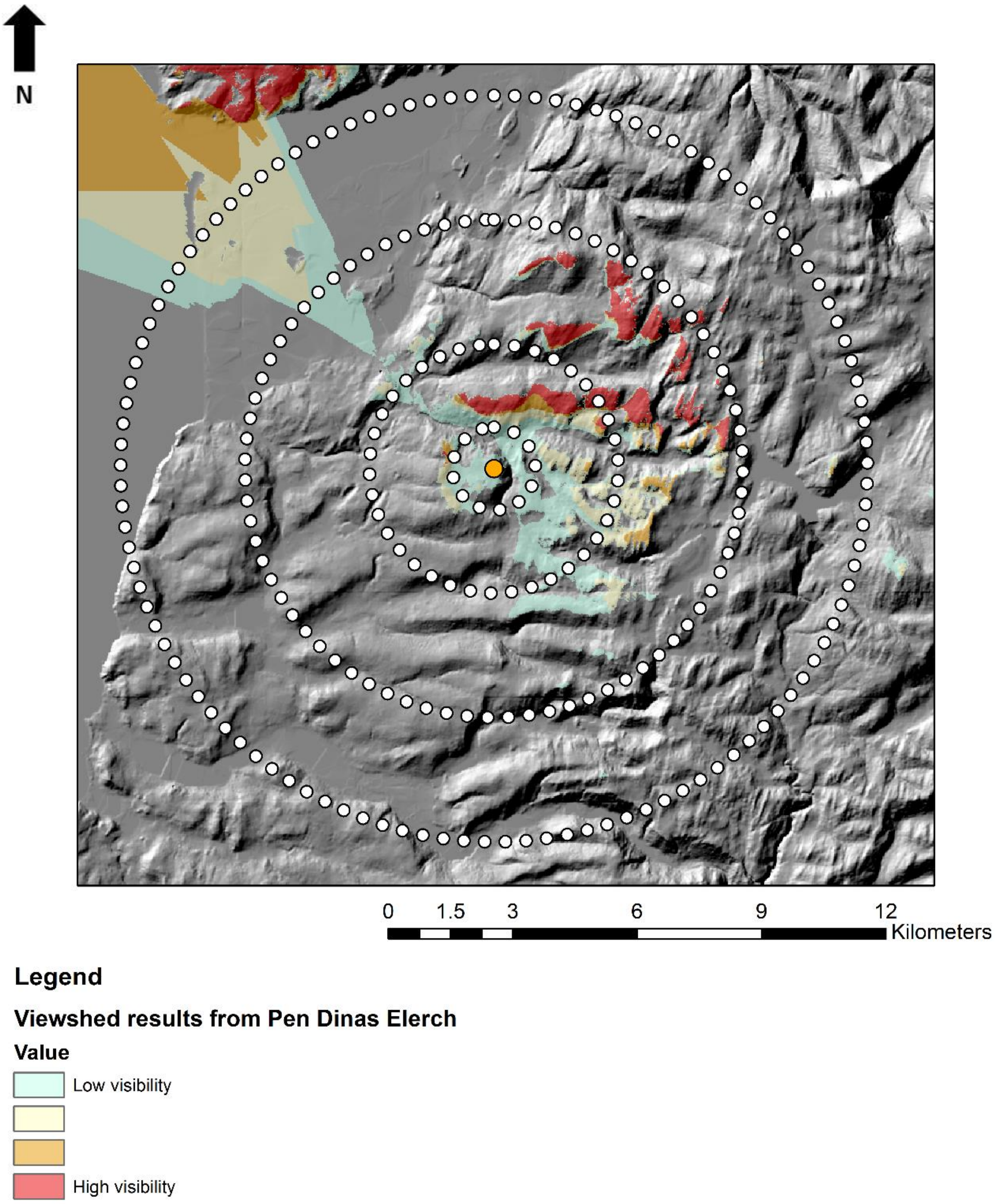
The site's northern area, particularly the slopes, formed the most sheltered area (*ibid* 2012) and contains a number of hut platforms. Between this area and the western rampart a piece of iron slag was also discovered with several more small finds discovered, a number of these in the north-western entrance (*ibid* 2012). One was a sherd of 'buff–coloured coarse-ware' pottery, which was found alongside two pieces of abraded daub fragments (*ibid* 2012). Three sling stones were also discovered close to the south-western entrance within an exposed section of the loose shale and earth to the west of this entrance (*ibid* 2012).

Physical relationship of the hillfort morphology and location with the landscape topography

Pen Dinas Elerch's enclosure encompasses the entire outcrop, which physically defines the site. It also reduced the amount of effort, and the cost involved in the construction of this artificial enclosure (Driver 2005a, 269; Driver 2013, 91).

Whilst the hillfort enhances the natural form of the landscape, and the natural formation reduced the amount of labour required to construct the site; the topographical position also influences the site's visibility of the surrounding landscape. To the 1km radius there is very scattered visibility (Figure 35) with the majority of the visible areas towards the west and east. Beyond 1km, and towards the 3km radius, the site's visibility to the east and north-east increases. Between the 3km and 6km radii there is increased visibility to the north-east and north-west, whilst between the 6km and 9km radius visibility is restricted solely to the north-west.

Figure 35. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Pen Dinas Elerch as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

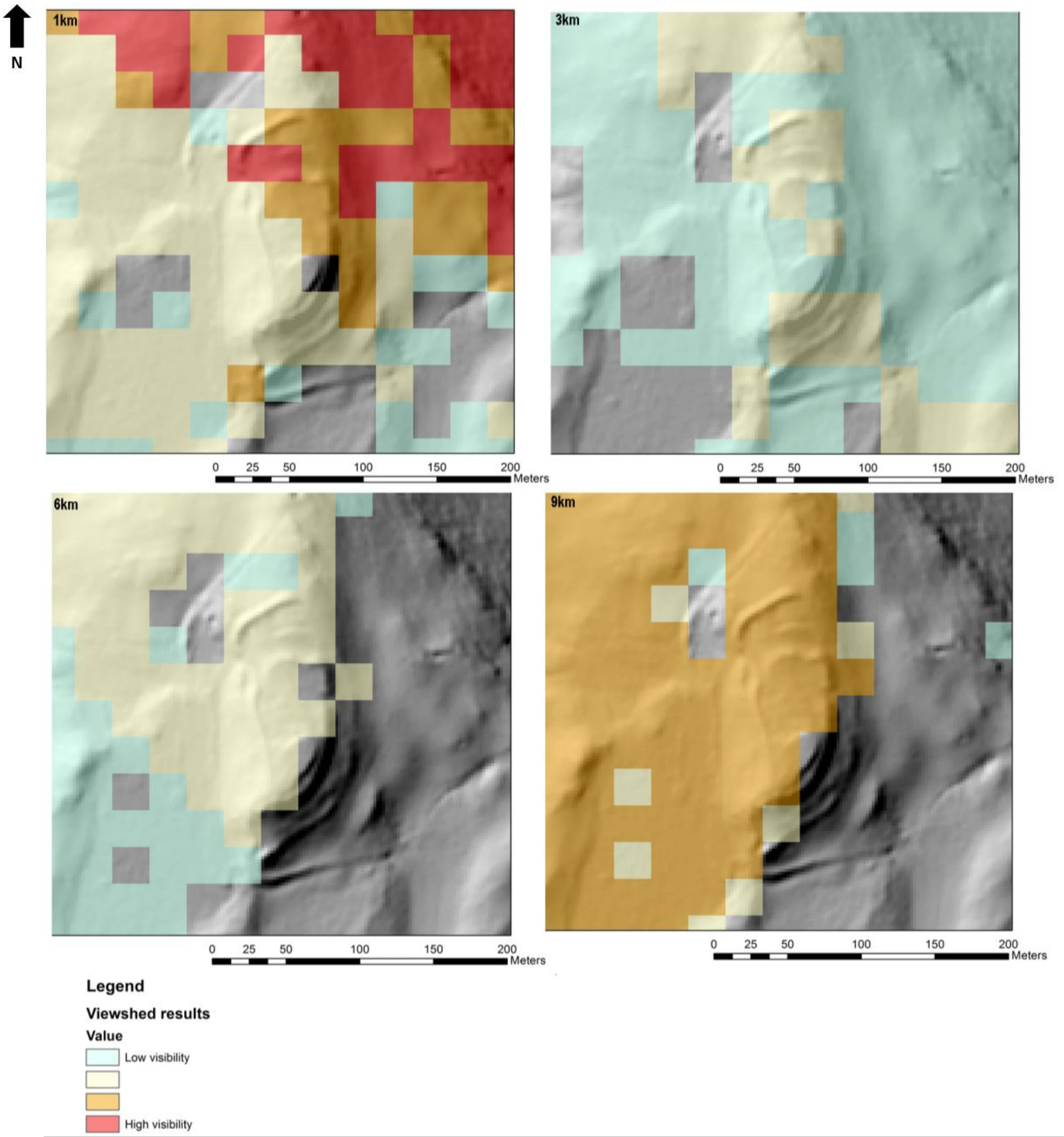


Image

Driver argues that the siting of Pen Dinas Elerch on a conspicuous knoll meant that it was a visually and physically commanding site (2013). However, it is not visible from the surrounding lowland valleys or from the routes to the west and the coastal plain to the north of the River Rheidol (*ibid* 2013, 110). The site is, however, visible as one descends from the mountains in the east and it is from here that it appears as one side of an upland plateau (*ibid* 2013, 110). The results of Driver's field observations are generally supported by those of the GIS-based viewshed analysis. For example, although the majority of the site is visible from the 1km radius the degree to which these areas are visible is highly variable (Figure 36). In general the most visible aspects of the site are the northern and north-eastern which have a visual magnitude within the upper percentile ranges. From the 3km radius the entirety of the hillfort is also visible but the visual magnitude of the areas within are much lower than from the 1km radius at a lower percentile range (Figure 36). The most visible area of the site from the 3km radius is its northern aspect. From the 6km radius the overall visible area of the site decreases, however the visual magnitude increases to within the 25th and 49th percentile (Figure 36). The visual magnitude of the visible areas continues to increase from the 9km radius with values between the 50th and 74th percentile (Figure 36).

The results of the GIS-based viewshed analysis found that the less elaborate and less physically prominent western side of the site is the most consistently visible compared to the more physically prominent and elaborate eastern side. Interestingly, this mirrors what was found at several other sites within this test area, for example Castell Tregaron and Castell Grogwynion.

Figure 36. Results of viewshed analysis from the radii towards Pen Dinas Elerch depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2014. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



The slopes of the western side of Pen Dinas Elerch are stone revetted and Driver argues that this physical construction was directed towards Bwlch-y-ddwyallt (2013), this is a pass which runs west-east towards the site. Driver further relates the orientation of this westerly façade to the easterly façade of Caer Llety Llwyd, which is to the west of Pen Dinas at the end of the Nant y Grogfwyd (a pass), which joins Bwlch-y-Ddwyallt (*ibid* 2013). The orientation of the façades at these neighbouring hillforts towards each other led Driver to suggest that they were contemporary (2013). However, GIS-based viewshed analysis found that Pen Dinas Elerch is not visible from Caer Llety Llwyd which puts doubt on the degree to which these sites could form a visual and immediate influence upon each other. They did not pose as a constant visual reminder to each other.

Whilst the western side of Pen Dinas Elerch is its most visible aspect, the southern entrance is also relatively consistently visible. This consists of a stone revetted bastion, which has a large amount of quartz within its structure, flanking the eastern side of the entrance (*ibid* 2013, 267).

Correct pathways

Pen Dinas Elerch is situated close to the lowland pass of Bwlch y Ddwyallt, which Driver argues would have been an important routeway in the past (2013). However, only 2 of the 257 slope-based least cost pathways use this pass; instead, cost surface analysis strongly suggested that the southern entrance is within the site's most accessible area as 251 slope-based pathways converge there (Figure 37). The majority of the visible pathways also approach the site very close to this entrance (Figure 38). This area has an actual correct pathway in the form of a causeway that allows access to this site from the boggy lowlands. A high frequency of the pathways which travel to the south of the site also coincide with a group of earthworks (Standing stones) and funerary monuments (Round barrows) at Banc Mynydd-Gorddu, however beyond this the pathways do not follow a distinct line of known archaeological features.

The correlation of the slope, visible and morphologically based correct pathways implies that this entrance was not only constructed where the site was most accessible, it is also where the site has the most visibility to those who were approaching it. The need to place an entrance within this area seems to have surpassed the fact that the land was boggy, and extra effort was needed to enable it to be used as a routeway.

The site's western aspect has a strong correlation with the blind pathways as 15 of the 42 least cost pathways interact here (Figure 39). These also travel primarily from the north-west. This supports Driver's observation that the site was not visible from the lowland valleys, particularly to the west and the coastal plain to the north (2013, 110). The high visibility of the site from the east (*ibid* 2013, 110) was indirectly supported by the cost surface analysis because no blind pathways travelled to or from this direction.

Figure 37. Results of slope based cost surface analysis to and from Pen Dinas Elerch. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale. Both maps are overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

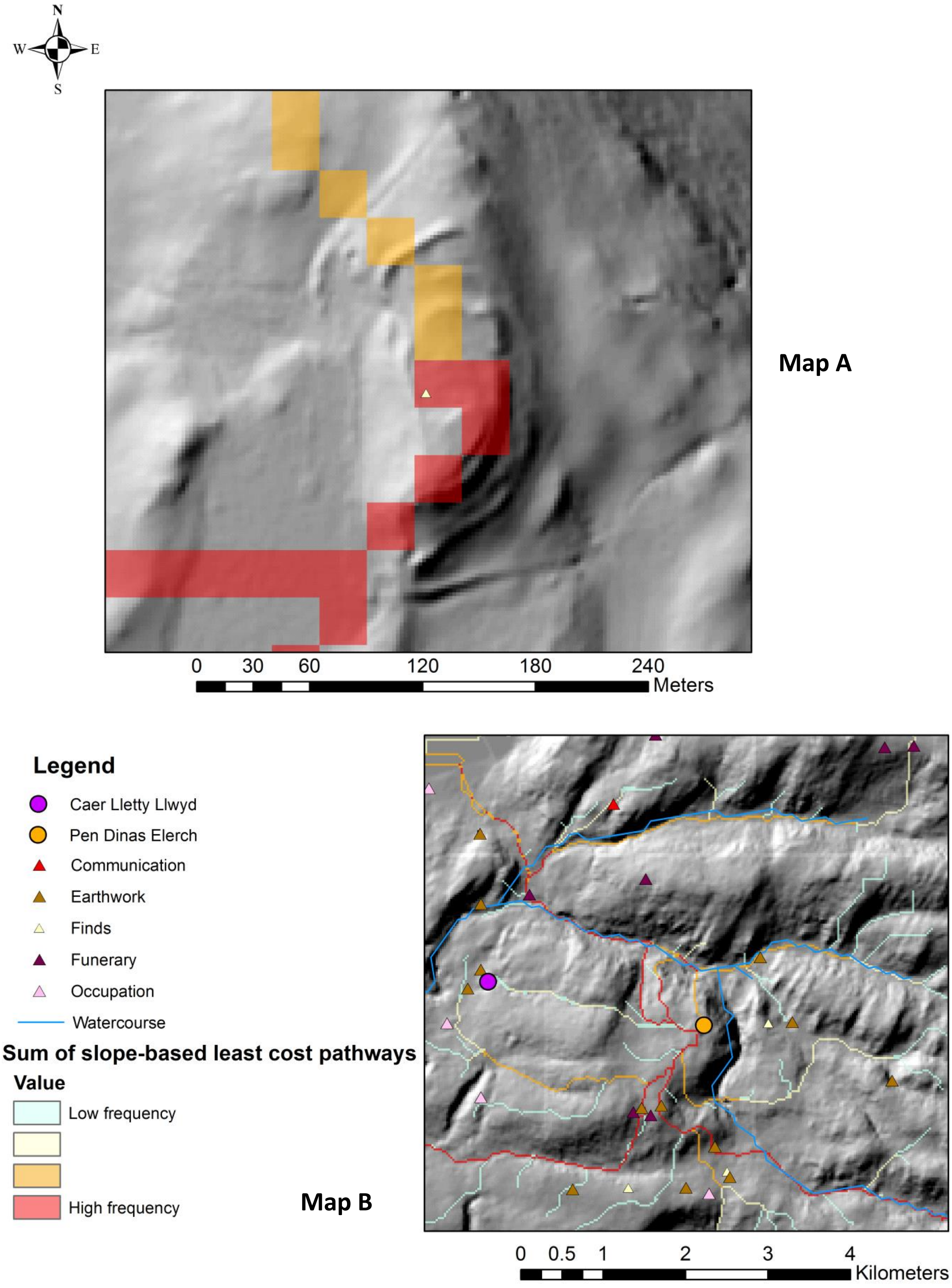


Figure 38. Results of cost surface analysis, which depicts the routes that visible pathways, took both to and from Pen Dinas Elerch. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale. Both maps are overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

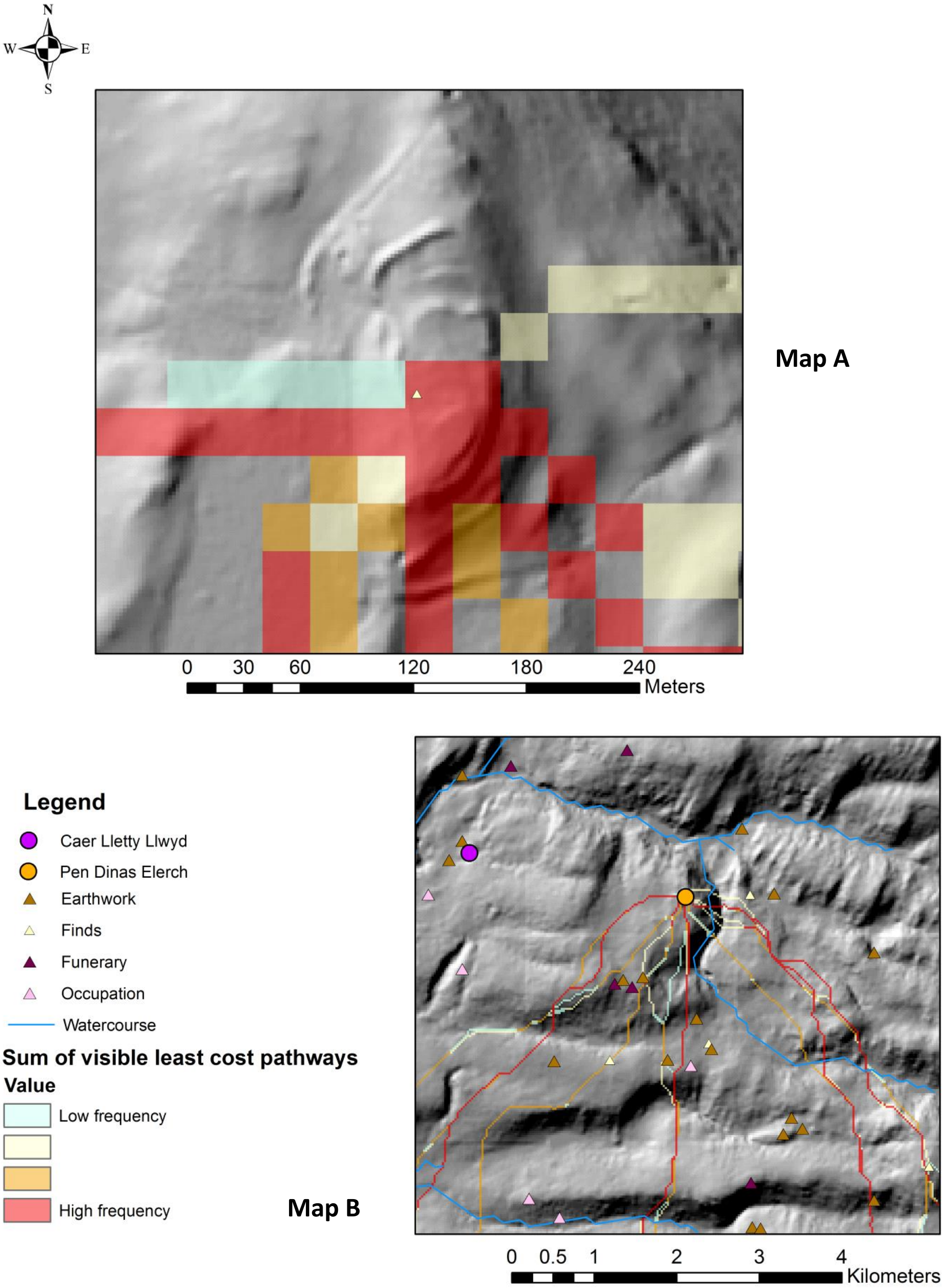
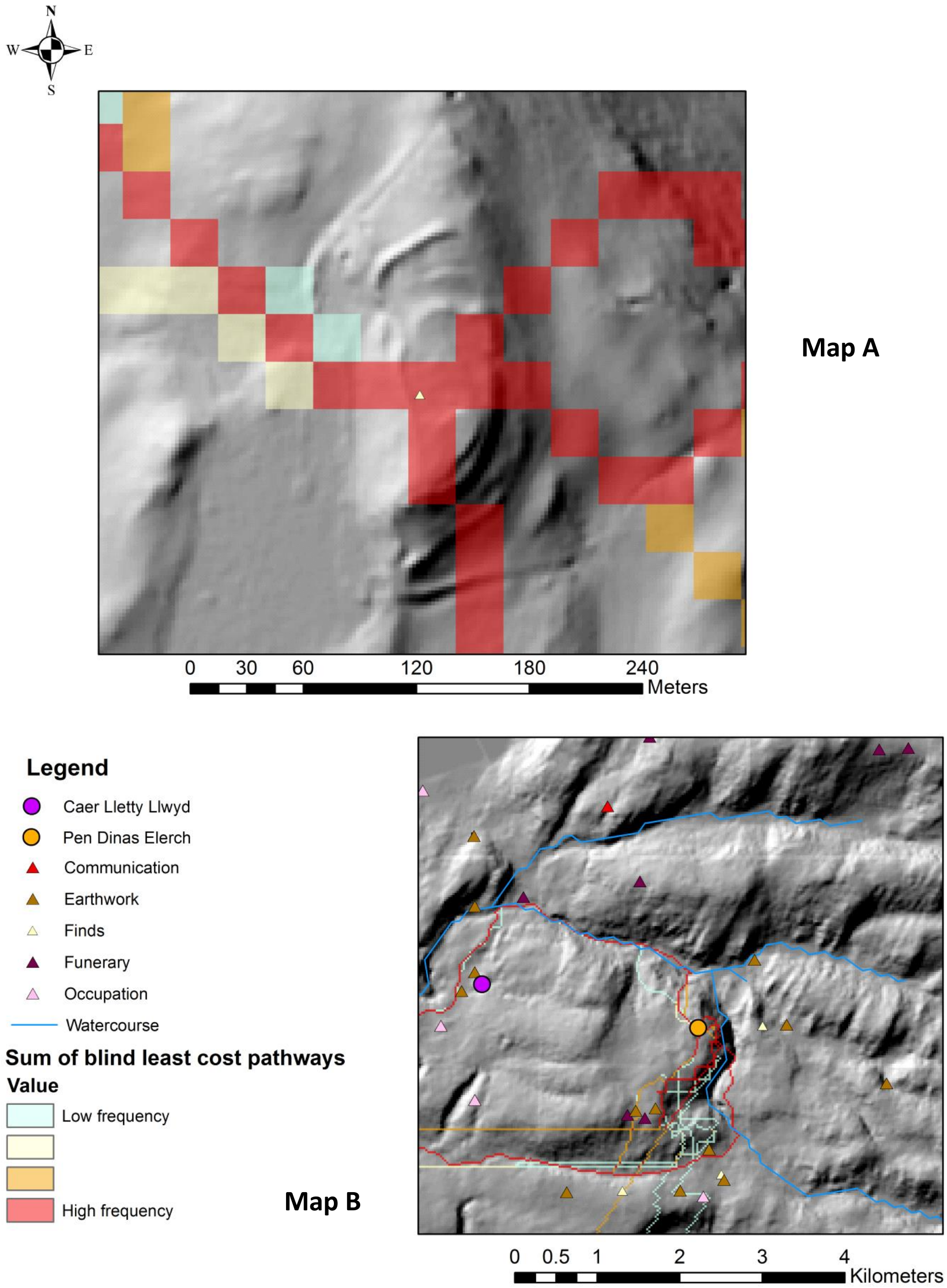


Figure 39. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Pen Dinas Elerch. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale. Both maps are overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)



The overall results of cost surface analysis demonstrate that a large number of pathways travel through the land to the south of Pen Dinas Elerch, an area that is also relatively densely populated with a number of archaeological features at Banc Mynydd-Gorddu. These include two potential Bronze Age Barrows (PRN-12034; PRN-12027) and two Bronze Age standing stones (PRN-12033; PRN-12026). The dense concentration of activity within this area coupled with the high correlation with a number of pathways implies that this was a significant area within later prehistory, perhaps a navigational point through the landscape.

Concluding site summary

Situated on an isolated hillock, the extent of this site is largely defined by the amount of usable space which was available on the hilltop. Its topographical position enables good all round visibility of the surrounding landscape, the site itself is also visible, but to varying degrees. The most visible parts of the site are the revetted bank in the west and the southern entrance.

The western bank also strongly coincides with the blind pathways, this demonstrates that although the western side is highly visible on a general landscape scale, the site itself is poorly visible when approaching from this area. The immediate visual impact of the western bank is that of surprise, it is the first aspect of the site visible to travellers. The revetted nature of this bank further enhances the first impressions of the site, and consequently further manipulates the site's image.

The site's eastern area is the most physically elaborate and prominent aspect of the site, yet it occurs in an area which has scattered visibility from the surrounding landscape. Driver argued that this aspect of the site is most visible from the routeways in the lowlands to the east (2013, 110), a suggestion supported by the viewshed analysis. However it is not universally highly visible, this implies that constructional effort was not proportionate to its visual 'target' audience.

Cost Surface Analysis supported Driver's identification of a routeway between this site and Caer Llety Llwyd (2013) as two slope-based least cost pathways follow its line. It also found that the southern entrance was placed in both the most physically accessible part of the site and where there is most visibility of those who were approaching it. The characteristics of this entrance coupled with its high accessibility, and the ability to see approaching traffic, implies that this exotic morphological component was designed to enhance the image of the site. The entrance formed the site's frontal face that inevitably strongly influenced people's impression of it. Also, the use of an exotic material at the front of this site manipulated its image, whilst also enhancing a morphologically and GIS based correct path of movement.

Pen Dinas

Site introduction

Sited on a coastal hill this site encloses an area of approximately 4ha (Driver 2000) and encloses both the northern and the southern summits (Figure 40). At least four phases of activity are represented at this site, the first of which was the enclosure of the broader north summit (Forde, Griffiths et al. 1963; Driver 2000). This comprises of a bank and ditch (Driver 2000) and a potential entrance from the isthmus (Forde, Griffiths et al. 1963). The bank itself may have been timber revetted (*ibid* 1963). Between approximately 400 and 300 BC the southern summit was enclosed with a substantial bank and an outer ditch (Driver 2000) with two elaborate gateways, one in the south-east, and the other in the north-east. Subsequently, the site fell into disrepair with the southern entrance collapsing and becoming overgrown (*ibid* 2000). In Phase 3 the earlier banks were repaired alongside the construction of new ones (*ibid* 2000). Then, in Phase 4 the banks which now enclose the isthmus were constructed (*ibid* 2000) including a stone walled gate which was a two storey building crossed by a wooden bridge (*ibid* 2000).

There are a number of circular and D-shaped scoops, which formed house platforms in the southern Fort (Driver 2000; Forde, Griffiths et al. 1963, 145) generally clustering around the southern entrance (Driver 2000; Forde, Griffiths et al. 1963, 145). Further evidence for activity within the interior of this site is represented by a number of finds including a sherd from an Iron Age stamp decorated jar, which dates to around 100BC (Driver 2000; Forde, Griffiths et al. 1963, 149). Others include a glass bead, stone bead, two spindle whorls, two loom weights, fragments of corroded iron and bronze and a cache of over 100 beach/river pebbles (Driver 2000; Forde, Griffiths et al. 1963). A Neolithic stone axe, a bronze palstave and a triangular barbed and tanged arrowhead, roman coin and a sword were also discovered at the site (Driver 2000; Forde, Griffiths et al. 1963).

Physical relationship of the hillfort morphology and location with the landscape topography

Sited alongside the coastline this site is largely defined by the topographical form of the land (Figure 40). Its position on the western end of a long ridge meant that the site is very conspicuous, its prominence is accentuated by the earthworks which encircle it (Driver 2013). This location makes this site one of the "strongest and most readily defensible hill[s] within the region", one of several factors which Driver (2013, 112) argues make this site a 'prime location'.

The others were:

- *'sits at the coastal confluence of the rivers Rheidol and Ystwyth'*
- *Sustained area of importance both pre and post hillfort activity*

Pen Dinas' ridge end position restricts the visibility of the landscape which immediately surrounds the site. There is poor visibility to the areas within the 1km radius (Figure 41). Visibility increases beyond this as the site has all round visibility to the line of the 1km radius. The majority of the area within the 3km radius is also visible, whereas to the 6km radius the majority of the areas to the west, north-west and south-west are visible. There is scattered visibility to the east. To the 9km radius a greater area of the west is visible, however visibility becomes increasingly scattered to the east.

Figure 40. 50cm resolution LiDAR hillshade model of Pen Dinas overlain by contours and HER data and a location map of the site (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved.)

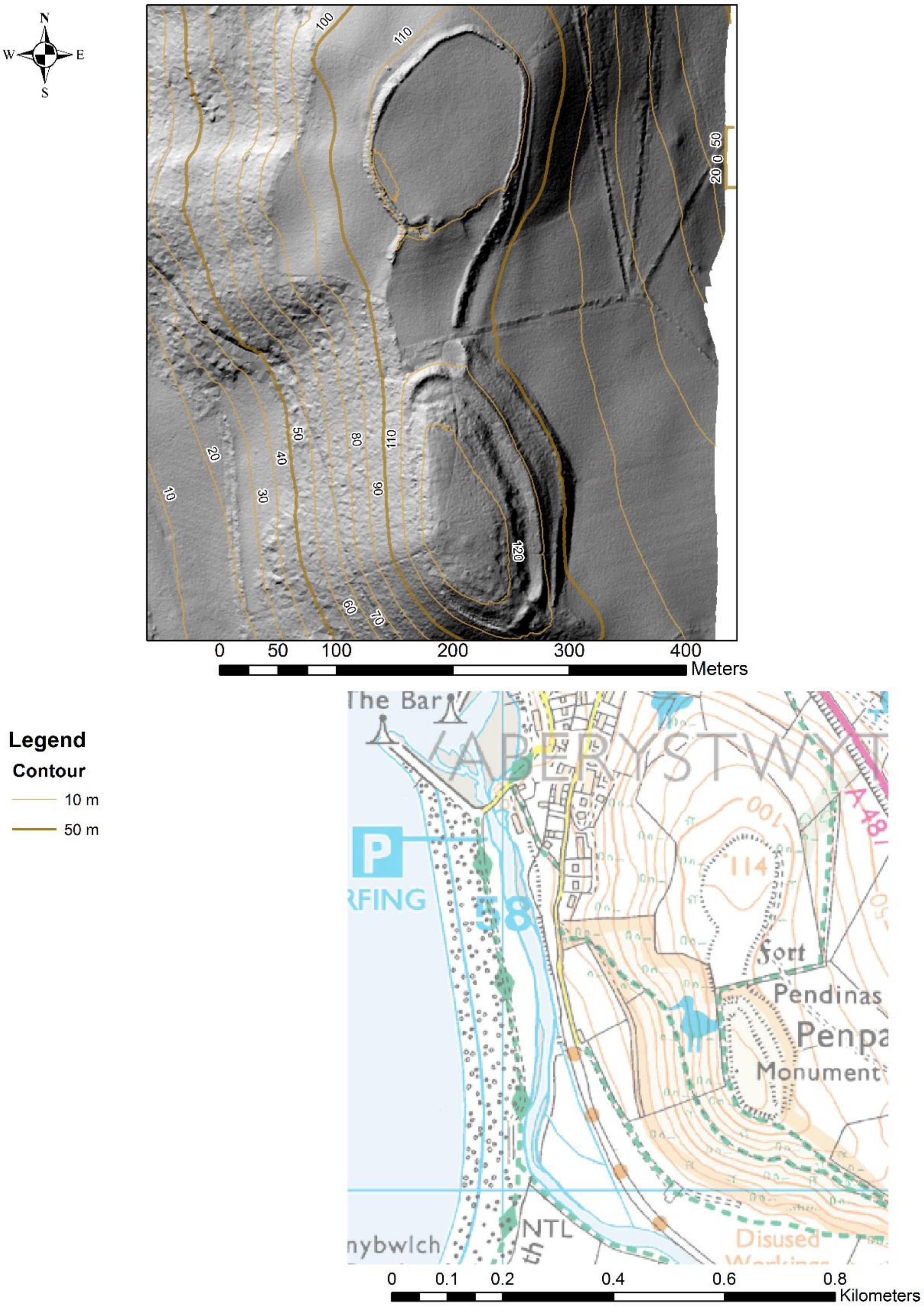
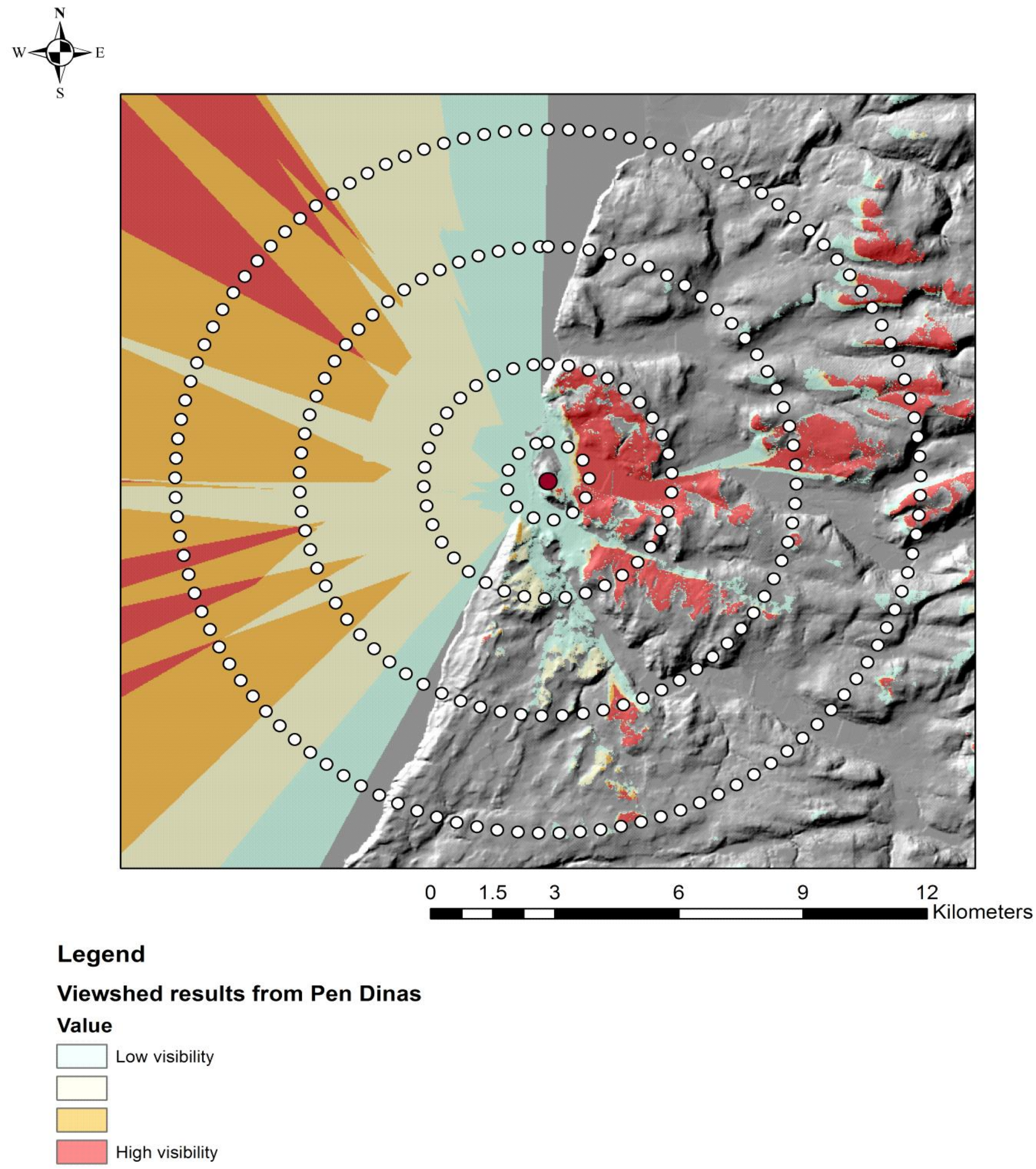


Figure 41. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Pen Dinas as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)



Image

The most consistently visible aspect of this site is its western side, however as distance varies the visual magnitude varies. For example, from the 1km radius the site is of scattered visibility (Figure 42). The western side continues to be the site's most visible aspect from the remainder of these radii, it also remains to have a visual magnitude in the upper quartile range.

Driver argued that Pen Dinas commanded a territory which was different to that of Gaer Fawr as the two were not intervisible (Driver 2005a, 271; Driver 2013, 96). GIS-based viewshed analysis demonstrates that Gaer Fawr is actually visible from Pen Dinas (Figure 43). As with the situation at Gaer Fawr, the contradictory nature of the viewshed results and Driver's observations is likely a result of the positioning of the points and Driver himself. However, only the north fort is visible from Gaer Fawr. Further investigation into the results of the grid-based viewshed analysis demonstrates that the majority of Gaer Fawr and its environs as defined by the distribution of the point grid have visual accessibility to the north fort of Pen Dinas (Figure 44). The points that lie on the southern aspect of Gaer Fawr have very limited or no visibility of Pen Dinas. Pen Dinas is not visible from any other sites within this test area.

Figure 42. Results of viewshed analysis from the radii towards Pen Dinas depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2014. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

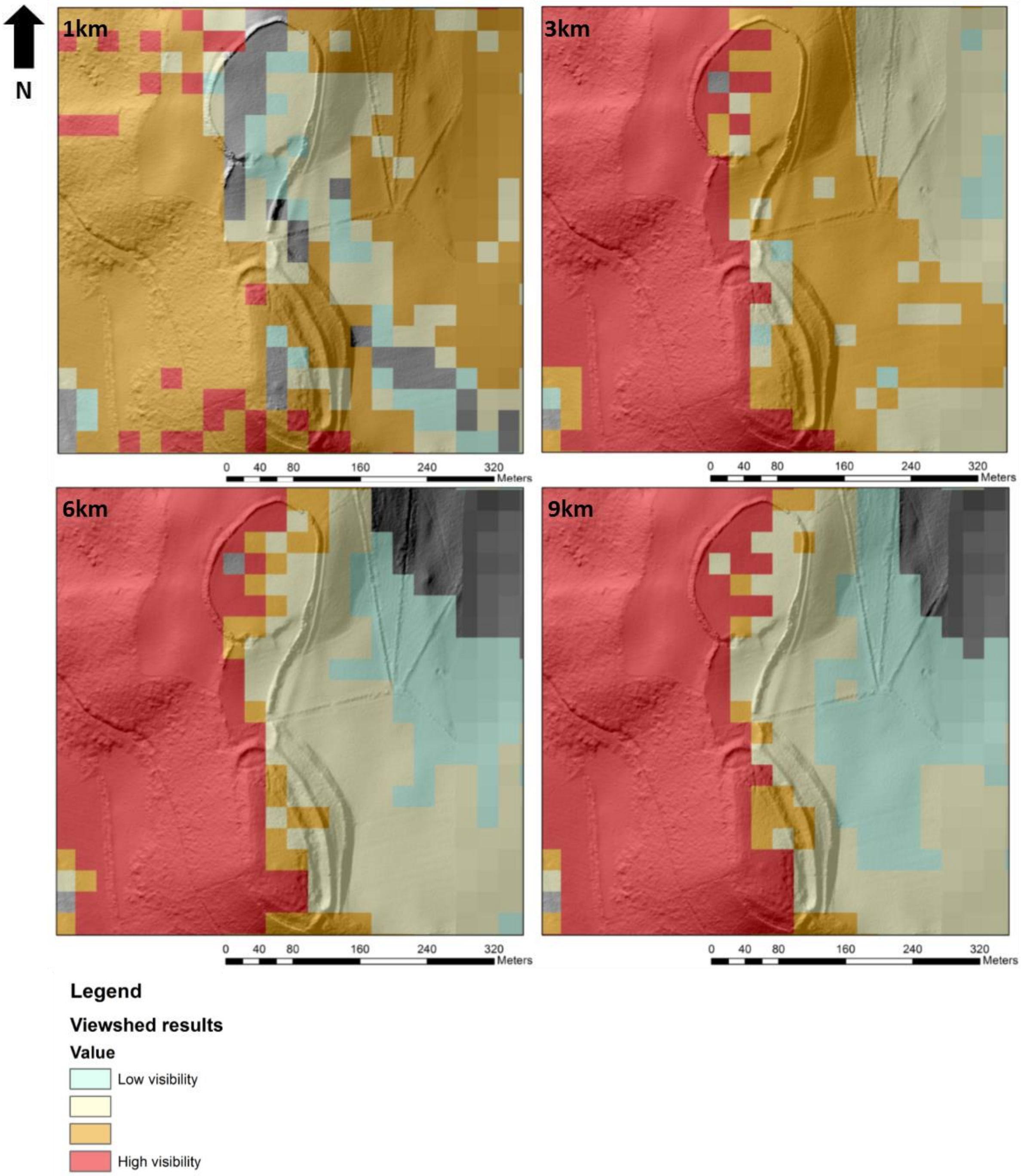


Figure 43. Visibility of Pen Dinas from Gaer Fawr according to both the Ordnance Survey PROFILE DTM and LiDAR DTM (© Environment Agency copyright and/or database right 2014. All rights reserved; © Natural Resources Wales 2015; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

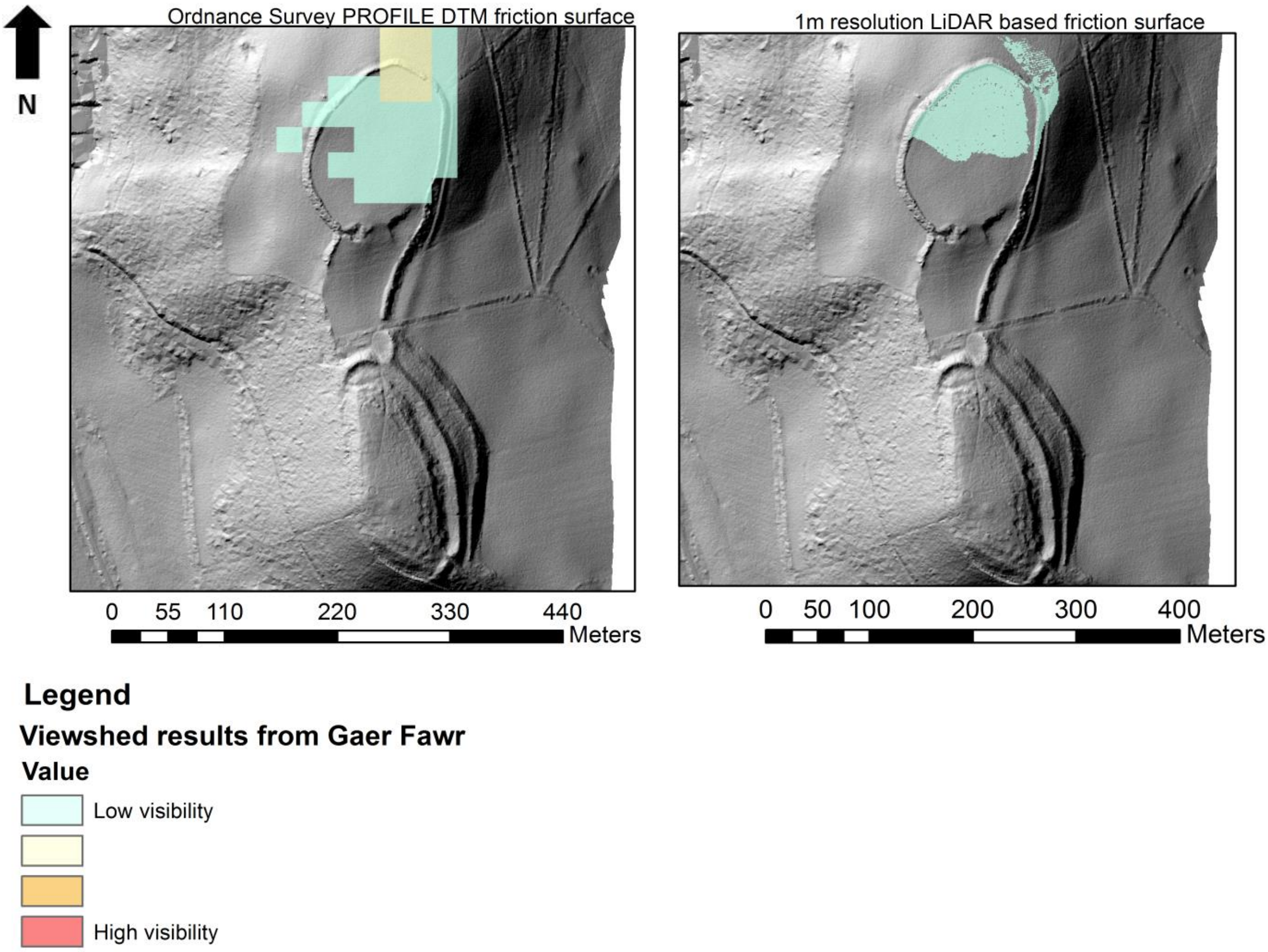
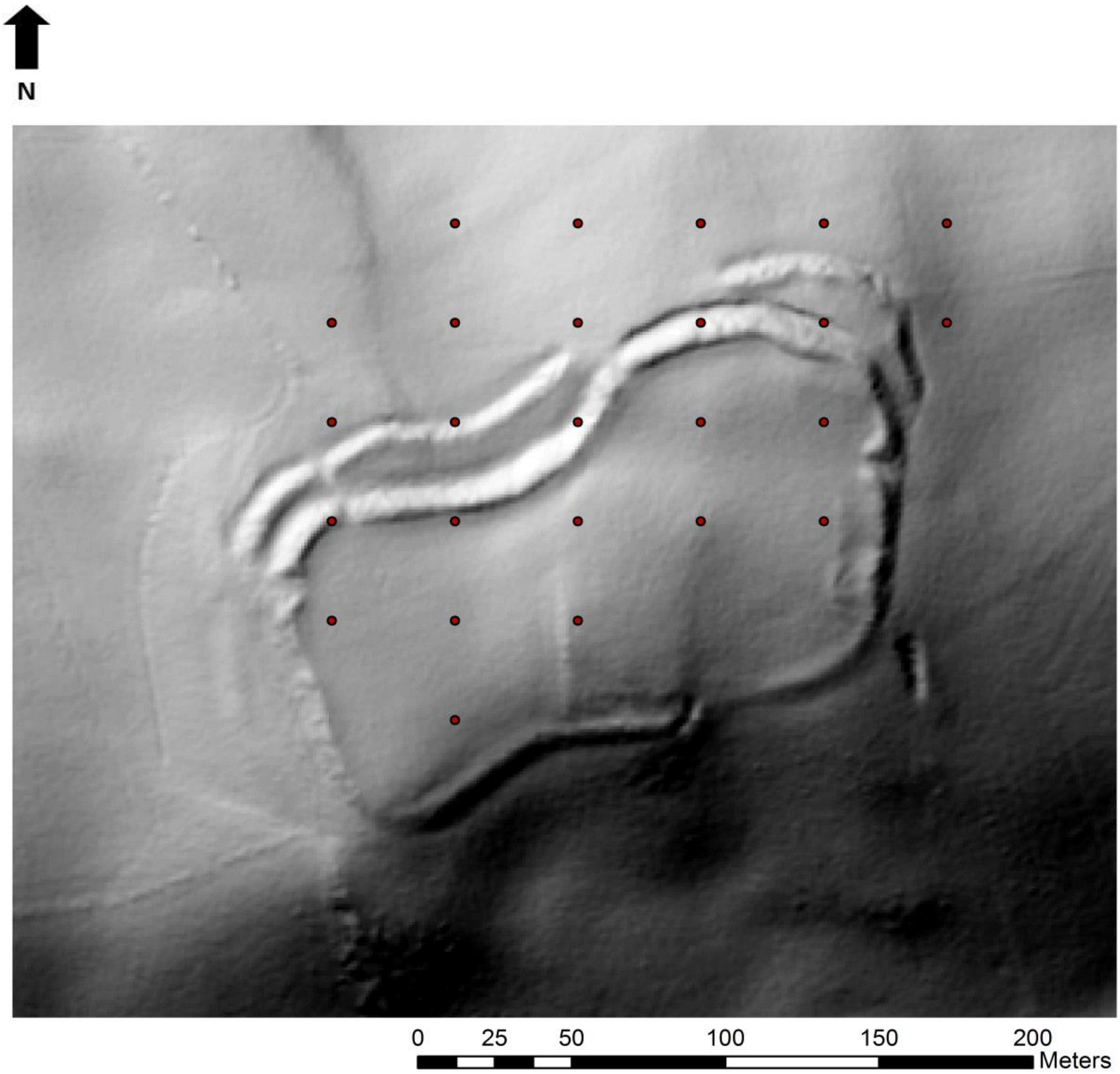


Figure 44. Distribution of points at Gaer Fawr which could see Pen Dinas (© Environment Agency copyright and/or database right 2014. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Correct pathways

Cost surface analysis indicates that the most accessible aspect of Pen Dinas is the eastern side of the isthmus as 250 out of 258 slope based least cost pathways use this area (Figure 45). This implies that the embankment of the isthmus was designed to hinder entry into the site.

Whilst there is a distinct correlation of the slope pathways with the eastern aspect of the site, this is also the case for the visible pathways (Figure 46), the majority of which travel to/from the site from both the uplands and lowlands to the east. The span of these pathways strongly indicates that this site has a high degree of visibility to the area immediately to the east. It also demonstrates that the site's most strongly defined aspect is also its most accessible with the most visual accessibility to those approaching the site. The blind pathways coincide with the site's western side, this is inevitable as the steep cliff line would have inhibited visibility into the site from the coast (Figure 47).

Although the route of the least cost pathways are distinctively topographically defined, they do not strongly coincide with known archaeology.

Figure 45. Results of slope based cost surface analysis to and from Pen Dinas. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

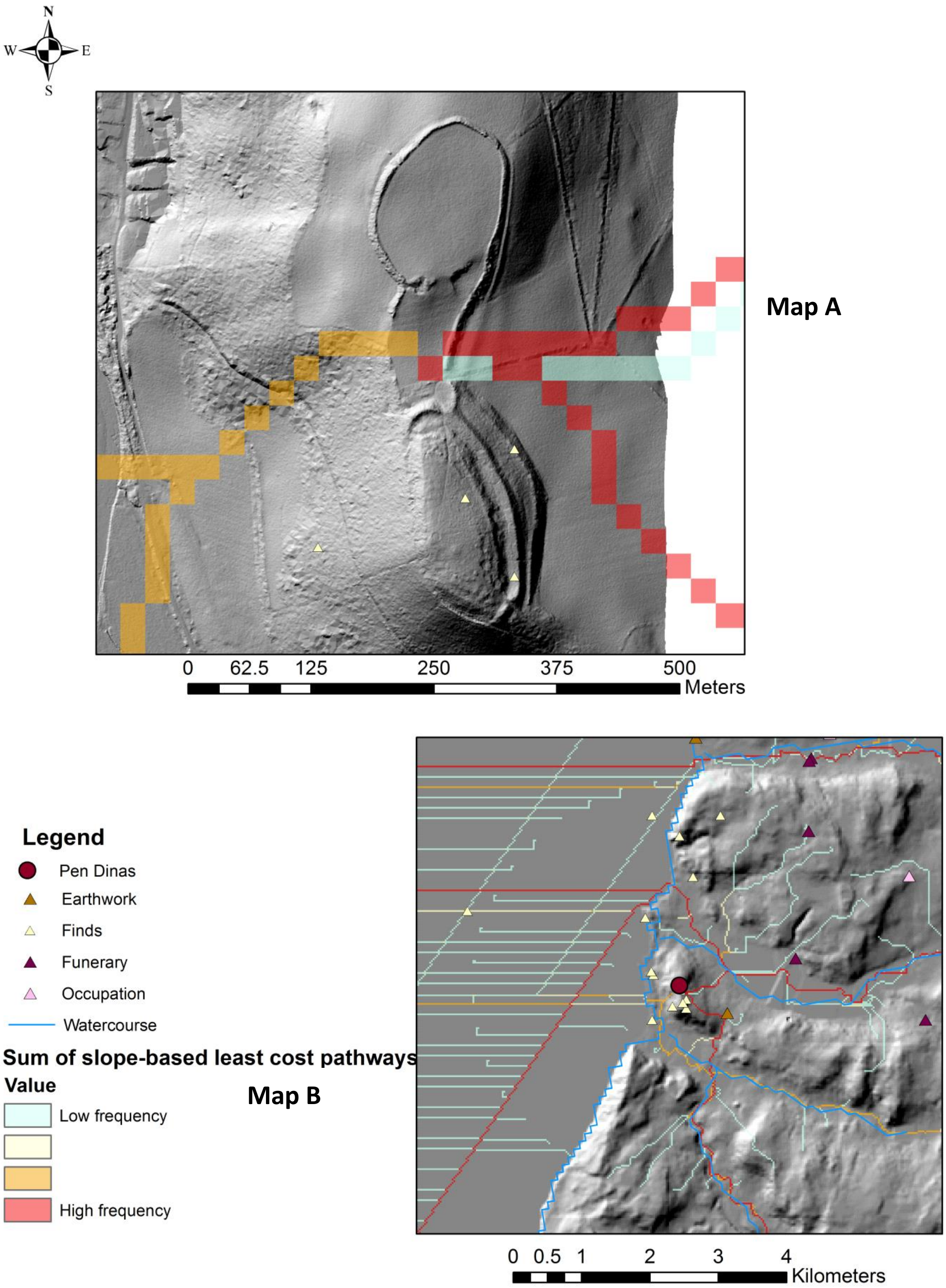


Figure 46. Results of cost surface analysis, which depicts the routes that visible pathways, took both to and from Pen Dinas. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

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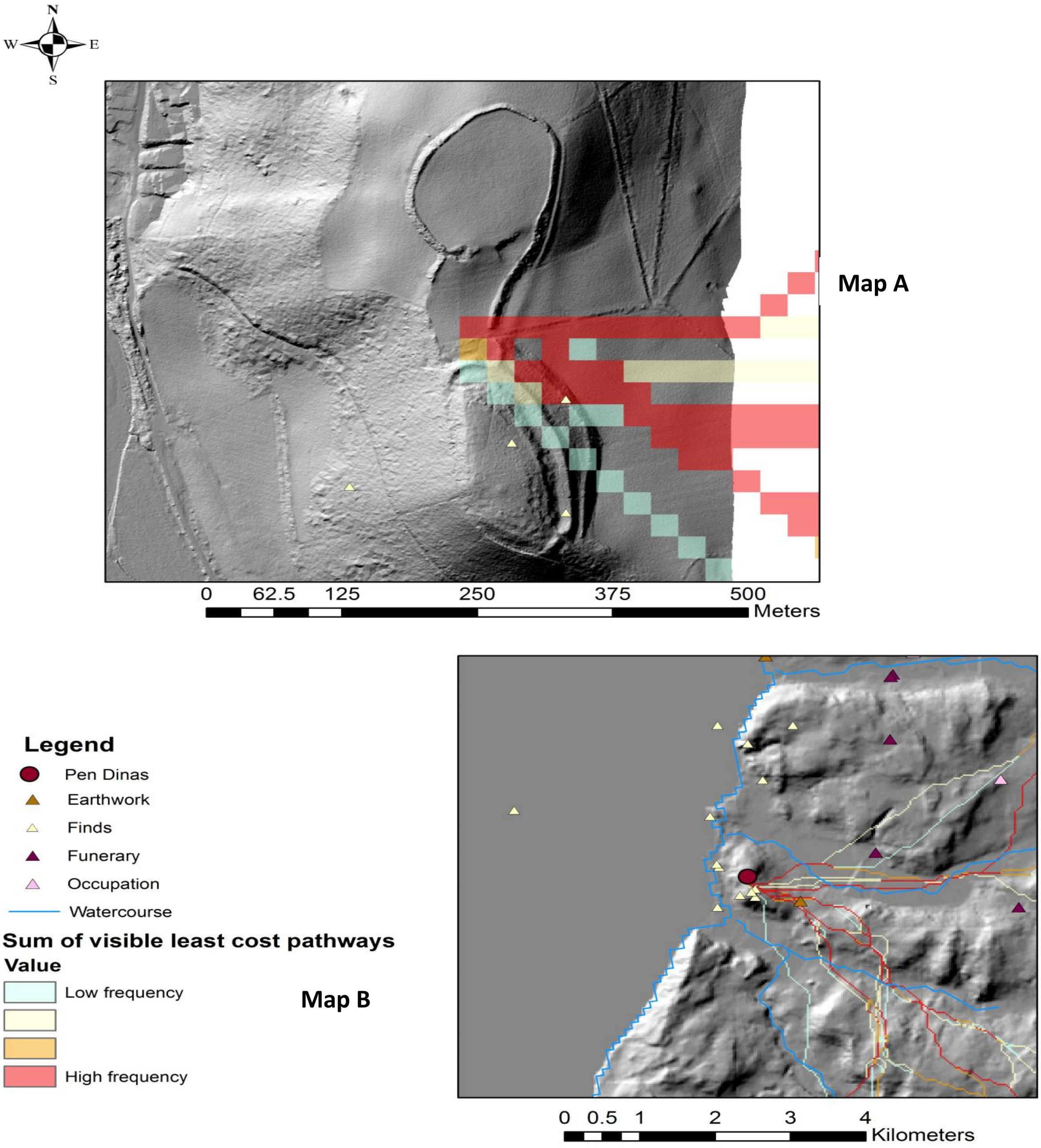

Figure 47. Results of cost surface analysis, which depicts the routes that blind pathways, took both to and from Pen Dinas. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

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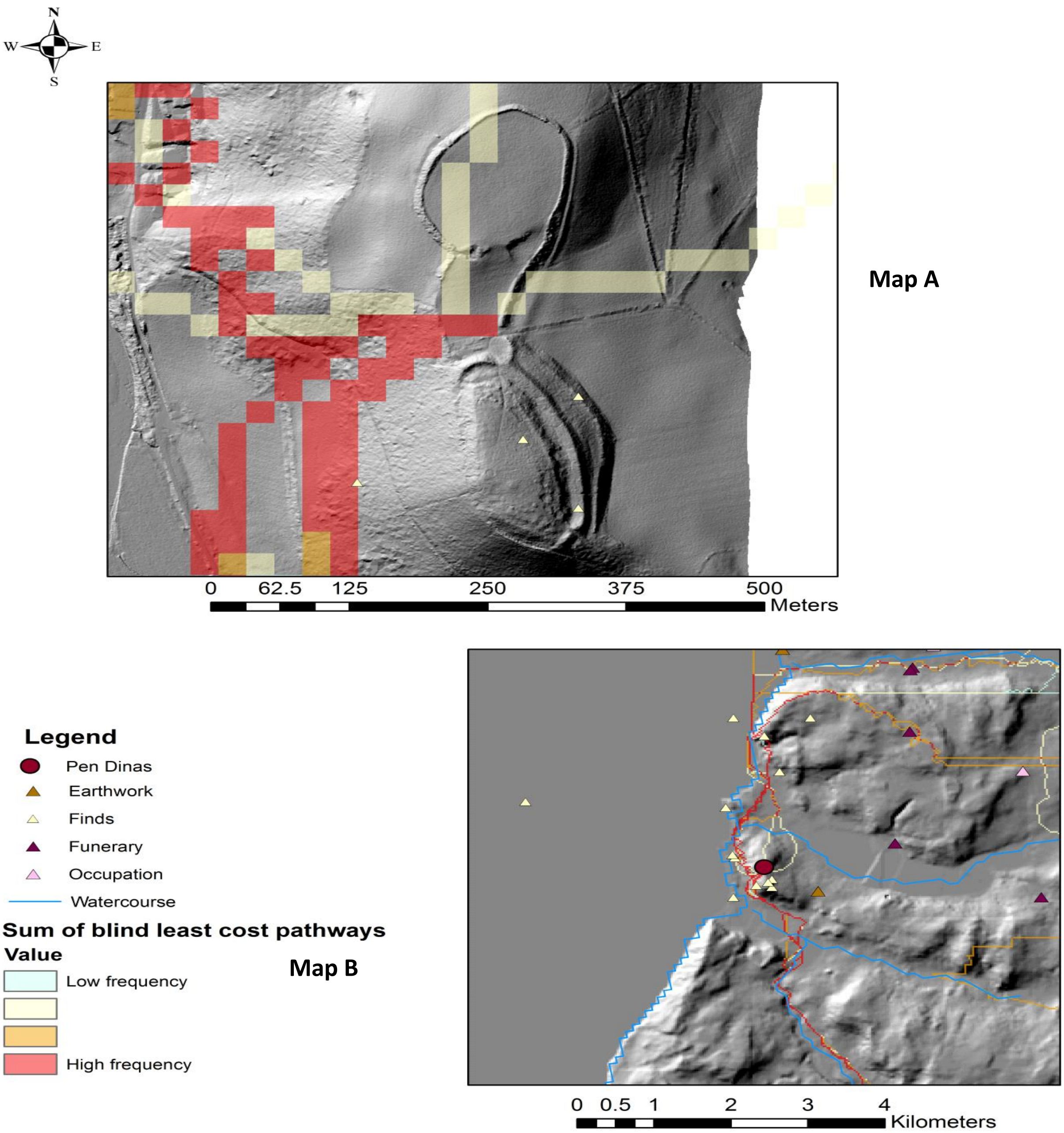


Concluding site summary

Located along the coastline this site is largely defined by the topographical form of its ridge-end position so that the act of construction enclosed a physically prominent hilltop. Driver believed that this enhances the visual prominence of the area. GIS-based viewshed analysis found that the site's enclosing earthworks are not its most visible part, instead, this is the western aspect which is defined by the coastal cliffs.

Driver argued that this site commanded a territory which was based upon visual accessibility. The fact that he believed that Pen Dinas was not visible from Gaer Fawr led him to conclude that they commanded different territories (Driver 2005a, 271; Driver 2013, 96). However, viewshed analysis demonstrated that these two sites are intervisible. Gaer Fawr was the only hillfort within this test area that Pen Dinas had visual access to and vice versa. These results contradict Driver's concept of territory.

The accessible nature of Pen Dinas is very fragmentary resulting in the site's visual and physical characteristics being contrasting. For example, the slope based and visible pathways coincided with the eastern side of the site's isthmus, whereas the western side corresponded with the blind pathways. These results demonstrate that the isthmus is the easiest way to approach and enter the site and that the enclosure of the isthmus potentially acted as a deterrent and boundary to such access. The establishment of this enclosure in the later phases of the site's life suggests that there was an increasing desire to enclose and more than likely fortify a space that was otherwise the site's most susceptible area.

Tan y Ffordd

Site introduction

This site is situated on an overlooked ridge between the Rheidol and Melindwr valleys.

It encloses an outcrop in the north-east which forms what Driver argues to be the most impressive aspect of the site (n.d.) (Figure 48). More specifically, he suggests that from the outside the outcrop appears to be a part of the site's artificial defences, when in fact the outcrop itself is cut in two by a rock cut ditch (*ibid* n.d.). Part of the northern aspect of the site is two terraces which follow the line of the northern enclosing bank.

Physical relationship of the hillfort morphology and location with the landscape topography

The site's main entrance is situated in the west (Driver 2005a, 272) where the rampart turns in before it meets the slopes in the south (Driver n.d.) and where gateways are offset from the inner (*ibid* n.d.). Situated on a ridge, the southern aspect of the site is largely defined by the slopes of this ridge side thus reducing the amount of physical effort needed to enclose the site (Driver 2013, 91).

Viewshed analysis demonstrates that from the site visibility to the 1km radius is restricted to the northern, western, and eastern areas (Figure 49). As distance from the site increases the landscape to the south becomes visible with only the south-eastern and south-western areas of the 3km buffer area being visible. Visibility to the 6km radius is also very restricted as only a small scattering of visible areas just beyond the 3km radius in the south-west and south-east. To the 9km radius visibility becomes even more restricted with only scatterings of visibility to the south-east.

Figure 48.1m resolution LiDAR hillshade models of Tan y Ffordd and its immediate environs. Map A focuses on the site and is overlain by contours, Map B depicts its topographical environs (© Environment Agency copyright and/or database right 2013. All rights reserved.)

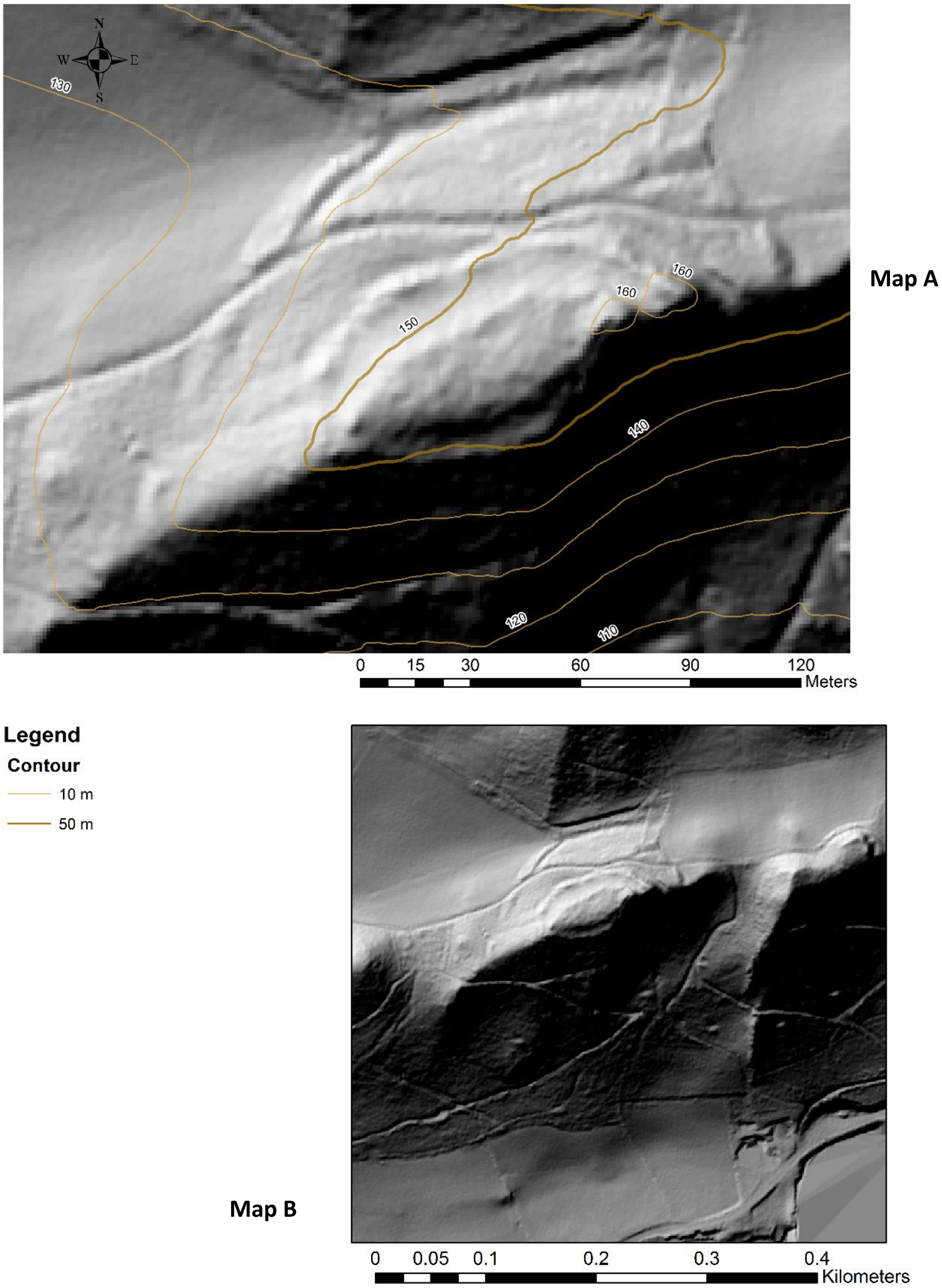
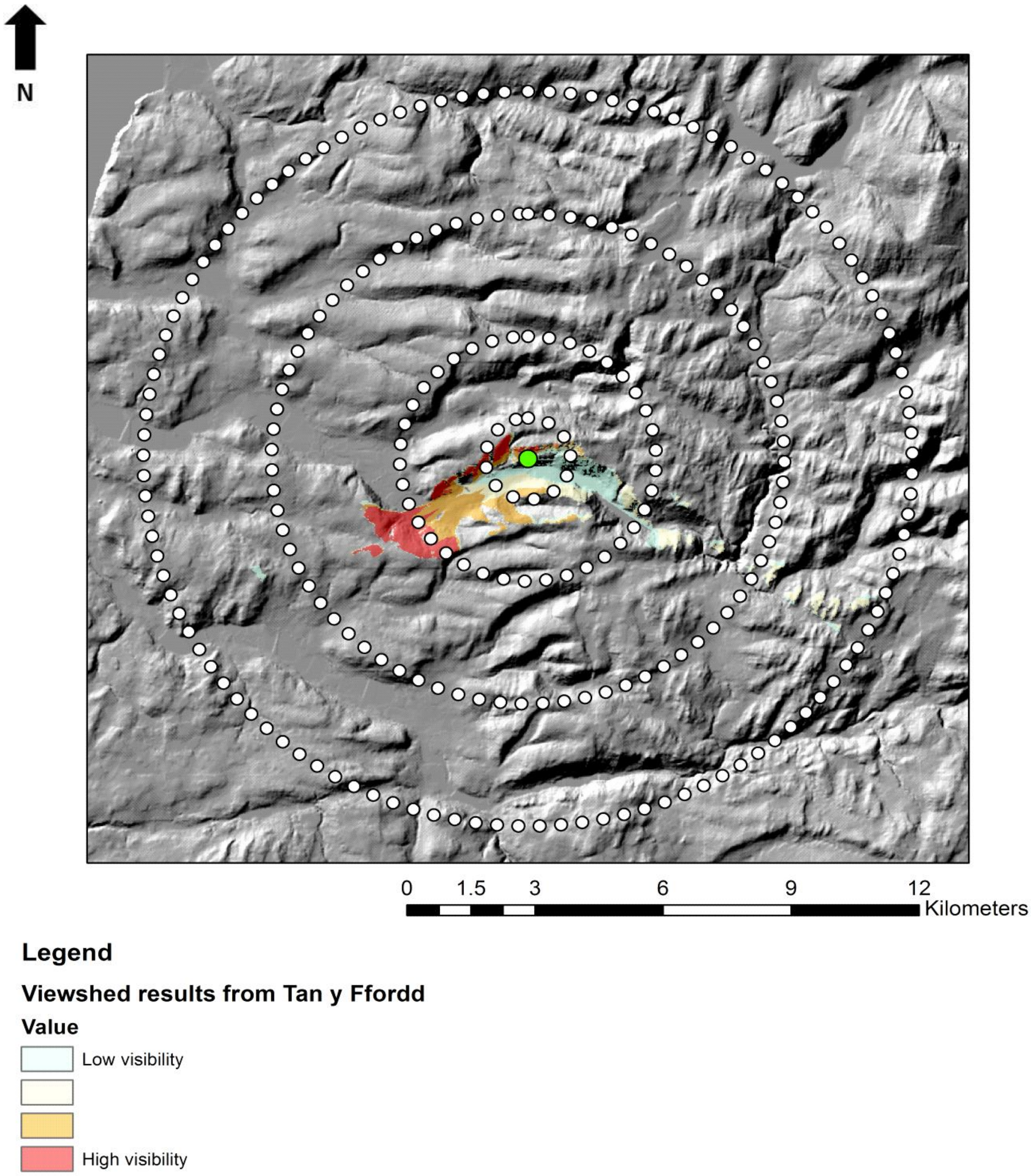


Figure 49. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Tan y Ffordd as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

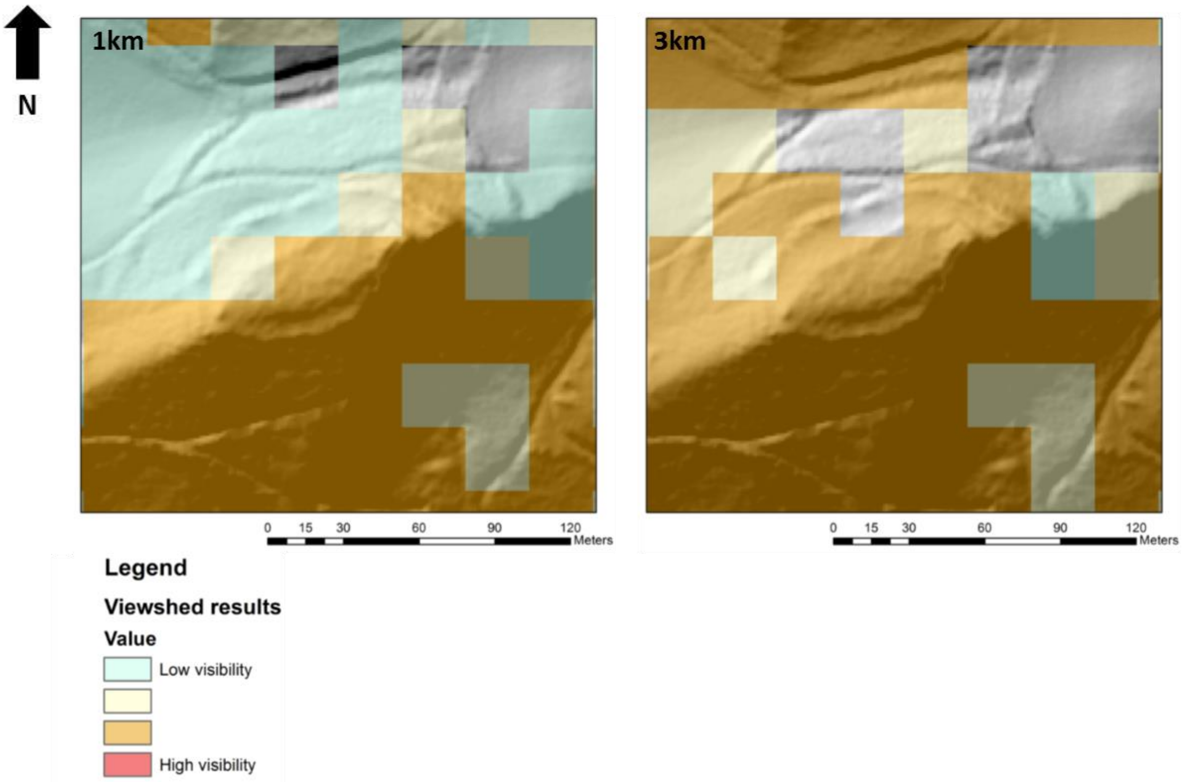


Image

The most physically prominent and elaborate aspects of this site's morphology are located on the eastern corner. As this does not have any evidence for an entrance, this prominent façade faces away from the site's entrance in the west. Driver argues that this is a blind façade that was designed to be seen by those who were descending from the uplands in the north-east (2013 114). Viewshed analysis from the hillfort grid demonstrates that there is limited visibility from within the site to the land immediately to the east of it, which supports the idea that these earthworks were constructed to face an area of limited visibility. There is greater visibility of the land to the north-west, where the western entrance is facing.

Although the eastern façade is the site's most physically elaborate component, viewshed analysis demonstrates that it is not its most visible. For example, from the 1km radius the entire site is visible; however, the most visually accessible area is the site's southern aspect (Figure 50) and the least visible is the outer northern bank. From the 3km radius the majority of the site is visible and the visual magnitude of the site is consistent with a percentile value of between 50 and 74 (Figure 50). The site is not visible from the 6km and 9km radii.

Figure 50. Results of viewshed analysis from the radii towards Tan y Ffordd depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2014. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Correct pathways

Driver argued that the site's entrance was 'quite elaborate' (n.d.) due to people approaching the site whilst ascending a long slope (*ibid* n.d.). They proceeded to enter the outer gateway past a 'command post' and then undertook a sharp reverse 's' by travelling uphill to the right, and then sharply left through the inner gate(*ibid* n.d.) . However, cost surface analysis found that there is no distinct correlation between the least cost pathways and the site's entrance.

The site's most accessible area is in the north-west where 203 out of the 257 slope based pathways intersect (Figure 51) and the least visible area when approaching from neighbouring hillforts is in the south as 21 out of 42 blind pathways meet there (Figure 52). The restricted visibility when approaching from this area is caused by the site's ridge end position, however, the overall visibility when approaching from the west is also limited as seven of the blind paths enter the site very close to the western entrance. On the other hand, cost surface analysis demonstrates that the site has most visibility of approaching traffic from the south-east as 12 of the 42 visible pathways use this area (Figure 53).

There is no strong correlation of the least cost pathways with known archaeological activity.

Figure 51. Results of slope based cost surface analysis to and from Tan y Ffordd. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale this map is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

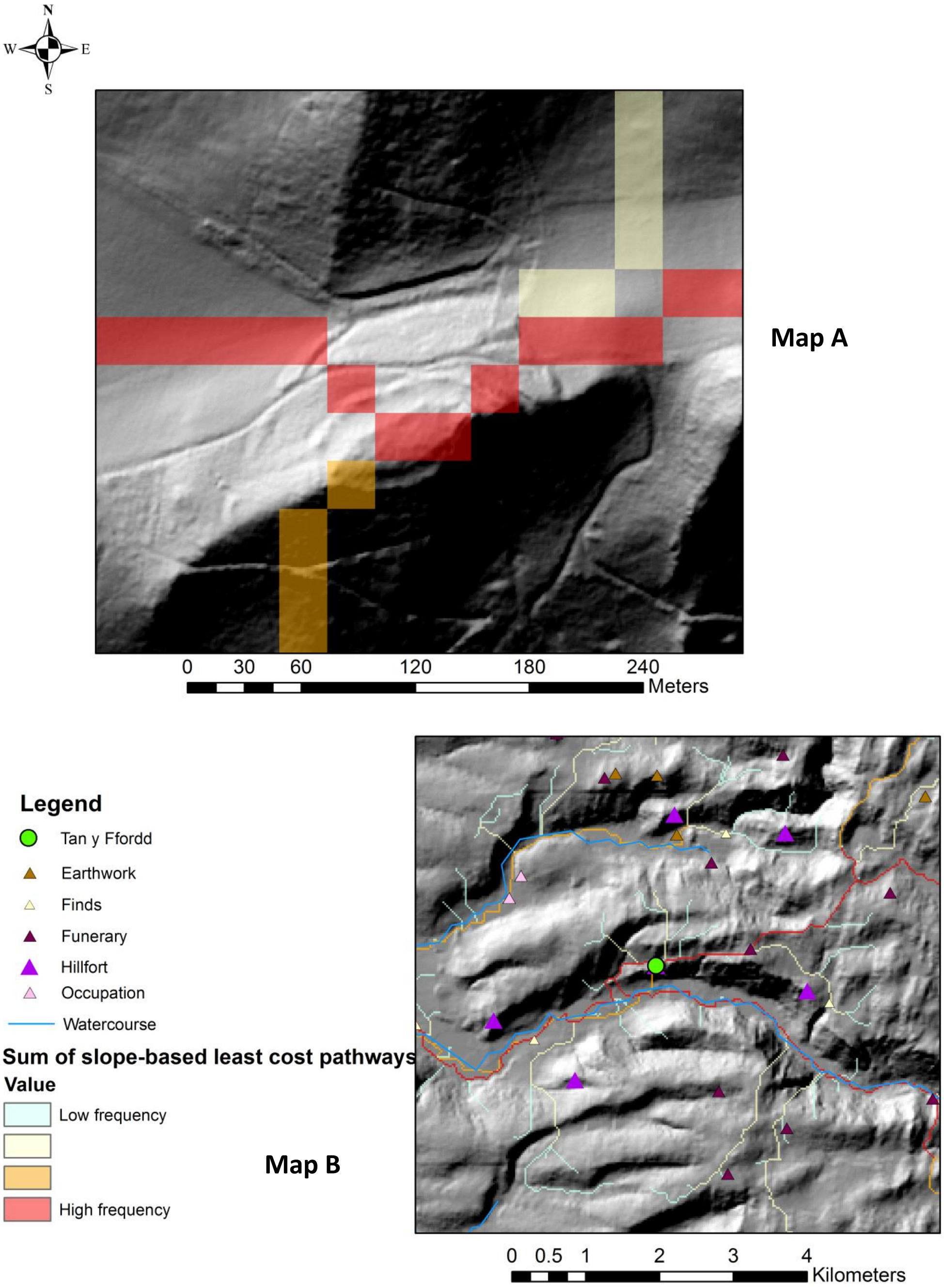


Figure 52. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Tan y Ffordd. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale this map is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

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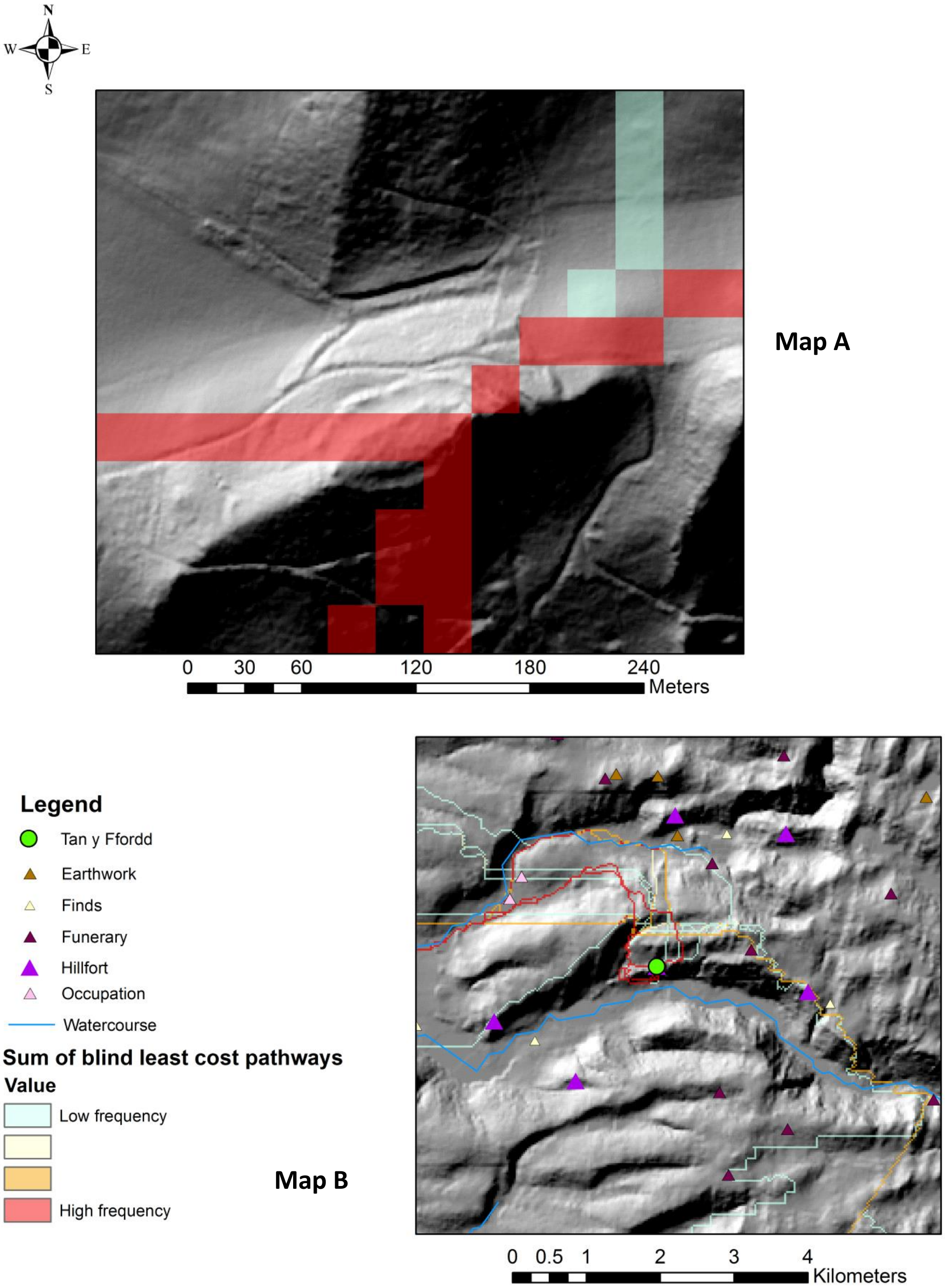
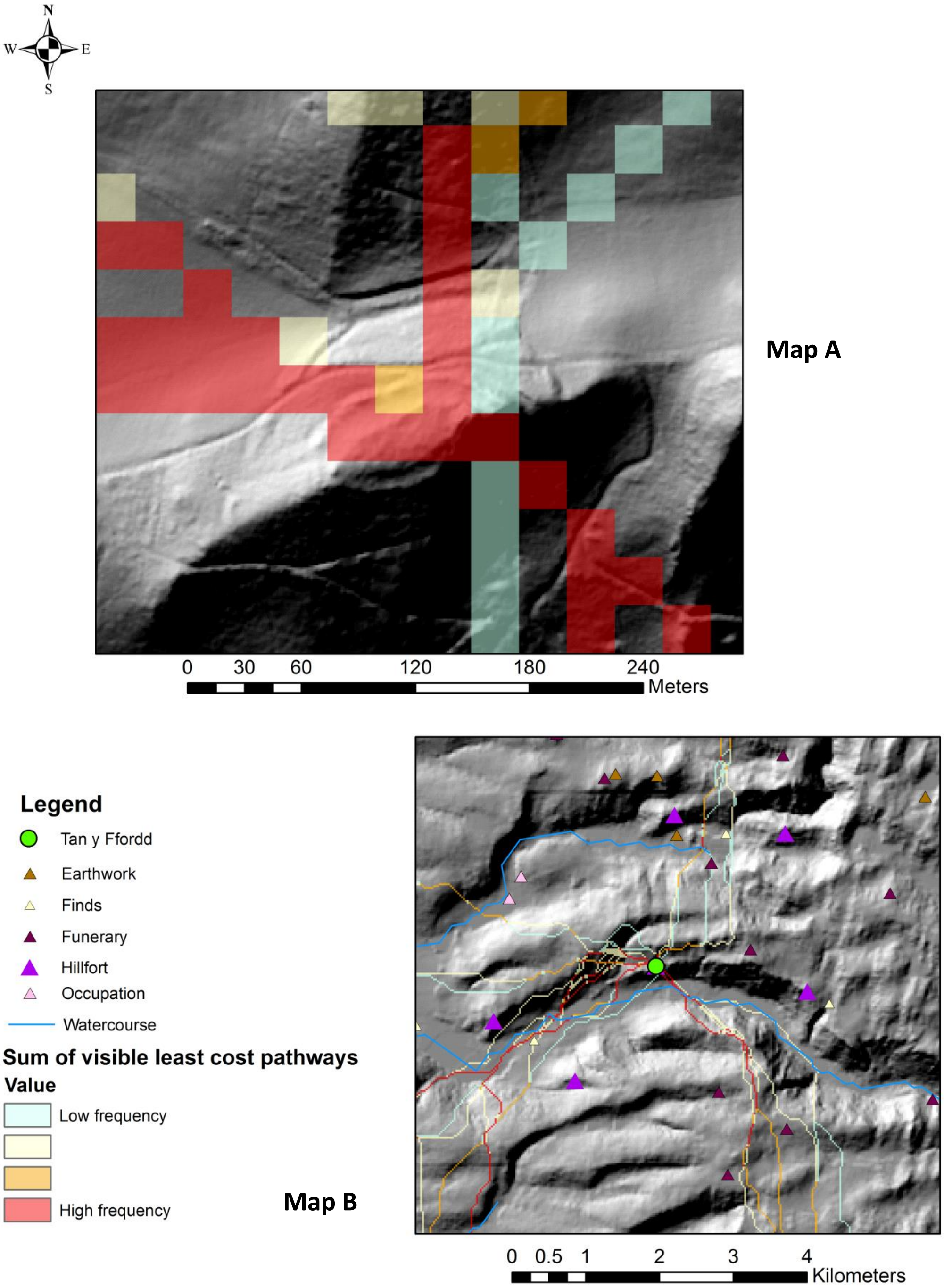


Figure 53. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Tan y Ffordd. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale this map is also overlain by HER data and watercourses. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)



Concluding site summary

Tan y Ffordd is situated on the edge of a ridge and the site's southern perimeter is defined by this whereas the remainder of the site does not closely follow the topographical form of the hilltop. It is only on the north-eastern side of the site that the enclosing works directly cut across the lie of the land where the bank cutting across the topography encloses the site. It also physically delineates and emphasises the site's boundary away from the piece of land upon which the hillfort is situated. This area forms part of the site's eastern façade which cuts through a rock outcrop to form a rock-cut ditch, a massive undertaking with poor visibility. However, the fact that there is no entrance within this area implies that people would not have directly approached the site from the east. The results of viewshed analysis from the surrounding landscape also supports the idea that there was a limited audience of the eastern façade as it is predominantly of poor visibility. Taken together, the poor visibility and limited need to access the site from the east suggests that the effort required for the construction of this façade was not proportional to its quantifiable visual impact. However, it may have faced an area of activity which is no longer visible thus suggesting that it was portraying an image towards a particular direction.

The site as a whole is of very limited visibility and it is not visible from the 6km and 9km radii and has very limited visibility to the surrounding landscape as it is restricted to the south. The overall visual restriction of this site to and from the surrounding landscape demonstrated that as a whole this and the site had a very limited visual affect over each other, consequently they had a limited degree of visual connectivity. This further supports the idea that the visual impact of the eastern façade compared to the effort which was required for its construction was highly disproportional. The audience for this construction must have been highly focused although the evidence for this audience is not evident within the data that is available today.

Access analysis also demonstrated that there is no significant correlation between any of the pathways and the western entrance. Seven blind pathways travel closely to it, which implies that visibility of the site when approaching from this direction is limited. The poor visibility of the site when approaching implies that the entrance was placed in an area for the surprise effect. Although there is a slight correlation of the blind pathways with the entrance, their frequency is not high enough to confidently argue that the entrance was located to surprise travellers.

Trecoll

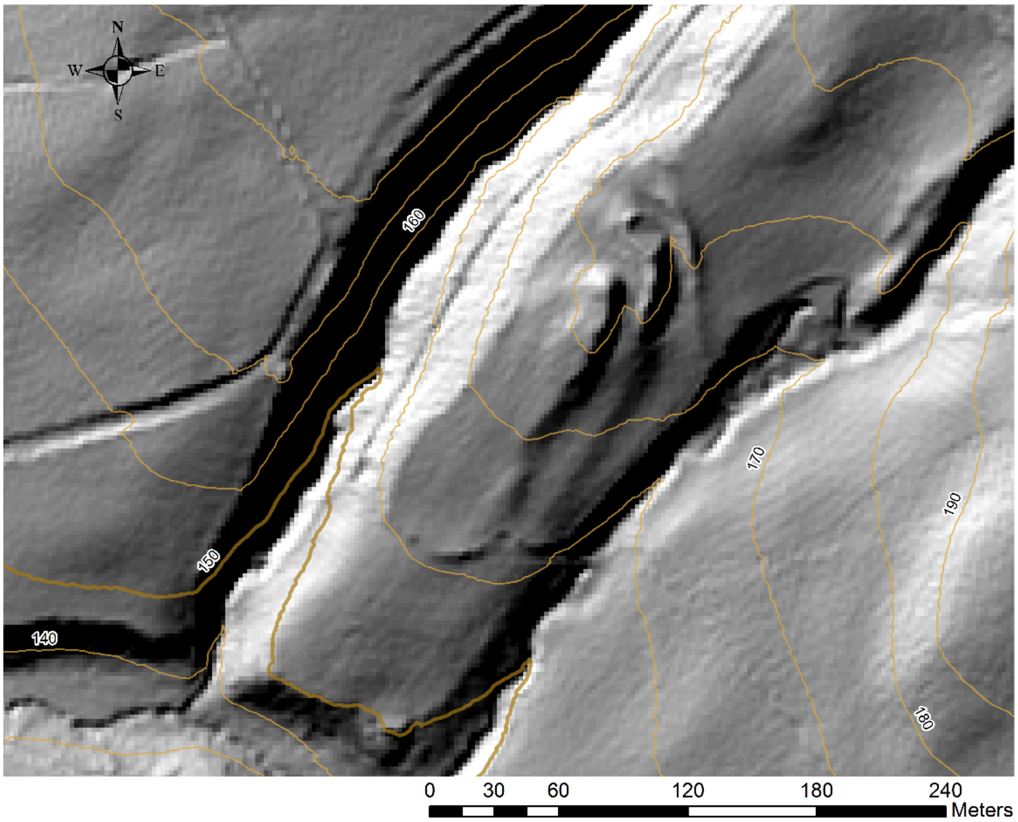
Site introduction

Trecoll is an inland promontory fort that is defended by streams and river valleys on three sides, the remaining side is heavily artificially defended by two large inner banks and an outer rampart (Driver 2005a; Driver 2013) (Figure 54). The south-eastern side of the fort is defined by a pair of low scarp banks which reinforce and emphasise the natural slopes, while on the east facing slope to the inner most rampart there are traces of stone revetment (RCAHMW n.d.a). The site's entrance is formed by the termination of all three ramparts in a north-south line to create a gap in the north/ north-west (*ibid* n.d.a).

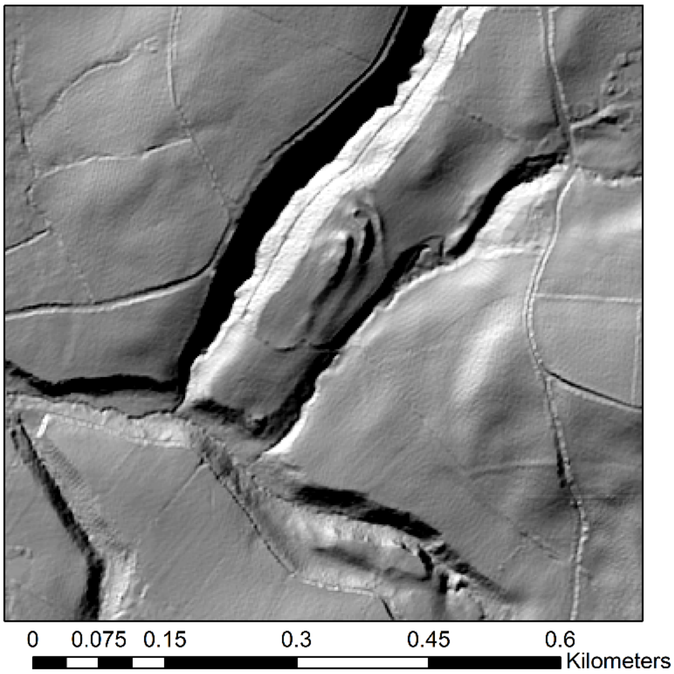
Physical relationship of the hillfort morphology and location with the landscape topography

Trecoll is situated close to the edge of a river valley escarpment and the site's morphology largely ignores the topography with only the south-eastern bank of the site very loosely following one line of contours. The series of banks in the north cut across the land to delineate and segregate the hillfort from the rest of the land. However, width wise the hillfort is defined by topography as there are breaks to both the east and the west.

Figure 54. 2m resolution LiDAR hillshade models of Trecoll and its immediate environs. Map A focuses on the site and is overlain by contours, Map B depicts its topographical environs (© Environment Agency copyright and/or database right 2013. All rights reserved.)



Map A



Legend

Contour

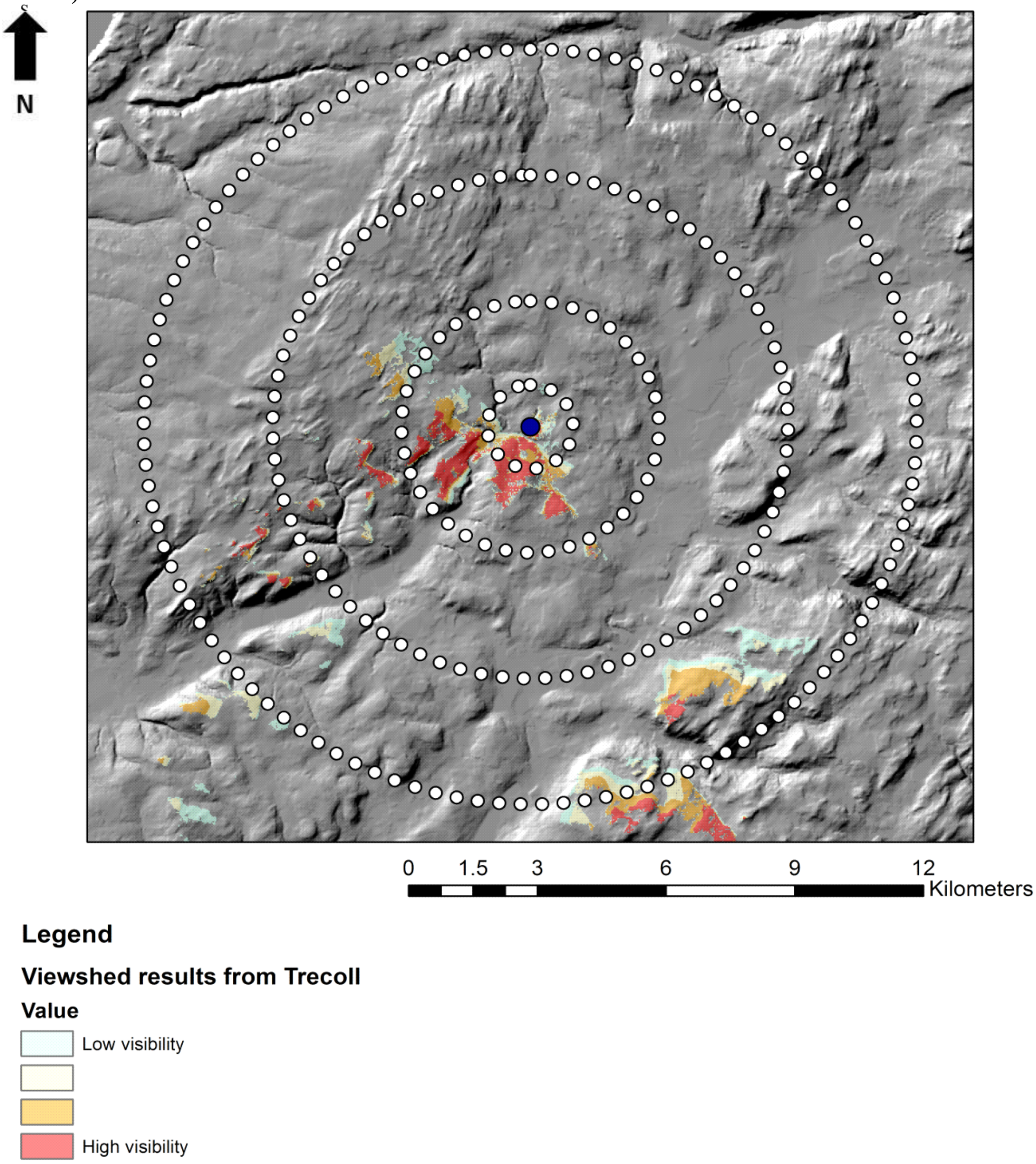
10 m

50 m

Map B

The site’s position promotes a varied degree of visual accessibility to the surrounding landscape, higher to the immediate areas surrounding the hillfort with a large degree of visibility to the 1km radius. This visibility is primarily focused to the south and south-west, and a limited area in the east (Figure 55). Visibility decreases between the 1km and 3km radius as it is restricted to the west and south-east, also between the 3km and 6km radius as it becomes scattered and restricted closer to the 3km radius in the west. Between the 6km and 9km radius visibility is very scattered to the south-west and south-east.

Figure 55. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Trecoll as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service).

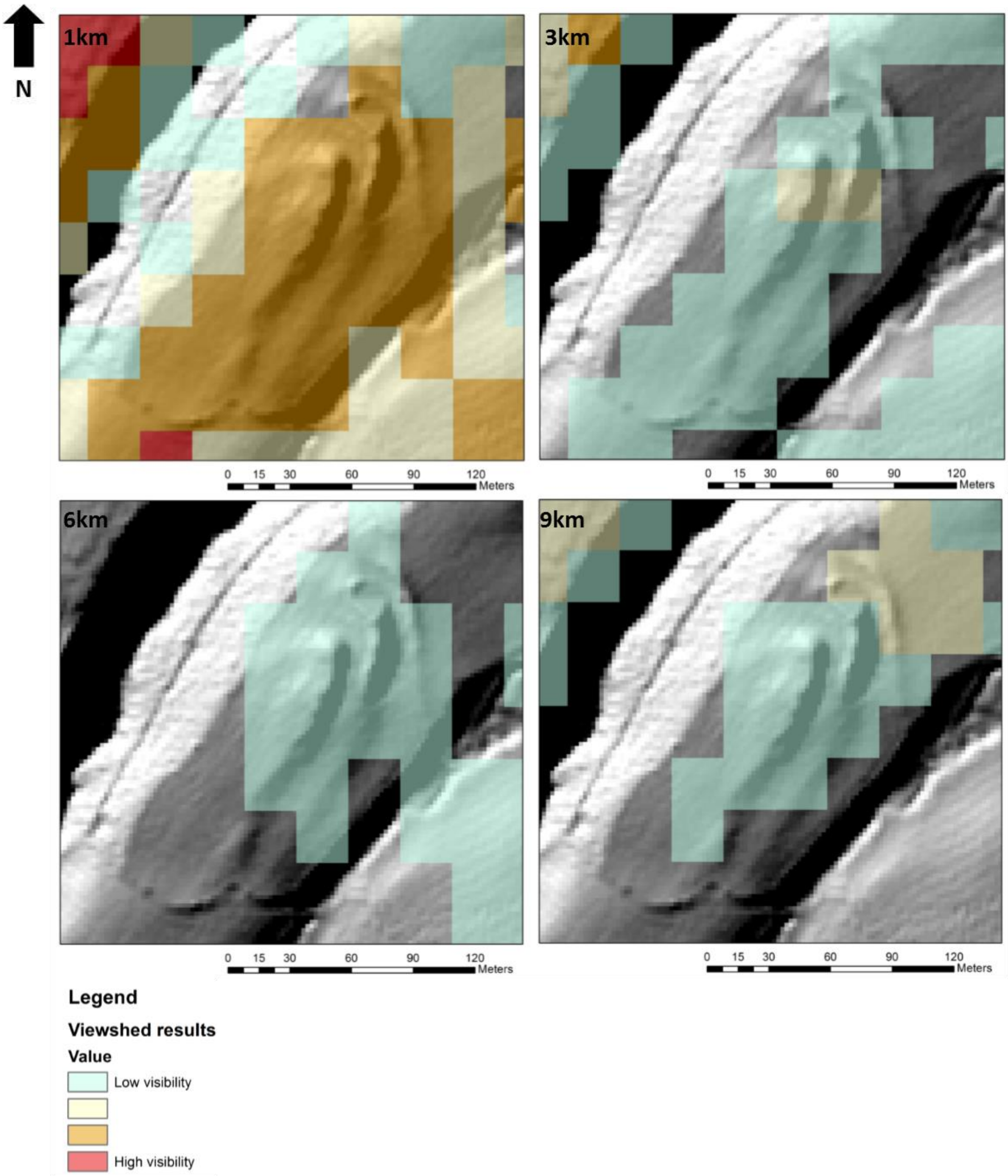


Image

Trecoll is overlooked by the uplands which are situated to the south-east of the site. The site's prominent façade is positioned towards its landward approach in the north (Driver 2013, 88). The inner rampart formed the "principal 'side wall" as seen from the higher ground in the south-east (*ibid* 2013). This wall is revetted and forms a monumental face to an aspect of the site which can be overlooked from higher ground. The northern terminal of the inner bank also had small blocks of quartz incorporated into its make-up. Instead of investing a large amount of material and effort into creating a truly multivallate site, the morphology is designed to mimic a multivallation sequence by constructing two large free standing banks that are separated by ditches (Driver 2013, 103). In terms of portraying a particular image within a particular direction, the site's north-eastern façade creates a much stronger image than the morphology otherwise did. This mirage is further supported by the selective revetment of the site's inner bank, which is visible from the land that overlooks the site from the south-east.

GIS-based viewshed analysis found that the site as a whole is of limited visibility from the surrounding landscape (Figure 56). Particularly the north-eastern façade which is not of high visibility, neither is it exceptionally more visible than the remainder of the site. The site as a whole is most visible from the 1km radius as the majority of the enclosure can be seen. From the 3km radius, the visibility of the site decreases with the western side not being visible and the remainder having a visual magnitude within the lower quartile range. The visibility of the site continues to decrease from the 6km radius as the visible areas are confined to a smaller area of the eastern aspect with values within the lower quartile range. There is a slight increase in the site's visibility from the 9km radius as the visible area increases. The visual magnitude of the northern aspect also increases.

Figure 56. Results of viewshed analysis from the radii towards Trecoll depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)



Correct pathways

Cost surface analysis indicates that the site's north-eastern façade faces its most easily accessible aspect as 113 of the 257 slope-based least cost pathways use this area (Figure 57) thus supporting Driver's statement that this faces the landward approach. However, the strong correlation of 21 of the 42 blind pathways with the north-eastern façade also implies that this faces an area where upon approach there was limited visibility of the site (Figure 58). The visible pathways strongly coincide with the site's northern aspect as 25 out of 41 interact with this area (Figure 59), these are relatively close to the site's entrance. The coincidence of the visible paths with the entrance suggests that it was located within an area that was very visible to people as they approached the site.

There is no distinct correspondence between the GIS based pathways and known archaeological activity within the area.

Figure 57. Results of slope based cost surface analysis both to and from Trecoll. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

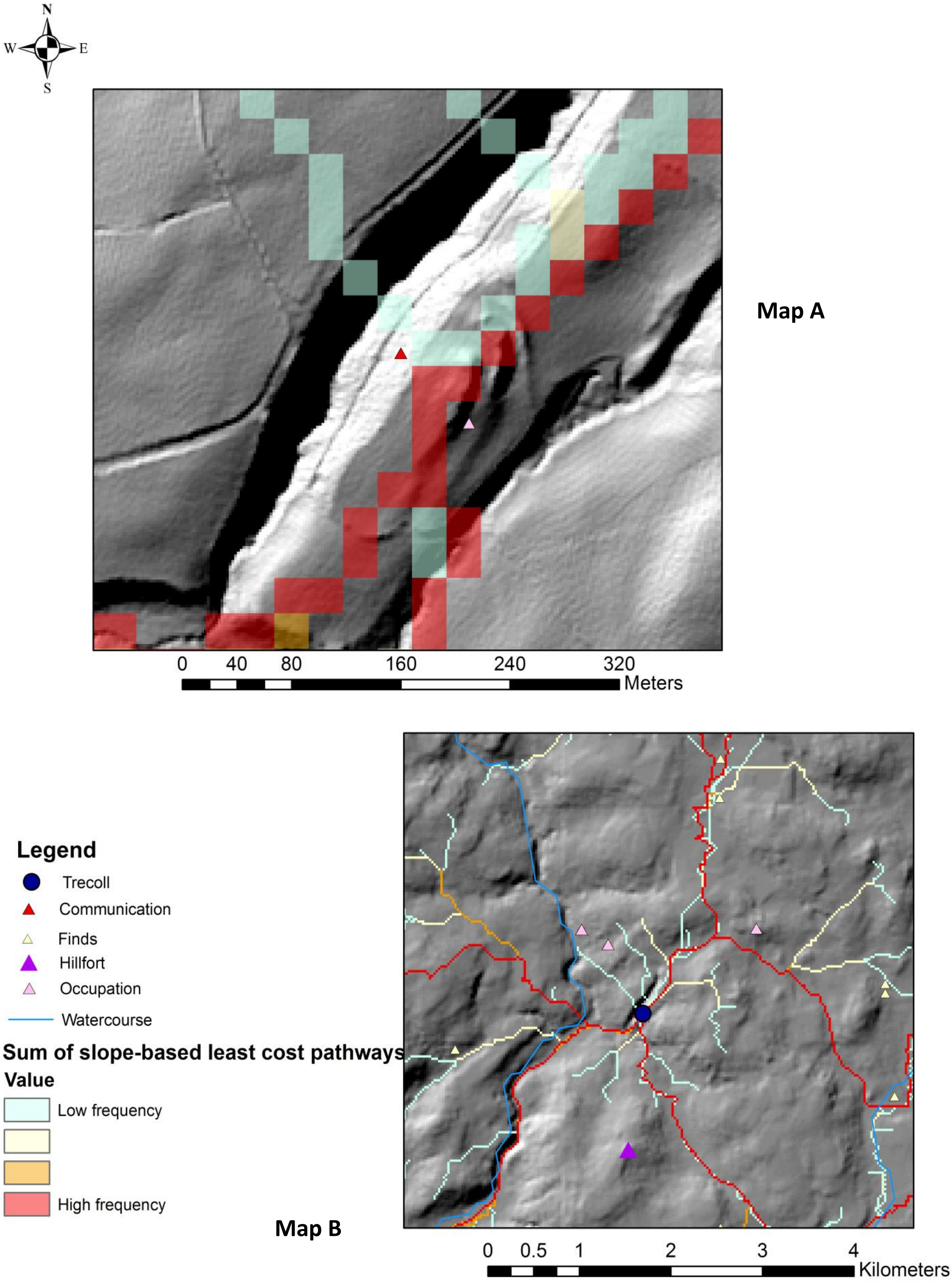


Figure 58. Results of cost surface analysis which depicts the routes that blind pathways took both to and from Trecoll. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

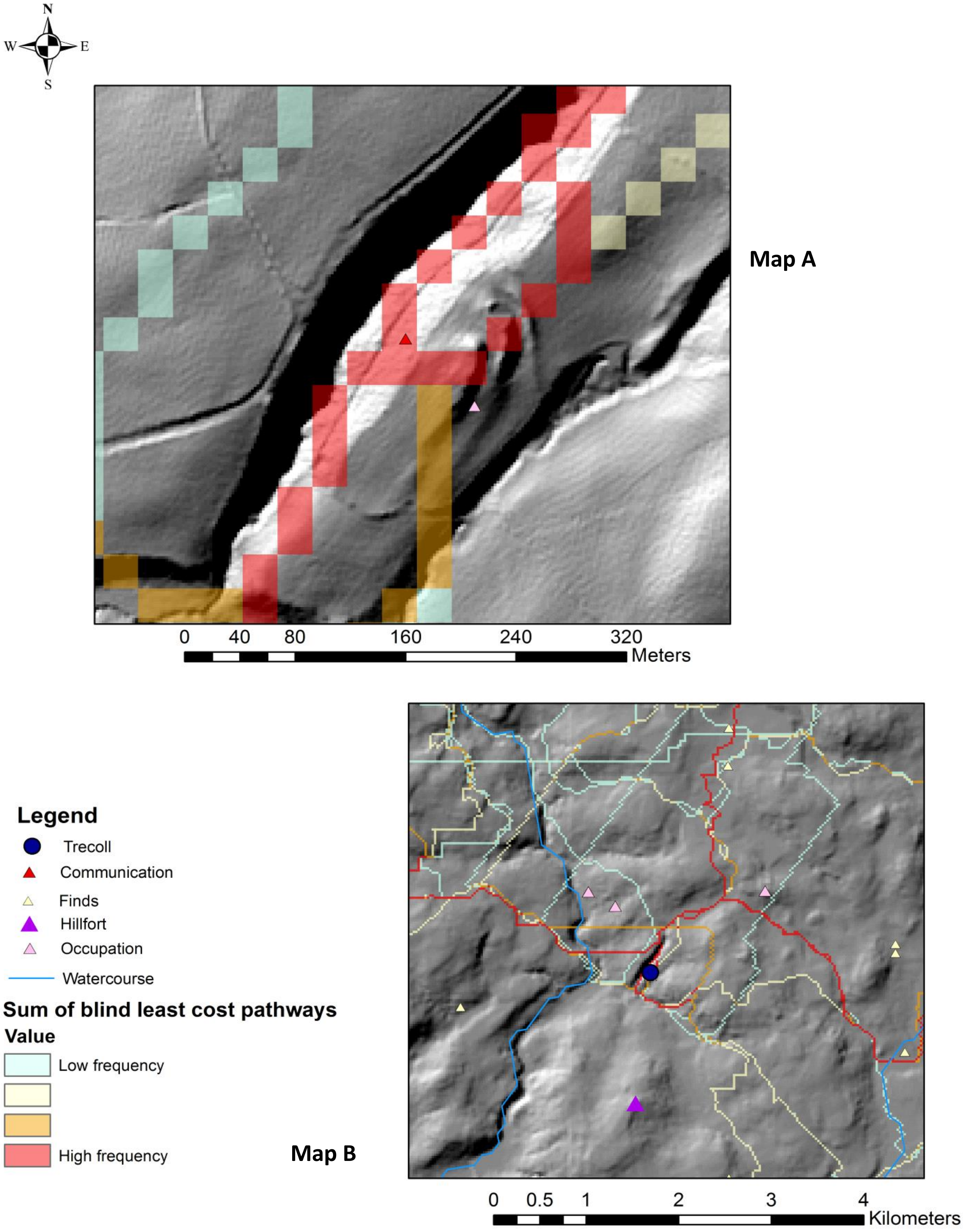
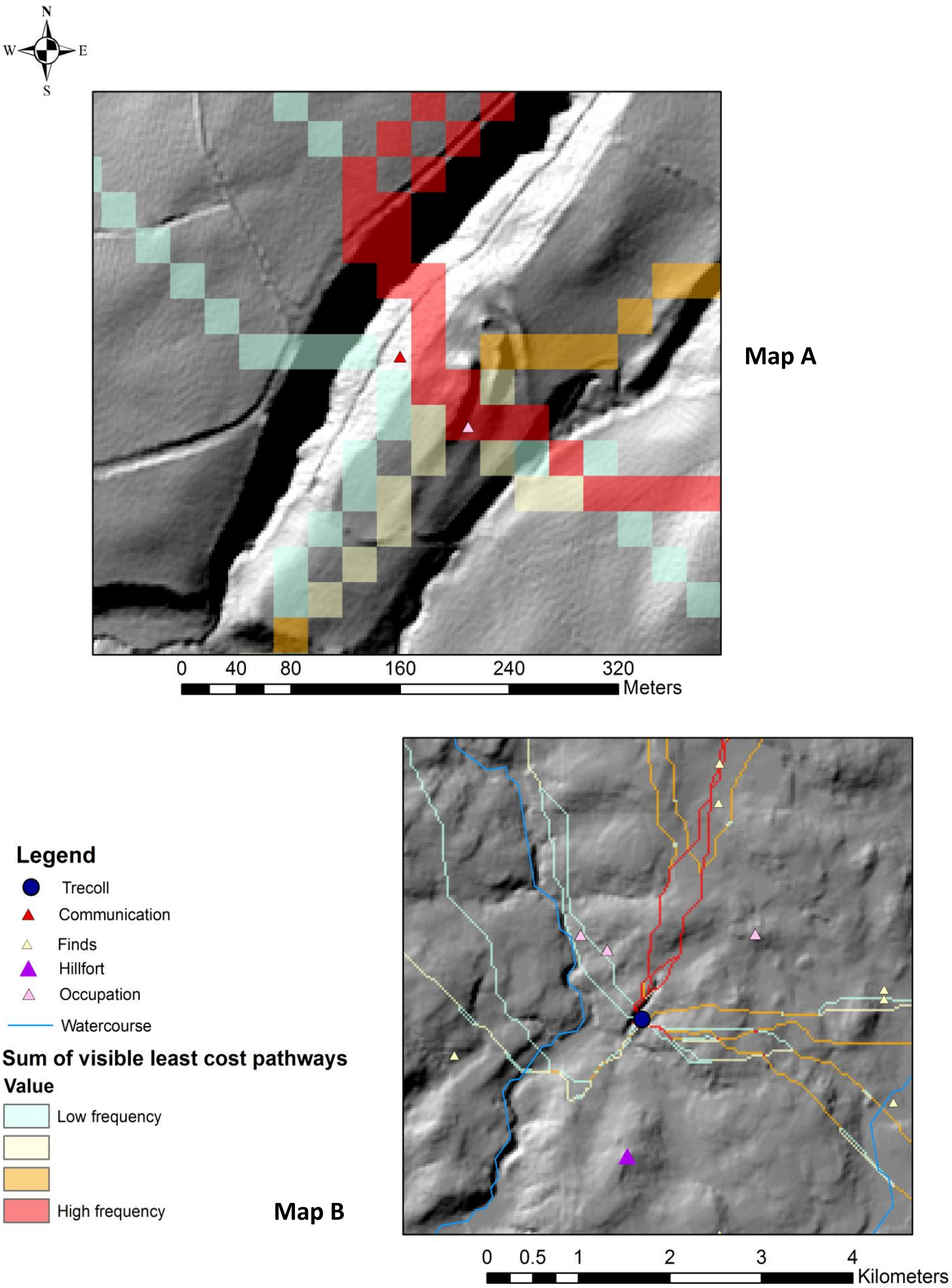


Figure 59. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Trecoll. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)



Concluding site summary

Situated close to the southern perimeter of a valley side, Trecoll adheres very loosely to the topographical form of the landscape although instead of solely relying upon topography, scarps were constructed to emphasise and reinforce its defining nature. The northern façade is the most physically prominent aspect of the site, creating a false sense of 'complete' multivallation. The façade itself is one of the most visible aspects of the site although it is not highly visible, as along with the entire site this area is predominantly of relatively low visibility. Cost surface analysis also found that this façade was situated at the site's most accessible area, people approaching from this north-easterly direction also had limited visibility into the site itself. The placement of the façade within this area must have been undertaken with an understanding of its accessible nature. However the manipulative nature of this façade in forming the site's image is not so clear as it was placed where there is limited visibility into the site. This reinforces the degree to which image was successfully manipulated at this site as the initial disproportionate enclosure of the north-eastern aspect of the site was the first step in directing site image. This has already been seen at Castell Tregaron with the construction of the outer north-eastern bank.

Another possible example of the manipulation of this site's image relates to the eastern enclosing works as demonstrated by their elaborate multiplicity and by the fact that the inner bank is revetted where it is overlooked from the uplands to the south-east. However, this inner bank is not distinctly more visible than other part of the site.

In terms of Driver's correct paths of movement the topography dictates movement to and from this site as it is only realistically approachable from the north. This was supported by the results of slope-based cost surface analysis which found that the site's northern aspect, including its entrance, is its most accessible area thus demonstrating that the correct pathways all relate to both the topographical and morphological paths and the GIS-based pathways.

Pen y Bannau

Site introduction

Pen y Bannau is situated on the western end of an upland plateau. The extent of the site itself is largely defined by the topography and is enclosed by a singular bank (Figure 60). The summit of the crag creates a spatial division within the centre of the enclosure. The bank that encloses the southern aspect of the site, was probably footing for a timber palisade due to its low position (RCAHMW n.d.b) and the northern defences form its primary enclosure and are the site's most impressive morphological component.

At the northern terminal of the crag, the ramparts turn in to form the main gateway which is flanked by two further ramparts (*ibid* n.d.b). An additional entrance is located on the western side of the southern half of the fort; however access to this is from a steep slope (*ibid* n.d.b). A number of house platforms were discovered at this site, two of which are located within the eastern side of the southern enclosure (*ibid* n.d.b).

Physical relationship of the hillfort morphology and location with the landscape topography

Pen y Bannau encloses the entire outcrop which reduced the effort needed to construct an artificial enclosure (Driver 2013, 91; Driver 2005a, 269). On the site's northern side, where the slope of the land is least prominent, an increased use of artificial enclosure is evident, here also sees the placement of the northern entrance, its prominence being enhanced by its ridgeway position (Driver 2013).

Whilst the topographical position of this site reduced the amount of effort and the material required to adequately enclose it, it also promoted a high degree of visual accessibility to the landscape immediately surrounding it. For example, to the 1km radius there is a high degree of all round visibility (Figure 61), whilst to the 3km radius visual accessibility is limited to the north and north-east. There is also a strong degree of visibility to the west, south and south-east, a pattern which continues towards the 6km radius, but increasing to the south-east and east with values in the higher percentile range. To the 9km radius there is a greater spread of visibility but it has become increasingly scattered.

Figure 60. 2m resolution LiDAR hillshade models of Pen y Bannau and its immediate environs. Map A focuses on the site and is overlain by contours, Map B depicts its topographical environs.

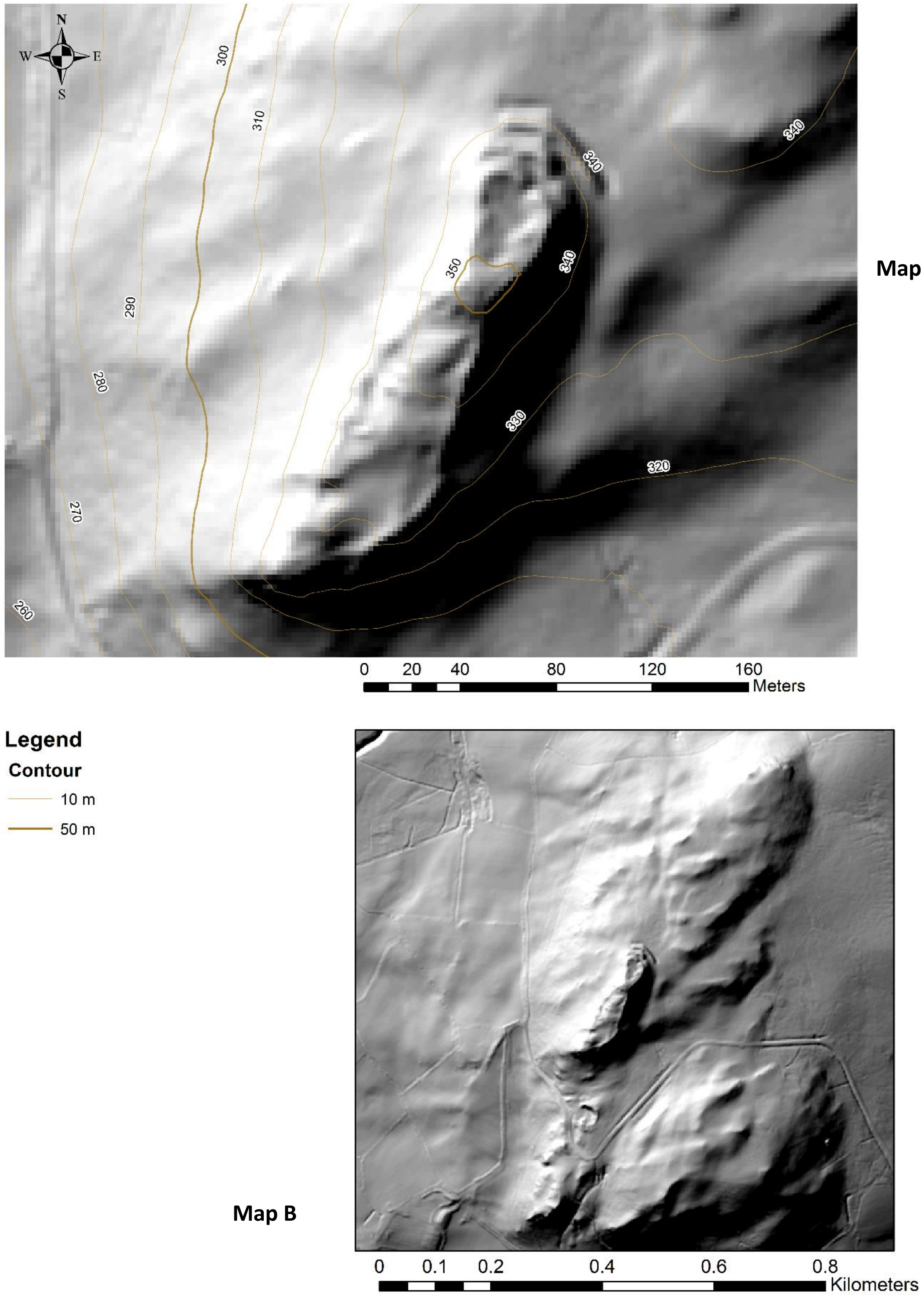
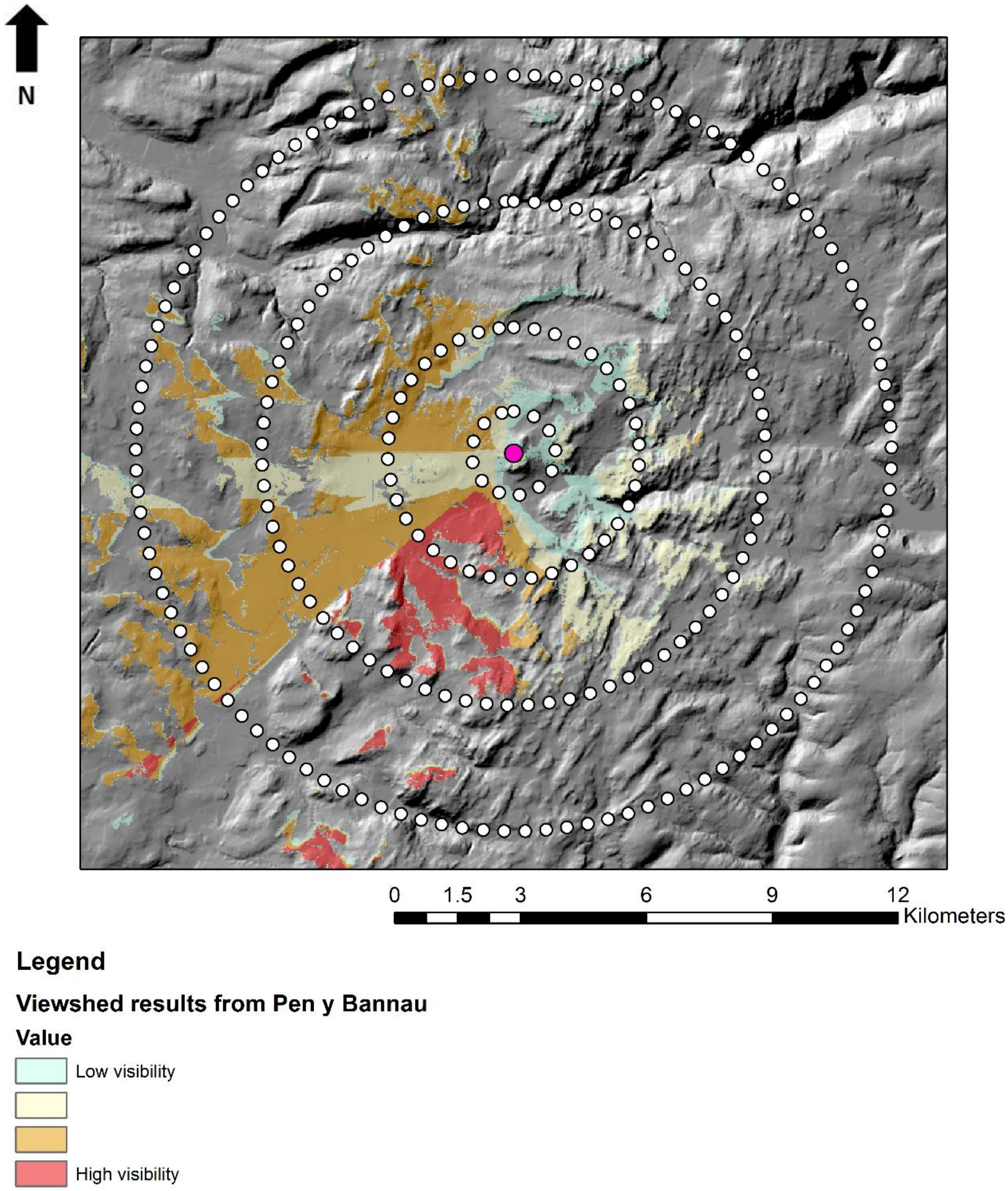


Figure 61. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Pen y Bannau as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)



Image

The most physically prominent and elaborate aspect of Pen y Bannau is the northeastern enclosing earthworks which form the site's façade exhibiting a falsified image of 'complete' multivallation (Driver 2013, 103). This façade, as with that at Castell Tregaron, faces away from the lowlands and towards the mountains in the north-east and according to Driver "visually commands the mountain fringe" although its orientation was highly limited (2013, 115). The limited visibility of the façade is supported by the results of viewshed analysis.

The northern façade has the lowest visual magnitude out of all of the site's architectural components from its surrounding radii although the site as a whole becomes more visible as distance from it increases. From the 1km radius there are varying degrees of visual accessibility to the site with the most visible area being its western side (Figure 62) and the northern outer bank is not visible from this distance although the least visible aspect is the eastern side. Beyond this distance and from the 3km, 6km and 9km radii the site's visibility increases as the majority of the site is of high visibility, although from the 6km and 9km radii the north-eastern corner of the site is not visible.

Castell Grogwynion is the only hillfort within this test area from which Pen y Bannau can be seen (Figure 63) although only the western side of the site, along with the western side of the northern banks are visible. These areas are of high visibility.

Figure 62. Results of viewshed analysis from the radii towards Pen y Bannau depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2014. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

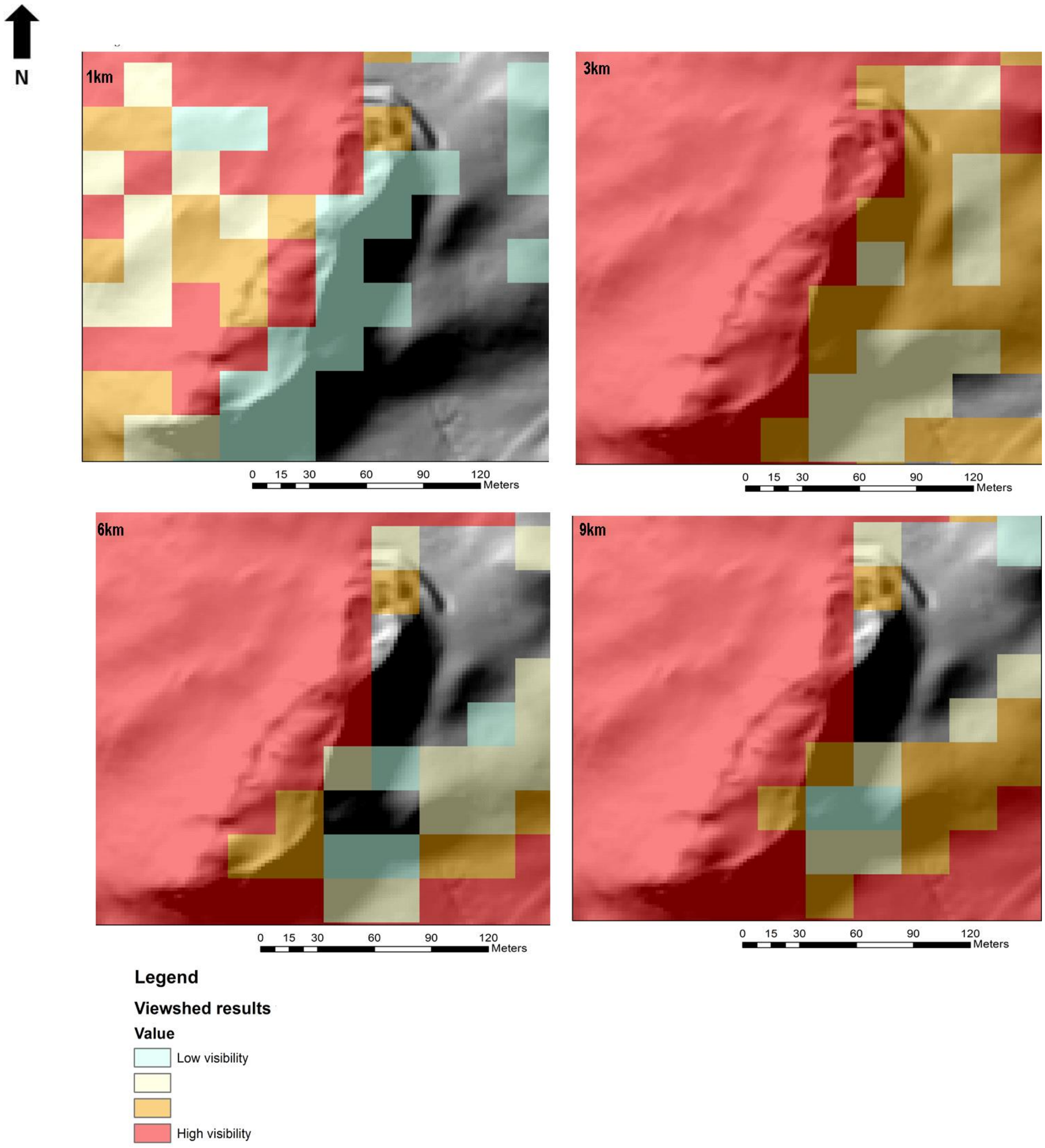
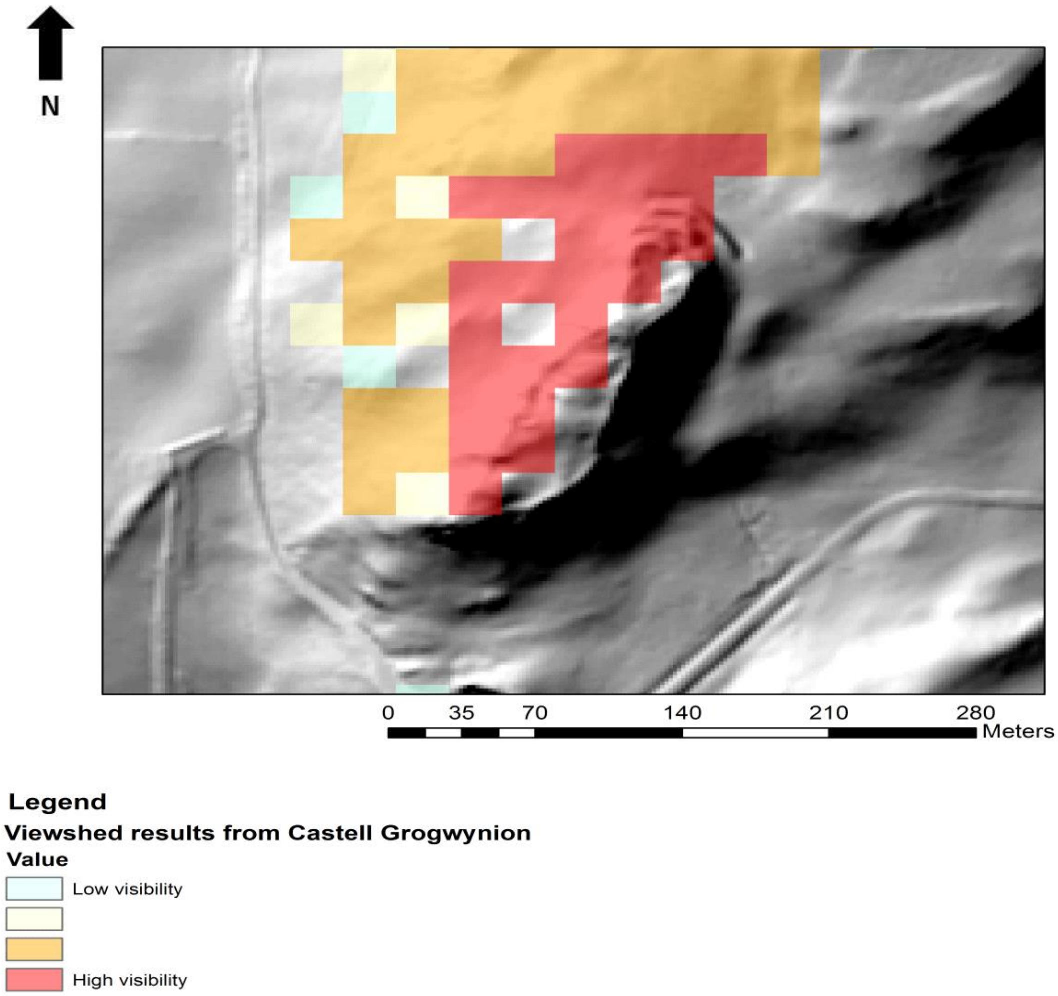


Figure 63. Visibility of Pen y Bannau from Castell Grogwynion (© Environment Agency copyright and/or database right 2014. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Correct pathways

The north-eastern entrance is easier to access than the western entrance which faces steep slopes (RCAHMW n.d.b), as supported by the results of cost surface analysis which identified that this entrance was placed in one of the site's most accessible aspects where 128 out of 260 slope-based pathways converged (Figure 64). It also coincides with 18 out of the 42 blind pathways demonstrating that the entrance was placed in one of the most accessible areas of the site, this area also has limited visibility to the site when approaching (Figure 65).

This façade, coupled with the northern slopes of the crag, inevitably obstructed visibility into the site from the areas immediately outside of it. However, poor visibility of the site extends beyond its immediate environs to the north as there is correlation between the blind pathways with this area. The results of GIS-based analysis are also supported by Driver's observations. He highlighted that there was limited visibility of the site's façade, particularly from a distance as there are several instances when it is obscured from higher ground (2013, 115). Driver also noted that there are slopes to the west of the façade where if it extended it would have been visible from the downlands (2013, 115). This is indirectly supported by the cost surface analysis as no blind pathways intersect with this area.

There is a strong correlation between the visible pathways and the south-western and western aspect of the site (Figure 66) indicating that the site has most visibility towards the lowlands in the west when compared to the uplands in the north and south-east. The least cost pathways do not, however, follow the correct morphologically defined entry point for this entrance which according to Driver was accessed through the northern ramparts by 'obliquely' passing through them from the left (east) (Driver 2013, 105).

There is no distinct correlation between the GIS based pathways and known archaeological activity within the area.

Figure 64. Results of slope based cost surface analysis to and from Pen y Bannau. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

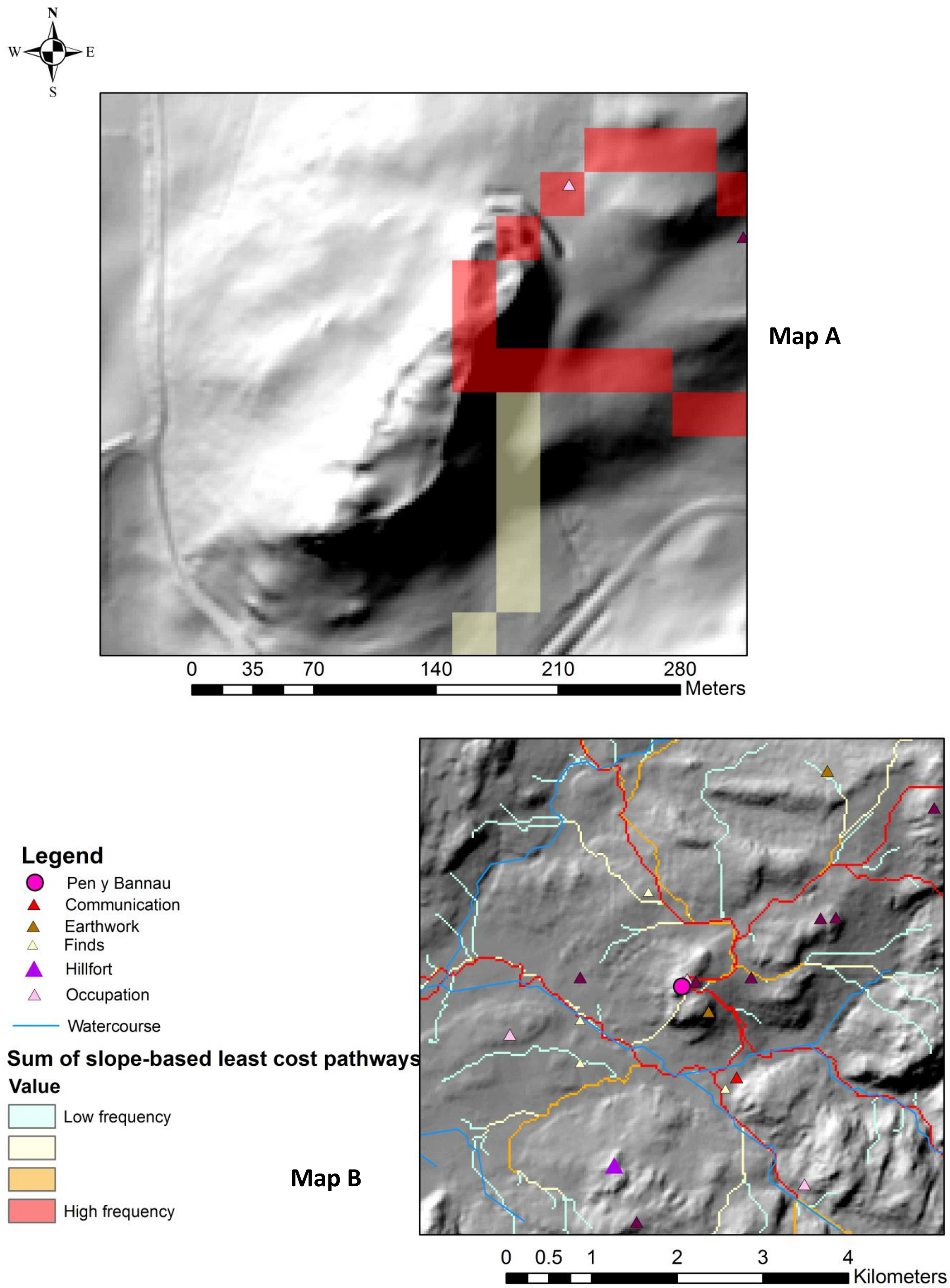


Figure 65. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Pen y Bannau. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)

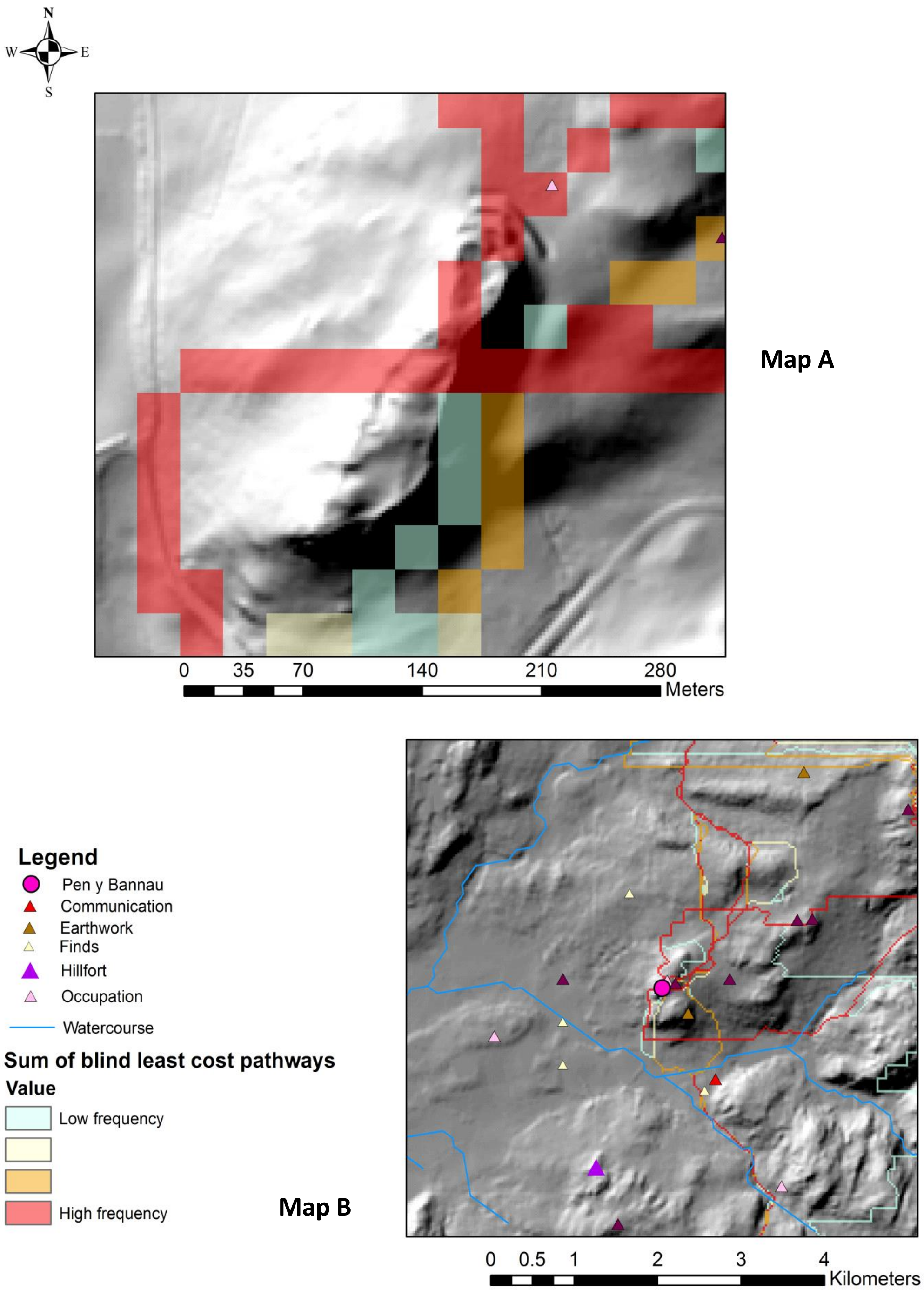
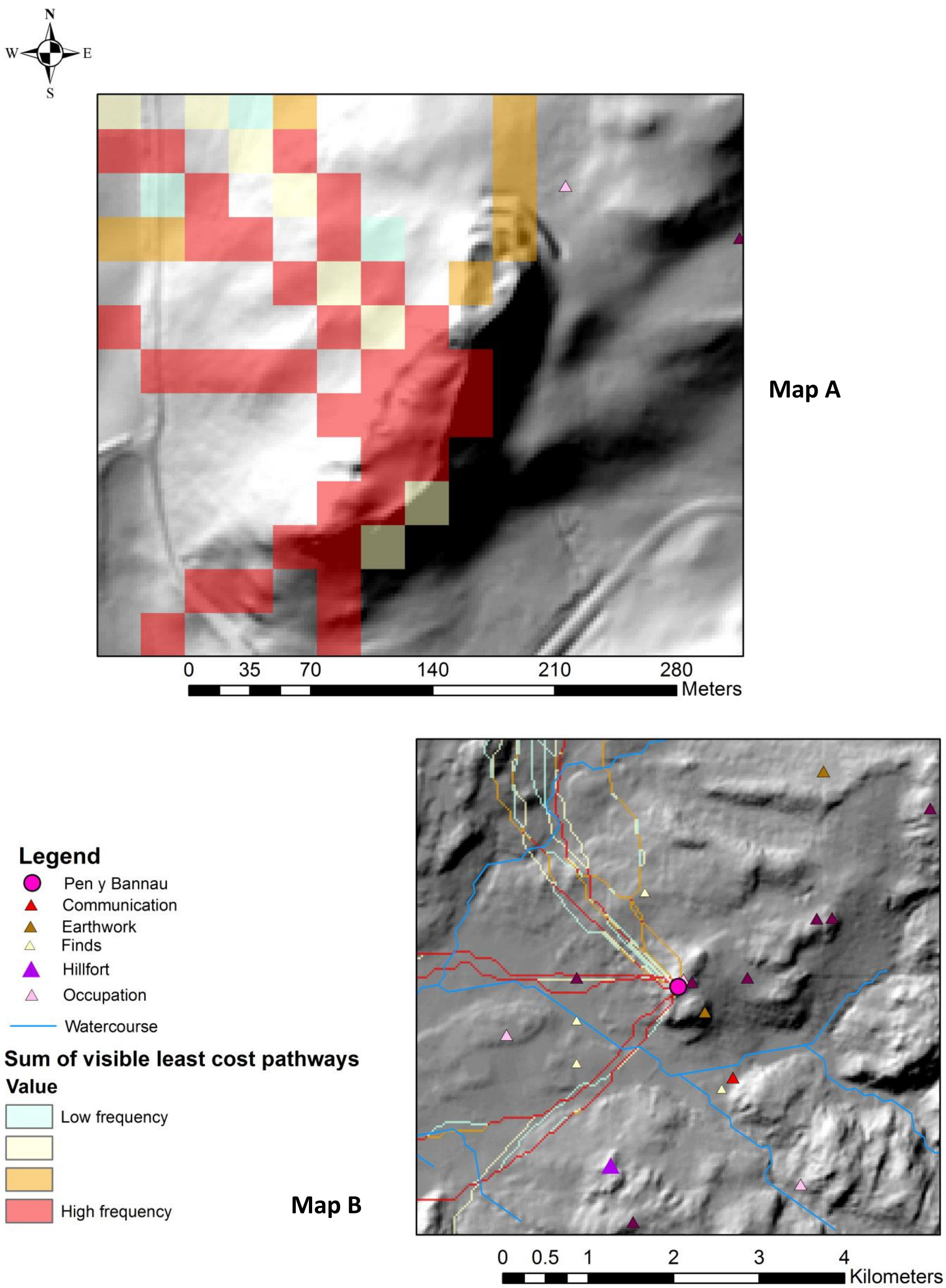


Figure 66. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Pen y Bannau. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon the Ordnance Survey Profile DTM (CCM River and Catchment Database © European Commission - JRC, 2007; Dyfed Archaeological Trust 2014; © Environment Agency copyright and/or database right 2013. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Vogt et.al 2007)



Concluding site summary

This site largely adheres to the topographical form of the landscape on which it sits. Its northern aspect is its most elaborate and accentuates the form of the land. It also forms a false impression of complete multivallation. The site's position promotes all round visibility of the landscape; however, the overall visibility of the site is very varied, the most visible part of it being the western side.

Even though the western side is the site's most visible aspect, it is not the most physically prominent or elaborate which is the northern area. This façade constitutes one of the site's least visible components and it incorporates one of the entrances. It also coincides with the slope based and blind pathways. This implies that the northern entrance was placed in its most accessible area, and where visibility is restricted into the site. A substantial amount of effort was applied to the construction of this aspect of the site to create a mirage of the actual extensity of the site. The effectiveness of this mirage was accentuated by the fact that it was placed where there is limited visibility of the remainder of the site, consequently the mirage could neither be proven or disproven. This has already been supported at Castell Tregaron and Trecoll by the results of the cost surface analysis in relation to the blind pathways. All of these sites exhibit the Cors Caron Façade scheme.

Whilst Driver's concept of image was supported with the application of GIS-based analysis, so too has his idea of correct pathways. In relation to Pen y Bannau the northern entrance formed a morphologically based pathway. This correct path of movement also relates to the GIS-based correct pathways, which are slope based and blind pathways.

Conclusion

The application of a GIS-based methodology to a subsection of Driver's study area enhanced his observations due to a GIS being able to investigate large quantities of data across large areas, which would not feasibly be possible within the time frame of an individual's research. Driver's work was limited to the routeways that he chose to walk, pre-defined topographical routes such as passes which meant that his study did not allow for the investigation of routes which were not topographically defined. Topography is likely to have defined movement in the past to a certain extent, however people would also have moved around the landscape beyond these routeways thus forming a part of people's visual understanding of these sites. Consequently, by investigating visibility on a radial and site basis this GIS-based study reduces the impact that choices of observation points had upon the overall visual understanding of sites.

Although GIS based visualisation aided the desk based interrogation of the physical relationship of hillfort morphology with topography it did not contradict Driver's observations (Table 1). There were differences between the results of visibility analysis in the investigation of the concept of image and those of Driver's observations (Table 1). For example, Driver claimed that Gaer Fawr and Pen Dinas were not intervisible, whereas viewshed analysis showed that they are although the visible areas are of low visibility which consequently meant that only a limited number of points of the hillfort grid (on either site) can see the area. The failure of the viewshed results to support Driver's observation could simply be that he was standing in the wrong place at the wrong time or that the points which can see the other site lie slightly offset from the enclosure circuit. Similarly, Driver stated that Gaer Fawr was the only hillfort within the area that was not intervisible with Pen Dinas although viewshed analysis from this subset of sites showed that Gaer Fawr was in fact the only hillfort that was intervisible with the site. This contradiction could simply be a result of the random positioning of the points on the hillfort grid, in that none of them fall on the same place that Driver was standing on the day.

Table 1. Table depicting the degree to which GIS-based analysis compliments the results of Driver's Non-GIS based analysis

	Morphology	Image	Correct Pathways
Castell Grogwynion	Agrees	Partially agrees	Disagrees
Castell Tregaron	Agrees	Partially agrees	Disagrees
Gaer Fawr	Agrees	Disagrees	Agrees
Pen Dinas Elerch	Agrees	Partially agrees	Partially agrees
Pen Dinas	Agrees	Disagrees	Not applicable
Tan y Ffordd	Agrees	Partially agrees	Disagrees
Trecoll	Agrees	Partially agrees	Partially agrees
Pen y Bannau	Agrees	Partially agrees	Agrees

The viewshed results failed to support Driver's observations in regard to Trecoll's façade (Table 1), which he believed was designed to face its landward approach. The façade as a whole was of limited visibility from the surrounding landscape. It did not have the visual impact that was implied, even though the physical construction of the façade was an attempt to manipulate the site's image. This was also mirrored at Castell Grogwynion, Castell Tregaron, Pen Dinas Elerch and Tan y Ffordd where the most prominently enclosed aspects of these sites were not necessarily the most visible (Table 1).

This observation was amplified by the results of Cost Surface Analysis which identified multiple instances where blind pathways intersected with the most elaborate aspect to a number of sites. The strong correlation of the blind pathways with the façades of Castell Tregaron, Trecoll and Pen y Bannau, for example, indicated that these façades faced an area where the site's interior is of limited visibility upon approach. The existence of these façades manipulated site images. However the risk of creating a false impression is that this can be disproven by those who were visiting the site at the time although the risk is minimalized through the placement of the façades where there was limited visibility to the remainder of the site. This is an important observation which is explored further in Chapters 5, 6 and 8 (Pages 352, 355, 382, 439-440, 528-529).

The importance of this observation also raised questions surrounding the terminology which Driver used to describe visibility when compared to the measurable results of viewshed analysis. Multiple examples were identified where Driver termed an architectural component as a site's most visible aspect, when in fact viewshed analysis showed that they were not. Instead these areas were visually prominent and such prominence could have been caused by the contrast between the form of these components with the remainder of the site and the surrounding topography. Driver's experience of the sites within their landscape context influenced his visual interpretation of them probably caused by the visual prominence of the architectural components and their ability to attract the eye, whereas GIS based analysis provides a more objective and quantifiable insight into a site's visual qualities. This is explored further in Chapters 5, 7 and 9 (Pages 287-288, 511 and 546-7) where further test area analyses highlights the contradictory nature of fieldwork observations and viewshed analysis.

In terms of correct pathways there was limited agreement between the results of Cost

Surface analysis and Driver's topographically and morphologically defined pathways (Table 1). For example none of the least cost pathways follow the complex entrance arrangement at Castell Grogwynion, Castell Tregaron or Tan y Ffordd which were identified by Driver. However at Gaer Fawr and Pen y Bannau there were multiple instances where several types of least cost pathways intersect with the morphologically defined correct pathways as indicated by the entrance placement. Similarly there are several instances where the slope-based least cost pathways in particular at Pen Dinas Elerch intersect with the causeway to the south of the site. The concept of correct pathways and the supporting evidence is discussed extensively in Chapter 8 (Pages 529-532).

The results of the investigations within this chapter have raised issues surrounding terminology, objectivity, and the correlation of blind pathways with prominent façades which are issues that will be investigated further in the subsequent chapters.

Chapter 4
Dartmoor

Introduction to the test area

This test area is situated in Devon on the perimeter of the Dartmoor National Park. It is an upland moorland area which surrounds the steep sided valley of the River Teign with topography that is distinctively divided by the Teign Valley (Figure 67). However, on either side of this valley the topography is characterised by undulating uplands. It is an area of moderate hillfort density (Figure 68) with three hillforts under investigation: Cranbrook Castle, Wooston Castle and Prestonbury Castle (Figure 67).

The three hillforts are hillslope enclosures enclosing internal areas that range from 5.25 ha to 9.4 ha. Situated along the valley of the River Teign these sites are separated by a distance of between c.1 km and c.3 km. This test area tests the methodology in terms of topography, looking at how extremes of topography (from an undulating upland to a deeply incised river valley) influence the effectiveness of the methodology. It also tests how each location affects visibility and movement within the area.

Figure 67. Distribution map of the test area hillforts on the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service)

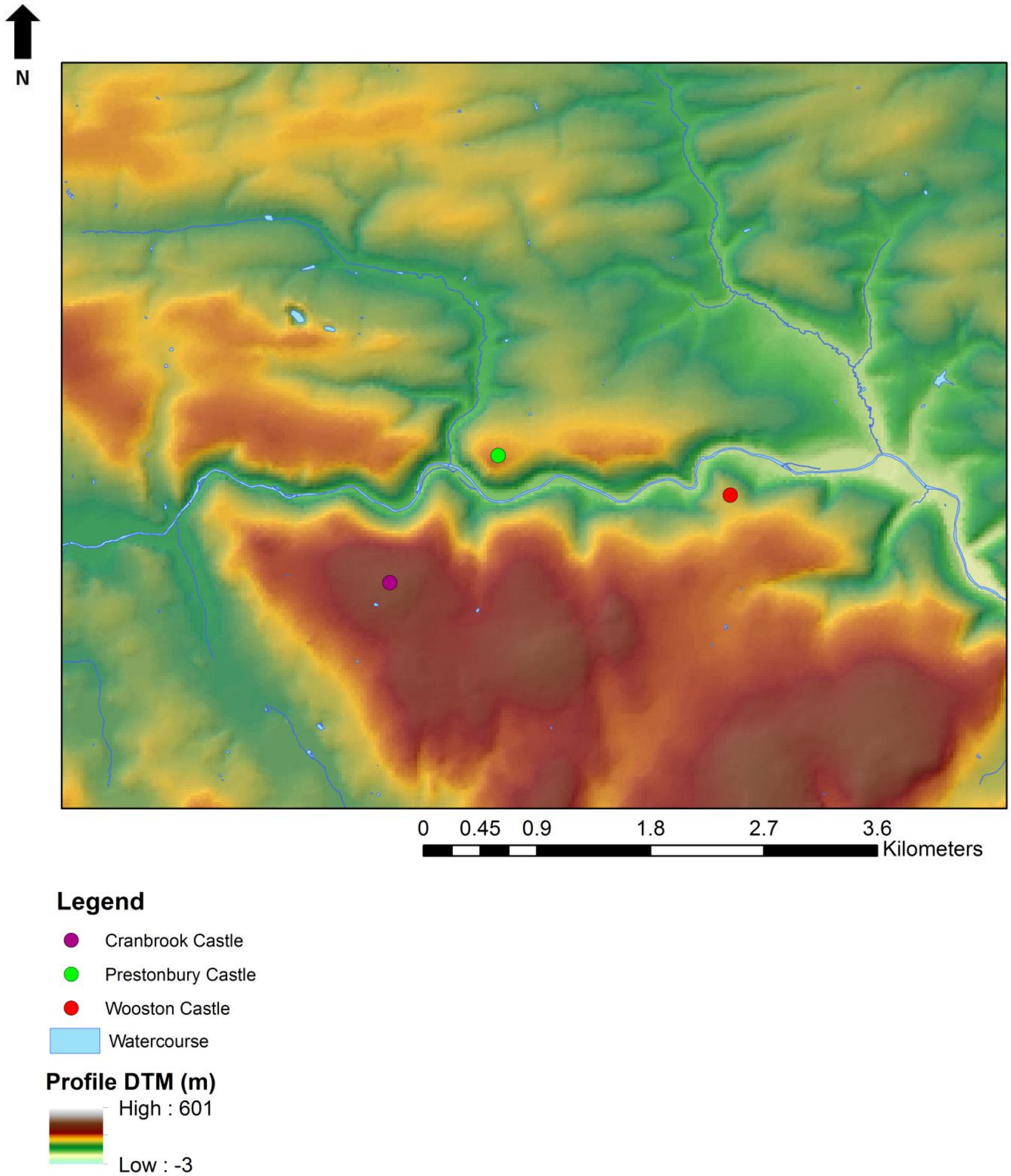
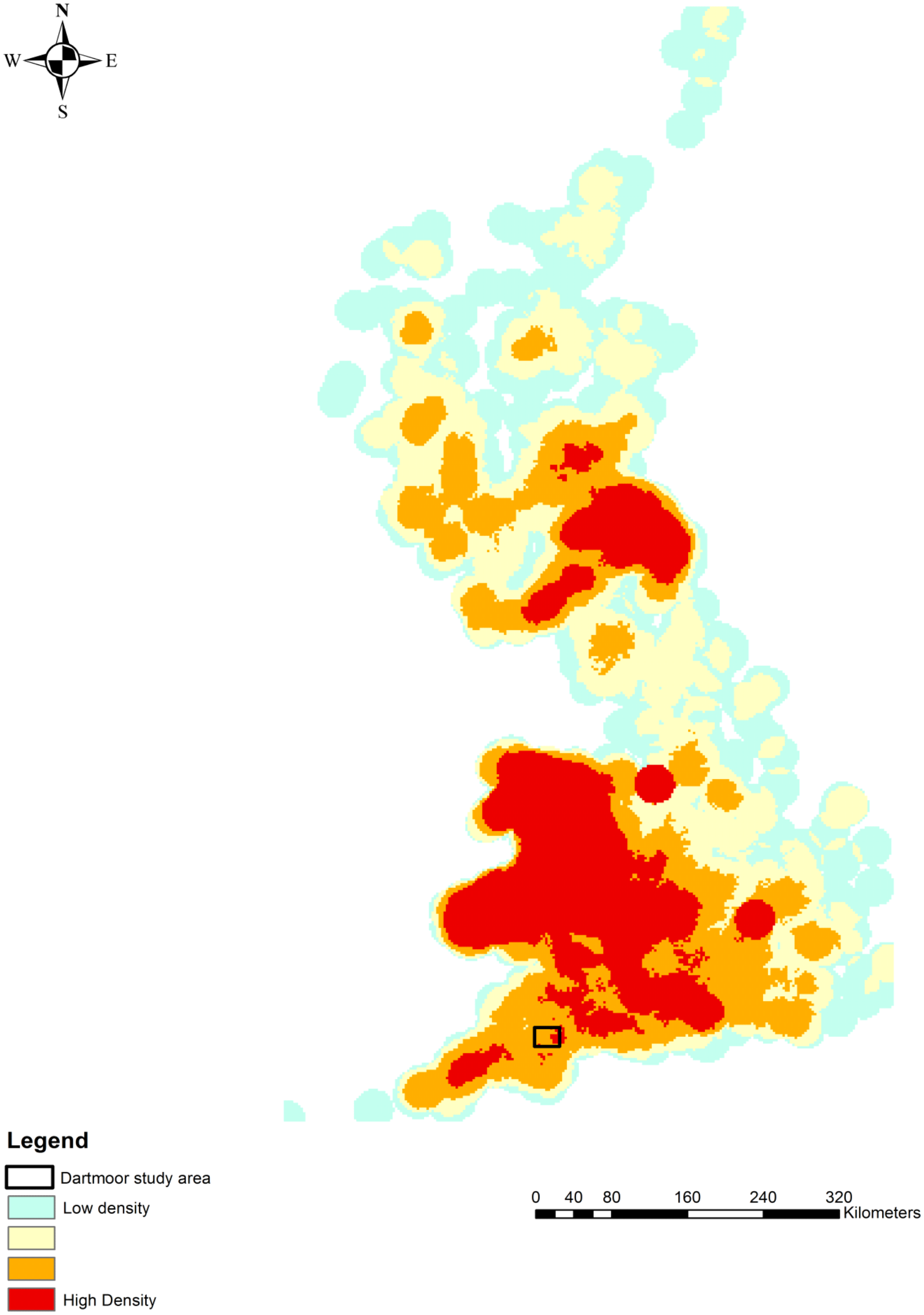


Figure 68. Location of Dartmoor sites in relation to plot density map of hillfort distribution (Atlas of Hillforts in Britain and Ireland project 2013; EngLaID 2013)



Data

LiDAR data was fundamental in providing a visual understanding of the morphology of the sites within this landscape, particularly in the case of Wooston Castle as this was not readily possible on the ground. The data was received from Geomatics and it was of 1m resolution. As with several of the other test areas within this study, a small sample of the analysis was undertaken with the LiDAR DTM as a friction surface allowing an assessment of how DTM resolution influences the results of GIS-based analysis.

To examine the evidence for prehistoric activity within the region and to get an understanding of the landscape context of the sites, Dartmoor National Park HER data was obtained for all records from the Palaeolithic to the Iron Age (including undated records).

Site visit

The sites were initially visited with the Hillfort Study Group in April 2013 and the area was then revisited in June 2014 and May 2015. Weather conditions during these visits were varied. There were good conditions for the majority of the trips but it was very misty during the Wooston Castle visit. Vegetation also affected the interpretability of the morphology of Wooston Castle; although this was counteracted by good LiDAR data. Vegetation coverage also affected the investigation of the wider visual characteristics of these sites from the surrounding landscape because in some places hedgerows and forestry plantations made it impossible to see them.

Analysis

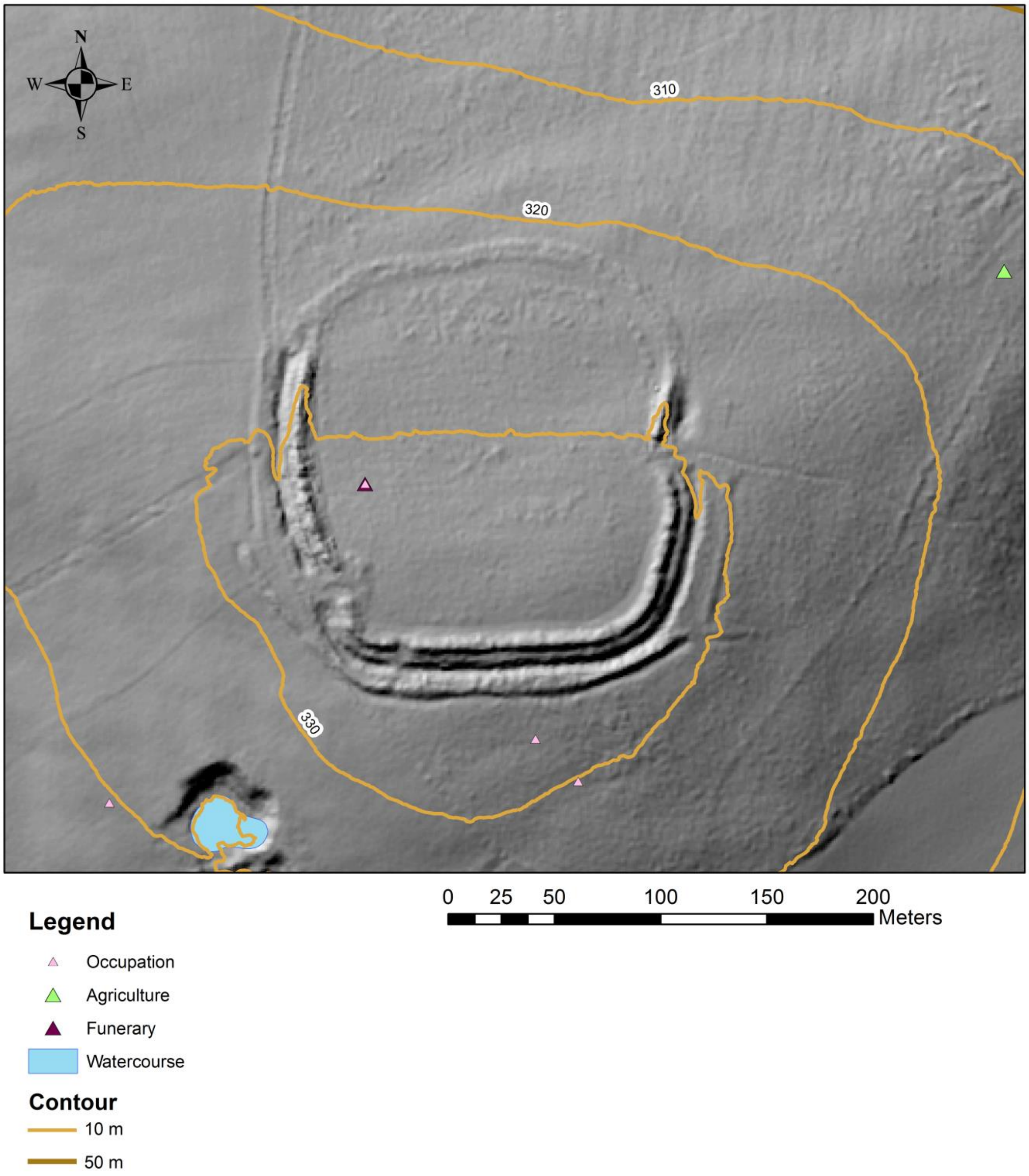
Cranbrook Castle

Site introduction

In the south-eastern corner of the study area Cranbrook Castle is located on a domed hill at 331m OD. The enclosure consists of a stone built bank with very slight ditches (Newman 2011) on all sides apart from the north. The failure to distinguish an extant bank within the northern area of this site led it to be interpreted as an unfinished hillfort (Collis 1972), however, analysis of the LiDAR data revealed very slight traces of a bank within this area (Figure 69) and there are also very slight indications of the bank in the field.

Collis argues that this hillfort was a two phase structure (1972) with the outer banks constructed prior to the inner because there are several areas in which their "lines diverge, and in one place, the inner cuts the outer" (1972, 220). The first phase constituted a univallate fort which enclosed an area of 4 ha (Hogg 1975, 184) whilst the second phase was enclosed by a more substantial bank, this was stone revetted but the enclosure itself was supposedly unfinished (Collis 1972, 221) and enclosed 2.8 ha (Hogg 1975, 184).

Figure 69. 1m resolution LiDAR hillshade model of Cranbrook Castle, overlain by contours, HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)



There is considerable disagreement about the number of entrances which were placed at this site, and their location with Newman and Collis both confident that there was an entrance in the south-west, whilst Grinsell termed it as a possible entrance (Grinsell 1970, 24; Collis 1972; Newman 2011, 91). This is in-turned (Newman 2011, 91). Collis also argues that there is an entrance in the south-east, which is approached by a hollow way although its position on the corner of the site meant that it is poorly defensible (1972, 220). Collis labeled the eastern break in the site's enclosure as a modern track in his 1972 publication, however he later spoke of it as an entrance (1979). Newman and Grinsell believed that this was an in-turned entrance to the hillfort (Grinsell 1970; Newman 2011).

The hilltop on which Cranbrook is situated also has reaves, one of which runs in a westerly direction intersecting with the outer bank of the hillfort (Collis 1979). Another runs parallel with the modern path to the site towards its eastern entrance and here the reave turns at a right angle and travels under the phase two rampart (*ibid* 1979 191) with a third possible reave running in a south-easterly direction (*ibid* 1979, 191). Collis believed that the reaves were earlier than the first phase of the hillfort, but that they were still potentially in use and reconstructed whilst the hillfort was being established (1979, 193).

Six cairns are also located within the hillfort's interior (*ibid* 1979, 221) as well as hut circles, one of which was visible during the field visit. Excavations at the site found pottery, charcoal and sling stones within the hut circles (Historic England 2015a) with some of the pottery being identified as Bronze Age Glastonbury ware.

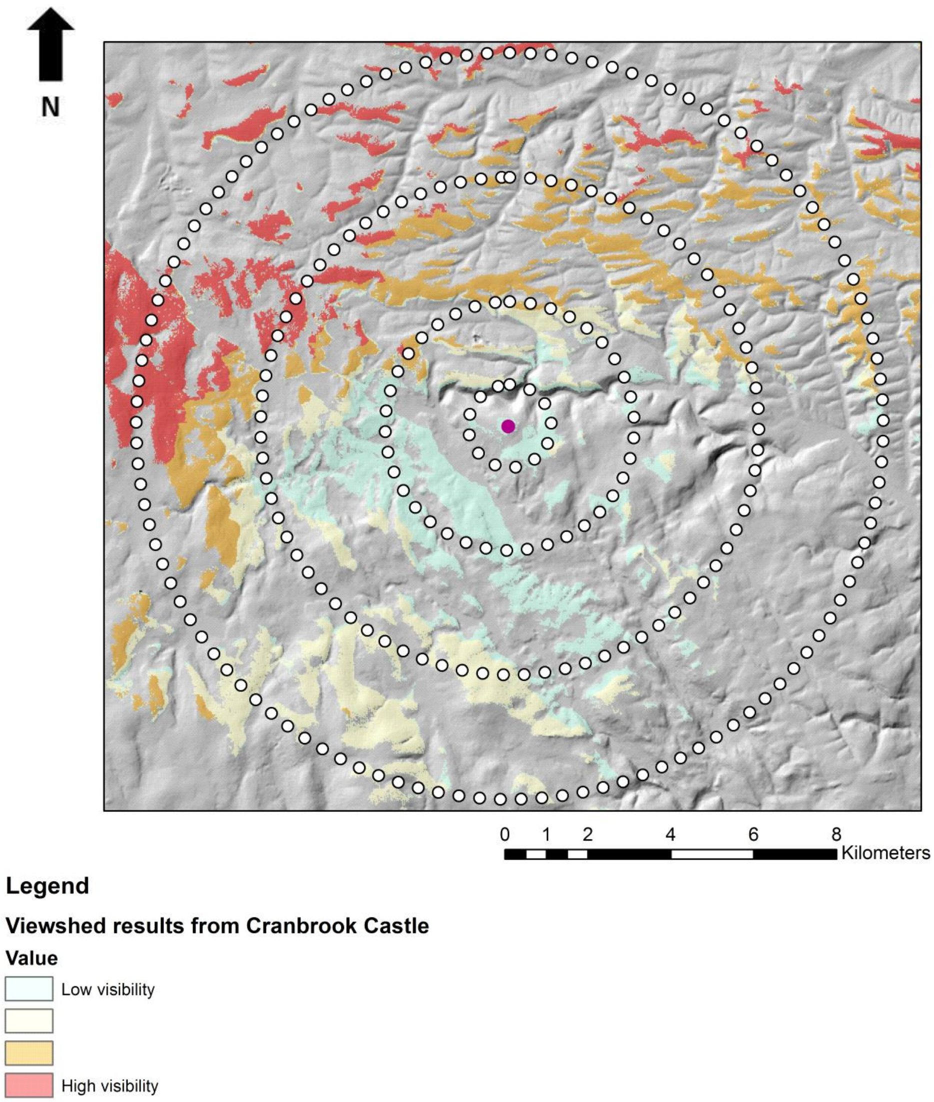
Physical relationship of the hillfort morphology and location with the landscape topography

Cranbrook is sited on the summit of a domed hill on the upland valley edge of the River Teign although the site does not strictly follow the shape of the hilltop. This implies that its plan was consciously selected to achieve a design which was enforced upon the landscape, perhaps influenced by reaves, which were situated on the hilltop prior to the construction of the hillfort (Collis 1979). The hillfort is centrally situated within a complex of reaves which descend from this hilltop, these may have been a response to land pressures and were constructed by sedentary groups (Fleming 1996, 65 +70). They had social importance as spatial markers within the landscape. The central placement of a new site, within an area of established importance helped the site to adopt and maintain the established importance of the hilltop. The placement of reaves and the summit of the hill provided a reference point for the commencement of the construction of the hillfort. The western aspect of the site also coincides with the modern field boundary which further resonates how earlier activity has an impact and influence on future constructional undertakings as the hillfort bank inevitably influenced much later land boundaries.

While the morphology of the site was influenced by earlier human activity on the hilltop, the overall site morphology does not vary with a variation in the topography. For example, the banks which enclose the site are most numerous in the south which is not a gently sloping area. In fact, there is no distinctively susceptible (to easy access) or naturally defended area of this site; this is caused by the fact that this hilltop is only slightly domed.

The position of this site in relation to the topography also affects the site's visibility of the surrounding landscape. Cranbrook's position on a dome shaped hill led Newman to argue that the site has a 360^0 vista (2011, 88). This is supported by the results of viewshed analysis from the hillfort grid (Figure 70). Viewshed analysis demonstrates that on a landscape scale there is a 360^0 vista, however, the visibility of the different areas differs with distance, consequently at any given distance it is not 360^0. The most visible aspects of the landscape are to the north and west and the degree to which these areas are visible increases as distance from the site increases. The least visible areas are to the south, south-west, east and south-east.

Figure 70.Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Cranbrook Castle as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)



Image

The visibility of this site from the surrounding landscape is variable, based on both the direction of the observer points from the site, and the distance between them and the site. From the 1km radius there is very limited visibility of Cranbrook and this is primarily confined to the northern and eastern enclosing works (Figure 71). A limited section of the northern aspect of the interior is also visible. These areas are only visible from a limited number of the buffer points of the 1km radius as they have a relatively low to moderate visual magnitude. This degree of visibility and how it varies from differing aspects of the buffer areas was demonstrated within the field. For example, Viewpoint 2 is situated on the south-eastern aspect of the 1km radius and from this point there is limited visibility and visual clarity of the site (Figure 72 and 73). From this location only the south-eastern enclosing works of the site are visible on the horizon, however they are not visually prominent.

Between the 1km and 3km radii, the visibility of this site increases as the western enclosing banks become visible, as well as the northern aspect and its eastern banks (Figure 71). The visual magnitude of the visible areas increases at 3km as the northern aspect and the centre of the eastern entrance are of high visibility while the remaining visible areas are of moderate but very variable visibility. Just as from Viewpoint 2, the visual clarity of Cranbrook Castle from Viewpoint 3, which is 2.1km to the south-east remains poor (Figure 74). From Viewpoint 4, which is situated in the north-east of the 3km radius, the interior is visible and the enclosing banks in the east and west are discernible (Figure 75).

Figure 71. Results of viewshed analysis from the radii towards Cranbrook Castle depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

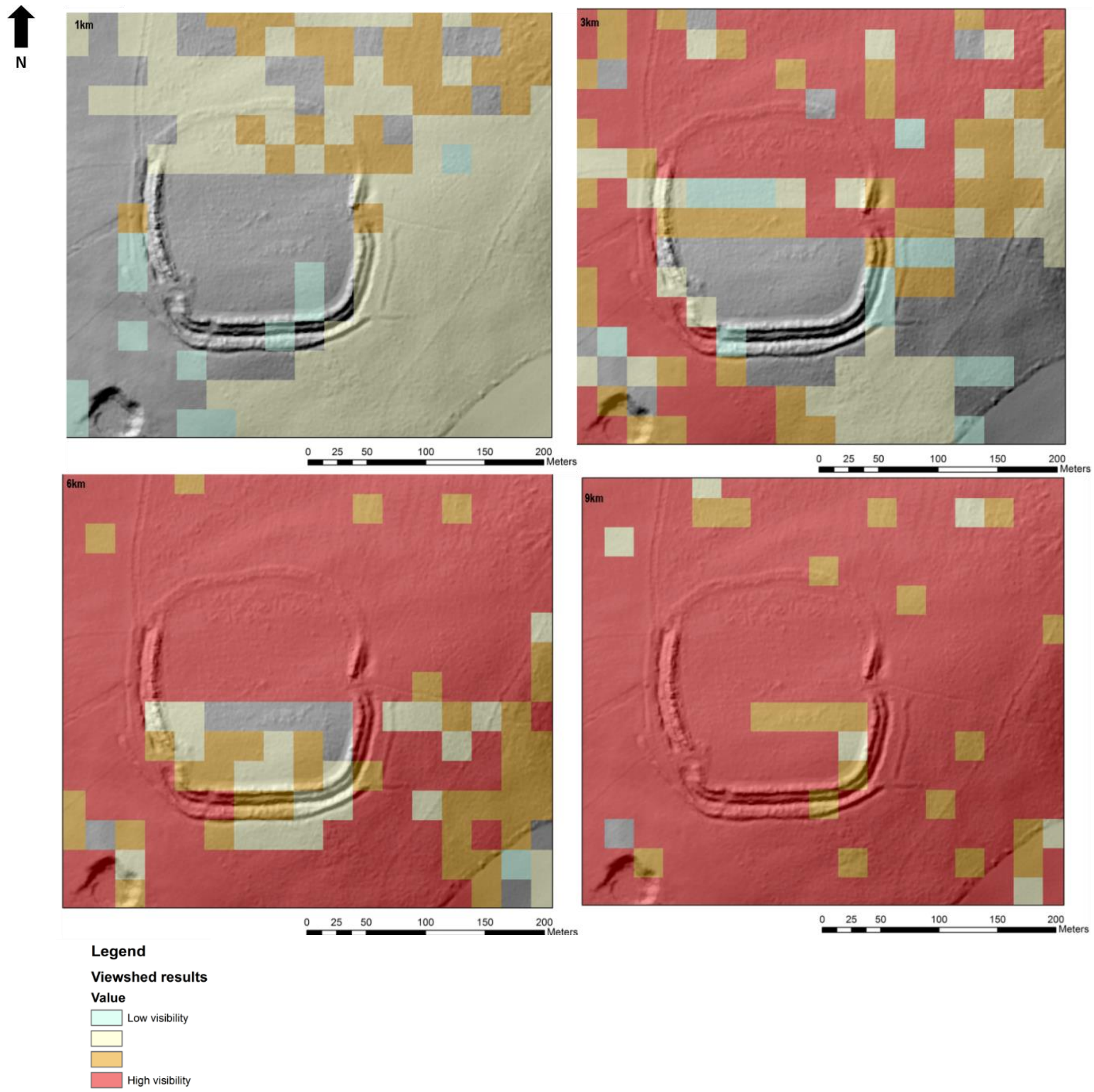


Figure 72. Location map of the Viewpoints in relation to Cranbrook Castle (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

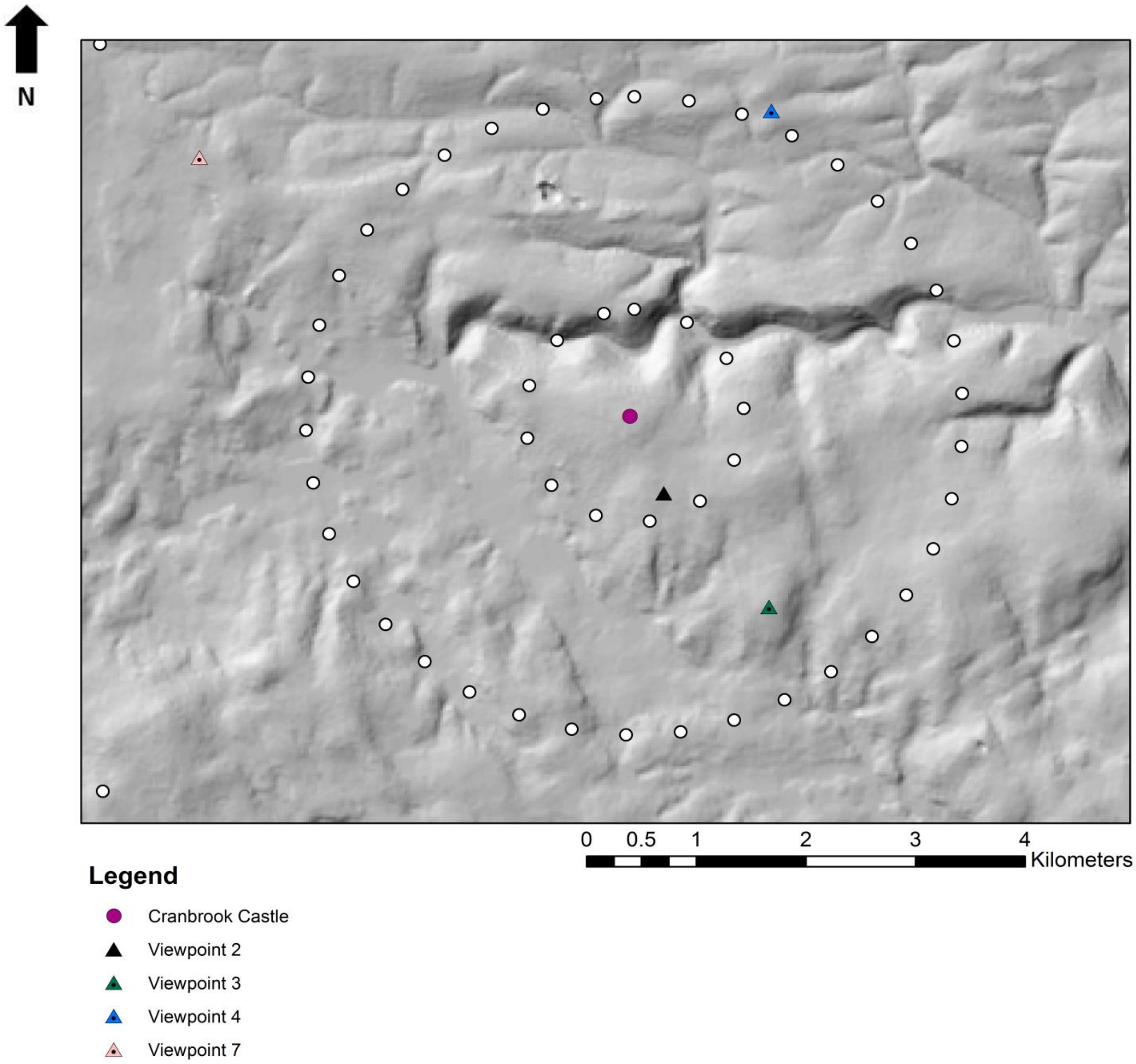


Figure 73. View of Cranbrook Castle from Viewpoint 2, 784m to the south-east of the site (Author's own 2014)

Figure 74. View of Cranbrook Castle from Viewpoint 3, 2.1km to the south-east of the site (Author's own 2014)

Figure 75. View of Cranbrook Castle from Viewpoint 4, 3.1km to the north-east of the site (Author's own 2014)

The visibility of Cranbrook Castle continues to increase from the 6km radius with the majority of Cranbrook's interior and its enclosing earthworks being visible and only a thin line of the southern aspect of the interior is not visible (Figure 71). The majority of this site apart from its southern half is of high visibility and has a visual magnitude within the upper quartile range. The remainder of the site's visual magnitude is variable. Viewpoint 7 is situated 4.6km to the north-west of Cranbrook. From this location the impact of the construction of Cranbrook on this site is clear (Figure 76) with the hilltop prominently levelled and the western enclosing works apparent.

Figure 76. View of Cranbrook Castle from Viewpoint 7, 4.6km to the north-west of the site (Author's own 2014)

The site's visibility continues to increase from the 9km radius, so too does its visual prominence, however, visual clarity decreases as from here, the entire site and its enclosing earthworks are visible (Figure 71). These are areas of predominantly high visibility with only small areas of the northern and southern parts of the site having a lower visual magnitude.

As the visibility of the site differs with the changing distance from it, it also changes from the neighbouring hillforts. For example, although Prestonbury Castle is only 1.6km away from Cranbrook Castle, Cranbrook is of limited visibility. Viewshed analysis indicates that from Prestonbury Castle the northern and north-eastern aspects of Cranbrook Castle are visible (Figure 77). The run of viewshed analysis using the 1m resolution LiDAR clearly depicts that the remains of the northern and eastern banks are one of the most visible aspects of the site. However, it was difficult to confirm the results from viewshed analysis in the field as the northern area of Cranbrook is its least extant; consequently it is not distinguishable through photography. These results demonstrate that even from relatively short distances visual clarity and prominence can be poor.

The visibility of Cranbrook remains fragmentary whilst travelling towards the site from Prestonbury (Figure 78) and the visibility of the northern and outer banks are very similar as there are large areas on the route where both are visible. However, the inner bank's visual qualities have proven to be very different from the remainder of the site as the bank is visible from different areas of the landscape.

Cranbrook Castle is also of limited visibility from Wooston Castle, as only a limited proportion of the north-eastern corner of the site is visible (Figure 79), and the visual magnitude of this area is predominantly within the lower quartile range. The results of LiDAR based viewshed analysis indicate that the site's interior is not visible due to the obstructive nature of the height and position of the north-eastern banks.

Figure 77. Results of viewshed analysis from Prestonbury Castle towards Cranbrook Castle depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

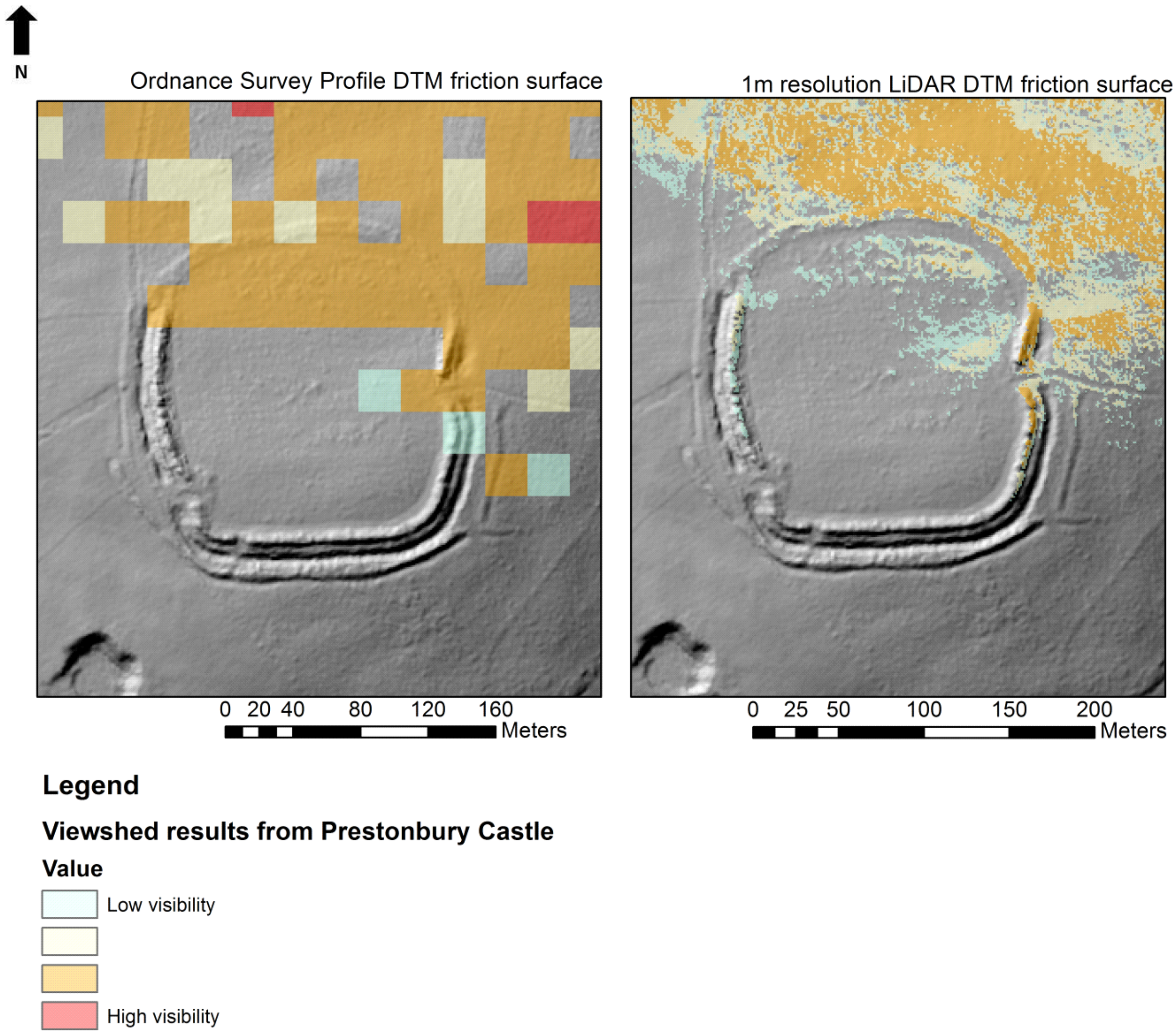


Figure 78. Results of cost surface analysis highlighting the routes where Cranbrook Castle's enclosing works are most visible from Prestonbury Castle overlain by HER data and watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved)

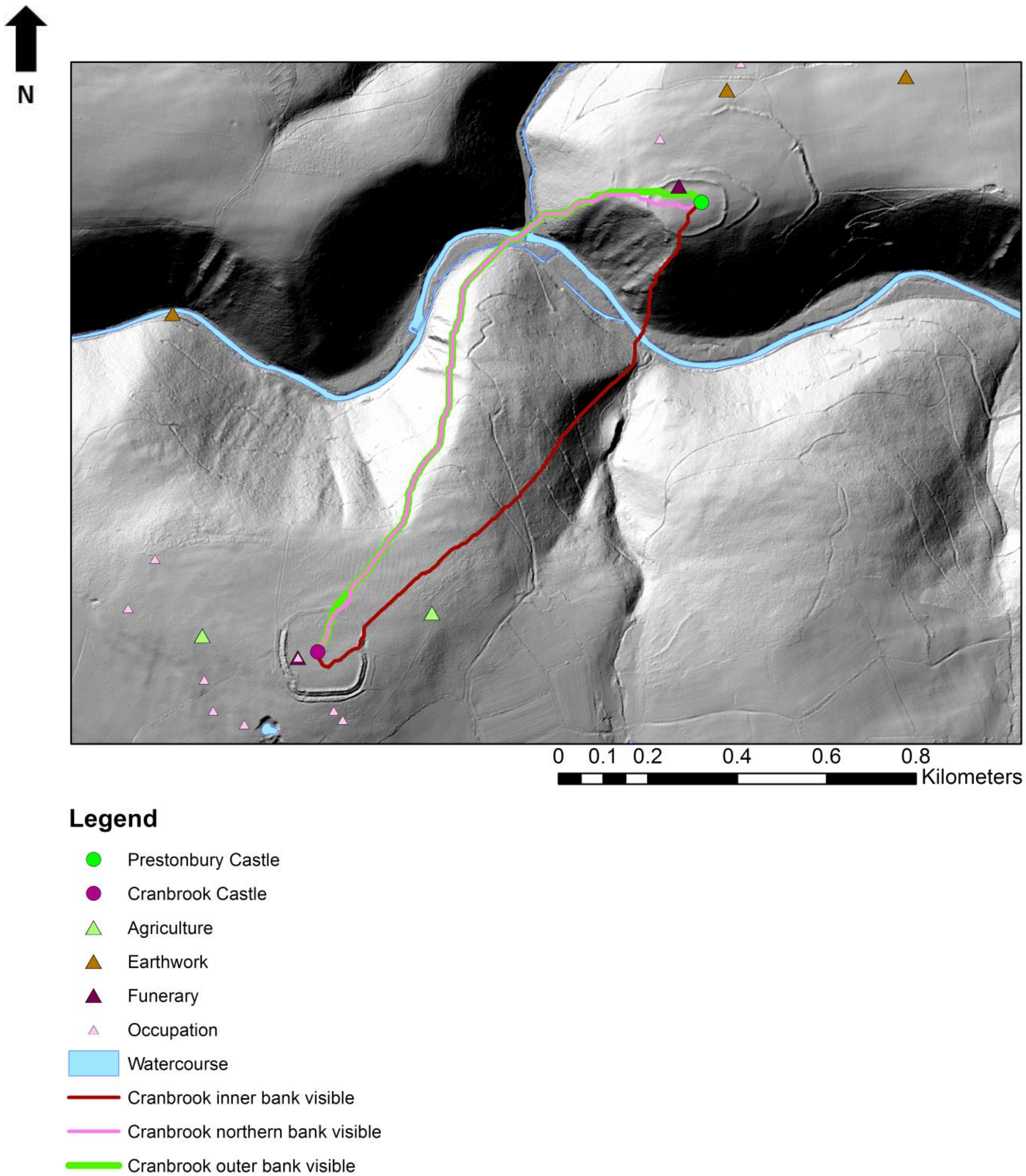
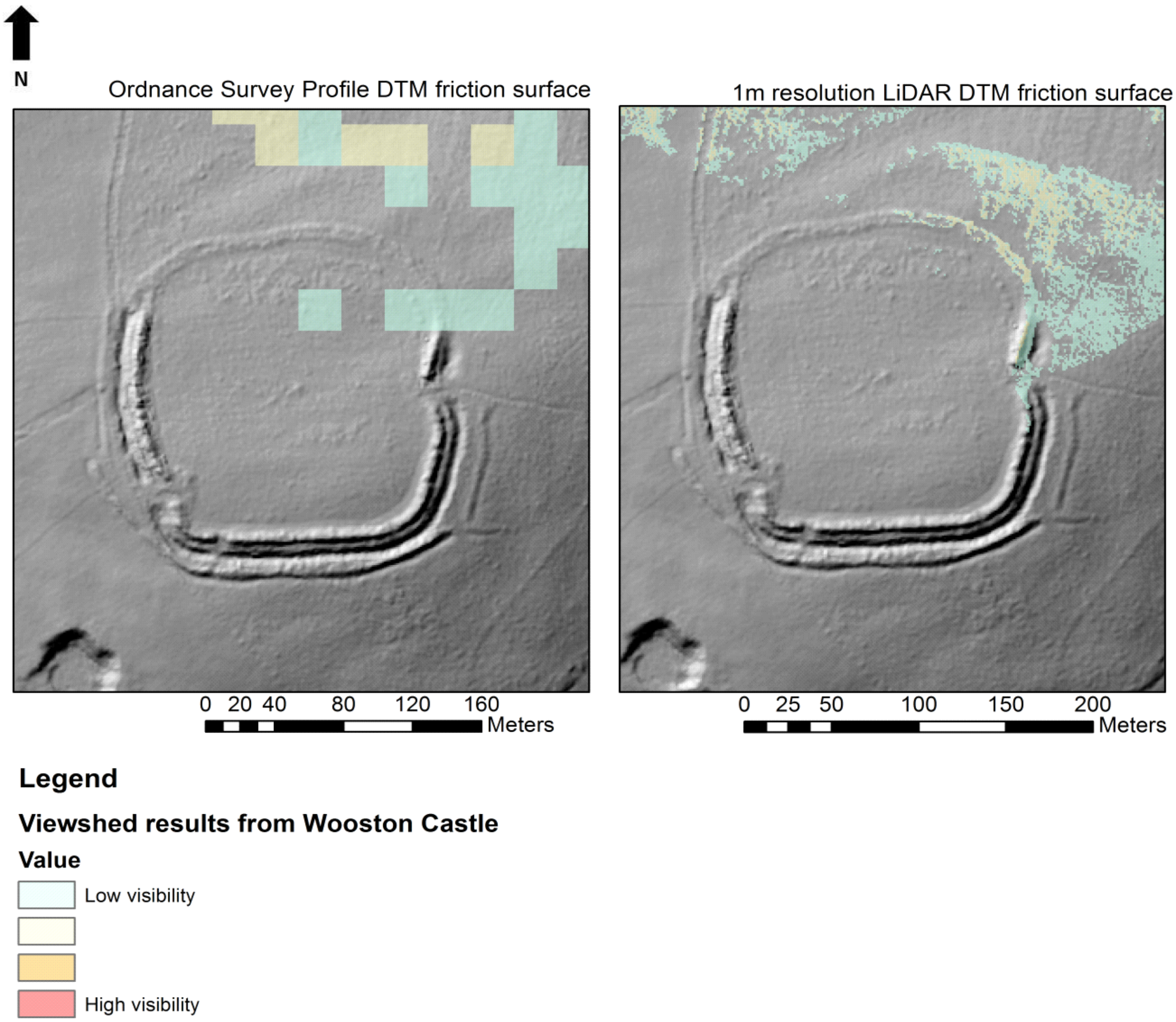
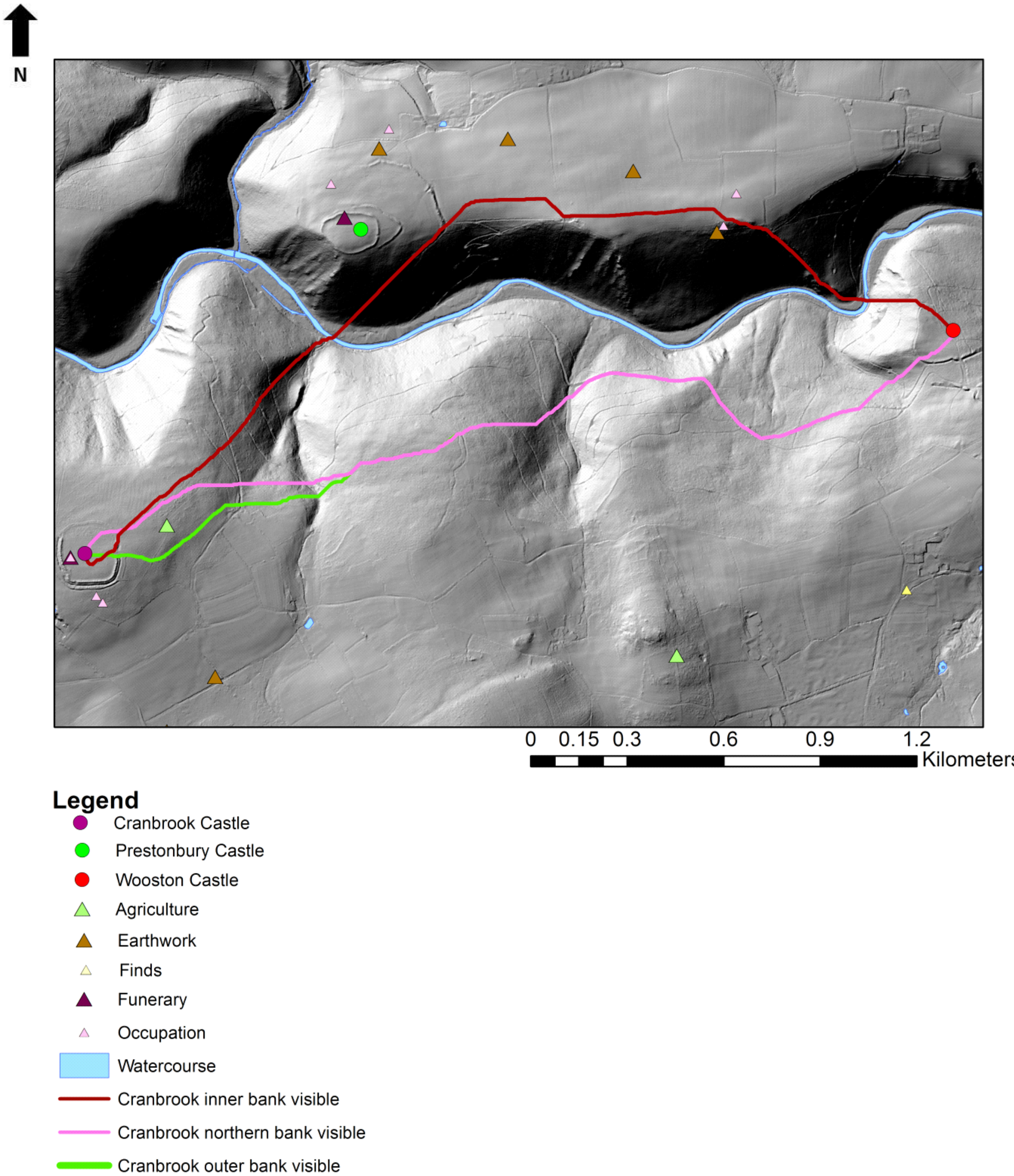


Figure 79. Results of viewshed analysis from Wooston Castle towards Cranbrook Castle depicting the visibility of the site using both the Ordnance Survey and LiDAR friction surfaces



Cost surface analysis indicates that whilst travelling between Wooston Castle and Cranbrook the site does not portray a complete image (Figure 80). The course of the paths which can see the outer and north bank follow relatively similar routes whilst the inner bank least cost pathway does not. The higher resolution DTM indicates that the inner bank is most visible when travelling in a westerly direction on the northern valley edge of the Teign and this pathway also coincides with a number of later prehistoric enclosures and banks which indicates that this area was possibly significant. None of the other least cost pathways interact with any known activity apart from a field system to the east of Cranbrook Castle. Field systems are difficult to date and it cannot be confirmed whether or not these were in use at the same time as Cranbrook. It does however, coincide with reaves to the east of Cranbrook which were extant at the time that the site was in use.

Figure 80. Results of cost surface analysis highlighting the routes where Cranbrook Castle's enclosing works are most visible from Wooston Castle overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved)



Correct pathways

Cost surface analysis found that the south-western entrance was placed very close to the site's most accessible area, as 143 of 247 Ordnance Survey slope based pathways interact with this area (Figure 81). 35 of the Ordnance Survey and 2 out of the 4 LiDAR based pathways also interact with the eastern entrance which implies that this is another entrance which was placed within a relatively accessible area. The eastern entrance and the north-eastern aspect of the site corresponds with the visible pathways as all of the Ordnance Survey pathways interact with these areas (4 in each area). The LiDAR based visible pathways also coincide with the north-eastern area as all of these pathways interact with this area. This demonstrates that approaching traffic is most visible within these areas, the eastern entrance was placed to exploit these visual properties.

The visible pathways between Cranbrook and Wooston Castle also coincide with activity which is likely to have been contemporary with that at the hillforts as they travel past two ovoid enclosures (MDV26738 and MDV26739), a bank (MDV26742) (**a**) and Prestonbury Castle (Figure 82). This routeway is therefore highly visible from both Cranbrook and Wooston Castle, but they were also highly significant places within this landscape due to the substantial investment in them.

Unlike the slope based and visible pathways, there is no coincidence of the blind pathways with the entrances to this site (Figure 83). 2 out of the 8 Ordnance Survey based blind paths, and 2 out of the 4 LiDAR pathways correspond with the southern aspect of the site, and three correspond with the area just to the north of the eastern entrance. The interaction of the blind pathways with the southern area in particular indicates that the site's most extensively enclosed area was placed where it is least visible upon approach.

Figure 81. Results of slope based cost surface analysis to and from Cranbrook Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved)

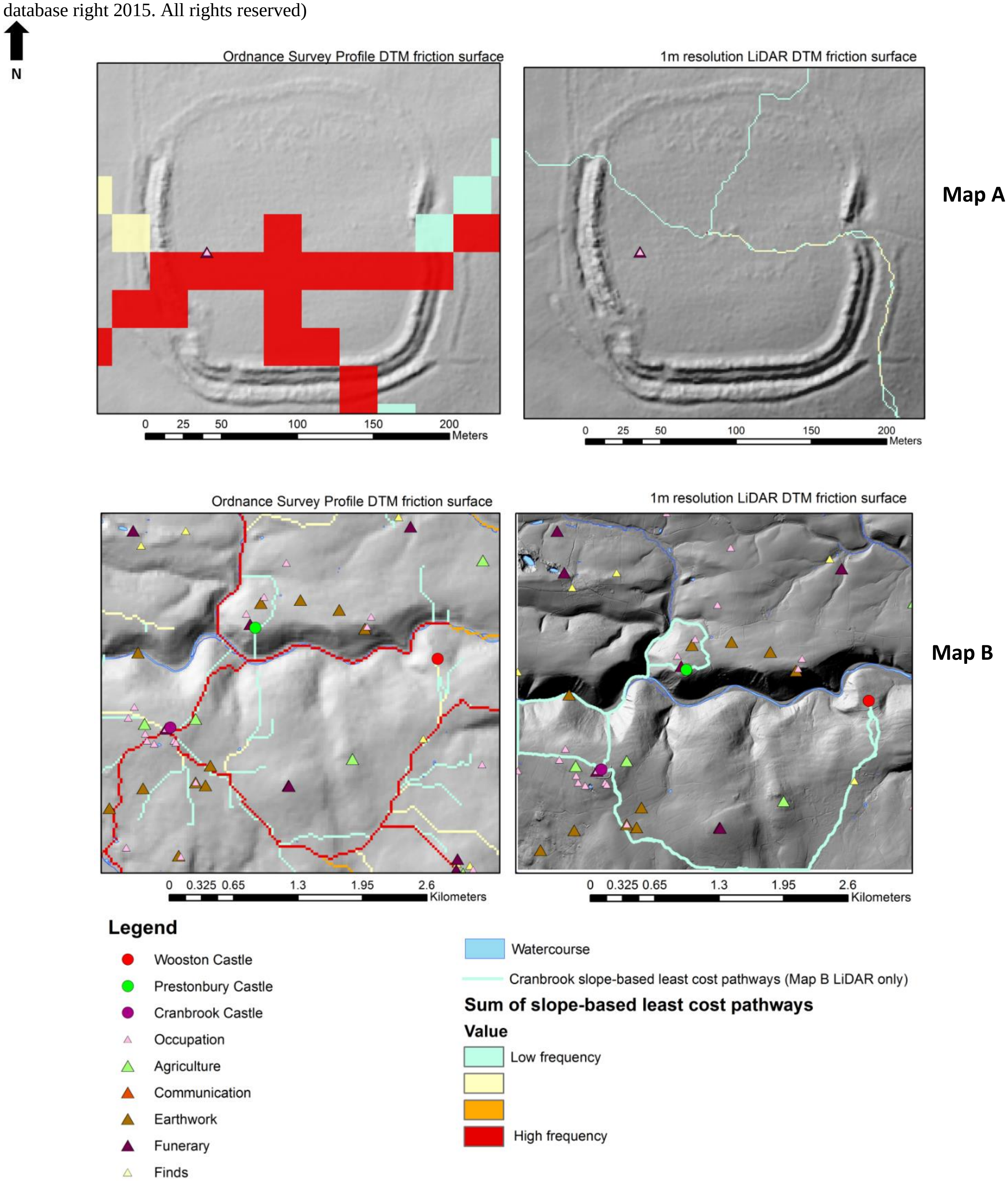


Figure 82. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Cranbrook Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

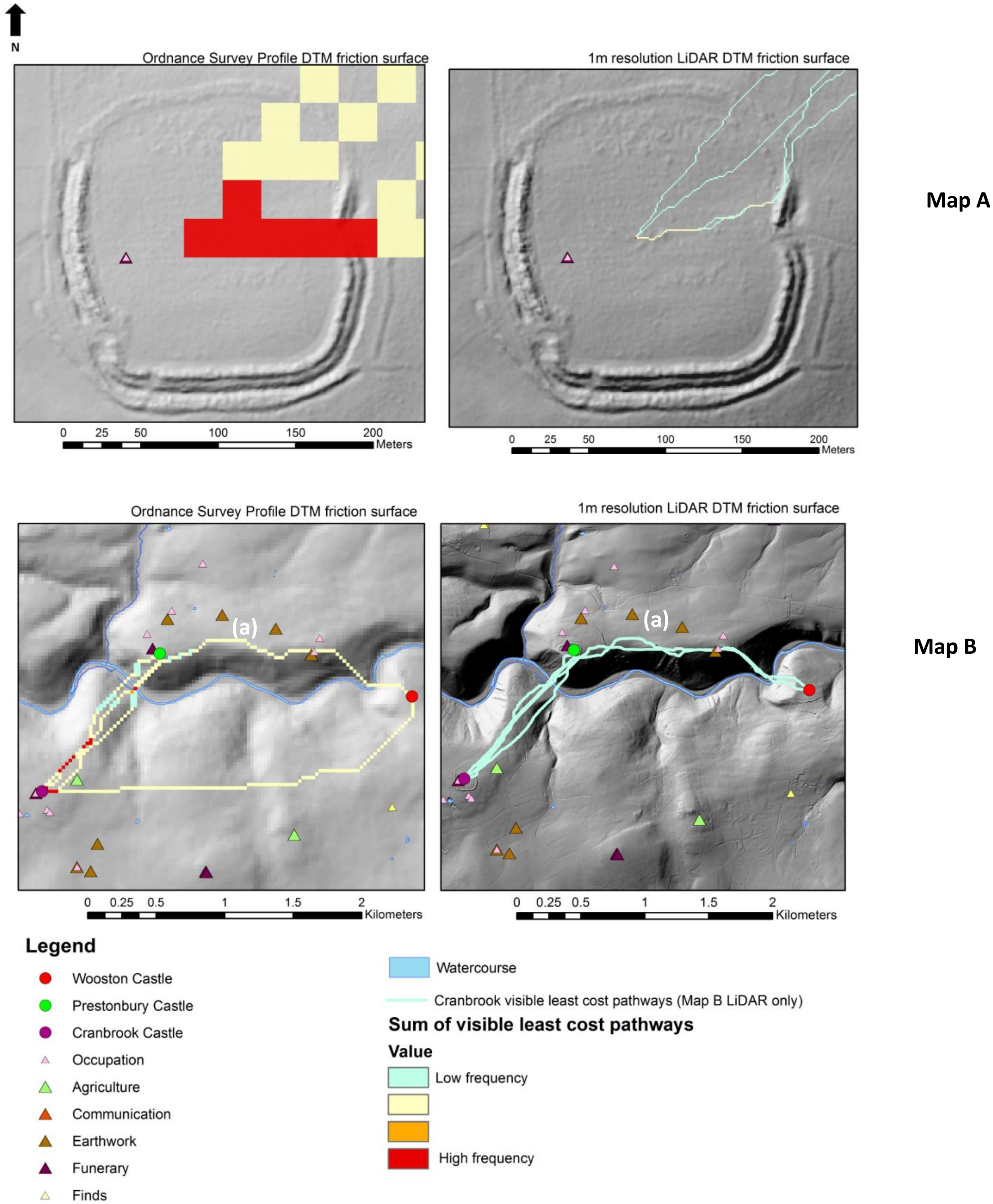
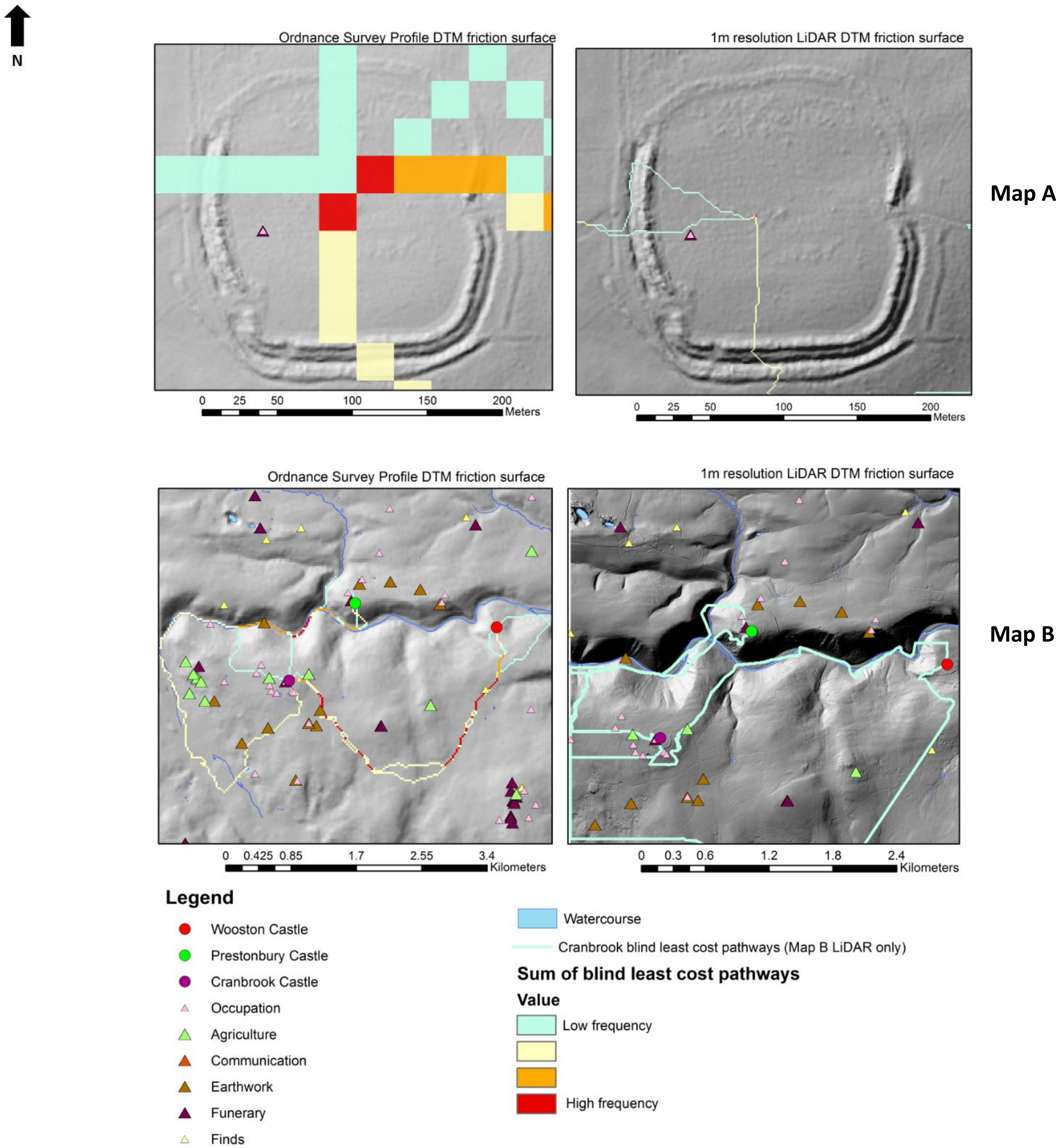


Figure 83. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Cranbrook Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)



Concluding site summary

Cranbrook Castle is not unfinished, the field and aerial evidence all indicate that the circuit of this site was complete, but is preserved to varying degrees. It was constructed on an established area of territorial importance. The construction of a hillfort on this hilltop physically enclosed an influential place within the landscape. As Lock and others state, hillforts were often "radical re-workings of old sites" (2005, 135) in the case of Cranbrook Castle the construction of a hillfort re-worked an important territorial area which was defined by the reave systems on this hilltop.

Although this location was of some importance, the initial draw of people to this area was not based on visibility as this topographical location is not distinct; its domed shape is not visually prominent or dominant. It does not draw the eye's attention unless one is specifically looking for it and it also fails to provide a directional and influential platform for the construction of a hillfort due to its subtle form. The hillfort was essentially imposed on this place. Cranbrook's morphology is fairly regular, particularly on its eastern and western sides and the uniform nature of this domed hilltop also meant that there was not one part of the site which was more susceptible to easy access from outsiders than others.

Whilst the topographical form of this hilltop does not create a directional platform in the construction of a hillfort, it also fails to direct visual connectivity. The site's visibility of the surrounding landscape is very general with an overall 360˚ view across the landscape, but the visual magnitude of these areas is limited. This generalised visual relationship is mirrored within the visibility of the site from the surrounding landscape as there is not one distinctively visible component. Consequently, there is no evidence for the portrayal of images of strength or grandeur towards its environs at Cranbrook.

The results from cost surface analysis indicate that the entrances to this site were both placed at its most accessible points. The eastern entrance was also positioned in an area which has a high correlation with the visible pathways. By definition these pathways follow a route which is most visible from the hillfort. Even though there are no strictly morphologically defined correct pathways into the site in terms of a complex entrance passageway, the entrances were placed in relation to the most accessible routes into the site. These formed a natural yet morphologically enhanced ‘correct pathway’.

Cranbrook Castle is not overtly distinctive or prominent within its immediate environs. Neither the position nor the morphology of Cranbrook Castle is visually or physically imposing. The act of constructing Cranbrook at this site physically marked and preserved an established site of importance, it did not dominate it.

Wooston Castle

Site introduction

To the east of Cranbrook lies Wooston Castle, at 200m OD with a main inner enclosure of 2ha (Forde-Johnston 1976, 206). Several argued that this site was a multiple enclosure hillfort (Forde-Johnston 1976; Fox 1996, 57) and it was also suggested that it consisted of several zones which were delineated by banks (Historic England 2015b). However, there is no confirmed evidence that these earthworks formed several complete enclosures and only the innermost bank constitutes a proportion of a complete enclosure; the inner enclosure (Quinnell, Griffith et al. 2013, 12).

The site’s three outer cross banks face uphill, and define the slopes of the spur (Forde-Johnston 1976, 206) (Figure 84) with the second short section of bank positioned either side of an in-turned entrance which adjoins a hollow way running between the second and third banks (Quinnell, Griffith et al. 2013). A hollow way also potentially ran between the third and fourth bank, this is believed to have been formed by the continuation of the eastern sector of the third ramparts downwards in a northerly direction towards the inner enclosure (Quinnell, Griffith et al. 2013).

It has been suggested that the hollow way, the main enclosure, and versions of the outworks represent the initial phase which is dated on a morphological basis to between the 2nd and 1st century BC (Historic England 2015b). However, the slight eastern bank of the main enclosure cuts into the main bank implying that the completion of this enclosure was secondary to the construction of the bank (Quinnell, Griffith et al. 2013; Historic England 2015b). The poor survival of the eastern bank in comparison to the remainder of the enclosure and its associated earthworks indicates that the effort applied to the construction of this area was less than that exerted upon the remainder of the site.

The site's three outer cross banks face uphill, and define the slopes of the spur (Forde-Johnston 1976, 206) (Figure 84) with the second short section of bank positioned either side of an in-turned entrance which adjoins a hollow way running between the second and third banks (Quinnell, Griffith et al. 2013). A hollow way also potentially ran between the third and fourth bank, this is believed to have been formed by the continuation of the eastern sector of the third ramparts downwards in a northerly direction towards the inner enclosure (Quinnell, Griffith et al. 2013).

Physical relationship of the hillfort morphology and location with the landscape topography

Located on a spur of the Teign Valley, the principal shape of the main enclosure is defined by the topography (Figure 84) although the site's outer banks do not adhere to it. In particular, the third rampart is longer than the other outworks and its course does not follow the line of the topography, like the other outworks, it abruptly stops with a disregard to it. Whilst the site's morphology fails to distinctively correspond with the topography, there is also a lack of evidence for the morphology responding to the topographical variation of this point in the landscape. However, the inner most bank and ditch are the site's most prominent aspect forming the southern perimeter to the main inner enclosure; they acted as a boundary between the activities within this enclosure and those outside of it.

The site's outworks also face uphill, and alongside the hollow way, lined the route into the site which overlooks Wooston Castle. The act of elaborating this route may have been a response to a topographically weak point of the site. Quinnel and others highlighted that the term hollow way implied that it was a track that had been worn into the landscape over time, however they argue that due to the depth of the feature, it is likely that it was partially dug out in prehistory (2013, 12). This hollow way formalised and elaborated movement into the site, although visibility is restricted from within the hollow way (Figure 85-86) which enhanced, and further controlled entry to the site. The restriction of visibility from the hollow way is accentuated by the slope of the land to the north and the curved nature of the hollow way which if straight and on less of a slope, would not be as restricted. The accentuation of the southern outworks to this site and the hollow way could have been a response to this topographically susceptible area, although the wide-spacing of the outworks implies that they could not be defensive and that they were a symbolic response to the topography.

Figure 84. 1m resolution LiDAR hillshade model of Wooston Castle, overlain by contours and watercourses (© Environment Agency copyright and/or database right 2015. All rights reserved.)

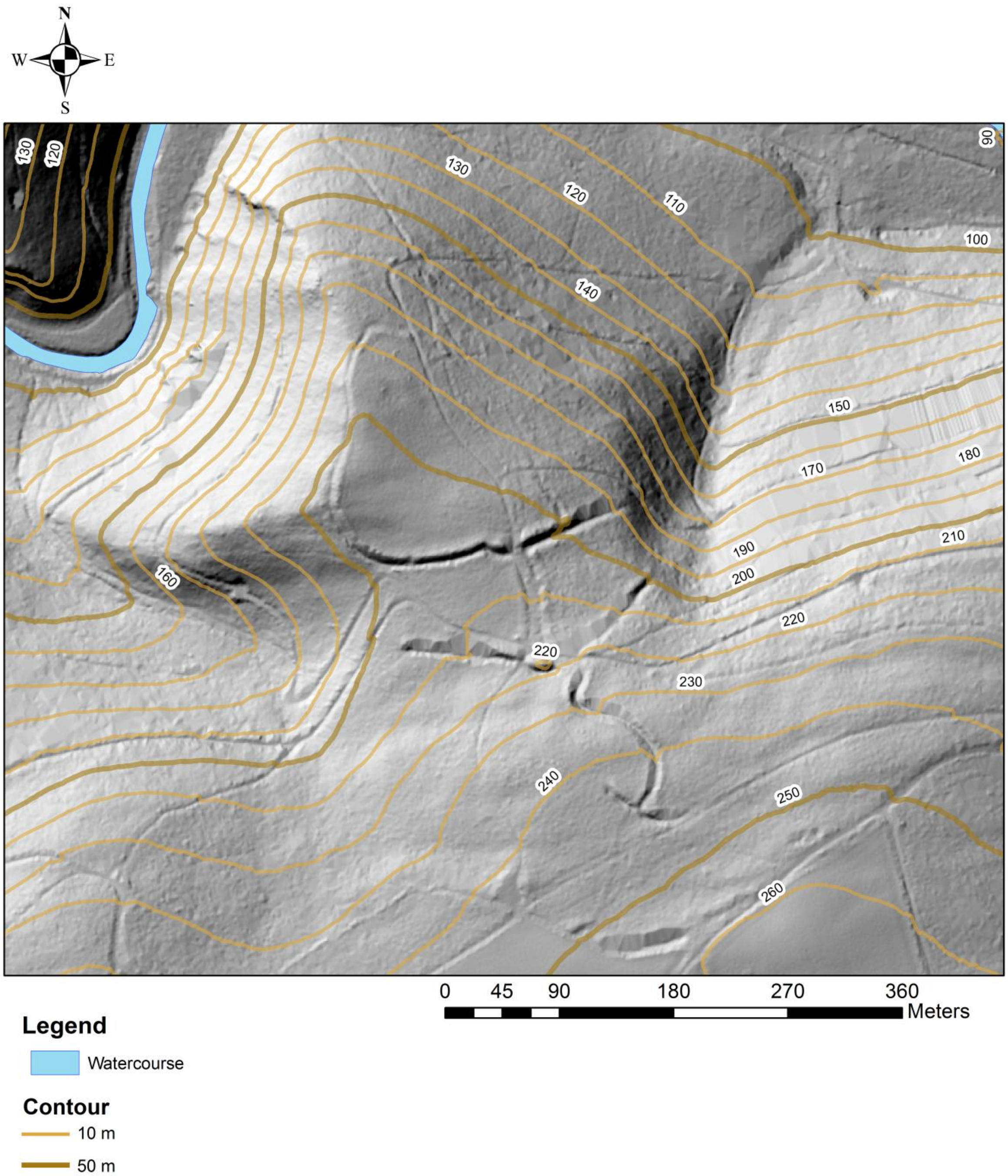


Figure 85. Field photograph from within the hollow way at Wooston Castle (Author's own 2014)

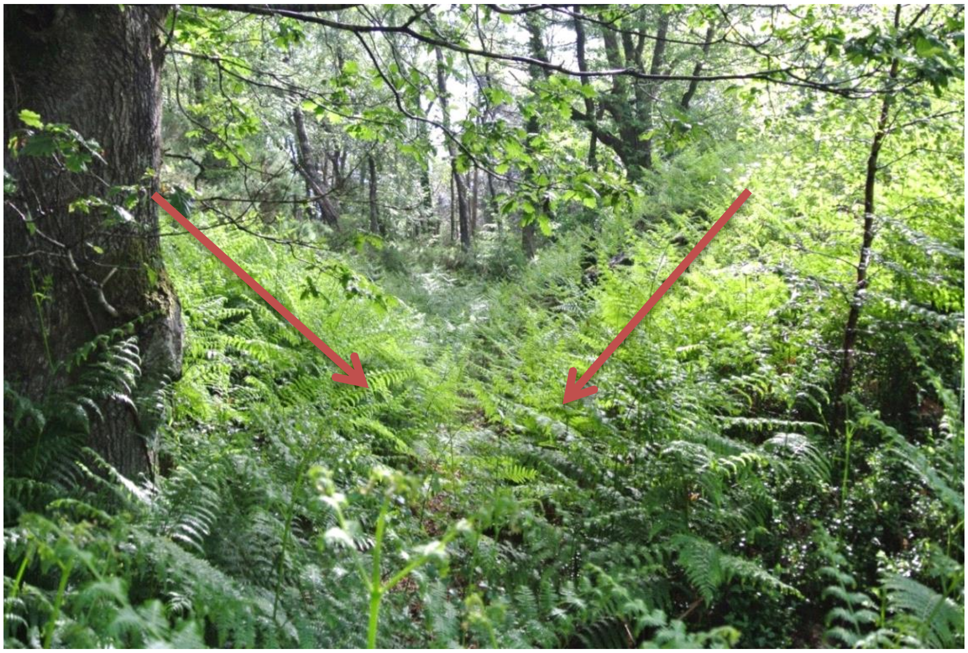
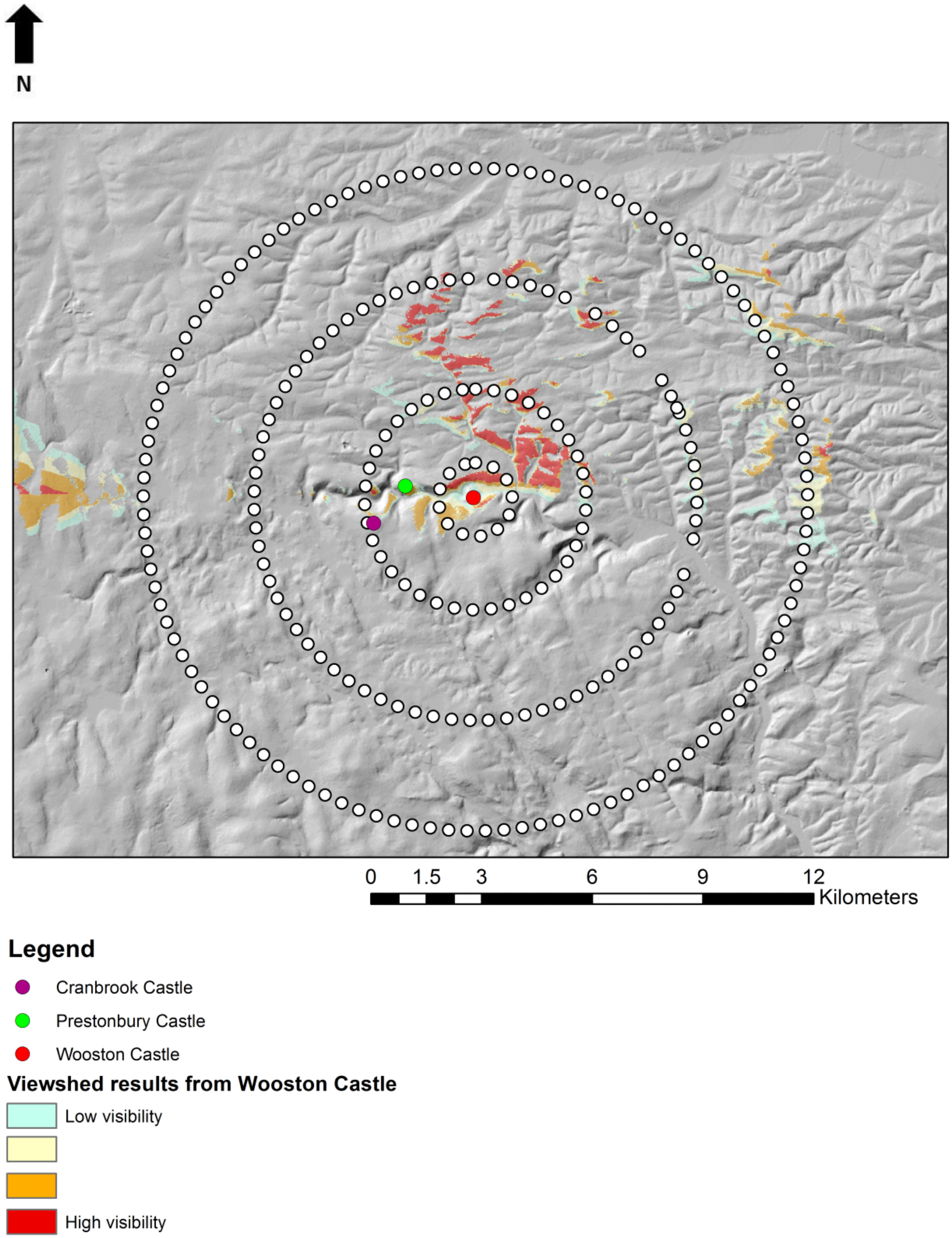


Figure 86. Visibility from within the hollow way towards the north (Author's own 2014)

Whilst the topographic position of the site meant that it was susceptible to people overlooking from the south, it also affects the visibility of the landscape from the site which has very limited visibility of the surrounding landscape (Figure 87). Visibility is primarily restricted to areas to the north with intermittent visibility to the east and west. The site has greatest visibility to the areas within the 1km radius with the majority of this area visible apart from the south-east. Visibility is restricted beyond the 1km radius, only scattered areas of the northern and western area of the 3km radius are visible and only the northern area of the 6km radius and a very small aspect of the eastern area within the 9km radius are visible.

Figure 87. Results of viewshed analysis from the hillfort grid, depicting the visibility of the surrounding landscape from Wooston Castle (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)



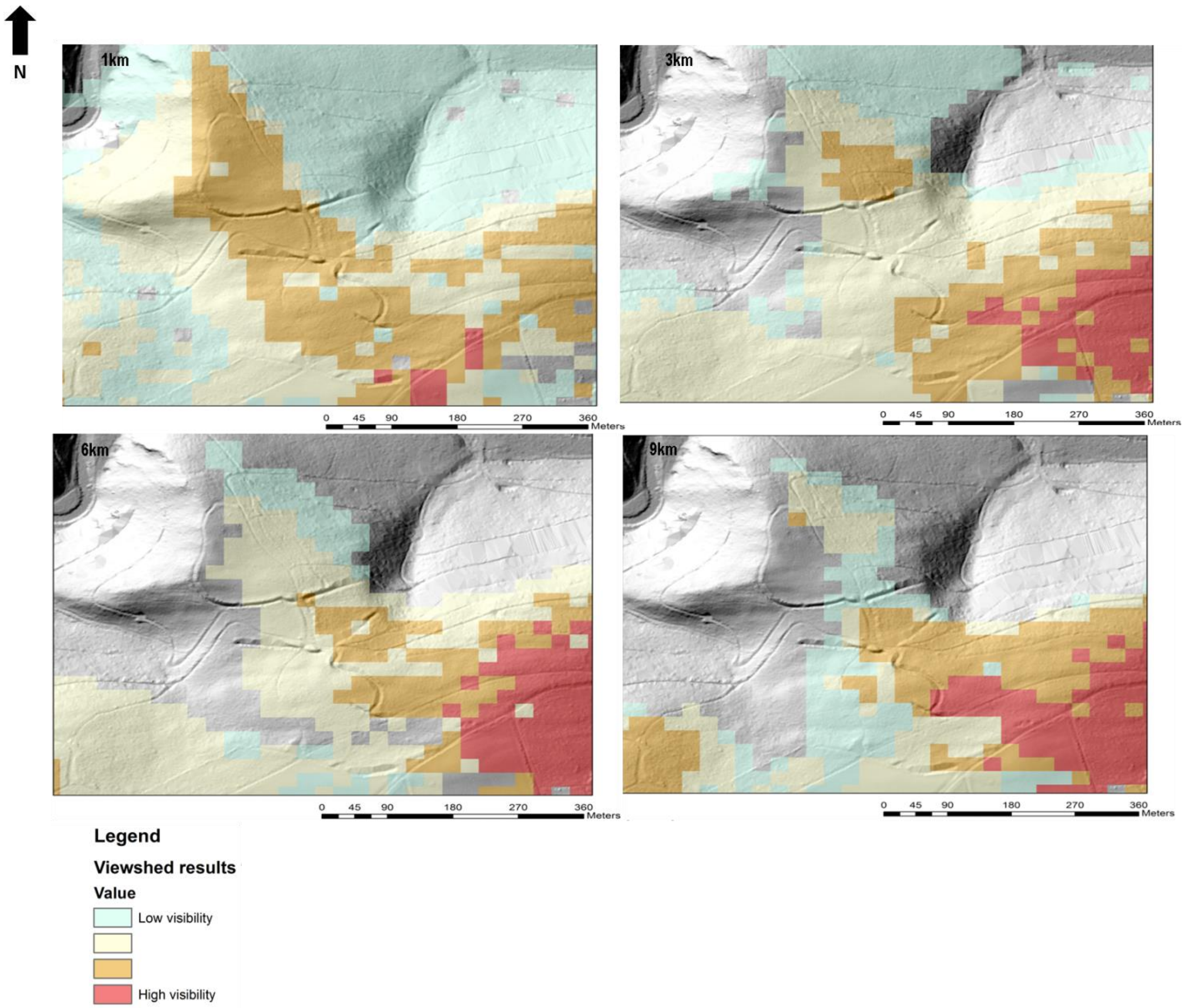
Image

The highly wooded nature of Wooston Castle and the land which surrounds it meant that it was not possible to verify the results of viewshed analysis in the field. Consequently, they provide a valuable insight into the changing visual accessibility of this site as distance from the site changes. For example, from the 1km radius there is visual accessibility to the entire hillfort including its enclosing works and the hollow way (Figure 88). The western aspect of the site and the hollow way are the site's most visible aspects as they have a visual magnitude of between the 50^{th} and 74^{th} percentile while the remainder of the site is of low visibility with a value within the lower quartile range.

The overall visibility of the site decreases from the 3km radius (Figure 88). The site's western aspect is largely not visible; the western areas that are visible are of low visibility. The remainder of the site is of variable visibility, this has values of visual magnitude ranging from the 25^{th} percentile to the 74^{th}. The most visible aspects of the site are the southern terminus of the hollow way and the south-eastern area of the main hillfort enclosure.

There is limited change in the visibility of the site between the 3km and 6km radii (Figure 88) with the site's western aspect not visible, whilst the southern terminus of the hollow way remains to be one of the most visible parts. The remainder of the site is of relatively low visibility with values of visual magnitude ranging from the 1^{st} and 49^{th} percentile.

Figure 88. Results of viewshed analysis from the radii towards Wooston Castle depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)



The site's visibility decreases between the 6km and 9km radii (Figure 88). From 9km the majority of the western and central area of the site is not visible, with the most visually accessible aspect being the hollow way, particularly its southern terminus which is of moderate to high visibility. The visibility of the interior of the main enclosure is highly variable with a visual magnitude ranging from the 1st percentile to the 49th.

The visibility of the site from the neighbouring hillforts is also highly variable, for example from Cranbrook Castle it is limited. The Ordnance Survey PROFILE DTM indicates that only the southern aspect of the hollow way and the northern corner of the site are visible with a visual magnitude within the lower quartile range (Figure 89). The 1m DTM also indicates that the site is of low visibility, but these results imply that the entire hollow way and the western bank are visible.

The visual magnitude of the visible areas increases from Prestonbury (Figure 90) with the most visible aspect being the southern portion of the hollow way which is of high visibility, this is largely supported by both DTM friction surfaces. The remainder of the visible areas have a visual magnitude between the 25th and 74th percentile. Both of the DTM's indicate that the visible area is confined to the western portion of the site (including the hollow way); however the higher resolution DTM indicates that visibility into the site is restricted.

Cost surface analysis shows that this site portrays a very fragmented image out towards the surrounding landscape. Nowhere between Wooston Castle and the neighbouring hillforts does the site portray a 'complete' image to the surrounding landscape (Figure 91-92). The hollow way is mostly visible from the northern valley side of the Teign river valley, whereas the remainder of the site is visible from the land to the south side. The paths which have maximum visibility to the hollow way also interact with later prehistoric enclosures.

Figure 89. Results of viewshed analysis from Cranbrook Castle towards Wooston Castle depicting the visibility of the site using both the Ordnance Survey and LiDAR friction surfaces (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

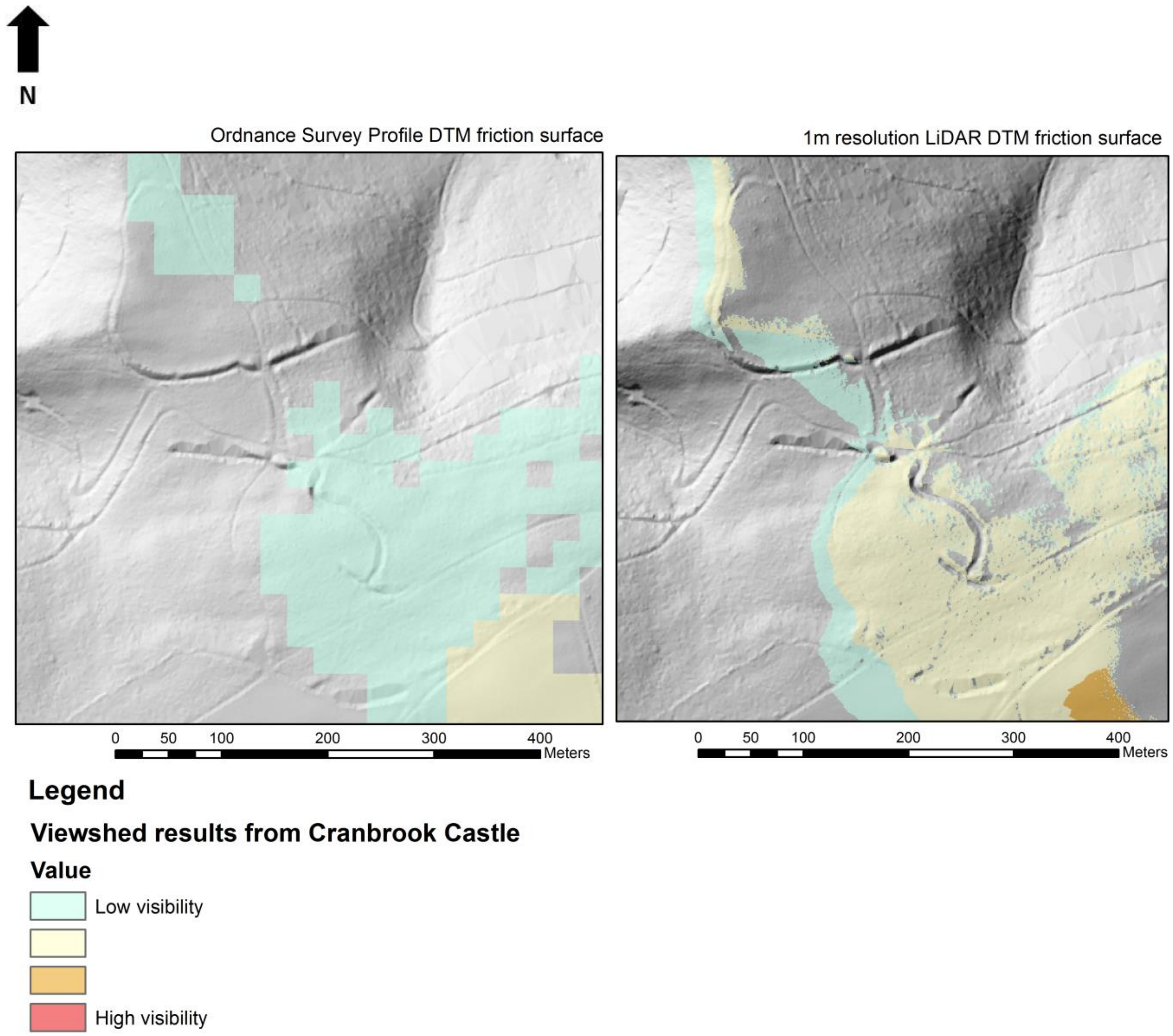


Figure 90. Results of viewshed analysis from Prestonbury Castle towards Wooston Castle depicting the visibility of the site using both the Ordnance Survey and LiDAR friction surfaces (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

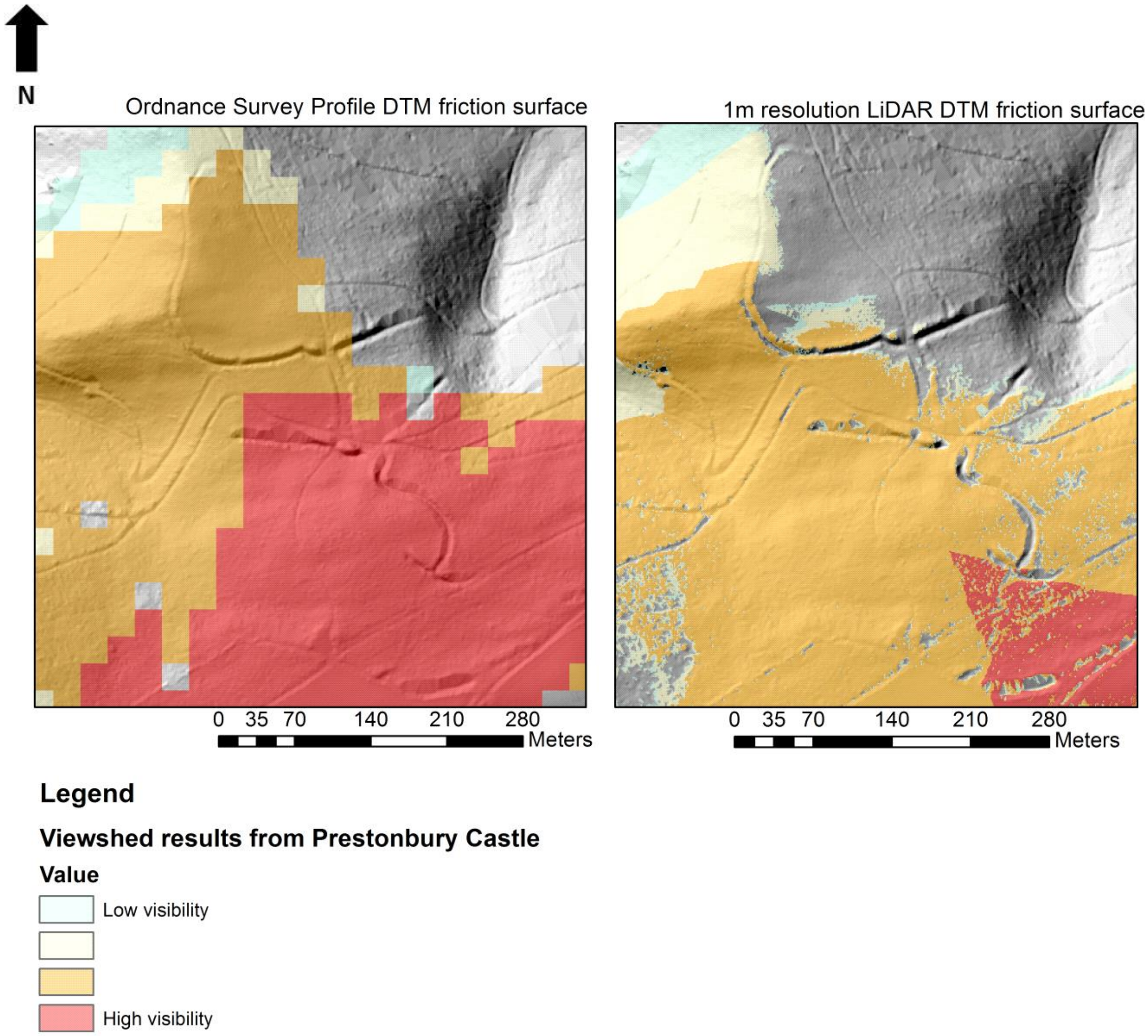


Figure 91. Results of cost surface analysis highlighting the routes where Wooston Castle's enclosing works are most visible from Prestonbury Castle overlain by watercourses and HER data

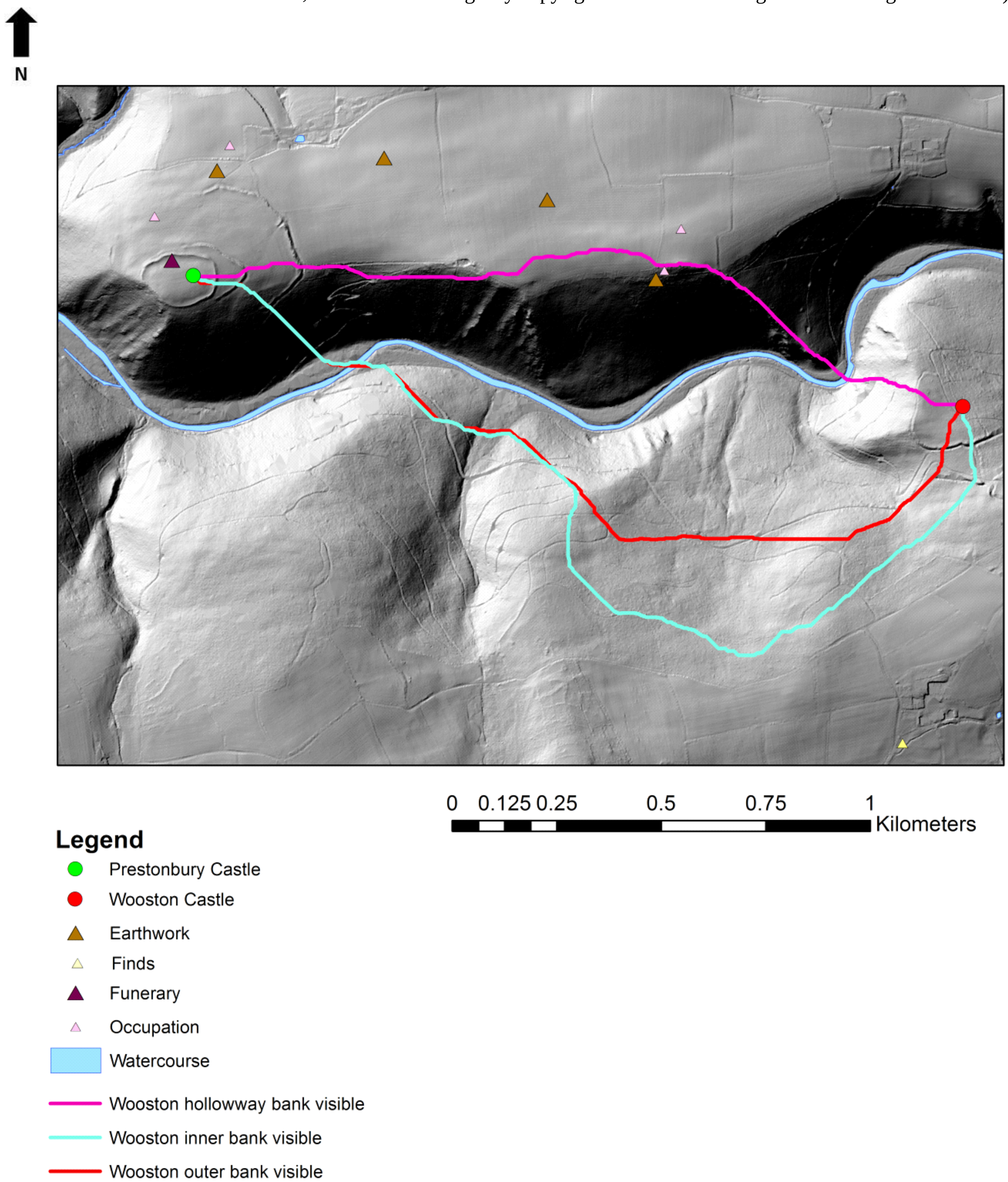
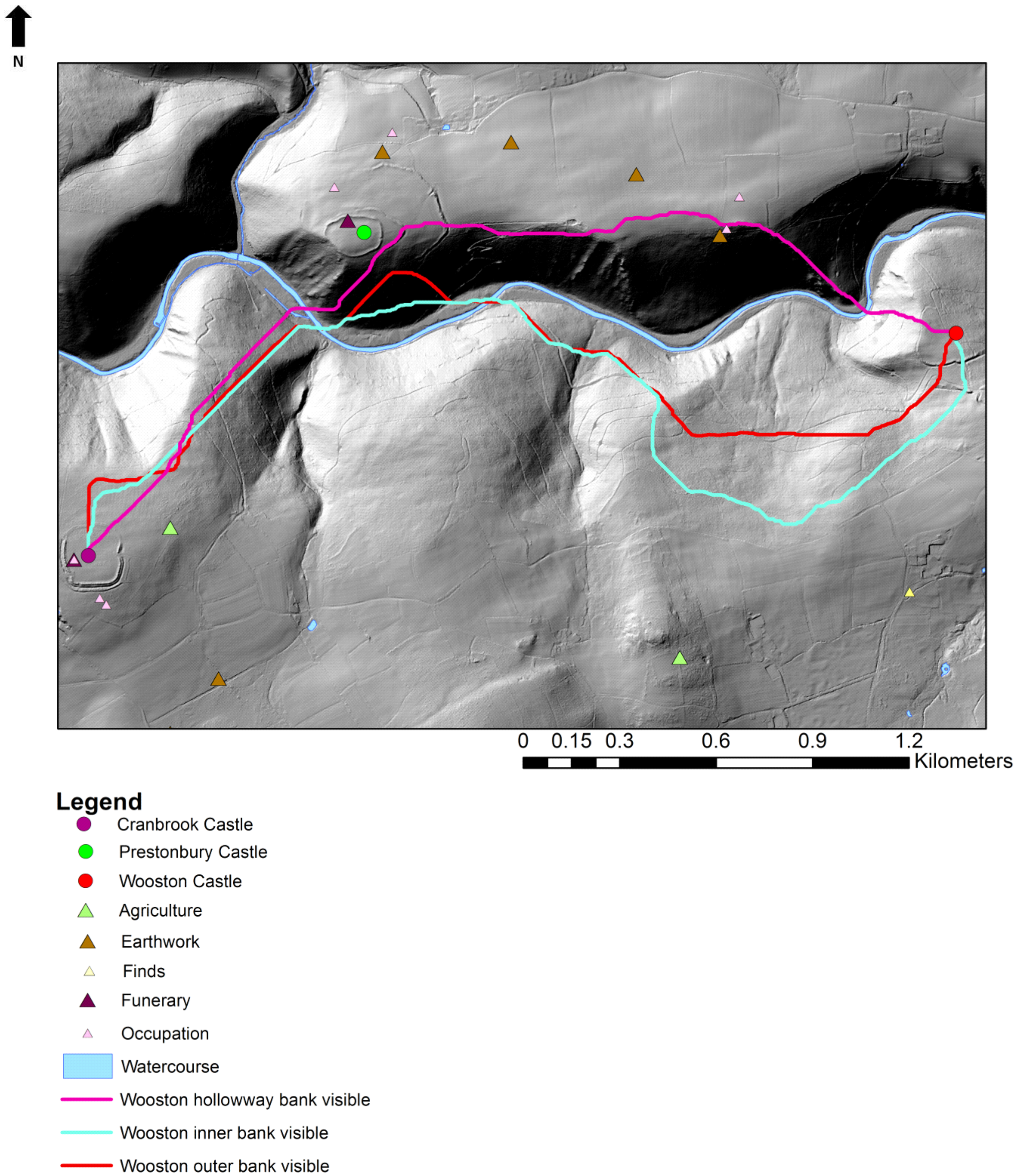


Figure 92. Results of cost surface analysis highlighting the routes where Wooston Castle's enclosing works are most visible from Cranbrook Castle overlain by watercourses and HER data (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)



Correct pathways

Whilst the hollow way is the most visible aspect of the site despite it restricting visibility out, it is also situated in one of the site's most accessible areas. This is the north-eastern corner as 115 pathways interact with this area, however this is closely followed by the southern area which coincides with 108 pathways (Figure 93). The results of the Ordnance Survey based cost surface analysis is supported by those from the LiDAR based analysis as 2 out of the 4 pathways also intersect with this area. This implies that the southern entrance was placed in one of the most accessible areas, potentially to aid access into the site. This entrance also corresponds with the visible pathways according to the Ordnance Survey Profile DTM as 4 out of the 8 pathways intersect with this area (Figure 94), which implies that here traffic was most visible to those within the site. However the LiDAR based DTM implies that the north-eastern corner is the most visible entry point to the site but these pathways do not have one single entry point. There is no distinct correlation of the blind pathways with morphological components to this site (Figure 95).

Several least cost-pathways also correspond with other activity within this landscape. For example, the slope-based pathways between Wooston Castle and Cranbrook travel past two possible Bronze Age enclosures MDV27964 (Figure 93) (**a**). These enclosures are to the south-east of Cranbrook. All of the LiDAR derived visible pathways and a number of the PROFILE DTM visible pathways travel past two ovoid enclosures (MDV26738 and MDV26739) and a bank (MDV26742) on the northern valley edge of the Teign (**a**) (Figure 94).

Figure 93. Results of slope based cost surface analysis to and from Wooston Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)

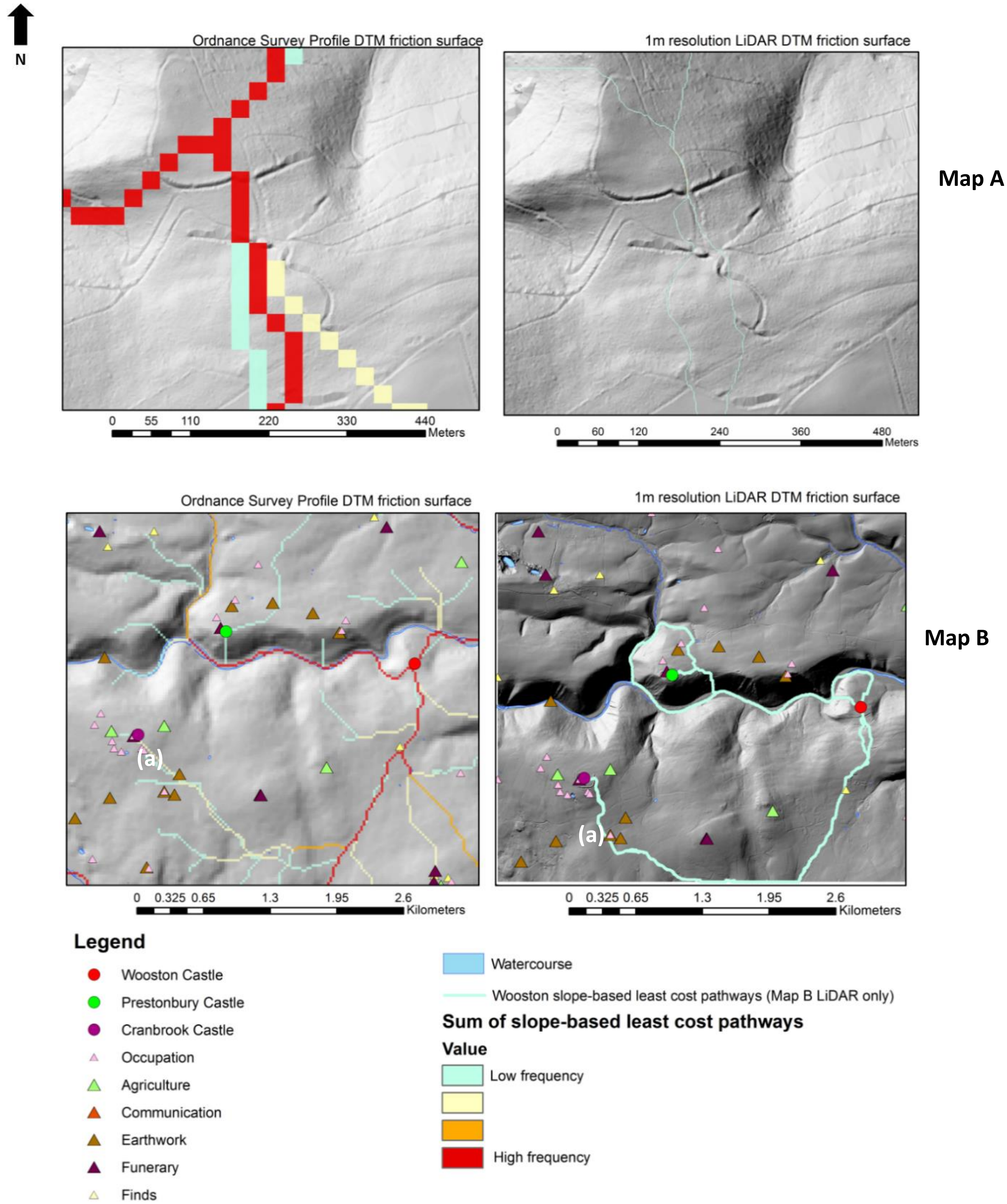


Figure 94. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Wooston Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)

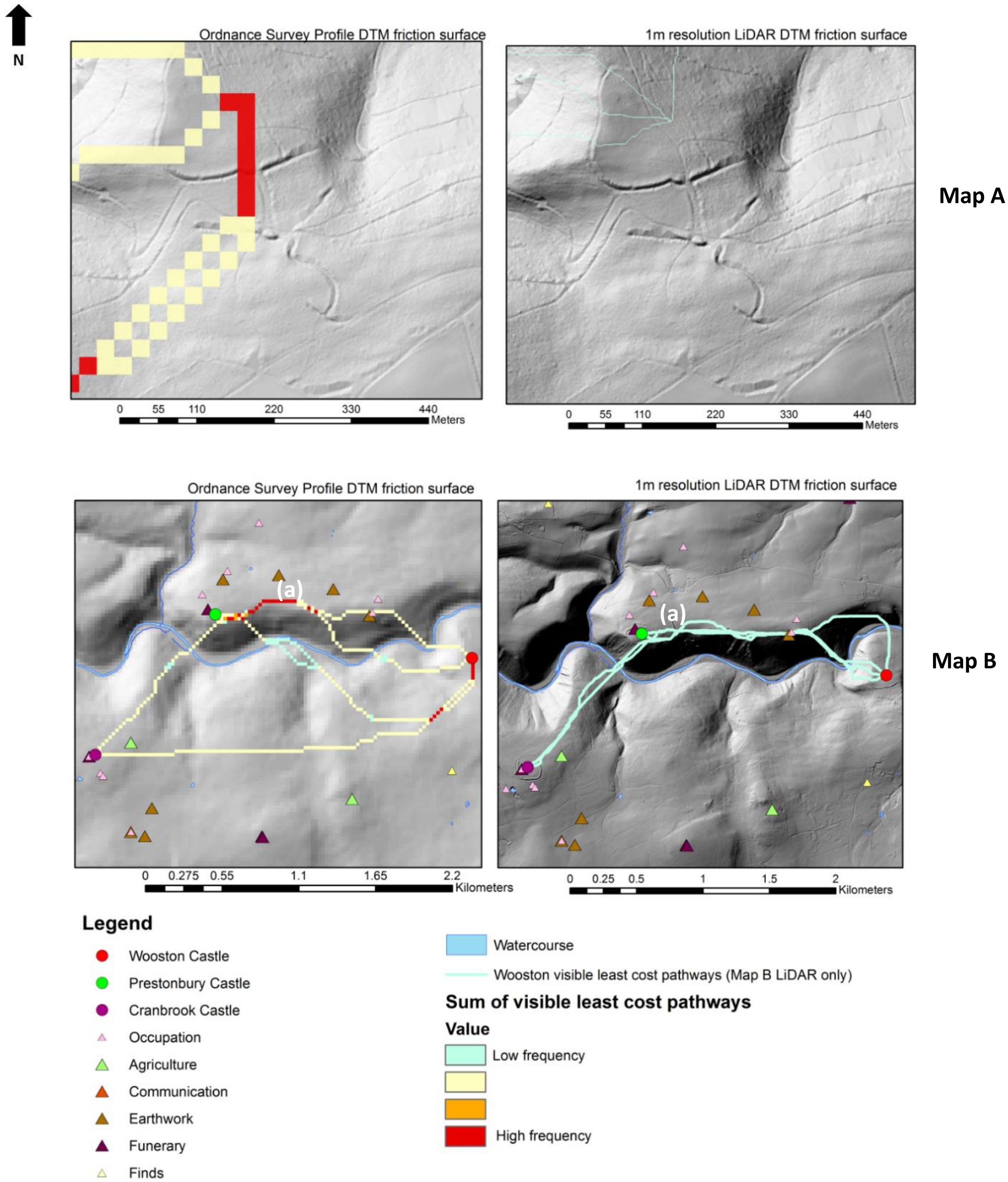
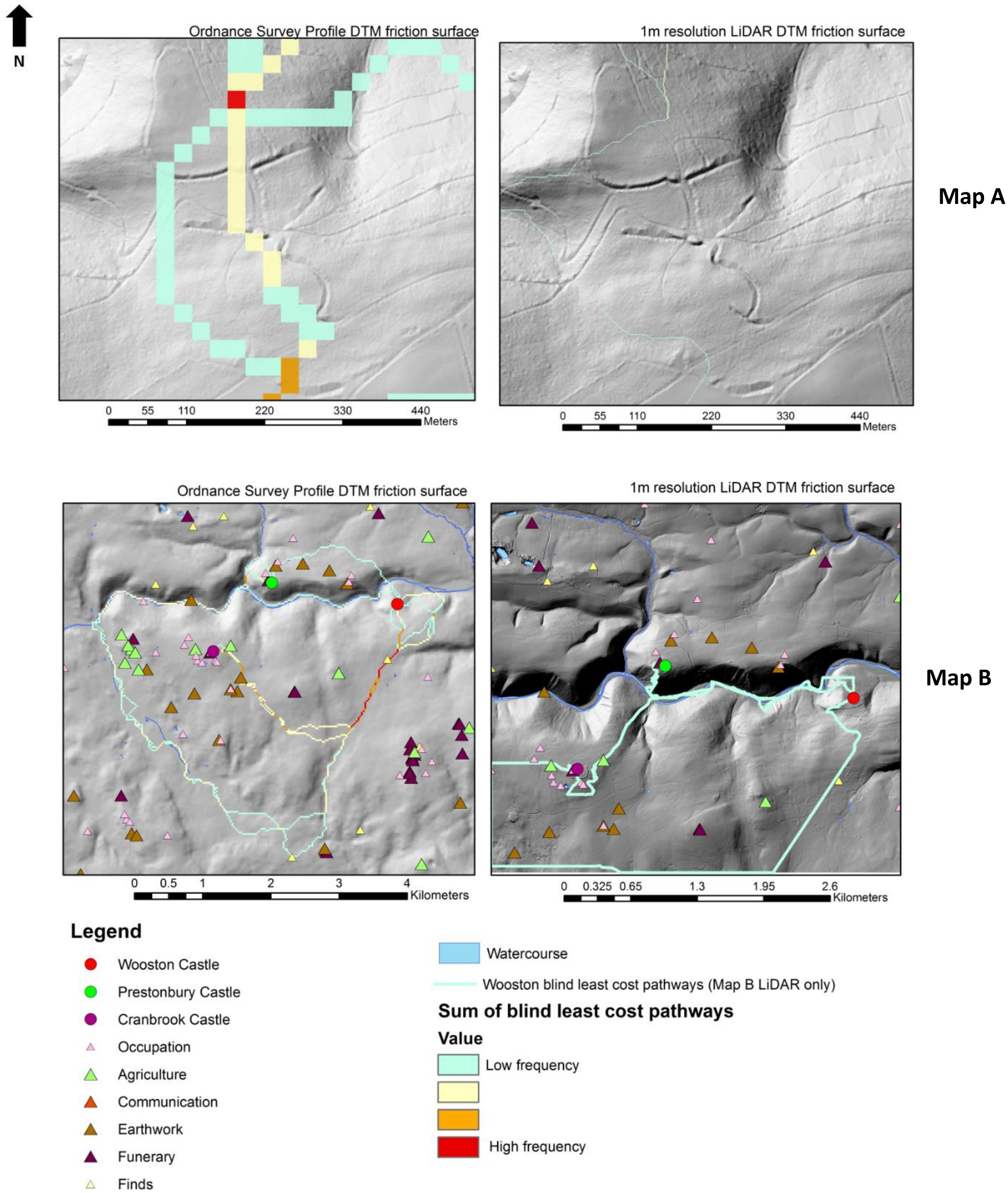


Figure 95. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Wooston Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)



Concluding site summary

Wooston Castle remains a poorly understood site due to its afforestation and although it could not be investigated in the field to the same extent as the other sites, the GIS based analysis coupled with LiDAR data gave a valuable insight into what was not distinguishable in the field.

The most prominent surviving architectural component of the site is the innermost southern bank, which flanks its inner entrance and is situated downslope from the hollow way. The northward sloping nature of the site enhances the visibility of the Teign Valley but it also increases the site's topographical vulnerability from the upland area to the south.

The topographical position of Wooston also meant that the site itself is not very visible with the hollow way being the most visible aspect although it restricts visibility from within it. This hollow way monumentalised movement to and from the site, by formalising movement into and out of it the hollow way formed a 'correct pathway'. This was not only a physically constructed 'correct pathway' it also related to the easiest route into the site, as defined by the results of slope based cost surface analysis.

Although the hollow way formalised and controlled movement, it was not fundamental in the use of the site, it was a symbolic component. This dualism between functional necessity and symbolism can also be seen at the eastern half of the site where there is very limited survival of an enclosing bank, which one would expect to be a fundamental component to the site. The poor survival of this bank implies that it was potentially not as big as the remainder of the enclosing banks suggesting that not as much effort was put into this area. Effort was disproportionately applied to symbolic areas such as the hollow way whilst functionally important components, in the case of the eastern enclosing banks were seemingly neglected.

Wooston Castle as a whole entity is not effective in defending an area and the enclosure itself also fails to be extensively visible from the surrounding landscape, consequently it does not outwardly portray any image. The monumentalisation of a route with the construction of a hollow way towards this non-imposing site creates expectations of grandeur. These could never be fulfilled by the location and form of a site like Wooston Castle due to outsiders having to travel down to the level of the site of Wooston Castle and its inhabitants.

Prestonbury Castle

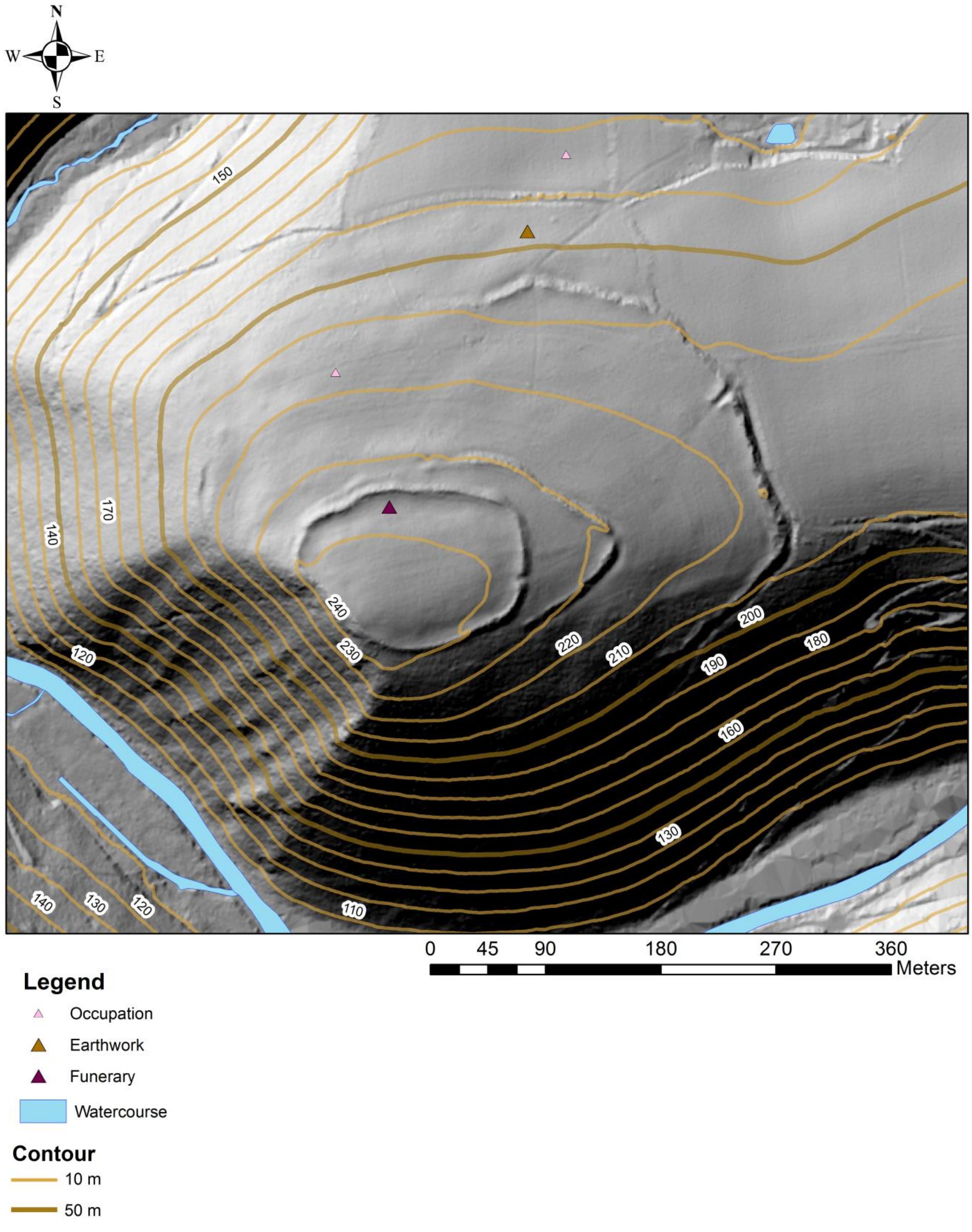
Site introduction

Prestonbury Castle is situated at 241m OD and overlooks the gorge of the River Teign. Newman argues that this site should not be termed a hillfort, but instead a 'multiple-enclosure- fort' because the banks that surround it lack both substance and a ditch (2011, 95) (Figure 96). According to Greeves and the HER record it comprises of an inner and an outer enclosure (Greeves 1985; Dartmoor National Park Historic Environment Record 2013).

Prestonbury potentially has three enclosures (inner, middle and outer), and this interpretation was hinted at by Historic England who argue that the outer enclosure bank may never have been finished (2015c). This outer earthwork is a single curving cross bank which adds another 4.8ha to the hillfort enclosure and delineated the outer enclosure (Historic England 2015c). The inner two enclosures enclose 1 ha (inner) and 0.8ha (middle) (Forde-Johnston 1976, 188). The hillfort has multiple entrances which reflect its multiple enclosures with the inner having an entrance in the east and west (Historic England 2015c). The middle enclosure's entrance is also in the east, and the outer enclosure's entrance is in the north-east (*ibid* 2015c). The inner and middle entrances are simple gaps whilst the outer entrance in the north-east is inturned (Forde-Johnston 1976, 221).

Within and around the site are a number of other archaeological features, one of which is a bank (MDV26751) to the north of the outer enclosure bank (Figure 96), dated very broadly to between the Lower Palaeolithic and the Late Medieval period. The remainder of the features on this hilltop are broadly dated to between 2200BC and 701 BC. These include a possible enclosure (MDV26750) to the west of the outer bank and within the unfinished area of the outer enclosure of the hillfort. Other possible evidence for occupation activity includes a hut circle (MDV26743).

Figure 96. 1m resolution LiDAR hillshade model of Prestonbury Castle, overlain by contours, HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)



Physical relationship of the hillfort morphology and location with the landscape topography

Prestonbury is situated on the edge of the valley junction of the River Teign, extending to the edge of the valley side to the south and west whilst to the north it follows the extent and form of the hilltop (Figure 96). On the eastern side of the site the hillfort's outer bank cuts across the land to enclose and define the hillfort's perimeter. This perimeter bank is the most physically prominent bank of those enclosing the site and faces Broadmoor Common which overlooks Prestonbury Castle. This bank does not restrict visibility into the interior due to the topography of the land which slopes up towards the west (Figure 97) so that the presence of a timber palisade on top of any of the banks would not have significantly hindered visibility into the site.

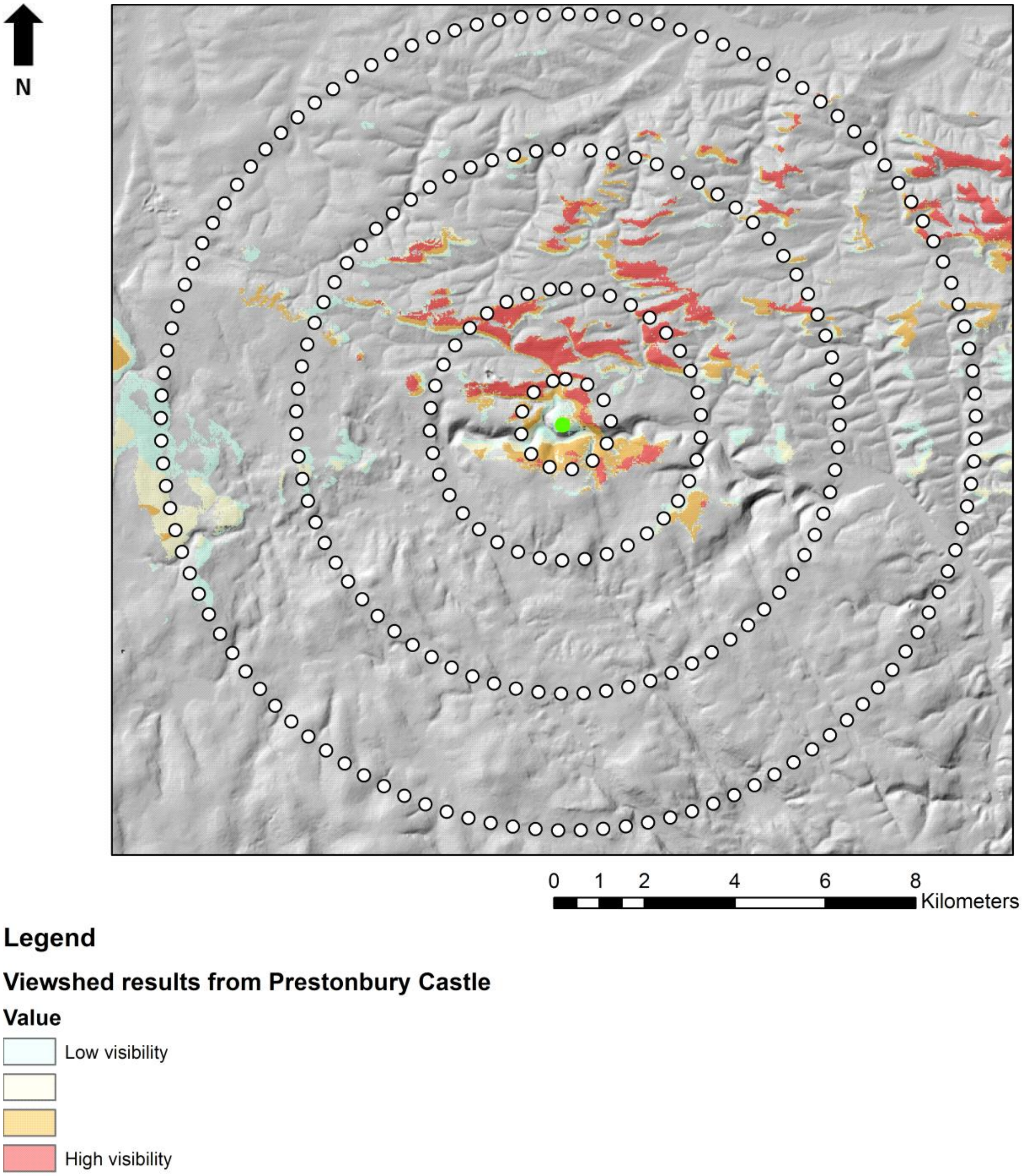
Figure 97. View of Prestonbury from Broadmoor Common (Author's own 2013)

As the slope of the land surrounding this site increases at the valley edge, the degree to which artificially constructed banks enclose it decreases so that on the western side only the inner enclosure bank joins the valley edge, here the valley side forms the site's perimeter. There is, however, a trace of a ditch which is in line with the outer bank and close to the edge of the gorge in the west although the lack of evidence for a ditch anywhere else on the outer line of this site meant that this observation needs to be taken with caution. In the south, the inner enclosure's bank continues along the valley edge to define its perimeter whilst the bank of the middle enclosure does not, nor does the outer enclosure; instead it travels c.122m down the valley slopes.

This evidence demonstrates that to varying degrees this site's morphology responds to the topography. It superficially and symbolically counteracts the susceptibility of the site in the east whilst it utilises and enhances the natural defensibility of the topography in the south and west.

The hillfort's topographical position also affects the visibility of the surrounding landscape from the site. The GIS-based viewshed analysis from the hillfort grid demonstrates that the majority of the 1km buffer zone is visible from the site (Figure 98). The majority of the northern area of the 3km radius is visible with only scatterings of the east and west, and areas to the south are not visible. Visibility decreases with distance in relation to the 6km and 9km radii with only scattered areas of the north visible to the 6km radius and to the 9km radius only a limited area to the west and north-east are visible.

Figure 98. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Prestonbury Castle as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Image

Prestonbury Castle's visibility is highly variable with changes in distance and observer location. From the 1km radius the inner enclosure and the north-western aspect of the middle and outer enclosure are the most visible areas of the site (Figure 99). The outer entrance is not visible from 1km radius. The remainder of the site is of moderately high visibility and has a visual magnitude between the 50th and 74th percentile. Viewpoint 1 is situated within the 1km radius and a photograph was taken en route from Cranbrook to Prestonbury whilst descending the valley sides. This shows that the visibility of the hillfort was highly restricted by the height of the valley side and the steepness of the valley slope (Figure 100). None of the earthworks which enclose the site are clearly discernible. Similarly none of the interior except the south-easterly aspects of the inner and middle enclosure are visible (Figure 101). Viewpoint 5 is also in the 1km radius and this has a high degree of visual accessibility to Prestonbury and its enclosing works (Figures 102).

The overall visibility of Prestonbury decreases between the 1km and 3km radii, with the southern aspect of the site being predominantly not visible whilst the remainder of the site is (Figure 99). The visible areas vary in visual magnitude ranging from the 1st percentile to the 74th. The least visible aspect is the site's north-western edge, which is defined by the valley side. Viewpoint 4 is 1.9km from the site and from this area a large proportion of the site's northern aspect is visible (Figure 103). All of the northern banks are visible, however they are not visually prominent, and they appear more as a delineation of space.

Figure 99. Results of viewshed analysis from the radii towards Prestonbury Castle depicting the visibility of the site when using the Ordnance Survey DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

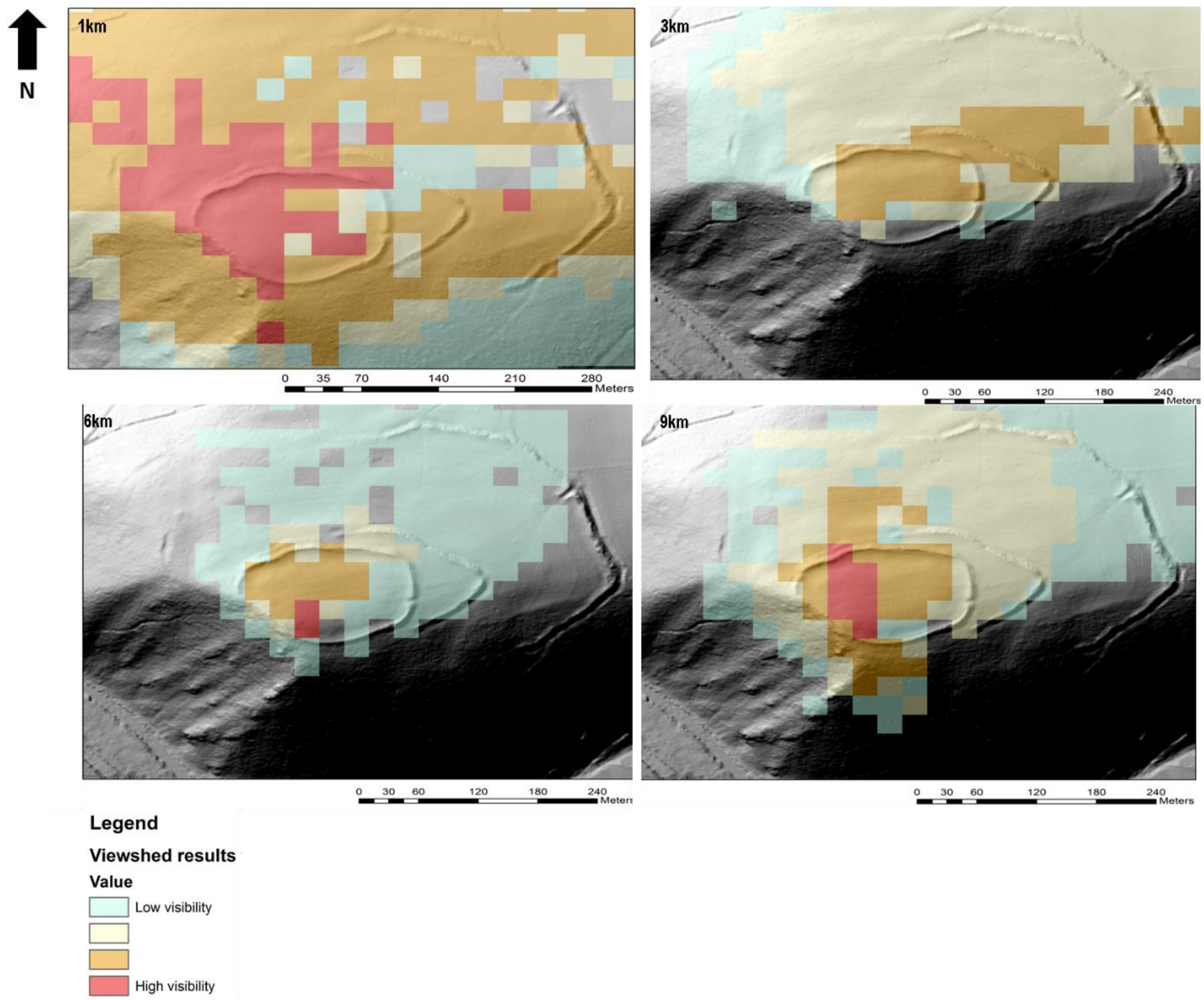


Figure 100. Location map of Viewpoints (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

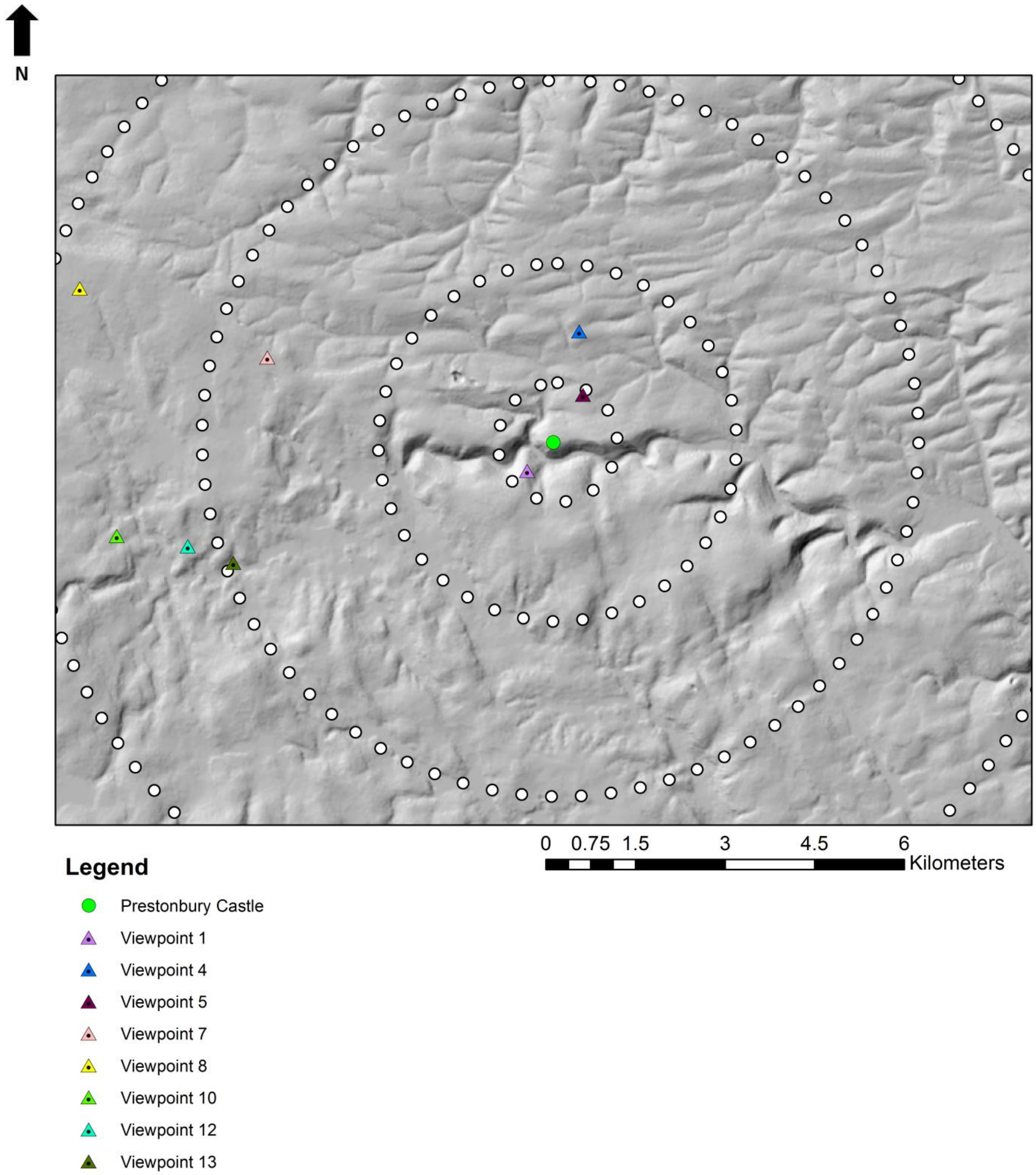


Figure 101. View of Prestonbury from Viewpoint 1, 646m to the south- east of the site (Author's own 2014)

Figure 102. View of Prestonbury from Viewpoint 5, 943m to the north-east of the site (Author's own 2014)

Figure 103. View of Prestonbury from Viewpoint 4, 1.9km to the north-east of the site (Author's own 2014)

The visibility of Prestonbury continues to decrease from the 6km radius as the central area of the site is its primarily visible area with a visual magnitude within the upper percentile range, the remainder of the site is of low visibility (Figure 99). The high visibility of the central area of the site particularly the inner enclosure is supported by the photography from Viewpoint 7 located to the north-west of Prestonbury and just shy of the 6km radius. From this point the peak of the inner fort is visible, however visual clarity is poor and the site's enclosing works are not very distinguishable (Figure 104).

Figure 104. View of Prestonbury from Viewpoint 7, 5km to the north-west of the site (Author's own 2014)

The visual accessibility of the site increases beyond the 6km radius to the 9km where the visible area increases, the inner enclosure remaining the most visible aspect (Figure 99). The visibility of the site's northern aspect also increases as it has a visual magnitude between the 25th and 74th percentile although for the remainder of the enclosure it is between the 1st and 49th percentile. The high visibility of the inner fort is supported by the field photography from Viewpoints 10 and 12, which are both situated to the west of the site. From these the peak of the site is clearly visible, however it is difficult to distinguish the morphological components of the site (Figure 105 and 106). Visual clarity towards the site is very poor from Viewpoint 8, which is to the north-west of the site and it is only possible to locate the site due to its position next to the more prominent Cranbrook Castle (Figure 107).

Figure 105. View of Prestonbury from Viewpoint 12. 6.4km to the west of the site (Author's own 2014)

Figure 106. View of Prestonbury from Viewpoint 10, 7.5km to the west of the site (Author's own 2014)

Figure 107. View of Prestonbury from Viewpoint 8, 8.3m to the north-west of the site (Author's own 2014)

The visual accessibility of Prestonbury Castle is also highly variable from the other hillforts within this test area. From Wooston Castle the majority of the southern and eastern aspects of the site are visible (Figure 108) and the most visible aspect is the southern portion of the inner enclosure whilst the least visible is the eastern aspect of the outer enclosure. From Cranbrook Castle the visibility of Prestonbury is limited (Figure 109) with the western and southern aspects the only visible parts of the site although these are of low visibility with a visual magnitude between the 1st and 49th percentile.

Cost surface analysis found that Prestonbury portrayed a relatively complete image to the surrounding landscape as there are several places where there is maximum visibility to its architectural components (Figure 110-111). These pathways do not however strongly coincide with any known contemporary activity to this site.

Figure 108. Results of viewshed analysis from Wooston Castle towards Prestonbury Castle depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

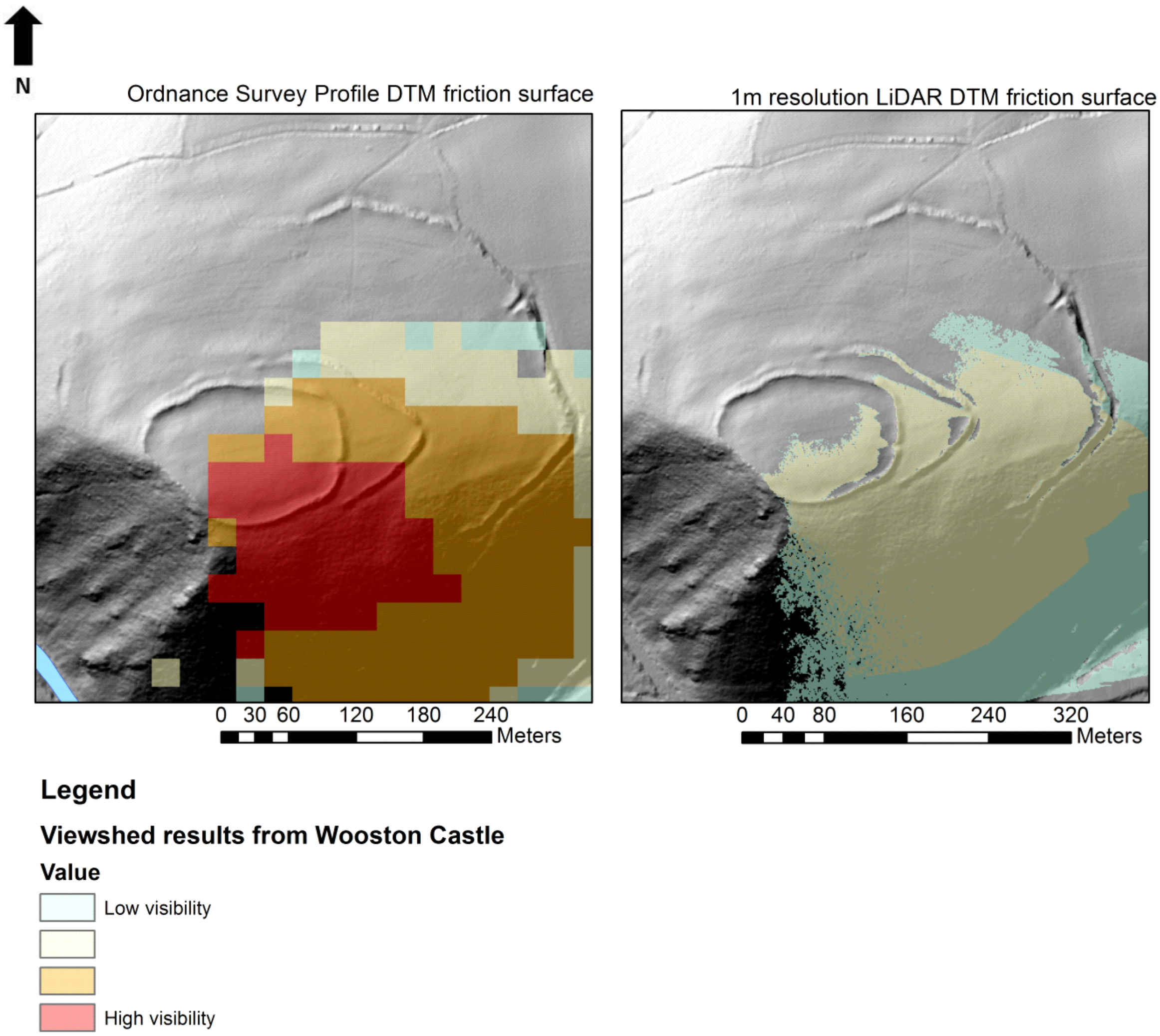


Figure 109. Results of viewshed analysis from Cranbrook Castle towards Prestonbury Castle depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

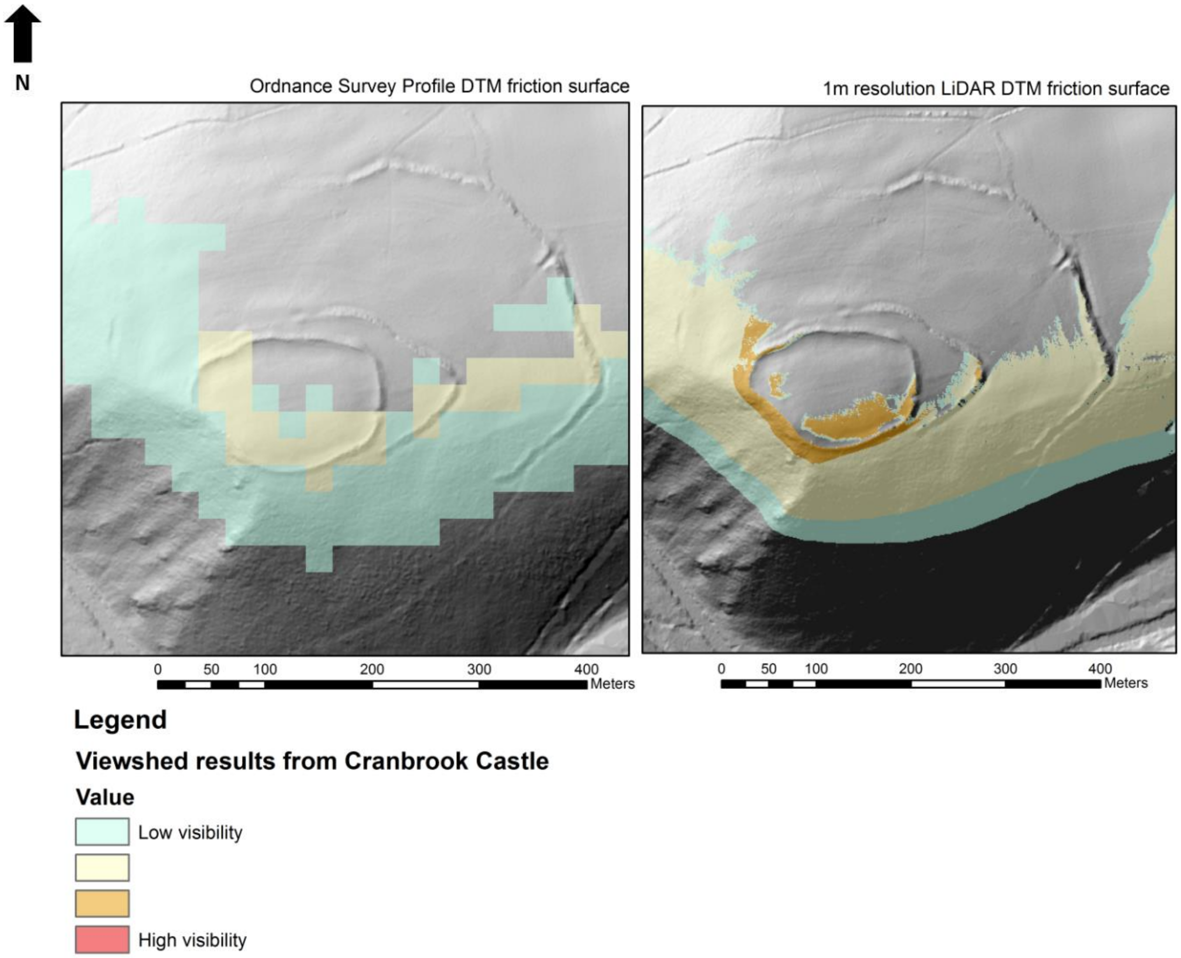


Figure 110. Results of cost surface analysis highlighting the routes where Prestonbury Castle's enclosing works are most visible from Cranbrook Castle overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)

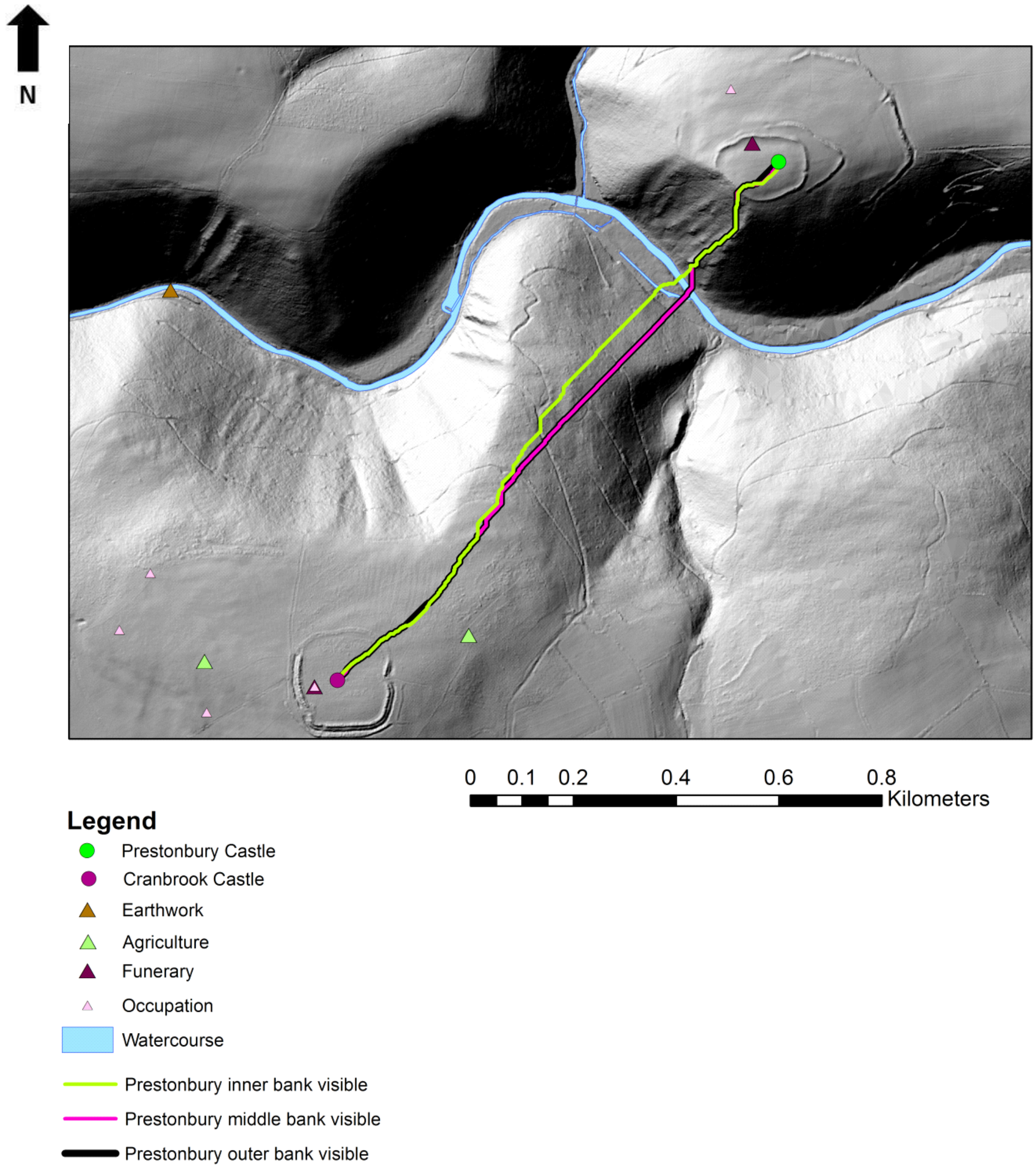
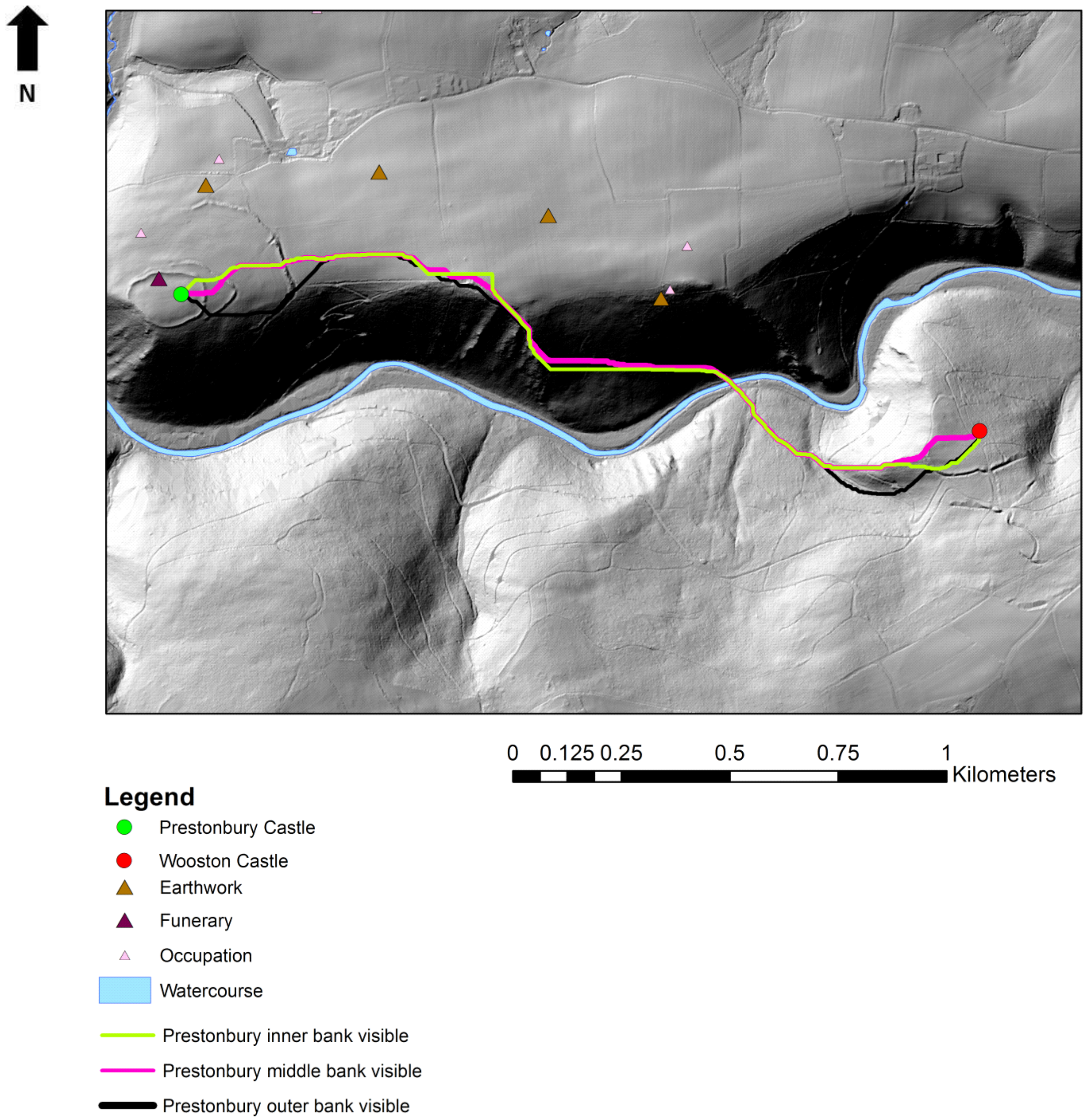


Figure 111. Results of cost surface analysis highlighting the routes where Prestonbury Castle's enclosing works are most visible from Wooston Castle overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)



Correct pathways

The results of cost surface analysis demonstrate that the most accessible aspect of the site in terms of slope is its eastern side as 228 out of the 244 Ordnance Survey DTM and 3 out of the 4 LiDAR based least cost pathways intersect with this area (Figure 112). However, these pathways do not strongly correspond with any known archaeological activity. There is also no correlation of the blind pathways with any distinct morphological component to this site (Figure 113) whereas the visible pathways correspond predominantly with the eastern aspect (Figure 114) as 4 out of the 8 Ordnance Survey DTM and 2 out of the 4 LiDAR based least cost pathways interact with this area.

A number of the visible GIS-based pathways coincide with activity which was contemporary with that within the hillforts, for example those between Prestonbury and Wooston Castle travel past two ovoid enclosures (MDV26738 and MDV26739) and a bank (MDV26742) (**a**). The pathways between Prestonbury and Cranbrook Castle travel past an area of field systems (MDV27962) (**b**) (Figure 114).

Figure 112. Results of slope based cost surface analysis to and from Prestonbury Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)

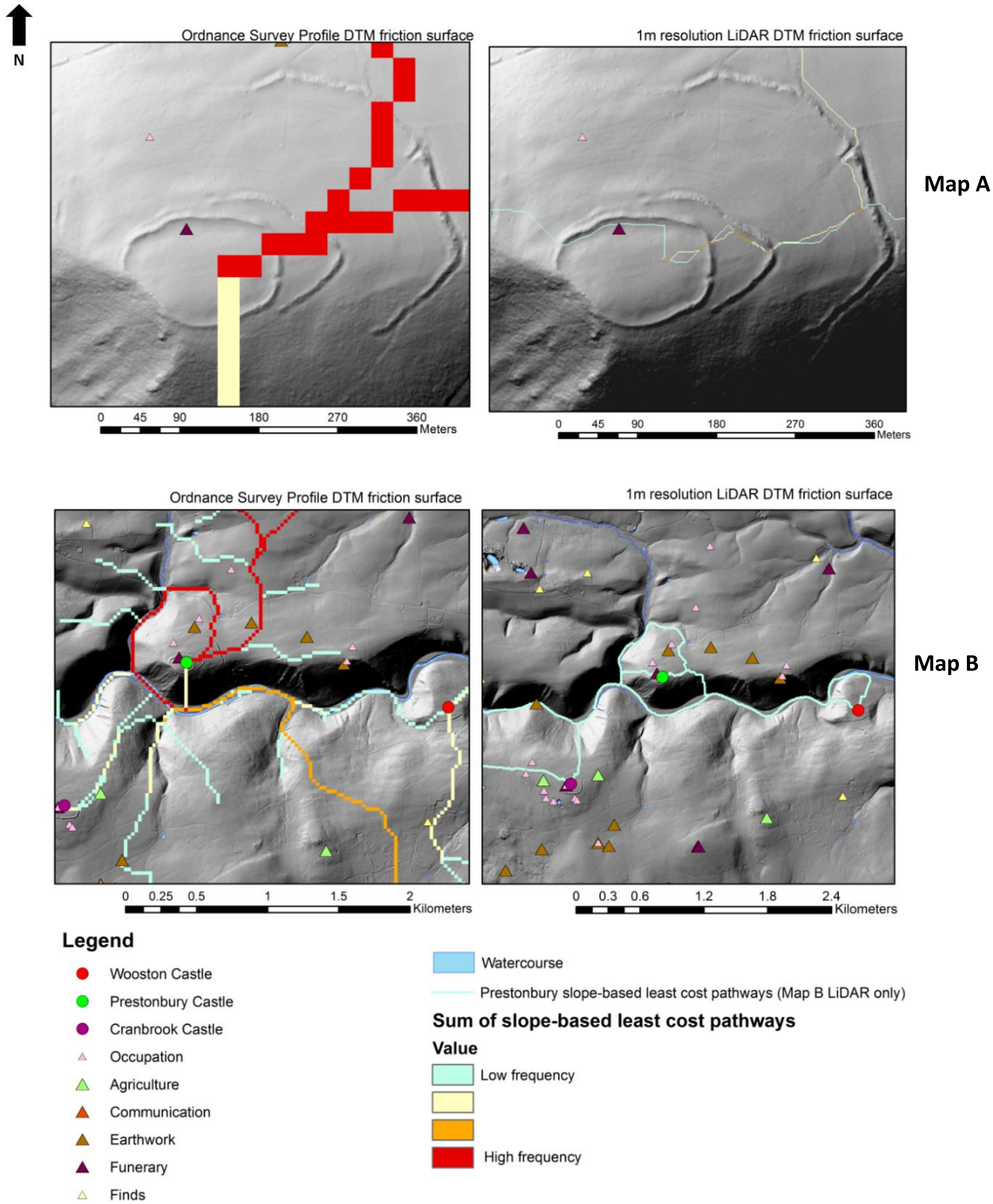


Figure 113. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Prestonbury Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)

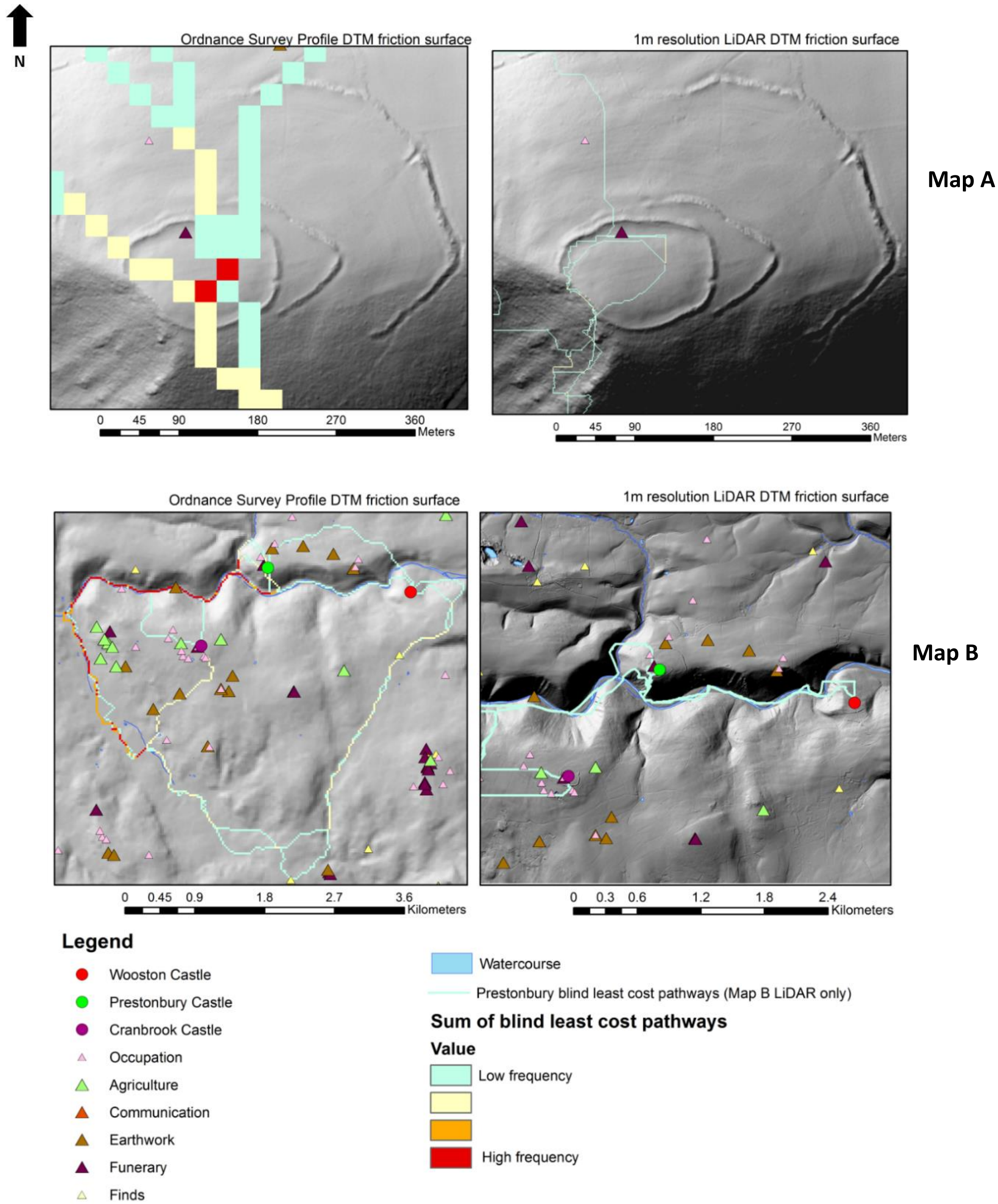
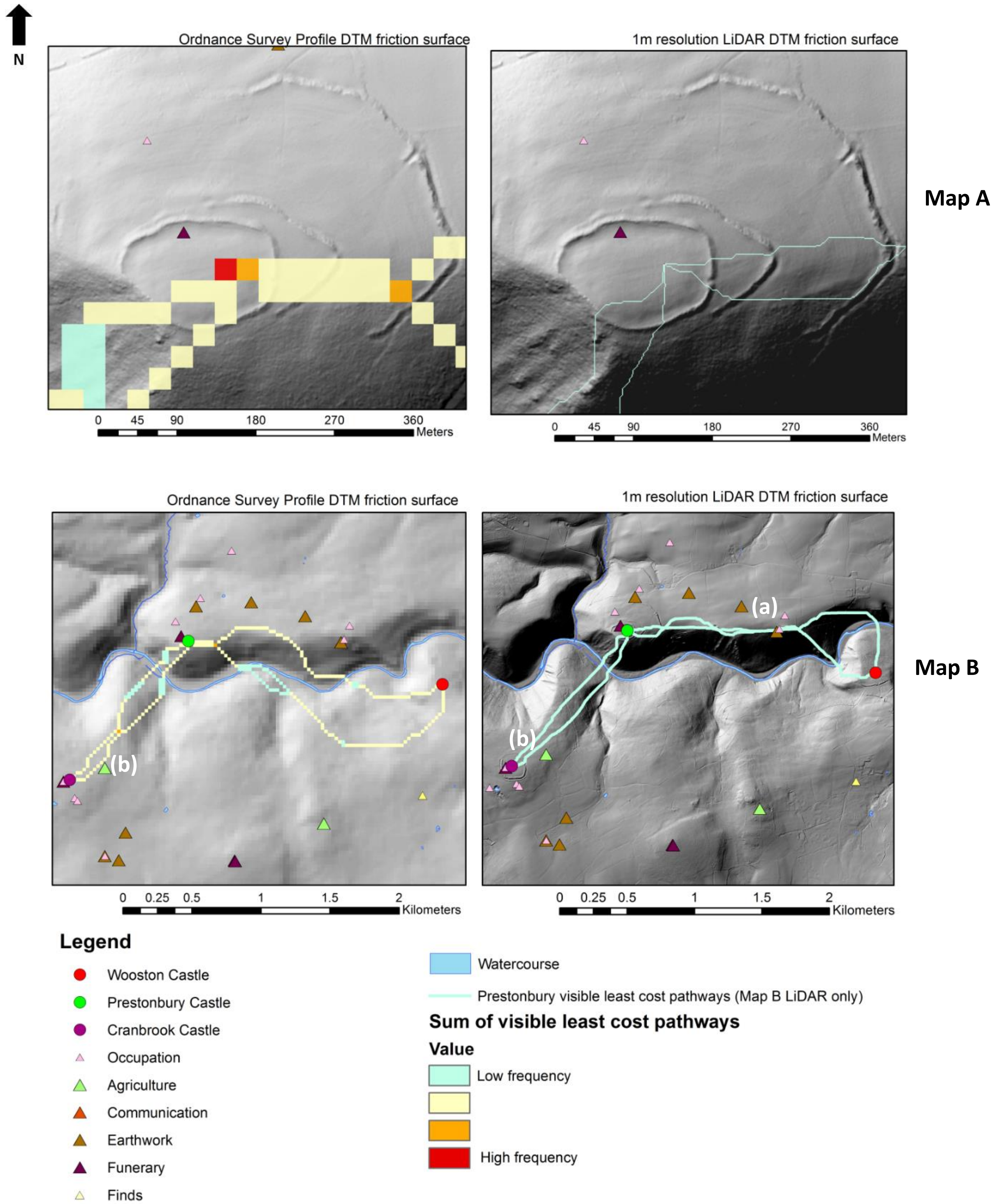


Figure 114. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Prestonbury Castle. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses. Both maps are overlain by HER data. Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Dartmoor National Park Historic Environment Record 2013; © Environment Agency copyright and/or database right 2015. All rights reserved.)



Concluding site summary

The banks that enclose Prestonbury largely follow the prominent lines of the topographical form of this hilltop, whilst also accentuating them with the enclosing banks being one of its most distinguishable aspects. However, these banks do not obstruct visibility into the site; neither are they visually imposing. Even though the enclosing works fail to dominate or impose on the landscape, it is questionable as to whether this observation warrants the site to be stripped of its hillfort status. This raises the question as to whether Newman (2011) sees hillforts to be dominating in the landscape.

Whilst the site's morphology was strongly influenced by the topography, its valley side location also influenced the visual and physical accessibility of both the site and the landscape. The results of viewshed analysis demonstrated that the most visually accessible aspect of the landscape from the site is the Teign Valley.

This site was constructed with a strong consideration of the physical properties of this hilltop, whilst the banks that enclose it accentuate the topographical form of the location by being only placed where they were needed. For example, where the site is naturally defined by the valley edge, the artificial enclosure was minimal, or non-existent. In the east where the site is least naturally defined by the topography an increased degree of effort, material and labour was applied with the construction of a bank. This bank was more prominent than the rest, although it was not overtly such and it did not obstruct visibility into the site.

Although the outer eastern bank defined the site's most accessible aspect, it did not prevent access from this routeway. Instead of concealing and protecting the site's most visually and physically accessible aspect, the morphology of the site encourages easy entry as signified by the systematic placement of the entrances within this eastern side. These entrances are not elaborate neither do they form a complex passage into the site. They also coincide with some of the visible pathways as well as the slope paths that enter and leave it. This demonstrates that there was a correct pathway into Prestonbury Castle. The correlation of the visible pathways with this eastern area also indicates that this area is the most visible route in and out. This, alongside the correlation of this area with the slope based pathways and overall visual openness of this site from the east implies that this site was oriented with a high awareness of activities within and around this landscape. The site was visually and physically open to the land to the east through its entrance arrangement and relationship to the topography. However, people in the site itself were also visually aware of the land to the east which potentially influenced those who constructed the site to direct the elaboration of enclosure towards this area. This has already been seen at Castell Grogwynion in the Ceredigion test area.

Conclusion

This test area comprised of a topographically highly structured and divided region which is focused on the valley of the River Teign. The topographical form of this landscape greatly influenced how people experienced the sites and upon the sites themselves. The effect that the topography has upon each of the sites within this test area varies although it structures the visual relationships within the landscape. However, the act of constructing monuments such as hillforts did not overtly enhance visual dominance or impact.

Whilst the topography structured the visibility of the sites, it also influenced how they physically engaged with the landscape having the ability to open or close the site to the surrounding landscape, to defend or expose it. However, the results of GIS based analysis along with an analysis of the site morphology demonstrated that there was no evidence for the overt response to the topographically induced vulnerabilities and strengths of these locations. For example if the landform was naturally defended, minimal artificial enclosure was constructed within that area. In these instances vulnerable areas where not overtly closed off or defended they were used to aid movement into the sites, with the placement of entrances. The nature of morphological responses to topography is extensively explored in this thesis particularly in Chapter 8.

The overall visibility of these sites is highly variable, for example there is limited visibility of Cranbrook and Wooston Castle from the wider landscape, whilst Prestonbury Castle is predominantly highly visible. The visual openness of sites such as Prestonbury is discussed in greater detail in Chapters 6, 7 and 8 (Pages 440, 511 and 520-523). The sites have differing visual access to the surrounding landscape as Prestonbury and Cranbrook both have relatively far reaching views whilst Wooston Castle does not. Driver implied that a lack of visual connectivity between sites indicated that they commanded different territories (2005a and 2013). The evidence for poor visual connectivity between Cranbrook and Wooston Castle raises doubt on this statement as these two sites are within the same topographical unit and it would be difficult to maintain and command two different territories within it. This issue is also raised in Chapters 6 and 7.

However, the results of GIS based analysis supported Driver's concept of a correct path of movement with the entrances to these sites found primarily located at the most accessible points. They consequently formed naturally induced correct pathways into the sites. On a wider landscape scale the central river valley also formed a correct pathway although there is very little evidence for activity which is contemporary with the hillforts along these route ways. This superficially implies that these pathways were not dominant route ways through this landscape at this time. However, these results may also be due to the survival and visibility of the archaeology. It has already been mentioned that this region has a large number of forestry plantations which have already had an impact on visibility studies within this area; it is also likely that afforestation has hidden and destroyed field archaeological evidence. This study has identified instances were pathways coincide with known archaeological activity and this is developed upon in Chapter 9 (Page 548) and the following chapter which examines the Aberdeenshire test area.

Chapter 5

Aberdeenshire

Introduction to the test area

Located in central Aberdeenshire this test area is a hilly upland region (Figure 115). It is densely occupied by a series of waterways. This area has a relatively low concentration of hillforts (Figure 116) and four hillforts are under study. This group has a cluster of sites in the western side of the test area which comprises of Tap o' Noth, Cairnmore and Wheedlemont. Dunnideer is located on the eastern side of the test area, this is also under investigation. These hillforts enclose areas which range from c.0.3ha to c.15ha. The distance between them ranges from c.3km to 14km.

This test area investigates the degree to which the quality of data influences the implementation of a methodology, and the subsequent analysis and interpretation of the results. The nature of this is conditioned by the fact that there is no LiDAR data available for the hillforts of this test area. Instead of being able to rely on LiDAR data to gain a better understanding of site morphology, aerial photographs and site plans were used. The degree to which the morphology of these sites has been subject to detailed mapping is variable. For example, Dunnideer and Tap o'Noth both survive well on the ground and have detailed plans, which enable a verification of their morphology within the field. On the other hand the upstanding enclosing works at Cairnmore and Wheedlemont are not sufficiently upstanding to enable the verification of the detail in the plans in the field. The failure to verify the morphology of these sites meant that any reference to their morphology could not be as detailed as for that of Dunnideer and Tap o' Noth.

Figure 115. Distribution map of the test area hillforts on the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

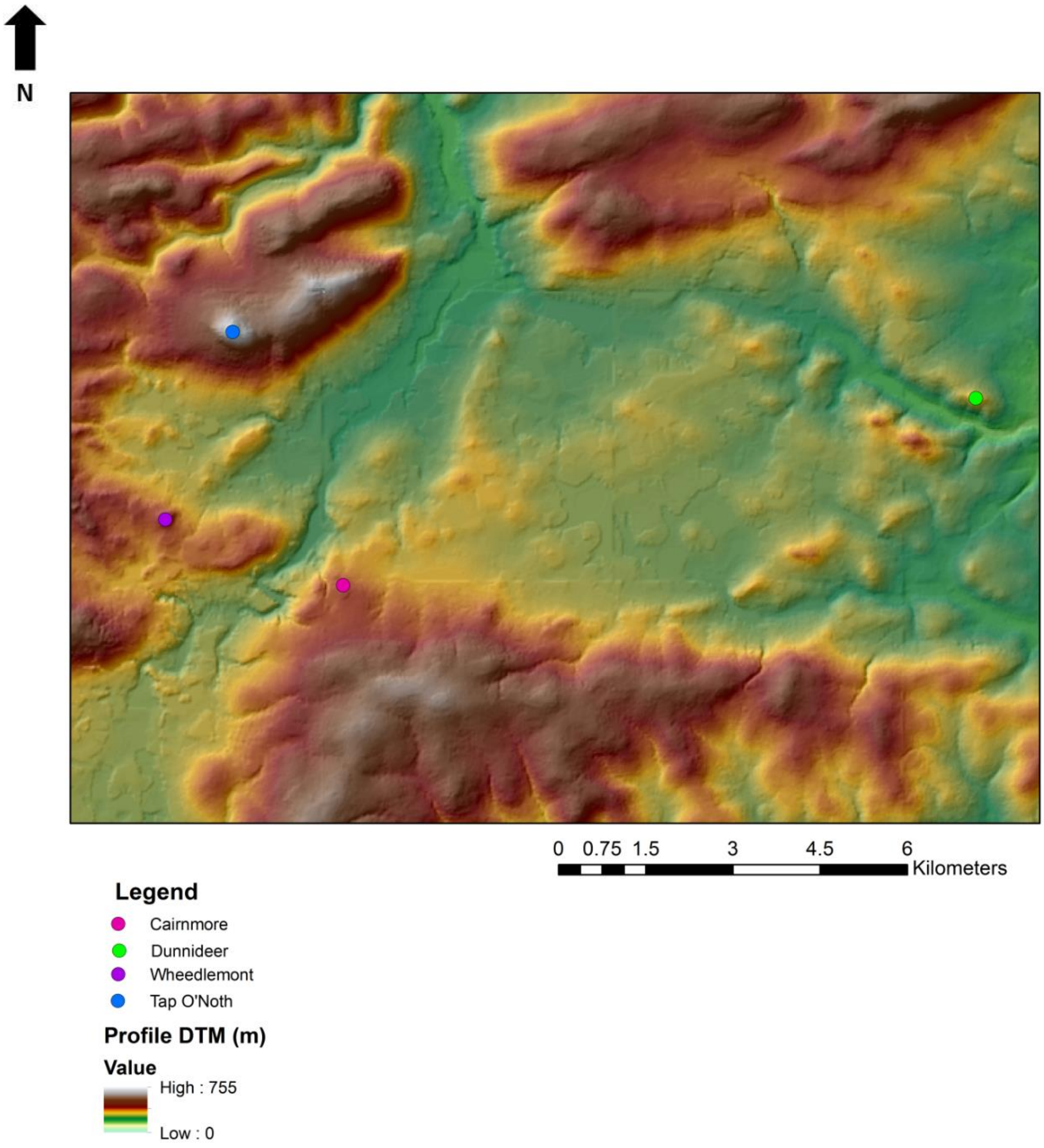
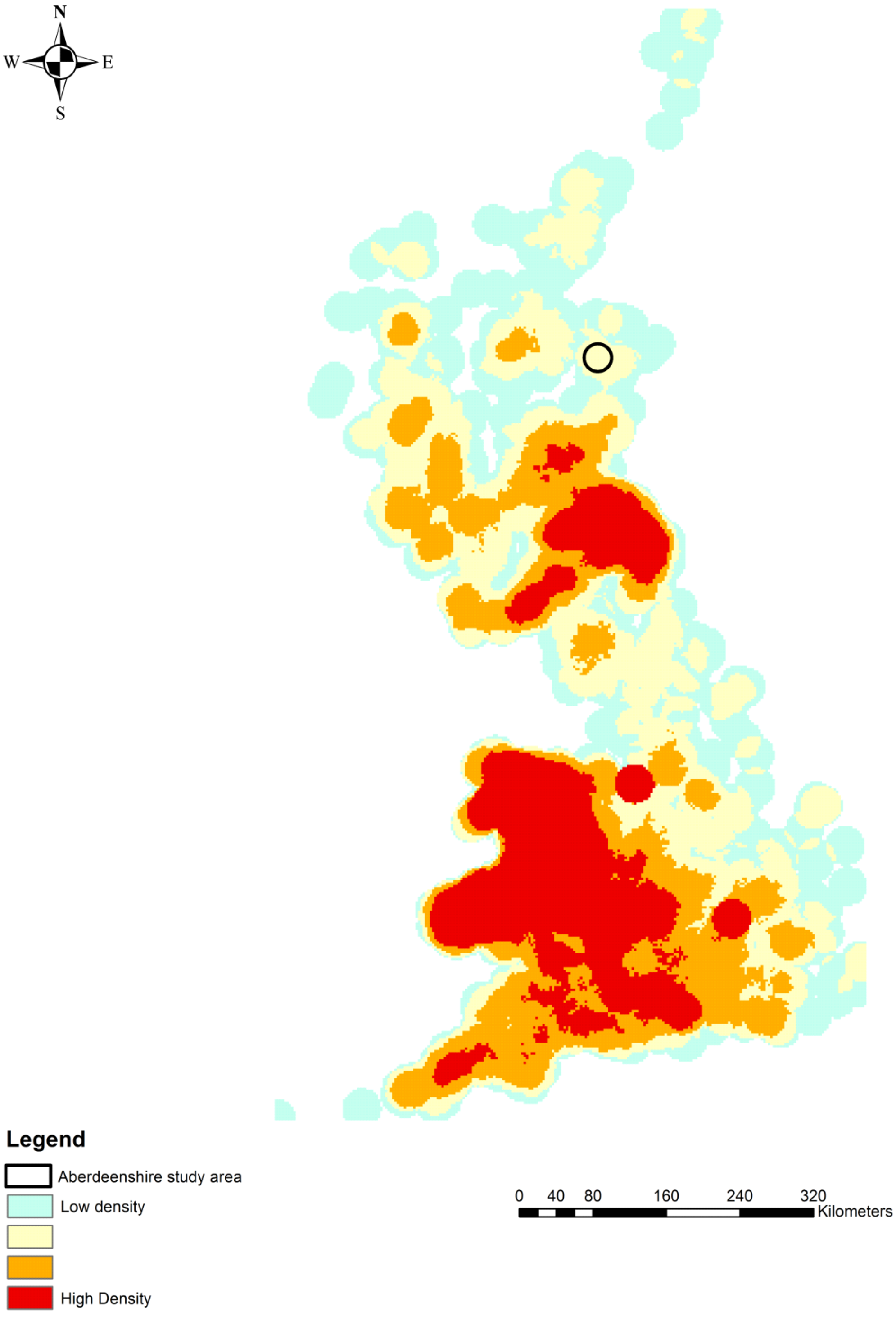


Figure 116. Location of Aberdeenshire test area in relation to the overall distribution of hillforts (Atlas of Hillforts in Britain and Ireland Project 2013; EngLaID 2013)



There is very little palaeoenvironmental evidence available for this area, however it is believed that within later prehistory it was largely cleared of woodland (Halliday 2008, 110). Intensive soil erosion in the Howe of Cromar to the east of this test area implies that these landscapes were intensively cultivated within later prehistory (*ibid* 2008, 110).

The sites have been dated to varying extents, both absolutely and relatively (Cook 2013; Gentles 1989; Harris and Hounslow 2010; Sanderson et.al 1988). This provides the writer with the ability to test the methodology within a relatively chronologically understood context, in particular to understand the visual relationships within their contemporary surroundings. This enables one to see how in both time and space site morphology and location was influenced by movement and visibility.

Data

SMR data for the sites and finds within this test area was received from the Aberdeenshire Council Archaeology Service (2014). This data was utilised within the analysis of the location and orientation of sites and pathways in relation to the wider landscape context. However, due to copyright restrictions the entire dataset could not be shown within the illustrations which covered the whole test area.

Site visit

The test area was visited in September 2014. This visit had varying degrees of success. Due to the poor upstanding nature of Wheedlemont and Cairnmore, and the heavy vegetation coverage on Cairnmore it was very difficult to gain an understanding of these sites' morphologies from field walking. Their enclosing earthworks were not sufficiently upstanding to be distinguishable from the surrounding landscape. On the other hand the site visits to Tap o'Noth and Dunnideer where highly informative in terms of getting a better understanding of their morphologies and their relationship to the topography. However, at Tap o' Noth it was very difficult to see the outer fort bank for parts of its circuit.

The investigations of the visibility of the wider landscape from Dunnideer, Cairnmore and Wheedlemont were successful as the weather conditions on that day were very clear. This was not the case at Tap o'Noth; this site had to be visited on another day to the rest of the sites and there was very heavy mist, which severely inhibited visibility out of the site. The site itself (as this was undertaken on a different day) was highly visible within the wider landscape.

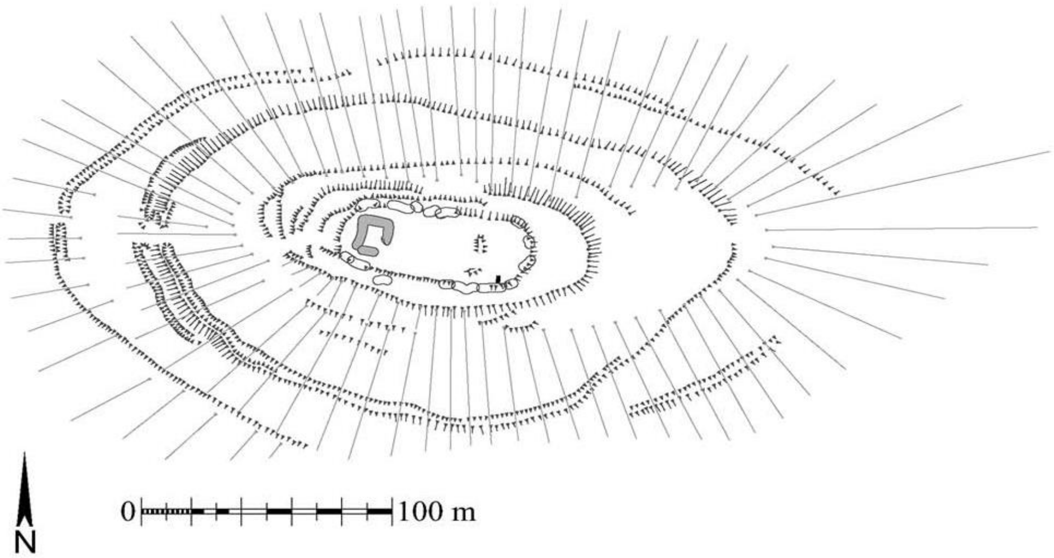
Analysis

Dunnideer

Site introduction

Dunnideer is sited at 265m OD on a conical shaped hill (RCAHMS 1990). The site also has a Medieval tower (*ibid* 1990). The fort consists of multiple enclosing banks (Figure 117). Two of these lines are situated on the summit of the hill and an intermittently trivallate sequence is situated downslope. At the western end of the summit enclosure there is a potentially contemporary cistern (*ibid* 1990).

Figure 117. Earthwork plan of Dunnideer (Copyright: Historic Environment Scotland)



The summit of the site is enclosed by inner and outer enclosure banks, the inner of which is heavily vitrified whilst the outer is a low stony bank (*ibid* 1990). The vitrified circuit is oblong in shape and encloses an area of 67m by 27m (Shepherd 1996, 144). The vitrified material mainly occurs in the north and south (Gentles 1989, 95). In the north the material was well vitrified (*ibid* 1989, 95). In the south, although the material is highly vitrified there is a large crack, which indicates that this is an area where two blocks of vitrified material were leaning against each other (*ibid* 1989, 95). These had been moved since the last firing as they had not fused together (*ibid* 1989, 95). Some of the vitrified material from the inner bank has been robbed and incorporated into the Medieval tower (*ibid* 1989, 95). Gentles argues that this robbing occurred from the north, where vitrified material overhung lower burnt/unfused rubble (1989, 95).

Downslope from the summit enclosure is a seemingly incomplete trivallate sequence of enclosure (Gentles 1989, 94). It is most extant in the north and east (*ibid*

1989, 94). This trivallate sequence encloses an area of 290m by 183m (RCAHMS 1990). The outermost line of this series of defences is only marked by a setting out trench; gaps were still made in the east and west for entrances (RCAHMS n.d.a). The inner rampart of the trivallate sequence was constructed either side of the entrance where its height and thickness increased (Halliday 2008, 103).

A number of hut platforms are also situated on this hilltop. It is believed that they are associated with an unenclosed platform settlement that predated the hillfort (Ordnance Survey 1969). These are located on the hillslopes of the outer fort in the north and south. It is possible that some of these were reused during the hillfort occupation period or even constructed then.

An accidental fire in 2005 on the southern slopes of the site stimulated an archaeological evaluation which assessed the extent of the damage (Badger & Dunwell 2006, 18). This evaluation involved carrying out test pitting in the affected area (*ibid* 2006, 18). One test pit identified a short length of the external portion of the inner vitrified wall (*ibid* 2006, 18). Field walking also recovered a possible sherd of prehistoric pottery, sherds of medieval and post-medieval pottery and flint flakes (*ibid* 2006, 18).

In July 2008, a trench was opened on the northern inner edge of the vitrified rampart (Cook 2010a, 83). Several radiocarbon dates were retrieved from charcoal taken from burnt wood from within the collapsed rampart (*ibid* 2010a). These samples had dates of 390-190 BC and 370-160 BC (*ibid* 2010a). Cook hypothesised that the latter sample may represent wood which was brought to the site as fuel for vitrification, or it may have been from a collapsed wooden structure (2010a, 85). However, he was sure that it did not derive from the timber lacing of the rampart (*ibid* 2010a, 85). The dates that derived from the charcoal samples both predate the firing of the inner rampart (*ibid* 2010a, 86). It is also assumed that they derived from structures that were within the interior of the inner fort, which meant that they provide a date of occupation within the inner fort (*ibid* 2010a, 86).

Gentles also undertook archaeomagnetic dating on samples taken from the north-eastern corner of the vitrified inner wall however the spread of the results led him to argue that they could not be used as an indication of date (1989). Much later, samples of the vitrified inner wall were also subjected to archaeomagnetic dating (Harris and Hounslow 2010). Six samples that were believed to be in situ were taken from the south-eastern portion of the vitrified wall (*ibid* 2010). The archaeomagnetic dating suggested that the "date of last heating was 345 BC (95% confidence interval of 606-257 BC)" (*ibid* 2010).

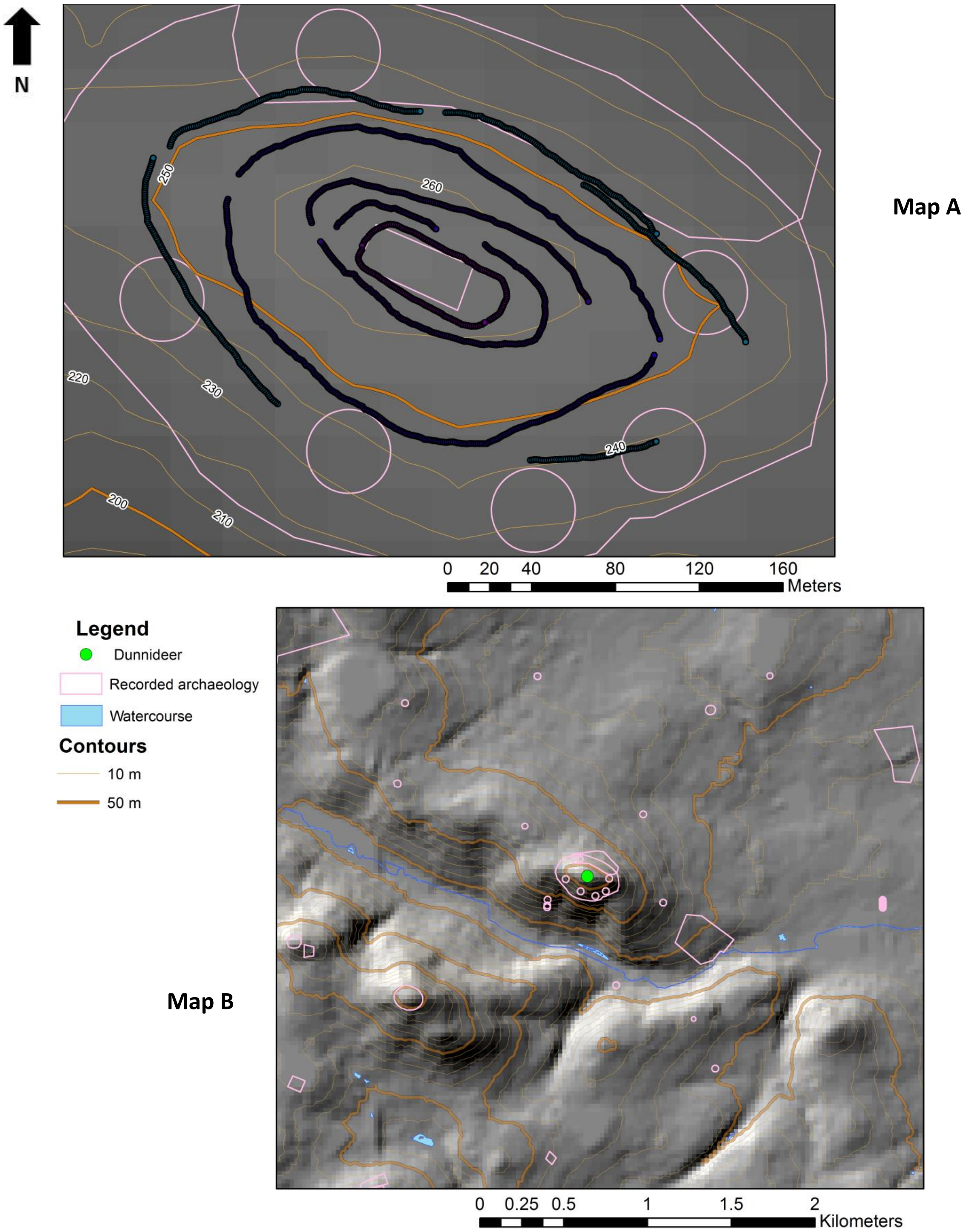
There is a degree of variation in the dates retrieved from the absolute dating of samples from this site, consequently they must be taken with caution. It also remains to be unknown as to whether or not the vitrified inner wall of this site was constructed before or after any of the subsequent enclosing works of this site. It was assumed that there were at least two phases of activity at this site which were related to the hillfort and prior to the construction of the Medieval tower (Shepherd 1996, 144).

Physical relationship of the hillfort morphology and location with the landscape topography

Dunnideer crowns the summit of the southwestern hilltop of a southwest-northeast hill range (Figure 118). This hilltop is well defined, and the morphology of the inner and outer fort distinctively follows the line of the various topographical stages of the hill. The outer fort adheres to the perimeter of the hillslopes, whilst the inner fort occupies the summit of the hilltop. The topographical form of this hilltop allowed for a site of this morphology to be constructed, however as Feachem states, it did not restrict the site to this formation; other forms were possible (1966, 68).

Whilst the topographical form of the hilltop influenced the site's morphology, it also influenced the site's visual qualities. The inner fort vitrified bank sits level with the interior of this enclosure. This exposes the interior of the enclosure as it accentuates the enclosure's visibility and physical prominence. The visibility of this enclosure's interior would have been affected by the placement of a timber palisade along its top; however it is not known whether this occurred at Dunnideer. However, to achieve the vitrification of the inner bank it had to be timber laced (MacKie 1976). This lacing may have protruded above the current height of the inner bank, and consequently affected the visibility of the site.

Figure 118. DTM model of Dunnideer and its environs overlain by an outline of the site's enclosing works, contours, SMR data and watercourses. Map A focuses on the site and Map B depicts its topographical environs (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland.)



The outer bank of the outer fort follows the slopes of the hillside, this meant that the enclosure did not form a visually prominent area. The enclosure of this area also failed to substantially increase the amount of usable space at this site as there are very few areas within this outer fort that are easily habitable due to the slope of the land.

There is no evidence for an entrance within the inner fort at Dunnideer; however the outer fort has entrances in the east and west (RCAHMS 1957). These entrances are simple breaks in the enclosure bank, which face the areas of gentle slope that approach the hilltop.

The topographical position of this site also influences its visual accessibility to the surrounding landscape. According to Dibon-Smith, Dunnideer has a clear view out to the lowlands in the east and out to the coast (n.d., 74). The high degree of visual accessibility to the east is supported by the results of viewshed analysis from the entire footprint of the site. However, the outer fort has a greater degree of visual accessibility to the area within the 1km radius compared to the inner fort (Figure 119 and 120). Beyond this radius, values of visual magnitude increase with the highest values occurring beyond the 3km and 6km radii in the north, south and east.

Figure 119. Viewshed results from the inner fort grid, depicting the visibility of the surrounding landscape from the inner fort at Dunnideer as defined by the hillfort buffers (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

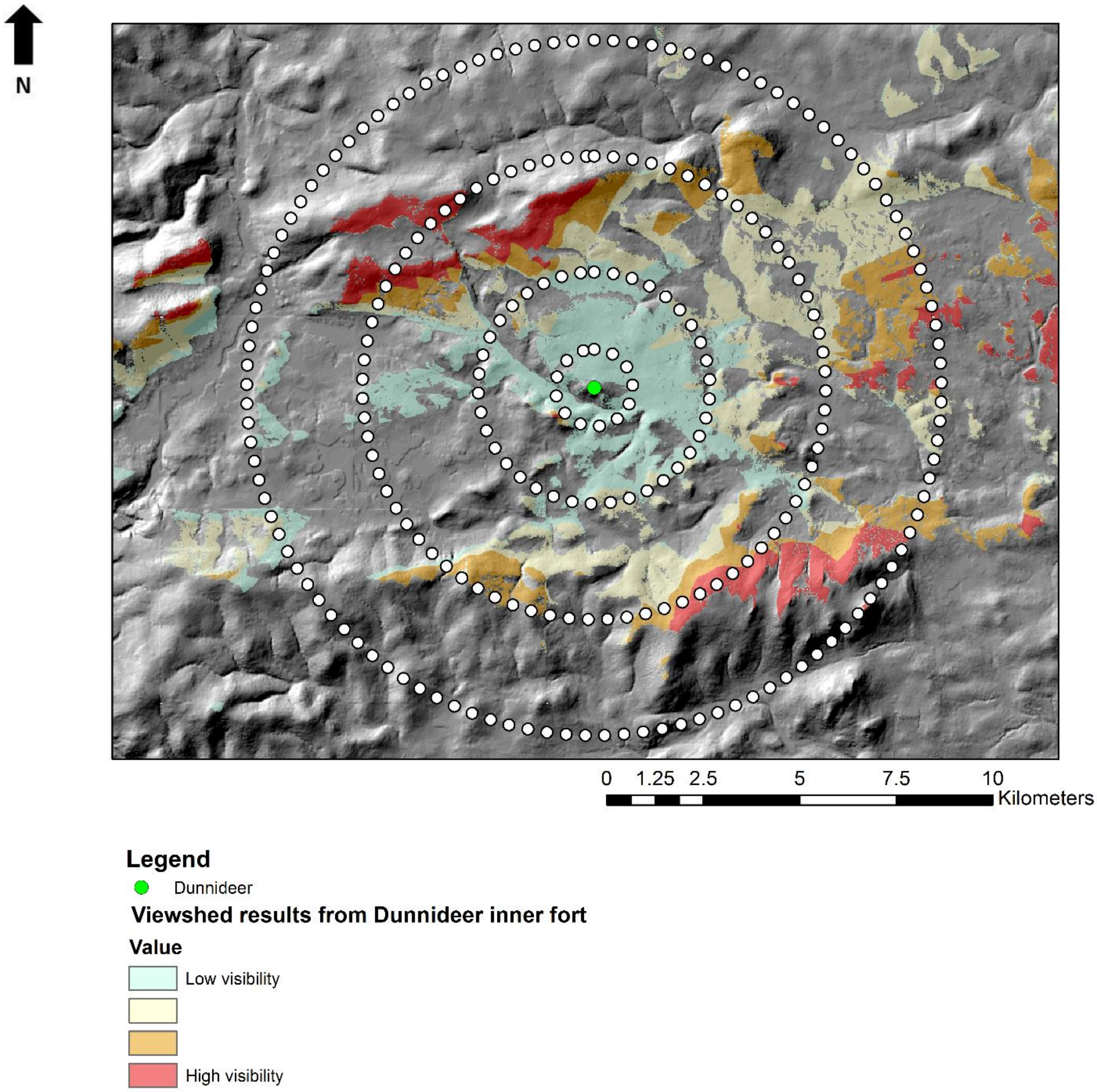
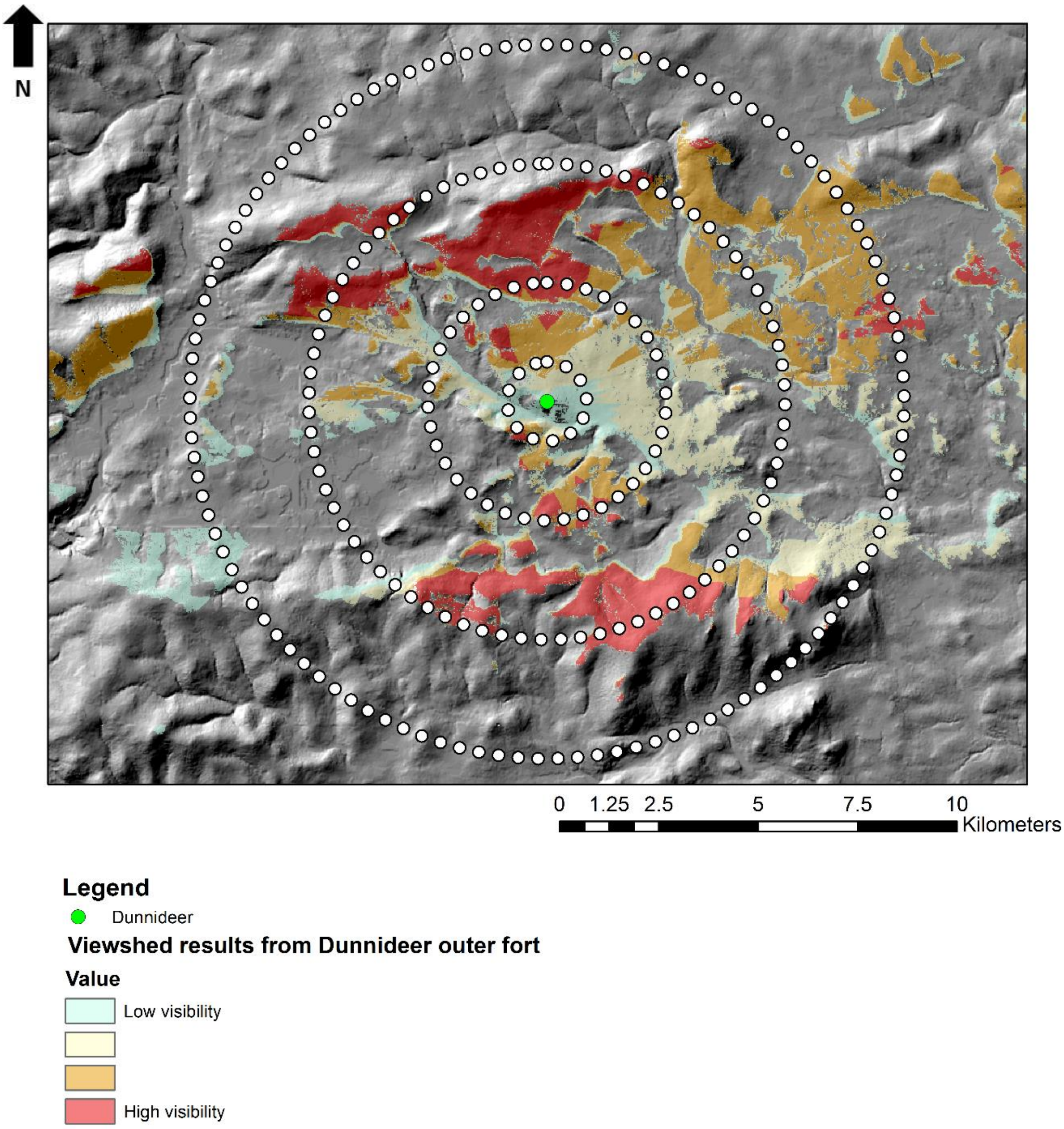


Figure 120. Viewshed results from the outer fort grid, depicting the visibility of the surrounding landscape from the outer fort at Dunnideer as defined by the hillfort buffers (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Image

The visibility of Dunnideer from the surrounding landscape is highly variable. From the 1km radius the majority of the site is of moderate visibility (Figure 121). These results are supported by the field photography. This found that although the hilltop is highly visible, its visual prominence is poor (Figures 122-126). Fieldwork photography demonstrates that the enclosing works to this site are poorly distinguishable.

Figure 121. Results of viewshed analysis from the radii towards Dunnideer depicting the visibility of the site (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

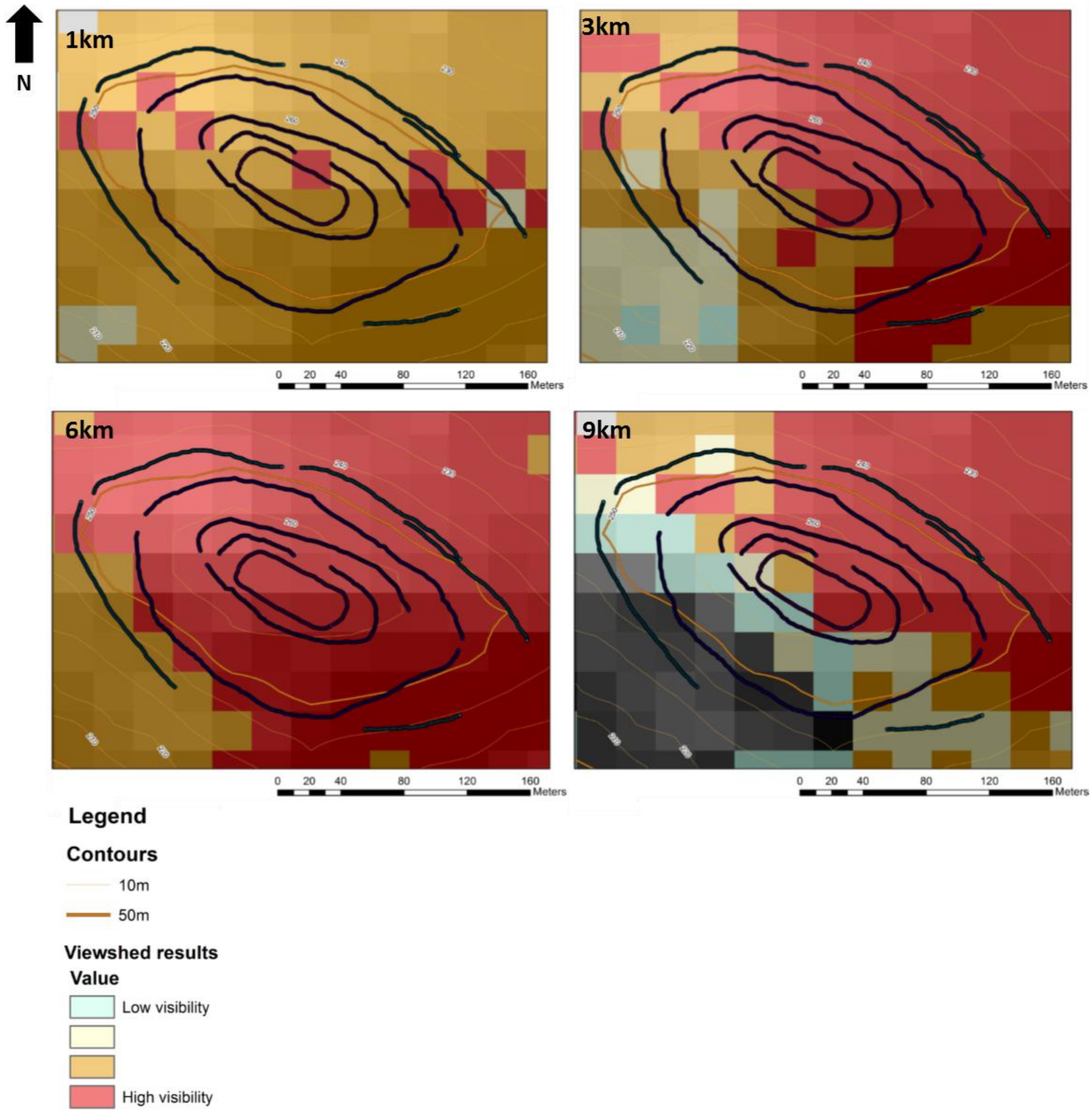


Figure 122. Location map of the viewpoints which surround Dunnideer in relation to the hillfort's radii (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

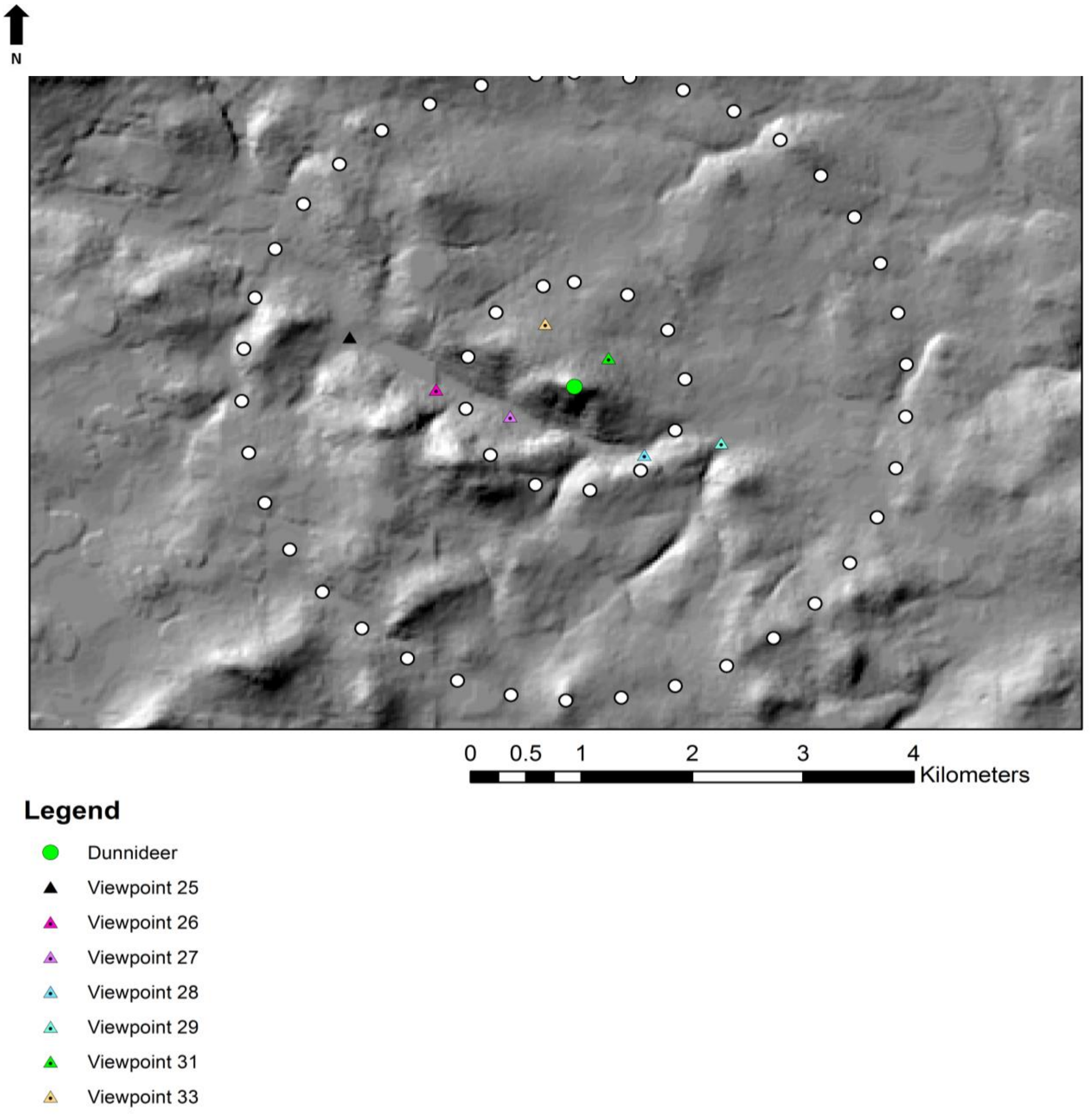


Figure 123. View of Dunnideer from Viewpoint 31, 411m to the north-east of the site (Author's own 2014)

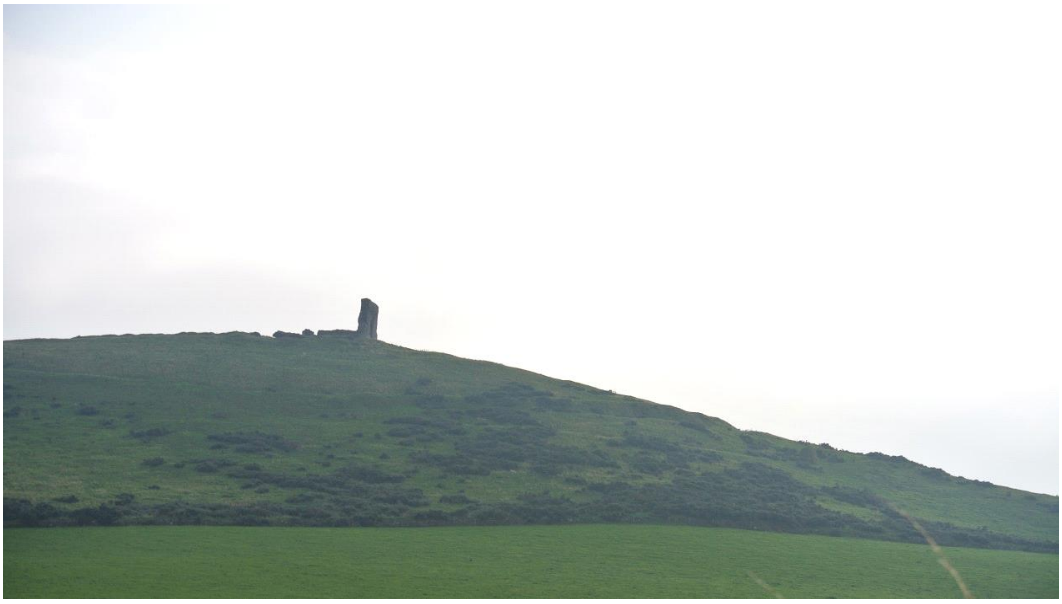


Figure 124.View of Dunnideer from Viewpoint 33, 656m to the NNW of the site (Author's own 2014)

Figure 125. View of Dunnideer from Viewpoint 27, 645m to the south-west of the site (Author's own 2014)

Figure 126. View of Dunnideer from Viewpoint 28, 907m to the south-east of the site (Author's own 2014)

The visibility of the site increases from the 3km radius as the majority of the site is of high visibility (Figure 121). The field photography also illustrates that there is an increase in the site's visual prominence (Figure 127-129). Although the site is visually prominent, its enclosing works remain poorly distinguishable. It was therefore not possible to clarify how changes in direction affect the 'image' of the site.

The site's visibility continues to increase from the 6km radius with an increased area of the site having a visual magnitude within the upper quartile range (Figure 121). The visual magnitude of the site decreases from the 9km radius (Figure 121). The majority of the northern and north-eastern aspect of the site is of high visibility. The remainder of the site is less visible whilst the south-western aspect is not.

Figure 127.View of Dunnideer from Viewpoint 26, 1.2km to the west of the site (Author's own 2014)

Figure 128.View of Dunnideer from Viewpoint 25, 2km to the west of the site (Author's own 2014)

Figure 129.View of Dunnideer from Viewpoint 29, which is to the south-east of the site (Author's own 2014)

The visual magnitude of Dunnideer is variable from the surrounding landscape, it is also the case from the neighbouring hillforts. From the inner fort of Tap o'Noth the entire western aspect of Dunnideer is of relatively low visibility whilst the remainder of the site is not visible (Figure 130). The visual magnitude of Dunnideer increases from the outer fort at Tap o'Noth, as the visible areas are of moderately high visibility, this is inevitably caused by the fact that the outer fort spans a wider area than the inner which increases the visual span of the area even if the number of observer points does not increase (Figure 131).

Figure 130. Viewshed results depicting the visibility of Dunnideer from the inner fort at Tap o'Noth (Copyright: Historic Environment Scotland; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

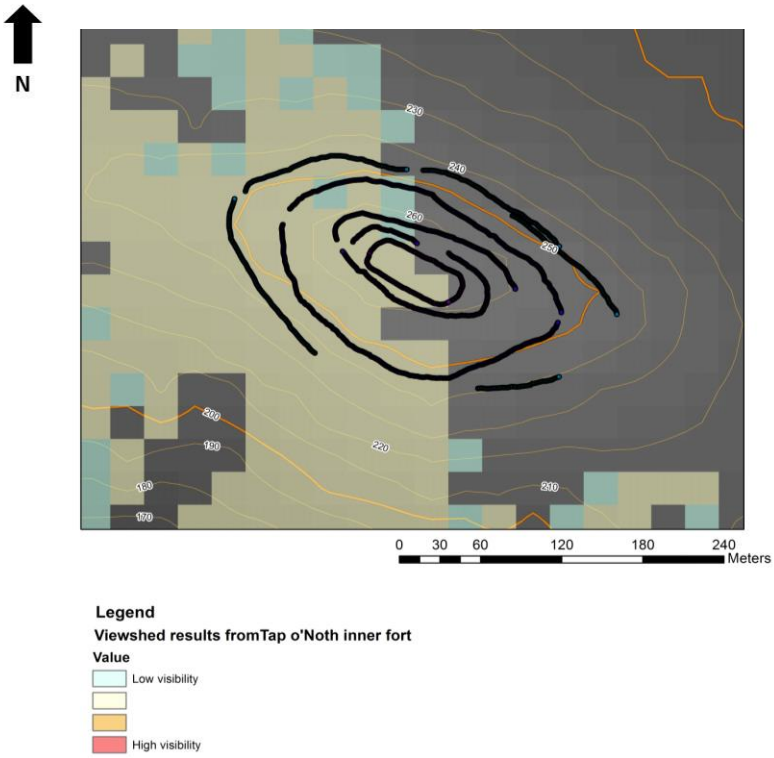
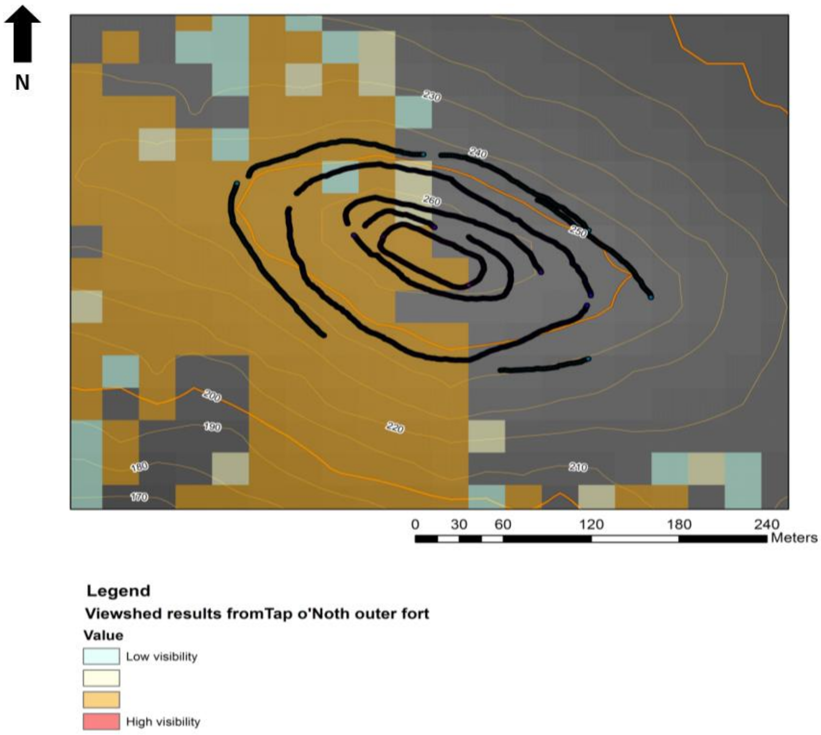


Figure 131. Viewshed results depicting the visibility of Dunnideer from the outer fort at Tap o'Noth (Copyright: Historic Environment Scotland; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



The western and southern aspects of Dunnideer are visible to varying degrees from Wheedlemont (Figure 132). The values of visual magnitude are highly variable, and range from low to moderate visibility. Dunnideer is poorly visible from Cairnmore, only a small section of the southern half of the inner fort is visible (Figure 133).

Figure 132. Viewshed results depicting the visibility of Dunnideer from Wheedlemont
(Copyright: Historic Environment Scotland; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

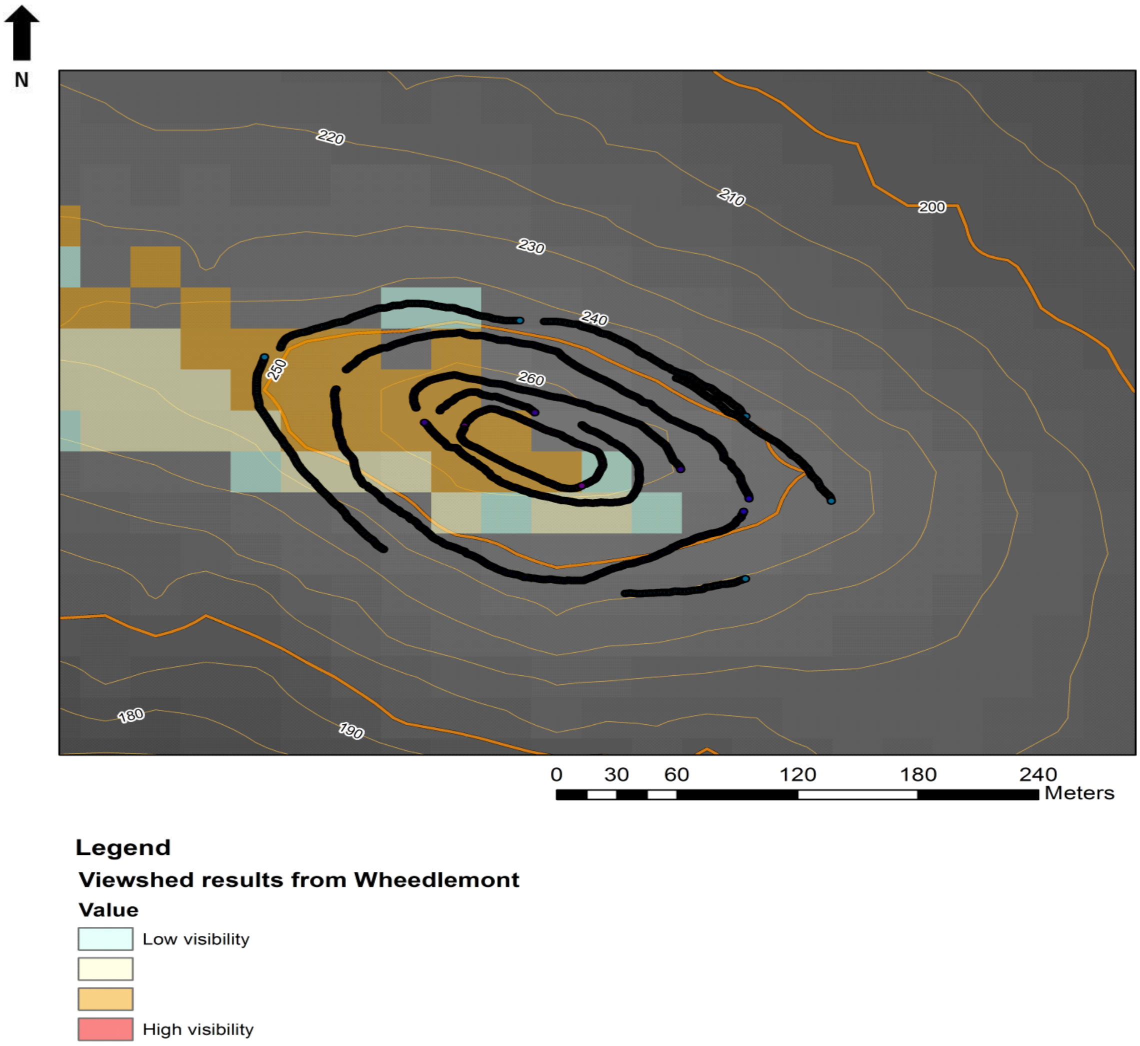
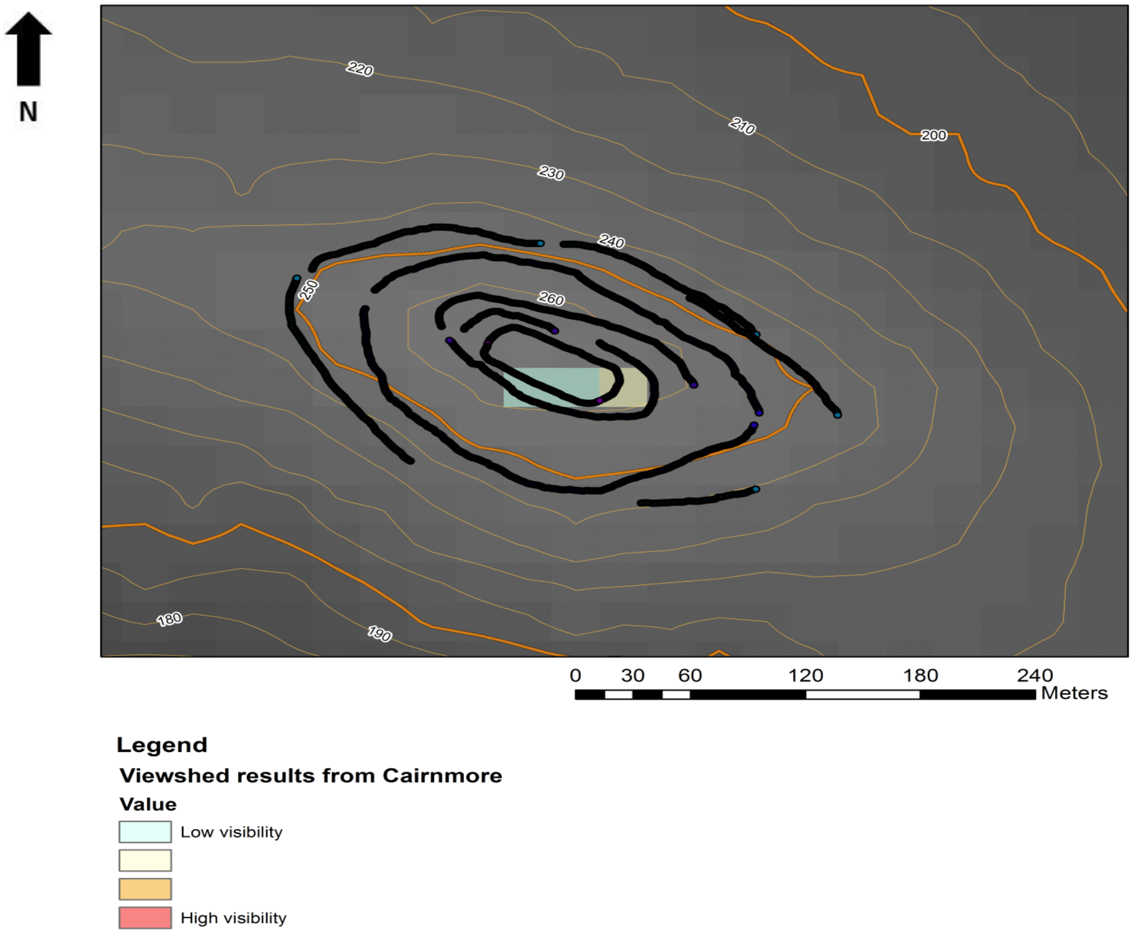


Figure 133. Viewshed results depicting the visibility of Dunnideer from Cairnmore (Copyright: Historic Environment Scotland; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Correct pathways

Cost surface analysis found that both the most physically accessible and the most visible route into the site is through the site's north-western area which also includes the one of the site's entrances (Figures 134-135). All of the 18 visible pathways intersect with this north-western area whilst 246 out of the 250 slope-based pathways use the site's north-western entrance. The correlation of these pathways particularly the visible pathways with the north-western (western in most literature) entrance significantly demonstrates that this entrance was placed to both aid access and to enable the approaching traffic to be most visible to those within the site. The correlation of the pathways with the entrance and the placement of the entrance in itself formed both a morphological and visible correct path of movement.

The slope-based and visible pathways pass the recumbent stone circle (NJ62NW0003), which is situated to the northwest of the site (Figure 136-137). On a wider landscape scale a number of the slope-based pathways between Dunnideer and the neighbouring hillforts also coincide with both topographical and archaeological features. For example both of the slope paths from Dunnideer to Wheedlemont and Tap O'Noth largely follow the same line (Figure 136). They initially follow the course of the River Shevock and the railway line to Kennethmont (**A**). Beyond this, the pathways follow the line of several waterways. Whilst following the line of these waterways the slope paths come across several archaeological features, which were potentially in use at the time of the hillforts. These features include a series of enclosures, ring ditches and standing stones (**B**). Beyond the standing stones (NJ52NW0003) the slope paths to Wheedlemont and Tap O'Noth take different courses to reach their chosen destination.

Figure 134. Results of slope based cost surface analysis to and from Dunnideer. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses (Copyright: Historic Environment Scotland; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)

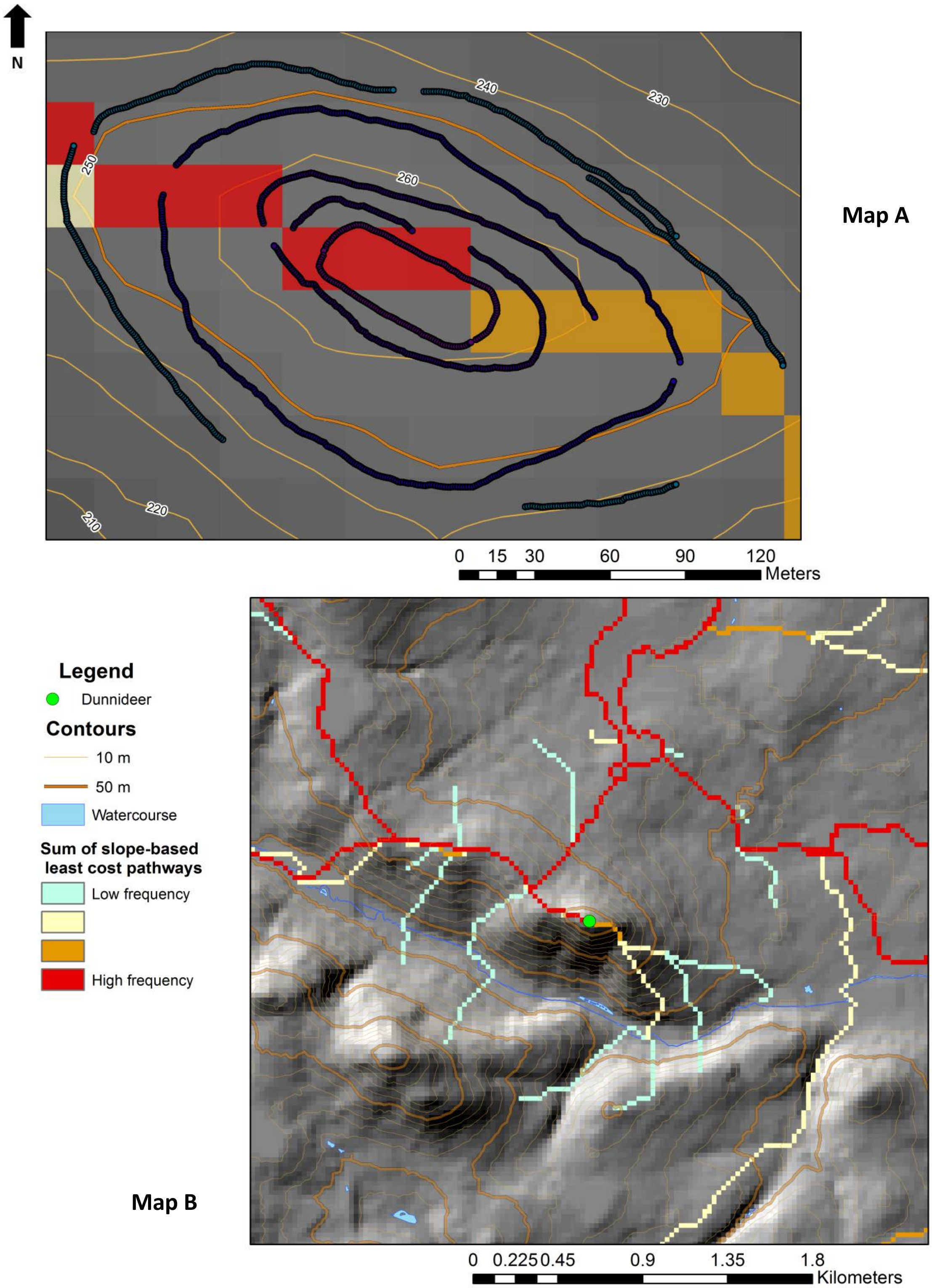


Figure 135. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Dunnideer. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses (Copyright: Historic Environment Scotland; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)

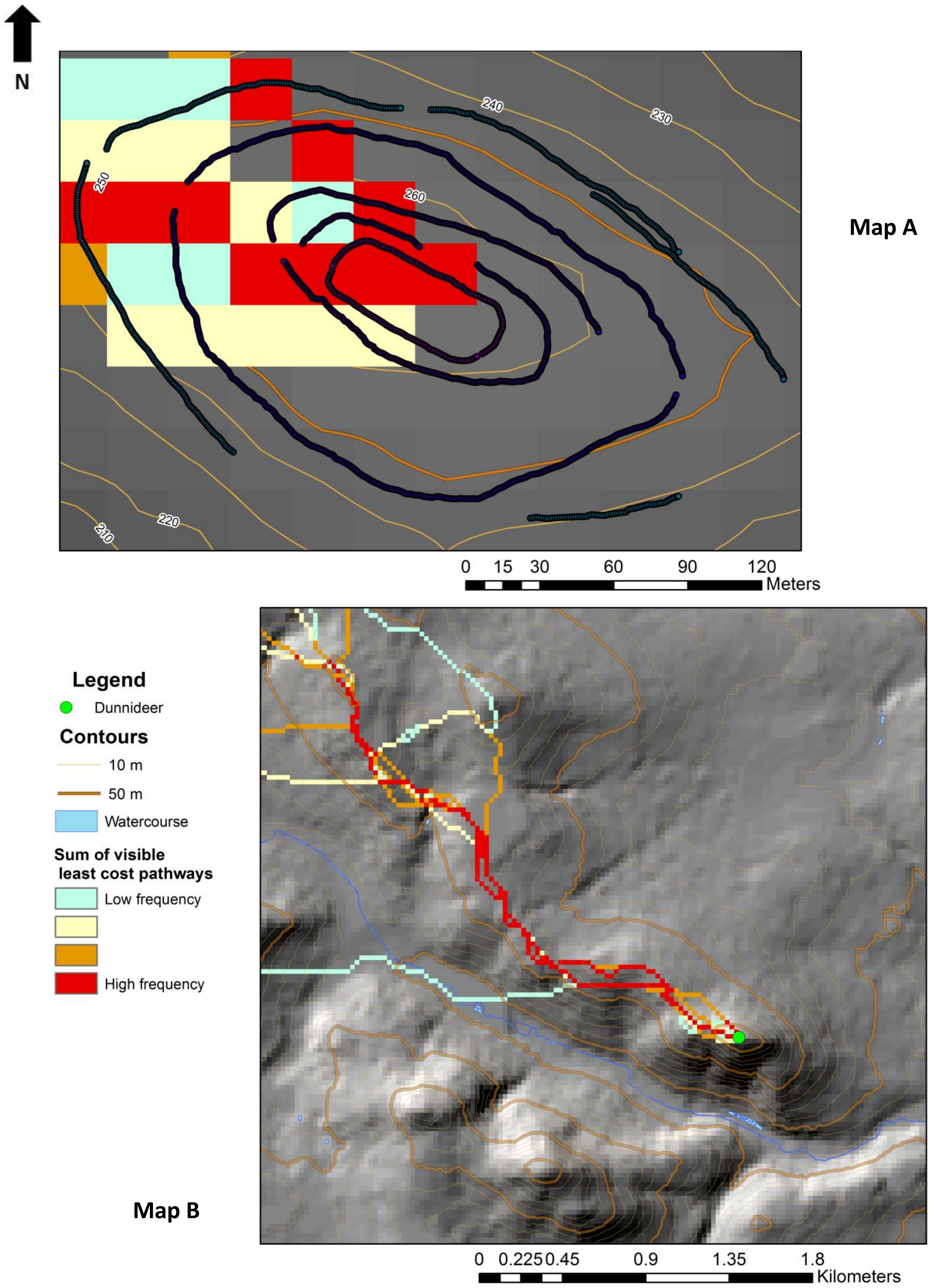


Figure 136. Results of slope based cost surface analysis surrounding Dunnideer in relation to the topography, recorded archaeology and watercourses (Landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)

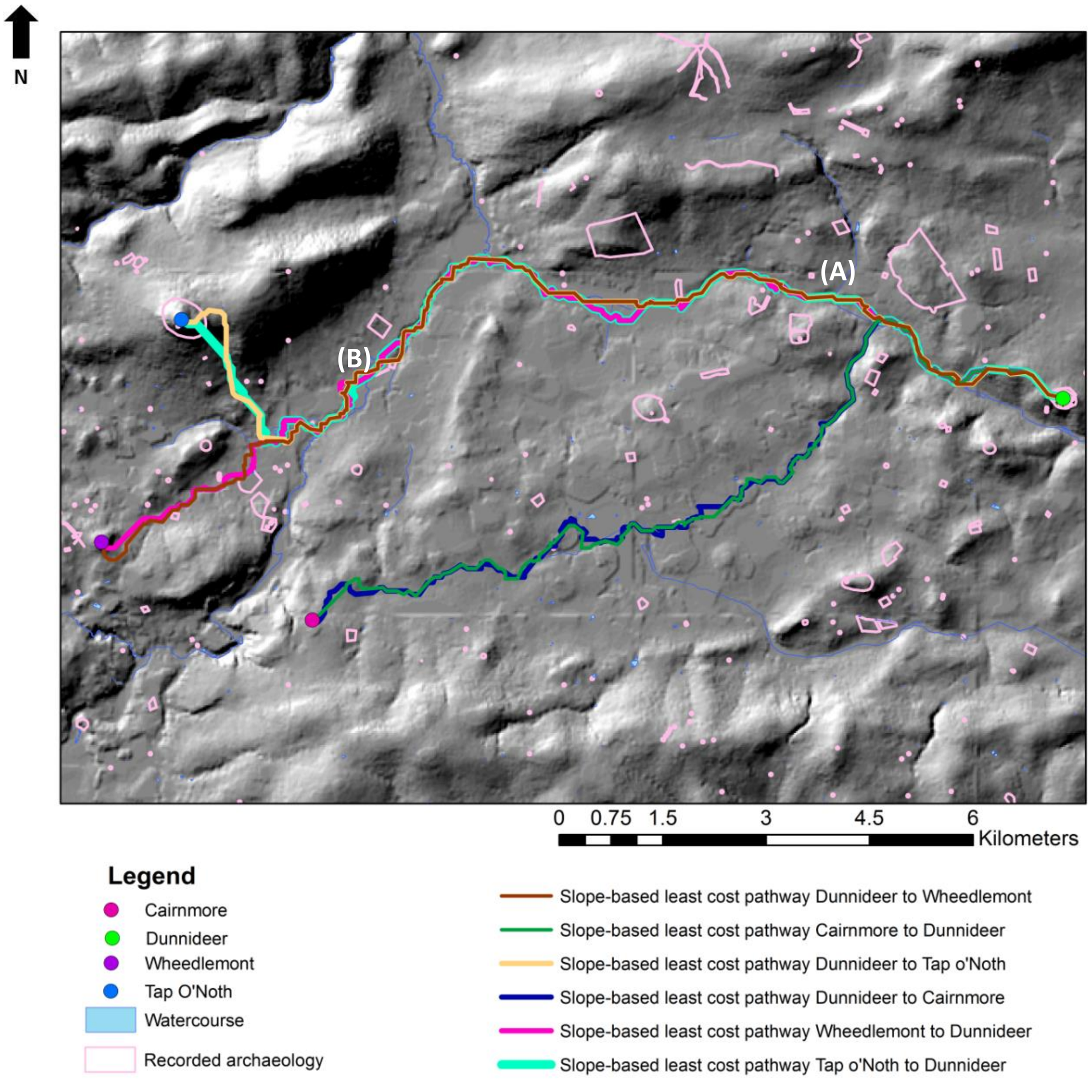
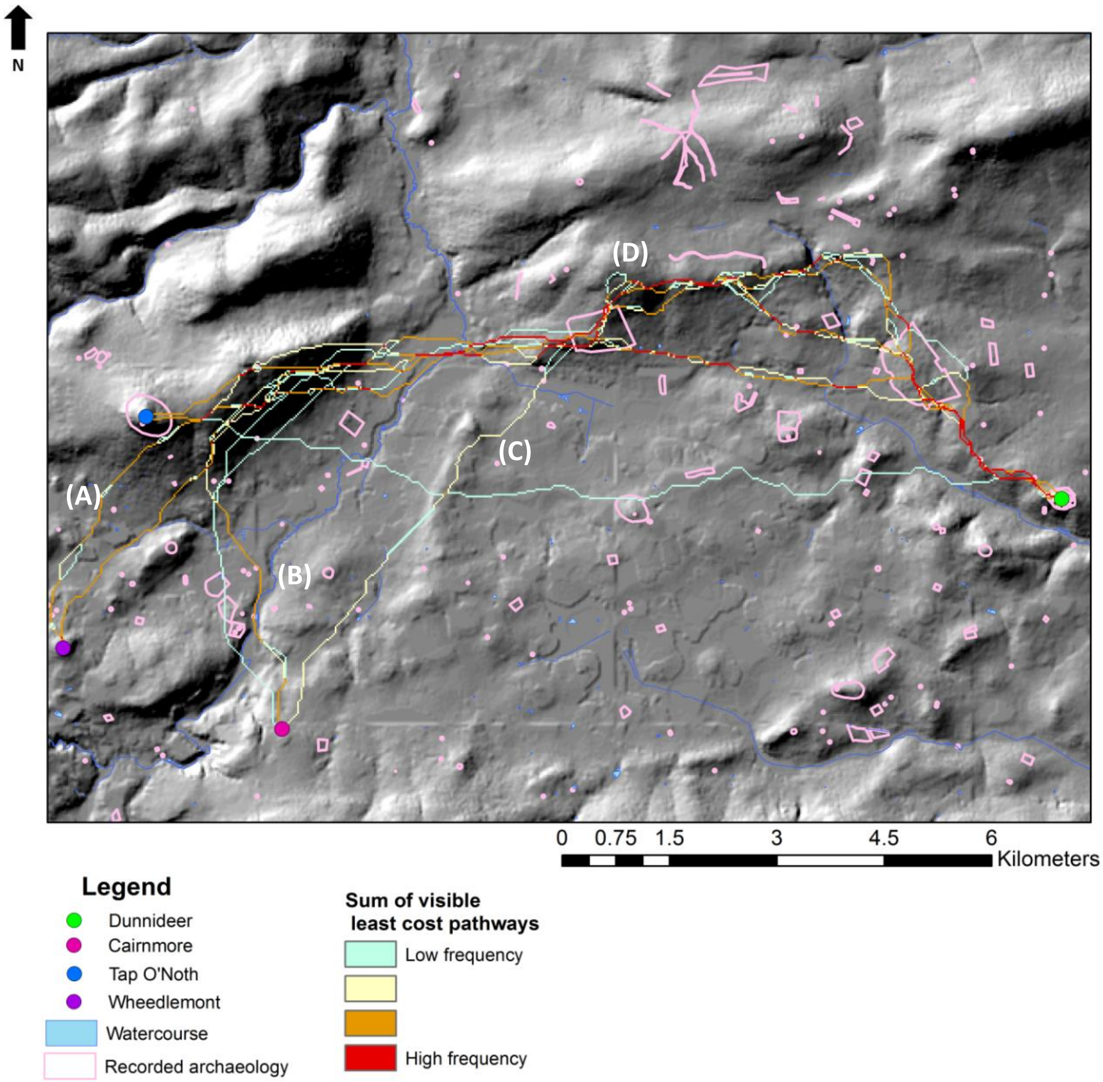


Figure 137. Results of cost surface analysis, depicting the route of visible pathways in relation to the topography, recorded archaeology and watercourses (landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)



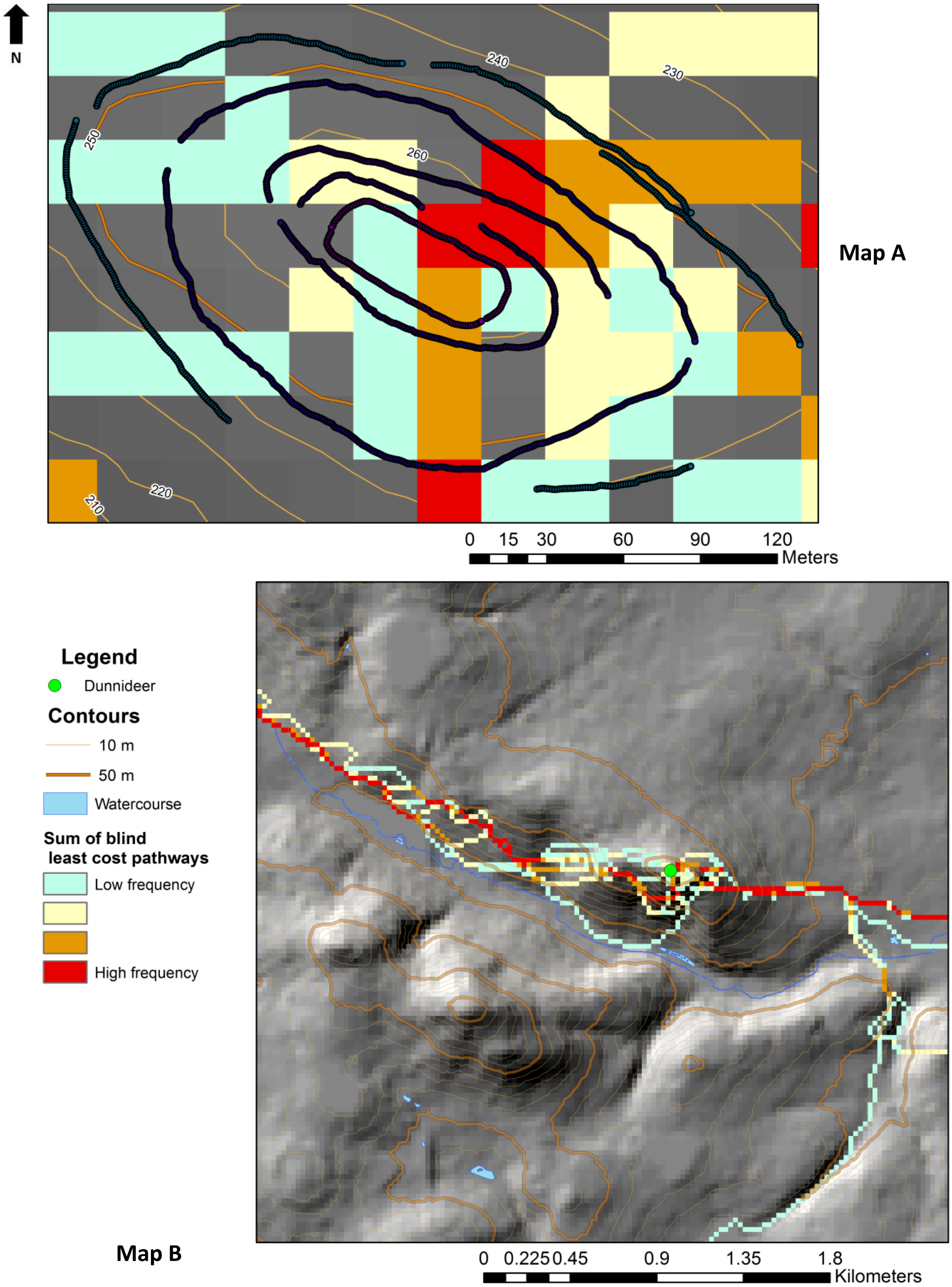
The visible pathways also correspond with a number of activity areas that are likely to be contemporary with the hillforts within this area (Figure 137). For example, the pathways to and from Wheedlemont travel close to a boulder with at least 10 cupmarks (NJ42NE0043), a possible late Bronze Age hoard (NJ42NE0032) and copper coins (NJ42NE0013) **(A)**. Even though it was implied by Cook on a morphological basis that Wheedlemont dated to the early Medieval period (2013), the activity around this site was dense within the later prehistoric period. This implies that within later prehistory this area was a significant place, which may have factored into communication routes within this landscape.

Another significant route that corresponds with the visible pathways are those between Dunnideer and Cairnmore. These pathways travel close to Rhynie, which has a dense concentration of both later prehistoric and early medieval activity **(B).** This activity includes the enclosure at Barflat (NJ42NE0047), excavations revealed that this comprised of concentric enclosures which were centred on a ring ditch which was in association with the Class I symbol stone, the Craw Stane (Noble and Gondek 2011). The enclosure consisted of an inner and outer ditch, a circular setting of postholes and a palisaded trench (*ibid* 2011). Finds of late Roman Amphorae, 6^{th} Century continental glass, metalwork and metalworking debris imply that this was a high status 6^{th} Century Settlement (*ibid* 2011). Subsequent excavations found multiple objects associated with metalworking which further supported the suggestion that this site was of high status and possibly a Royal site which had both a ritual and settlement nature (Noble et al. 2012). These pathways also come across square barrows (NJ42NE0057) and two further enclosures (NJ42NE0060). Route **C** does not intersect with any activity that can be confidently confirmed to be activity which was contemporary with that of the hillforts. This is due to the fact that these are several areas of rig and furrow, which are notoriously difficult to date but they are not later prehistoric. This area is however a relatively featureless lowland area which was inevitably highly visible and overlooked by Dunnideer.

The most significant correlation of the visible pathways with known routeways travelled between Dunnideer and the surrounding landscape was found at (D). This routeway travels via Wardhouse Hill. Although this area is not populated by archaeological activity there is an extant trackway (NJ53SE0054), however it is of unknown date. This track may have been a significant routeway in the past, a significant route that was also highly visible from Dunnideer.

There is very little correlation of the blind pathways with the entrance to Dunnideer (Figure 138). There is also no distinct trend in the entry point of these pathways. The primary route of the blind pathways is via the valley bottom to the northwest of the site, which demonstrates that the site is of limited visibility from this area. Cost surface analysis also indicated that the site was of limited visibility from areas to the east and south-east. These results demonstrate that within the site's immediate environs Dunnideer is of limited visibility, consequently activities within the site are unlikely to be outwardly visible.

Figure 138. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Dunnideer. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses (Copyright: Historic Environment Scotland; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service)



Concluding site summary

There was a strong tradition of building within the immediate area of Dunnideer from the prehistoric period up until the Medieval period. This is demonstrated by the construction of a stone circle, hillfort and medieval tower at the site. The longevity of this site symbolised that those who came and settled on this hilltop had a mythical understanding of the past (Gosden and Lock 1998).

It was postulated that the inner fort was constructed after the outer fort, even though the outer fort is seemingly incomplete. Feachem believed that the vitrified fort was constructed upon an incomplete site (the outer fort) (1966, 69). On the other hand, following a lapse in the occupation of the outer fort and with a strain being placed upon society, the decision may have been taken to refortify sites such as Dunnideer (*ibid* 1966, 70). After all Dunnideer was located in an area that had good land but with few hillforts (*ibid* 1966 70).

The hilltop on which Dunnideer is situated did not dictate the form of the hillfort; other site forms were possible (Feachem 1966, 68). The proposed addition of the vitrified inner fort at Dunnideer adheres to the trend of the enhancement of hillforts within the Middle Iron Age with the rise of the 'Developed' hillfort. If Dunnideer developed similarly to how it is postulated that Tap o' Noth (Cook 2013) developed then the outer fort would have been the initial hillfort phase at this site. The two phases at this site had completely different properties; the initial outer fort subtly followed the line of the hillslopes. The adherence of this bank with the topography reduces the visual prominence of this enclosure. It also encloses an area that does not provide a substantial area that encourages and aids occupation due to the sloping nature of the land even though house platforms were found in both the southern and northern sector of this outer fort.

The results of viewshed analysis did not indicate that the inner and outer forts had significantly different degrees of visual accessibility to the surrounding landscape. However, the visual and physical prominence of these forts differed greatly. For example, the inner fort is visually and physically prominent both due to its summit position and the flat nature of this hilltop, which contrasts with the lower hillslopes. Viewshed analysis demonstrated that the inner fort is more visible that the outer. The overall visibility and visual prominence of this site particularly the inner fort increases as distance from the site increases. The inner vitrified bank is not physically prominent today, but this is likely to be as a result of its poor survival, however in the middle Iron Age this would have been visually and physically prominent both through its initial firing and through its relatively solid state. The lack of entrance within this fort compared to the outer fort portrayed a dominant and impenetrable image to those who approached the site. This emphasised the developed nature of the inner fort phase. The lack of an entrance to this fort, limited number of house platforms, exposure to the elements, and its overall high visibility reduces the likelihood that this fort was used for day to day occupation. It is likely that this was a public front to the site.

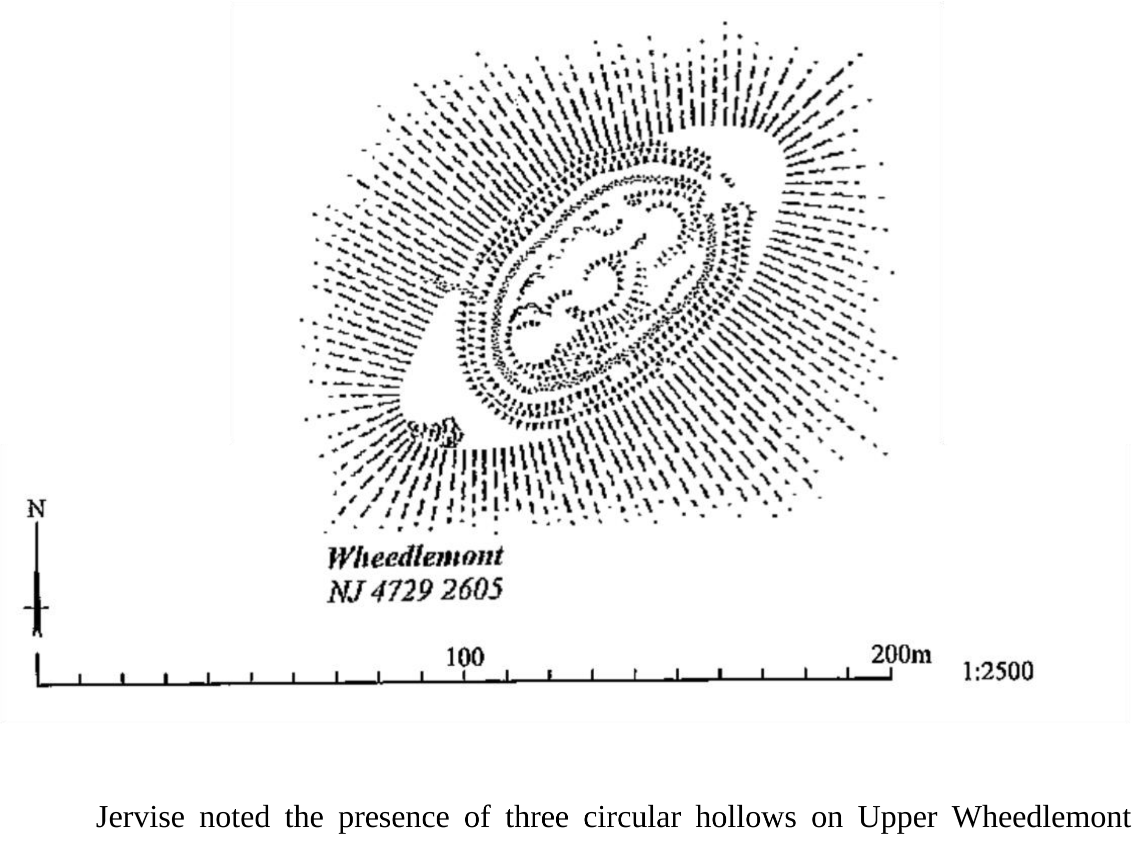
Cost surface analysis indicated that the siting of the entrance in the north-west of the outer fort corresponds with the most visible and accessible entry point into the site. The strong coincidence of this entrance and the site's most elaborately enclosed area with the visible and slope-based pathways demonstrates that this area was oriented towards the site's most visibly accessible entry point. This correct pathway has already been seen at other hillforts within this study for example Castell Grogwynion and Prestonbury.

Wheedlemont

Site introduction

This oval shaped site is situated on the summit of Wheedlemont Hill. Jervise noted an ‘entrenchment’ within this area which enclosed 100 acres (Jervise 1871, 327), however Ordnance Survey argue that this must refer to a field wall which “skirts the base of the hill” (1967) (Figure 139). The site’s entrance is situated in the north-east and is 3m wide (Ordnance Survey 1967).

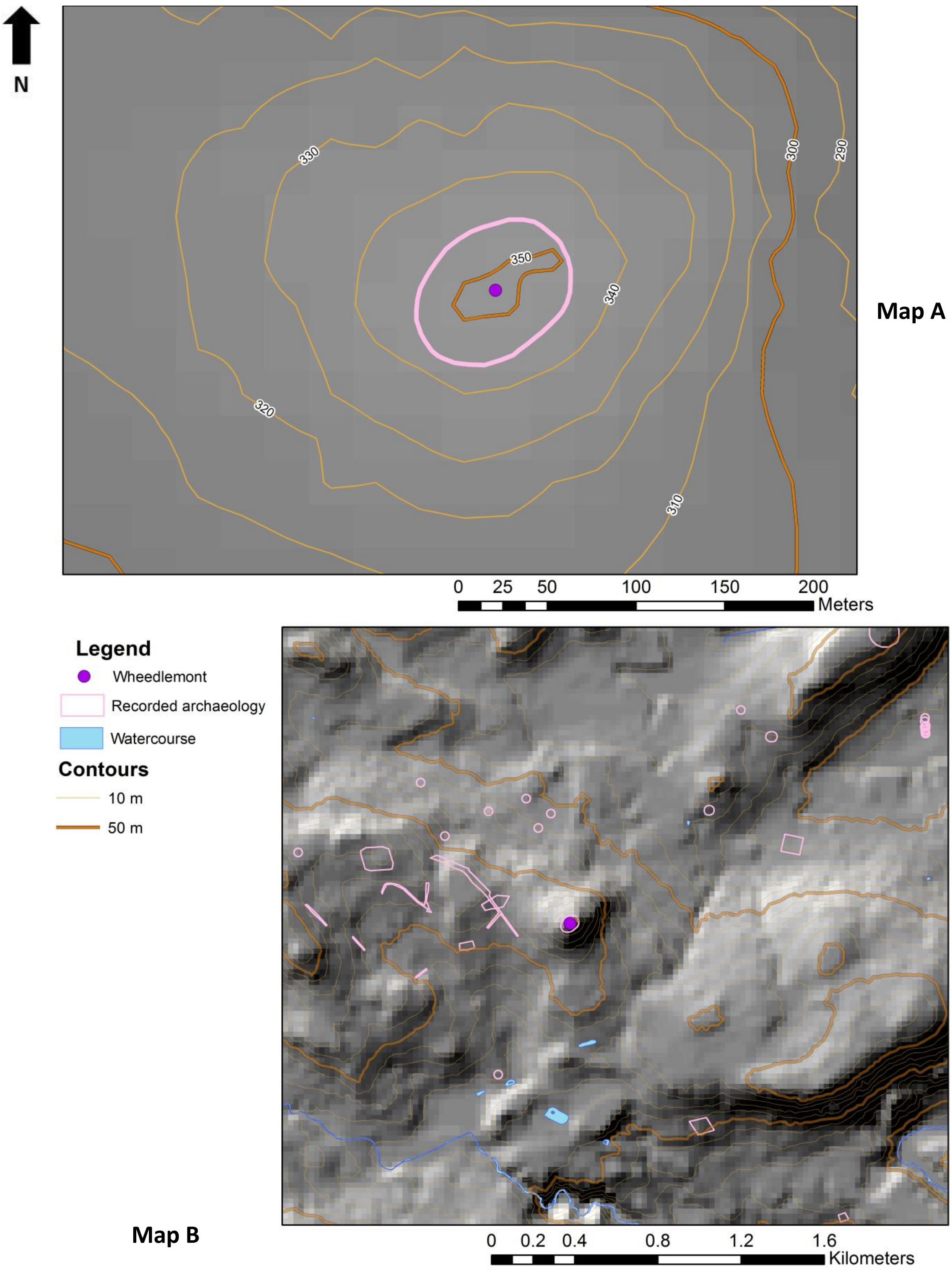
Figure 139. Plan of Wheedlemont Hill (Copyright: Historic Environment Scotland)



Jervise noted the presence of three circular hollows on Upper Wheedlemont (1871, 327). They measured ‘12 by 14 feet in diameter, and from 30 to 36 inches deep (*ibid* 1871, 327). Fragments of querns were discovered close to the hollows (*ibid* 1871, 327). Greig (1989, 21) and RCAHMS (1996) both noted the existence of two adjoining hut circles on this hill, however the dimensions of the huts that they discovered did not correspond with Jervise's observations (1871, 327) (Figure 140). The eastern hut circle measures 9m in diameter whilst the western hut circle is 11m in diameter (RCAHMS 1996). Both of them have southern entrances (*ibid* 1996).

The site has not been radiocarbon dated, however Cook postulated an Early Medieval date for it (2013). This date was extrapolated from sites of a known date and with a similar morphology and spatial location (*ibid* 2013). However, the influences behind morphology and location cannot be solely chronologically defined, consequently this relative dating must be taken with caution. Later in this thesis it will be highlighted that there are similarities and differences in hillfort location and morphology across time and region.

Figure 140. DTM model of Wheedlemont and its environs overlain by contours, SMR data and watercourses. Map A focuses on the site and Map B depicts its topographical environs (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



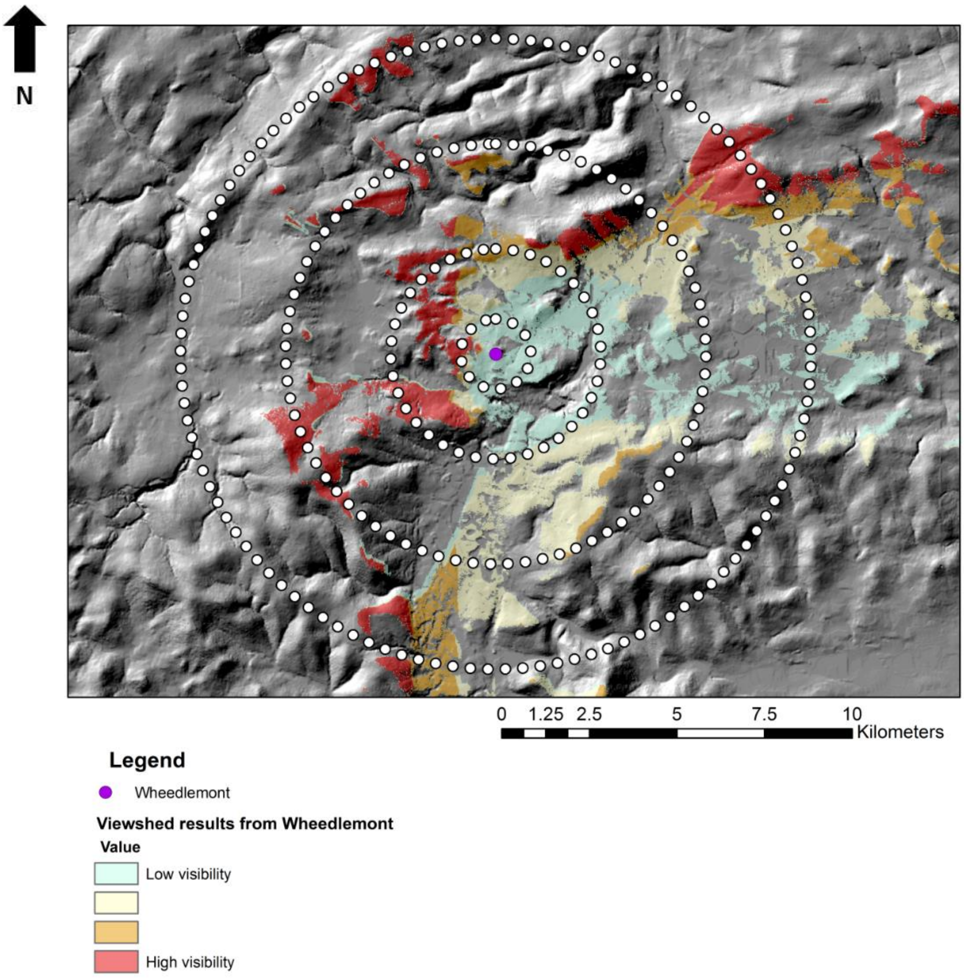
Physical relationship of the hillfort morphology and location with the landscape topography

Wheedlemont is situated on the eastern summit of Wheedlemont hill. This is the most topographically defined aspect of the hill as the remainder is a very gentle rolling hilltop. The occupation of the summit of this conspicuous hilltop immediately meant that this site was visually and physically prominent within the surrounding landscape. However, due to the site's poor survival it is very difficult to distinguish how its prominence related to the topography or the morphology. Whilst approaching the site from the slopes below, the enclosing works are not visible, although this is unlikely to have been the case when the site was in use as they have inevitably eroded over the centuries and they are likely to have been substantially higher. The site's enclosing bank sits downslope from the interior consequently the interior was likely to be visible from the surrounding landscape.

Although Wheedlemont is situated on the summit of Wheedlemont Hill, it does not occupy the entirety of this piece of land; neither does the morphology of the site differ with changes in topography. There is a substantial amount of wasted space that surrounds this site and if defence was a primary concern during its construction, the site would have extended across the whole of the hilltop with more substantial enclosing works (Shepherd 1996, 145). The limited defensive capability of this site is also emphasised by the position of the entrance, which faces the north-eastern hillslope that forms a blind side to the hilltop as approaching traffic from these slopes are not visible. Jervise did however note that a ditch was only constructed on the base of the southern and western aspects of the site, which he argues were the site's most accessible areas (1871, 327). This demonstrates that although the site was not ostentatiously defended, efforts were made to counteract the susceptibility of the site from intruders, which was caused by its topographical location.

Viewshed analysis found that although a large proportion of the area that is within the 1km radius is visible, the area's actual visual magnitude is low (Figure 141). The majority of the areas within the 3km radius are also visible, however beyond this radius, visibility becomes scattered. Within the 6km radius visibility is predominantly focused in the east, whilst within the 9km radius visibility becomes very scattered, but it is of high visibility.

Figure 141. Viewshed results from Wheedlemont hillfort grid, depicting the visibility of the surrounding landscape from Wheedlemont as defined by the hillfort buffers (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Image

Wheedlemont is of high visibility from the 1km radius (Figure 142). The majority of the site has a visual magnitude within the upper quartile range. The high visibility of the hilltop on which Wheedlemont sits is supported by the fieldwork photography from the viewpoints that are situated within this radius. The small scale of the earthworks that enclose this site means that they are not visually prominent from either the north-east or south-east (Figures 143-145). The poor survival of the site means that it is not possible to differentiate the 'image' as portrayed by the enclosing works of this site from these different viewpoints. It was not possible to distinguish the extent or prominence of the enclosing works from the surrounding landscape consequently one could not interpret whether there was evidence for the disproportionate allocation of resources in order to portray a particular image within a particular direction.

Figure 142. Results of viewshed analysis from the radii towards Wheedlemont depicting the visibility of the site (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

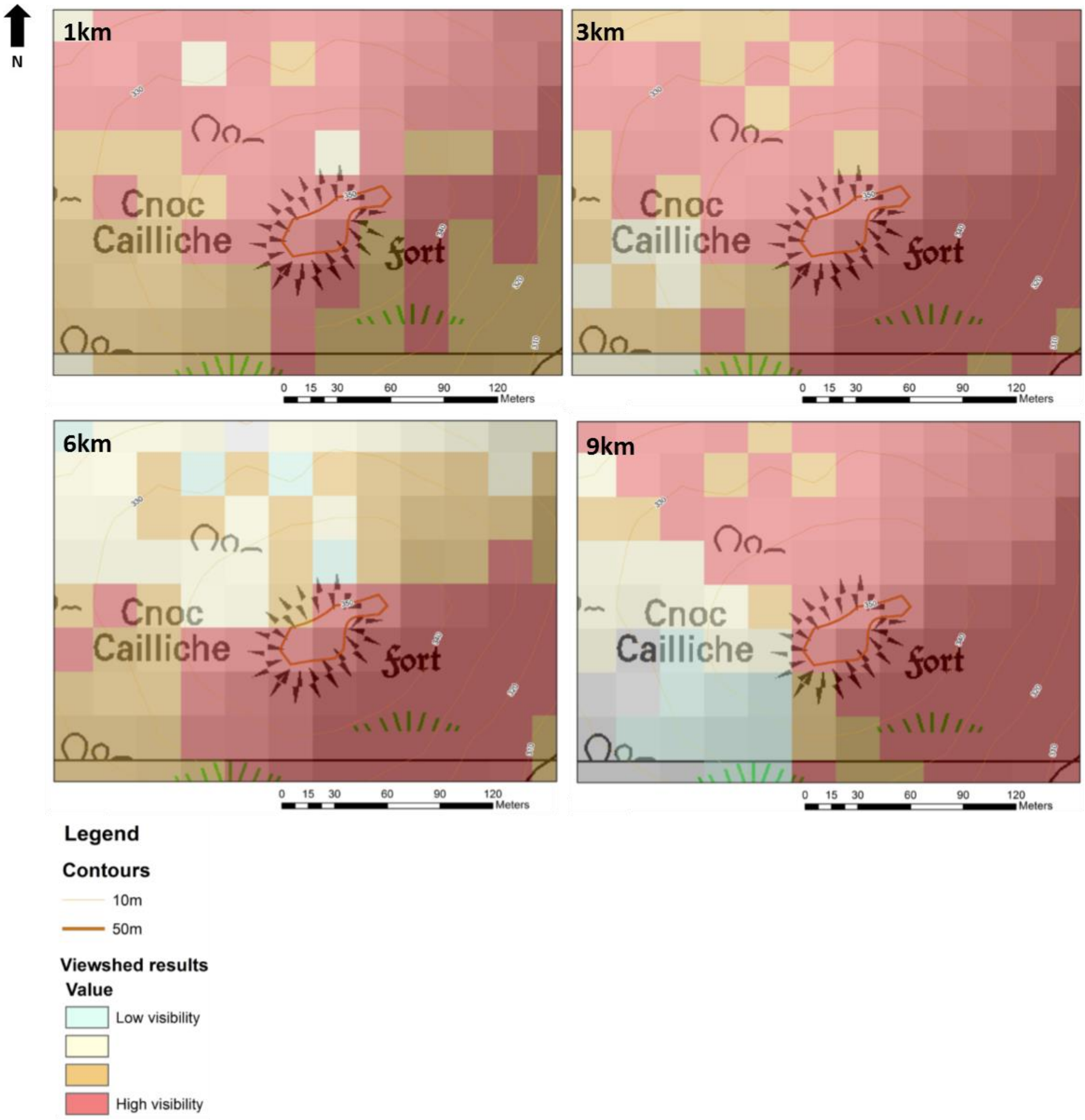


Figure 143. Location map of the viewpoints surrounding Wheedlemont in relation to the site's radii (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

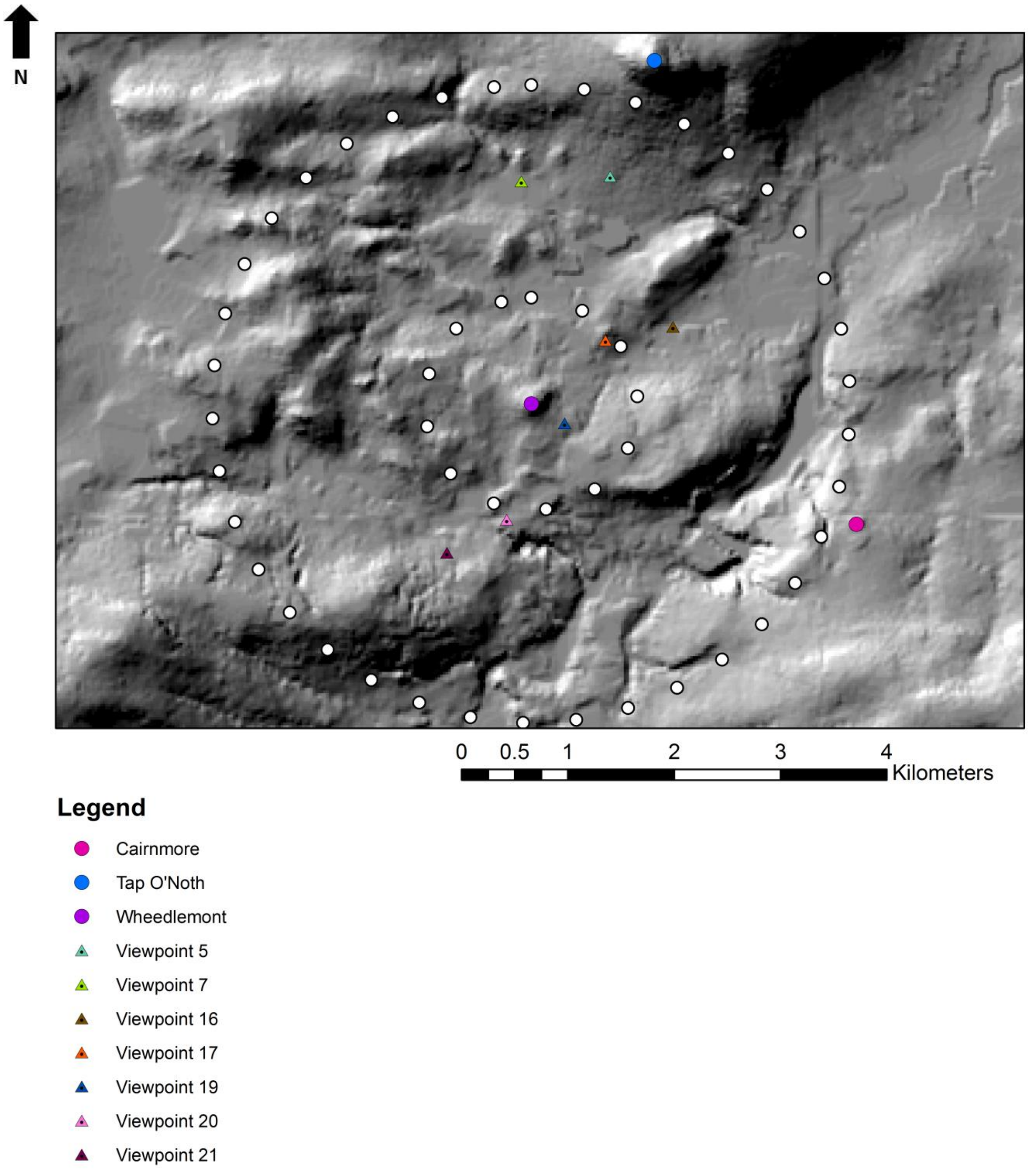


Figure 144. View of Wheedlemont from Viewpoint 19, 364m to the southeast of the site
(Author's own 2014)

Figure 145. View of Wheedlemont from Viewpoint 17, 920m to the northeast of the site
(Author's own 2014)

The visibility of Wheedlemont increases from the 3km radius as the majority of the site has a visual magnitude within the upper quartile range (Figure 142). The fieldwork photography illustrates that the visual prominence of this hilltop increases yet the enclosing works to the site are not visible (Figure 146-150). The poor survival of this site meant that it was not possible to discern whether direction affected the visibility and/or prominence of the enclosing works.

Figure 146. View of Wheedlemont from Viewpoint 7, 2km to the north of the site (Author's own 2014)

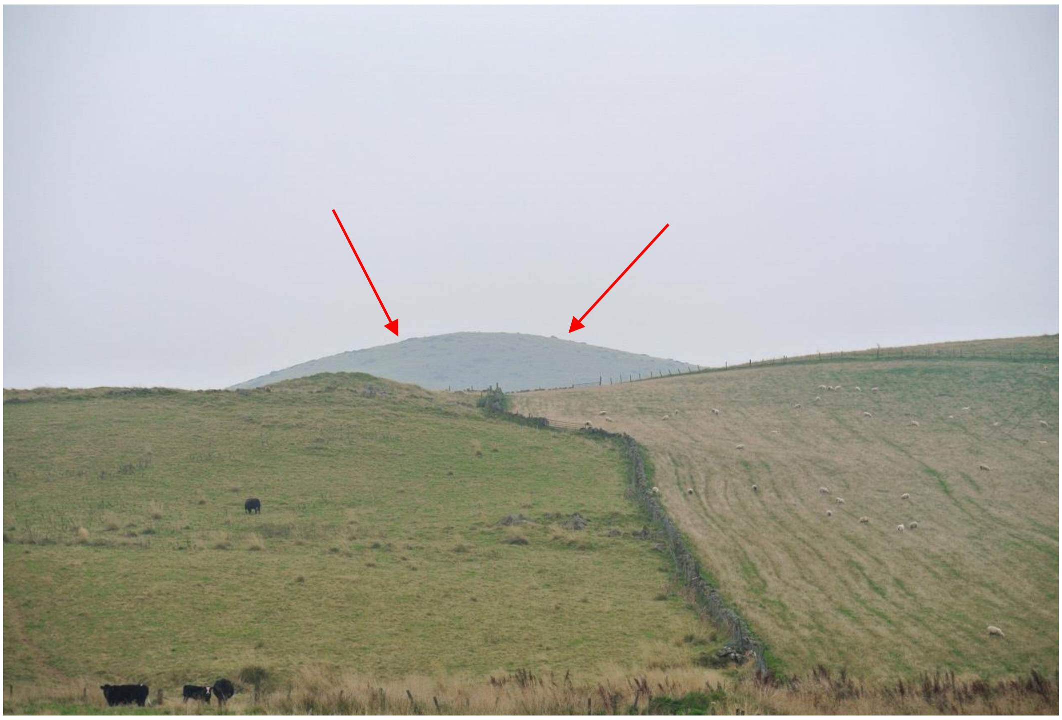


Figure 147. View of Wheedlemont from Viewpoint 5, 2.3km to the NNE of the site (Author's own 2014)

Figure 148. View of Wheedlemont from Viewpoint 16, 1.5km to the north-east of the site (Author's own 2014)

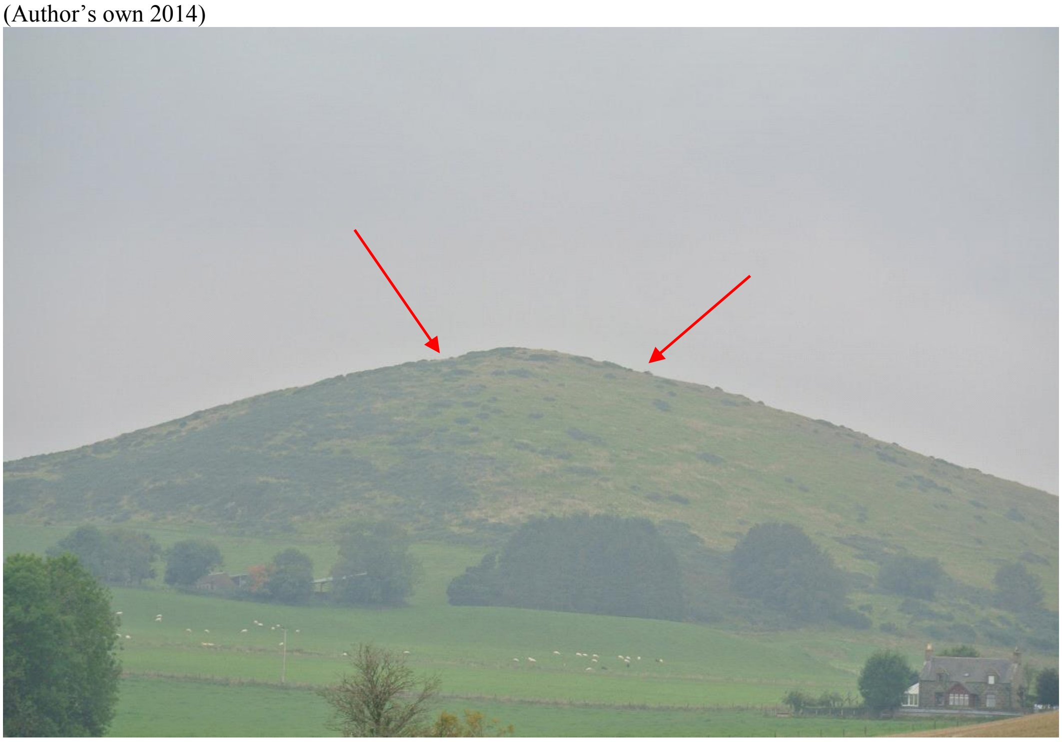


Figure 149. View of Wheedlemont from Viewpoint 20, 1.1km to the SSW of the site (Author's own 2014)

Figure 150. View of Wheedlemont from Viewpoint 21, 1.6km to the south-west of the site (Author's own 2014)

The visibility of the hilltop decreases from the 6km and 9km radii however the site itself is still highly visible (Figure 142). Viewpoint 11 is situated between the 3km and 6km radii to the north-east of the site. Field photography demonstrated that Wheedlemont Hill is highly visible, however the distance between the site and the viewpoint meant that visual clarity is poor (Figure 151).

Figure 151. View of Wheedlemont from Viewpoint 11, 3.6km to the north-east of Wheedlemont (Author's own 2014)

Viewshed analysis and fieldwork photography demonstrate that the site is of high visibility from Cairnmore (Figure 152). It is also visually prominent even though the enclosing earthworks cannot be distinguished (Figure 153).

Fieldwork photography indicated that Wheedlemont is visually prominent from Tap o'Noth, but mist on the day meant that visual clarity was poor (Figure 154). However the results from the viewshed analysis indicate that the site is of moderate visibility from both the inner and outer fort at Tap o'Noth (Figure 155- 156). The differentiation in these results was inevitably caused by the influence of experiential perception on interpretation, compared to the results of an objective GIS-based viewshed analysis. In the field observations are influenced by past experiences within the landscape and beyond, similarly routeways are constrained consequently what appears visually prominent is instinctively seen to be highly visible, however on a landscape scale this is not a true reflection of visibility, which is measurable in a GIS. This issue was raised in Chapter 3 in relation to Castell Grogwynion.

Figure 152. Viewshed results from Cairnmore depicting the visibility of Wheedlemont (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

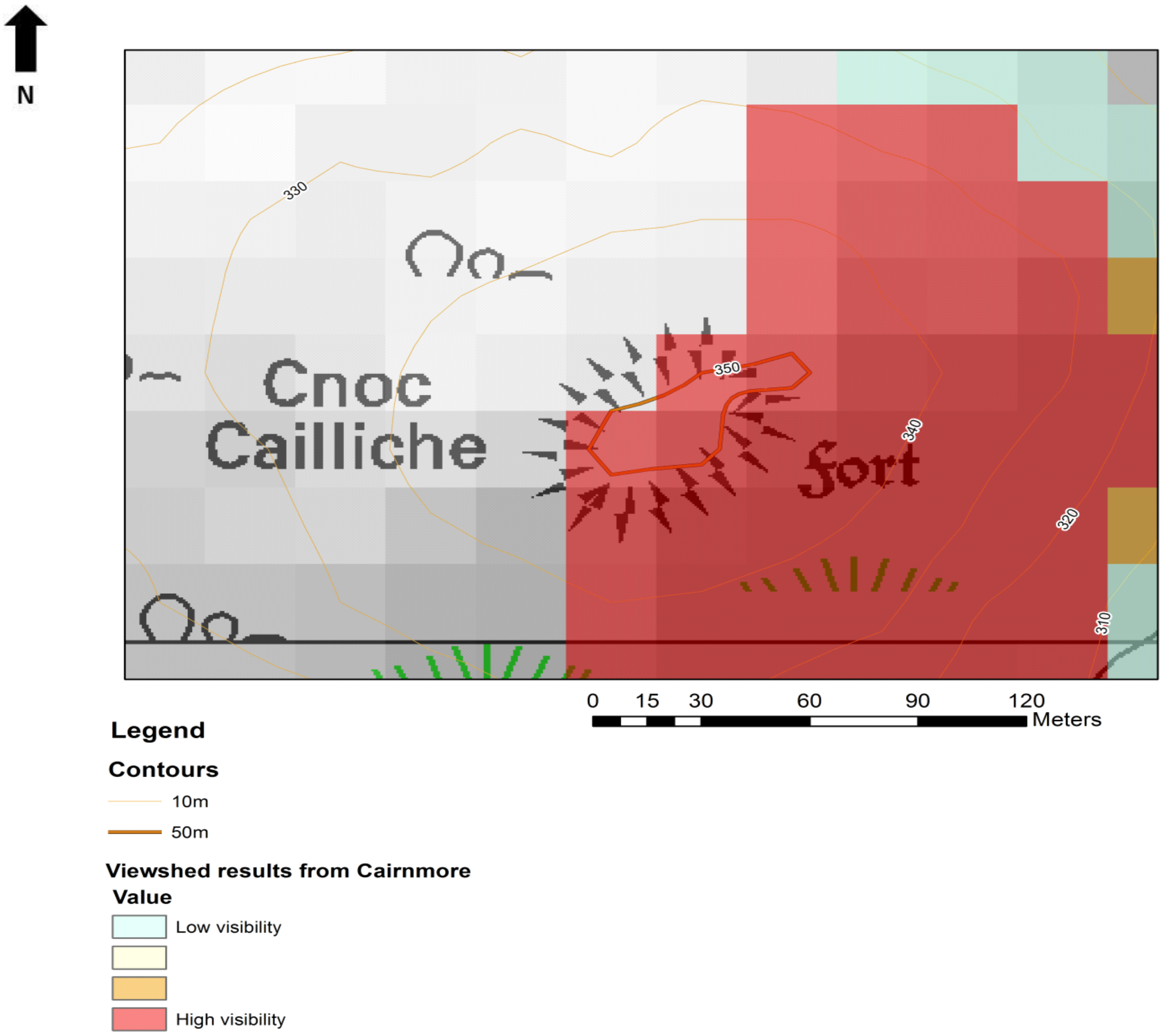


Figure 153. View of Wheedlemont from Cairnmore. The summit of the hill is highly visible but the enclosing earthworks are not distinguishable (Author's own 2014)

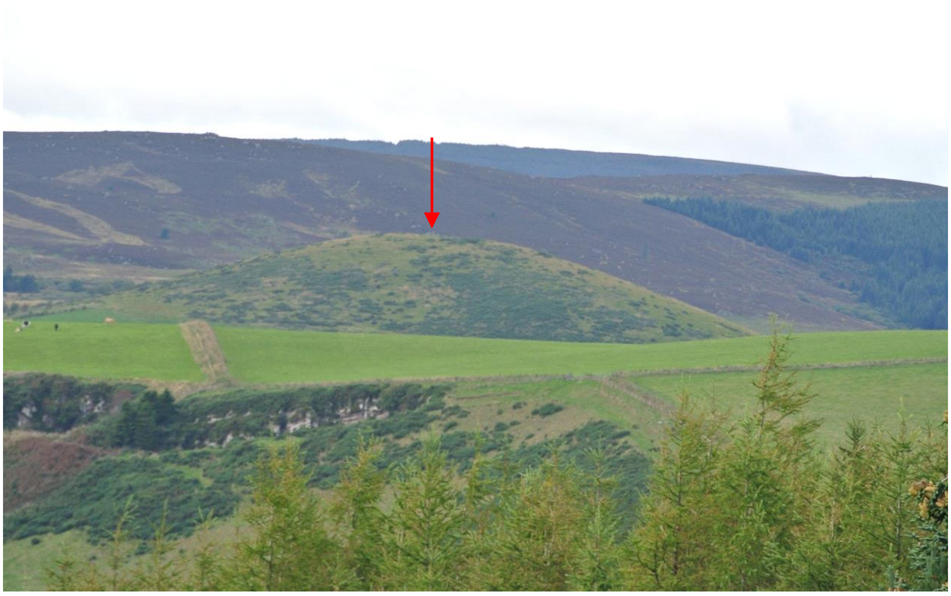


Figure 154.View of Wheedlemont from the slopes of Tap o'Noth (Author's own 2014)

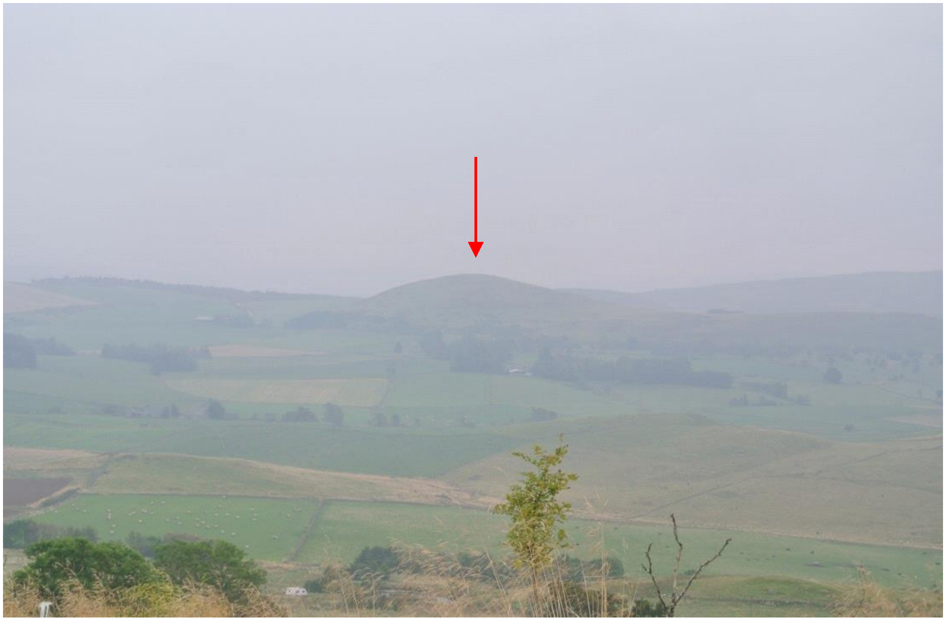


Figure 155. Viewshed results from the inner fort at Tap o'Noth depicting the visibility of Wheedlemont (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

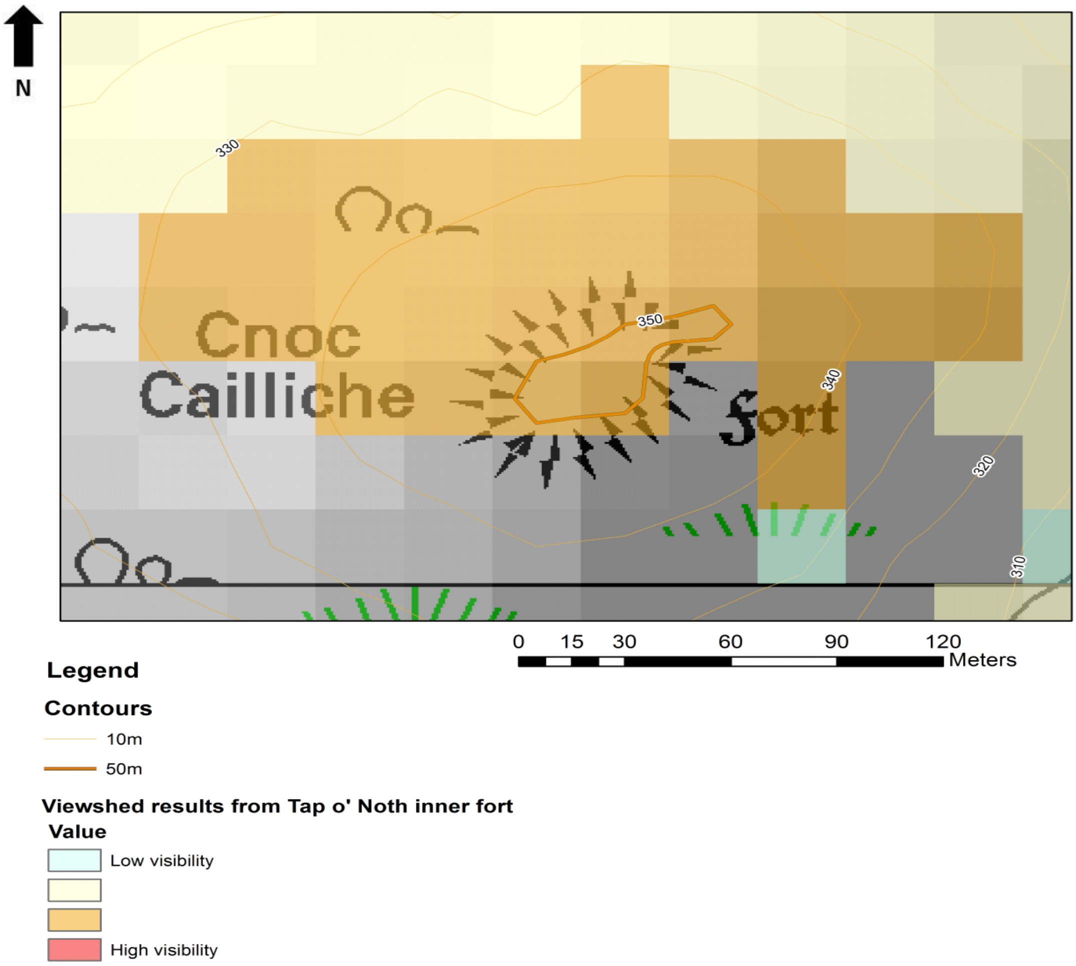
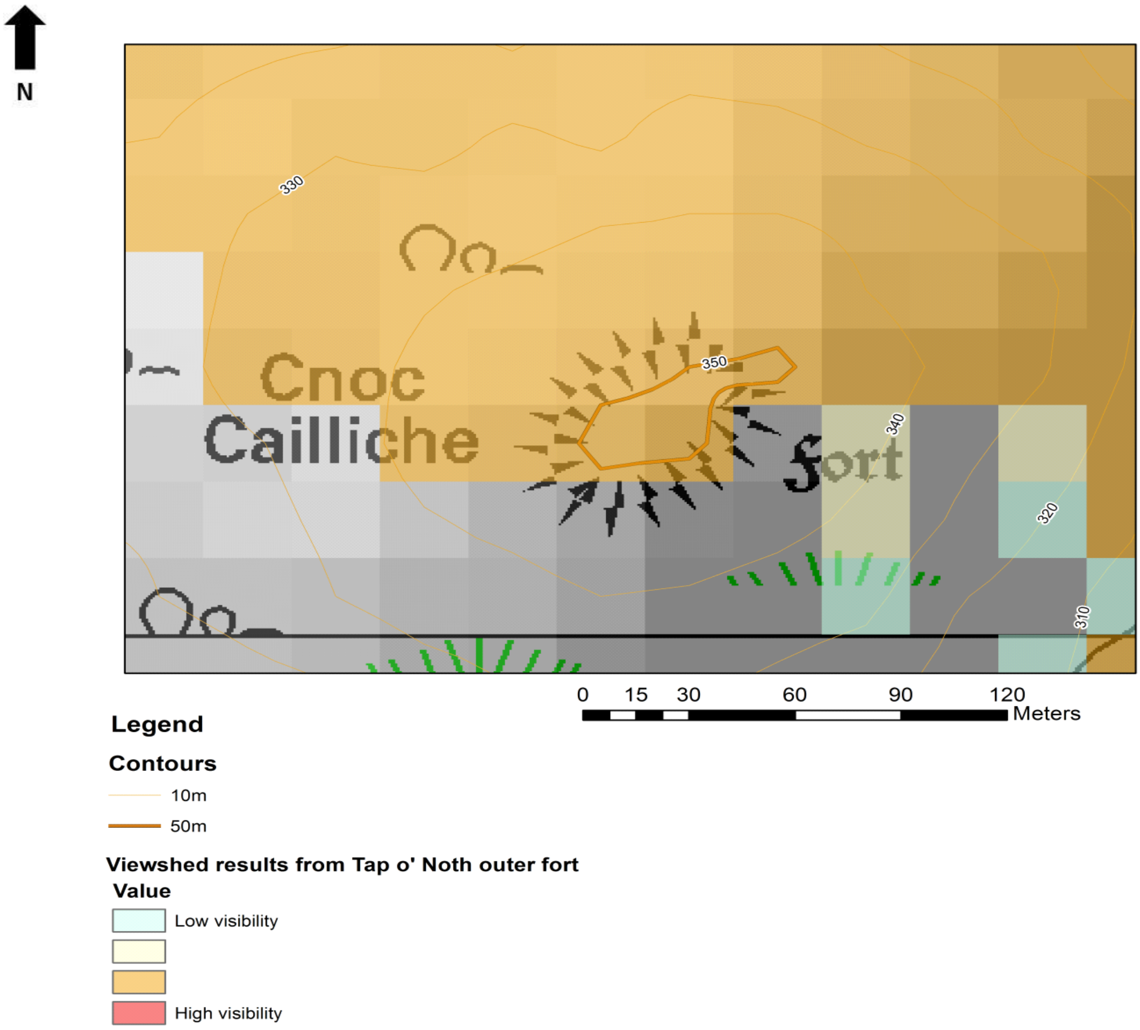


Figure 156. Viewshed results from the outer fort at Tap o'Noth depicting the visibility of Wheedlemont (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)



Wheedlemont is also poorly visible from Dunnideer (Figure 157-158). The viewshed results imply that the site is of very low visibility and the visible areas are confined to the eastern side of the site. The site was not discernible during the field visit to Dunnideer.

Figure 157. Viewshed results from the inner fort at Dunnideer depicting the visibility of Wheedlemont (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

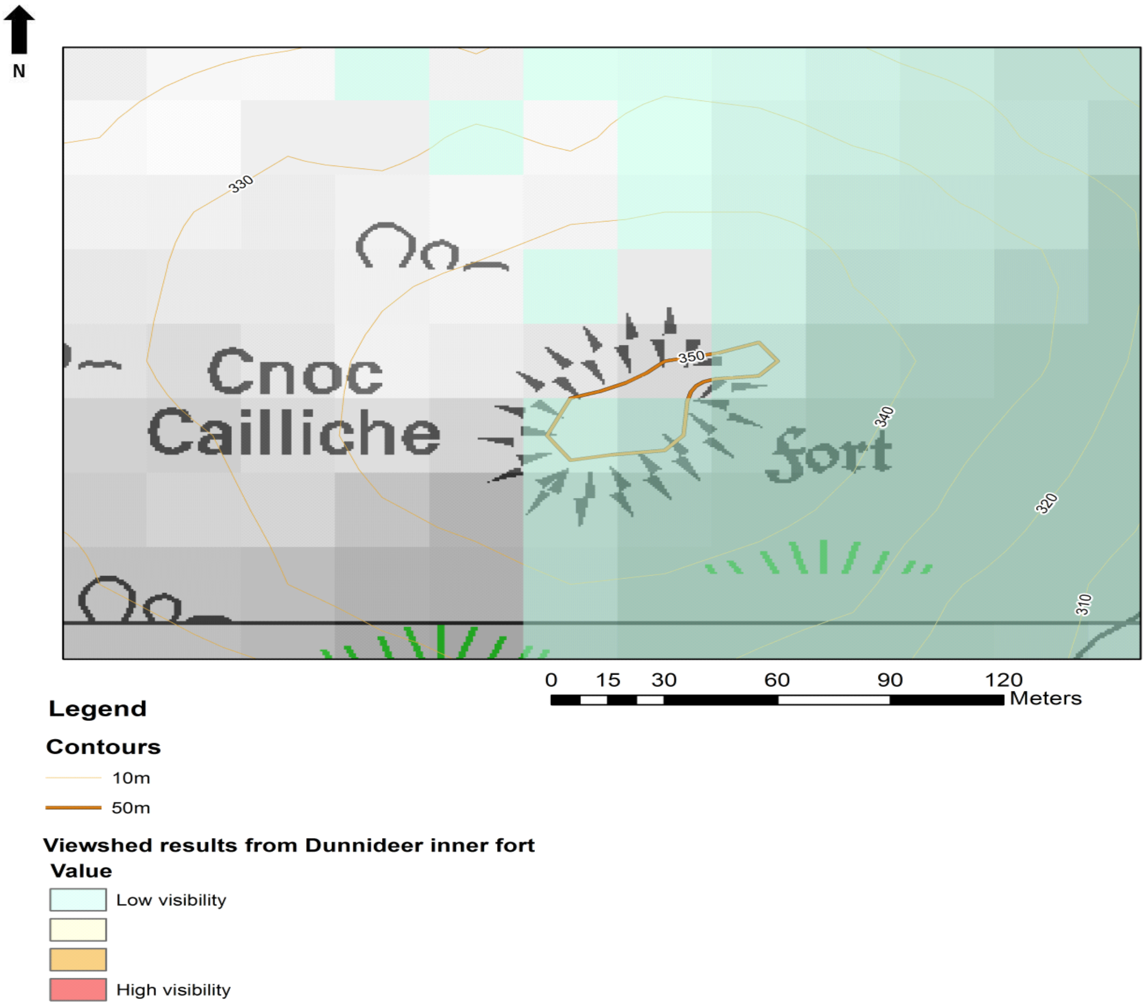
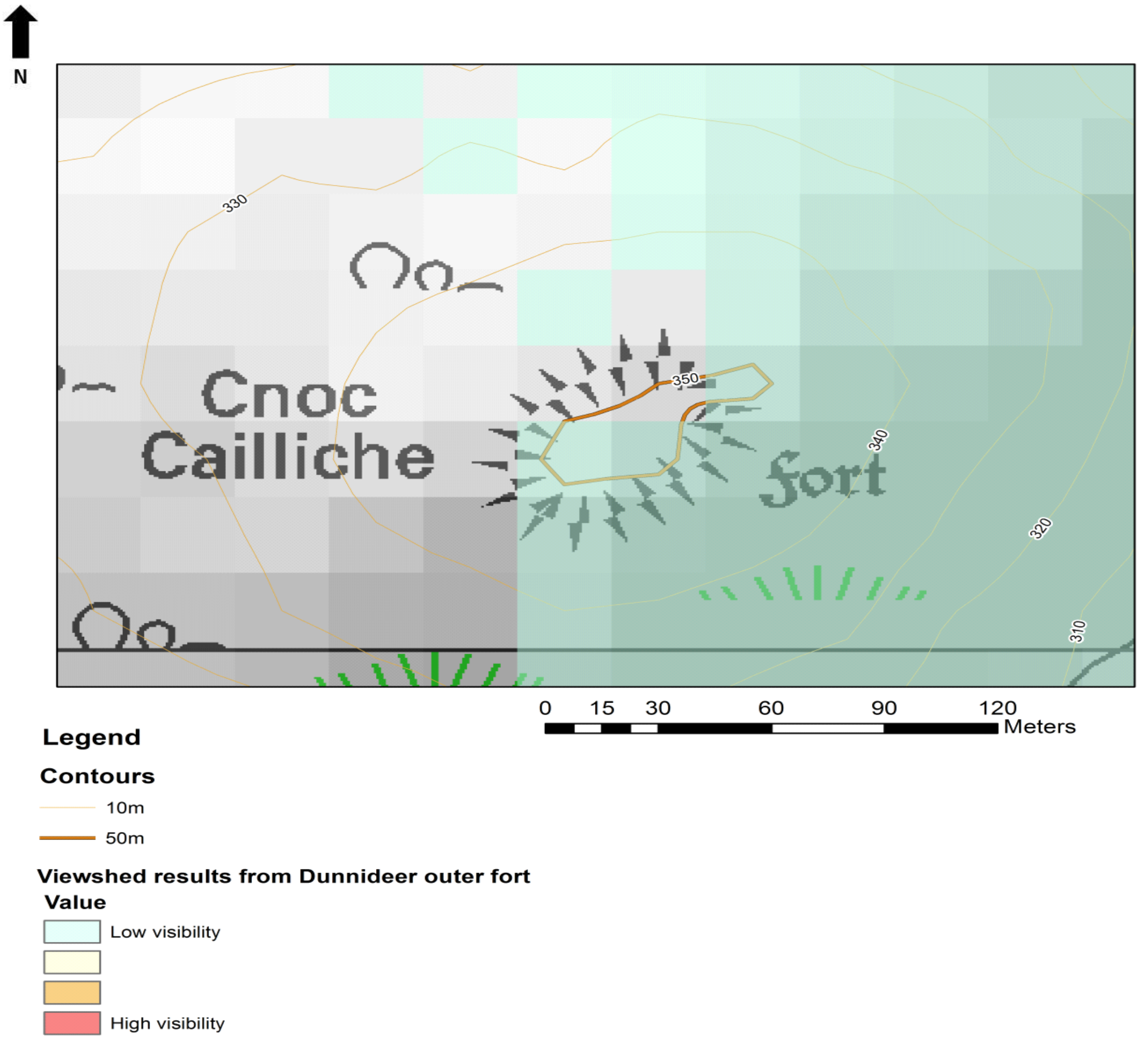


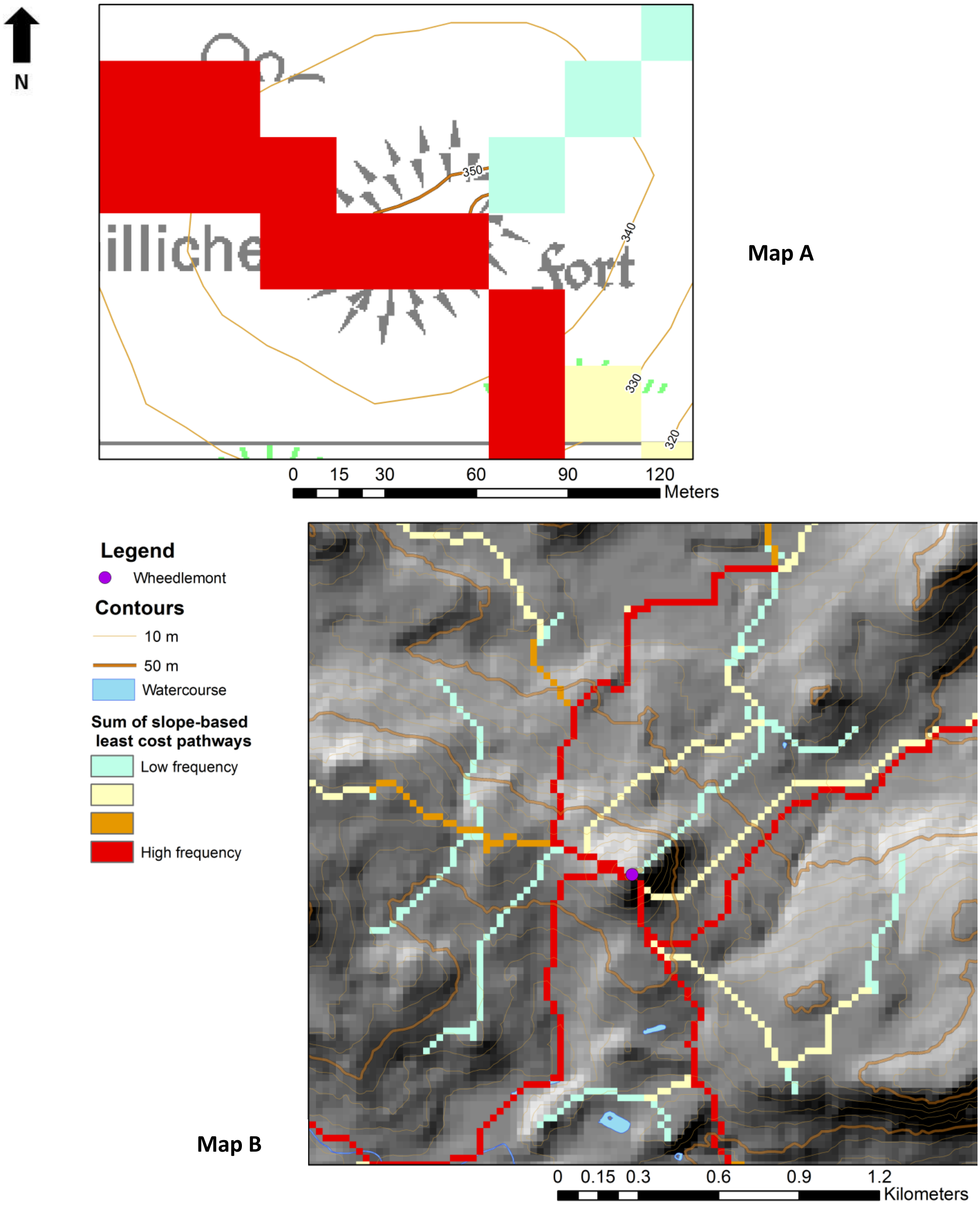
Figure 158. Viewshed results from the outer fort at Dunnideer depicting the visibility of Wheedlemont (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)



Correct pathways

According to the results of cost surface analysis only 1 out of the 249 slope based pathways coincides with Wheedlemont's entrance in the north-east (Figure 159). 69 out pathways interact with the western aspect of the site, which supports Jervise's belief that this is one of its most accessible areas (1871, 327). However the majority (154 out of 249) intersect with the south-eastern aspect of the site.

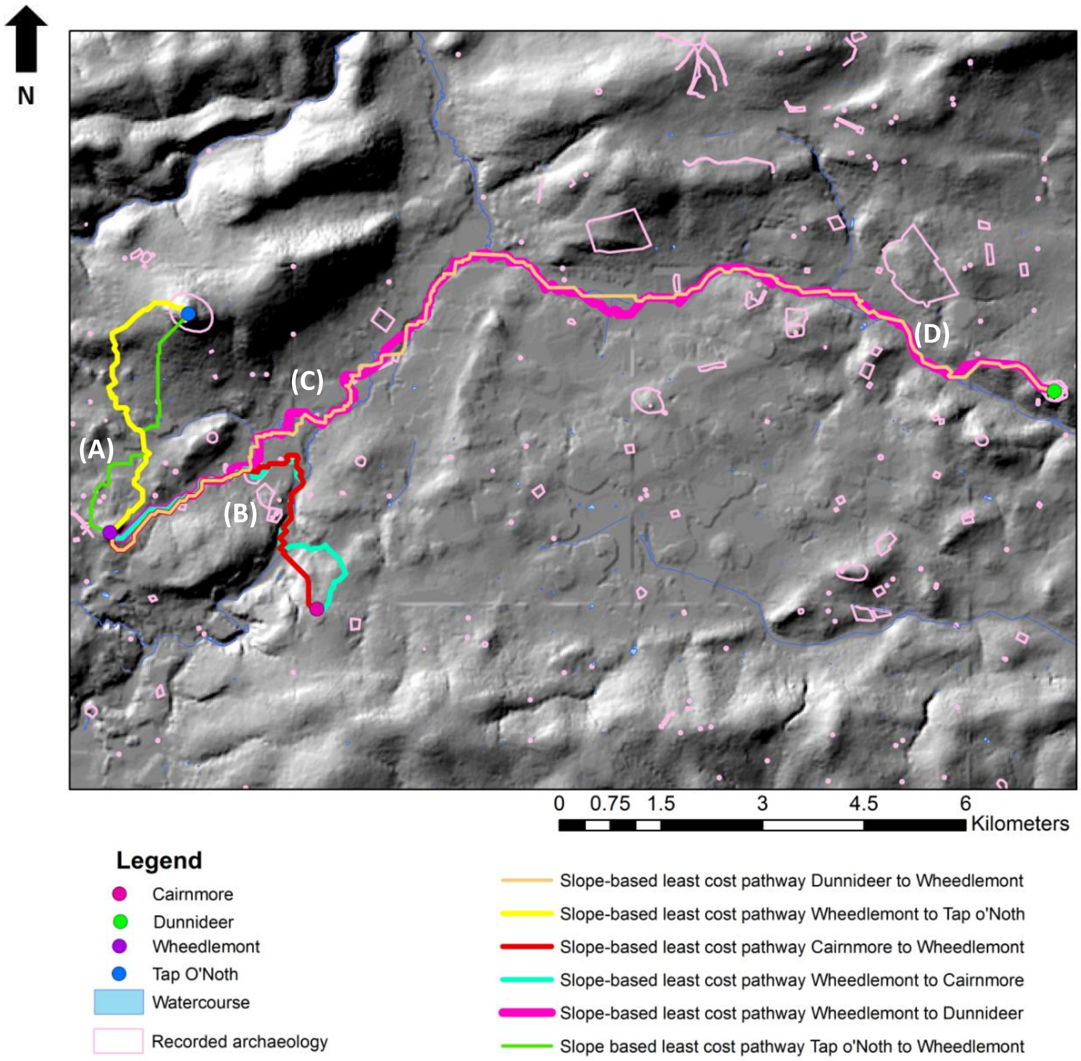
Figure 159. Results of slope based cost surface analysis to and from Wheedlemont. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)



A closer look at the results of cost surface analysis found that the slope-based pathway from Wheedlemont to Tap o'Noth does not coincide with any sites, finds or distinct topographical features between the two sites (Figure 160). However, the path to Wheedlemont from Tap o'Noth interacts with a number or archaeological features such as a boulder with at least 10 cupmarks (NJ42NE0043), a possible late Bronze Age hoard (NJ42NE0032) and copper coins (NJ42NE0013) (**A**). The slope based paths between Cairnmore and Wheedlemont travel close to a D-shaped cropmark (NJ42NE0056) and two enclosures (NJ42NE0060). They also follow the line of the Water of Bogie and interact with several symbol stones (NJ42NE0029, NJ42NE0045 and NJ42NE0033) and Barflat enclosure (NJ42NE0047) (**B**).

The paths between Wheedlemont and Dunnideer interact with several archaeological features which are close to Wheedlemont (**C**). These features include 2 enclosures (NJ42NE0060), a D-shaped enclosure (NJ42NE0056), a cluster of prehistoric finds and two standing stones (NJ52NW0003). These pathways subsequently follow the line of numerous waterways which include the River Shevock (**D**). The pathways also follow the line of the modern railway line, which runs close to Dunnideer, the establishment of the railway within this area indicates that it is an important route through this landscape even today.

Figure 160. Results of slope based cost surface analysis surrounding Wheedlemont in relation to the topography, recorded archaeology and watercourses (Landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service)



None of the visual pathways have any correlation with the entrance to Wheedlemont (Figures 161-162). The blind pathways do however strongly coincide with the south-western aspect of the site as all 18 of them intersect with this area; this correlation indicates that the site was least visible when approaching from this area (Figure 161). However, as there is no strong evidence for morphological variation at this site, there is no indication that the site portrayed a particular image within a particular direction.

Figure 161. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Wheedlemont. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service)

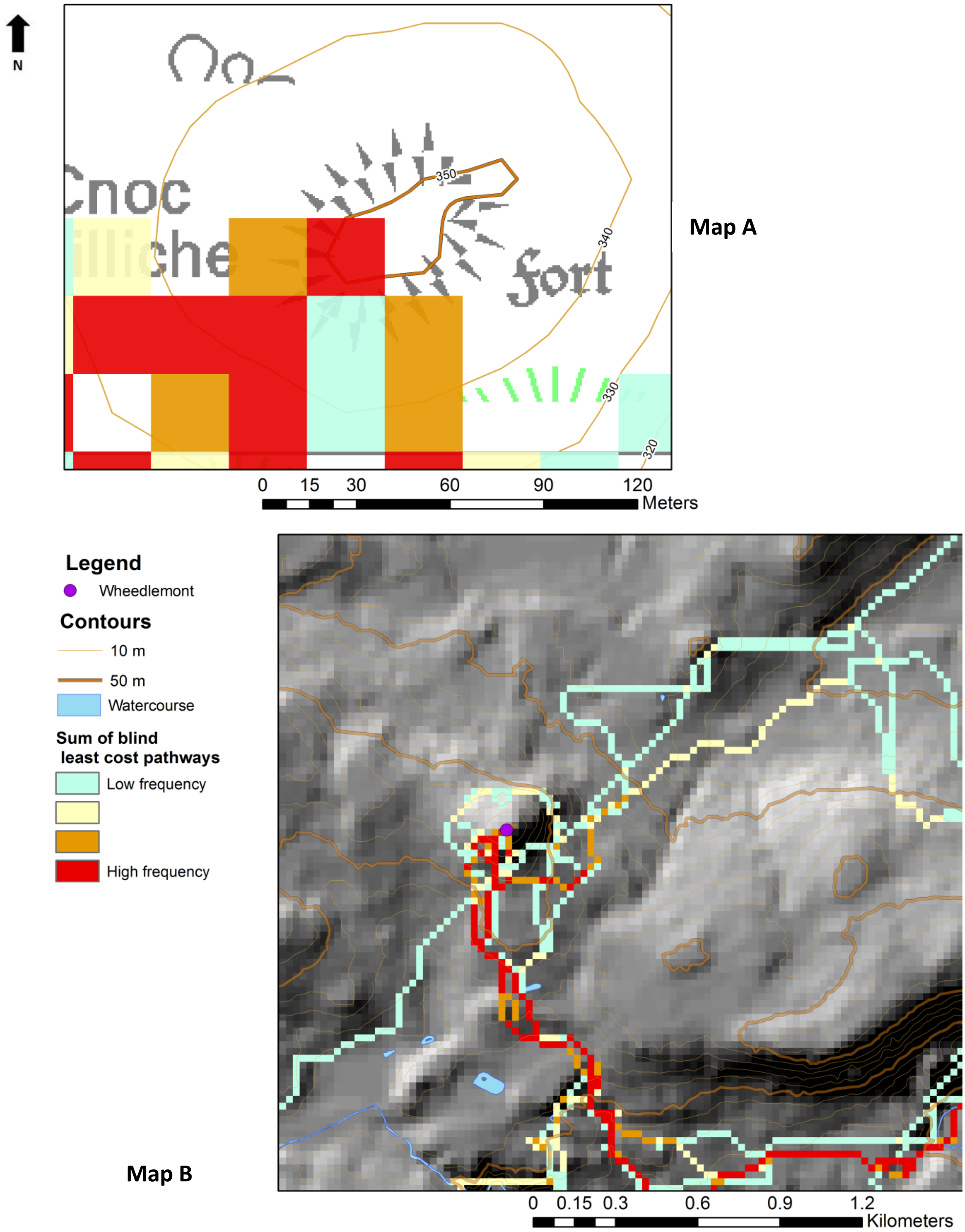
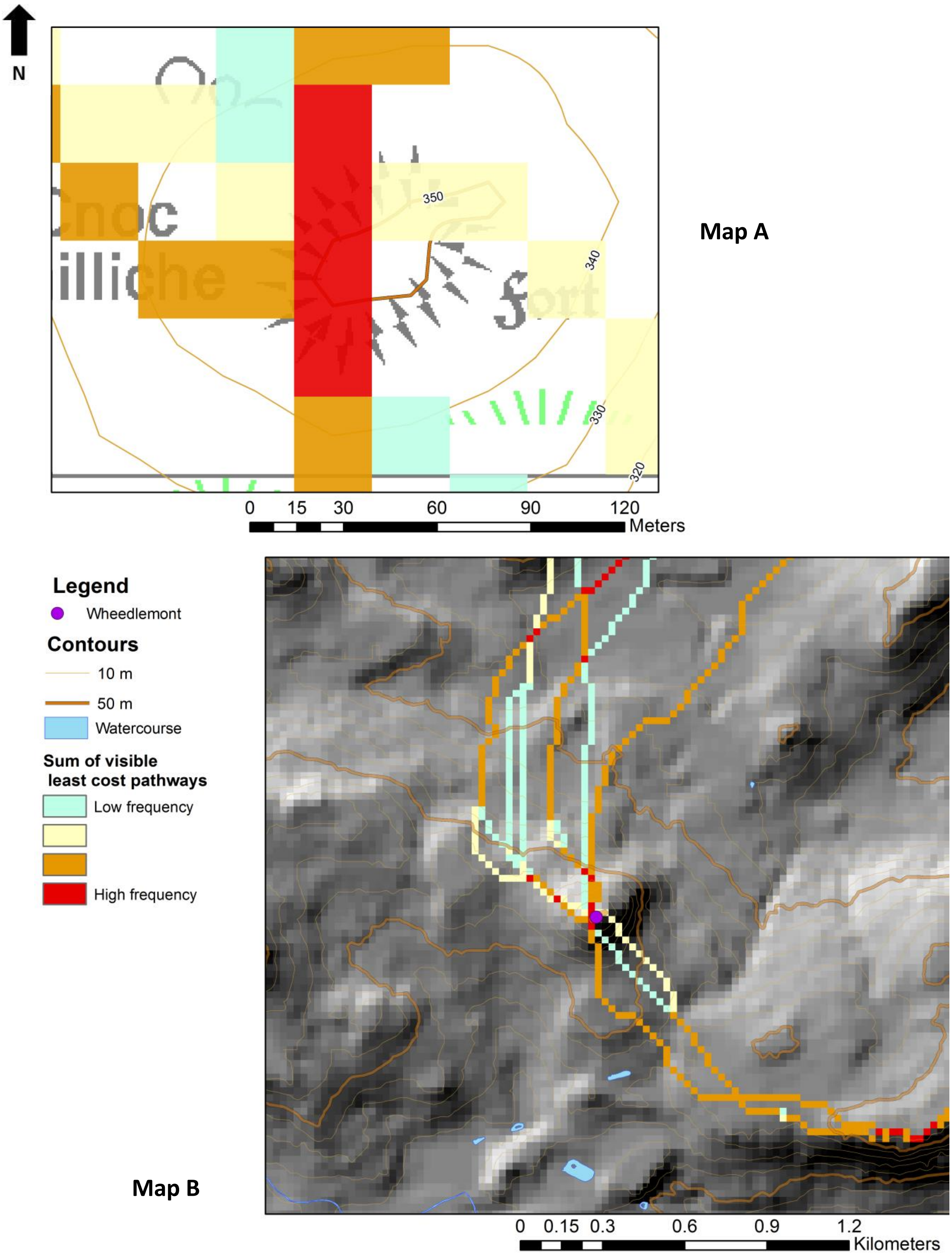
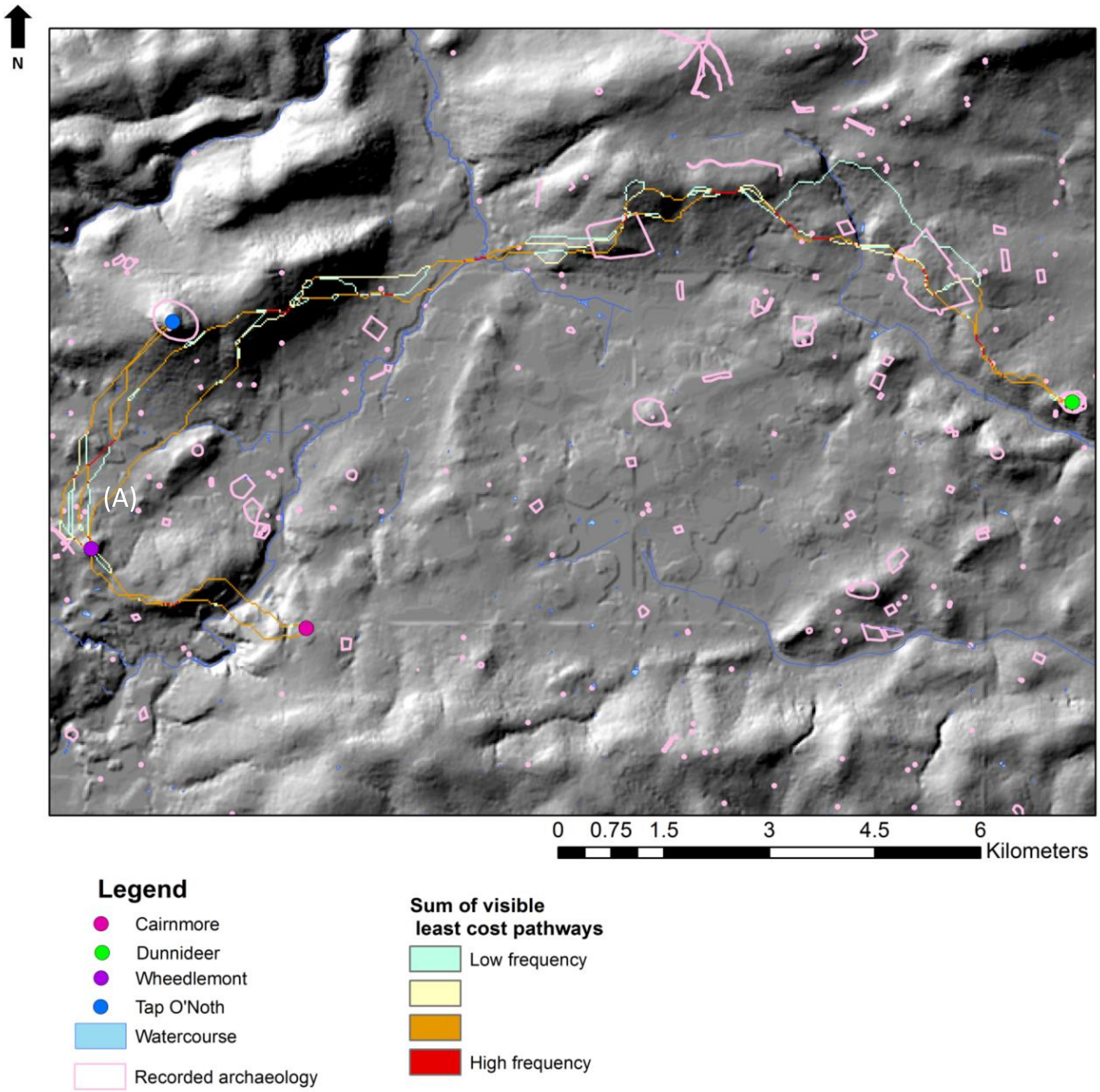


Figure 162. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Wheedlemont. Map A depicts the entry and exit points of the pathways on a site scale , Map B depicts their routes on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service)



A high proportion of the visible pathways both to and from Wheedlemont coincide with the area to the north of the site **(A)** (Figure 163). These pathways travel through an area which was highly significant within later prehistory that could indicate that it was a route in the past. This route is in close proximity to a boulder which has at least 10 cupmarks (NJ42NE0043), a possible late Bronze Age hoard (NJ42NE0032), copper coins (NJ42NE0013), remains of cup markings (NJ42NE0075), remains of banks and a clearance cairn (NJ42NE0143) and two adjoining hut circles (NJ42NE0050) **(A)**. This routeway was also highly visible from Wheedlemont.

Figure 163. Results of cost surface analysis, depicting the route of visible pathways in relation to the topography, recorded archaeology and watercourses (landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)



Concluding site summary

As with Dunnideer, Wheedlemont is situated on one summit of a dual topped hill. There is a substantial amount of unenclosed land on Wheedlemont Hill beyond the fort which meant that its defensibility was limited. The poor defensibility of this site is further implied by the fact that the site's north-eastern entrance faces a blind hillside which meant that it would be impossible to see anyone approaching the site. However, those that constructed this site did not completely ignore the need to defend this piece of land. As was noted, there is only a ditch in the south and west, which are the site's most accessible areas. The accessibility of the western area of the site is demonstrated by slope based cost surface analysis, this analysis also identified that the north-eastern entrance is also a highly accessible aspect to this site.

The site is highly visible from the 1km and 3km buffers. The poor survival of Wheedlemont means that its enclosing works are not visually prominent, however its summit position enhances its visibility. The position of the site also influences its visibility of the surrounding landscape; its highest degree of visual accessibility is to the west and from those areas beyond the 3km radius.

Morphologically this site was hypothesised to date from the early medieval period. This date cannot be securely confirmed; however the presence of hut circles confirms that it was occupied in at least one phase of use.

Tap o' Noth

Site introduction

Situated at 564m OD, Tap o' Noth encloses an area of 21ha (RCAHMS 2007). The site is enclosed by two walls (Figure 164). The inner wall, which encloses the summit of the hill, consists of a stone and an inner timberlaced wall; the wall is heavily vitrified and was originally c.6.1m thick (RCAHMS n.d.b). There is a medial ditch between the two banks that cut across the south-eastern corner of the inner fort (Dunwell and Strachan 1997, 11; Halliday 2008, 105). This ditch is a potential indication of an earlier enclosure on the hilltop (*ibid* 2008, 105). Lower down the hill is a second wall which delineates another fort, this is a lesser stone bank (RCAHMS n.d.b). The evidence for multiple phases of enclosure at this site is a strong indicator that Tap o'Noth was a persistent significant place within the landscape.

Between the two main walls that enclose this site there are over 300 features, which are circular and oval platforms (RCAHMS 1999, 95). Two huts were also claimed to be found within the northern area of the inner fort (Dunwell and Strachan 1997, 11). Within the earliest enclosure of the inner fort there were traces of a possible large timber round house (RCAHMS 1999, 95). There was also a cistern in the centre of the inner fort (Halliday 1999).

There is no evidence of an entrance at this site, but this has been a contentious issue. Hibbert placed the entrance in the south-east and argued that it had a series of outworks (1857, 296). Present access to this site is gained by travelling over debris in the south-east. There are ten gaps within the outer bank, these mainly occur within the northern area (Halliday 1999; 2008, 105). It is not known whether any of these entrances are contemporary with the hillfort occupation but some may be 'ancient' (*ibid* 2008, 105; 1999). Halliday suggested that they may have served the house platforms that are within this area (1999).

Figure 164. Earthwork plan of Tap o'Noth (Copyright: Historic Environment Scotland)

The site has not been radiocarbon dated, however Cook estimated that based upon its morphology the site's outer wall could have been constructed in the late Bronze Age whilst the inner wall was likely constructed within the Middle Iron Age (2013). Thermoluminesence dating was undertaken on the vitrified material of the inner wall. This retrieved a terminus post quem date for the vitrification of

2160BC+_180+_410 (Sanderson, Placido, Tate 1988, 315) which contradicts Cook's dating. However, the results of this thermoluminesence dating have not been widely adopted within subsequent discussions surrounding the site. A year later Gentles sampled vitrified material from the north-western aspect of the vitrified inner wall these were subject to archaeomagnetic dating which retrieved dates from the 1st Century BC to the 1st Century AD (1989). There is evidently no agreed date for Tap o' Noth.

Physical relationship of the hillfort morphology and location with the landscape topography

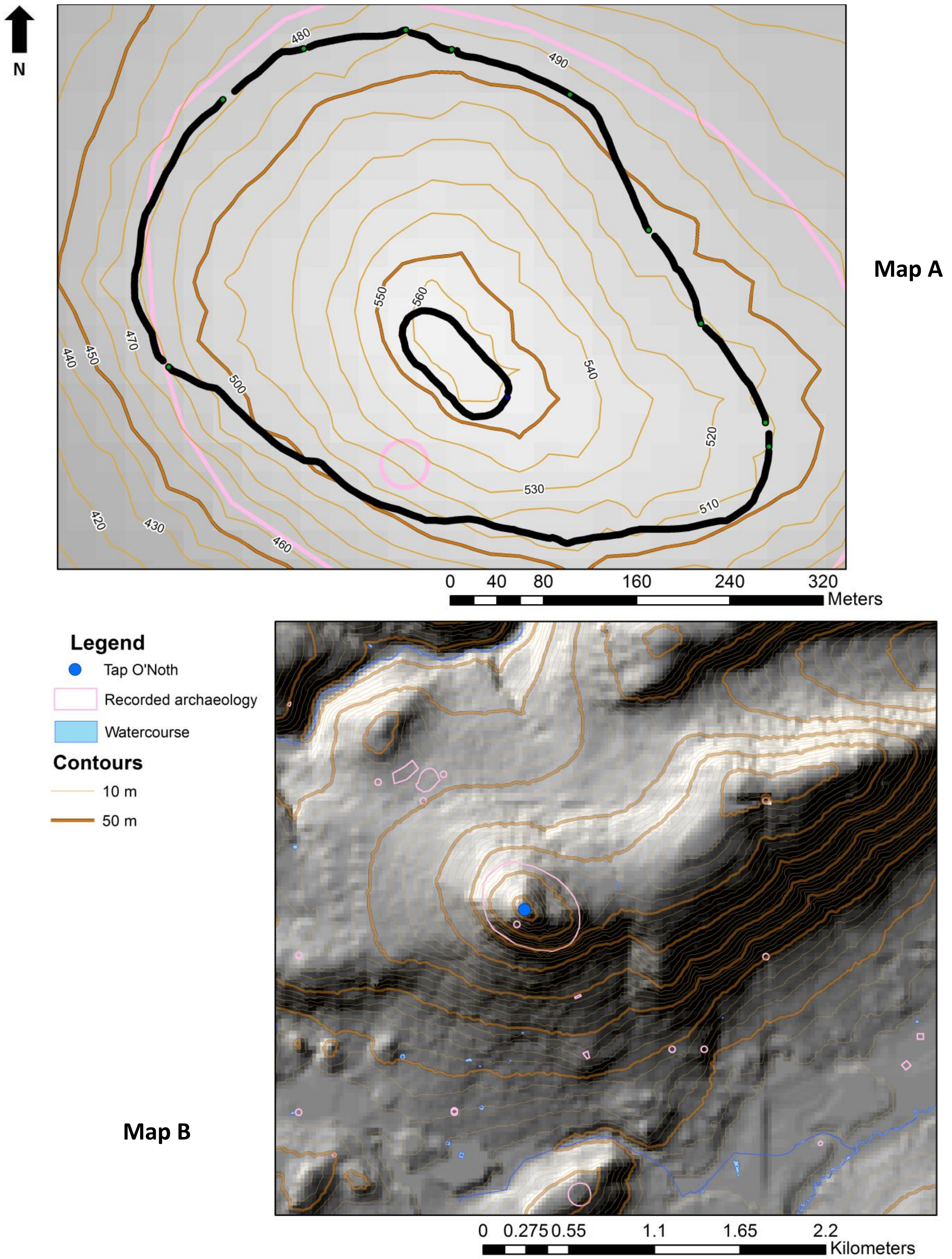
The inner fort occupies the summit (Figure 165). Although the site is positioned on the summit, the fort itself is positioned slightly offset so it does not occupy the whole summit. This meant that the shape of the hilltop did not dictate the shape of the inner fort. The addition of the oblong inner fort was a design which was applied to this hilltop. Prior to the construction of the inner fort, the outer fort was likely constructed. The outer fort bank generally follows the shape of the hill consequently the shape of the hillside defined the shape of the fort. This bank is less substantial than the inner bank.

Harding suggests that the high altitude of the site coupled with weather conditions meant that it could only be occupied on a seasonal basis (2004, 89). However, the physical evidence for material investment on this hilltop in at least three periods implies that this location was imbued with an importance that surpassed the harshness of this location. The outer bank not only secured a topographic location; they enclosed a dense area of occupation as over 300 platforms were discovered at this site (RCAHMS 1999, 95). These platforms are all located between the banks of the inner and outer fort. They are most numerous on the "NE-through- E and SW- through- W portions of the circumference of the hill" (Ralston & Watt 1982, 12). The larger of the house platforms were situated on the slopes of the hill, which had a southerly aspect, as the southern winds make the south side of the hill less hospitable (Ralston et.al. 1983, 157).

Whilst the construction of the initial banks and the huts required a large amount of effort, so did the vitrification of the inner fort. To achieve the degree of vitrification that was present at the inner fort this site required timber laced ramparts and a large quantity of fuel (MacKie 1969; MacKie 1976). The fire also needed to be maintained over several days, maybe even weeks (Ralston 2006, 163).

As a whole entity this site had extensive views to the surrounding landscape. According to Halliday, on a clear day views from Tap O' Noth extend as far east as the North Sea (Halliday 2008, 103). However, the poor weather conditions at the time of the site visit could not confirm this statement. GIS based viewshed analysis also found that the overall topographical position of Tap o'Noth enables the site to have a good degree of visual access to a large proportion of its environs, particularly the areas further afield than the immediate environs. From the area between the inner fort and the outer fort and the 1km radius there is a large degree of visibility in all directions apart from the south-east and the slopes that the hillfort is on (Figures 166-167). However, the visible areas have a visual magnitude that generally falls within the low visibility category. The visual magnitude of the visible areas increases towards the 3km radius. Both the inner and the outer fort fail to have visual accessibility to the northeast/east whereas the remainder of the landscape is visible. The most visible area is the west. Beyond the 3km radius the visibility to the surrounding landscape becomes more scattered. However, the outer fort has a greater degree of visual accessibility to the surrounding landscape as the areas to the west have a higher visual magnitude.

Figure 165. DTM of Tap o'Noth and its environs overlain by contours, SMR data, watercourses and an outline of the enclosing works at Tap o'Noth. Map A focuses on the site and Map B depicts its topographical environs (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)



Although the site has a large degree of visual accessibility to the surrounding landscape, the physical relationship of the site's morphology in relation to the topography coupled with the positioning of the inner bank above the interior of the inner fort impedes visibility in and out from the area it encloses. The field visit to this site concluded that the two enclosures were visually and physically completely separate entities.

Figure 166. Viewshed results from the inner fort grid, depicting the visibility of the surrounding landscape from the inner fort at Tap o'Noth as defined by the hillfort buffers (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

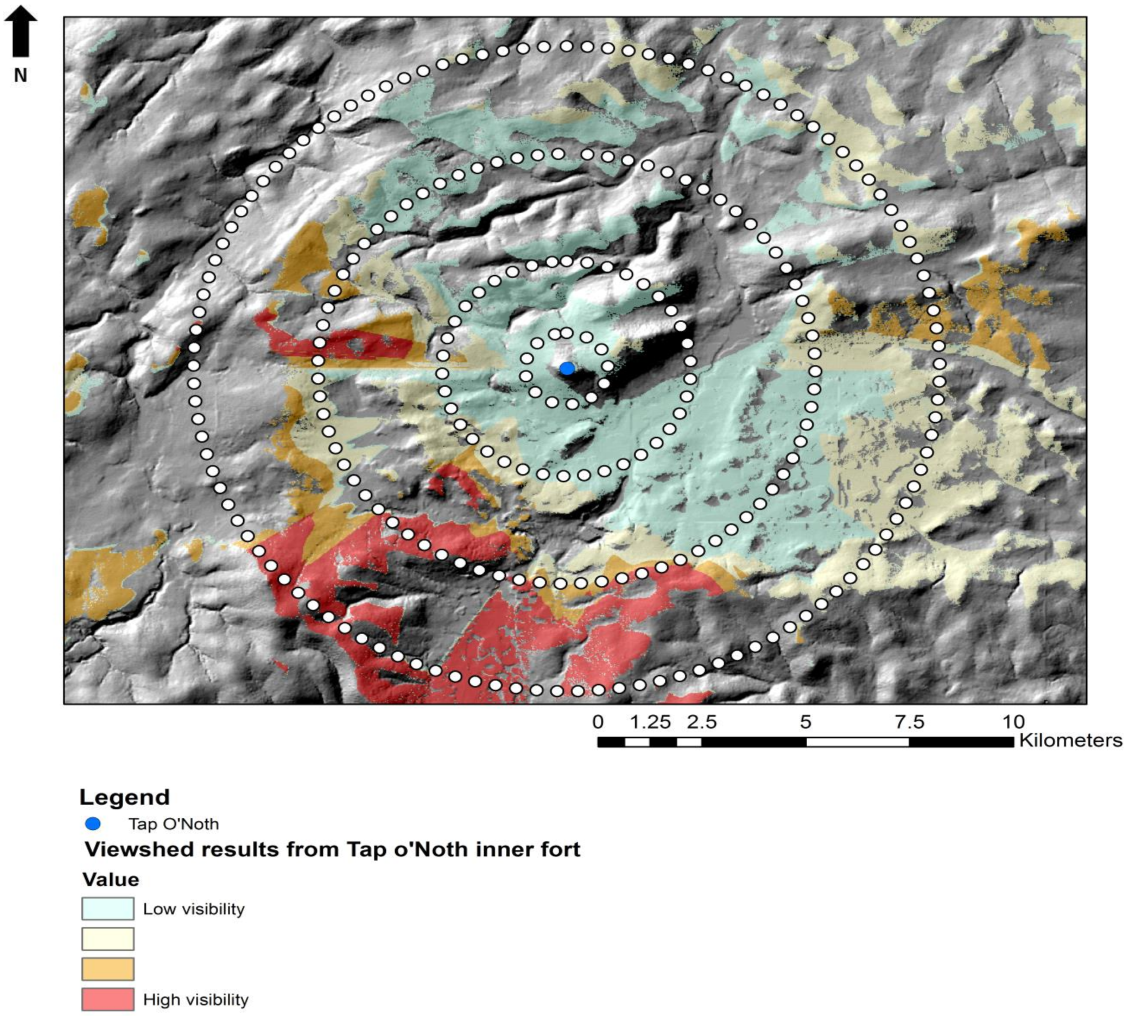
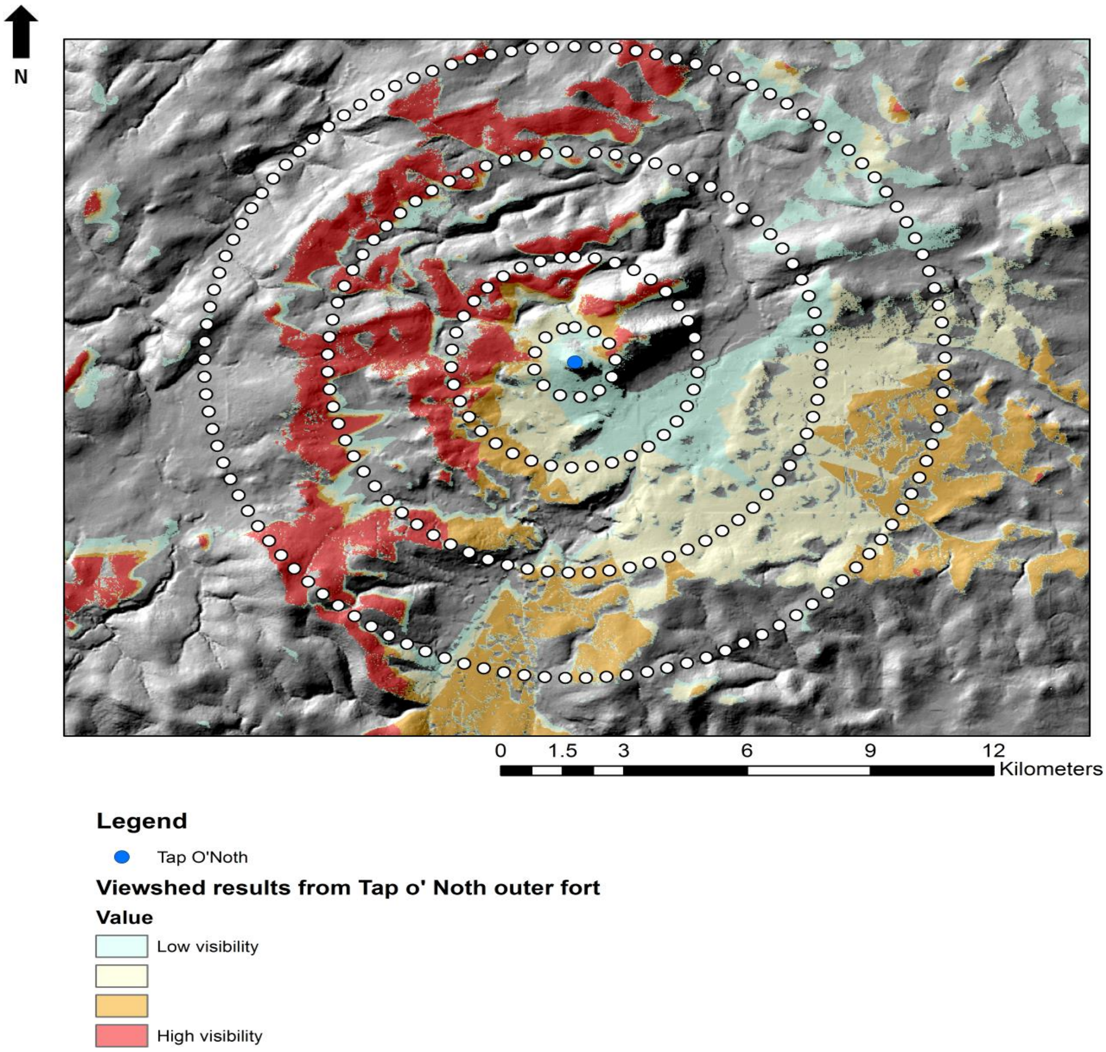


Figure 167. Viewshed results from the outer fort grid, depicting the visibility of the surrounding landscape from the outer fort at Tap o'Noth as defined by the hillfort buffers (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Image

Tap o'Noth is visually prominent from the surrounding landscape, however the visual magnitude of the site is highly variable. From the 1km radius the site is predominantly of moderate to high visibility (Figure 168). The variable visibility of the different components of the site is supported by the fieldwork photography from various points within the 1km radius (Figure 169). From Viewpoint 3, which is to the west of Tap o' Noth, there is a high degree of visibility into the site (Figure 170). However, whilst nearing the site from Viewpoint 4, which is also to the west, the visibility of the site becomes clearer but it is obstructed by the hill-slopes (Figure 171).

Figure 168. Results of viewshed analysis from the radii towards Tap o'Noth depicting the visibility of the site (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

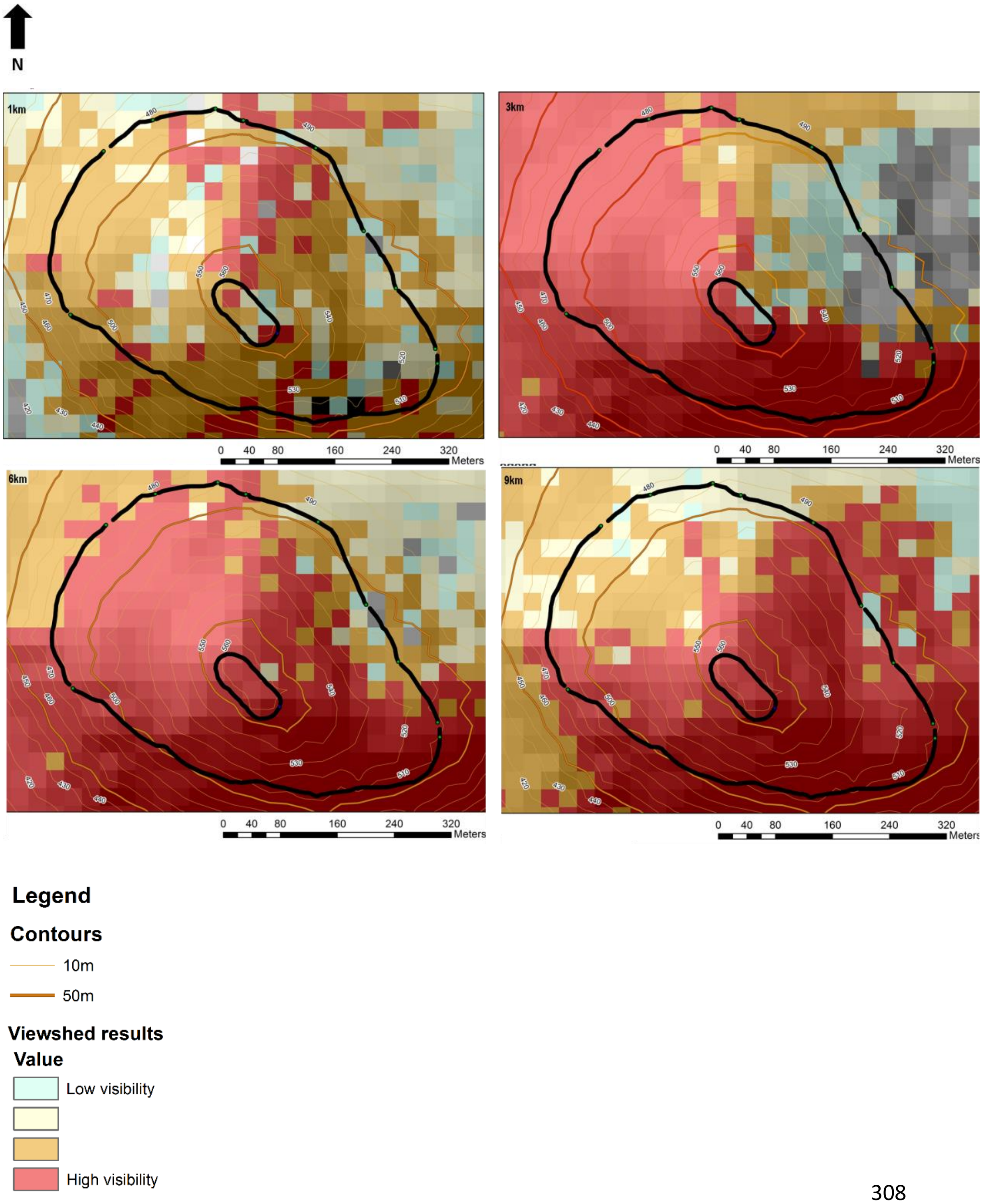


Figure 169. Location map of the Viewpoints in relation to the radii that surround Tap o'Noth (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

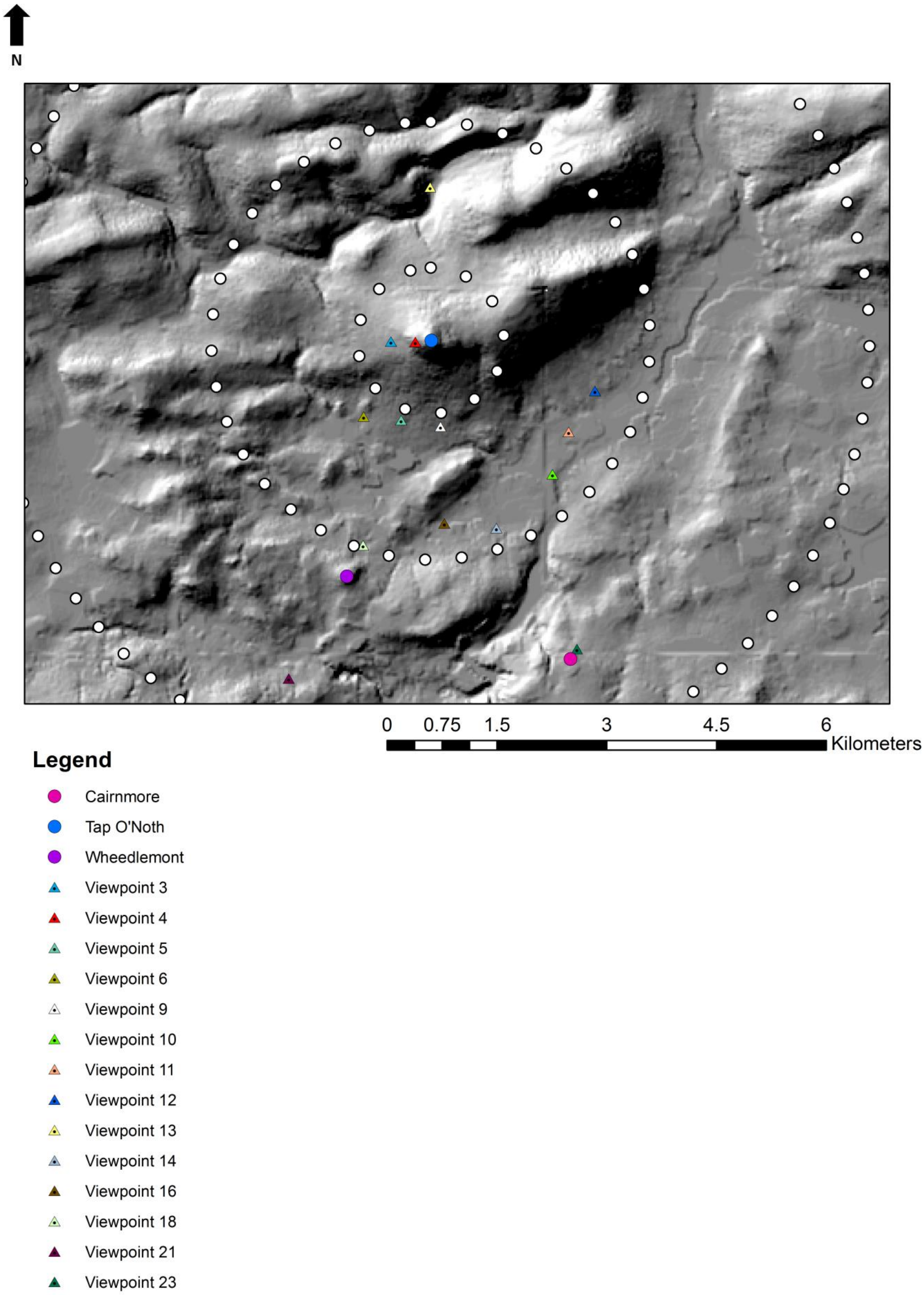


Figure 170. View of Tap o’Noth from Viewpoint 3, 550m to the west of the site (Author’s own 2014)

Figure 171. View of Tap o’Noth from Viewpoint 4, 219m to the west of the site (Author’s own 2014)

The visual prominence of Tap o’Noth increases from the 3km radius as the majority of the site has a visual magnitude within the upper quartile range (Figure 168).

This is supported by the field photography from within this radius which demonstrates that the site is highly visible and visually prominent (Figures 172-181). The visual clarity of the site is poor: any interior activity could only be seen from within the outer fort as the inner fort bank obstructs visibility from the surrounding lowlands. Although the inner bank obstructs visibility into the inner fort, it is visually and physically prominent: this prominence is accentuated by its summit position. Field photography demonstrates that from the majority of directions it looks as though the inner fort is positioned on the summit of the hill. However, from Viewpoints 11 and 12, which are in the south-east, the actual offset position of the inner fort is visible (Figures 176-177).

Figure 172. View of Tap o'Noth from Viewpoint 9, 1.2km to the south of the site (Author's own 2014)

Figure 173. View of Tap o'Noth from Viewpoint 16, 2.5km to the south of the site. (Author's own 2014

Figure 174. View of Tap o'Noth from Viewpoint 10, 2.5km to SSE of the site (Author's own 2014)

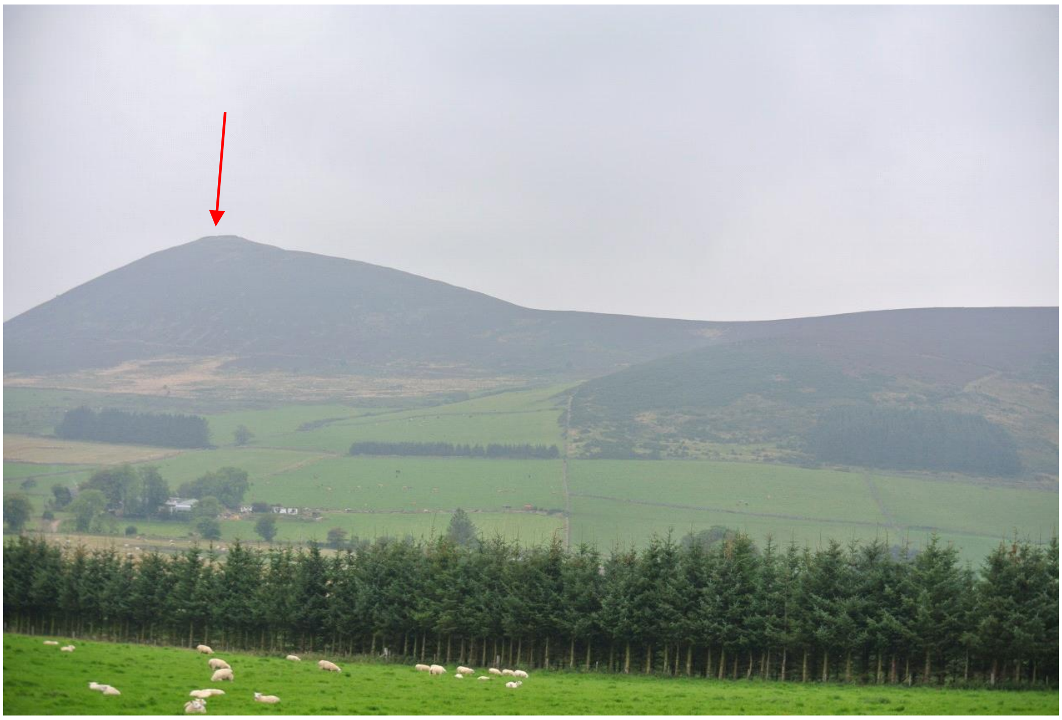


Figure 175. View of Tap o'Noth from Viewpoint 14, 2.7km to the SSE of the site (Author's own 2014)

Figure 176. View of Tap o'Noth from Viewpoint 11, 2.3km to the south-east of the site (Author's own 2014)

Figure 177. View of Tap o'Noth from Viewpoint 12, 2.3km to the south-east of the site (Author's own 2014)

Figure 178. View of Tap o'Noth from Viewpoint 13, 2.1km to the north of the site (Author's own 2014)

Figure 179. View of Tap o'Noth from Viewpoint 6, 1.4km to the southwest of the site (Author's own 2014)

Figure 180. View of Tap o'Noth from Viewpoint 5, 1.2km to the SSW of the site (Author's own 2014)

Figure 181. View of Tap o’Noth from Viewpoint 18, 3km to the SSW of the site (Author’s own 2014)

The visual magnitude of Tap o’Noth remains high from the 6km radius (Figure 168). Although the site is demonstrated to be visually dominant from the viewpoint photography, the distance between the site and these points meant that visual clarity is poor (Figures 182- 183). The inner bank remains prominent due to its summit position; however its form is not clearly distinguishable.

Figure 182. View of Tap o'Noth from Viewpoint 21, 5km to the southwest of the site (Author's own 2014)

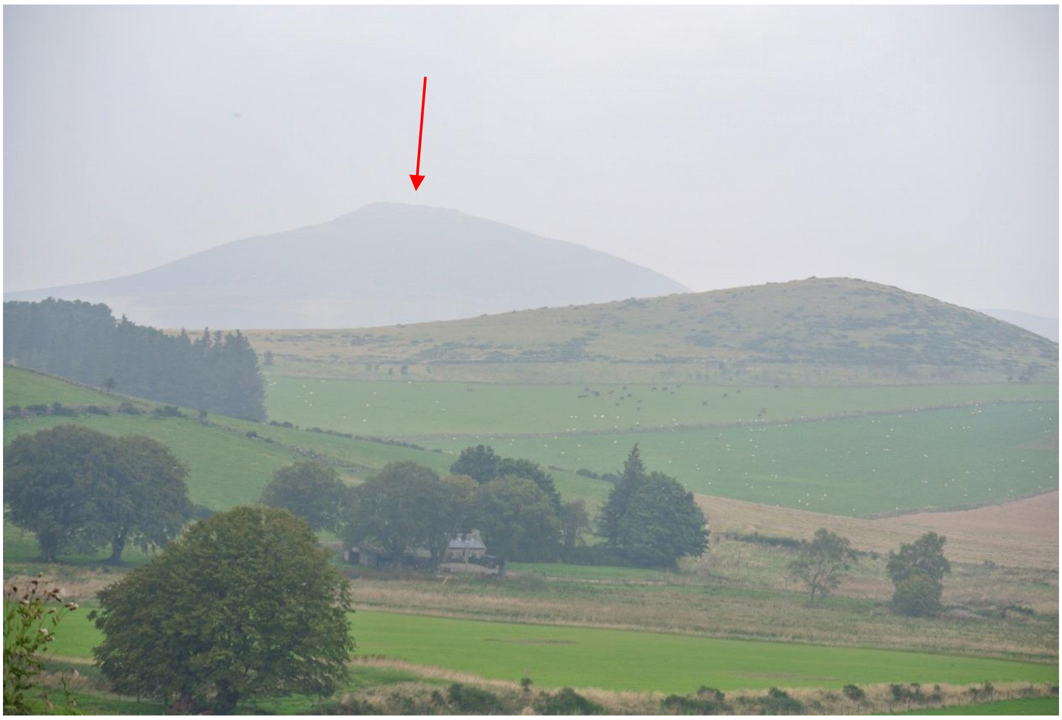
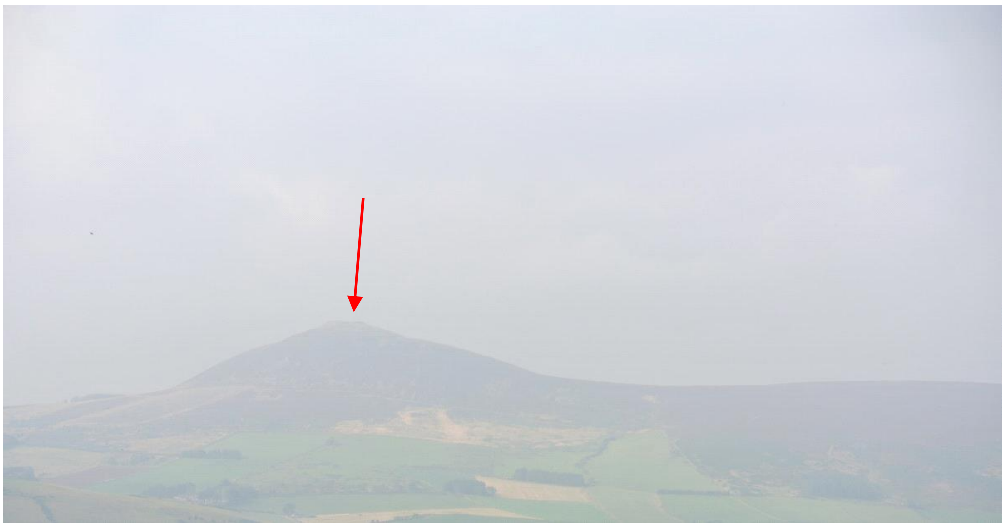


Figure 183. View of Tap o'Noth from Viewpoint 23, 4.7km to the southeast of the site (Author's own 2014)



The visibility of the site decreases slightly from the 9km radius (Figure 168). From this distance the visual magnitude of the northern aspect of the site decreases, whilst the remainder of the site is of high visibility.

Whilst the viewshed results from the radii indicate that the majority of the site is visible, the viewshed results from the hillfort grids do not. According to Cook (2013), Dunnideer was in use at the same time that the inner fort at Tap o'Noth was constructed. However, this interpretation was based upon a comparison with the dated and morphologically similar inner fort at Dunnideer, which needs to be taken with extreme caution as it was with regards to Wheedlemont. Viewshed analysis from both the inner and outer fort at Dunnideer indicates that the eastern sides of both the inner and outer forts at Tap o'Noth are of moderate visibility (Figure 184-185). This is supported by the field photography from the summit of the inner fort. From this point, Tap o'Noth and the Hill of Noth are visually prominent, however the distance between the sites is great, consequently visual clarity is poor (Figure 186 and 187).

Figure 184. Viewshed results from the inner fort at Dunnideer depicting the visibility of Tap o'Noth (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

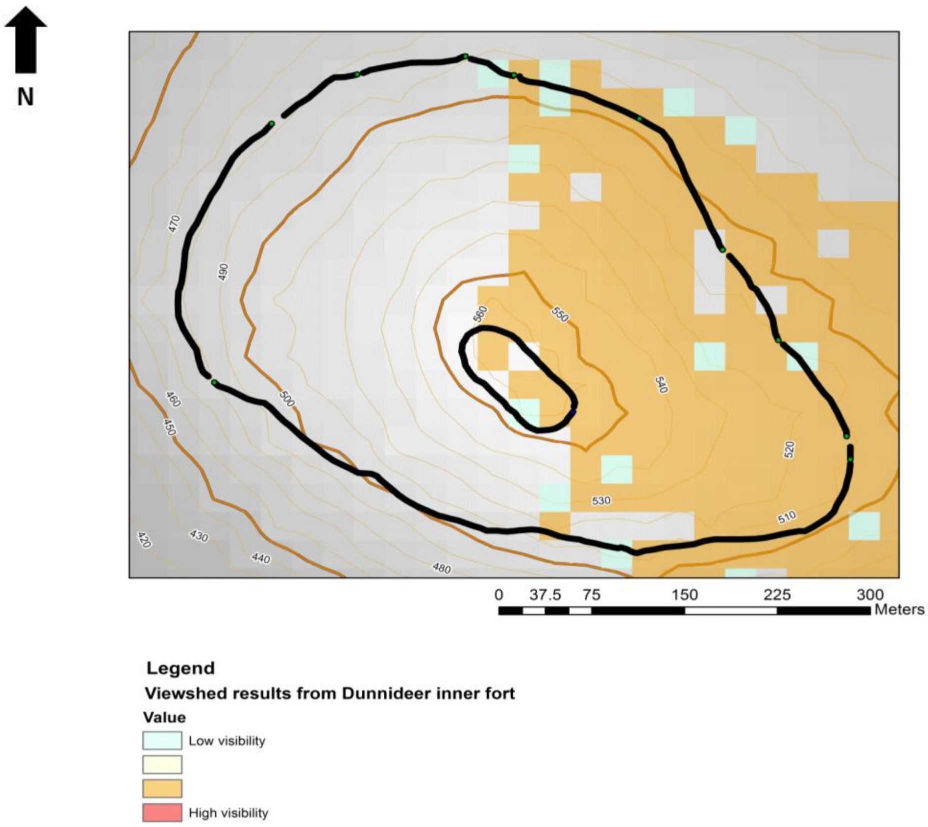


Figure 185. Viewshed results from the outer fort at Dunnideer depicting the visibility of Tap o'Noth (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

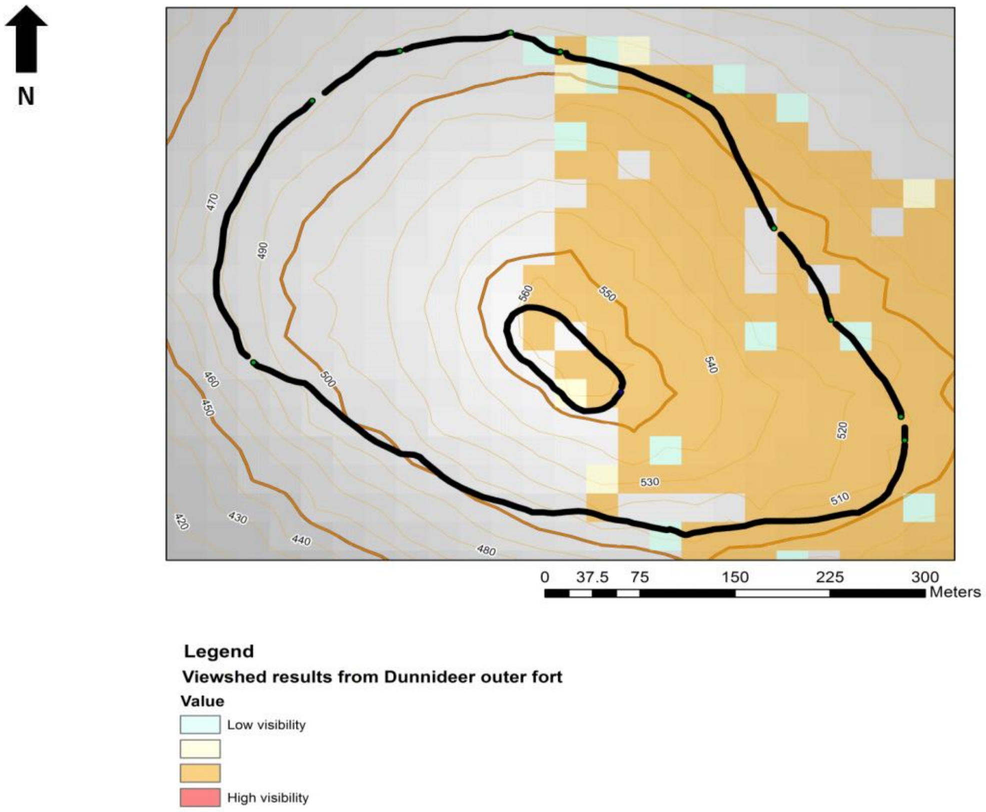


Figure 186. View of Tap o'Noth from the inner fort at Dunnideer (Author's own 2014)

Figure 187. Zoom in on the view of Tap o'Noth from the inner fort at Dunnideer (Author's own 2014)

Tap o'Noth is more visible from Wheedlemont and Cairnmore. Both of these sites have a high degree of visual accessibility to the southern aspect of the outer fort of Tap o'Noth, and also to the majority of the wall line of the inner fort (Figures 188-189). The results of viewshed analysis from these sites indicate that Tap o'Noth is highly visible; this is supported by fieldwork photography. However, these photographs demonstrate that the height difference and the distance between the sites means that although the site is visually prominent, visual clarity is poor (Figures 190-191).

Figure 188. Viewshed results from Wheedlemont depicting the visibility of Tap o'Noth (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

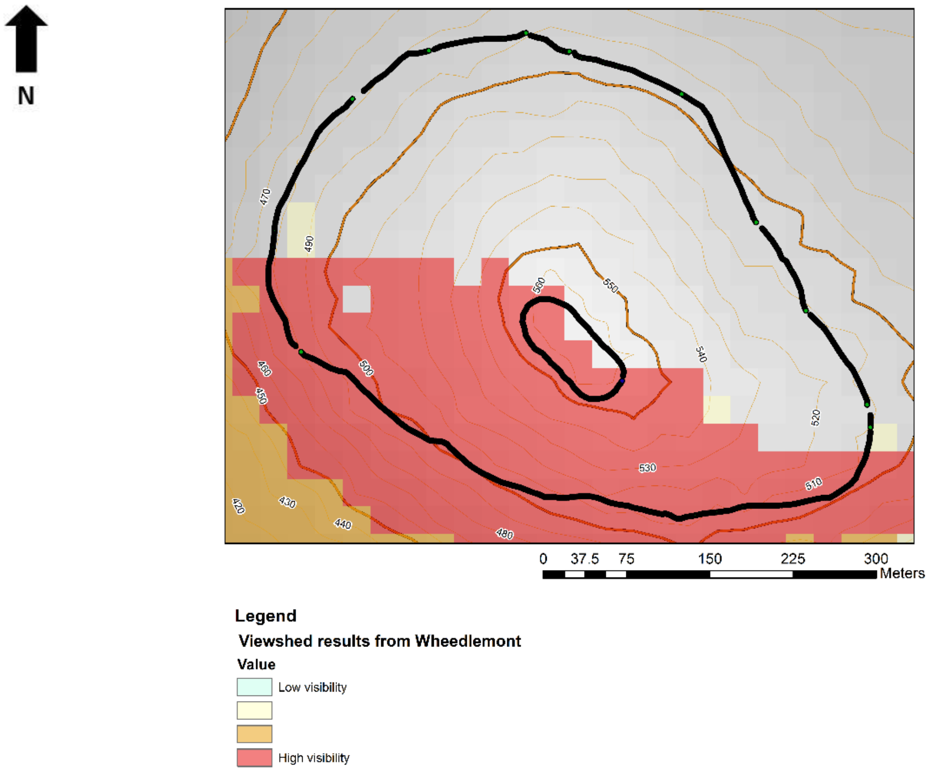


Figure 189. Viewshed results from Cairnmore depicting the visibility of Tap o'Noth (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

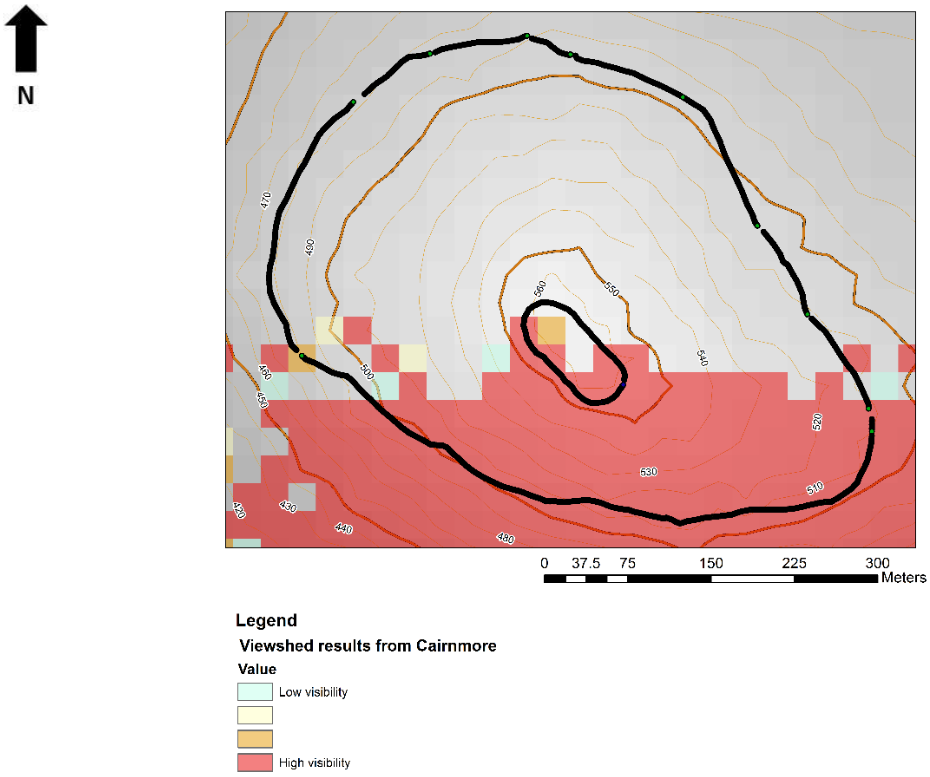


Figure 190. View of Tap o'Noth from Wheedlemont (Author's own 2014

Figure 191. Zoom in on the view of Tap o'Noth from Wheedlemont (Author's own 2014)

Figure 192. View of Tap o'Noth from Cairnmore (Author's own 2014)

Figure 193. Zoom in on the view of Tap o'Noth from Cairnmore (Author's own 2014)

Correct pathways

Cost surface analysis found that 161 out of 247 slope-based pathways predominantly use the site's south-eastern corner (Figure 194). The accessibility of Tap o'Noth's eastern side was also noted by Macdonald (1891, 39). There is also a correlation of a large number (6 out of 18) of the visible pathways with this corner of the site (Figure 195). The south-eastern corner of the inner fort also corresponds with the modern day entry point into the site.

The slope paths between Tap o' Noth and Cairnmore, and Tap o'Noth and Dunnideer follow topographically and archaeologically defined routeways (Figure 196). Both sets of pathways follow the line of Glamlach Burn into the lowlands (**A**). From this point the pathways take a different route. The paths between Tap o' Noth and Dunnideer run parallel to the Water of Bogie. Whilst following this line the pathways travel within 120m of a number of ring ditches (NJ52NW0029 and NJ52NW0030) and a rectilinear enclosure (NJ52NW0041). The pathways continue their journey by roughly following and running parallel with several watercourses and the modern railway line towards Dunnideer (**B**).

Figure 194. Results of slope based cost surface analysis to and from Tap o'Noth. Map A depicts the entry and exit points of the pathways at the site, Map B depicts their routes on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

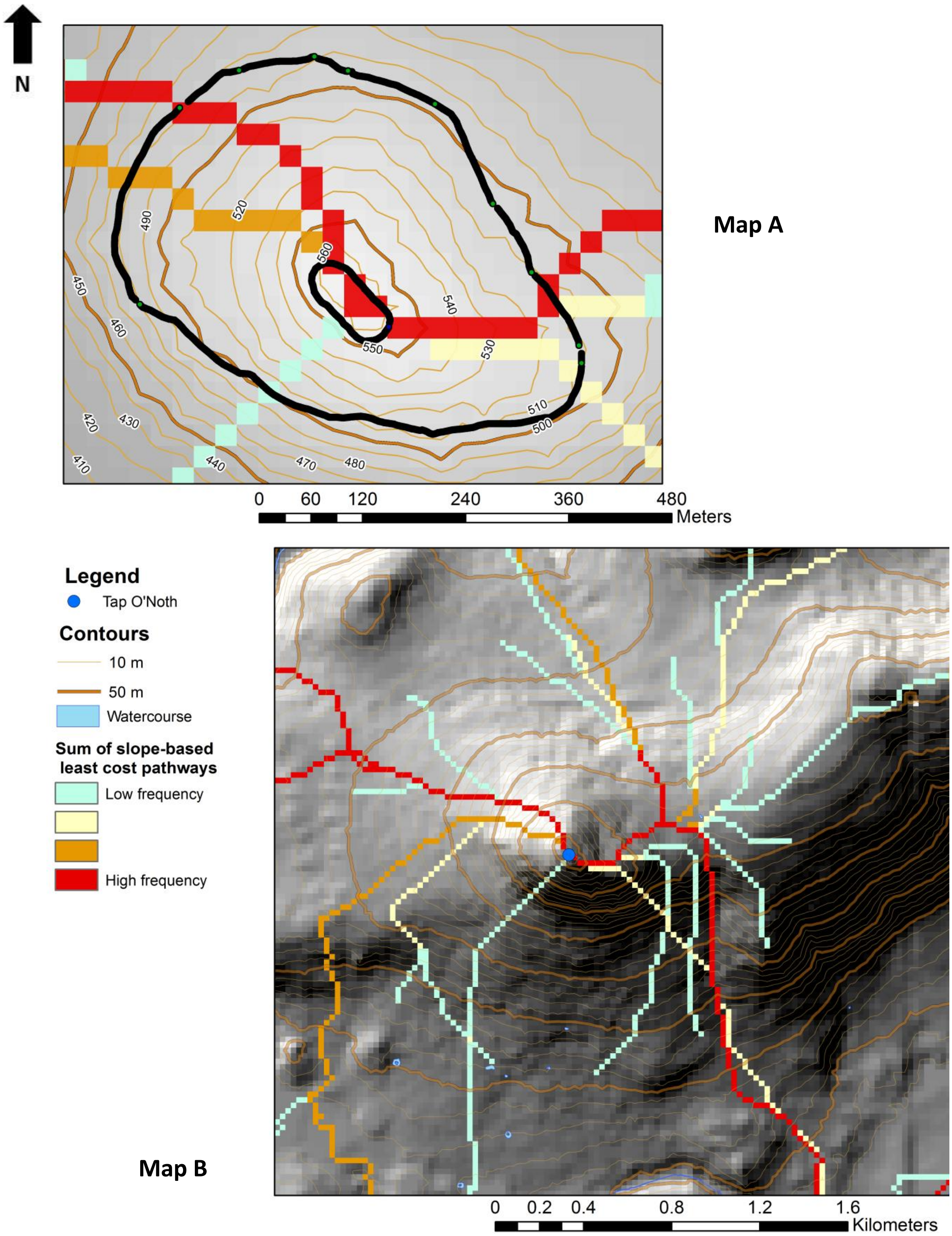


Figure 195. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Tap o'Noth. Map A depicts the entry and exit points of the pathways at the site, Map B depicts their routes on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)

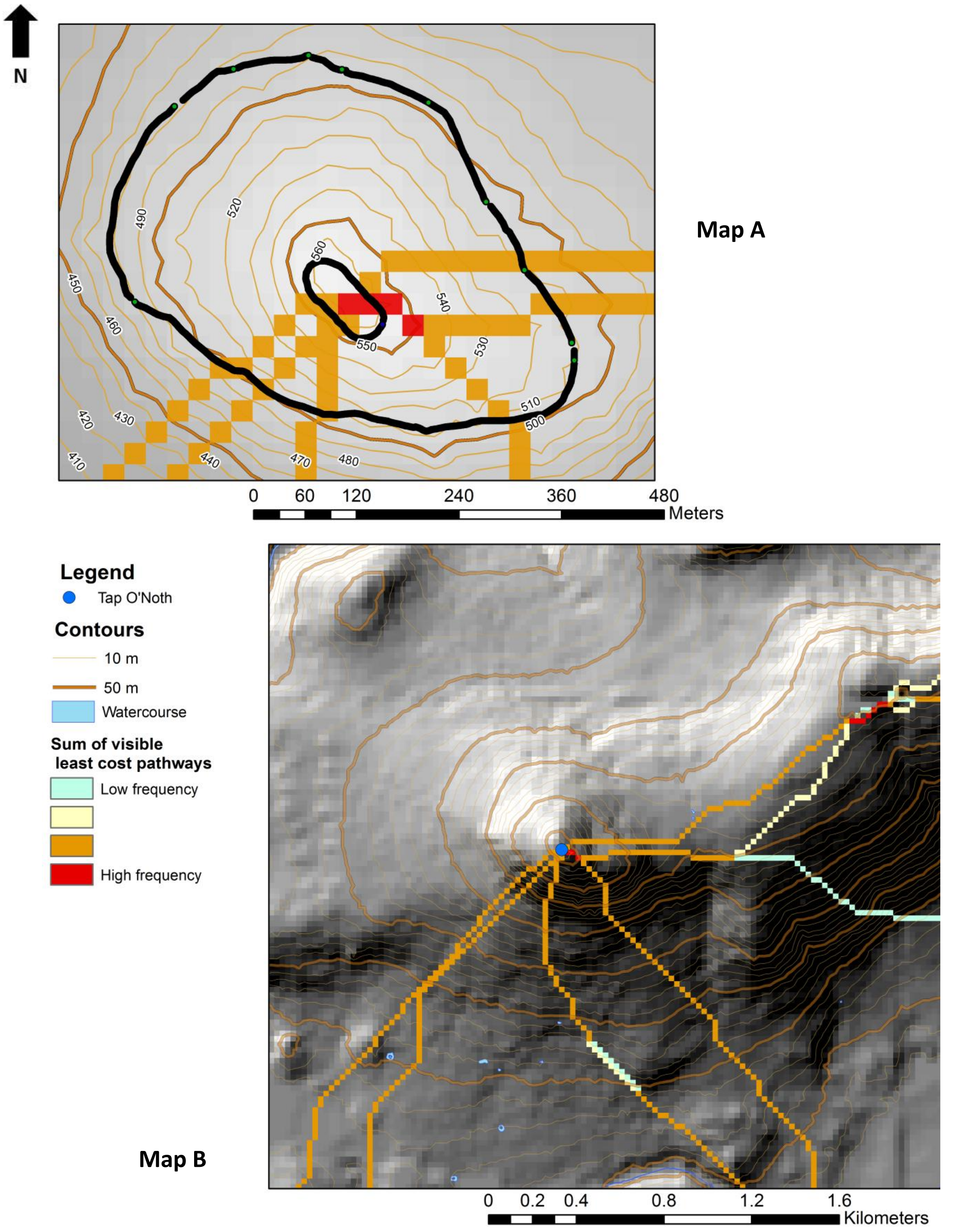
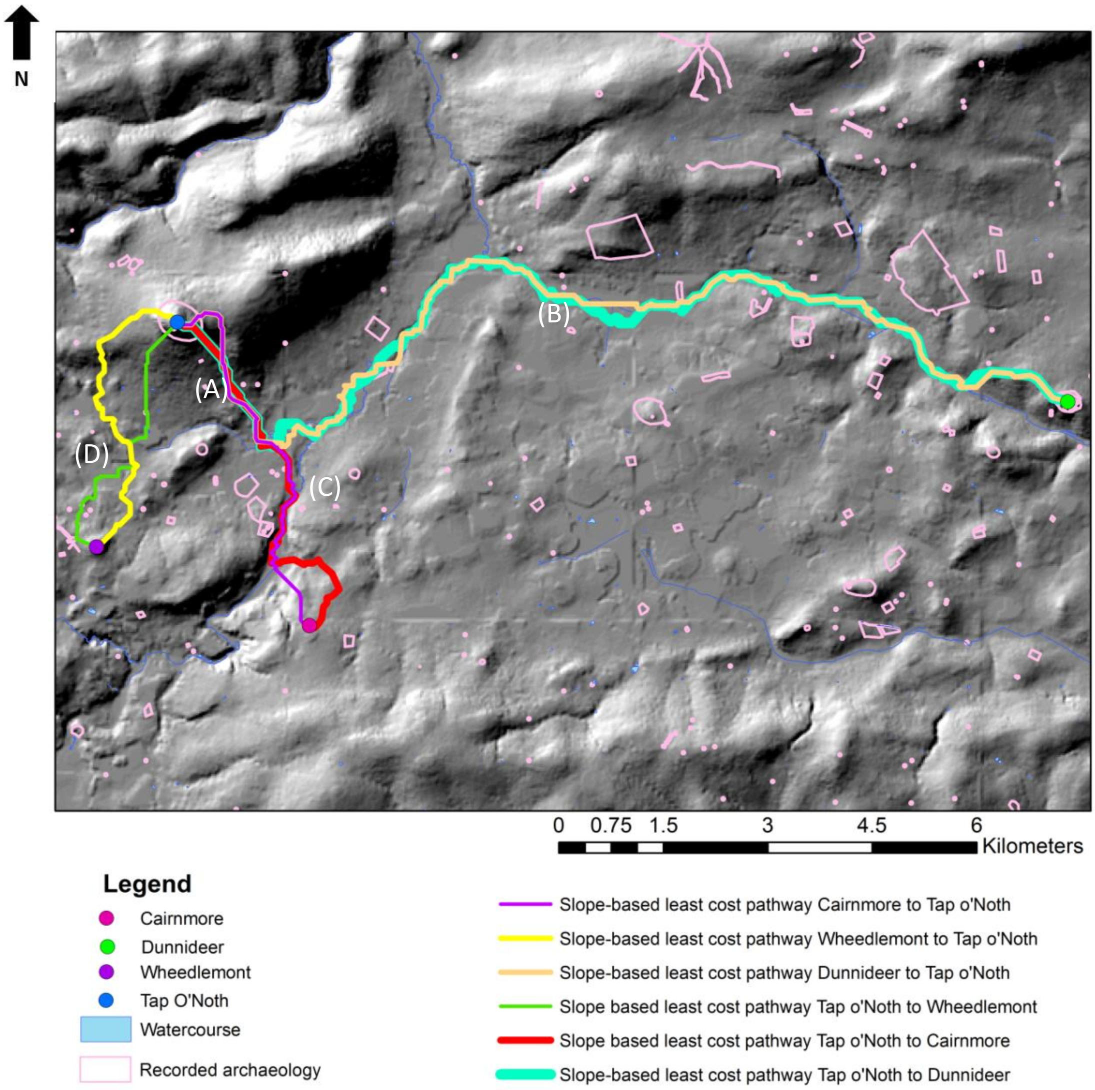


Figure 196. Results of slope based cost surface analysis surrounding Tap o'Noth in relation to the topography, recorded archaeology and watercourses (Landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)



To the south of Rhynie the pathways between Tap o'Noth and Cairnmore follow the line of the Water of Bogie (**C**). Whilst following this, the pathways come into contact with several archaeological sites. These sites are potentially contemporary or likely to have been extant at the time of movement between the two hillforts. They are primarily symbol stones (NJ42NE0029, NJ42NE0045 and NJ42NE0033) and enclosures (NJ42NE0047). The dense concentration of Pictish symbol stones within the Rhynie area implies that this was a highly significant place within the Early Medieval period (Fraser and Halliday 2008, 119). Fraser and Halliday highlight that Rhynie was situated on an influential north-south routeway through the hills, which provided access to the Moray coast (2008, 119-120).

Unlike the paths to Cairnmore and Dunnideer the pathway from Tap o'Noth towards Wheedlemont does not distinctively follow the line of any topographical features (Figure 196). It does however interact with a small number of sites/records, these include a boulder with at least 10 cupmarks (NJ42NE0043), a possible late Bronze Age hoard (NJ42NE0032) and copper coins (NJ42NE0013) (**D**). The visible pathways which travel between Tap o' Noth and the remainder of the hillforts within the area have a very similar correlation with archaeological activity that then slope based pathways do (Figure 197)

The visible pathways between Tap o'Noth and Cairnmore travel close to and through Rhynie, which has a dense concentration of both later prehistoric and early medieval activity **(A)** (Figure 197)**.** This activity includes the enclosure at Barflat (NJ42NE0047), square barrows (NJ42NE0057), two further enclosures (NJ42NE0060), two standing stones (NJ42NE0022), two Pictish symbol stones (NJ42NE0021) and two urns (NJ42NE0020).

There is no distinct correlation of the blind pathways with any particular aspect to this site (Figure 198).

Figure 197. Results of cost surface analysis, depicting the route of visible pathways in relation to the topography, recorded archaeology and watercourses (landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)

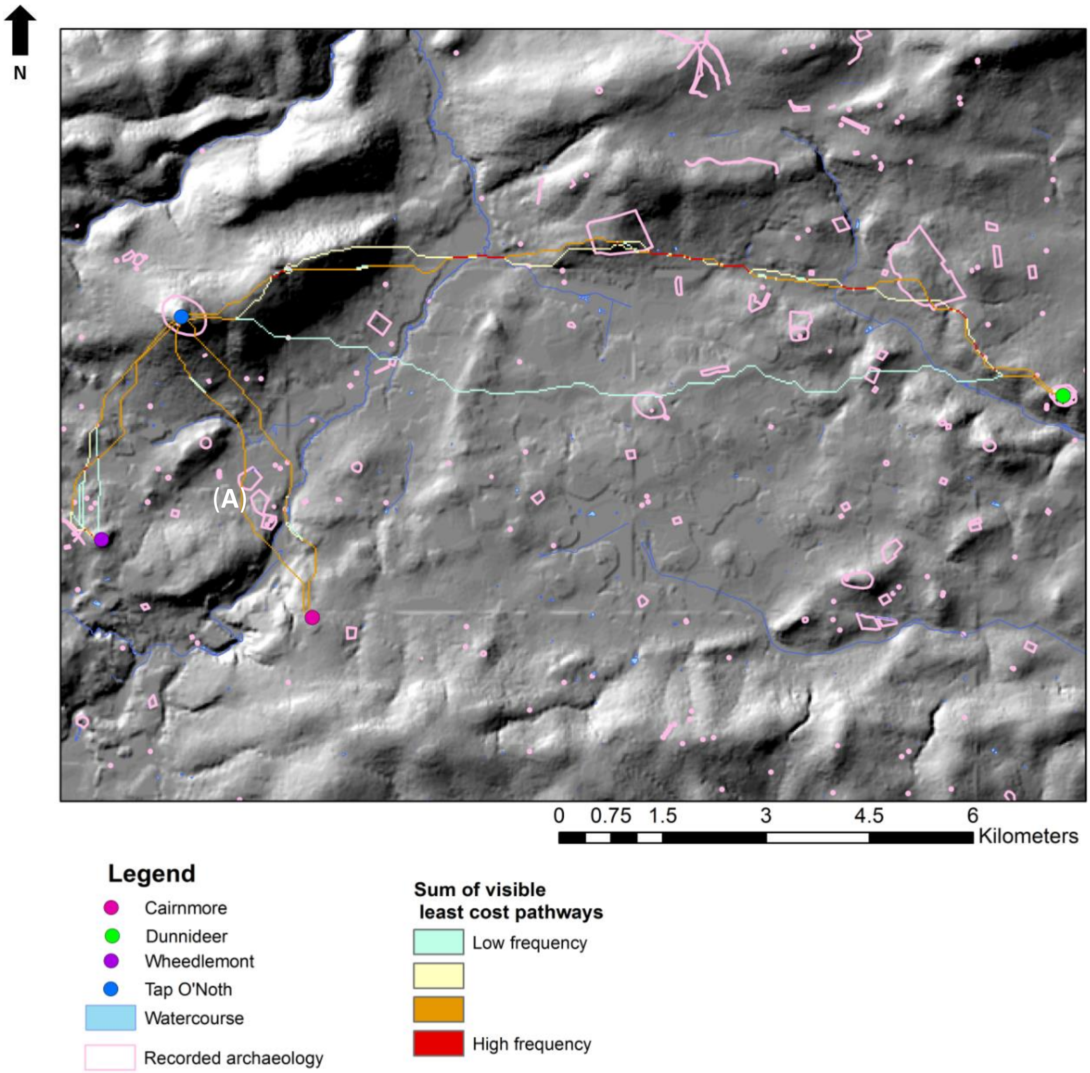
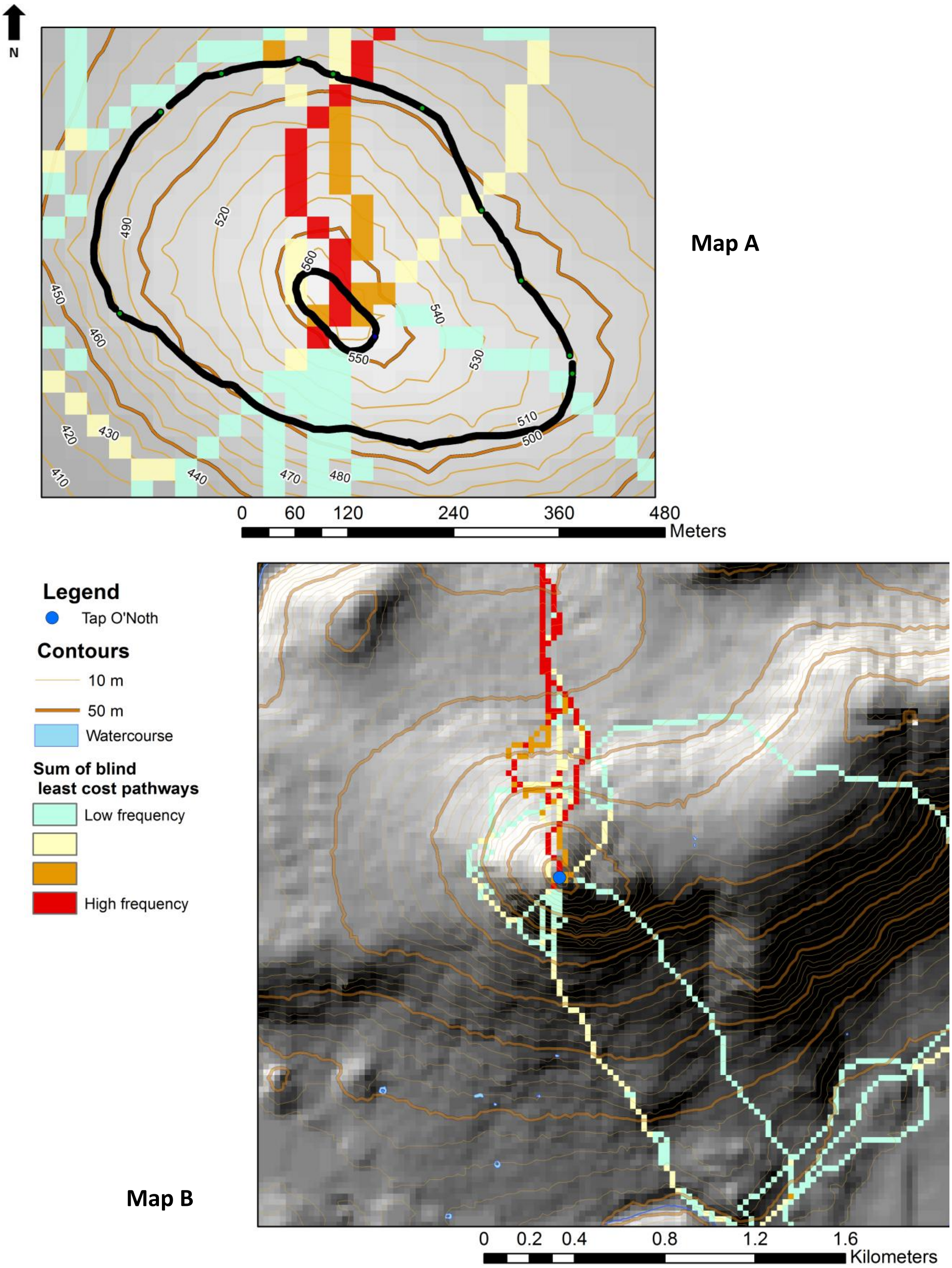


Figure 198. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Tap o'Noth. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is also overlain watercourses (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; Copyright: Historic Environment Scotland)



Concluding site summary

As with several of the sites within this test area, Tap o'Noth is situated on the summit of one end of a much larger hill. This is the Hill of Noth. The site comprises of an inner and an outer fort with the former crowning the summit of the hill but the shape of its enclosure was not dictated by the shape of this area. On the other hand, the outer fort bank strongly follows the slopes of this hill; this is a lesser stone bank than the vitrified inner wall. The slight nature of the outer bank alongside its downslope position meant that it was much less physically and visually prominent than the inner bank. The inner bank's extensivity and its summit position meant that it was visually prominent; it also obstructed visibility into the interior from the outer fort and beyond.

Although the inner bank is visually dominant, viewshed analysis did not identify any area of the site that was more visible. This indicates that there is no definitive evidence for the disproportionate allocation of resources in order to portray an image in a particular direction. However, this technique did identify that the visual magnitude of the site from the surrounding landscape increases as distance from the site increases. The lack of distinct variability in the overall visual magnitude of the site and the failure to identify any particularly visible aspect of the site also indicates that there was no designed directionality with regards to the morphology of this site.

Whilst the site portrays a complete image to the surrounding landscape the visual access of the landscape from the inner and outer fort differs. The inner fort has less visual accessibility to the surrounding landscape, whilst from the outer fort the surrounding landscape is of a higher visibility. This fort also has a higher degree of occupational evidence within its interior as over 300 hut circles have been discovered between the inner and outer bank. Only two huts were discovered within the inner fort. The multitude of hut circles coupled with the evidence of at least three building phases at this site demonstrates that this hill was highly significant. The significance of this area surpassed its inhospitability.

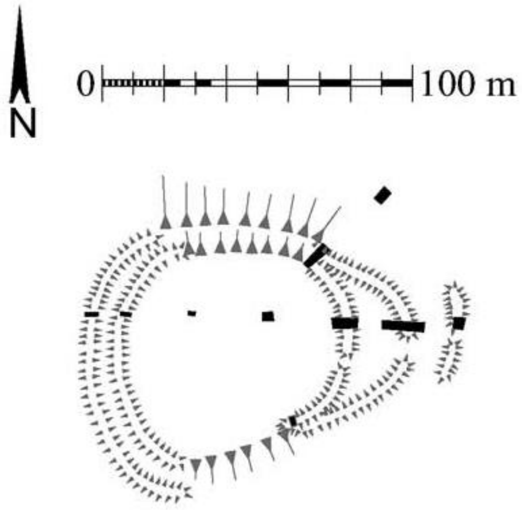
No entrance in the inner wall was confidently discovered at this site, the inner fort is believed not to ever have had an entrance but the modern entry point is from the south-east but over the wall. This entry point coincides with both slope based and visible pathways. The coincidence of the slope and visible pathways with this modern entry point into this site indicates that if this was to be an entrance it would have formed a correct path of movement. Unlike the inner bank there are several breaks in the outer bank’s circuit that are believed to be ancient and to relate to the house platforms within this area. These breaks formed correct paths of movement, which potentially directly served occupation areas within the outer fort.

Cairnmore

Site introduction

Cairnmore consists of an outer soil bank and ditch, a middle stone wall and a lesser inner stone wall (Cook 2010b, 63) (Figure 199). Cairnmore was classed as Type 6 of the classification systems of Scottish hillforts (Halliday 2008, 100-101; Cook 2013, 333). This ‘Type’ grouped together small thick stone walled enclosures. Cook classified this group of sites further, Type 6a included small sites, which were potentially roofable whilst Type 6b were larger and non-roofable, Cairnmore was classed as the latter (2013, 333).

Figure 199.Plan of Cairnmore from Cook 2013



The outer rampart consisted of a soil bank, stone kerb and ditch, the latter of which could not be traced beyond the south-east entrance (Cook, Cook, et.al. 2010). The middle rampart enclosed the entire circuit of the hill which was an area of 64m x 44m (*ibid* 2010). Material from this bank was robbed for the creation of internal platforms (Cook, Cook, et.al. 2010). The inner rampart abutted the middle rampart and enclosed an area of 50m x 40m (*ibid* 2010). The collapse of this rampart was associated with an area of charcoal, which led Cook to argue that this area had been subject to burning (*ibid* 2010). The rampart was subsequently robbed to create internal platforms like the middle rampart (*ibid* 2010). Unlike the outer and middle rampart there is no trace of an entrance in the inner rampart, however it is likely to be in the southeast like in the middle and outer rampart (*ibid* 2010).

The survival and consequently the interpretation of Cairnmore were greatly affected by the fluctuating vegetation coverage at this site over the years. For example, contrary to Cook, Feachem described that the site had two concentric lines of defence (1966, 72). After Feachem, RCHAMS later modified the site's classification to that of a collapsed stone built univallate enclosure (Cook 2012, 7). However, in 2010 Cook undertook a series of key-hole excavations at the site and found that it consisted of a pair of enclosures (Cook 2012, 8). He also discovered a third outer bank and ditch (*ibid* 2012, 8).

Within the outer ditch two potential wheel ruts were found approximately 1m apart (Cook, Cook, et.al. 2010). Further evidence for activity at this site was represented by the discovery of two brooch moulds and a pin mould of possible early Historic origin within the foundation cut of the middle rampart (*ibid* 2010). Burnt bone and charcoal was also discovered within this area of the middle rampart, whilst saddle quern rubbers were discovered within the material composition of this rampart (*ibid* 2010). Several instances of cobbled surfaces were also found within the inner enclosure (*ibid* 2010).

Two radiocarbon dates were retrieved from this site, one of which was retrieved from some charcoal found underneath the middle rampart, this had a radiocarbon date of 1510+-30 BP (Cook 2013). The other was from some charcoal from within a destruction layer over a rampart and this had a radiocarbon date of 1580 +-30 BP (Cook 2013).

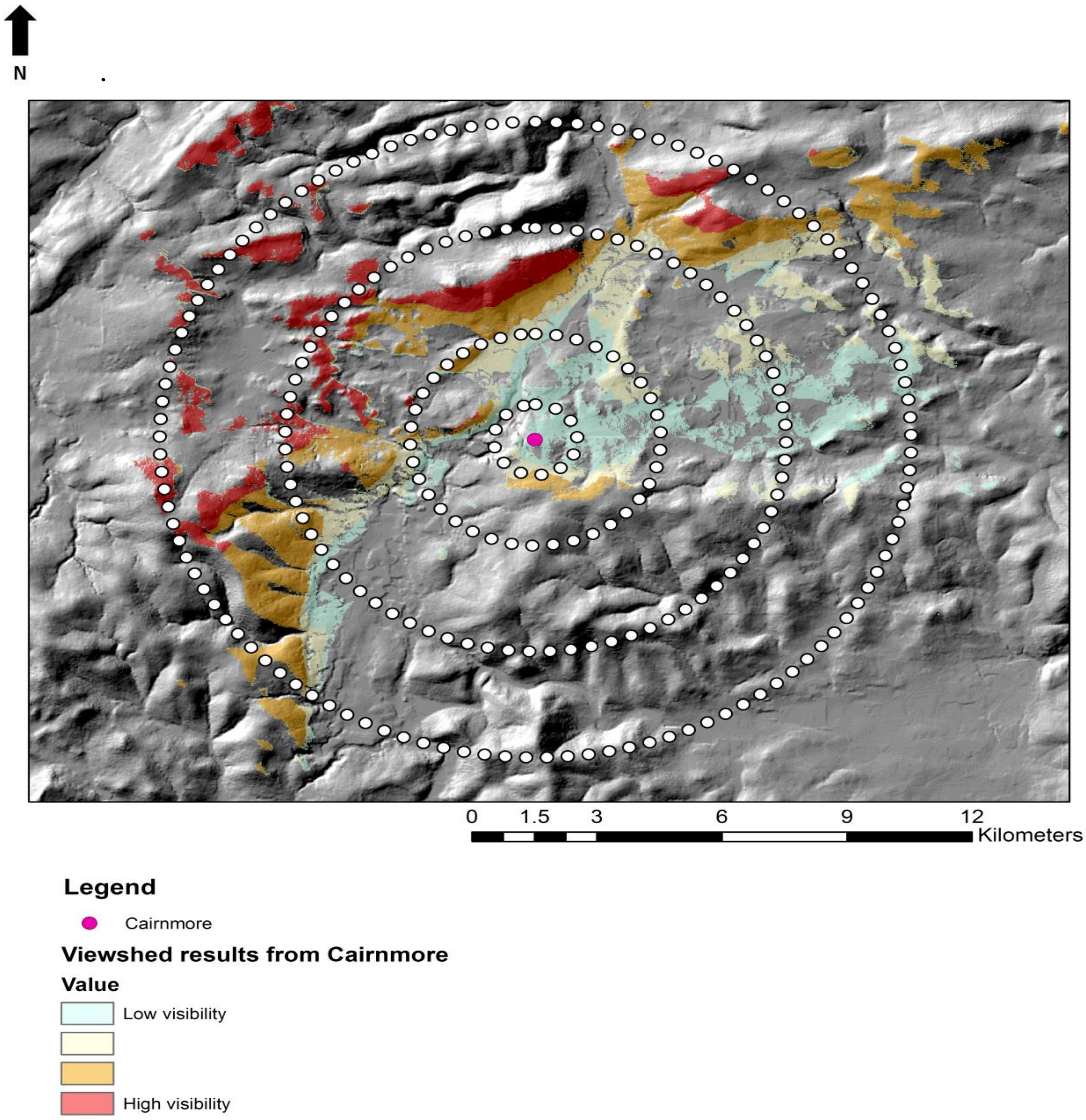
Physical relationship of the hillfort morphology and location with the landscape topography

Cairnmore occupies the summit of an area of rolling uplands. As with Wheedlemont, this site's survival is very poor and it is under dense vegetation coverage. There is no evidence for any artificially constructed defences on the northern and southern sides of the site; these areas use the slope of the hill.

The enclosure's morphology is substantially enhanced and strengthened along the eastern and western sides. Within this area the slope of the land is least and the site is physically associated with the surrounding landscape. On the western side the banks and ditches are spaced closely together, these earthworks cut the hillfort off from the adjacent western spur of land. On the eastern side, the gap between the inner and middle ramparts is greater than on the western side; this enhances the entranceway as it physically lengthens the entrance passage. It also acts as a further means to define and use space.

Its topographical position means that it has scattered visibility to the surrounding landscape. Distance from the site does not affect visual magnitude, but it does affect what can be seen. The spread of visibility is very variable, but the majority of the site can see to the north and east. Between the hillfort and the 1km radius there is very scattered visibility to the north and south (Figure 200). Visibility is primarily focused to the northern and eastern areas between the 1km and 3km radii. Between the 3km and 6km radii visibility is slightly more scattered to the north, east and west. Beyond these radii, visibility becomes very scattered to the north-east and south-west.

Figure 200. Viewshed results from Cairnmore hillfort grid, depicting the visibility of the surrounding landscape from Cairnmore as defined by the hillfort buffers (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)



Image

Viewshed analysis demonstrates that Cairnmore has a relatively high degree of visibility to the surrounding landscape; the site itself is also highly visible. The results of viewshed analysis indicate that the site is least visible from the 1km radius (Figure 201). These results indicate that although the entire site is visible it is of relatively low visibility. The limited visibility of this site is supported by the site photography from Viewpoint 22 which is to the west of the site (Figures 202-203). The slope of the hill on which Cairnmore is situated hinders visibility into the site; however the bank that encloses its western side is visible.

Figure 201. Results of viewshed analysis from the radii towards Cairnmore depicting the visibility of the site (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

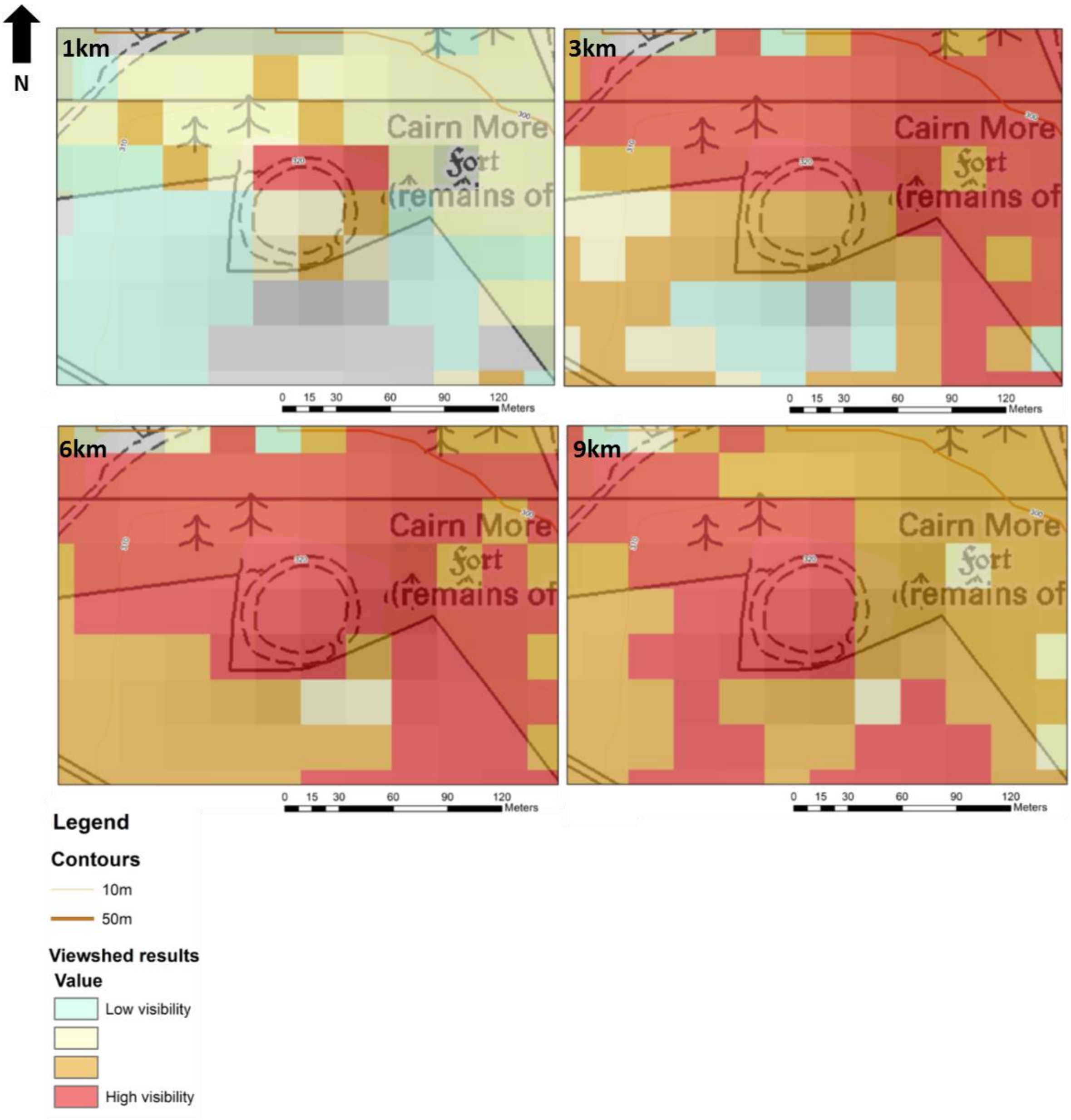


Figure 202. Location map of Viewpoint in relation to Cairnmore (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service.)

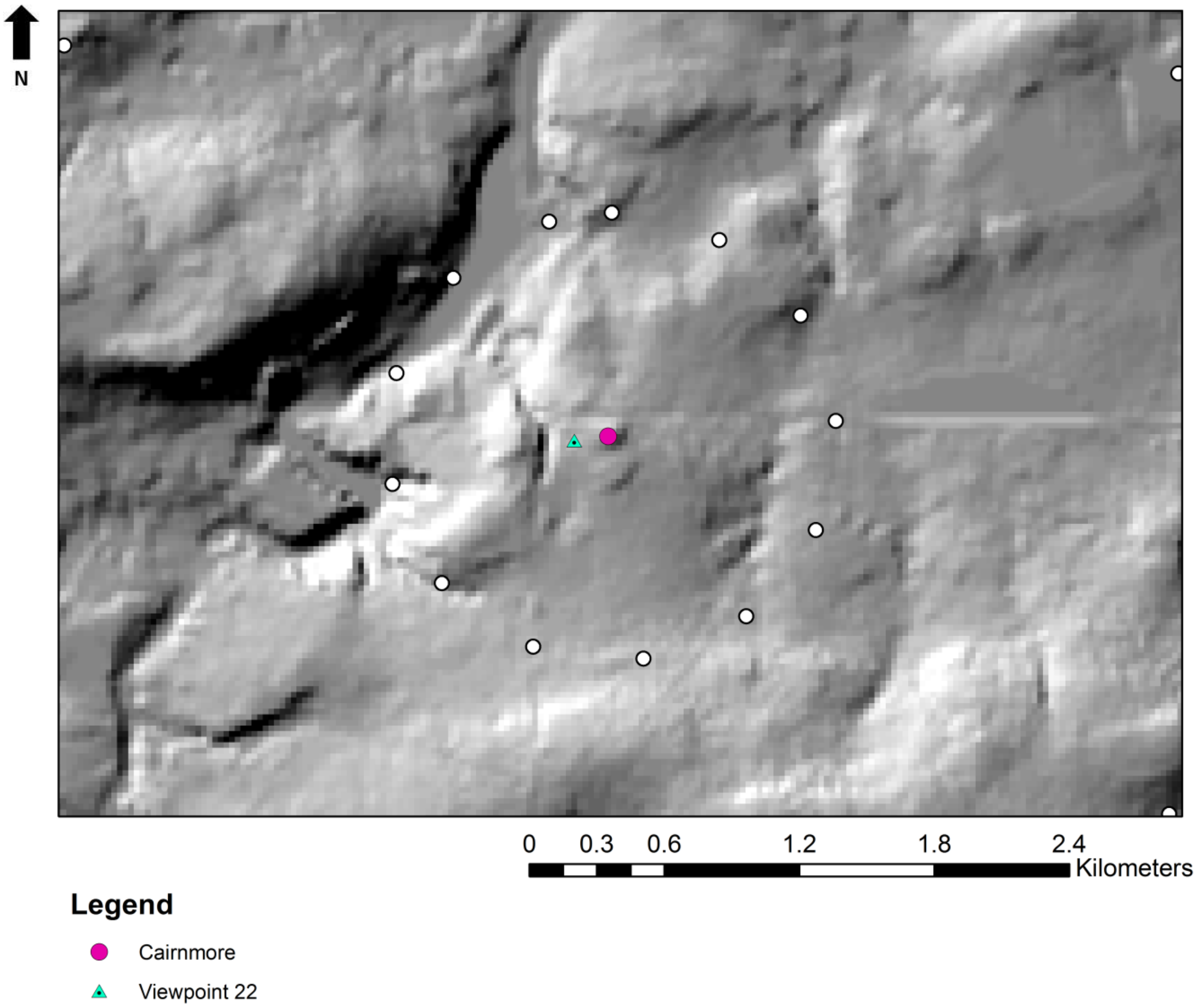


Figure 203. View of Cairnmore from Viewpoint 22, 150m to the west of the site (Author's own 2014)

According to the results of viewshed analysis the visibility of the site increases with distance, with a rise in visual magnitude from the 3km radius (Figure 201). The most visible aspect at this range is the site's northern half, which is of high visibility. The visual magnitude of the site continues to increase from the 6km radius as the majority of the site is of high visibility (Figure 201). Although this site is of high visibility visual clarity would be poor. The visibility of the site decreases slightly from the 9km radius as the visual magnitude of the eastern aspect of the site decreases (Figure 201).

Although the site generally has a high visual magnitude from the surrounding landscape, it is poorly visible from the remaining hillforts within this test area. This poor visibility does not reflect the distance between the sites as they all have poor visual accessibility to the site regardless of their distance from Cairnmore. For example from

Wheedlemont, which is closest to Cairnmore, the majority of the site is visible but it is of low visibility (Figure 204). This is supported by the field photography, where although the site is visible, it is impossible to distinguish the enclosing works (Figure 202). This difficulty is accentuated by the heavy vegetation coverage at the site.

Figure 204. Viewshed results from Wheedlemont depicting the visibility of Cairnmore (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

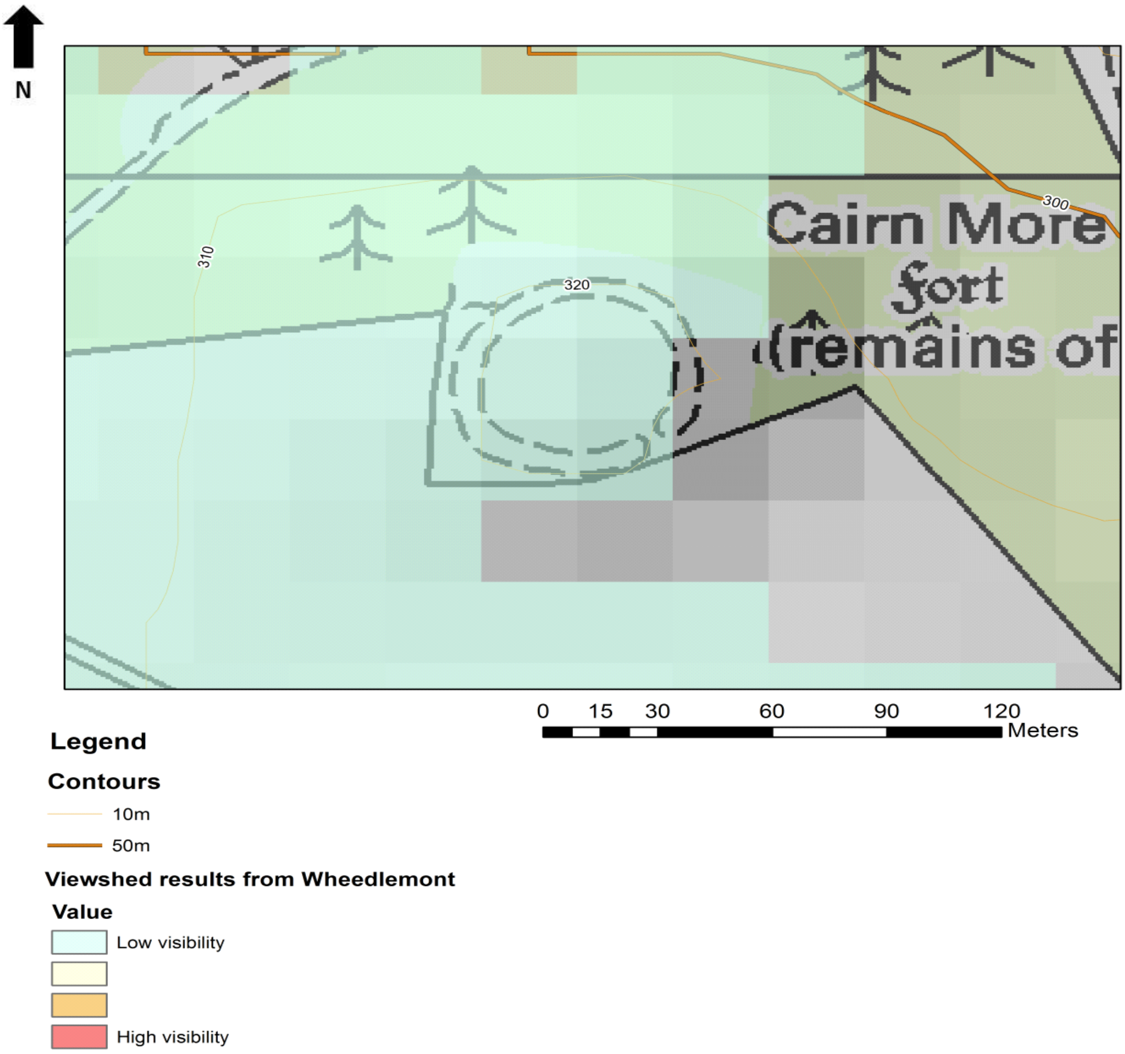


Figure 205. View of Cairnmore from Wheedlemont (Author's own 2014)

The visual magnitude of the site increases from both enclosure lines at Tap o'Noth (Figure 206-207). From the grid which extends to the outer fort of Tap o'Noth, Cairnmore is completely visible however it is of relatively low visibility. The visibility of the site and its environs decreases from the inner fort of Tap o'Noth as there is a decrease in visual magnitude. The viewshed results could not be clarified in the field due to the poor weather conditions during the Tap o'Noth site visit.

Figure 206. Results of viewshed analysis from the outer fort at Tap o'Noth depicting the visibility of Cairnmore (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

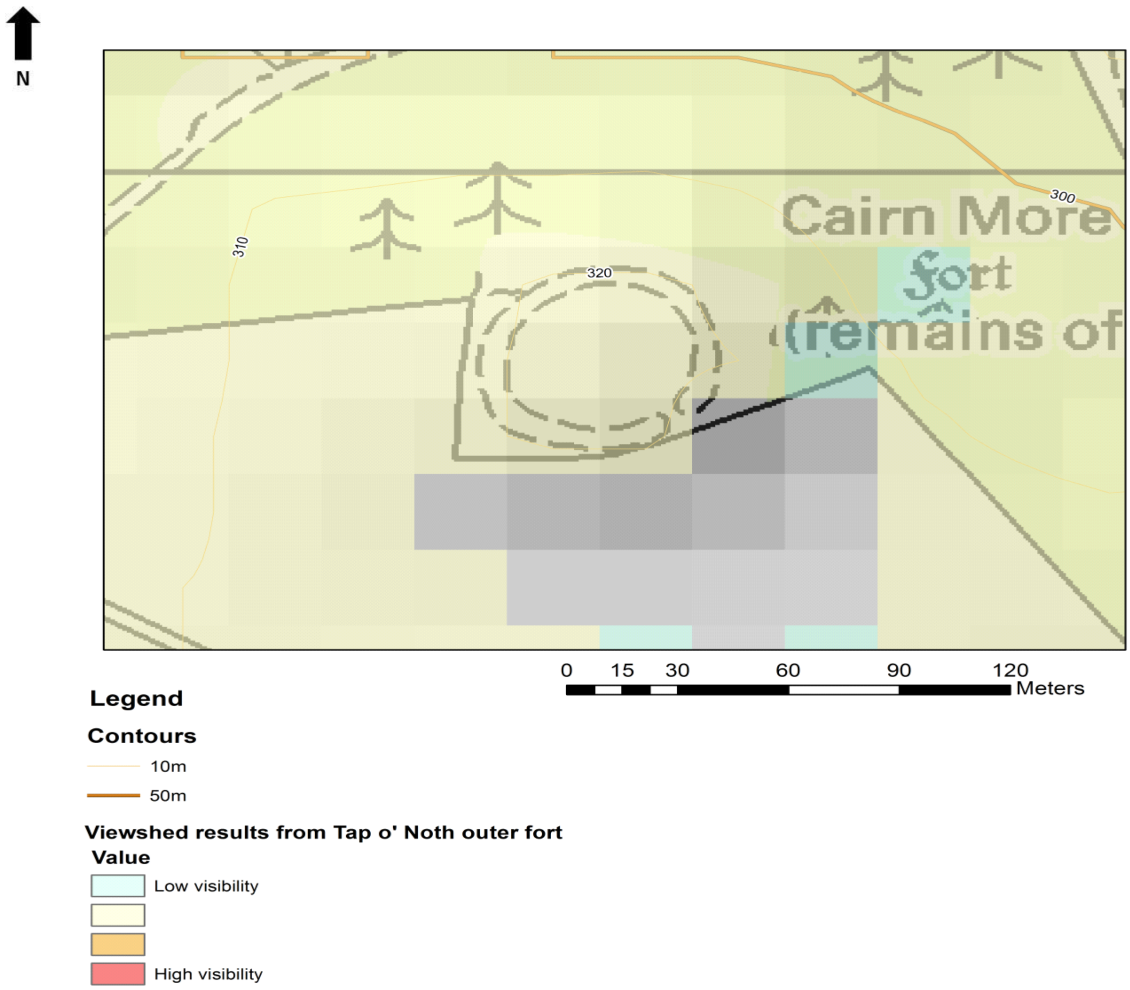
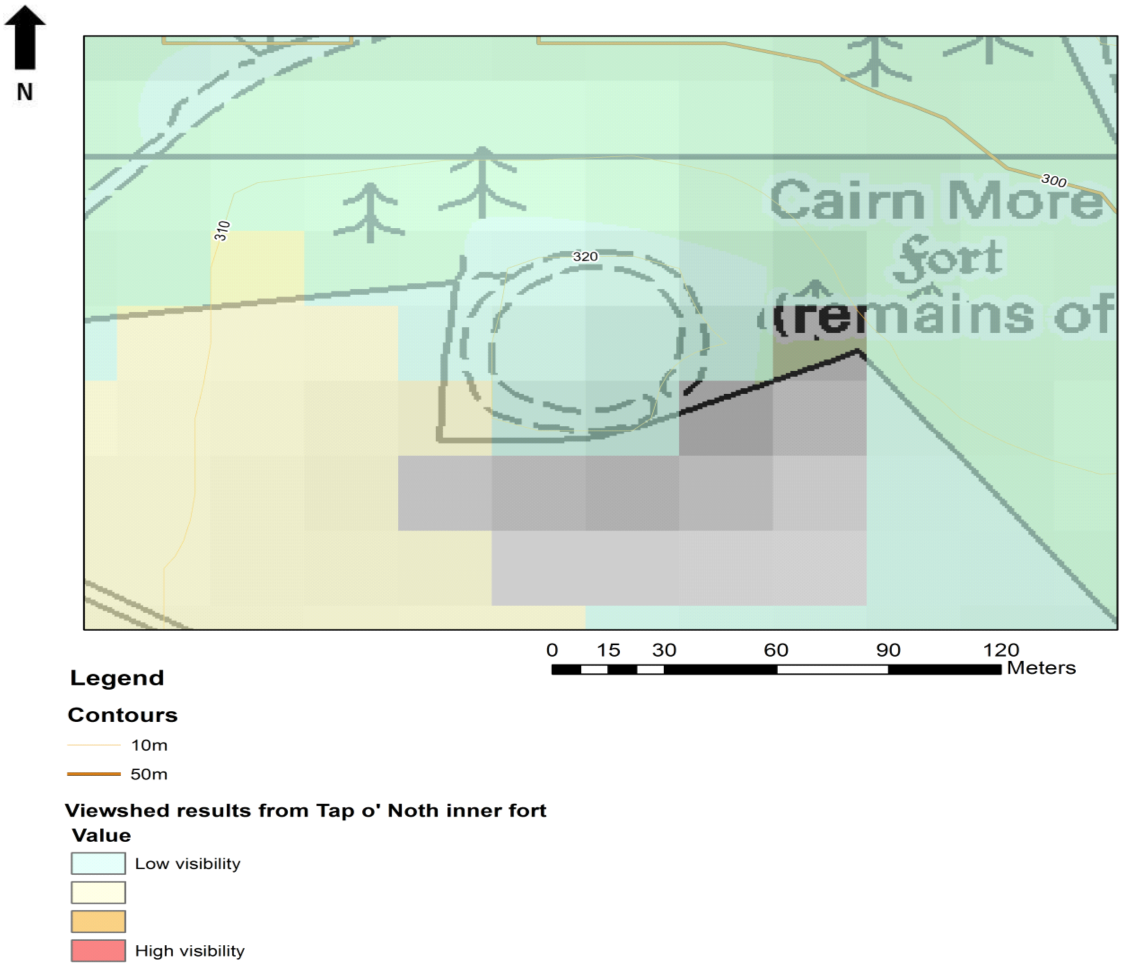


Figure 207. Results of viewshed analysis from the inner fort at Tap o'Noth depicting the visibility of Cairnmore (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)



There is very limited visibility to Cairnmore from both the inner and outer fort at Dunnideer (Figure 208-209). Only the north-eastern aspect of the site is visible from Dunnideer and that has a low value of visual magnitude. The low value of visual magnitude coupled with the distance between the sites meant that visual clarity between the two sites is very poor.

Figure 208. Results of viewshed analysis from the inner fort at Dunnideer depicting the visibility of Cairnmore (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

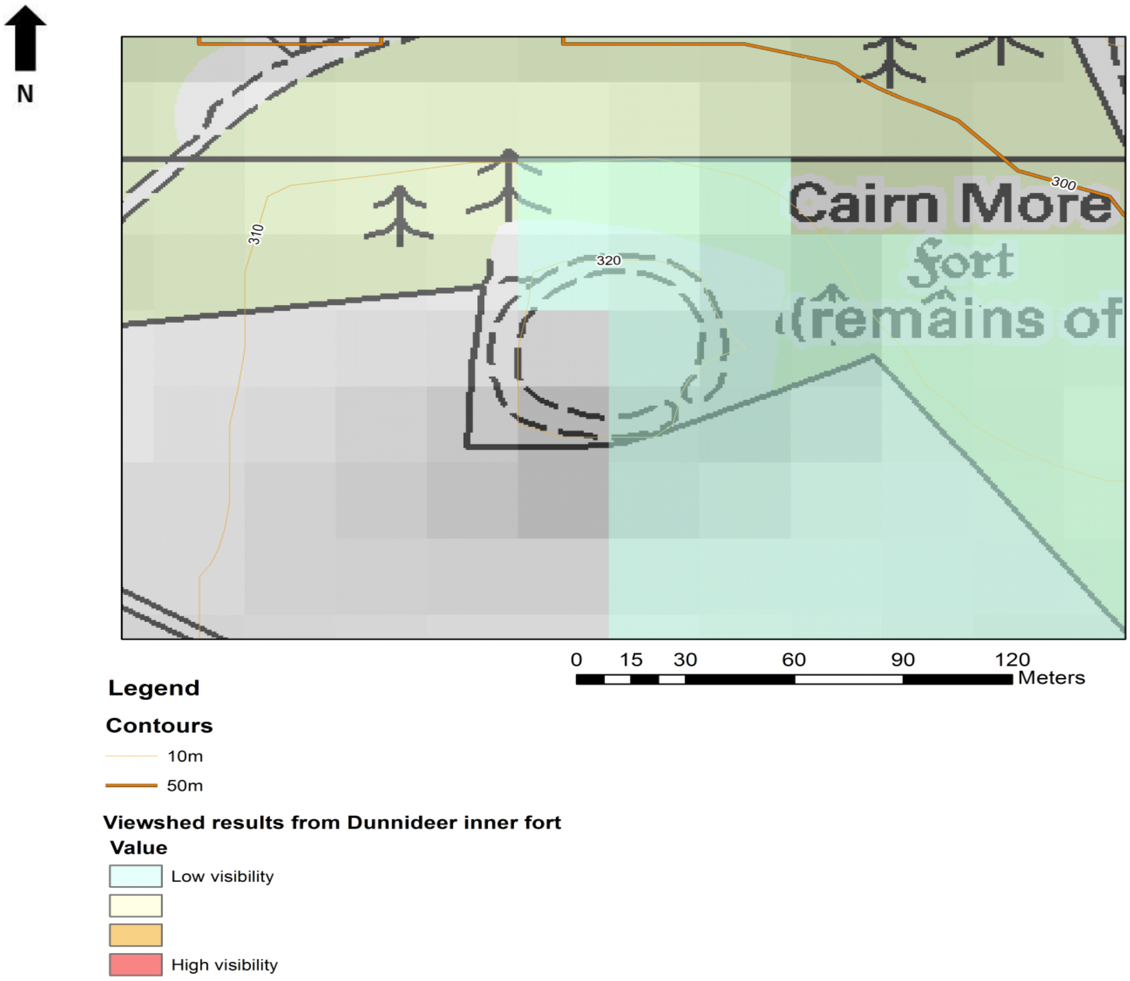
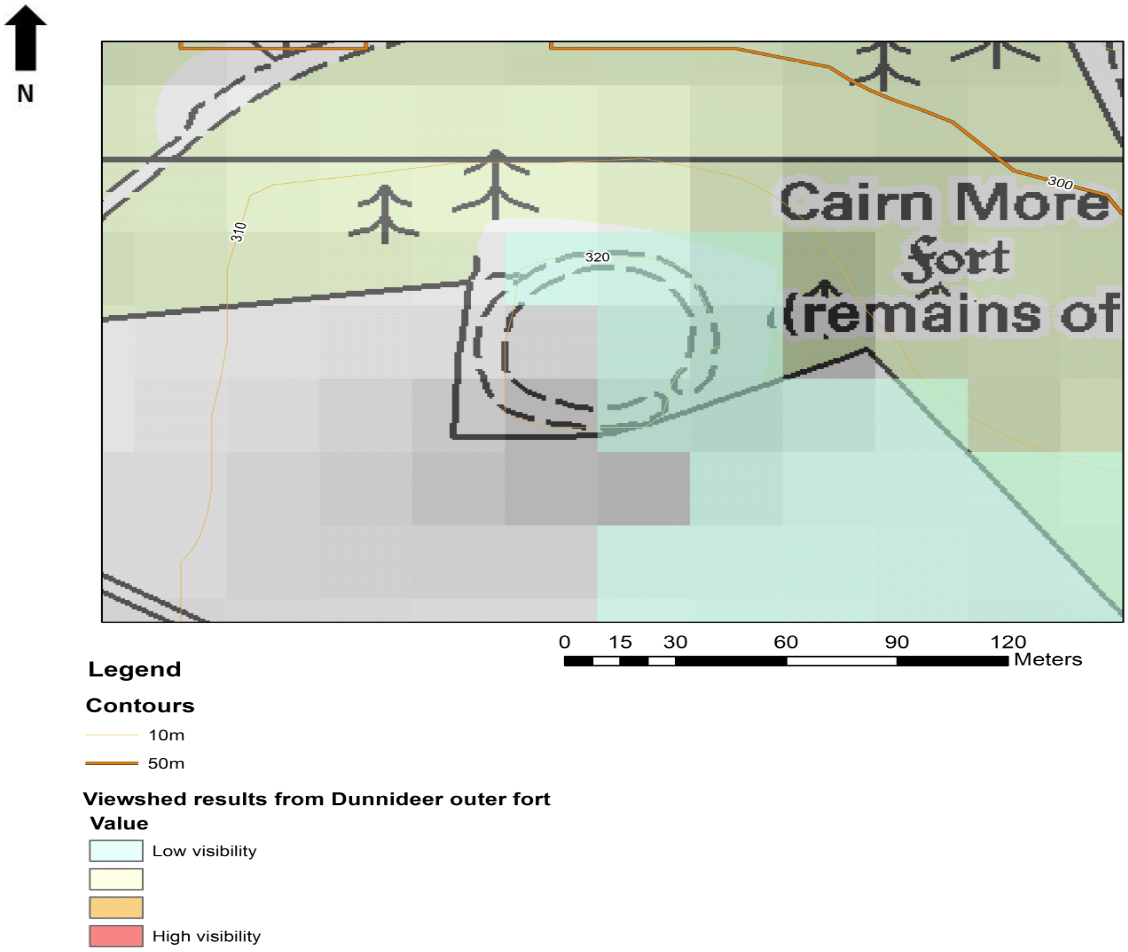


Figure 209. Results of viewshed analysis from the outer fort at Dunnideer depicting the visibility of Cairnmore (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

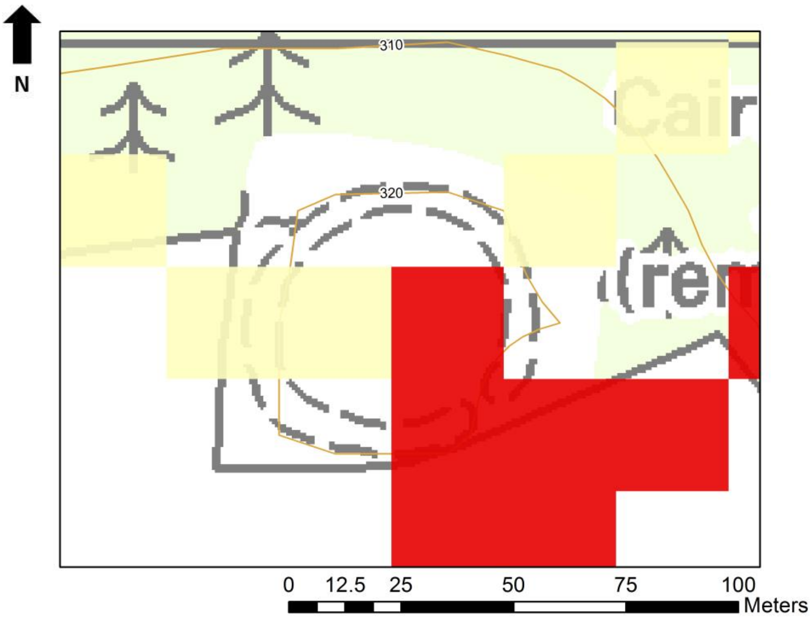


Correct pathways

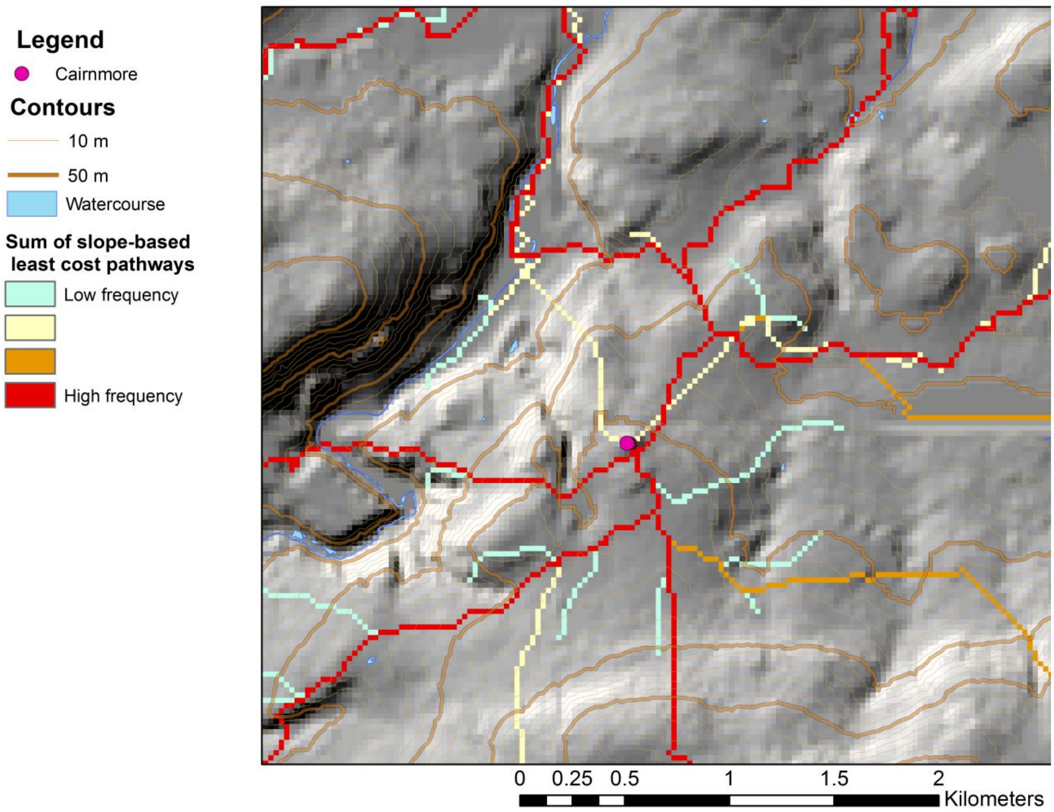
The majority of the slope based pathways (136 out of 250) enter/exit this site very close to its entrance (Figure 210).

The initial routes of the slope paths between Cairnmore and Dunnideer do not distinctively follow any topographically defined routes (Figure 211). At various stages they briefly follow the line of a watercourse. To the east of Clatt the pathway travels through a large circular enclosure **(A)**.

Figure 210. Results of slope based cost surface analysis to and from Cairnmore. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

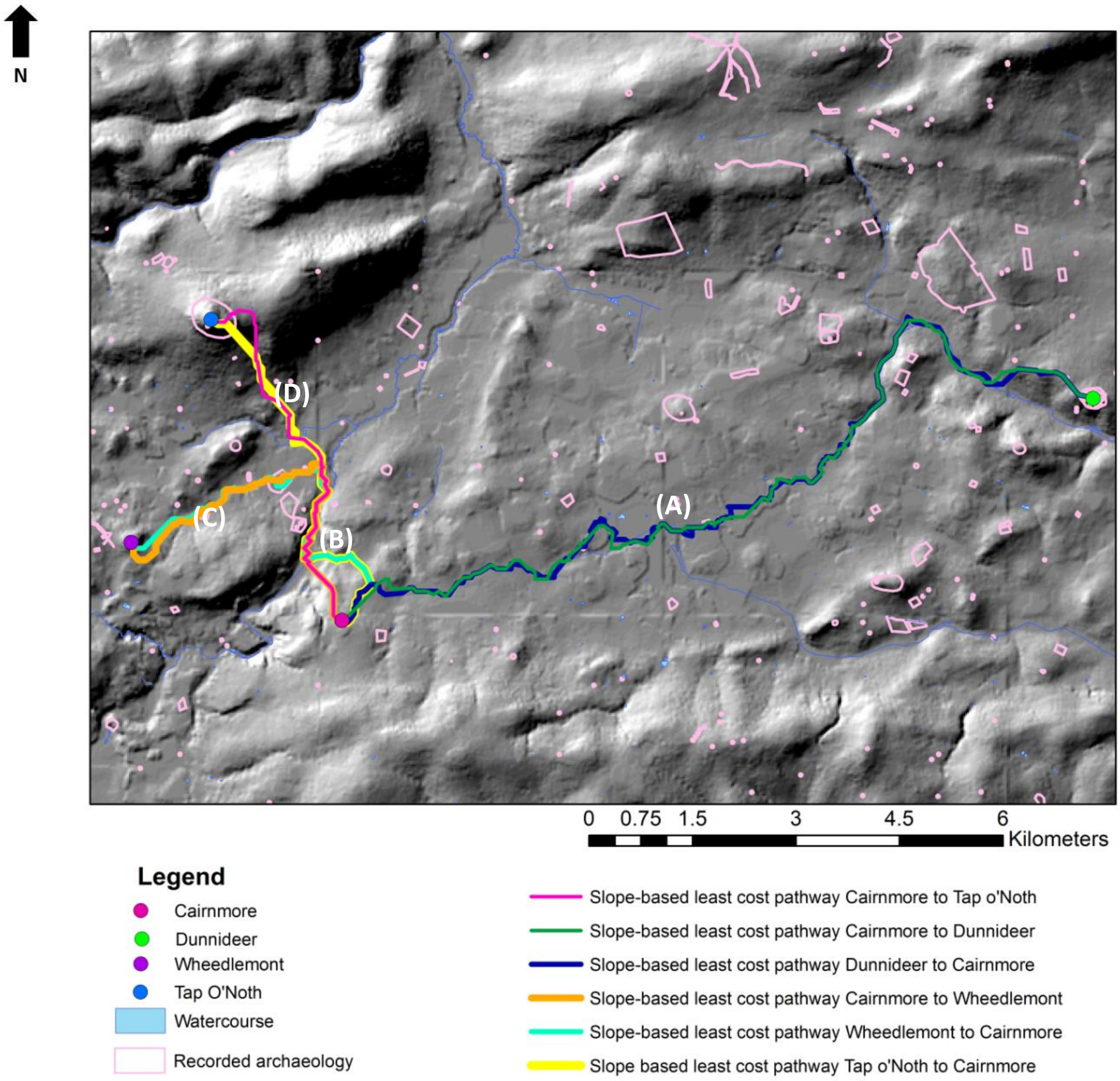


Map A



Map B

Figure 211. Results of slope based cost surface analysis surrounding Cairnmore in relation to the topography, recorded archaeology and watercourses (Landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)

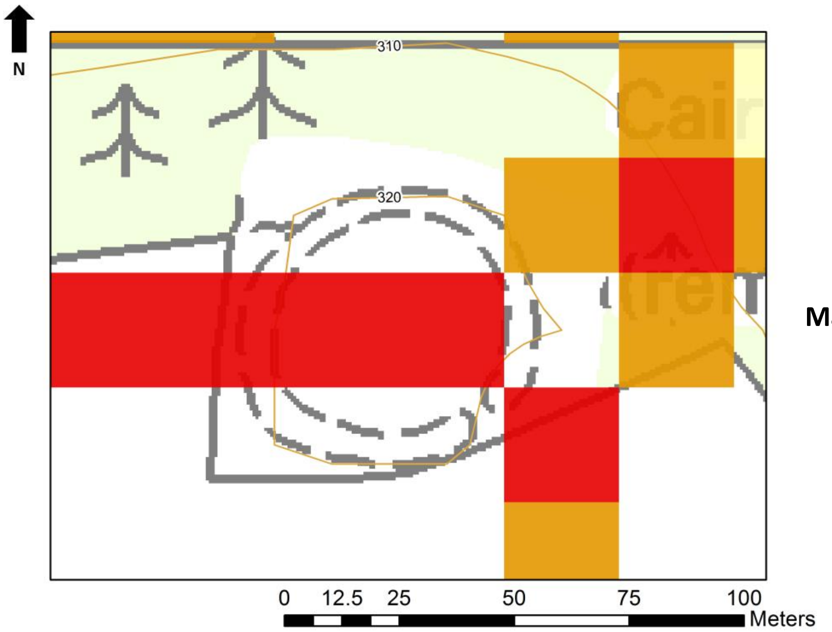


The pathways towards Wheedlemont and Tap o'Noth intersect with both topographical and archaeological features (Figure 211). They follow the line of the Water of Bogie and come into contact with several enclosures (NJ42NE0047) and symbol stones (NJ42NE0045, NJ42NE0033 and NJ42NE0029) (**B**). At Rhynie the pathways take different routes. The pathways between Wheedlemont and Cairnmore follow the line of several water ways and enclosures (NJ42NE0060 and NJ42NE0056) (**C**).

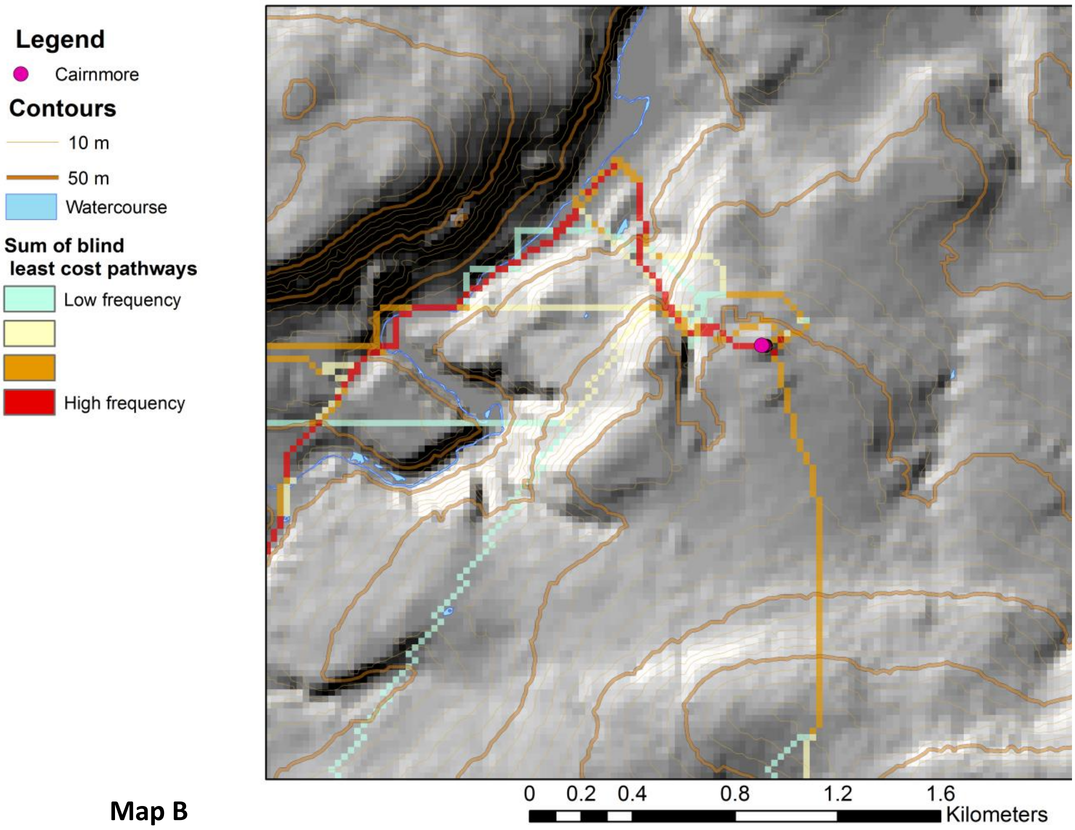
The paths between Cairnmore and Tap o' Noth do not travel past any further archaeological features but they do follow the line of Glamlach Burn (**D**). This implies that this area may not have been a significant route in the past or more recent activity has removed all traces of activity.

Cost surface analysis failed to identify any correlation between the visual pathways and the entrance to the site (Figures 212-213). Half of the blind pathways (9 out of 18) use the western side of the site whilst the visible pathways do not trend towards a single area (Figure 213). This western side is the most strongly defended as the banks that enclose this area are situated close together. This arrangement implies that the construction of the hillfort took into account that the western side of the site was an approach where the site was least visible. The enhancement of this area of the site's morphology may have been an attempt to produce a feeling of surprise in those approaching the site and to enhance the first impressions of the site. These enclosing works would also have inhibited the visibility of the site's interior. The enhancement of site morphology within an area that would have been the first impression of a site has been seen at a number of the Ceredigion hillforts, which were explored in Chapter 3.

Figure 212. Results of cost surface analysis depicting the entry and exit points of the blind pathways at Cairnmore. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)

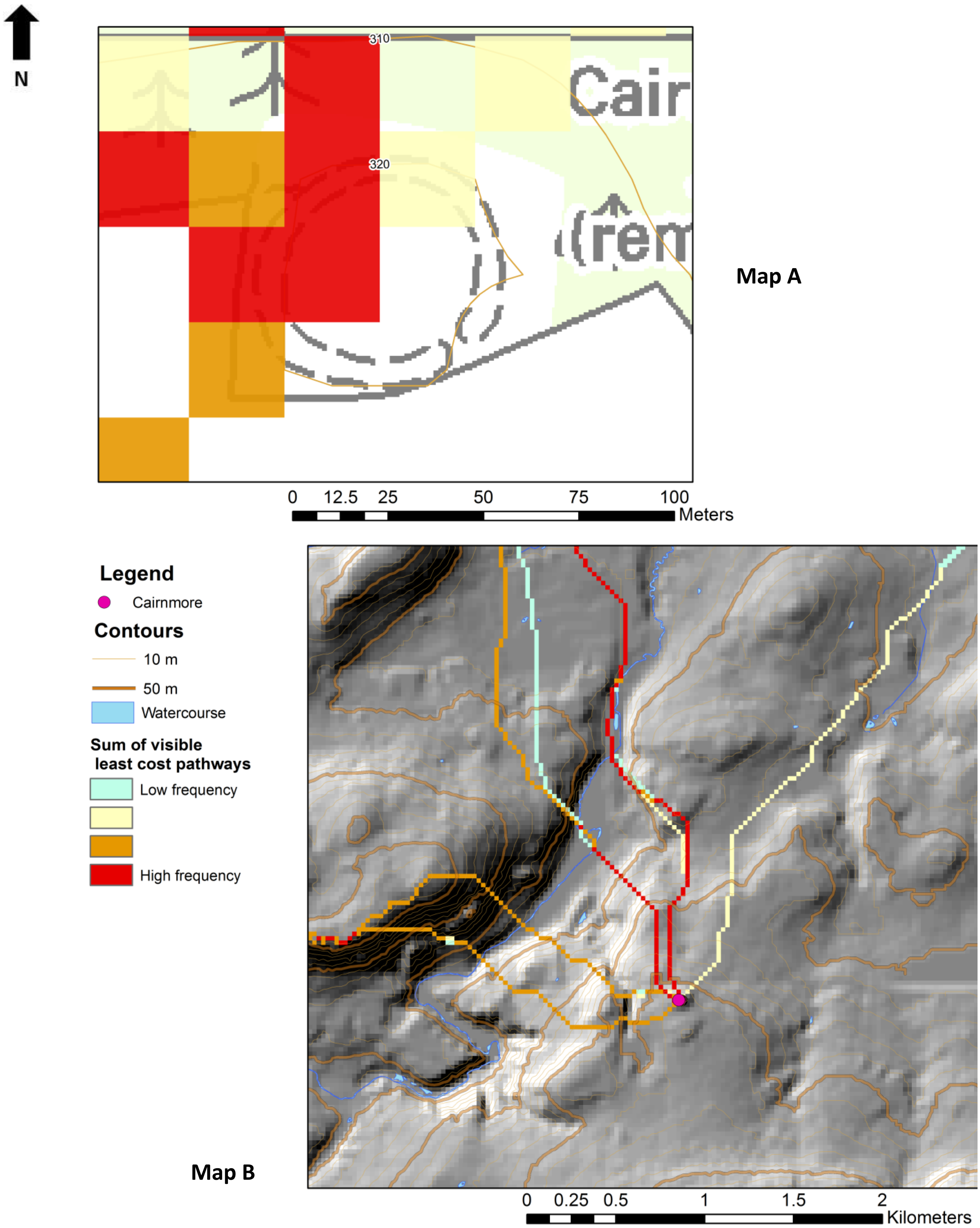


Map A



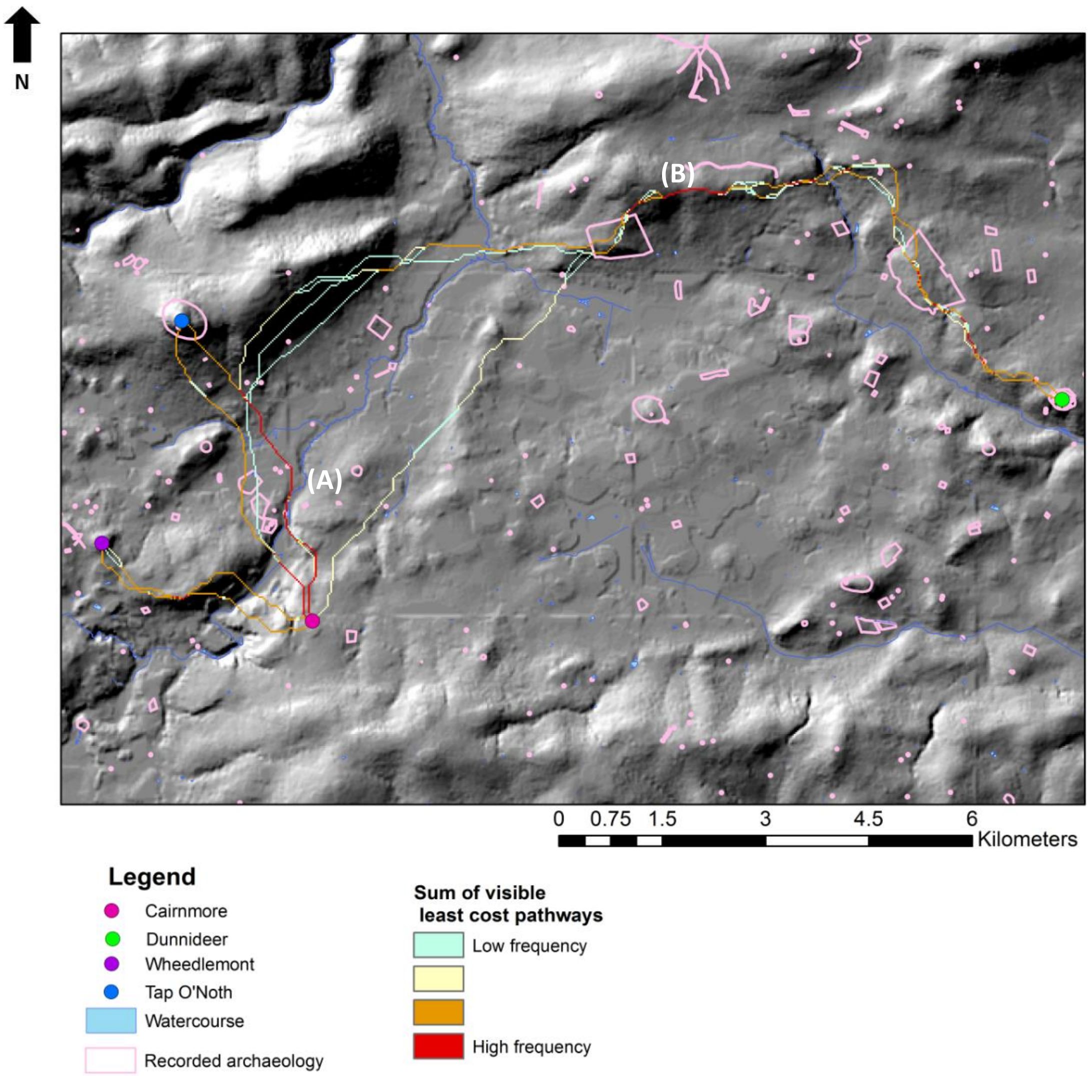
Map B

Figure 213. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Cairnmore. Map A depicts the entry and exit points of the pathways at the site, Map B depicts the routes of the pathways on a landscape scale and is overlain by watercourses (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2013. An Ordnance Survey/EDINA supplied service.)



The visible pathways between Cairnmore and Tap o'Noth have a high correlation with the activity at Rhynie (Figure 214). This activity includes the enclosure at Barflat (NJ42NE0047), square barrows (NJ42NE0057), two further enclosures (NJ42NE0060), two standing stones (NJ42NE0022), two Pictish symbol stones (NJ42NE0021) and two urns (NJ42NE0020) (**A**). From Dunnideer the pathways coincide with the extant pathway at Wardhouse Hill (NJ53SE0054) (**B**).

Figure 214. Results of cost surface analysis, depicting the route of visible pathways in relation to the topography, recorded archaeology and water courses (landscape scale) (Aberdeenshire Council Archaeology Service 2014; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service.)



Concluding site summary

The scope of the investigation of Cairnmore was severely hindered by the heavy vegetation coverage of the site coupled with the lack of a georeferenced plan. The investigations did however reveal that the site's morphology responded both to its physical and visual characteristics. The banks that enclose the western side of the site are much more closely packed than the eastern group. The western area corresponds with the blind pathways. This correspondence implies that the morphological sequence was a design imposed upon the landscape to influence the site's image. The remainder of the enclosure was defined solely by the natural hillslope.

The location of the site meant that it has scattered yet high visibility to the surrounding landscape. The site itself is also relatively highly visible from its environs; however it is not visually prominent. Viewshed analysis failed to identify any particularly visible aspect of the site than the others.

Conclusion

The lack of LiDAR data and georeferenced plans for this test area hindered the scope of the analysis. The absence of this data meant that analysis and interpretation took longer than for other test areas within this study, however valuable observations were still made which will be influential in the overall outcome of this project.

This region is topographically distinct with low lying river valleys and large hillrange's such as the Coreen Hills, Wardhouse Hill and the Hill of Noth. The distinctiveness of this topography influenced the visual and physical prominence of the sites that were constructed upon them. The relationship between topography and hillfort morphologies is explored extensively in Chapter 8, however the key observations are also discussed below.

All of the sites were positioned on the summit of the hills on which they were constructed; it was this position alongside the relationship between site morphology and topography that influenced their prominence. For example, the inner forts of Dunnideer and Tap o'Noth are oblong in shape; this form was not dictated by the rounded, irregular shape of the hilltop. This relationship causes a visual and physical contrast between the topography and the site morphology that enhances the visual prominence of these sites. On the other hand these sites' lower outer forts conform to the shape of the hillsides. These forts are enclosed by lesser banks than the inner forts which inevitably reduces their prominence, however the adherence of these lines of enclosure to the topography also added to this effect. The morphology of Cairnmore and Wheedlemont also fails to contrast with the topographic setting they occupied; consequently they are not visually prominent. There are, however, instances at these seemingly subtle sites where their morphology responded to the topography but not in an overt way. For example at Cairnmore there are no artificial enclosing works in the north and south as the break of slope delimits the enclosure. At Wheedlemont, although the site's morphology is predominantly non-defensive, a ditch only occurs at the site in the west and south where the site is believed to be most accessible.

Although the outer forts to Dunnideer and Tap o'Noth are the least prominent morphological components to these sites, they have the densest concentration of hut platforms. The poor concentration of huts within the visually prominent and architecturally extravagant vitrified inner forts implies that the sites as a whole have a dual role, with the inner forts functioning differently to the outer. The lack of entrance and the highly visible nature of the inner forts (the bank in the case of Tap o'Noth) potentially dictated that they functioned as a strong and prominent public space. From the surrounding landscape they appeared impenetrable and strong having secured such prominent hilltops.

Many believed that the vitrification of sites such as the inner forts at Tap o'Noth and Dunnideer resulted from warfare (MacKie 1976; Shepherd 1996). This may have been an act of arson; however the degree of vitrification which was achieved at these sites would have needed a sustained fire over several weeks (Ralston 2006). Recent theories into the cause of vitrification focused upon it as a ritual act of closure or an act of aggression (Ralston 2006, 163; Armit 2005, 53). Although firing potentially indicated the end of the use of these inner forts, it does not take away from the fact that these inner banks were the most physically prominent aspect of the sites. Furthermore, the fact that these enclosures were constructed without an entrance implies that they were never intended to be in daily occupational use. Their function may have been for display and the subsequent burning of the timber wall formed a theatrical finale to such a use. This is just one idea surrounding the function of these structures. However evidence elsewhere such as at Craig Phadrig indicated that the site was destroyed soon after its construction but post destruction occupation within this site has been recorded from before 150BC up until c.400 A.D (Small 1971, 23).

Although the relationship between site morphology and topography in the case of the inner forts at Dunnideer and Tap o'Noth enhanced their visual prominence, there is no evidence for the portrayal of a particular image within a particular direction at any of these sites. Viewshed analysis failed to identify any strong evidence for visually based directionality in the morphology at these sites.

Although there are trackways through the outer fort of Tap o'Noth the entrances to the sites within this test area were relatively simple unlike Castell Grogwynion in Ceredigion. However, the impenetrability of the inner forts of Dunnideer and Tap o’Noth created a correct pathway in the sense that the morphology dictated where entry was not possible or allowed. Cost surface analysis also identified that where entrances did exist at the sites, they were predominantly placed at the most accessible and visible entry/exit points to them. The concept of a correct pathway and the evidence for their existence is discussed in Chapter 8 (Pages 529-532)

Within this test area there was also an example of where blind pathways strongly intersected with a site’s area of extensive enclosing works, this occurred at Cairnmore. This correlation has already been found at several sites in Chapter 3(Pages 168-169) and it will be explored further in Chapter 6 and 8 (Pages 439 and 528-529). The gradual increase in the instances of blind pathways interacting with areas of extensive enclosure amplifies the importance of this observation and its potential significance to hillfort studies.

Similarly the visible and slope-based pathways that travel through this landscape also had a strong correlation with both topographical and archaeological features. This correlation implies that these GIS-based routeways travel through areas that were highly significant at the time that the hillforts within this landscape were in use. This evidence implies that the GIS-based routeways may have been actual routeways through this landscape, or at least partial routeways, this correlation reinforces the value in applying GIS based analysis as it can identify patterns of significance within landscapes. This is explored further in Chapter 9 (Page 548).

Chapter 6

The Gower

Introduction to the test area

This test area consists of an inland section of the Gower Peninsula (Figure 215). This is a region of low density hillfort distribution (Figure 216). The topography is predominantly flat coastal plain, which also has a series of isolated hills and ridges such as Llanmadoc Hill, Hardings Down, Rhosilli Down and Cefn Bryn. The sites under investigation are The Bulwark, which is located on the eastern terminus of Llanmadoc Hill, and the three enclosures on Hardings Down. The sites on Hardings Down are: Hardings Down North enclosure, Hardings Down East enclosure and Hardings Down West enclosure.

Figure 215. Distribution map of the test area hillforts on the Ordnance Survey PROFILE DTM
(© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service)

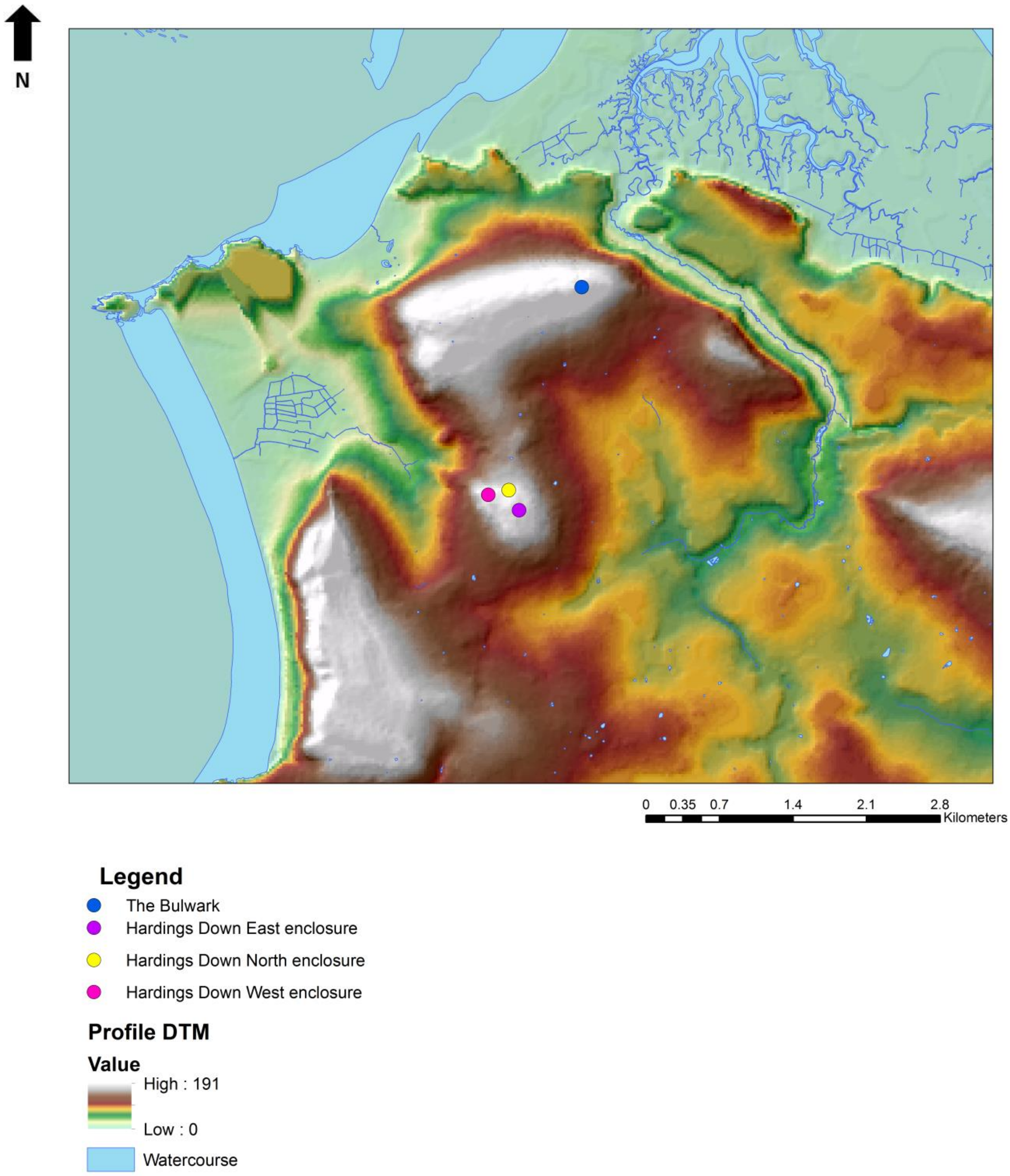
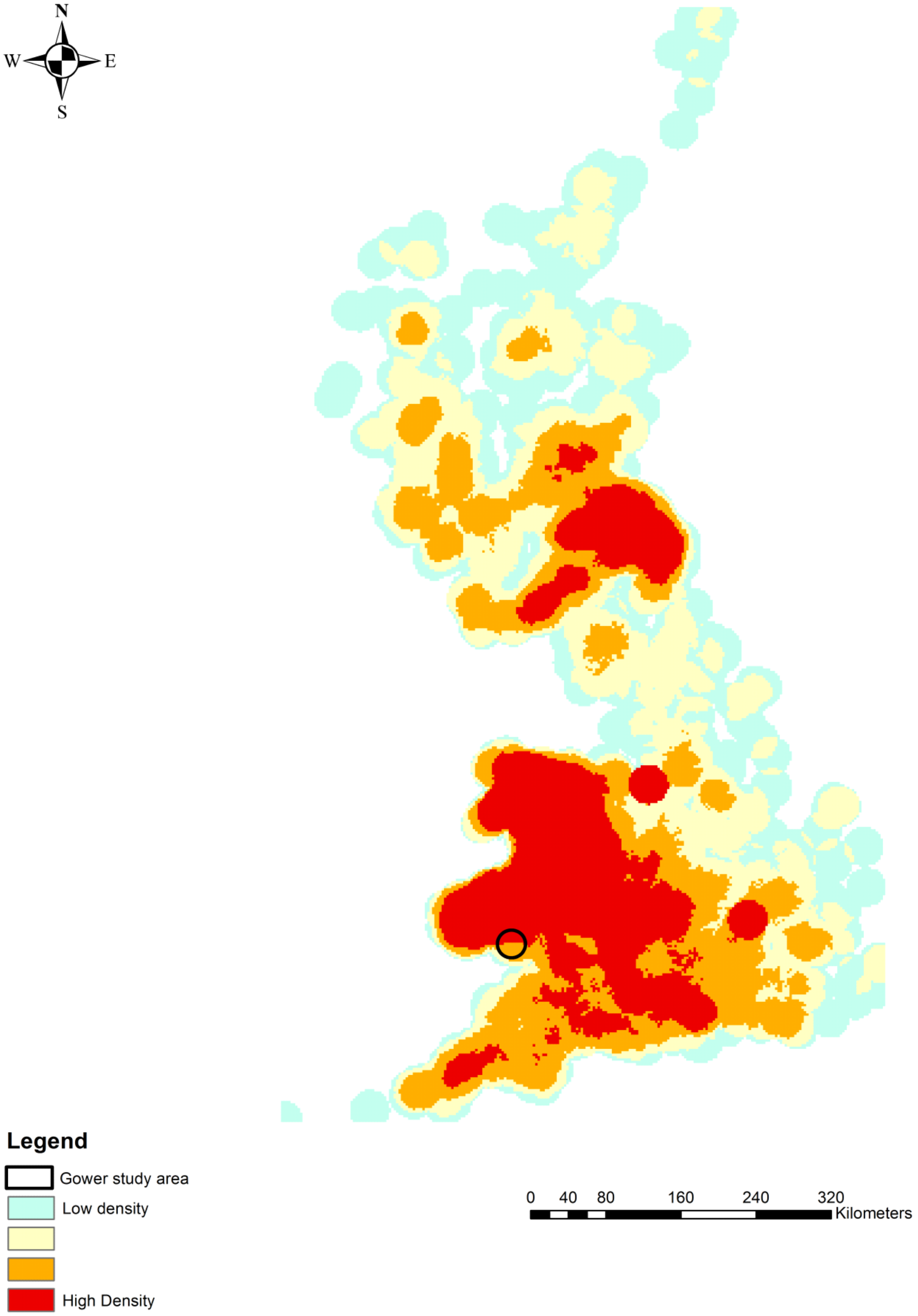


Figure 216. Overall distribution density map of hillforts in Britain (Atlas of Hillforts in Britain and Ireland Project 2013; EngLaID 2013)



As with many areas of Britain the current state of knowledge surrounding the paleoenvironment of this region is restricted. Pollen samples, retrieved from below a rampart of the West enclosure, indicate that prior to the construction of the rampart the hilltop was dominated by oak forest with ferns (Crampton 1973, 68). The forest declined in the Bronze Age when it was replaced by grassland (*ibid*, 1973). This demonstrates that when the West enclosure was constructed, Hardings Down was covered by grassland. Visibility was therefore not likely to have been inhibited by tree cover.

The sites within this test area are small, with enclosed areas ranging from c.0.2ha to c.2 ha. The distance between the sites is also very small, a maximum of c.2km separates The Bulwark from the sites on Hardings Down. The sites on Hardings Down are separated by a maximum of c.0.3km.

This test area allows the methodology to be tested in a topographical region that encompasses flat coastal plain, hilltops and ridges. The small sizes of the sites coupled with the small distances between them enables the testing of the methodology's resolution within this type of analytical and topographical environment.

Data

LiDAR data (DTM) for these hillforts was downloaded from Geomatics. The data was of 2m resolution and was initially processed through hillshade modelling in Landserf; however this processed data did not clearly depict the sites, particularly the East enclosure. At a later date the DTM was re-processed using hillshade modelling in ArcMAP. This was more effective, and it helped to achieve a better understanding of the morphology of the sites. A LiDAR based DTM was also created for the central area of the study area and this was later used as a friction surface to test the affectivity of the different resolutions of DTM. However, this DTM has a small area of data which was not supplied by Geomatics, this strongly biased some of the results, particularly cost-surface analysis. In this case it was found that using the Ordnance Survey Profile DTM was much more effective as a friction surface.

HER data for the remaining sites and archaeological records within the test area was received from Glamorgan-Gwent Archaeological Trust.

Site visit

The test area was visited on August 25th 2013. The aim was to gain an understanding of the topography and how the hillforts appeared within the landscape today. Their topographical position and how that affected the visibility of the enclosures was also investigated. The success of the visit was two-fold. An understanding of the true scale of the sites and the landscape, and the inter- and intra-visibility of the sites was gained by travelling around the landscape. However, due to the time of year it was very difficult to see the fine detail of the hillfort morphologies on the ground. This did not hinder the progress of the study as the fieldwork notes were analysed in conjunction with the processed LiDAR data to gain the necessary understanding of the sites' morphology.

Analysis

Hardings Down West enclosure

Site introduction

The oval-shaped West enclosure encloses 0.6ha (Glamorgan Gwent Archaeological Trust Historic Environment Record 2013). This is a multiple-enclosure site, which has an annexe that sits 15m away from the inner enclosure (Forde-Johnston 1976, 202).

The site's entrance is situated in the north-east of the main inner enclosure and forms a break in the enclosure circuit, it is accompanied by a slight out-turning of the rampart. There is evidence for the gateway having a four-post timber framework, which measures 9ft square (Hogg 1973, 59). A cobbled roadway was situated between the kerbs of the entrance (*ibid*, 1973 60).

Excavations did not reveal evidence for any timberwork within the enclosing work of this site (*ibid* 1973). Large stones were discovered in the inner ditch, which may have tumbled from a stone revetment (*ibid* 1973). Although large stones were discovered, their number was not substantial enough to confirm the presence of a revetment, consequently Hogg interpreted them to be remnants of a stone breastwork (1973, 58).

Hogg also hinted at the possibility that the evidence indicates that the enclosing bank was of a two period construction (*ibid* 1973). He argued that the stone free material in the middle of the bank and the counterscarp potentially represented the first phase (*ibid* 1973, 58). The outer banks had no revetment and were formed from the upcast of ditch material (ibid 1973, 58). These outworks look unfinished but this appearance is typical of the southwestern hillforts (*ibid* 1973, 58).

Three hut platforms were found in the interior (*ibid* 1973). The middle platform had approximately 34 posts that defined the 9.8m diameter hut (*ibid* 1973, 60). There were also four well defined post holes in the centre of this hut, two of which were a potential indicator of the hut's entrance (*ibid* 1973). An oval hut platform was situated to the rear of the rampart. A layer of discoloured soil was discovered on the hut's rock cut floor which included crushed charcoal, pottery fragments and 'utility stones' (*ibid* 1973, 64). This pottery was attributed to 'B' pottery and led to the interpretation that this hut originated from the second period of occupation, whilst the middle hut platform was suggested to be from the site's first phase (*ibid* 1973, 66).

Physical relationship of the hillfort morphology and location with the landscape topography

As a hillslope enclosure, this site slopes down to the north-west (Figure 217). Its sloping nature accentuates the site's visibility from the surrounding landscape, particularly from the north where the site is visually prominent (Figure 218). The topographical form of this hillside was not used to aid in the construction of the West enclosure, the site's morphology also fails to adhere to the topography. However, in the southern corner of the site, where the site faces the summit of Hardings Down and the East enclosure; the banks are most numerous with a main, middle and outer rampart.

Figure 217. 2m resolution LiDAR hillshade model of Hardings Down West Enclosure overlain by contours (© Environment Agency copyright and/or database right 2015. All rights reserved.)

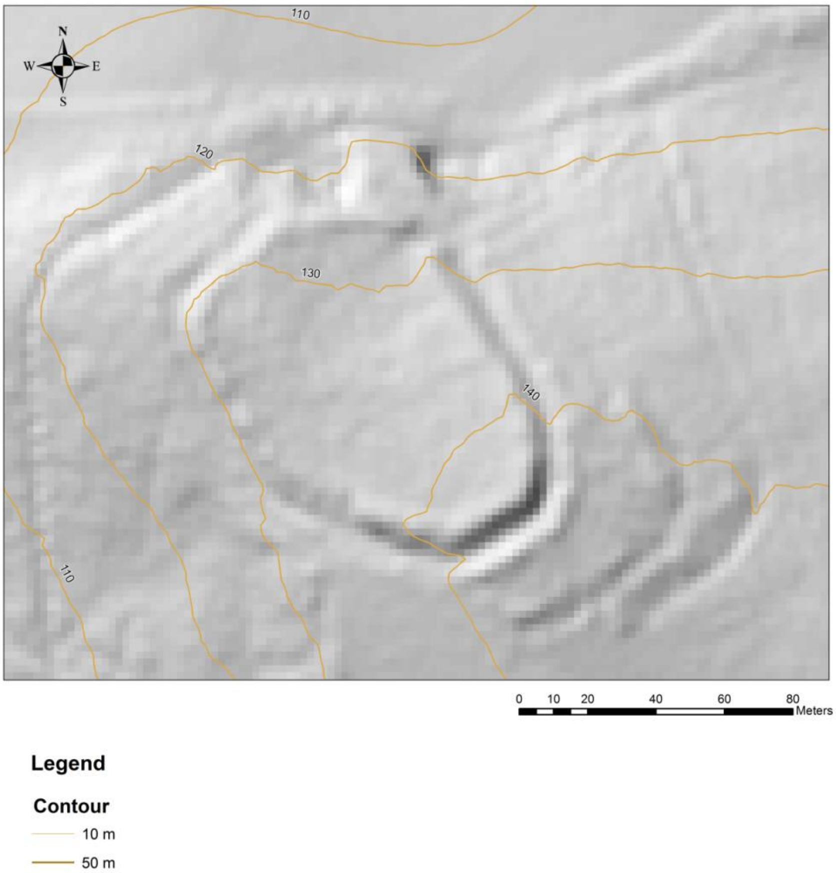
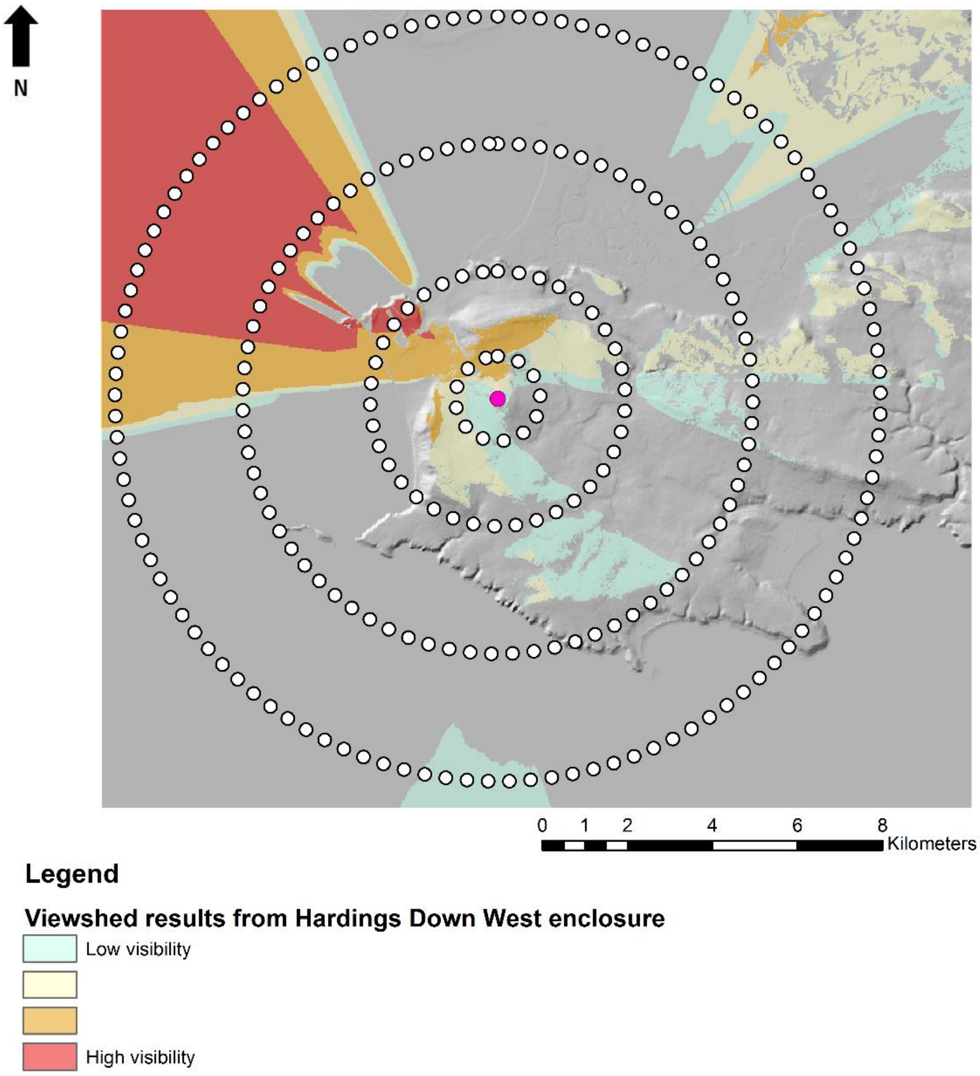


Figure 218. Photograph depicting the visibility of the enclosure from the downland to the north-west of the site (Author's own 2013)

The slope of the West enclosure reduced the visual accessibility of the surrounding landscape from this site as it was impossible for it to have 360˚ landward views (Figure 219). This is demonstrated by the fact that the site had very restricted visibility to the south. Visual accessibility within the 3km radius is relatively low, and predominantly confined to the north, west and south. Beyond this radius the visual magnitude of the visible areas increases; these visible areas are confined to the north-west and are predominantly out to the coast.

Figure 219. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Hardings Down West Enclosure as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)



Image

Viewshed analysis demonstrated that its visual magnitude falls into a relatively high percentile range from the 1km radius (Figure 220). The whole site is visible from this area, however its most visible aspect is in the south. The least visible area is the outer southern bank, this forms the outer bank of the annexe. The high visibility of this enclosure is supported by the fieldwork photography, which was taken from within this radius. Viewpoints 2 and 3 are both situated to the north of the West enclosure (Figure 221). From both of these viewpoints the banks that enclose the site do not inhibit visibility into it (Figure 222-223). However, these banks are prominent, this prominence was achieved by their contrasting position on an otherwise sloping topographical feature.

Figure 220. Results of viewshed analysis from the radii towards Hardings Down West enclosure depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2015. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

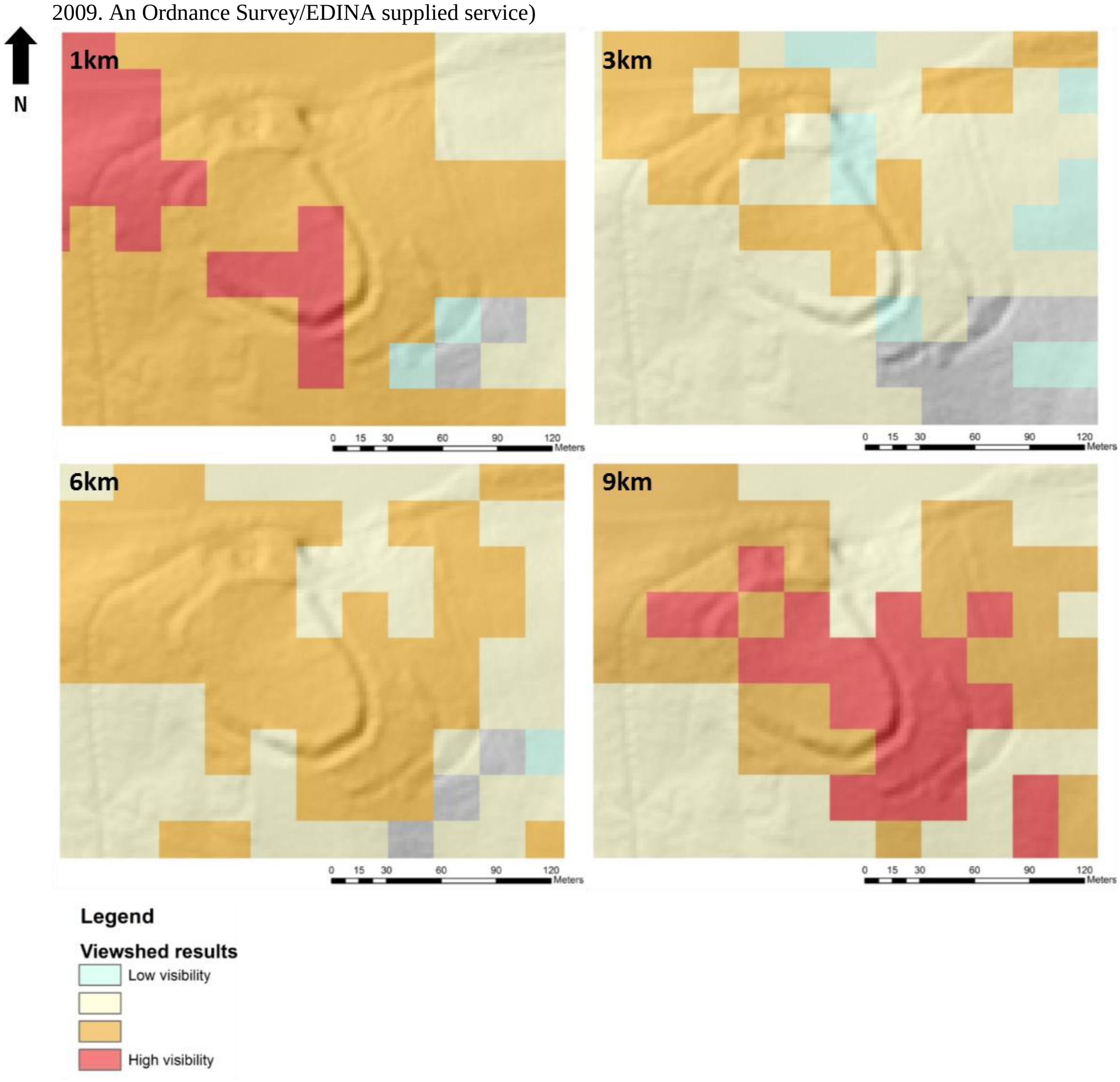


Figure 221. Location map of the Viewpoints which relate to the West enclosure overlain by watercourses (© Crown Copyright/database right 2009.An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved)

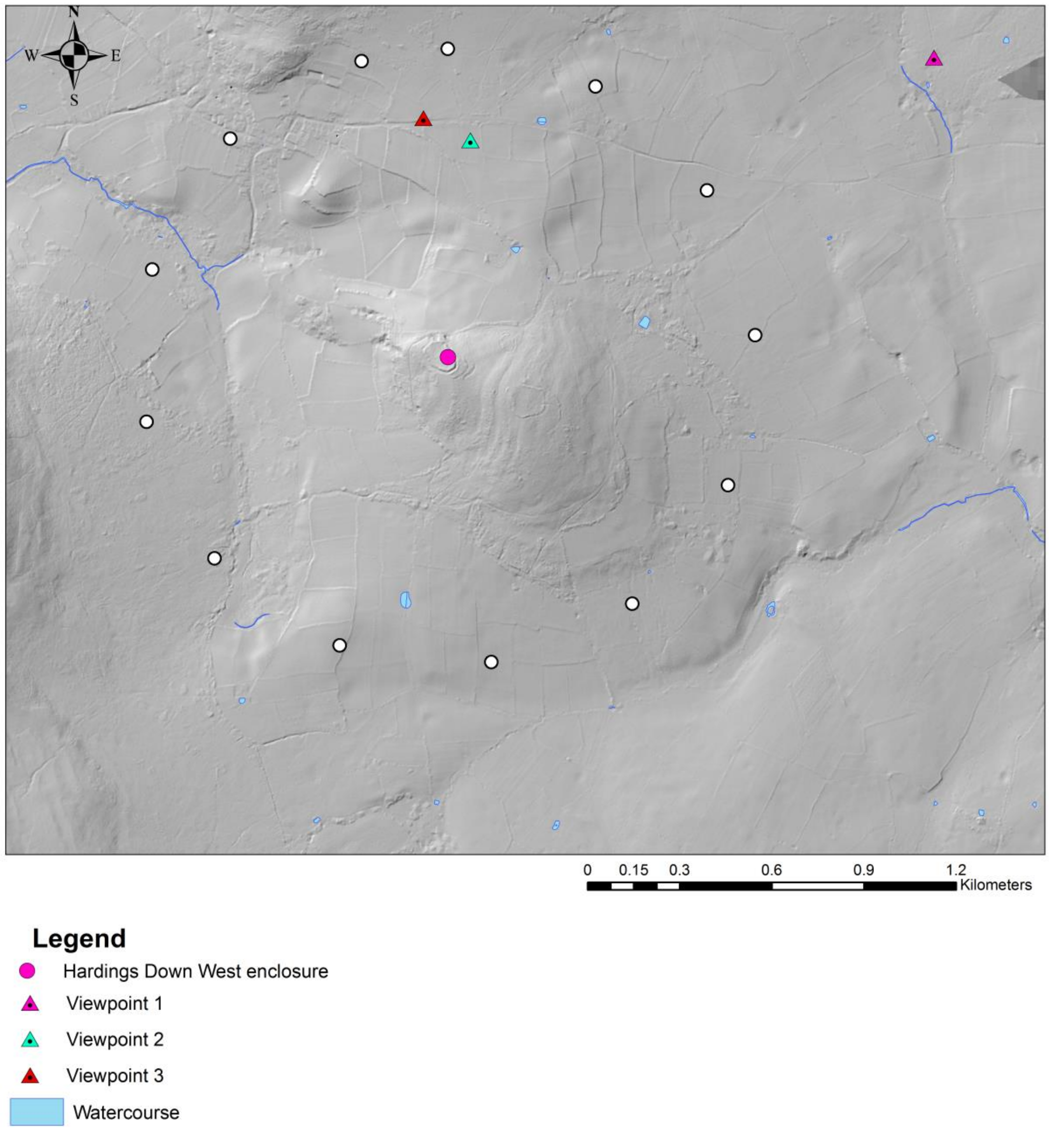


Figure 222. View of the West enclosure from Viewpoint 2, 707m to the north of the site (Author's own 2013)

Figure 223. View of the West enclosure from Viewpoint 3, 780m to the north of the site (Author's own 2013)

The visibility of the site decreases between the 1km and 3km radii (Figure 220). The overall visual magnitude of the visible areas decreases but the most visible areas are in the central and north-western areas of the site. The decreasing visibility of the site between the 1km and 3km radii is supported by the observations from Viewpoint 1, which is situated to the north-east of the West enclosure. Although the enclosure is visible from this distance and direction, it is neither prominent nor is it easily distinguishable (Figure 224). The visibility of any activities within the site from this distance would have been minimal.

Figure 224. View of the West enclosure from Viewpoint 1, 1.9km to the north-east of the site (Author's own 2013)

The visibility of the site increases from the 6km radius, where the majority of the site is visible (Figure 220). The visibility of the site continues to increase from the 9km radius (Figure 220). All of the enclosure is visible from this area; and most of it is of high visibility. The least visible area is the north-eastern corner.

Whilst the majority of the hillfort is to varying degrees visible from the surrounding landscape, it is of limited visibility from its neighbours on Hardings Down. The outer south-eastern banks that enclose this site face the East enclosure; these earthworks obstruct visual accessibility to the inner enclosure (Figure 225). Viewshed analysis found that these earthworks are among the few areas of the site that are visible from the East enclosure. These visible areas are of low visibility, as they have a visual magnitude within the lower quartile range. These results are demonstrated from viewshed analysis which was undertaken from both the Ordnance Survey Profile DTM and the LiDAR based DTM. This was also confirmed by the field photography (Figure 226).

Figure 225. Results of viewshed analysis from Hardings Down East enclosure towards Hardings Down West enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

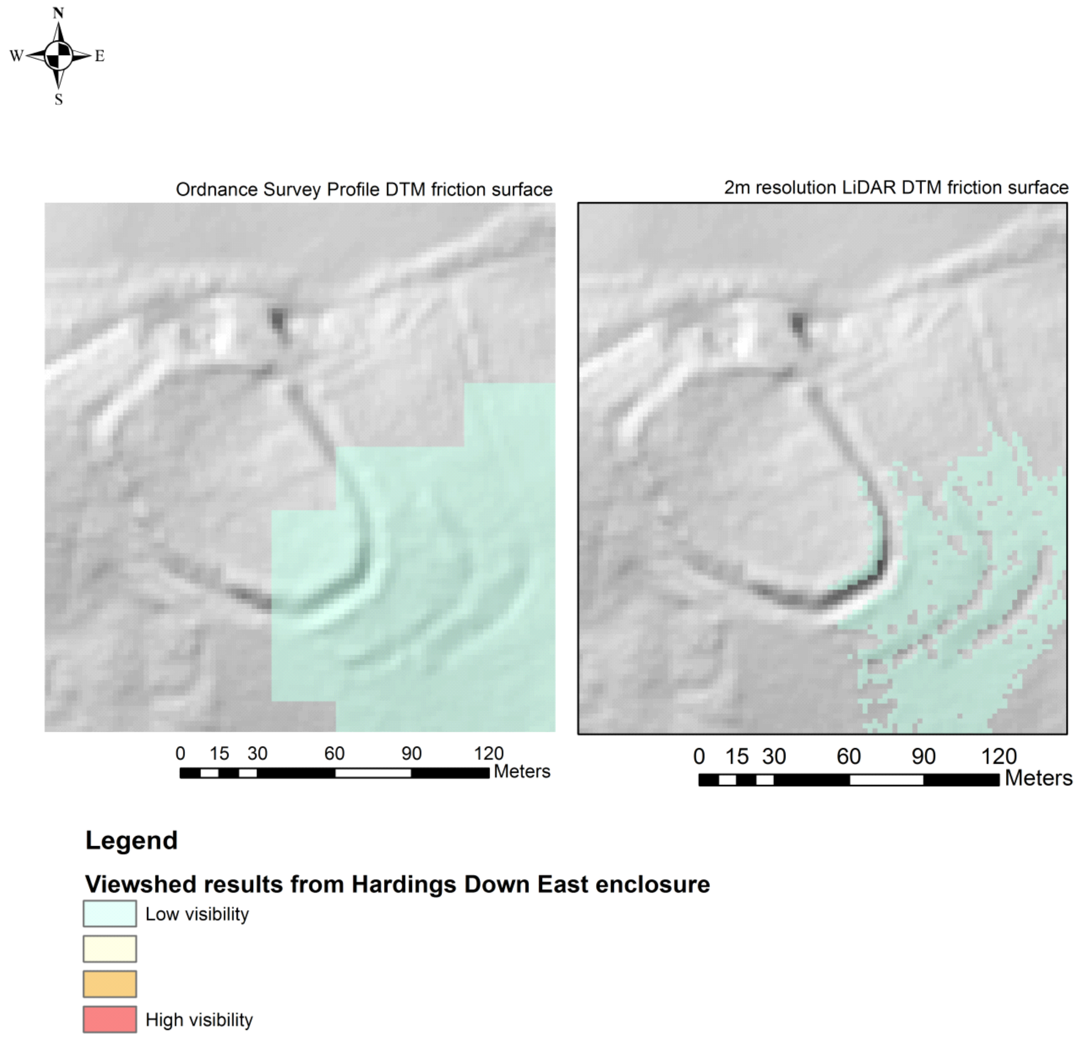


Figure 226. View of the West enclosure from the East enclosure (Author's own 2013)

From the North enclosure the West enclosure is of limited visibility (Figure 227). The majority of the visible areas are confined to the outskirts of the site; these include a large area of the annexe. These areas have highly variable values of visual magnitude. Both of the viewsheds from the different resolution friction surfaces support these results. However, the 2m DTM indicates that the banks in the south-east are the most visible aspect of the site, some sectors have a visual magnitude within the upper quartile range. The high visibility of the south-eastern banks is supported by the fieldwork photography from the North enclosure (Figure 228). The vegetation coverage on this hilltop meant that it was difficult to distinguish these banks; however they can be made out. This hilltop was covered by grassland at the time that the hillforts were in use (Crampton 1973, 68); consequently, poor visual accessibility due to vegetation coverage is unlikely to have been the case in later prehistory.

Figure 227. Results of viewshed analysis from Hardings Down North enclosure towards Hardings Down West enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

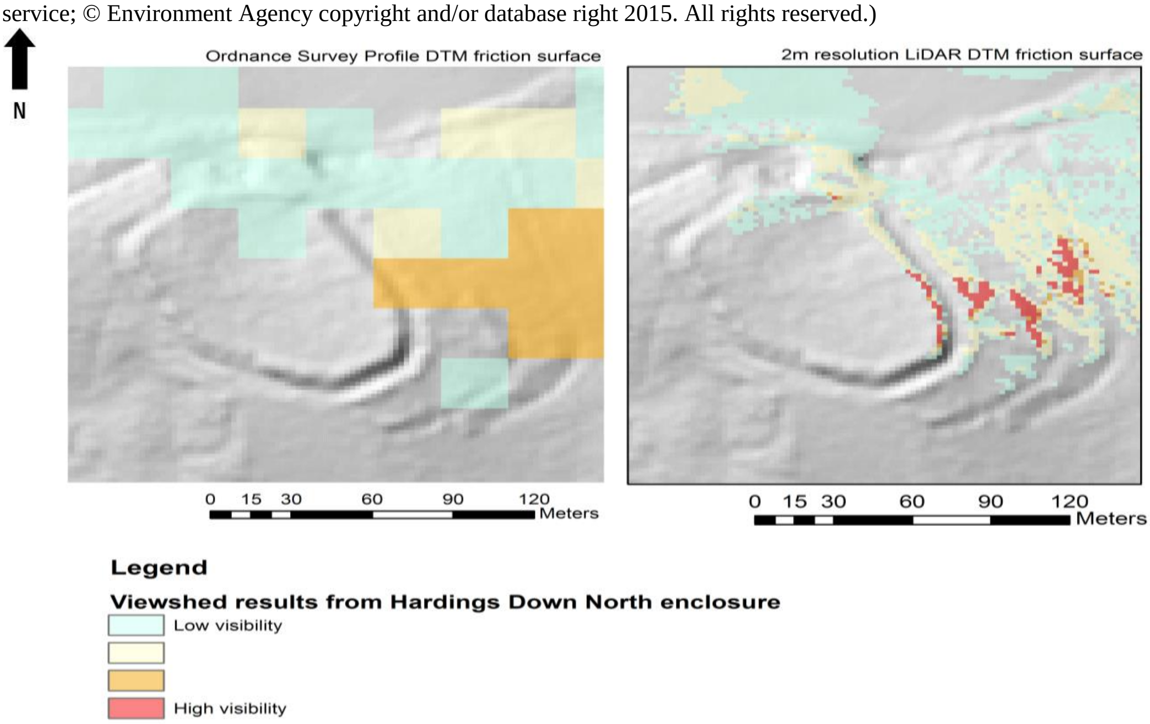
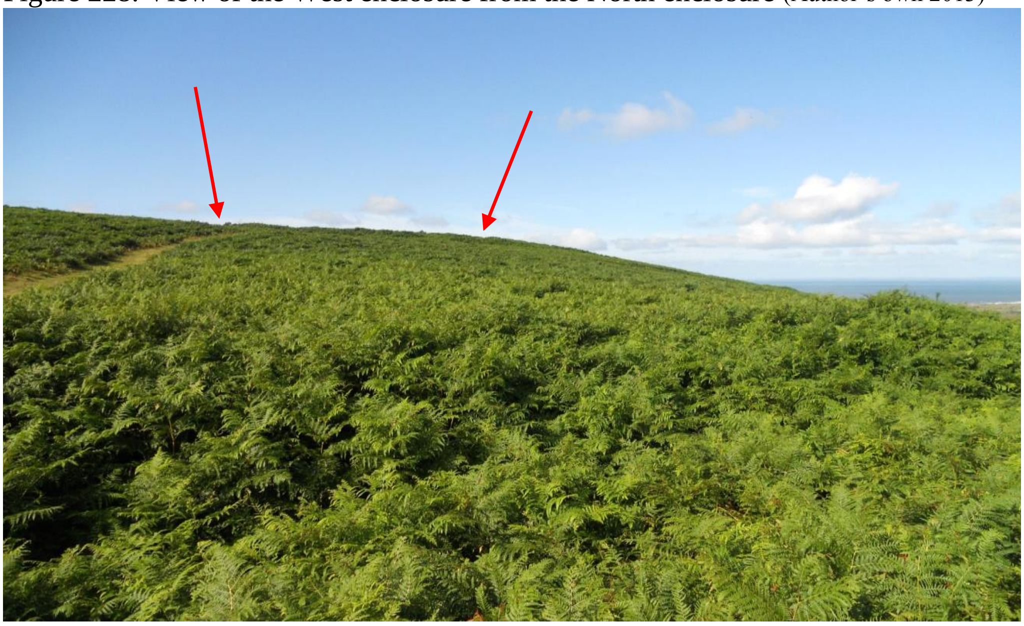


Figure 228. View of the West enclosure from the North enclosure (Author's own 2013)



On the other hand, from The Bulwark the majority of the West enclosure is visible but with a low visual magnitude (Figure 229). The viewshed results from the 2m

DTM do not identify any differentiations between the values of visual magnitude, however the Ordnance Survey DTM does. This DTM indicates that the most visible area is the site's annexe and the southern half of the site's interior. The fieldwork photography from The Bulwark also demonstrates that a large proportion of the southern half of the interior and the southern banks of the West Enclosure are visible (Figure 230). The site does not appear prominent or imposing because The Bulwark overlooks Hardings Down.

Figure 229. Results of viewshed analysis from The Bulwark towards Hardings Down West enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

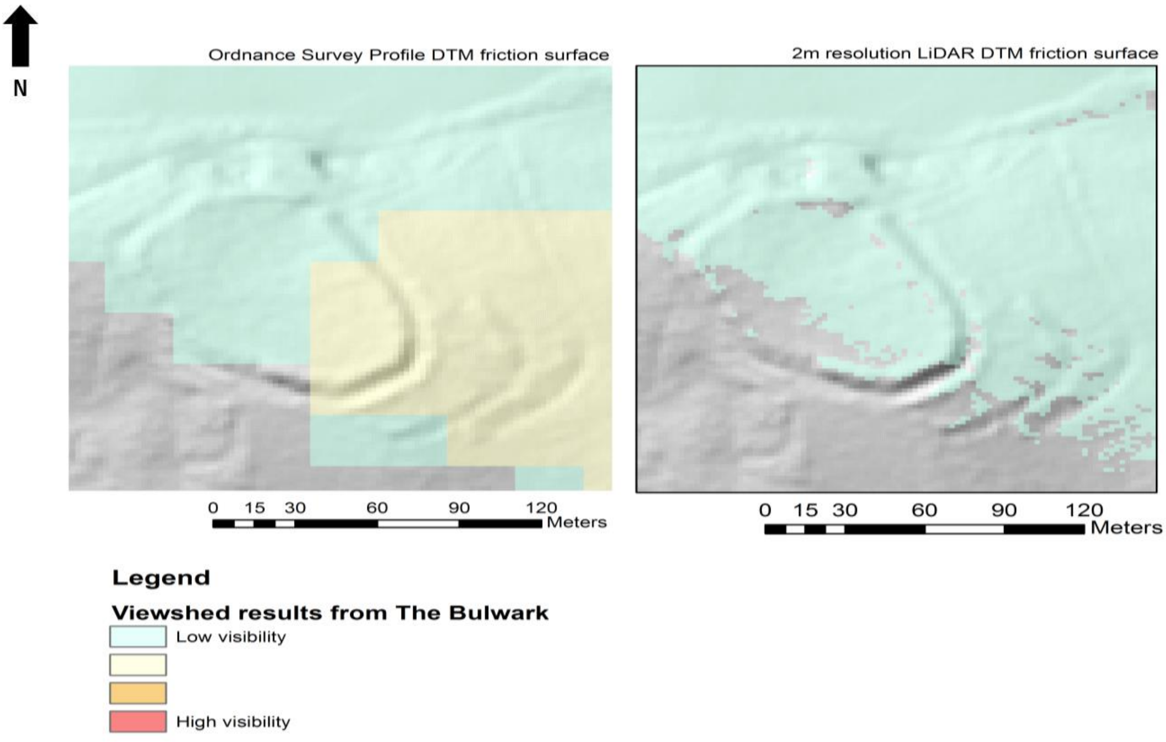


Figure 230. View of the West enclosure from The Bulwark (Author's own 2013)

Whilst travelling between the hillforts within this test area and the West enclosure it is not possible for people to gain a complete visual understanding of the site's morphology (Figures 231-233). Only the pathways from The Bulwark correspond with archaeological features within this landscape; these fall into the funerary category (**a**). Their distribution implies that this was a significant area in the past and the results of cost surface analysis indicate that people within this area had the potential to gain a relatively complete visual understanding of the West enclosure's morphology.

Figure 231. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the West Enclosure whilst travelling from The Bulwark overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

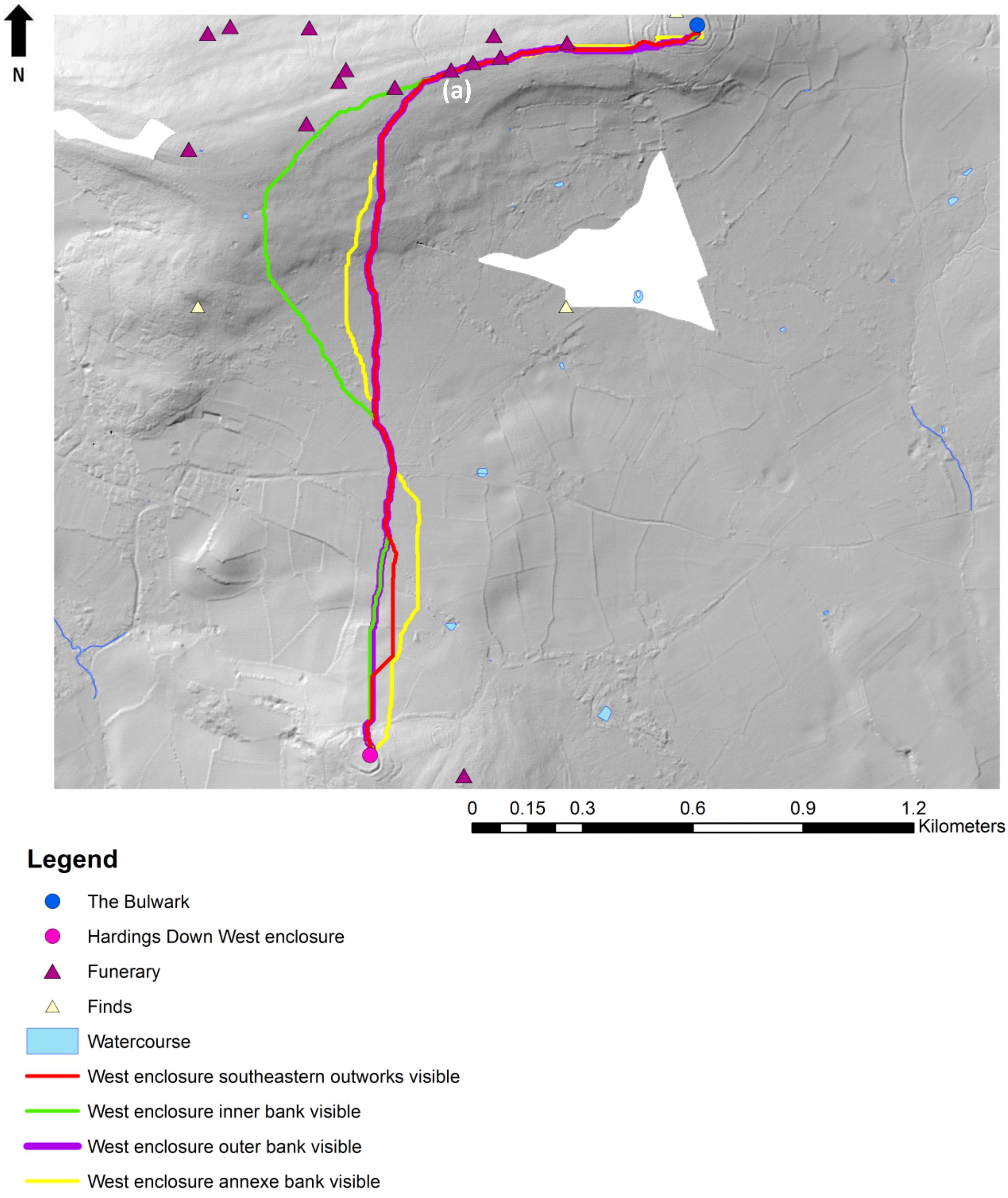


Figure 232. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the West Enclosure whilst travelling from the North Enclosure overlain by HER data (© Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

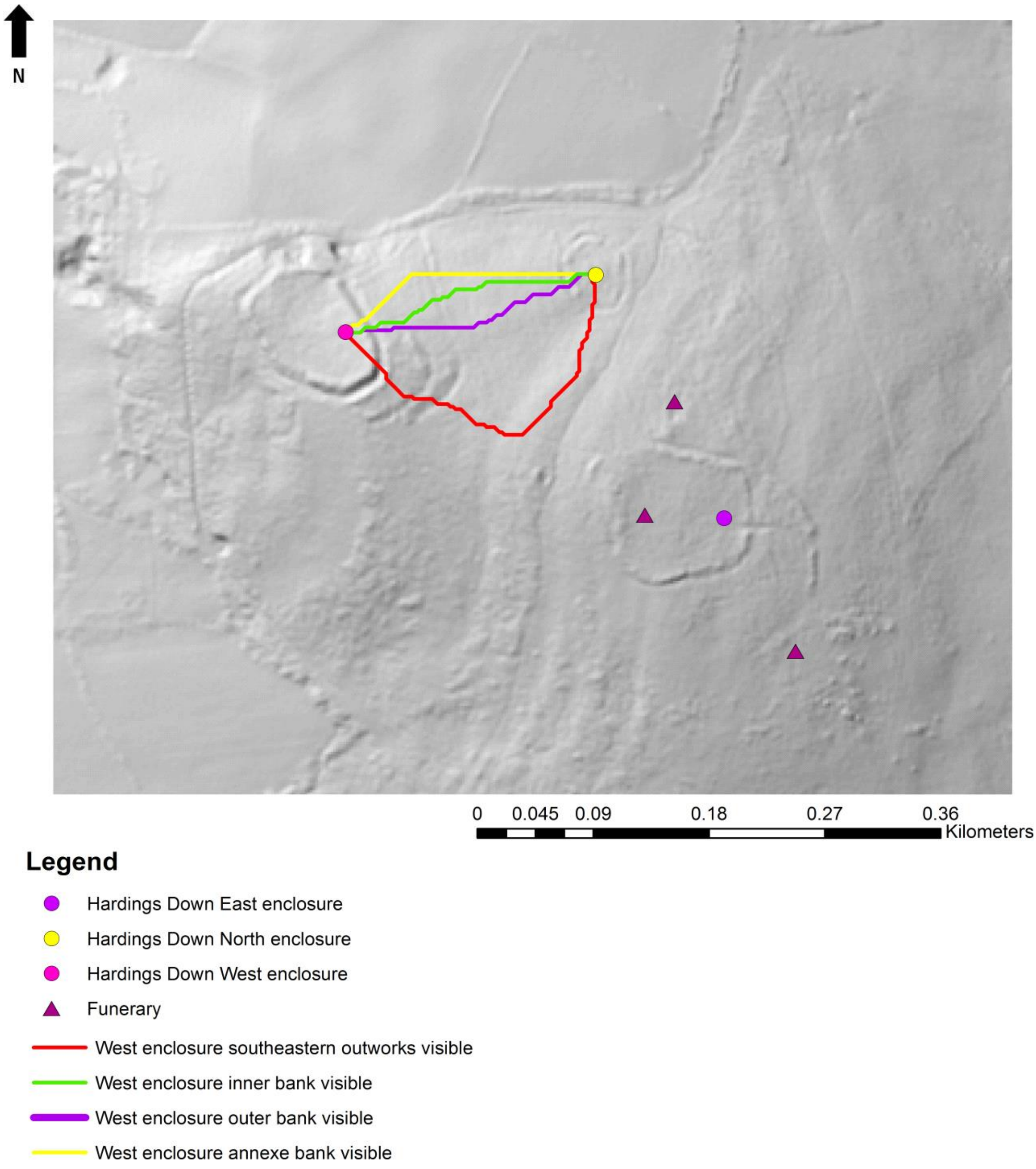
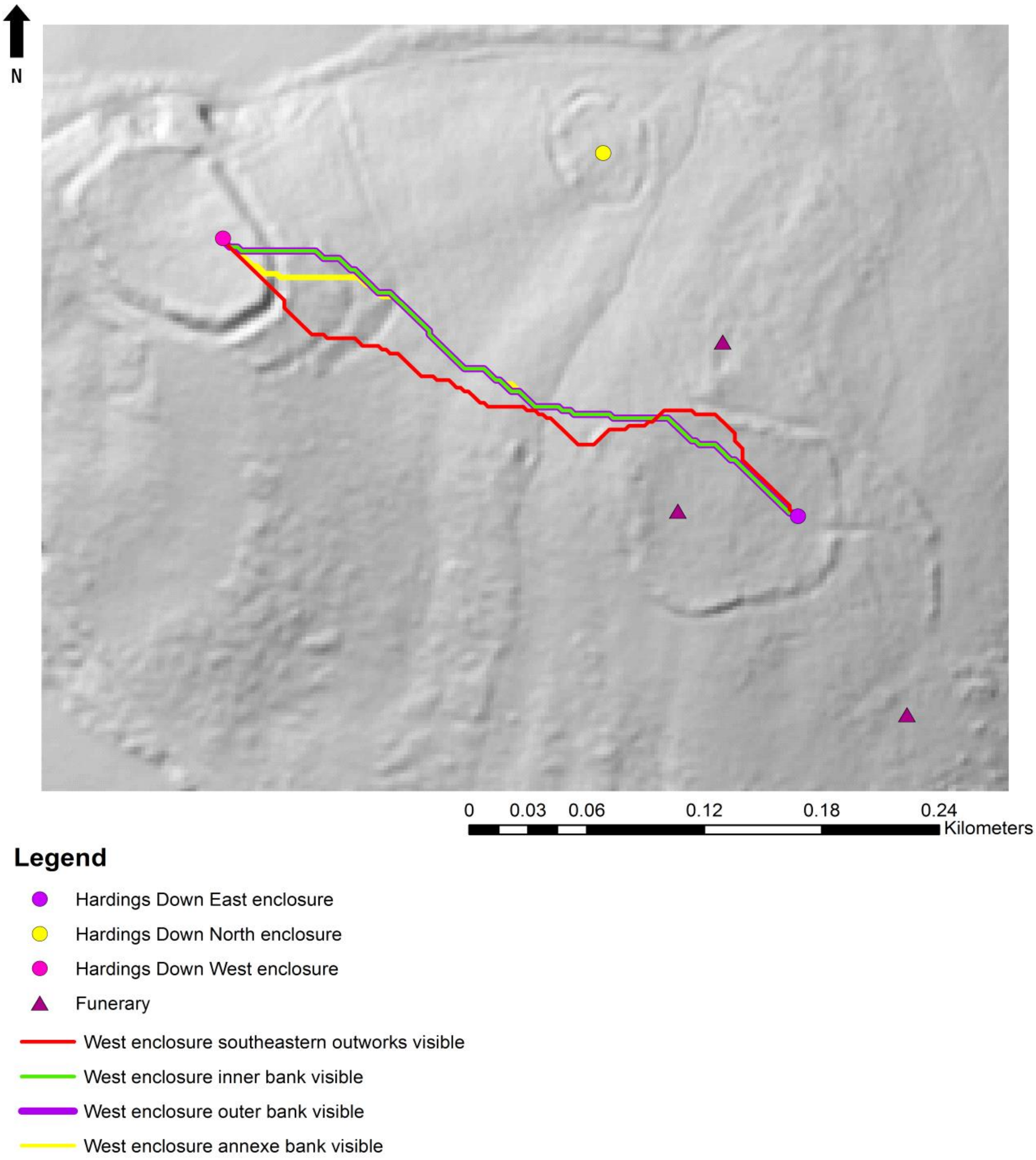


Figure 233. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the West Enclosure whilst travelling from the East Enclosure overlain by HER data (© Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Correct pathways

Cost surface analysis identified that the north-east entrance is situated within the site's most accessible area as 204 (out of 249) Ordnance Survey DTM based pathways and 2 (out of 6) LiDAR based pathways intersect with this area (Figure 234). The second most accessible aspect of the site is its south-eastern corner as 21 Ordnance Survey based pathways and 3 LiDAR pathways use this area. This corner faces the east enclosure and it is also one of the most prominently defined aspects to the site as there are multiple outworks within this area. This is not the most visible aspect to the site as it coincides with the highest number of the blind pathways (7 out of 18 Ordnance Survey based DTM pathways and 3 out of 6 LiDAR pathways), which by definition have the least visual accessibility to the origin/destination (Figure 235). The most visible entry point into the site as defined by cost surface analysis is its eastern side, this area has 9 of the 18 Ordnance Survey and 2 of the 6 LiDAR based pathways (Figure 236).

There is no distinct correlation of the least cost pathways with any known archaeological and topographical features.

Figure 234. Results of slope based cost surface analysis to and from Hardings Down West Enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

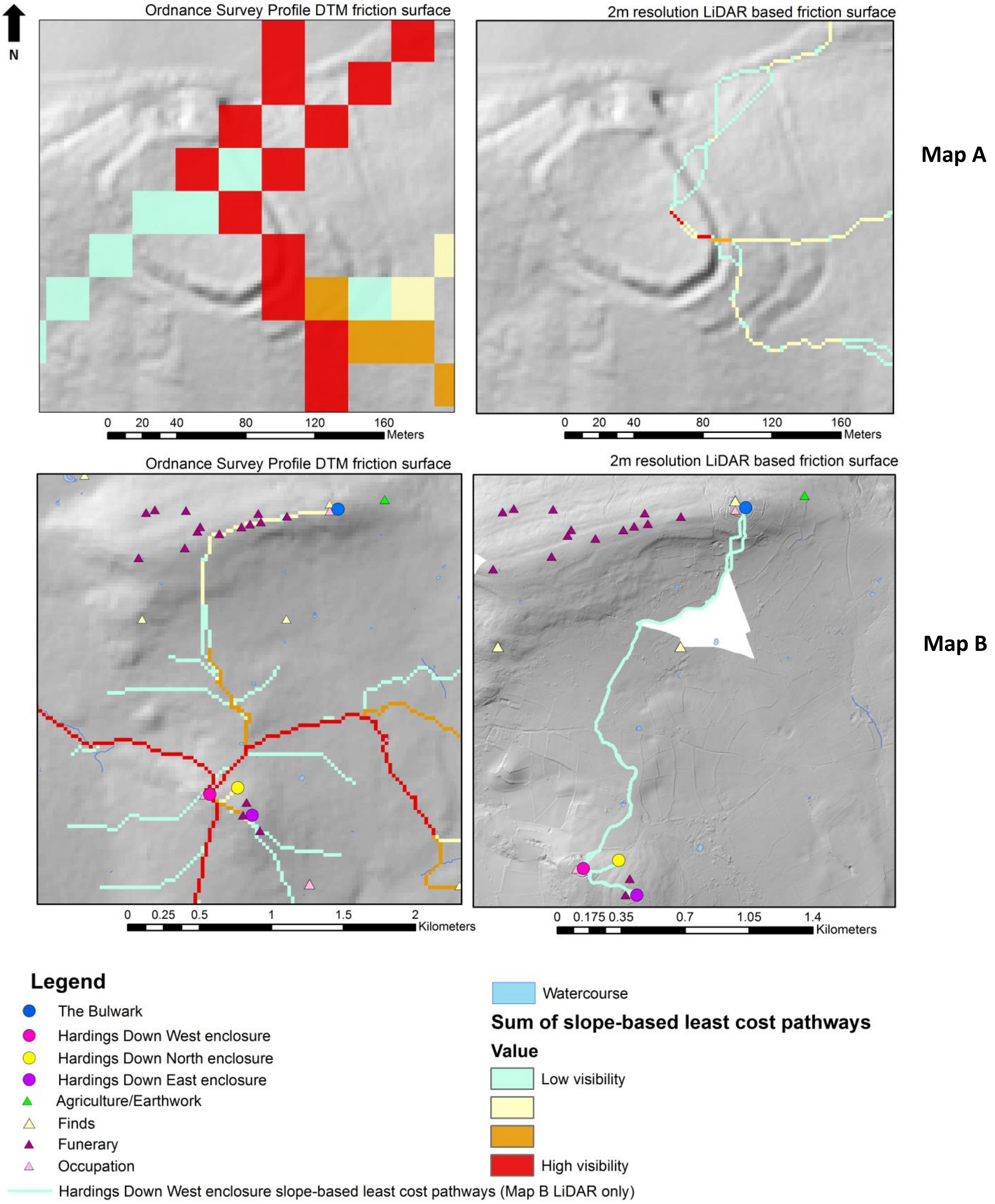


Figure 235. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Hardings Down West enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

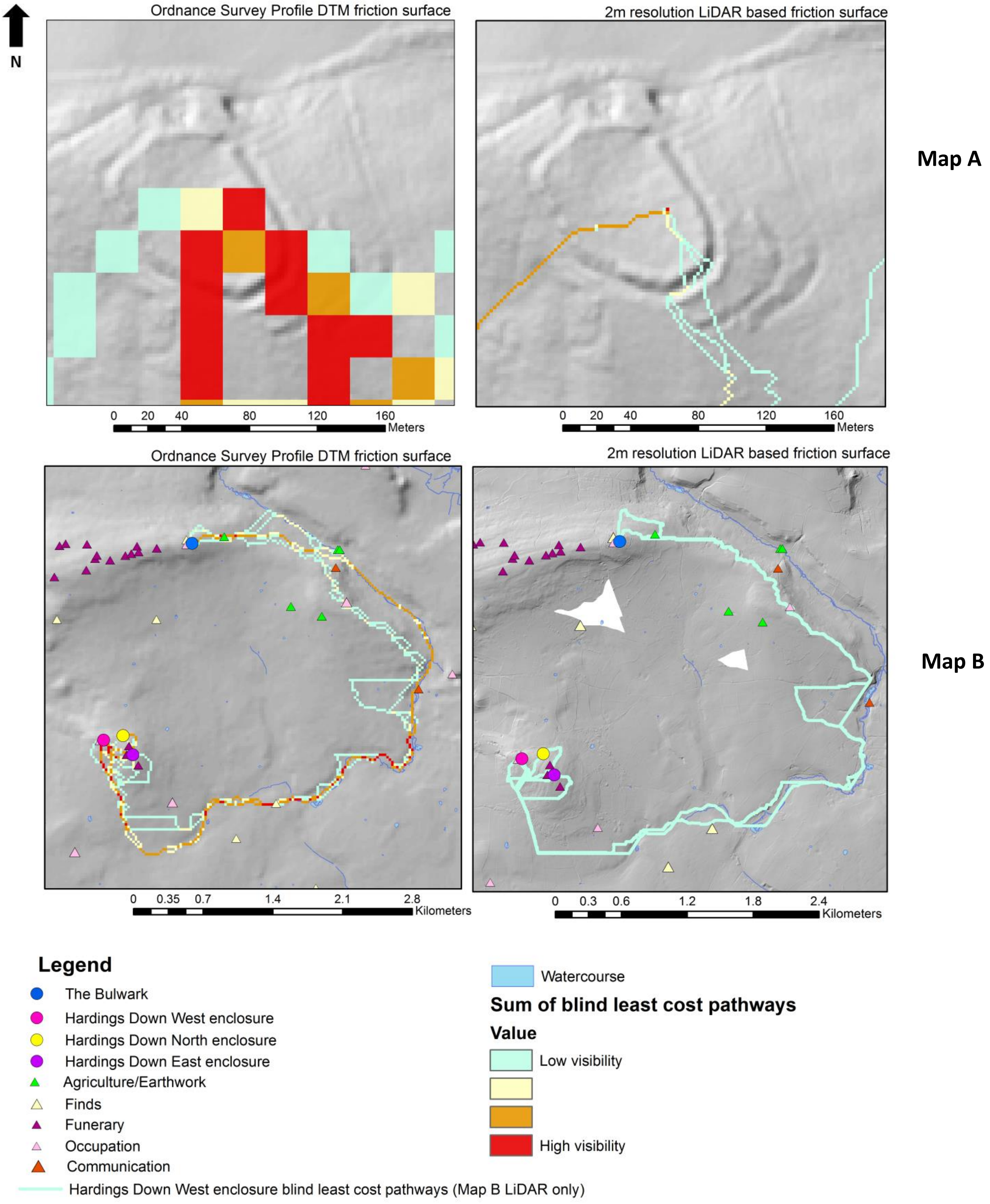
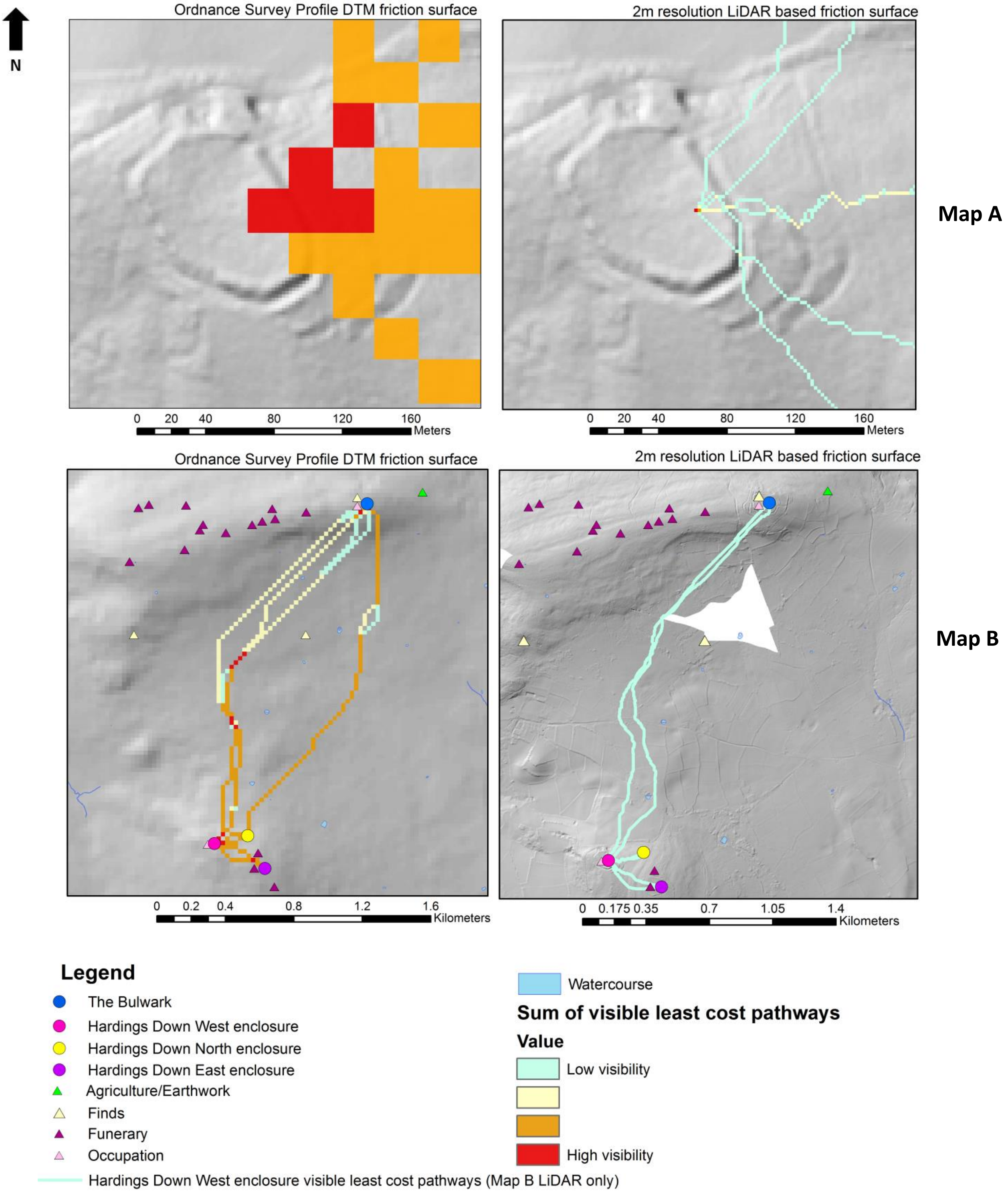


Figure 236. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Hardings Down West enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Concluding site summary

The West enclosure had at least two phases of occupation. The addition of the annexe and the outworks enhanced its physical prominence and its footprint. These outworks also limit visibility into the site; this meant that the bank acted as both a physical and visual barrier for the site from the remainder of those on Hardings Down. The physical imposition of this series of outworks is enhanced by the fact that the banks cut across the topography which otherwise slopes down to the north-west. This area is the most visually accessible aspect of the site to the remainder of those on Hardings Down.

The sloping nature of the north-western hillside to Hardings Down means that the interior of the site is highly visible from the surrounding landscape, to the north-west in particular. This was supported by both viewshed results and fieldwork photography. Excavations at this site failed to identify any evidence for a timber palisade, which might have hindered visibility into the site, the slope of the land ensured that the interior would always have been visible to a certain degree consequently it formed an open site.

According to Harding, hillforts either merged into the landscape or were highly visible (2012), however the West enclosure's visibility is of a dual nature. The site predominantly merges with the topography to the north which meant that its interior was relatively highly visible. On the other hand the outworks in the south-east fail to merge with the landscape as they cut across the hilltop and obstruct visibility into the site from its neighbours. Hardings Down West enclosure portrays contrasting images. To the wider landscape it is physically and visually open, whilst to its neighbours on Hardings Down it is strong, hidden and imposing. This in itself raises the question as to how the image of a site is defined for example whether it was on a general landscape basis or in relation to its hillfort peers.

As Driver (2005a) noted site image can also be portrayed and influenced through movement and through the site's varying properties of physical accessibility. For example, the entrance to this site is situated away from the East enclosure through its placement in the north-eastern corner, which is the most accessible aspect of the site. Contrastingly the site's prominently enclosed south-eastern corner faces the East enclosure. Even though these outworks are imposing from the neighbouring sites on Hardings Down, they do not form its most visible aspect as they coincide with the blind pathways. These earthworks were not placed to impose upon the wider landscape, or to protect its most accessible aspect. They were placed to focus and influence the site's image towards observers placed in its immediate environs on Hardings Down. Only traffic on Hardings Down had limited visibility to the site's interior due to the south-eastern outworks. The remainder of the landscape failed to be as affected by the inhibitive nature of these outworks. The impact of these outworks was visually and physically focused and had a very limited landscape scale of influence.

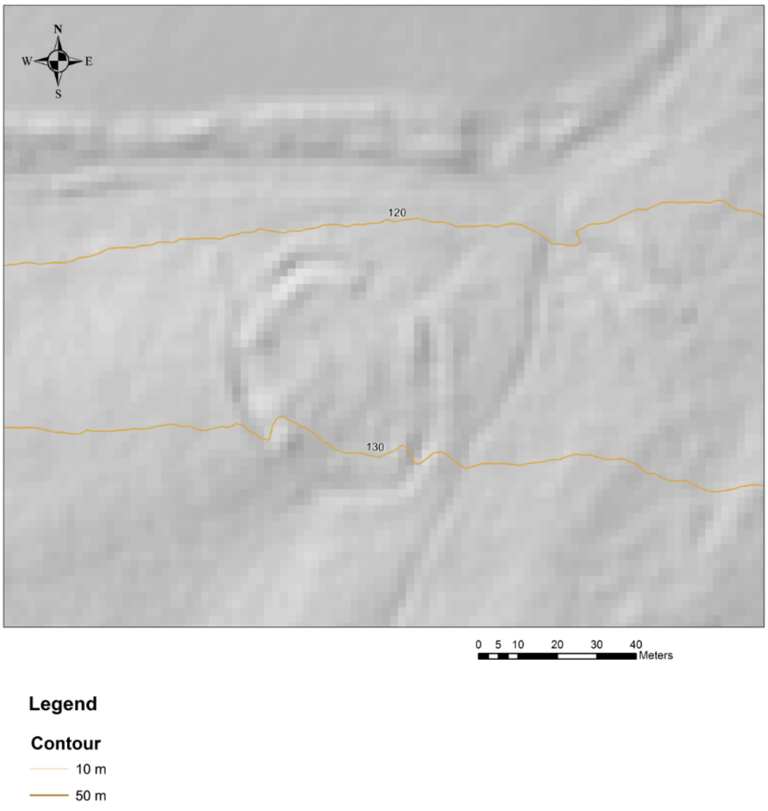
The correlation between a site's most prominently enclosing works and the majority of blind pathways was seen at several sites within this overall study. There is a strong trend for a site's most prominent earthworks to be located to enhance the first impressions of the site. These earthworks were created and directed towards a much focused small scale audience, i.e. those people that are already in the site's grasp, they were not directed towards wider landscape scale audiences. This evidence supports Driver's concept of image however its highly focused nature means that it is not likely to be readily identified within a non-GIS based analysis. After all, when one initially thinks of image it is instinctively related to as wide an audience as possible

Hardings Down North enclosure

Site introduction

This site is situated on the northern slopes of Harding's Down, it encloses 0.2ha (Glamorgan Gwent Archaeological Trust Historic Environment Record 2013). It slopes down towards the north/north-east (Figure 237). Although the site is listed as a hillfort in most records, Rutter records it as a ring work (1948, 66). The site's enclosure comprises of a bank, ditch and counterscarp with an entrance in the north-west (Glamorgan Gwent Archaeological Trust Historic Environment Record 2013) (Figure 234). This entrance is approached by a 3m wide hollow way, which is set between low stony banks (*ibid* 2013). A hut platform that measures 6m in diameter is also located on the site's western side (RCAHMW 1976).

Figure 237. 2m resolution LiDAR hillshade model of Hardings Down North Enclosure overlain by contours (© Environment Agency copyright and/or database right 2015. All rights reserved.)



Physical relationship of the hillfort morphology and location with the landscape topography

The site's morphology is uniform. The enclosure slopes down to the north, which means that the site is highly visible from this direction (Figure 238). This sloping topography also affects the visibility of the landscape from the site, as it has a higher degree of visual accessibility to the north than of the south (Figure 239).

Figure 238. View of the North enclosure from the lowlands to the north (Author's own 2013)

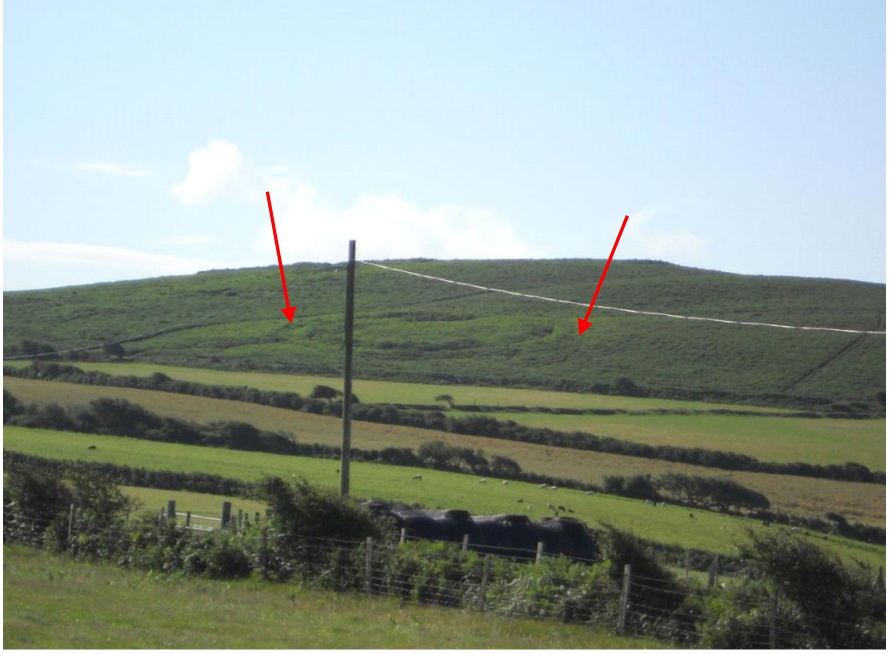
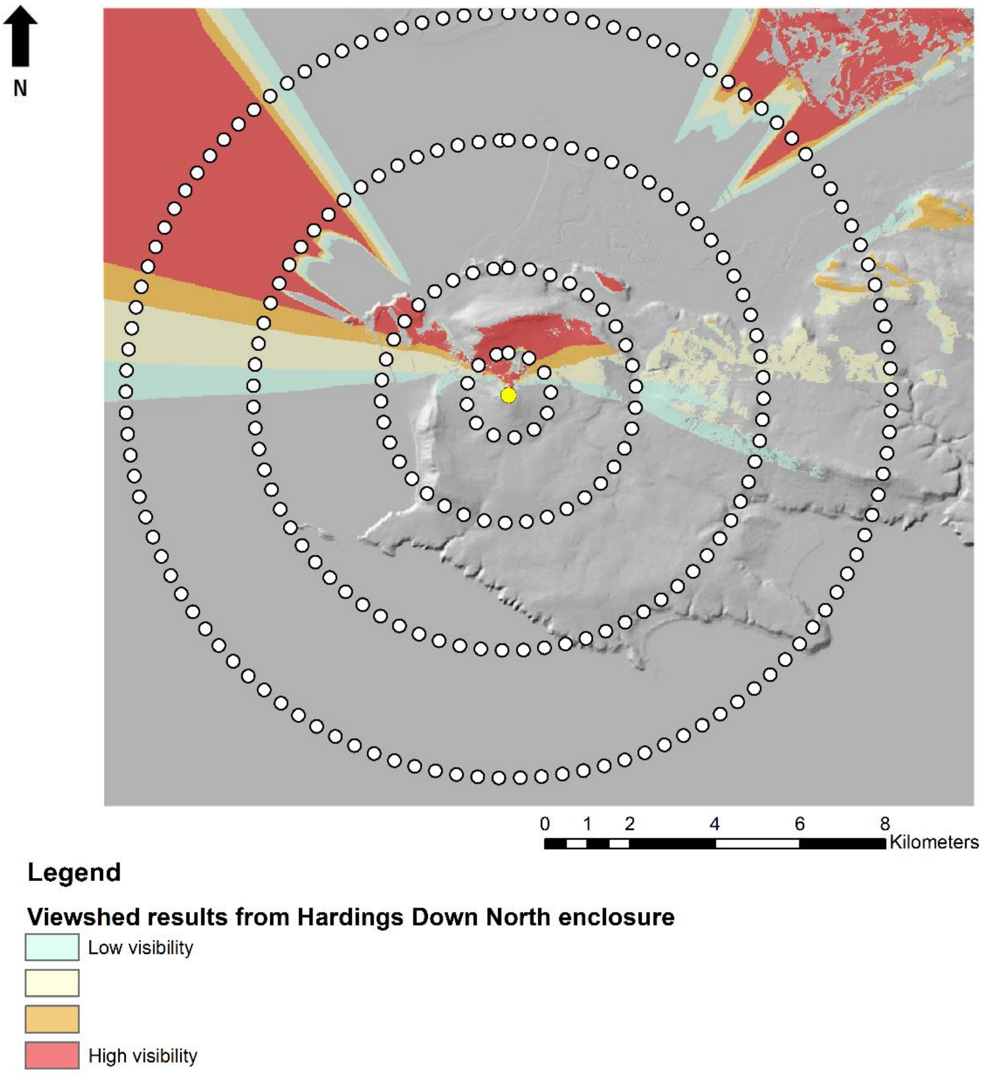


Figure 239. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Hardings Down North Enclosure as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service)



Image

It has already been highlighted that the location and the sloping nature of the topography meant that the whole site is visible from the northern lowlands. Viewshed analysis demonstrates that the site is of high visibility and it has a visual magnitude within the upper quartile range from the 1km radius (Figure 240). The high visibility of this enclosure from within the 1km radius is supported by the fieldwork photography from Viewpoints 2 and 3. These viewpoints are to the north-west of the site; both of them have total visual accessibility to the site (Figures 241). The site appears well defined, but the enclosing works are not imposing (Figures 242-243).

Figure 240. Results of viewshed analysis from the radii towards Hardings Down North enclosure depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Environment Agency copyright and/or database right 2015. All rights reserved; © Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service)

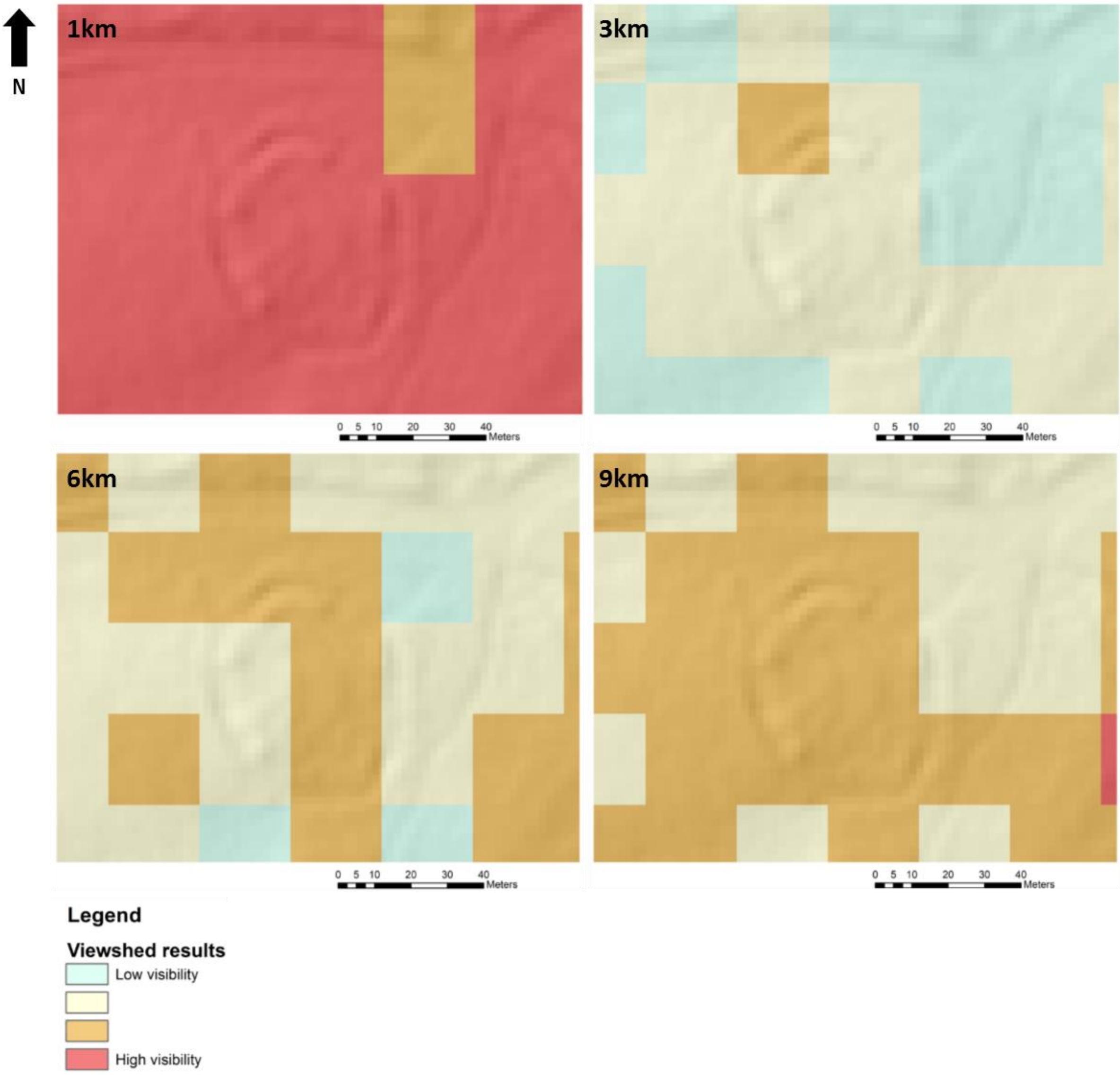


Figure 241. Location map of the viewpoints which relate to the North enclosure overlain by watercourses (© Crown Copyright/database right 2009.An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved)

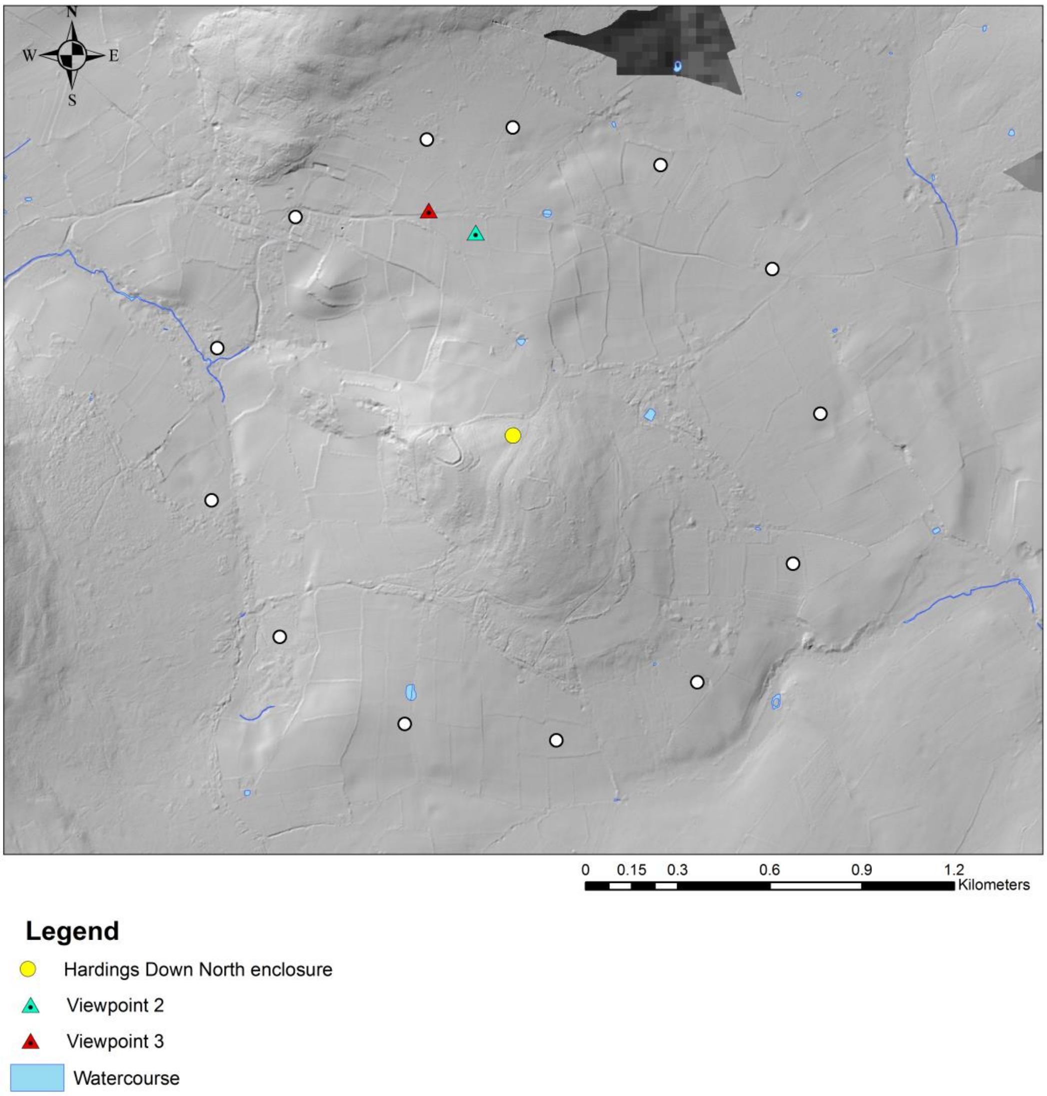
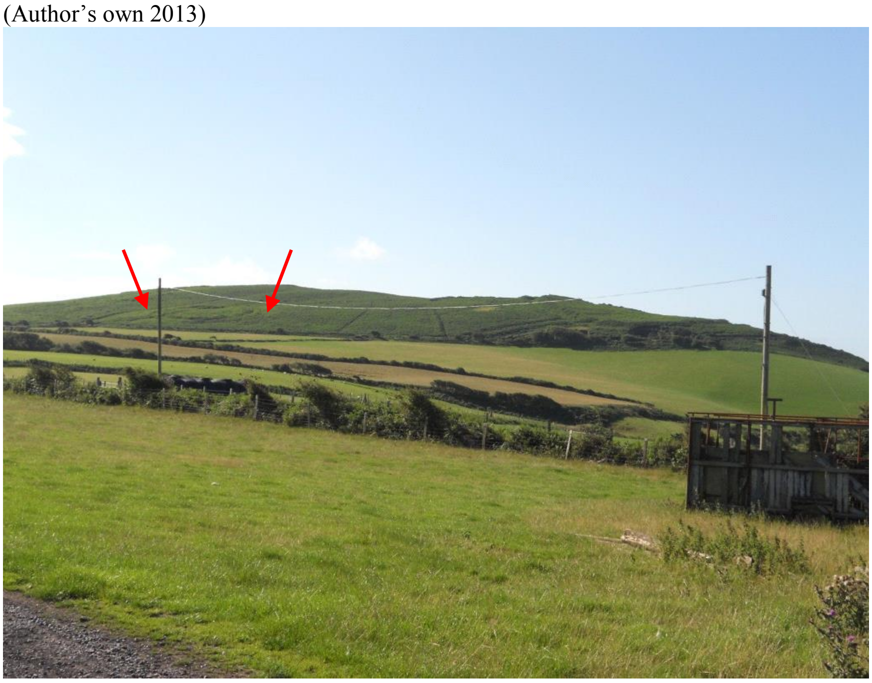


Figure 242. View of the North Enclosure from Viewpoint 2, 670m to the north of the site
(Author's own 2013)

Figure 243. View of the North Enclosure from Viewpoint 3, 780m to the NNW of the site
(Author's own 2013)



The site's visibility decreases from the 3km radius, where, although there is total visibility of the site the areas that are visible are of relatively low visibility (Figure 240). The least visible aspect is the north-eastern perimeter earthworks, which also include the north-eastern entrance. The entire site is visible from the 6km radius; however its visual magnitude is variable (Figure 240). The most visible aspect is its northern perimeter and a central sector within the interior. The least visible area is the north-eastern entrance passageway. The visual accessibility of the site continues to increase from the 9km radius (Figure 240). The majority of the site is visible but the north-eastern entrance passageway remains the least visible aspect of the site.

There is very little variation in the visual accessibility of this site from the neighbouring hillforts. The overall visibility is very poor as there are no visible areas that are above the 49th percentile. The results from the viewshed analysis undertaken from the Ordnance Survey Profile DTM implies that the site is more visible from The Bulwark than from the sites on Hardings Down (Figures 244). However, the results from the 2m DTM implies that the site is of low visibility. The complete visual accessibility of the North Enclosure from The Bulwark is supported by the fieldwork photography (Figure 242). This photograph illustrates that the whole enclosure including its enclosing works are visible from this site, however it is not visually dominant, but it is visually and physically open.

From Hardings Down West enclosure the Ordnance Survey Profile DTM indicates that the whole of the site is visible but it is of low visibility. However, the 2m DTM indicates that the enclosing banks are the predominantly visible aspect of this site (Figures 246). The clarity of the site photography is hindered by the high growth of the vegetation on the hilltop, however, the western bank is visible in the picture (Figure 247). Similarly, from the East enclosure the Ordnance Survey Profile DTM indicates that the entire site is visible, the 2m DTM indicates that it is predominantly the southern aspect of the site which is visible (Figure 248).

Figure 244. Results of viewshed analysis from The Bulwark towards Hardings Down North enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

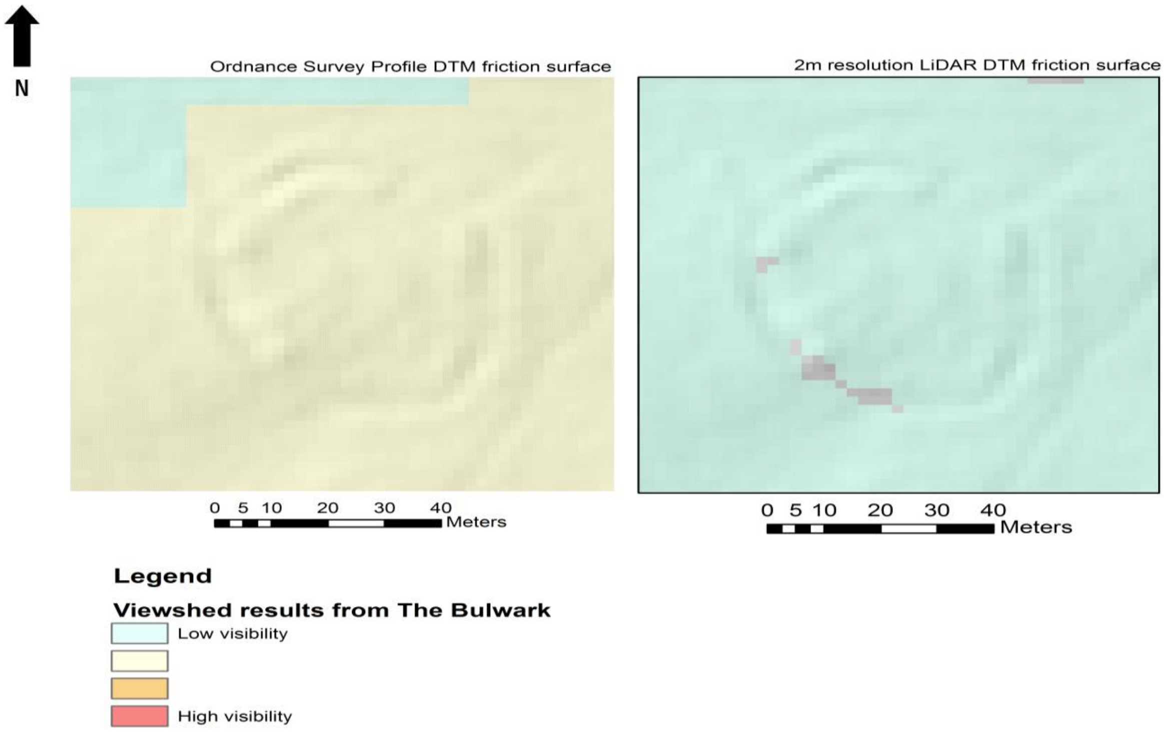


Figure 245. View of the North enclosure from The Bulwark (Author's own 2013)

Figure 246. Results of viewshed analysis from Hardings Down West enclosure towards Hardings Down North enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

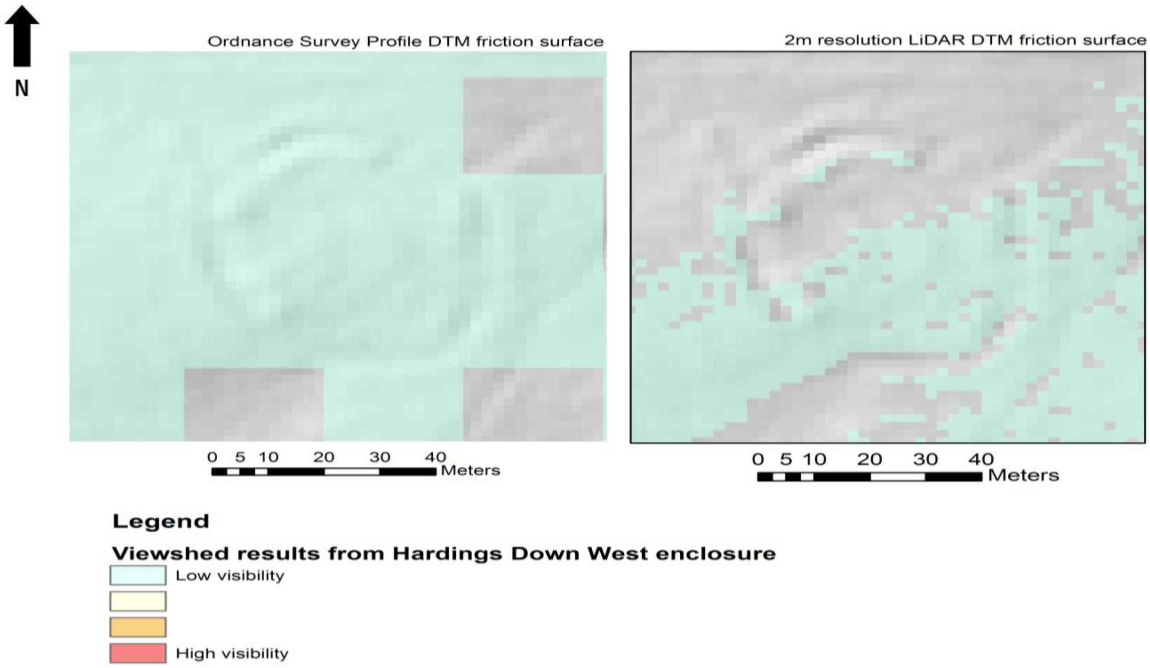
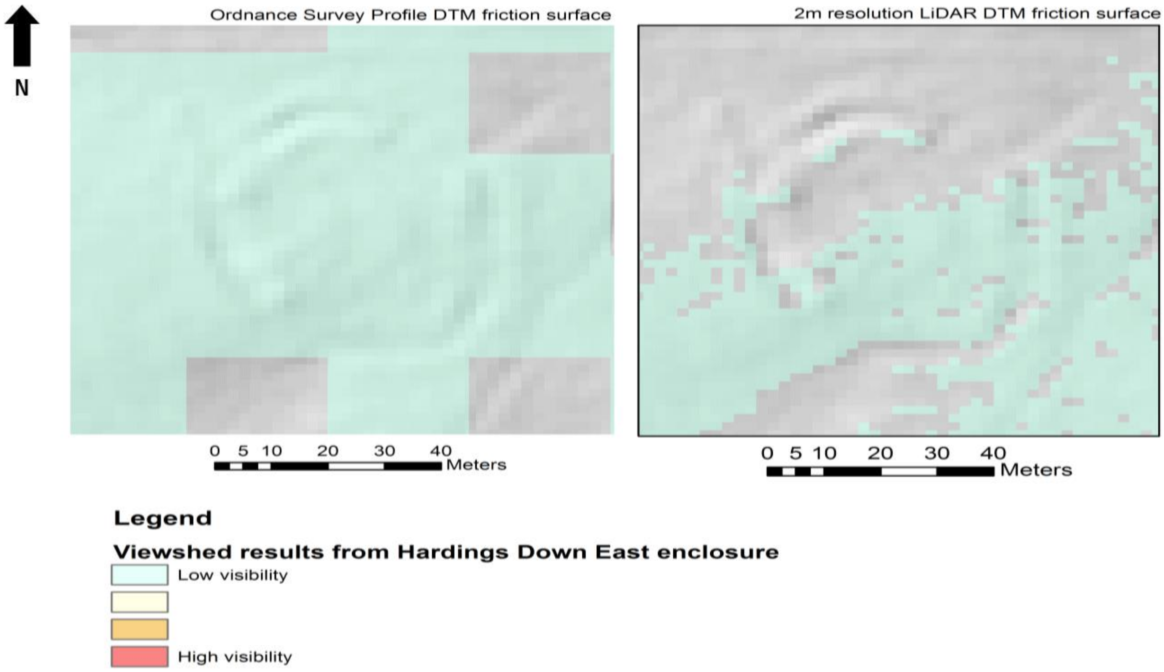


Figure 247. View of the North enclosure from the West enclosure (Author's own 2013)

Figure 248. Results of viewshed analysis from Hardings Down East enclosure towards Hardings Down North enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)



Cost surface analysis found that whilst travelling to this site from the surrounding hillforts, the image that is portrayed by the site is variable (Figure 249-251). For example, whilst travelling from the West enclosure on Hardings Down the site portrays a ‘complete’ image. The majority of the site’s enclosing works are also visible whilst travelling westerly along Llanmadoc Hill past a number of funerary monuments (**a**); however the site’s image becomes fragmented in the lowlands. The site’s image is also fragmented along the trajectory from the East enclosure.

Figure 249. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the North Enclosure from the East Enclosure overlain by HER data (© Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

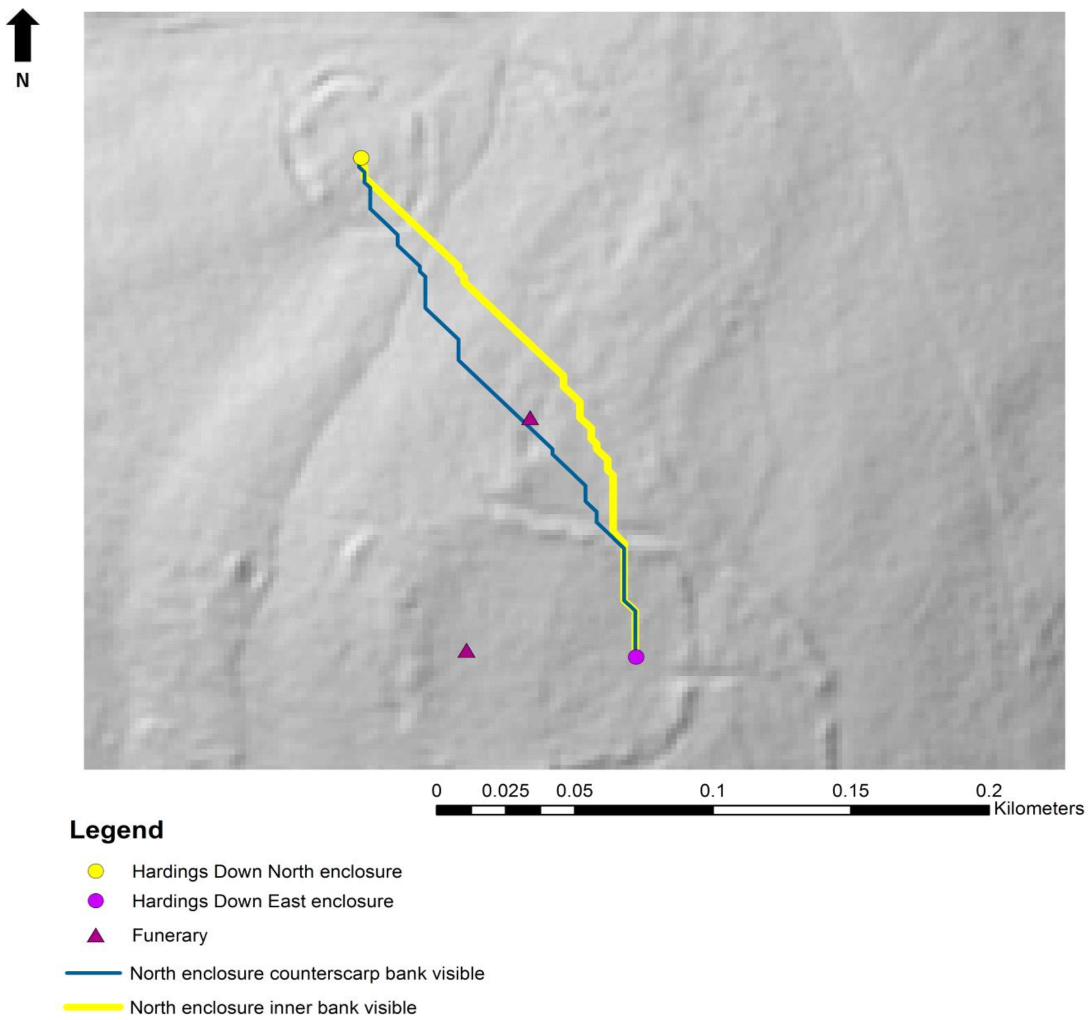


Figure 250. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the North Enclosure from the West Enclosure (© Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

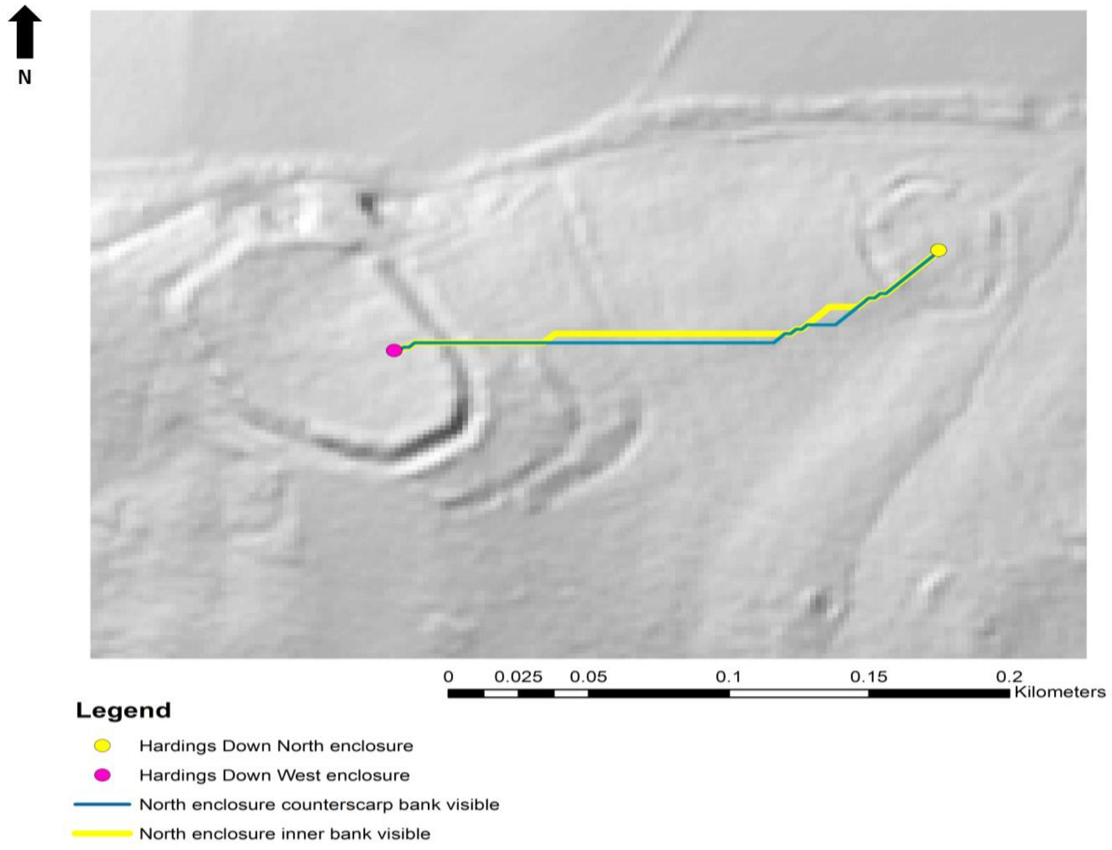
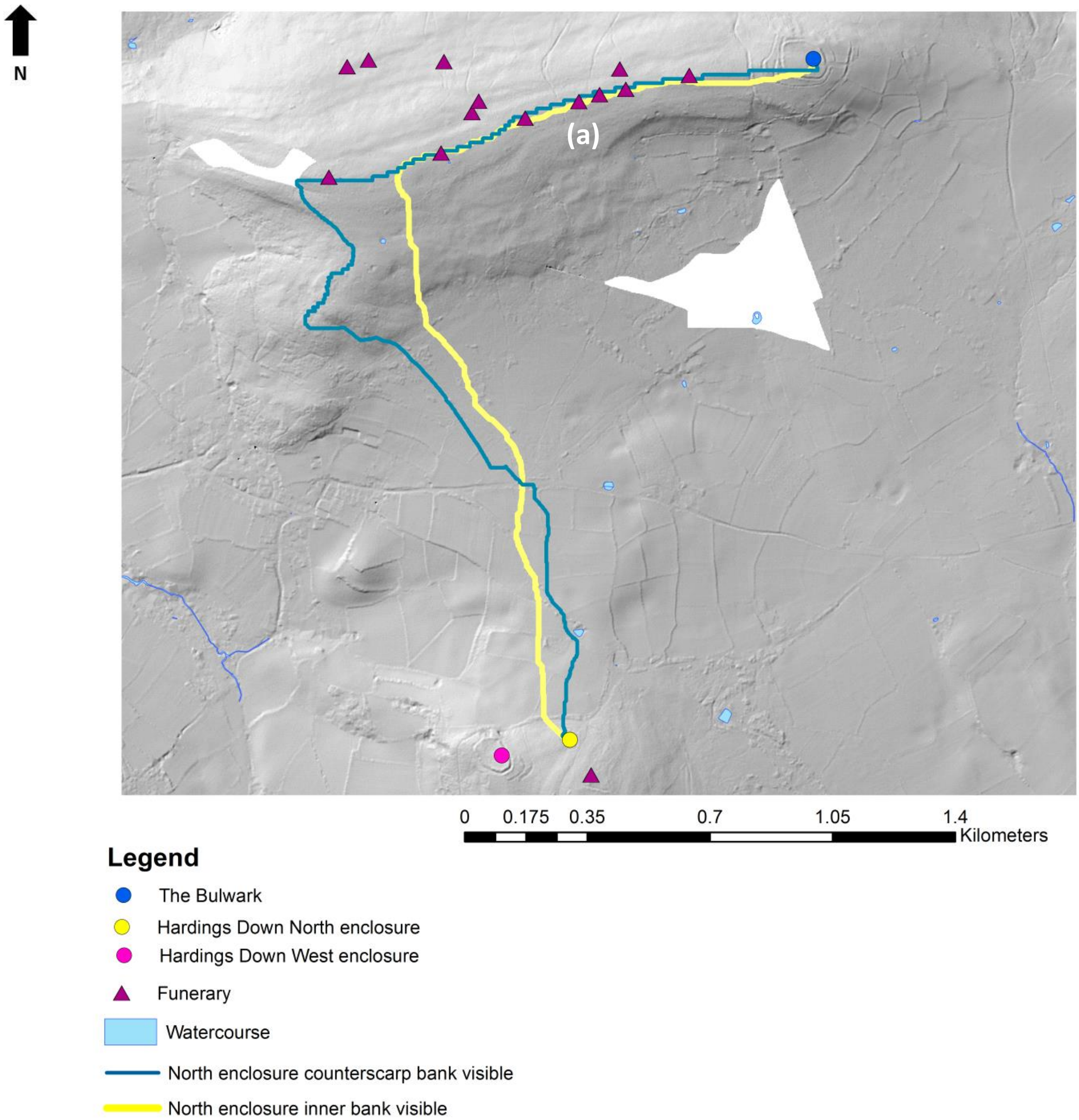


Figure 251. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the North Enclosure from The Bulwark overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Correct pathways

Cost surface analysis indicates that the most accessible area into the site is from the north/northeast as 229 out of 250 slope Ordnance Survey DTM based pathways and 2 out of the 6 LiDAR pathways use this area. The northern sector is also the most visible entry/exit point, 6 out of 17 (Ordnance Survey based DTM) and one of the LiDAR pathways intersects here (Figures 252-253). This entrance does however correspond with the blind pathways (7 out of 18 Ordnance Survey pathways and 1 LiDAR), which are by definition the least visible entry point into the site (Figure 254).

Figure 252. Results of slope based cost surface analysis to and from Hardings Down North Enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

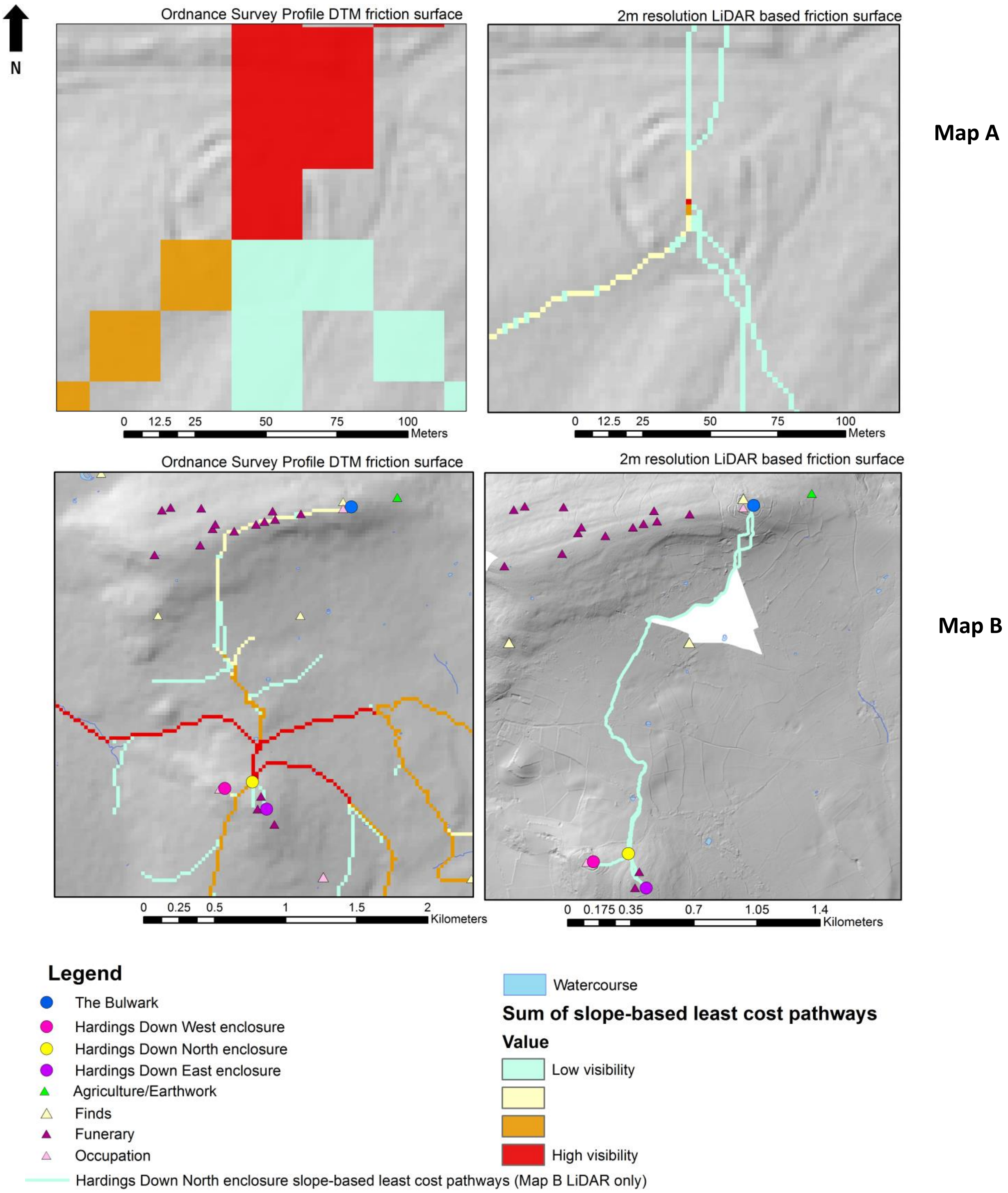


Figure 253. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Hardings Down North enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

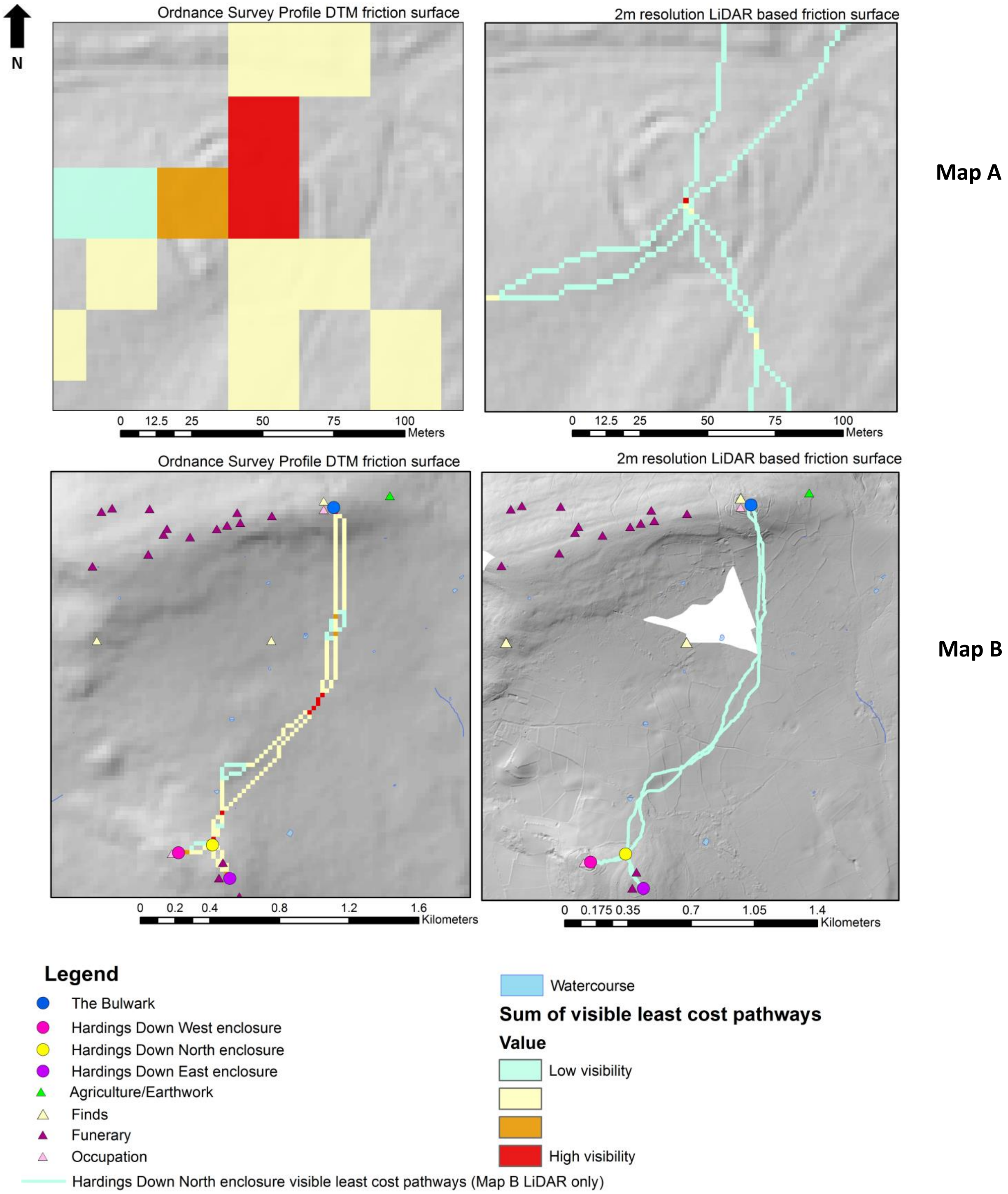
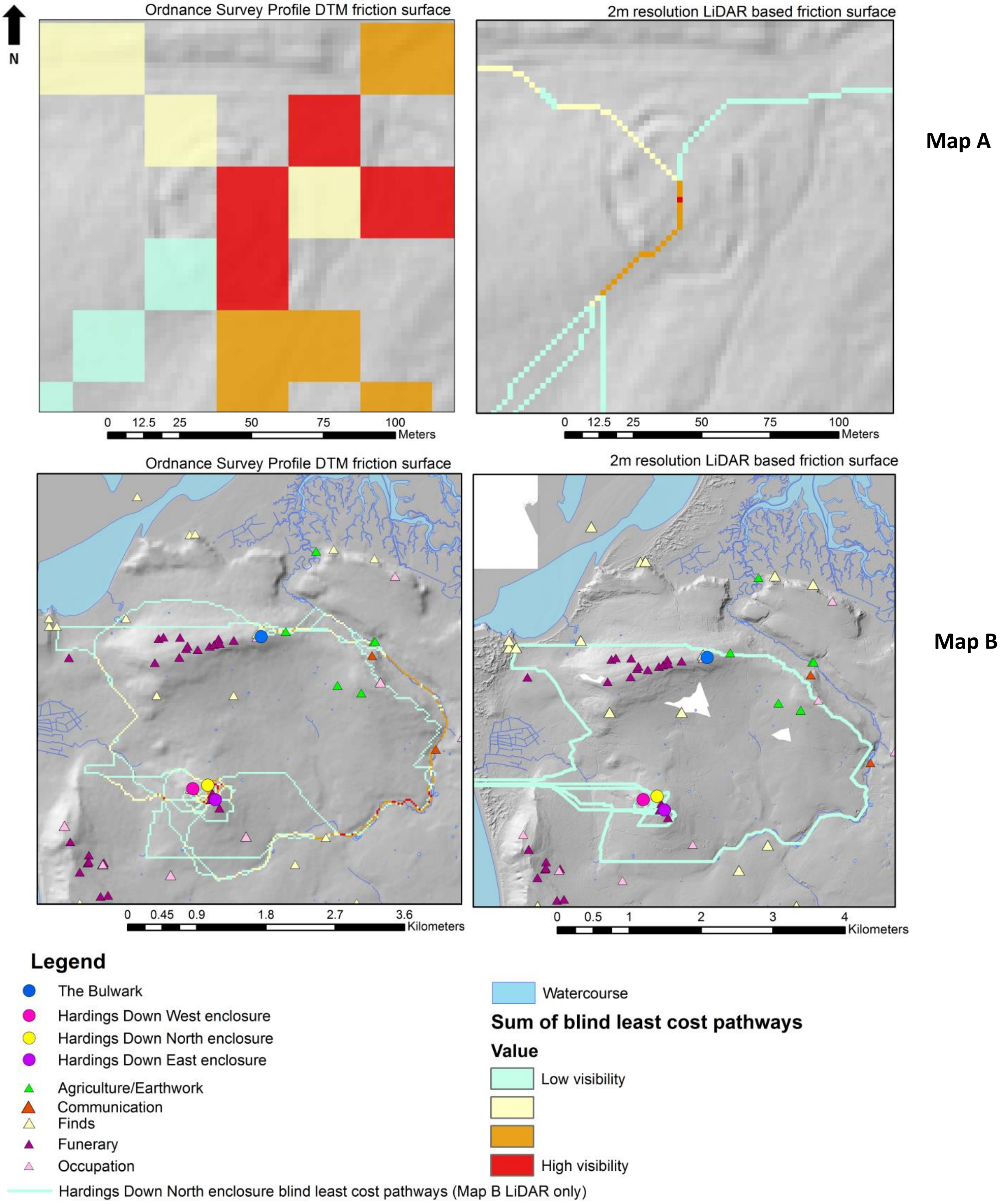


Figure 254. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Hardings Down North enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Concluding site summary

The North enclosure is the smallest site within this study; its small size has led to the suggestion that it was an animal enclosure. However, there is also evidence that this site, at one stage, was occupied as there is a hut platform within its interior and its erosion suggests heavy use. The entrance is approached by a hollow way, this regulated movement by forming a correct pathway into the site. This correct pathway may have been designed for both humans and animals. It also corresponds with some of Driver's findings in north Ceredigion (2005a) as it is a morphologically induced correct pathway.

The site itself slopes to the north, which meant that it is highly visible from the landscape to the north of the site. The viewshed results and the field photography demonstrated that whilst the site is highly visible from the surrounding landscape, which included The Bulwark, it is not visually imposing. The slope of the land means that the site's interior is visually open to the sites which are to the north of it. From the other sites on Hardings Down there is limited visual accessibility to this site. The viewshed results and field observations therefore fail to confirm any evidence for the portrayal of a particular image in a particular direction, which was found by Driver elsewhere (2005a, 2013). There is no evidence for the disproportionate allocation of resources within the construction of this site; neither do the viewshed results imply that there is a more visible aspect of the site compared with others. However, the site as a whole is visually orientated towards the north whilst it is orientated away from its neighbours on Hardings Down.

As with the West Enclosure this site portrays contrasting visual images within this landscape, to the wider landscape it is visually open whilst to its immediate environs on Hardings Down it is visually closed off. This as with many sites, which have already been identified within this study raises the question of whether a hillfort can be defined as such based upon visual qualities (Sharples 2010) as they are often highly variable in relation to the observations points.

The North enclosure is also physically orientated away from its neighbours on Hardings Down as the site's entrance faces towards the downlands. This entrance was not positioned to encourage easy access from the sites on Hardings Down, neither was it placed in the site's most accessible aspect. The entrance is in the site's least visible area as it coincides with the blind pathways.

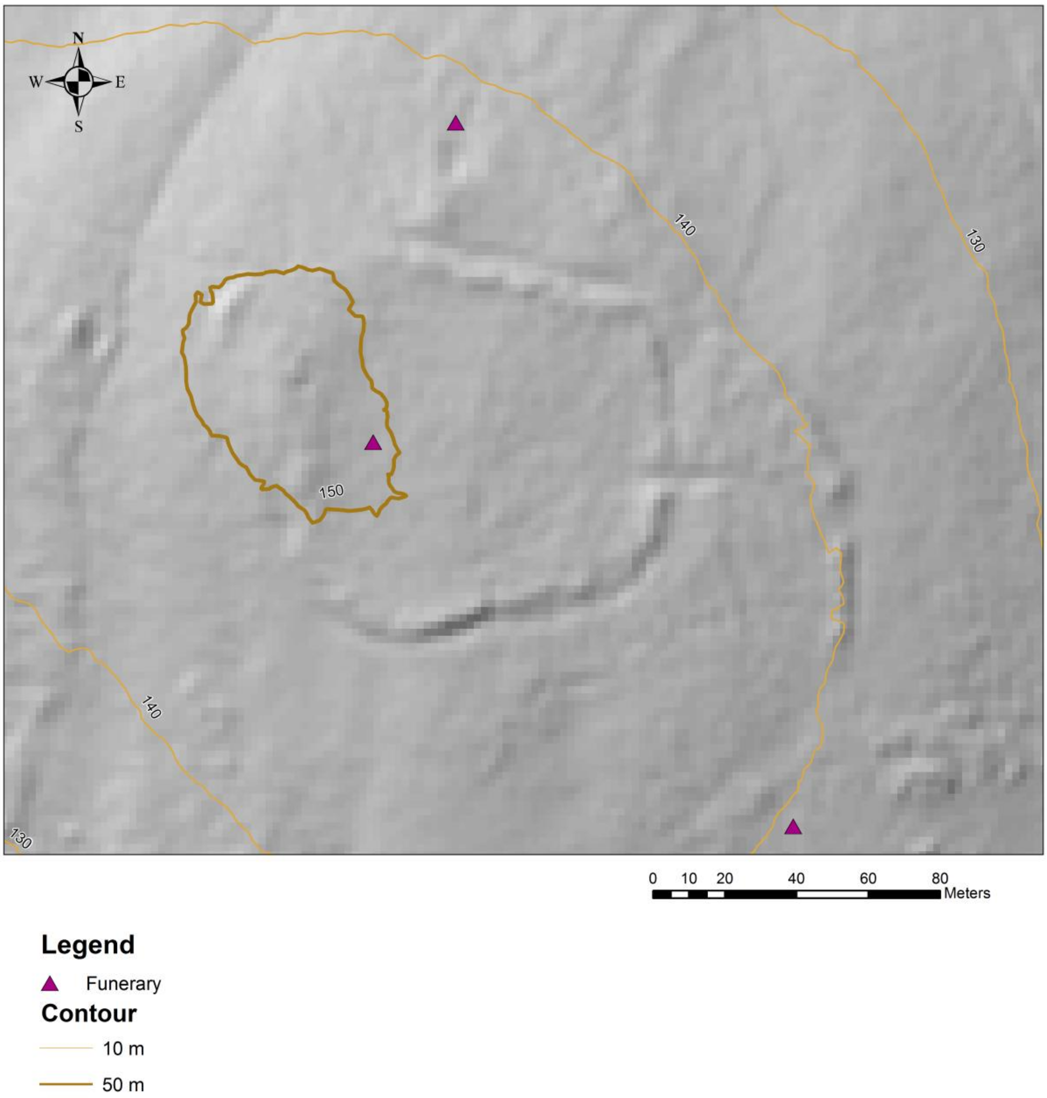
Hardings Down East enclosure

Site introduction

This site encloses c.0.9ha (Glamorgan Gwent Archaeological Trust Historic Environment Record 2013). Superficially it appears incomplete (Figure 255). However, RCAHMW suggest that the short isolated stretch of western rampart is an indication of the western perimeter of the site (*ibid*, 1976). The western bank seems to be visible on the hillshade model of the LiDAR based DTM (Figure 255). This indicates that the site may have been complete, but that the western bank was robbed in antiquity.

Forde-Johnston believed that the site comprised of an oval main enclosure and an annexe (1976, 202). From the LiDAR survey results it is not possible to see a closed shape for the annexe. The annexe is located to the east of the entrance, which consists of a break in the enclosure circuit. Its southern side has a thickened terminal (*ibid* 1976).

Figure 255. 2m resolution LiDAR hillshade model of Hardings Down East Enclosure overlain by contours and HER data

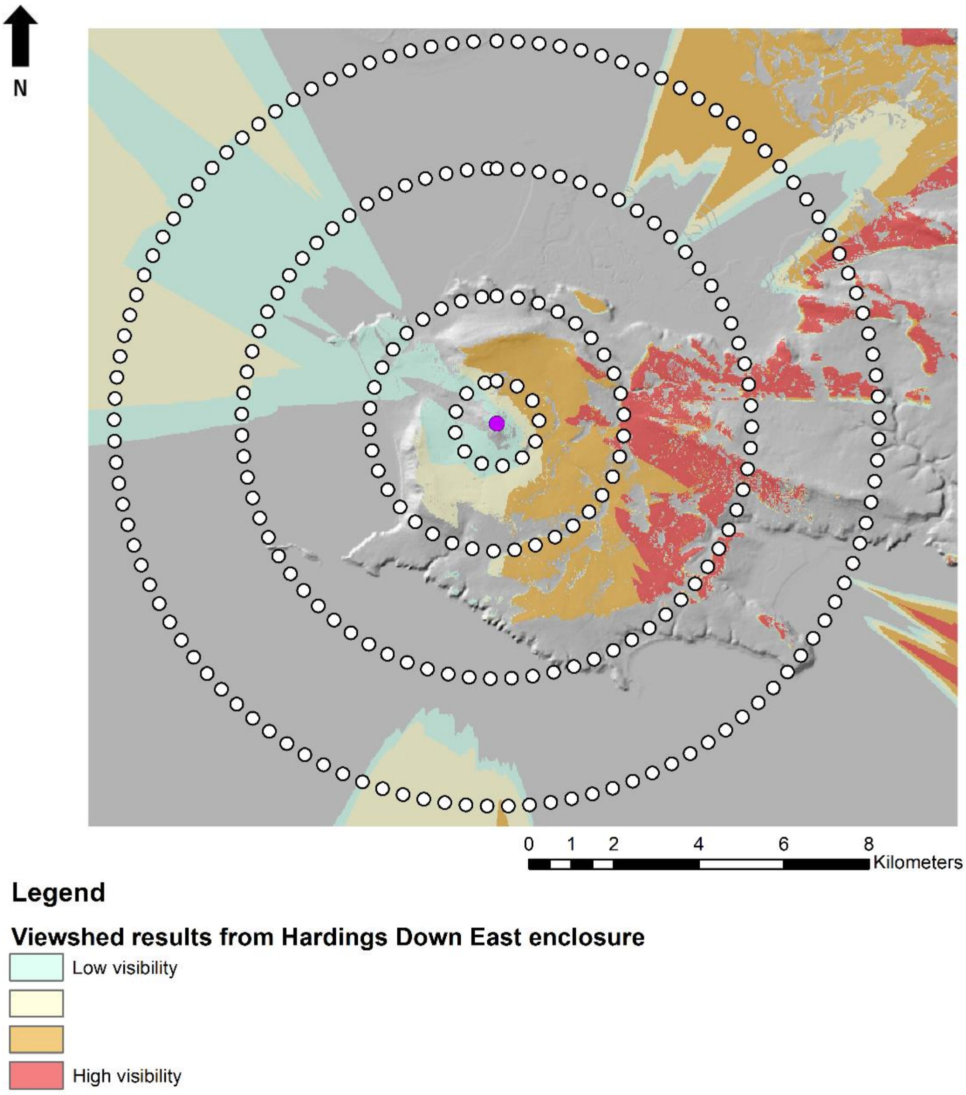


Physical relationship of the hillfort morphology and location with the landscape topography

The site's morphology is relatively uniform, apart from in the east, where there is a series of outworks that are associated with the entrance. These outworks face towards the gentle eastern slopes of Hardings Down. They also act as an extension to the footprint of the site by taking in the break of slope.

The site does not enclose the summit of this hill. Even though the site fails to enclose the summit, it is positioned sufficiently close to it such that the site has a large degree of visual accessibility to the surrounding landscape particularly within the 1km radius to the north/north-east and the south-west (Figure 256). There is a large range of visibility but the visual magnitude of the visible areas is highly variable. The surrounding landscape becomes more visible as the distance from the site increases. A large proportion of the area between the 1km and 3km radii is visible. Between the 3km and 6km radii, visibility is confined to the north-west and east. The most visible area is the east, this has a visual magnitude within the upper percentile range. Visibility is restricted to the coastal areas in the north-east and west between the 6km and 9km radius.

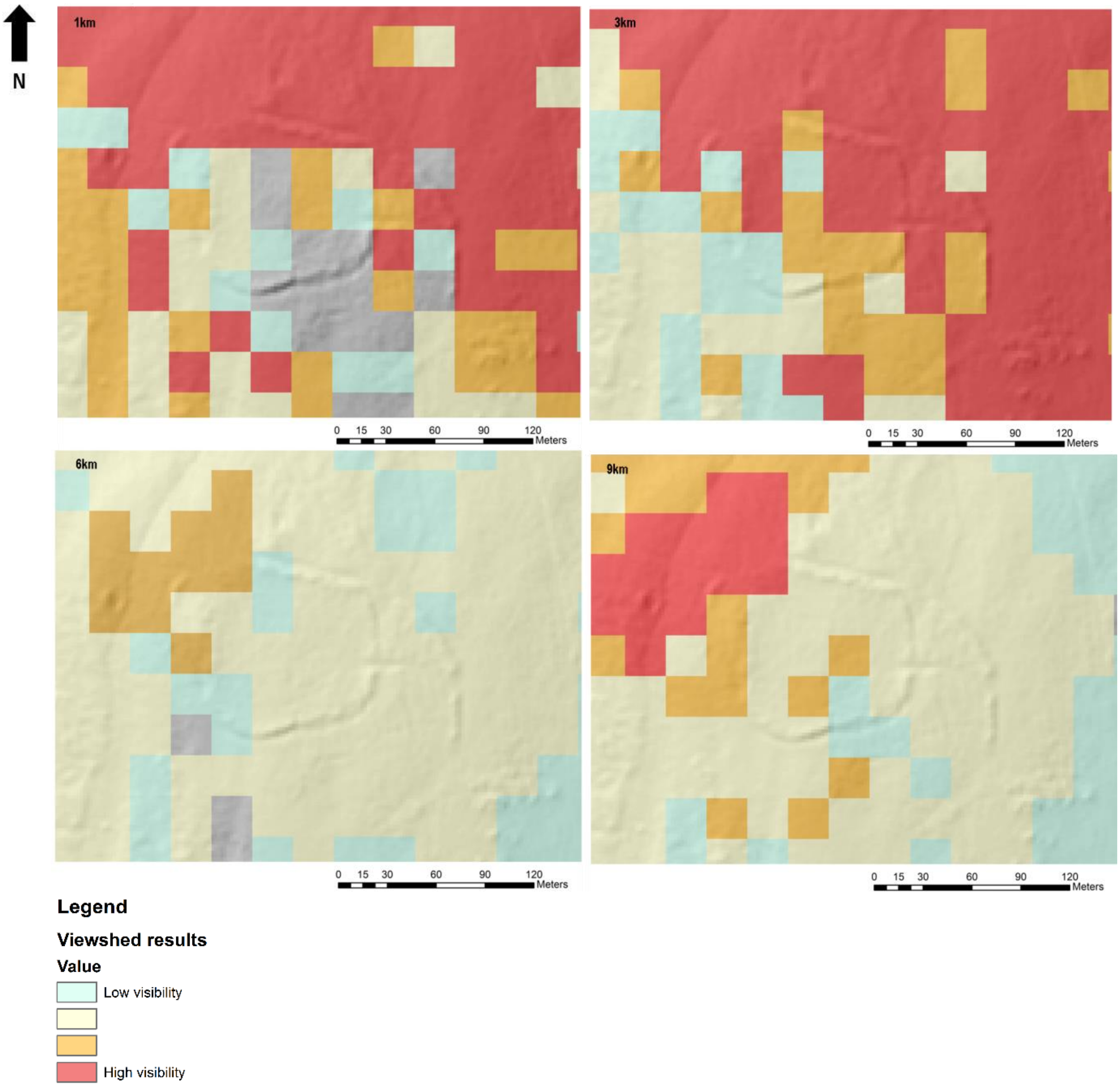
Figure 256. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Hardings Down East Enclosure as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service)



Image

The results of viewshed analysis from the radii surrounding Hardings Down East enclosure demonstrates that the site is more visible from the land closer to the site than from that further away. The overall visual accessibility of the site from the 1km radius is highly variable. The most visible areas are in the north, north-east and north-west of the site's enclosure perimeter (Figure 257). The least visible aspect of the site is its south-eastern corner.

Figure 257. Results of viewshed analysis from the radii towards Hardings Down East enclosure depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)



From the 3km radius the whole site is visible but to varying degrees. Its northern aspect remains to be the most visible area (Figure 257). The visibility of the site decreases between the 3km and 6km radii. The entire site is visible from the 6km radius but it has a relatively low visual magnitude (Figure 257). The most visible area is the site's north-western corner. From the 9km radius the entire hillfort remains visible and the majority of the site has a visual magnitude between the 25th and 49th percentile

(Figure 257). The site's north-western corner remains to be its most visible aspect; its visual magnitude is within the upper quartile range.

There is limited visibility between this site and the other hillforts on Harding's Down. Both of the viewsheds from the Ordnance Survey and LiDAR DTMs indicate that the East enclosure is not visible from the North Enclosure (Figure 258). The viewshed results from the West enclosure indicate that only the very outskirts of the western side of the East Enclosure is visible (Figure 259). As with the remainder of the field photography for the sites on Harding's Down, the clarity of the view to the East enclosure from the West enclosure is poor (Figure 260). This photograph illustrates that the westernmost outline of the East enclosure is visible on the horizon of the hilltop. The summit position of this hilltop enhances the visual prominence of this site from the West enclosure, which sits downslope from the East Enclosure.

Figure 258. Results of viewshed analysis from Hardings Down North enclosure towards Hardings Down East enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

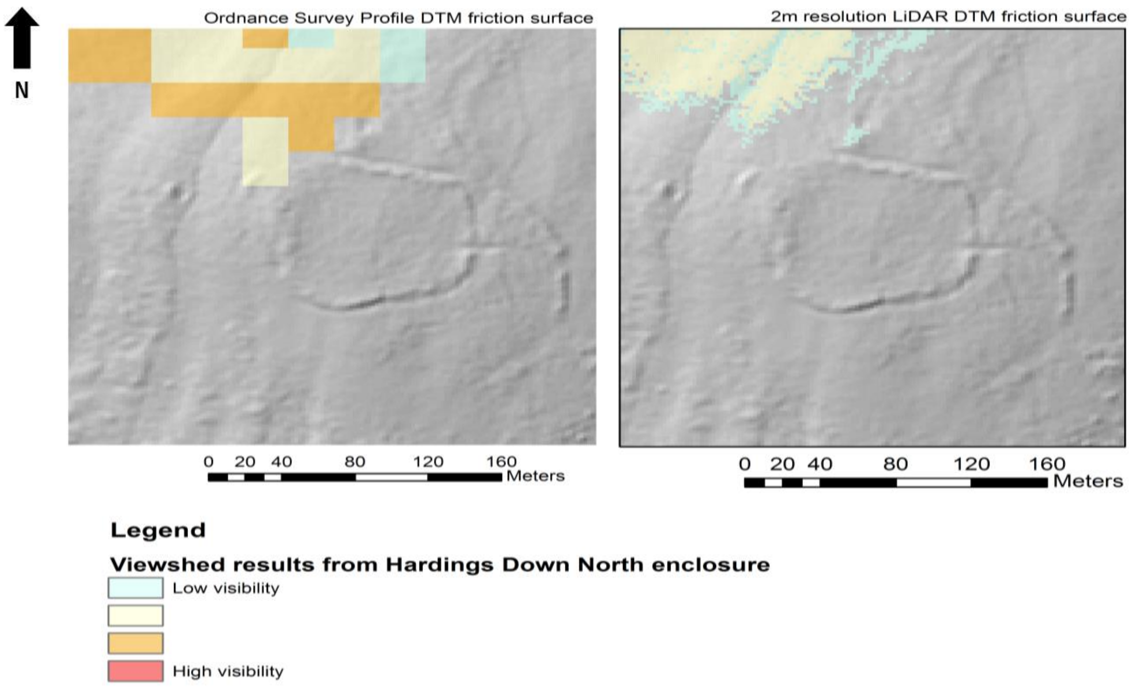


Figure 259. Results of viewshed analysis from Hardings Down West enclosure towards Hardings Down East enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

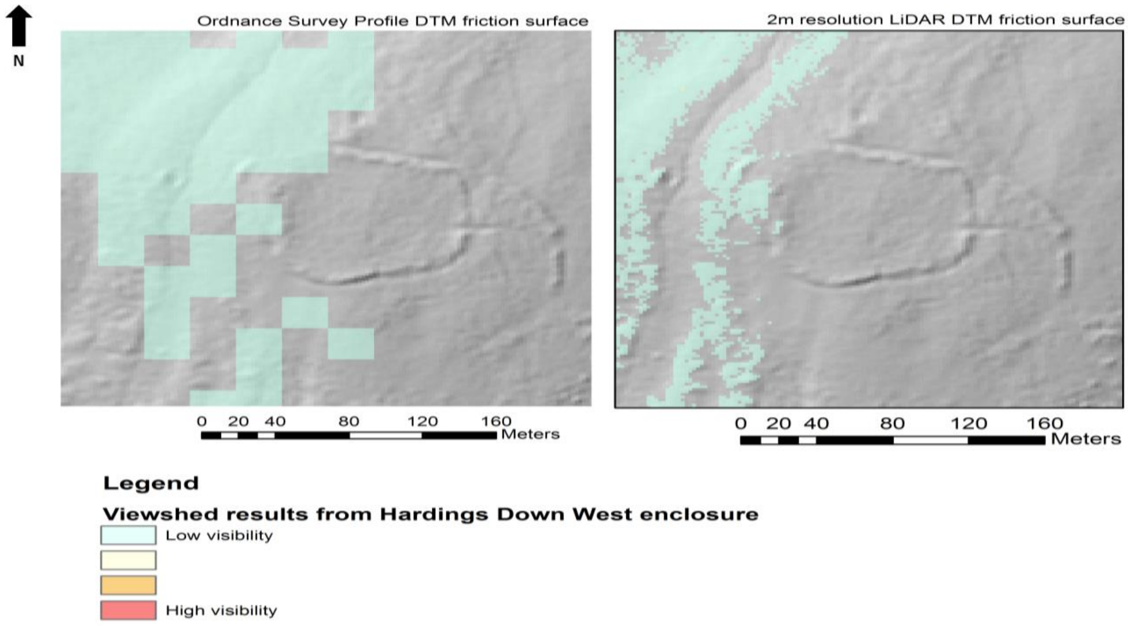


Figure 260. View of the East Enclosure from the West enclosure (Author's own 2013)

The site's visibility increases from The Bulwark. Both the viewshed results from the Ordnance Survey Profile DTM and the LiDAR DTM indicate that the majority of the site apart from a small sector of its southern side is visible (Figures 261). However, there is a slight differentiation in the results from the different DTMs. For example from the Profile DTM the site has a slightly higher visual magnitude than from that which was depicted in the 2m DTM. The 2m DTM also implies that the entrance passageway is not visible. The field photography from The Bulwark supports the viewshed results as the East enclosure is visible from this site (Figure 262). However, the site is not clearly distinguishable from The Bulwark. Today, the East Enclosure can only be visually referenced due to its summit location and the banks that cut across the hilltop.

Figure 261. Results of viewshed analysis from The Bulwark towards Hardings Down East enclosure depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

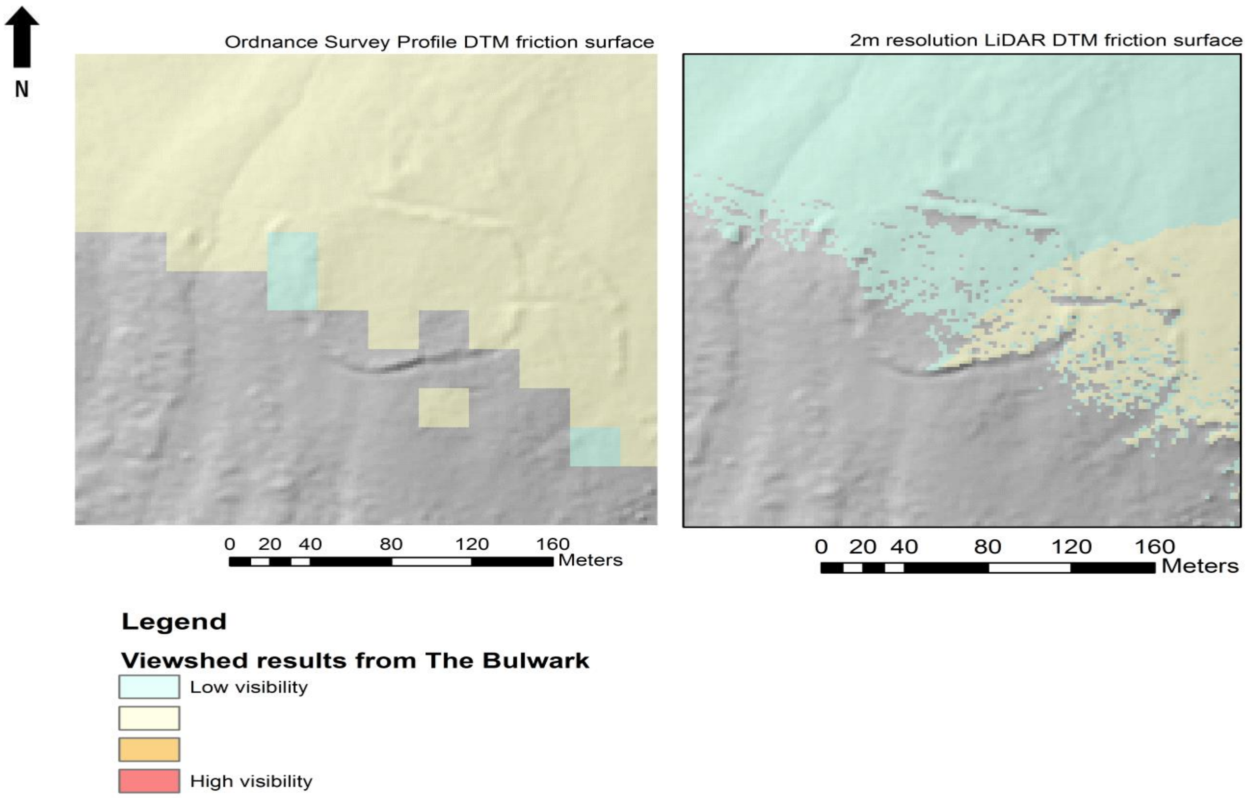


Figure 262. View of the East enclosure from The Bulwark (Author's own 2013)

Cost surface analysis found that the East enclosure portrays a very fragmented image out to the surrounding landscape (Figures 263-265). None of the pathways which are based upon the visual accessibility of the individual components to this site follow the same route. The poor correspondence of these pathways with each other is found whilst travelling very short distances from its neighbours on Hardings Down and from a greater distance from The Bulwark. The site's inner bank and western outwork are both visible from along the western side of Llanmadoc Hill, which also intersects with the funerary monuments within this area.

Figure 263. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the East enclosure from the West enclosure overlain by HER data (© Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

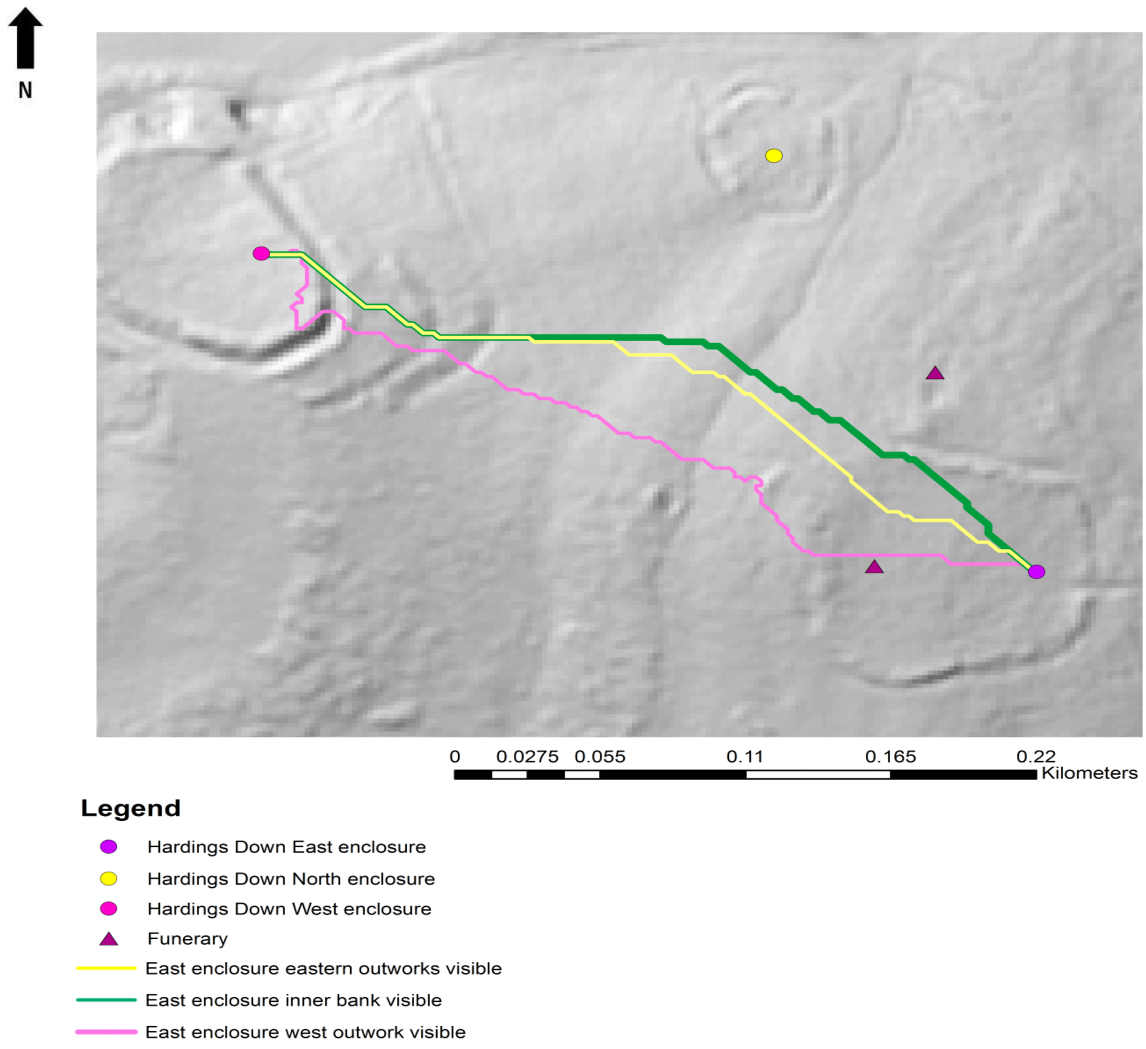


Figure 264. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the East Enclosure from the North Enclosure overlain by HER data (© Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

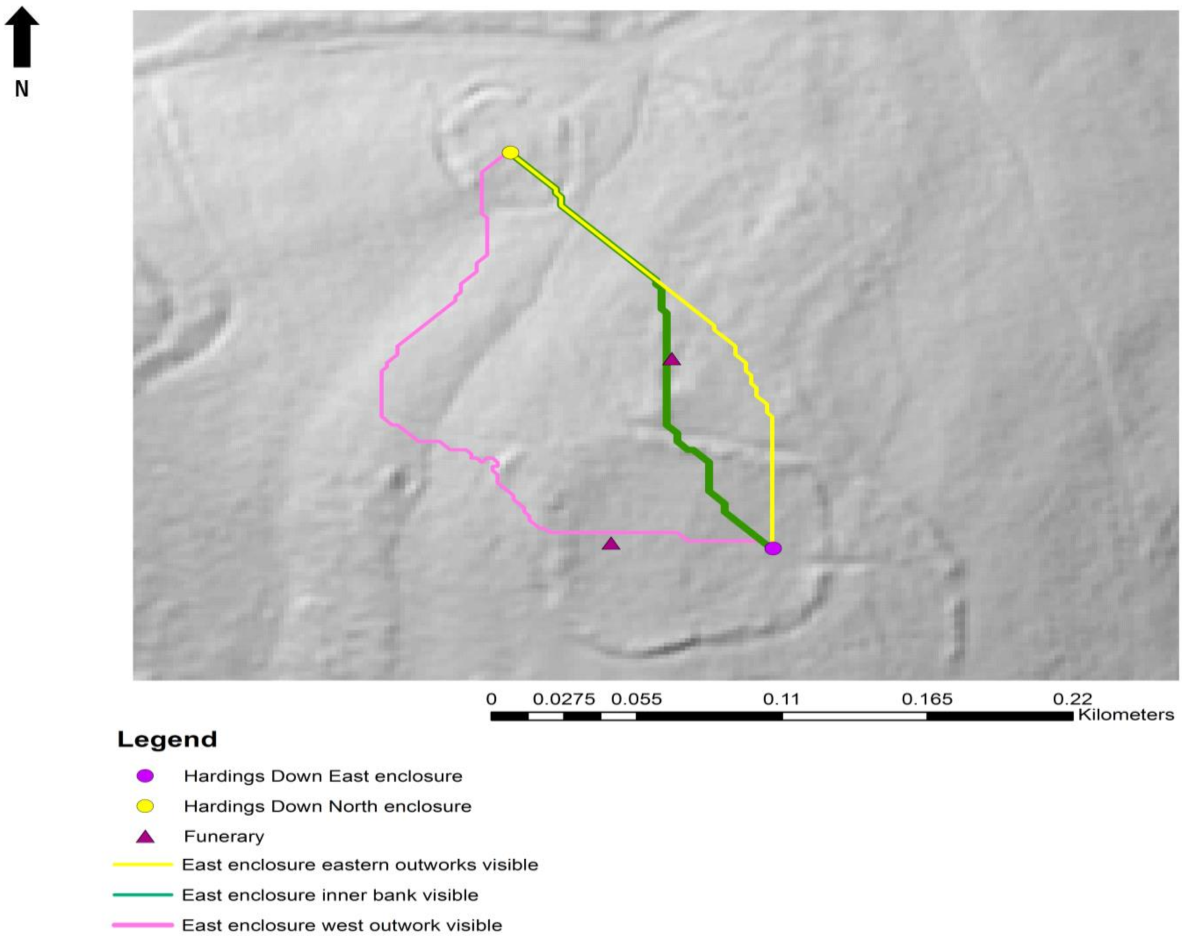
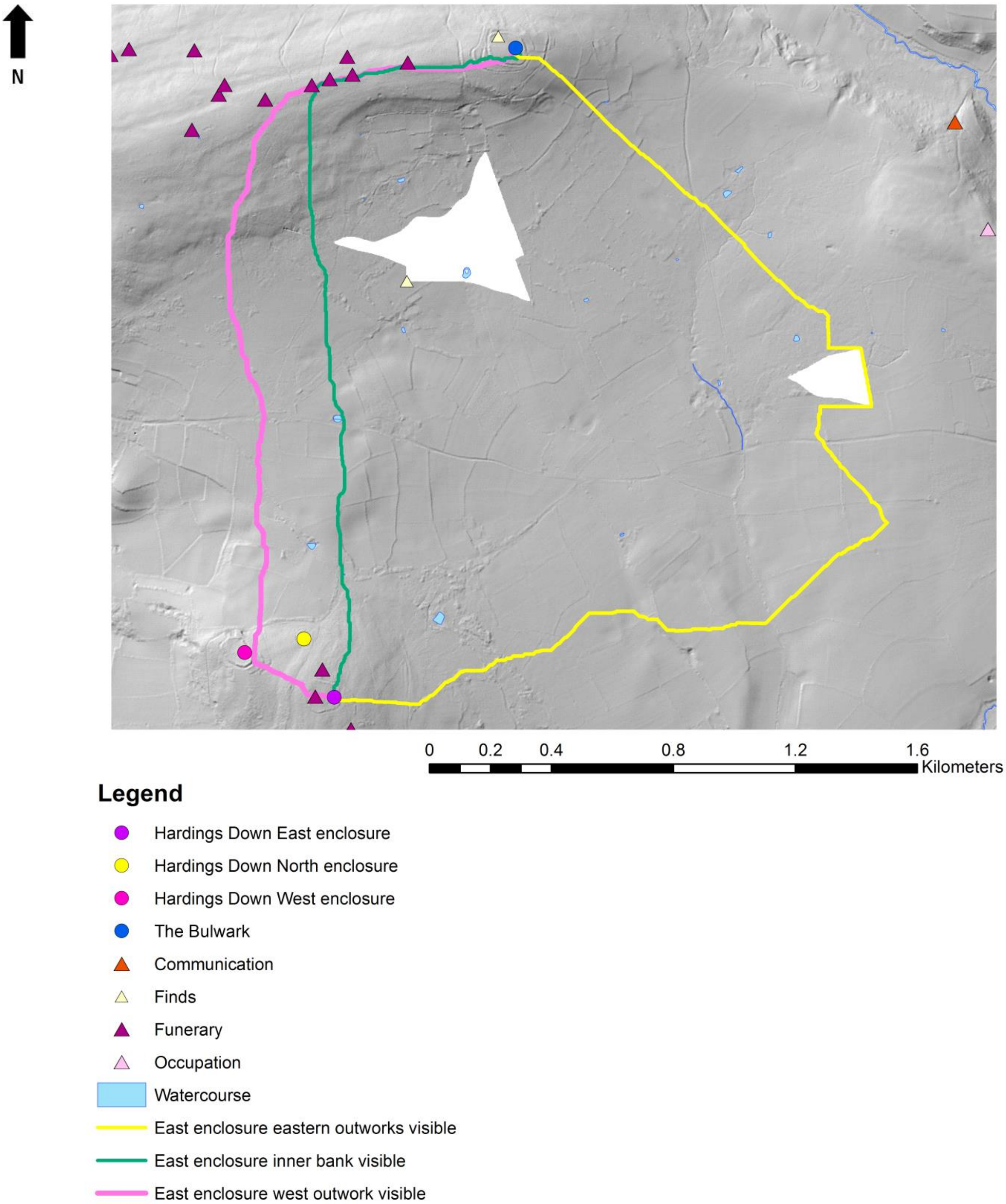


Figure 265. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of the East enclosure from The Bulwark overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Correct pathways

Cost surface analysis did not identify any correlation between the least cost pathways and the site's entrance. Its most accessible aspect is from the south as 214 out of 248 Ordnance Survey based pathways intersect with this area. The second most accessible aspect according to the Ordnance Survey DTM is in the north-east as 18 of these least cost pathways use this area, which is very close to the entrance (Figure 266). The blind pathways also enter the site through its southern aspect (Figure 267). The visible pathways primarily enter from the north-east and north-west (Figure 268).

Figure 266. Results of slope based cost surface analysis to and from Hardings Down East enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

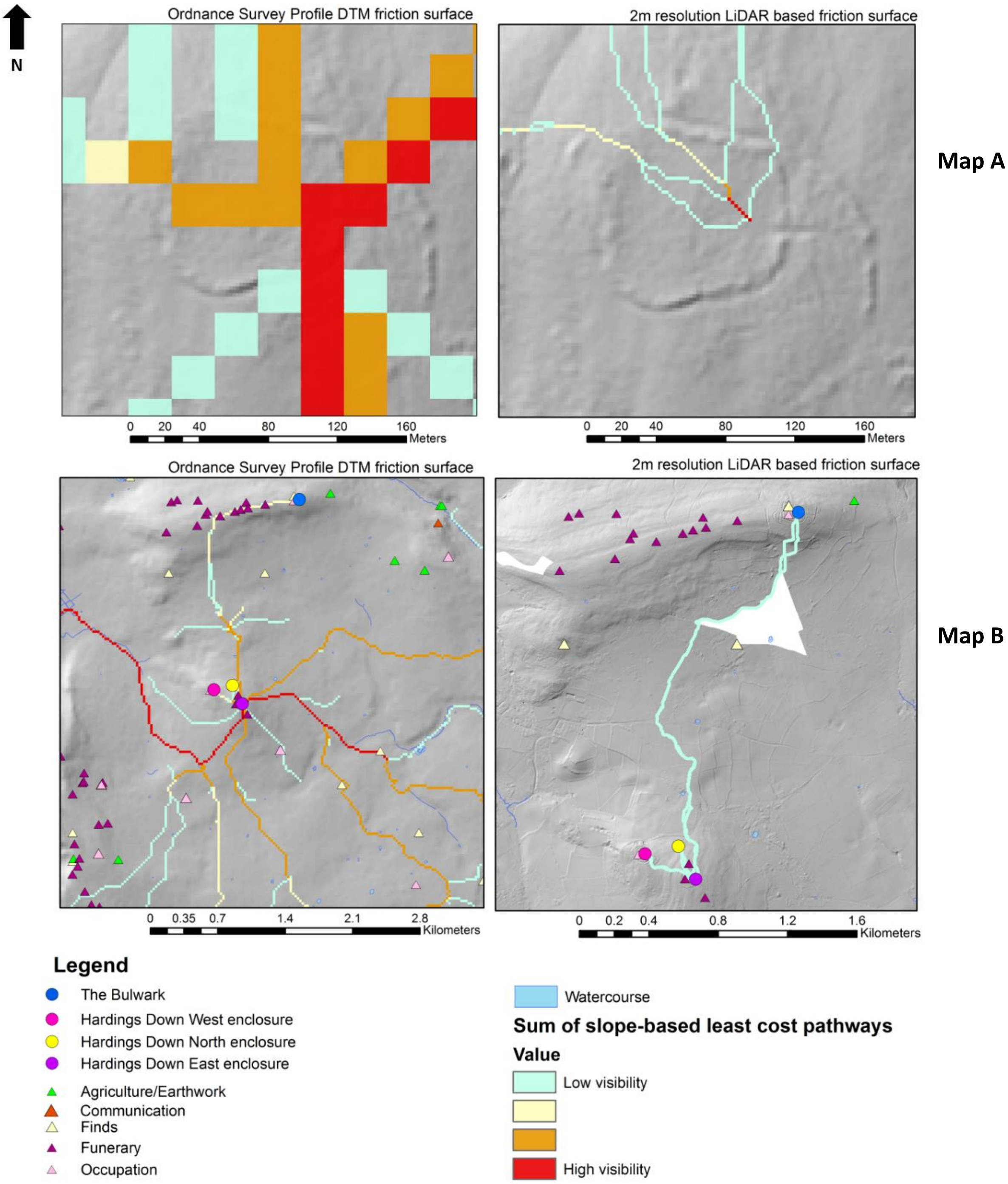


Figure 267. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Hardings Down East enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

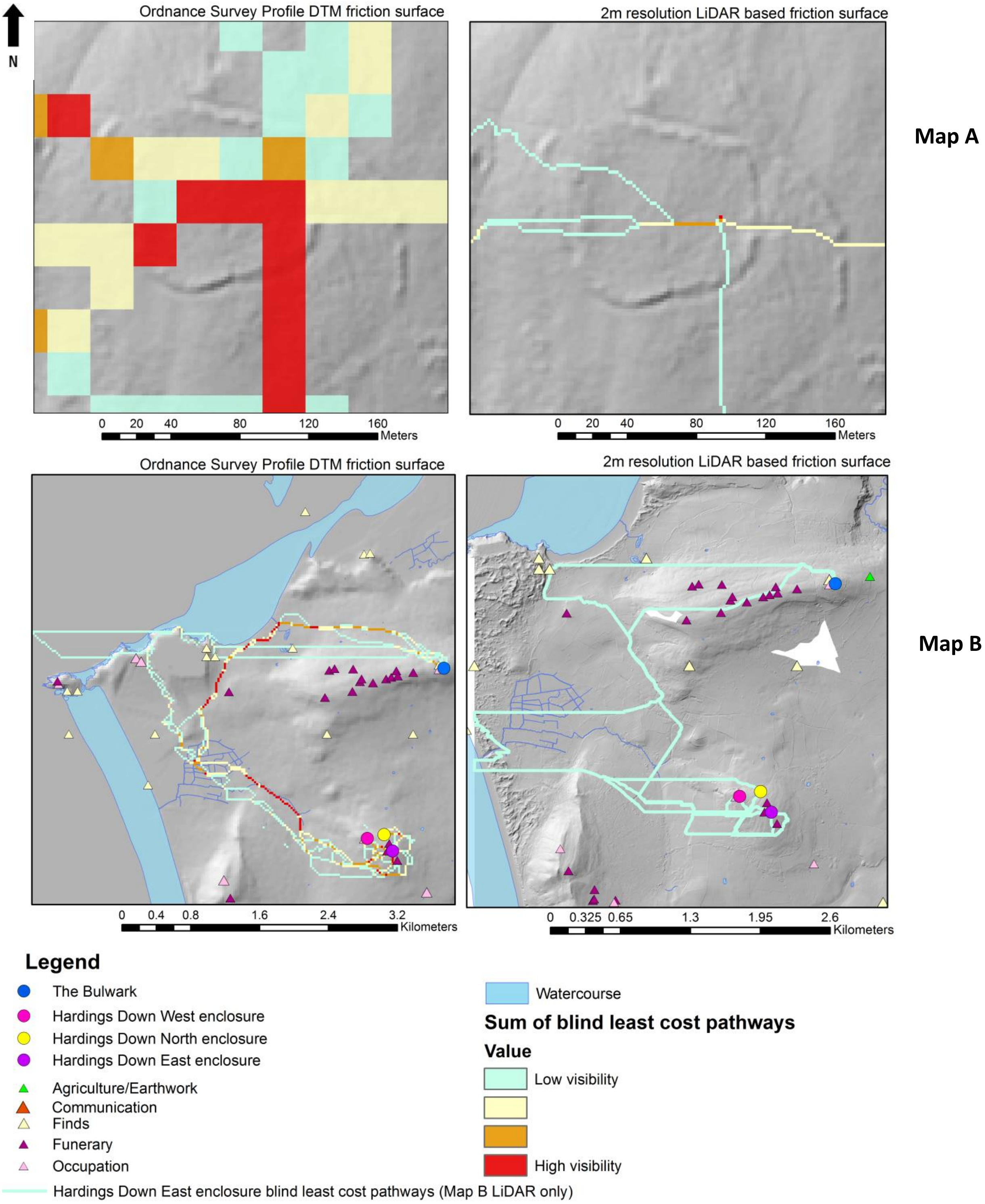
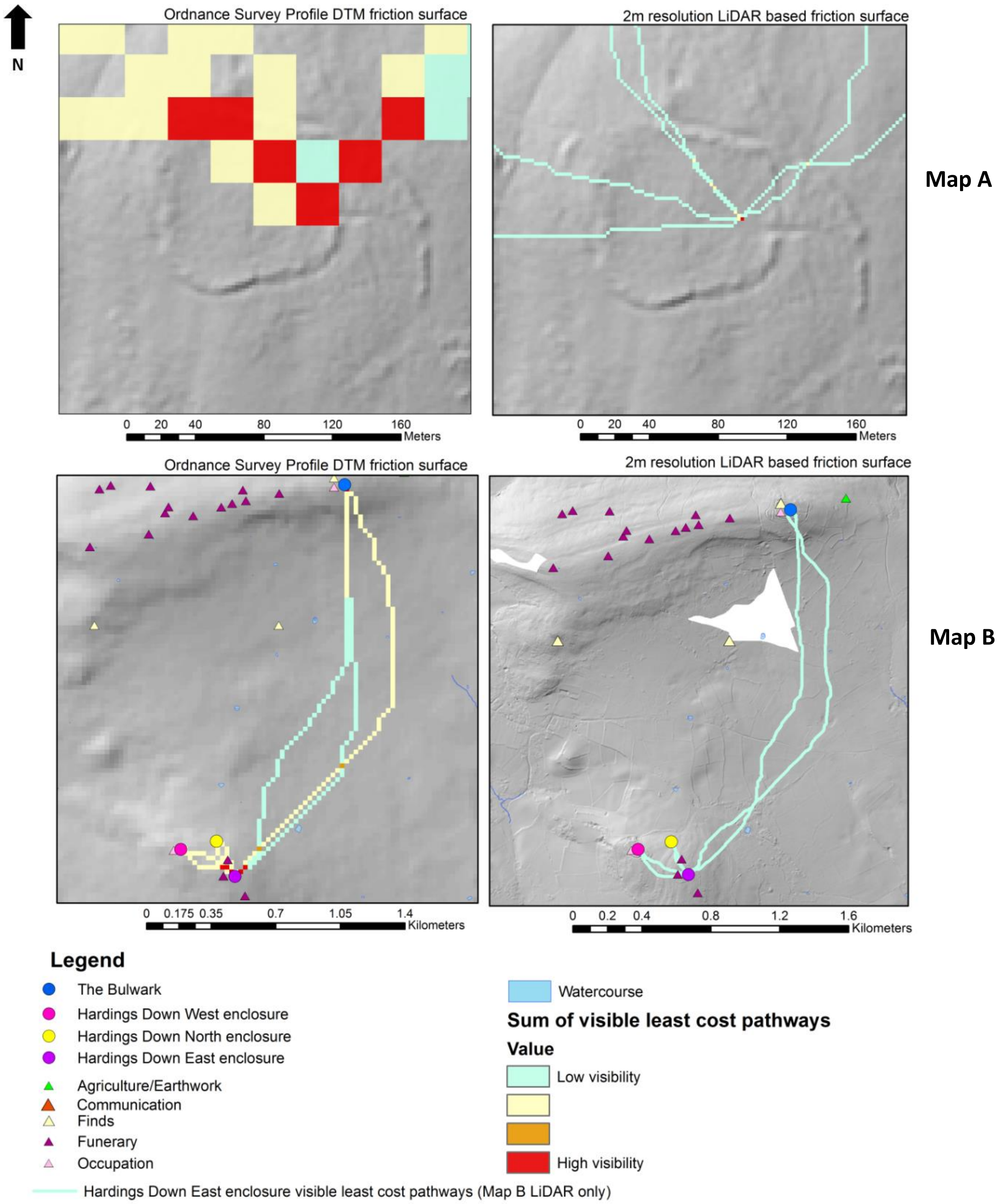


Figure 268. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Hardings Down East enclosure. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Concluding site summary

This site was introduced as an incomplete hillfort. However, the morphological evidence implies that it is not unfinished, just poorly preserved, which is a similar state of affairs to those noted at Cranbrook Castle.

The East enclosure is sited next to the summit of Hardings Down. This summit position enhances the visual prominence of the site from the surrounding landscape as it provides a visual reference point. From between the 1km and 3km radii which also includes The Bulwark, the site's enclosing earthworks appear visually prominent; however poor visual clarity meant that they were not visually imposing. The site's visibility decreases beyond the 3km radius and from the sites on Hardings Down. From the neighbouring sites there is virtually no visual accessibility of the site apart from its outermost banks. Consequently unlike the West and North enclosures this site was visually closed to the surrounding landscape. The results of visibility analysis for this study demonstrate that it portrayed a very fragmented image to the areas beyond the site itself. From the wider landscape the site is visually prominent, yet from the neighbouring sites on Hardings Down it forms a barrier to visual connectivity as these sites have a poor degree of visual accessibility to the East enclosure.

Whilst this site is poorly visually connected to the remainder of those on Hardings Down it is also poorly physically associated with them as the entrance is orientated towards the east. The entrance does not correspond with the majority of the slope based pathways and the visual pathways. This demonstrates that both visual and physical accessibility were not the primary influence in the placement of this entrance. Whilst the entrance does not coincide with any GIS-based correct pathways, its morphology formed a correct pathway. The extensive outworks and the passageway, which are associated with this entrance formalised movement into the site. This formed and matched Driver's principal definition of a correct path of movement (2005a).

The most accessible and yet the least visible aspect of the site is its southern area. The morphology of this area is no more extensive than the remainder of the site considering it is the most accessible aspect which is consequently susceptible to intruder entry. The most visible area of the East enclosure, as defined by the cost surface analysis, was the north-eastern aspect; this is very close to the entrance and its associated outworks. This suggests that the elaboration of this entrance area may have been influenced by its visibility; however the results of the viewshed analysis did not strongly indicate that this area was the site's most visible area.

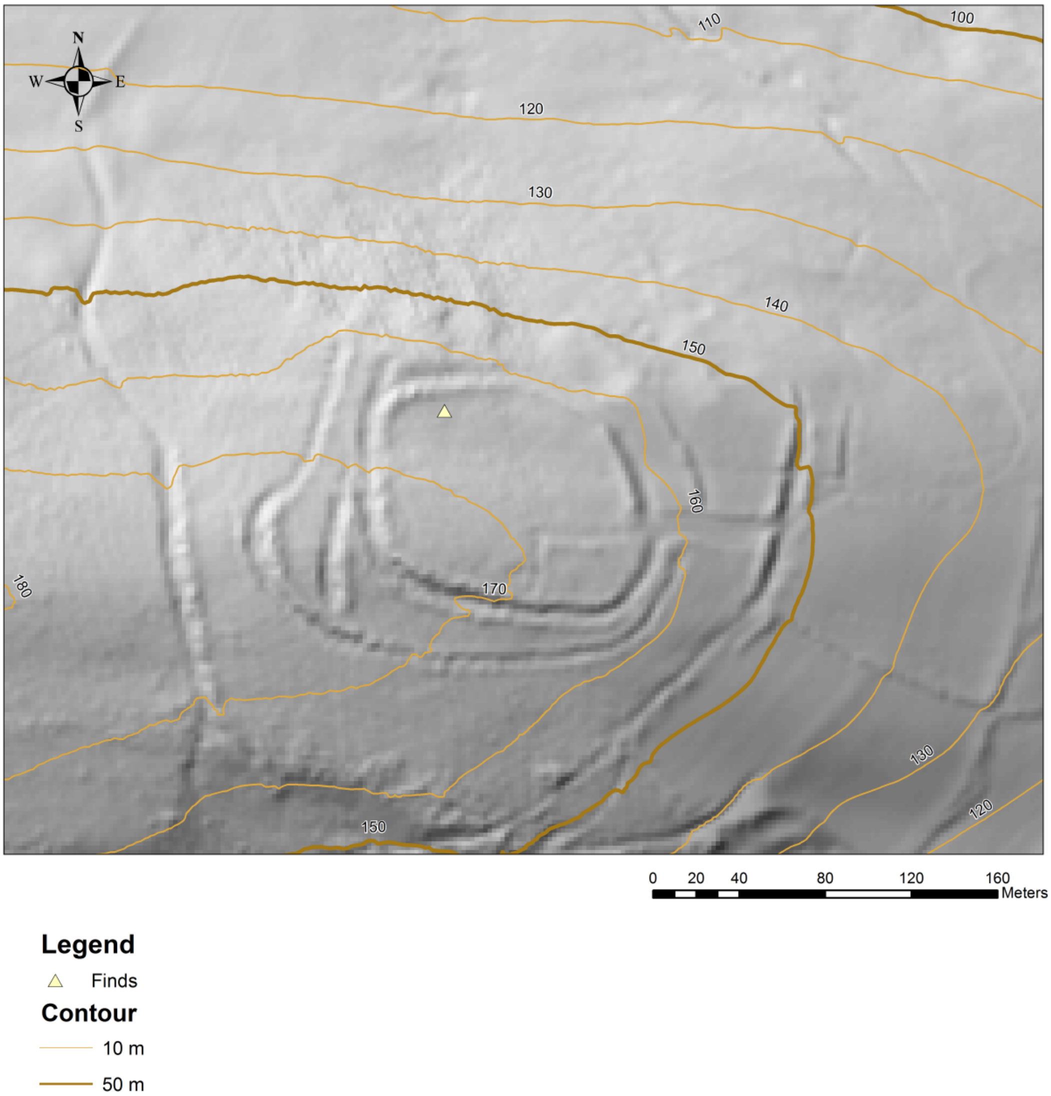
The Bulwark

Site introduction

The Bulwark is situated on the eastern end of Llanmadoc Hill, which is to the north-east of Hardings Down. The site is recorded as a multi-enclosure hillslope fort, which has two enclosures (Figure 269). The inner enclosure is defined by a bank and ditch, this has steep slopes to the north. The outer enclosure is the area between the inner enclosure bank and the outer bank (RCAHMW 1976).

The site's entrance is situated on the eastern side of the site. It penetrates the site from the third set of banks and ditches as a simple gap (RCAHMW 1976). A 12m wide passageway defines the approach to the site from the outermost bank to the innermost bank and ditch, from here the entrance in-turns slightly (*ibid* 1976).

Figure 269. 2m resolution LiDAR hillshade model of The Bulwark overlain by contours and HER data (© Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



There is a rectilinear enclosure in the south-east of the innermost enclosed area; to the west of this there is also a hut platform that measures 9m in diameter (*ibid* 1976). The irregularities of the land in the site's north-western corner led RCAHMW to believe that they could represent evidence for further hut platforms (*ibid* 1976). These irregularities are not visible within the hillshade model of the LiDAR DTM.

Physical relationship of the hillfort morphology and location with the landscape topography

The Bulwark strongly adheres to the topographical form of the hillside that it is situated on. The site's outer eastern earthworks extend out towards the eastern edge of this hilltop. This extension did not enlarge the inhabited area of this site as there is no visible evidence for occupation within this area. Instead, the extension enhanced the site's entrance passageway. This implies that to the hillfort builders it was important to secure the eastern edge of Llanmadoc Hill.

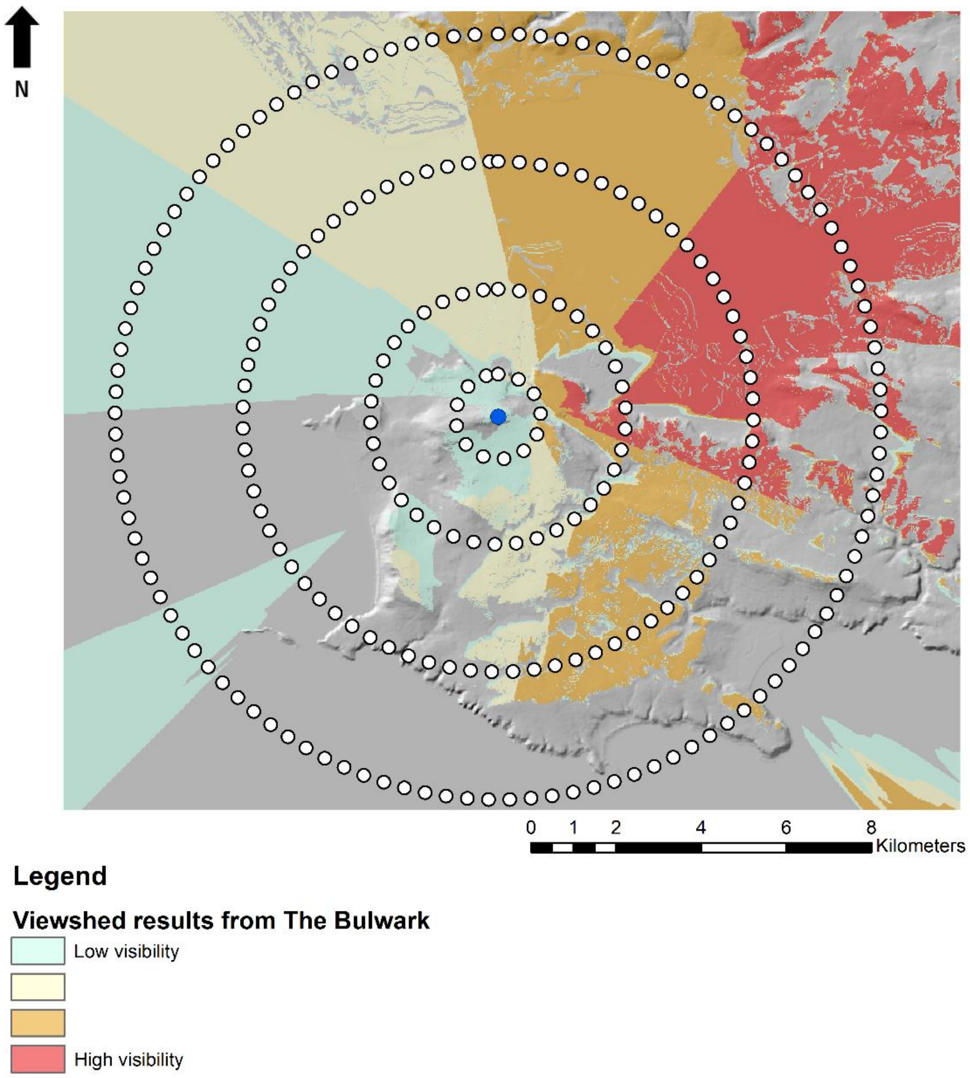
The outer eastern earthworks accentuate the prominence of the eastern entrance. This entrance faces away from the remainder of Llanmadoc Hill, towards the gentle eastern slopes down to the lowlands. The Bulwark's western side faces the remainder of Llanmadoc Hill and the banks that enclose this aspect of the site cut across the hilltop. Approximately 68m away from the western outer bank of The Bulwark is a ditch which cuts across the entire hilltop (north-south). The date of this ditch is unknown. However, it may have been constructed whilst the hillfort was in use. This may have been an attempt to accentuate the site's separateness from the remainder of Llanmadoc Hill, which was also implied by the easterly orientation of the site's entrance.

To the north there is very little surviving evidence of a bank enclosing the extensive slopes forming this area of the site. The southern hillside also has relatively steep slopes; however the banks that enclose this area are of the same number and magnitude as those which enclose the lesser slopes to the east and west. These southern earthworks were not defensively needed within this area.

Due to the fact that this site is a hillslope enclosure, it does not have 360˚ views to the surrounding landscape, neither is there complete intra-visibility across the enclosure (Figure 270). Visibility was also restricted to the remainder of Llanmadoc

Hill. The site has a greater degree of visibility to the land further away from the site, particularly to the east. Visibility increases as distance from the site increases.

Figure 270. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from The Bulwark as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service)



Image

The visibility of The Bulwark from the surrounding landscape is highly variable as distance from the site increases. From the 1km radius the overall visual accessibility of the site is variable; the most visible aspect is the site's northern half whilst the least visible is its southern half (Figure 271). The poor visibility of the southern aspect of the site is supported by the fieldwork photography from Viewpoint 4, which is situated to the north-west of The Bulwark (Figure 272). From this point Llanmadoc Hill appears visually imposing (Figure 273). The outline of the site's northern half is also visible but it is not clearly distinguishable, neither is it visually prominent. The Bulwark is only visible as the site placement contrasts with the slope of the eastern end of Llanmadoc Hill.

Figure 271. Results of viewshed analysis from the radii towards The Bulwark depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

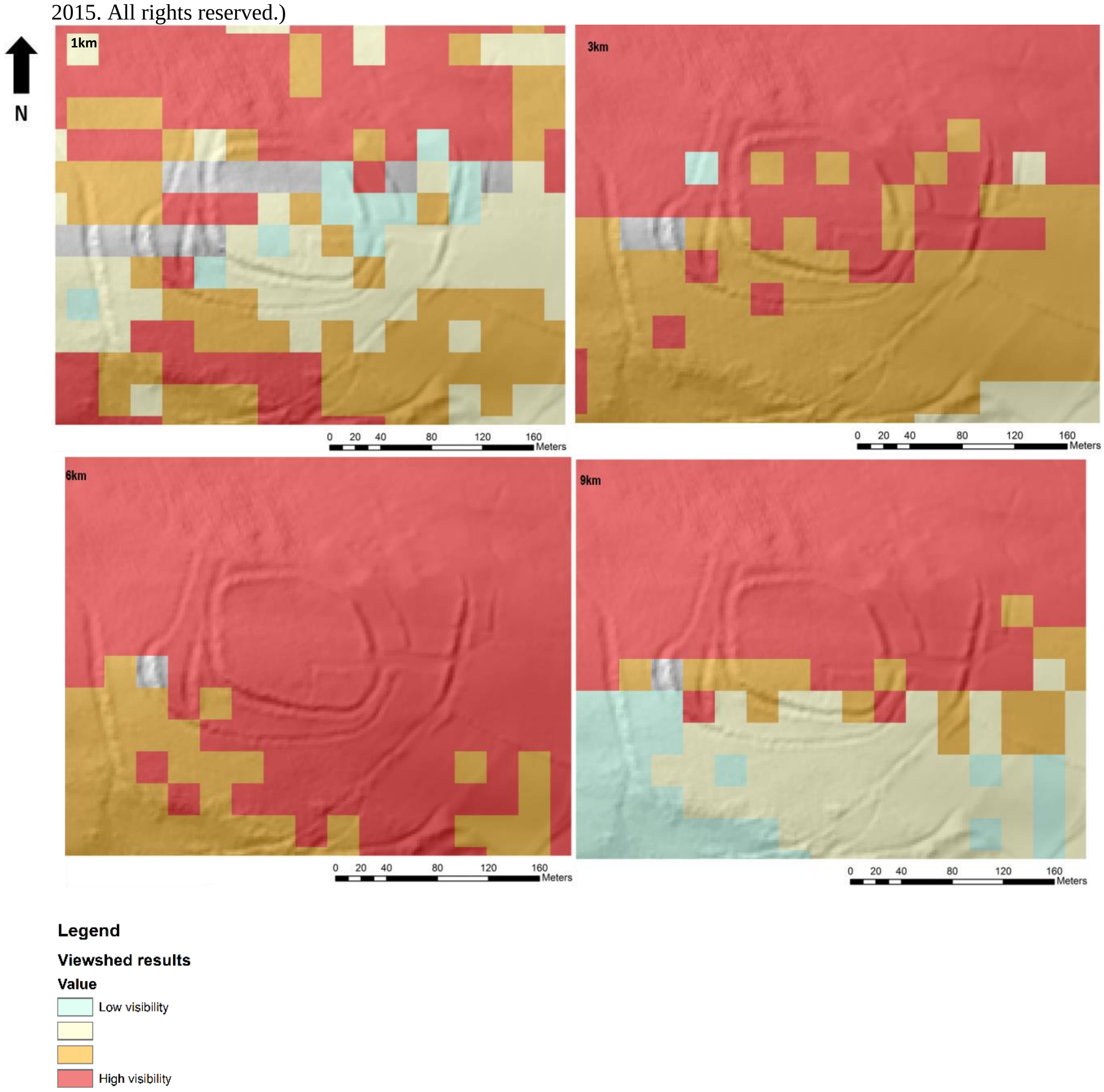


Figure 272. Location map of the Viewpoints which relate to The Bulwark overlain by watercourses (© Crown Copyright/database right 2009.An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved)

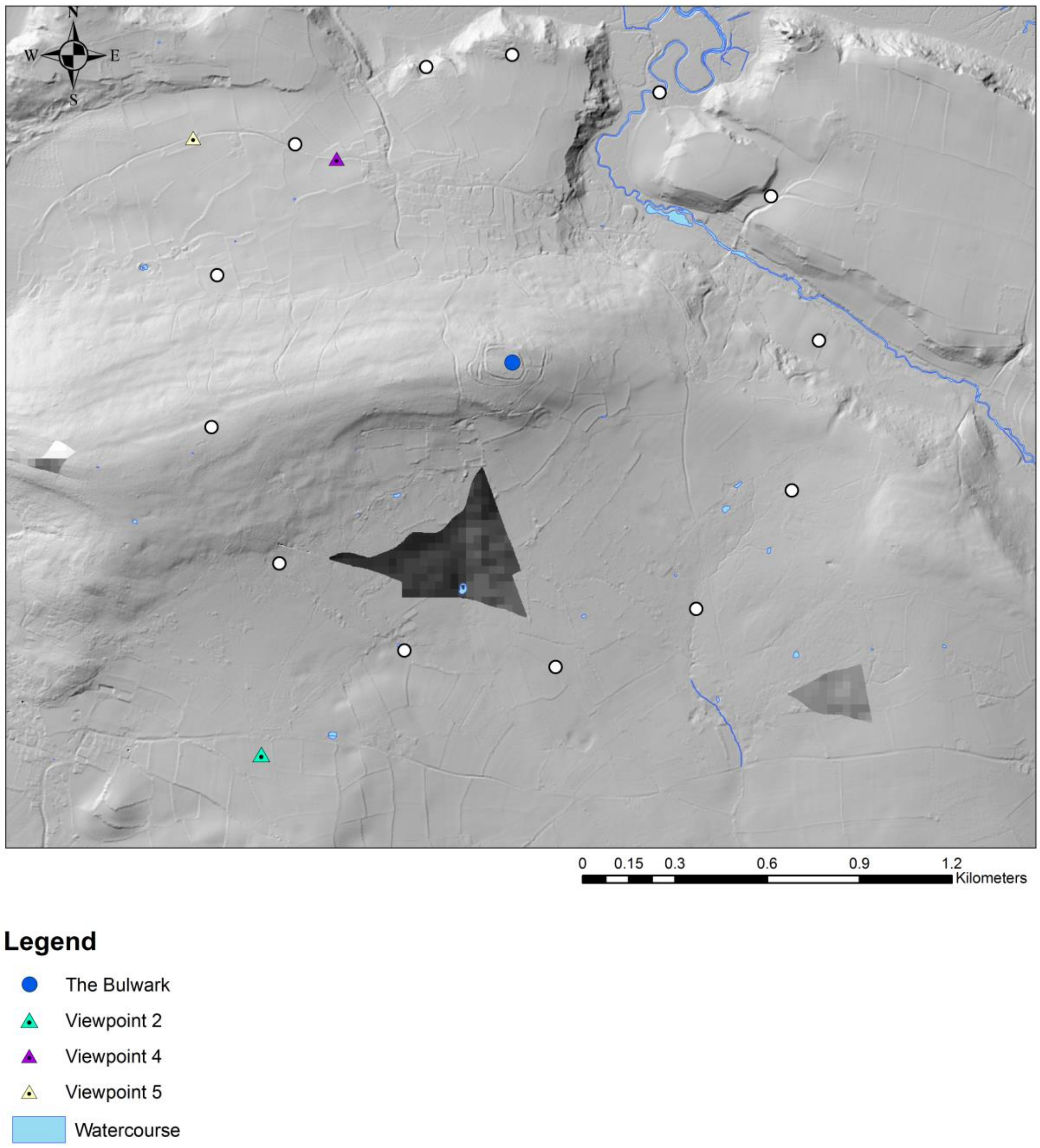


Figure 273. View of The Bulwark from Viewpoint 4, 875m to the north-west of the site (Author's own 2013)

The site's visibility increases from the 3km radius as the majority of the site is visible from this range (Figure 271). The most visible aspect remains to be the north. This has a visual magnitude within the upper quartile range whilst the southern half of the site has a visual magnitude between the 50^{th} and 74^{th} percentiles. Viewpoints 2 and 5 are situated within the south-west and north-west of the 3km radius respectively. Both of these points can see The Bulwark, however the site is not clearly distinguishable; neither is it visually or physically prominent from them (Figures 274-275).

Figure 274. View of The Bulwark from Viewpoint 2, 1.5km to the south-west of the site (Author's own 2013)

Figure 275. View of The Bulwark from Viewpoint 5, 1.3km to the north-west of the site (Author's own 2013)

The site's visual accessibility continues to increase from the 6km radius and the majority of the site is of high visibility (Figure 271). The site's least visible aspect at this range is its outer southwestern corner. The visibility of the site decreases from the 9km radius (Figure 271). The southern point of the site remains to be its most visible area as it has a visual magnitude within the upper quartile range. The site's least visible aspect is its southern enclosing earthworks.

Although the southern aspect to The Bulwark is the least visible aspect of the site from the wider landscape, it is the site's most visible aspect from Hardings Down. Viewshed analysis particularly from the 2m DTM demonstrates that the site's southern enclosing works are its most visible components (Figures 276, 278 and 280). These components have a high visual magnitude. The results from the viewshed analysis, which was based on the 2m DTM, also indicates that the southern banks overshadow the ditches within this area, as they are not visible from the sites on Hardings Down. The photography from the sites on Hardings Down demonstrates that the southern aspect of the site is visible but it is neither clearly distinguishable nor visually prominent (Figures 277, 279, 281).

Figure 276. Results of viewshed analysis from Hardings Down East enclosure towards The Bulwark depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

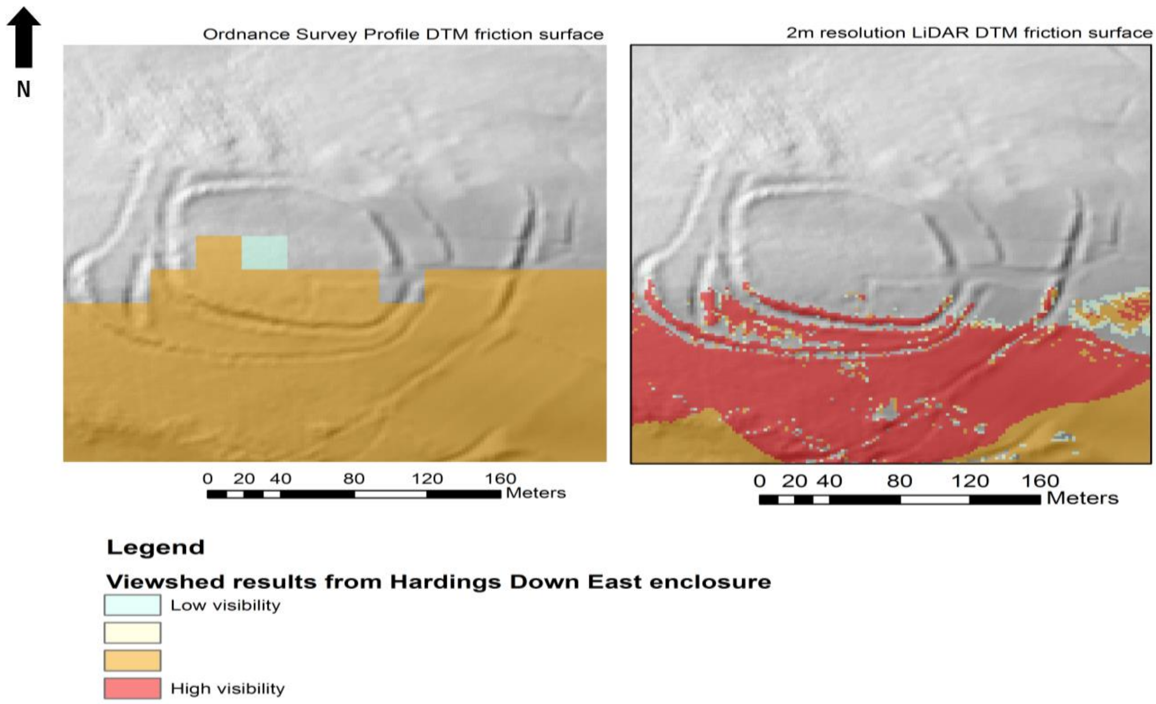


Figure 277. View of The Bulwark from the East Enclosure (Author's own 2013)

Figure 278. Results of viewshed analysis from Hardings Down North enclosure towards The Bulwark depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

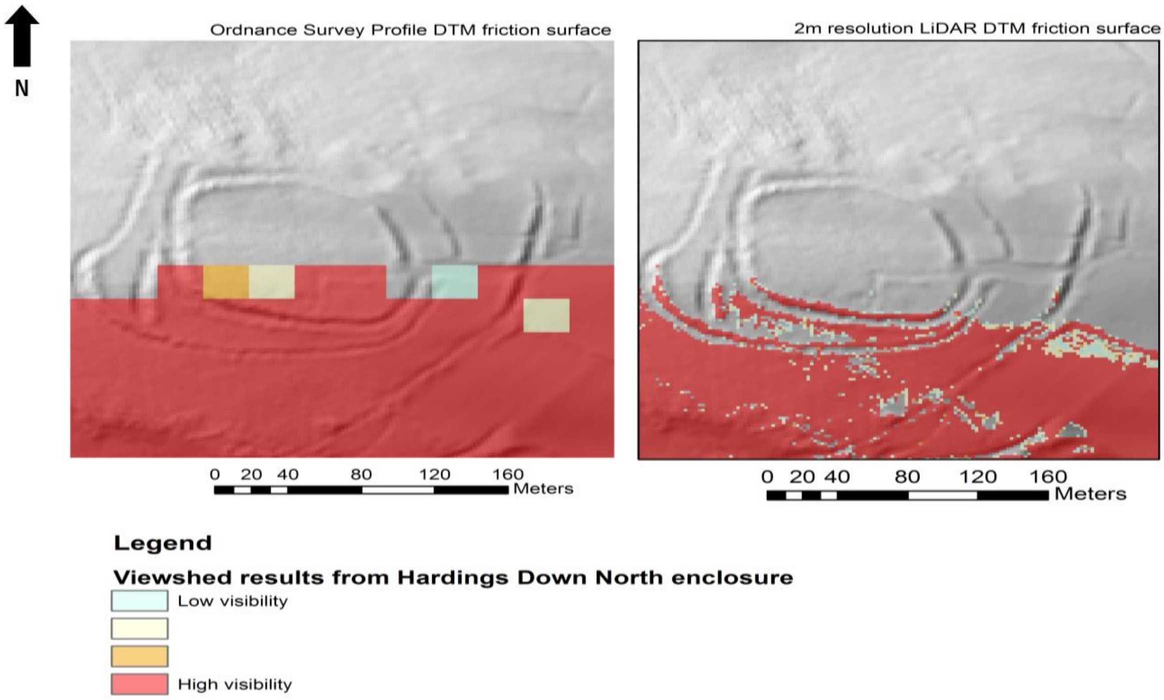


Figure 279. View of The Bulwark from the North Enclosure (Author's own 2013)

Figure 280. Results of viewshed analysis from Hardings Down West enclosure towards The Bulwark depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

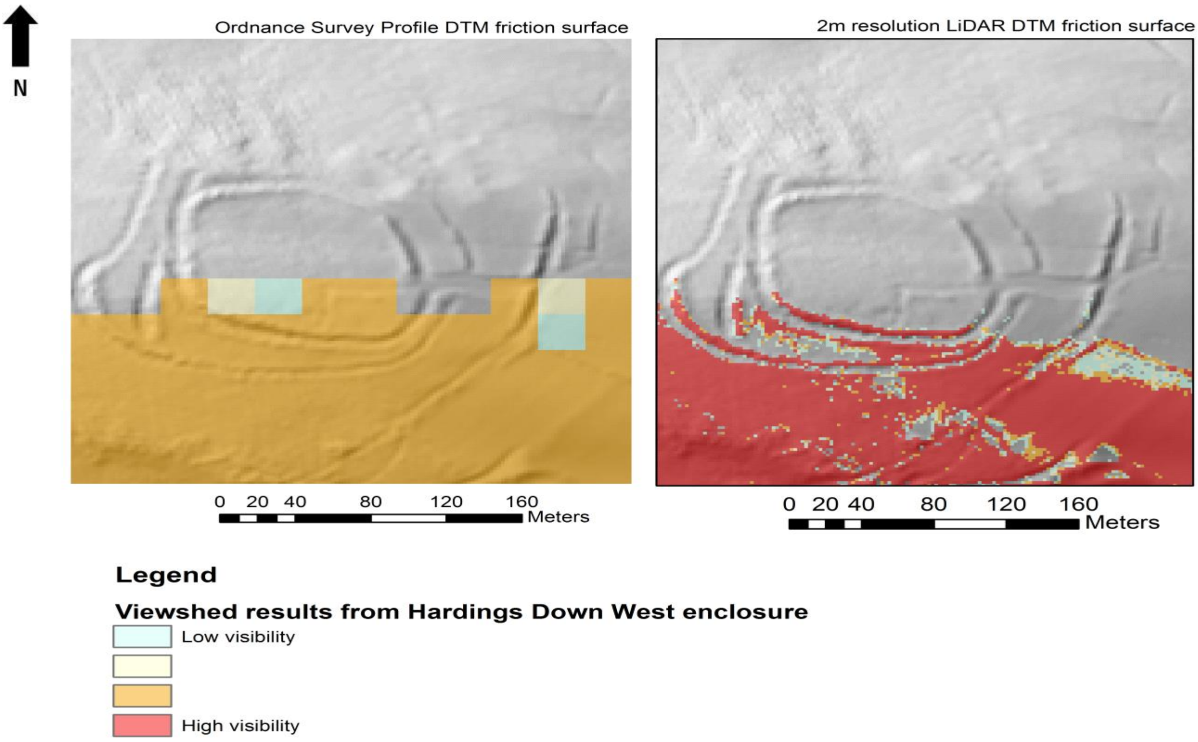


Figure 281. View of The Bulwark from the West Enclosure (Author's own 2013)

Cost surface analysis demonstrates that The Bulwark's image is split in two across this landscape. The routes that have the greatest visibility of the ditch and outer bank follow a very similar route to each other. This demonstrates that these architectural components have similar visual qualities whilst travelling from the sites on Hardings Down (Figures 282-284). The remainder of the site is visible from different areas within the landscape than the ditch and outer bank. These routeways do not follow the line of any distinct topographical or archaeological features.

Figure 282. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of The Bulwark from the North Enclosure overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

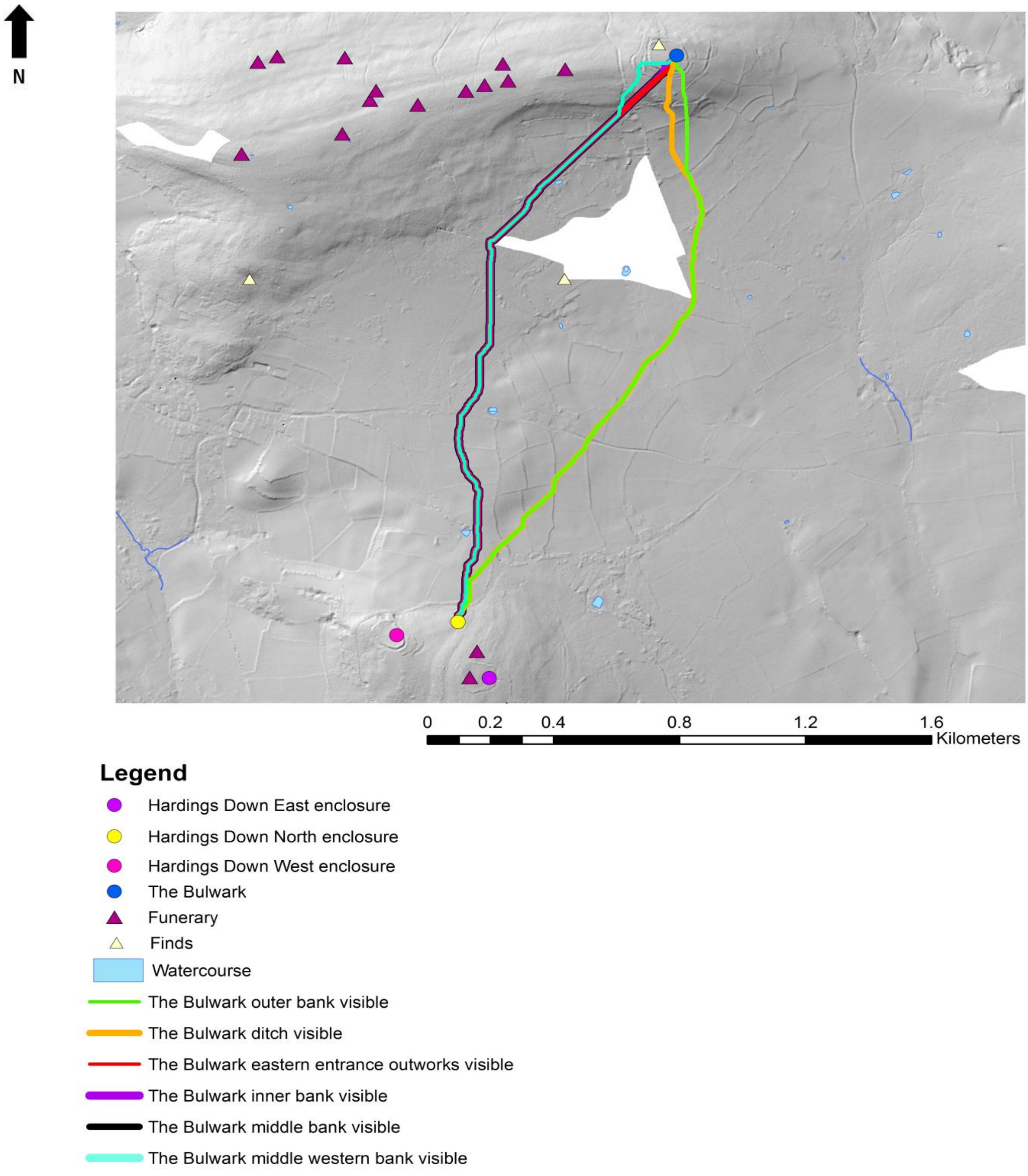


Figure 283. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of The Bulwark from the East Enclosure overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

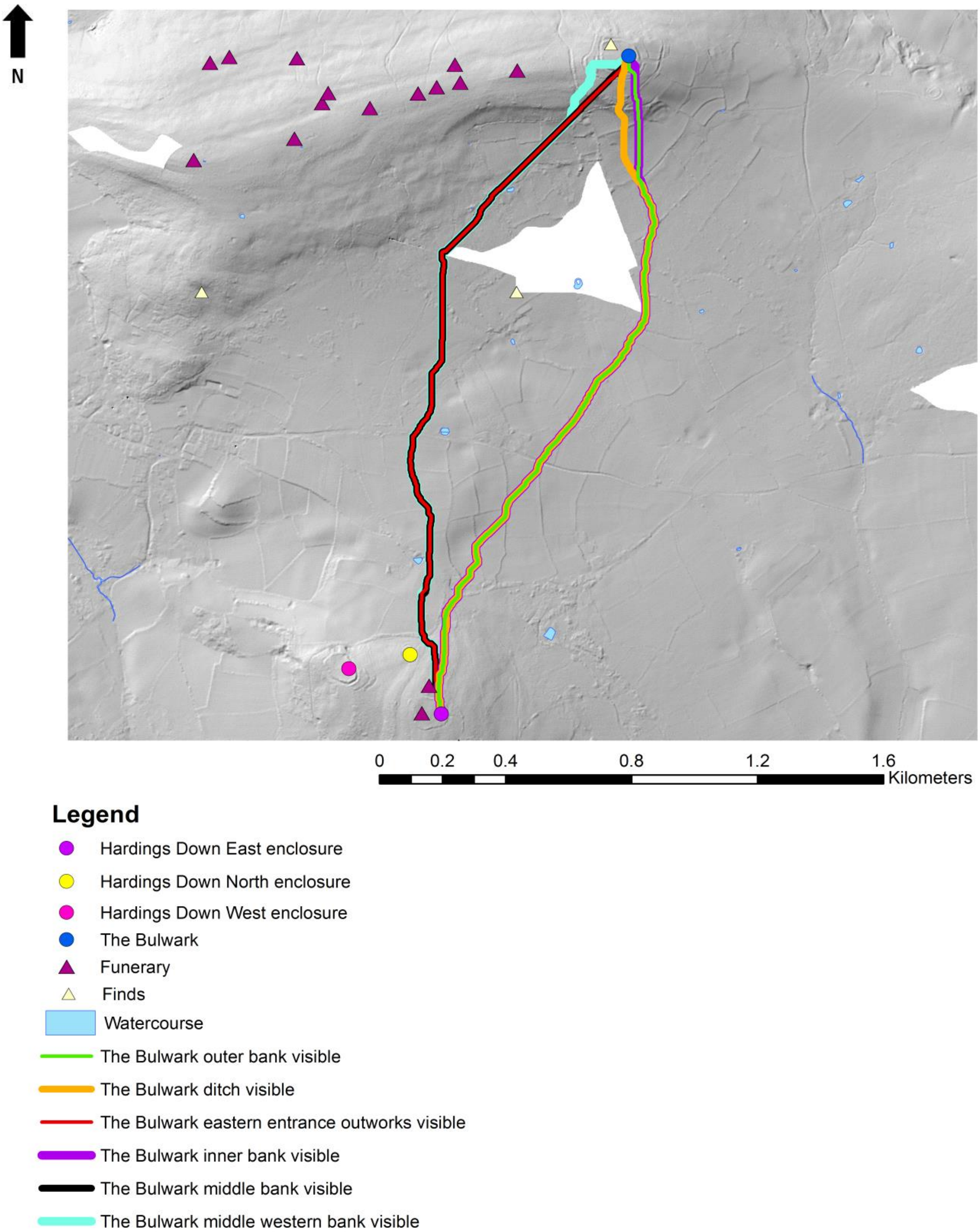
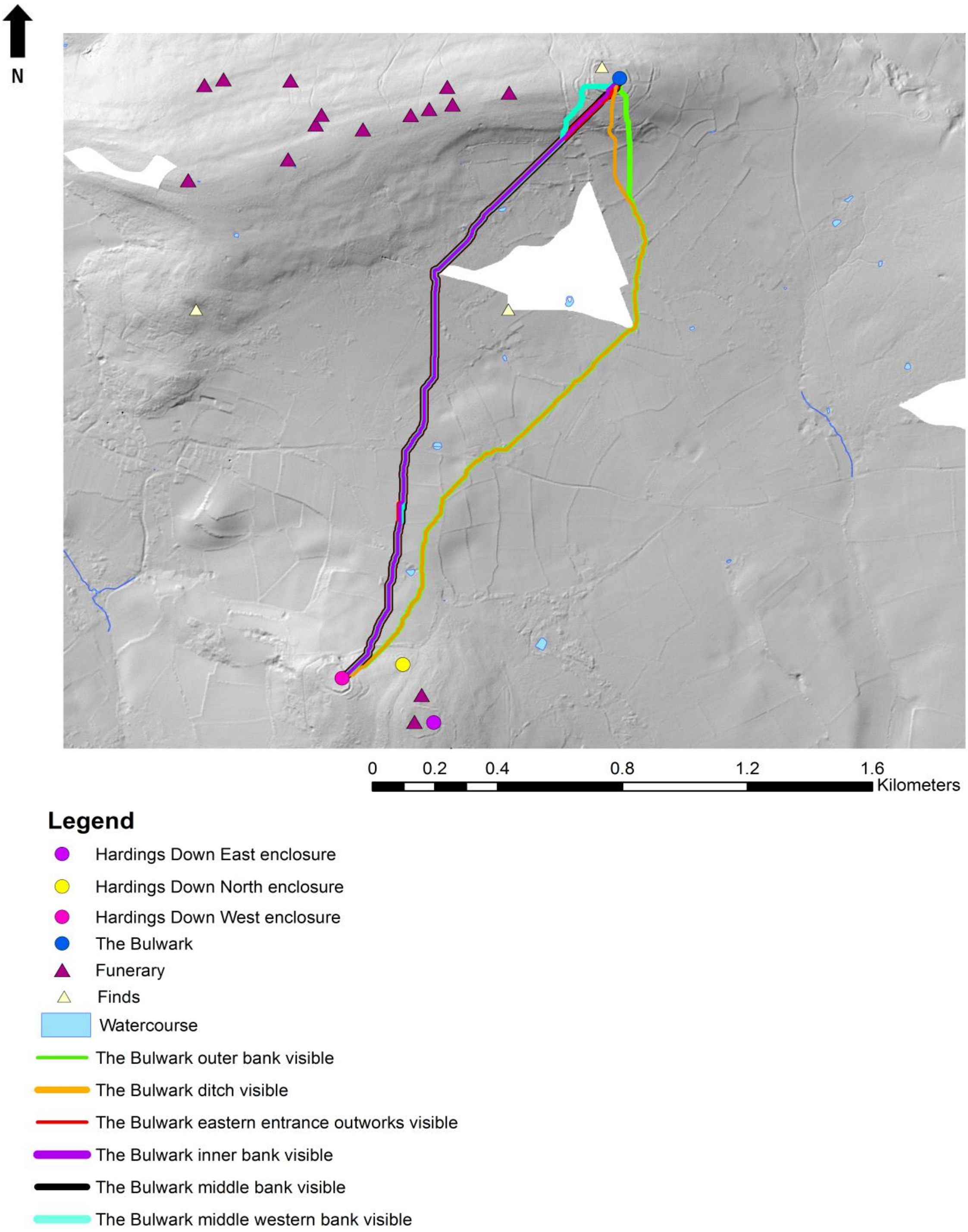


Figure 284. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of The Bulwark from the West Enclosure overlain by HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Correct pathways

238 out of the 250 slope based Ordnance Survey pathways intersect with the eastern and north-eastern aspect of the site, which also includes its entrance (Figure 285). However the results from the LiDAR based DTM intersect with the south (Figure 285). These contradictory results are likely to have been caused by the fact that the LiDAR pathways only travel between the hillforts, whilst the Ordnance Survey based pathways travel from the buffers as well. A section of the LiDAR DTM is also missing which is likely to have influenced the results. The entrance fails to correspond with the majority of the visible or blind pathways; these pathways intersect with the site from the south and north respectively (Figures 286-287).

The paths which interact with The Bulwark and approach/enter the site from the west are the only pathways which coincide with distinct topographical and archaeological features within this landscape (Figure 285 and 287). These slope based (Ordnance Survey DTM) and blind (LiDAR) pathways travel along the western end of Llanmadoc Hill, along the line of a series of barrows.

Figure 285. Results of slope based cost surface analysis to and from The Bulwark. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

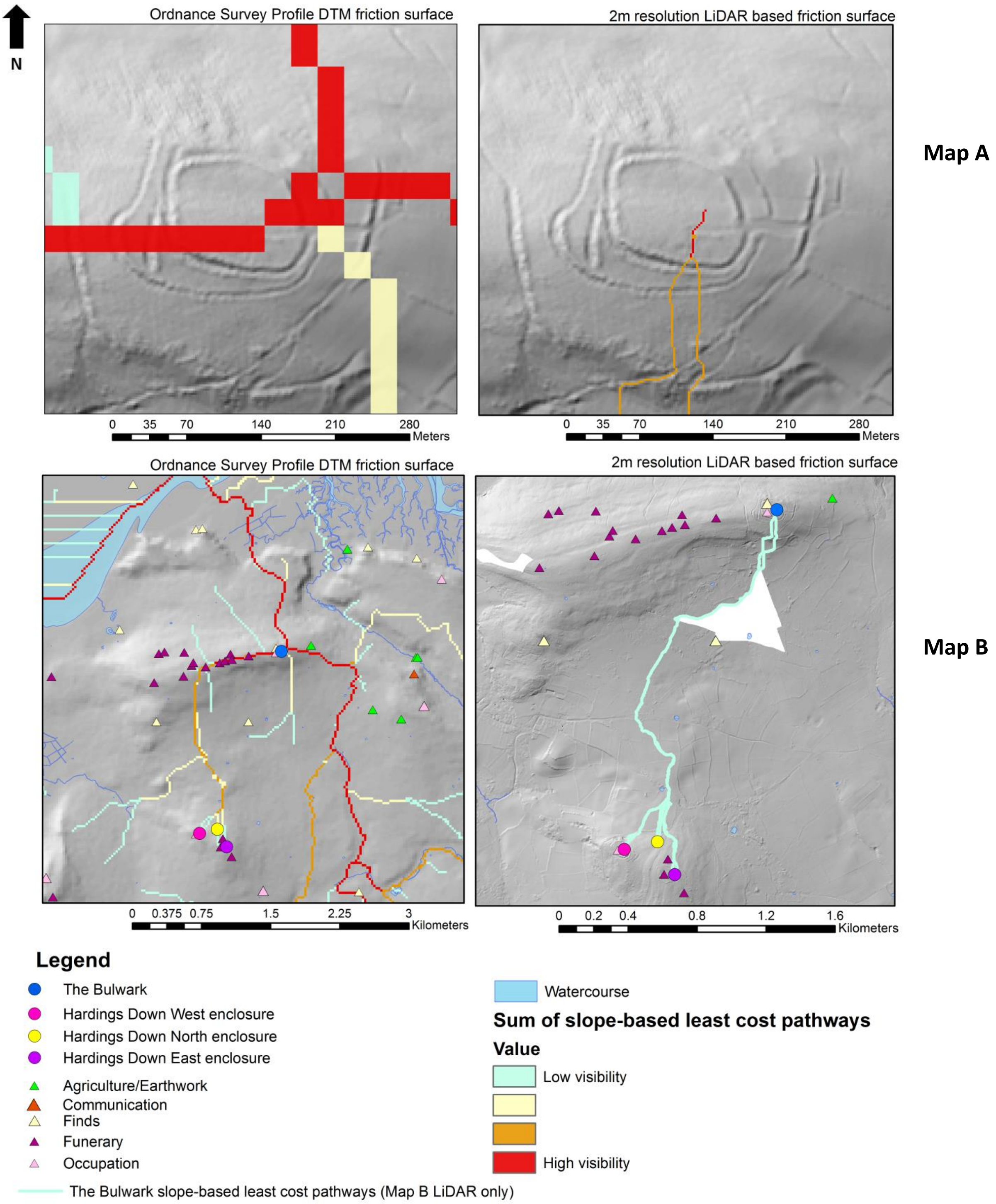


Figure 286. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from The Bulwark. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)

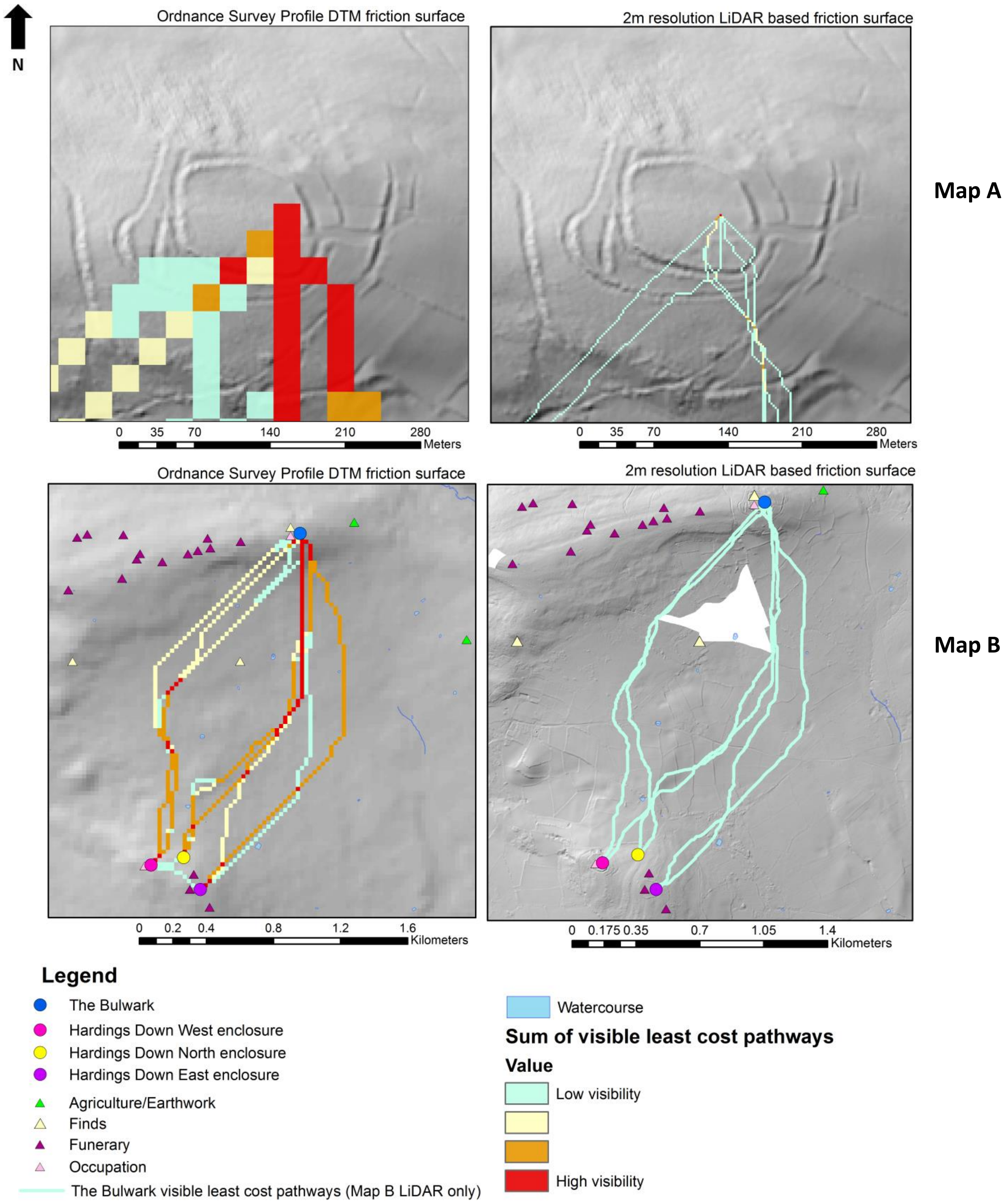
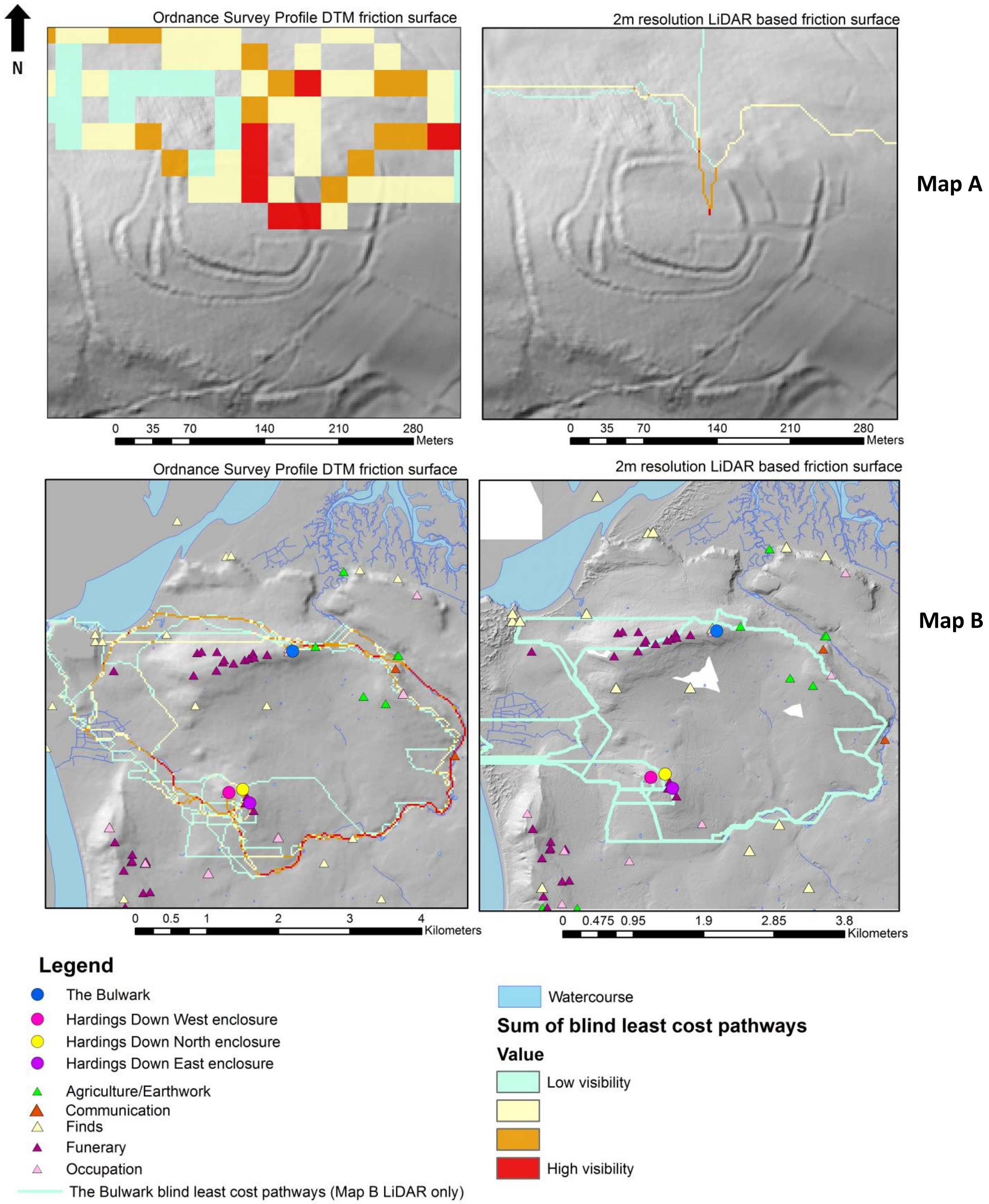


Figure 287. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from The Bulwark. Map A depicts the entry and exit points of the pathways on a site scale, Map B depicts their routes on a landscape scale and is overlain by HER data and watercourses. Cost surface analysis was based upon both the Ordnance Survey and 2m LiDAR resolution DTMs (© Crown Copyright/database right 2009. An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; Glamorgan-Gwent Archaeological Trust 2013)



Concluding site summary

The Bulwark was constructed on a landform, which had established importance within the landscape due to the prior construction of barrows in the Bronze Age. Instead of placing the hillfort close to the barrows, or ensuring that the site had any visual or physical association with them, the morphology of the site completely disassociated itself from it. The physical disassociation of this site from the neighbouring barrows is also accentuated by the construction of a ditch which extends north-south along Llanmadoc Hill. This disassociation could imply that those who constructed The Bulwark did not have a historical understanding of the barrows, instead they associated them with a mythical past (Gosden and Lock 1998). The physical and symbolic disassociation of The Bulwark with this mythical past implies that those who constructed the site potentially feared or were unsure of it. If this was not the case the western side of the site would have been a suitable area to place an entrance. The influence of the past on hillfort location and morphology is explored in Chapter 8 (Pages 532-535)

There is a large amount of occupational evidence at this site in the form of small finds, huts and additional enclosures. This site was a multiple enclosure hillfort; the two enclosures had differing visual qualities; whilst the inner enclosure was relatively visible from the surrounding landscape, the outer enclosure was not. LiDAR based viewshed analysis indicated that the southern portion of the outer enclosure was not visible from the Hardings Down sites, whereas the southern enclosing banks and the southern portion of the inner enclosure was.

The viewshed results indicate that the extensive southern half of this site was the only aspect, which was visible from Hardings Down which implies that the site as a whole was visually closed to its neighbours. The enhancement of the morphology of the site within this area may have been an attempt at portraying an image of strength within a particular area. However the distance between The Bulwark and its desired audience meant that this act of display was potentially not as effective as visual clarity was poor.

The manipulation of image was also seen with the enhancement of the eastern entrance. This enhancement both increased the footprint of the site and formalised movement into it. This created a morphologically based correct pathway. However, it does not correspond with GIS-based correct pathways, which identify that the most accessible route into the site was from the north. The visible and blind pathways intersect with the south and north respectively which supports the viewshed results.

Conclusion

This test area is topographically diverse. It has a combination of coastal plains, ridges and isolated hills. The hillforts were constructed on the ridges and hills. These locations enhanced the visual and physical prominence of the sites, however they are not visually dominant. The North and West enclosures on Harding's Down promote a high degree of visual accessibility from the surrounding lowlands, but The Bulwark and Hardings Down East enclosure do not.

The variable visibility of these sites is strongly influenced by the physical relationship of the site morphologies with the landscape topography. They are hillslope enclosures, which caused a high degree of directionality within their visual relationships. The interiors of the West and North enclosures on Hardings Down are highly visible from the downland to the north and west, as the land slopes in these directions. There is poor intervisibility between the sites on Hardings Down as they slope away from each other.

The sites on Hardings Down are also morphologically orientated away from one and other, this is explored in greater detail in Chapter 8 (Pages 534-535) but it is touched upon below. For example none of the entrances to these sites are located to allow easy access among these sites. In the case of the West enclosure, its most physically prominent aspect faces the East enclosure; this portrays its strongest image towards one of its neighbouring sites. This is also the case at The Bulwark where one of its most elaborate and extensive series of enclosing works is in its most visible area (in relation to Hardings Down). This was not defensively needed as this area is surrounded by the relatively steep slopes of Llanmadoc Hill. The evidence therefore implies that images were manipulated within this landscape. There was a disproportionate allocation of resources to enhance site impressions, which supports Driver's concept of the use of image at sites (2005a, 2013).

The elaboration of site perimeters is further seen with the entrance morphologies at the majority of these sites as they all have passageways which lead to them. These morphological components are physical indicators for the attempt to control and monumentalise movement into and out of these sites. They formed a series of morphologically based 'correct pathways', which was the fundamental underpinnings of Driver's definition of a correct path of movement as they physically controlled how people experienced the sites, this is explored further in Chapter 8 (Pages 529-532). However, this GIS-based study failed to identify any correlation between the GIS-based pathways and the sites' entrances. However, the prominent south-eastern enclosing works of the West enclosure correspond with the blind pathways. This implies that these outworks were potentially placed to surprise travellers and to manipulate their first impressions. This phenomenon was seen at a number of sites within this study such as Castell Tregaron, Pen y Bannau and Cairnmore.

However, this landscape's topography did not form a defined area of movement to guide travellers through this landscape and towards these sites. Unlike the Aberdeenshire, Dartmoor and North Ceredigion landscapes (Chapters 5, 4 and 3) there were no distinct valleys or long hill ranges to form way markers through this landscape. However, topographically defined routeways may not have been as important within this small-scale landscape as it is whilst navigating within much larger landscapes such as that of North Ceredigion. The small travelling distance between these sites meant that visual clarity, once visual accessibility was achieved, would have been quite good, consequently one could navigate by sight alone.

In terms of the overall visibility of the hillforts within this landscape this study has identified two site types: open and closed, both of which have already been explored in Chapter 4 (Page 240) and will also be discussed in Chapters 7 and 8 (Pages 511 and 520-523). Both the West and North enclosures on Hardings Down are visually open to the surrounding landscape. Their morphology and hillside position means that they are not visually imposing from the wider landscape. The closed sites within this area are The Bulwark and the East enclosure. These sites secured the most prominent positions within the landscape that was available to them. Although The Bulwark does not occupy the summit of Llanmadoc Hill, this area had an established importance within the landscape due to the earlier establishment of barrows on the hilltop. There is limited visibility of this site from Hardings Down; the most visible area is also the most extensively enclosed aspect to the site, which portrays an image of strength. The use of symbolism was also demonstrated with the extensive enclosure of the western side of the site. The East enclosure is also a closed site as there is poor visual accessibility from the surrounding landscape, whilst it physically secures the summit of Hardings

Down. This position physically secures a location of strength; such strength is accentuated by the fact that the site is poorly visible.

Whilst the sites within this landscape have varying degrees of visual openness to their surroundings, they all portray very fragmented images to the surrounding landscape. Cost Surface analysis failed to identify strong evidence for the portrayal of complete images of the sites; this meant that access to visual information within this landscape was limited.

The following test area forms a comparative study to that of the Gower, as it is also a relatively subtle landscape but on a much larger scale. This enables the study to investigate how scale influences the visibility, accessibility and morphology of hillforts.

Chapter 7
Warminster

Introduction to the test area

This test area surrounds the modern day town of Warminster in West Wiltshire, which is a region that is highly populated with hillforts (Figure 288). It is situated on the outskirts of the high chalk plain extension of Salisbury Plain (Land Use Consultants 2005). This landscape is a rolling chalk downland which has very few distinctive topographical features (Figure 289). Within the centre of the test area there is a very flat plain which borders the edge of the slight uplands of Salisbury Plain. The sites under investigation are Battlesbury and Scratchbury, which are situated on the outskirts of Salisbury Plain in the east of the region, and Cley Hill, which is in the west and is located on an isolated hill.

There has not been any palaeoenvironmental work undertaken on the hillforts within this test area. However, aerial photographic evidence indicates that prior to the construction of Battlesbury and Scratchbury this area was occupied by field systems (McOmish, Field et al. 2002, 78). This implies that visibility at these sites would not have been hindered by the presence of woodland as it was predominantly an area of agricultural land in later prehistory.

The hillforts of this region are very large in comparison with those of the Gower as their enclosed area ranges from c.10ha to c.22ha. The sites are also spaced more widely apart than those of the Gower with the separation between the sites ranging from c.2km to c.7km. Also unlike the Gower, these sites are situated on the summit of hilltops and consequently do not form hillslope enclosures.

Figure 288. Location of Warminster test area in relation to the overall distribution of hillforts (Atlas of Hillforts in Britain and Ireland Project; EngLaID 2013)

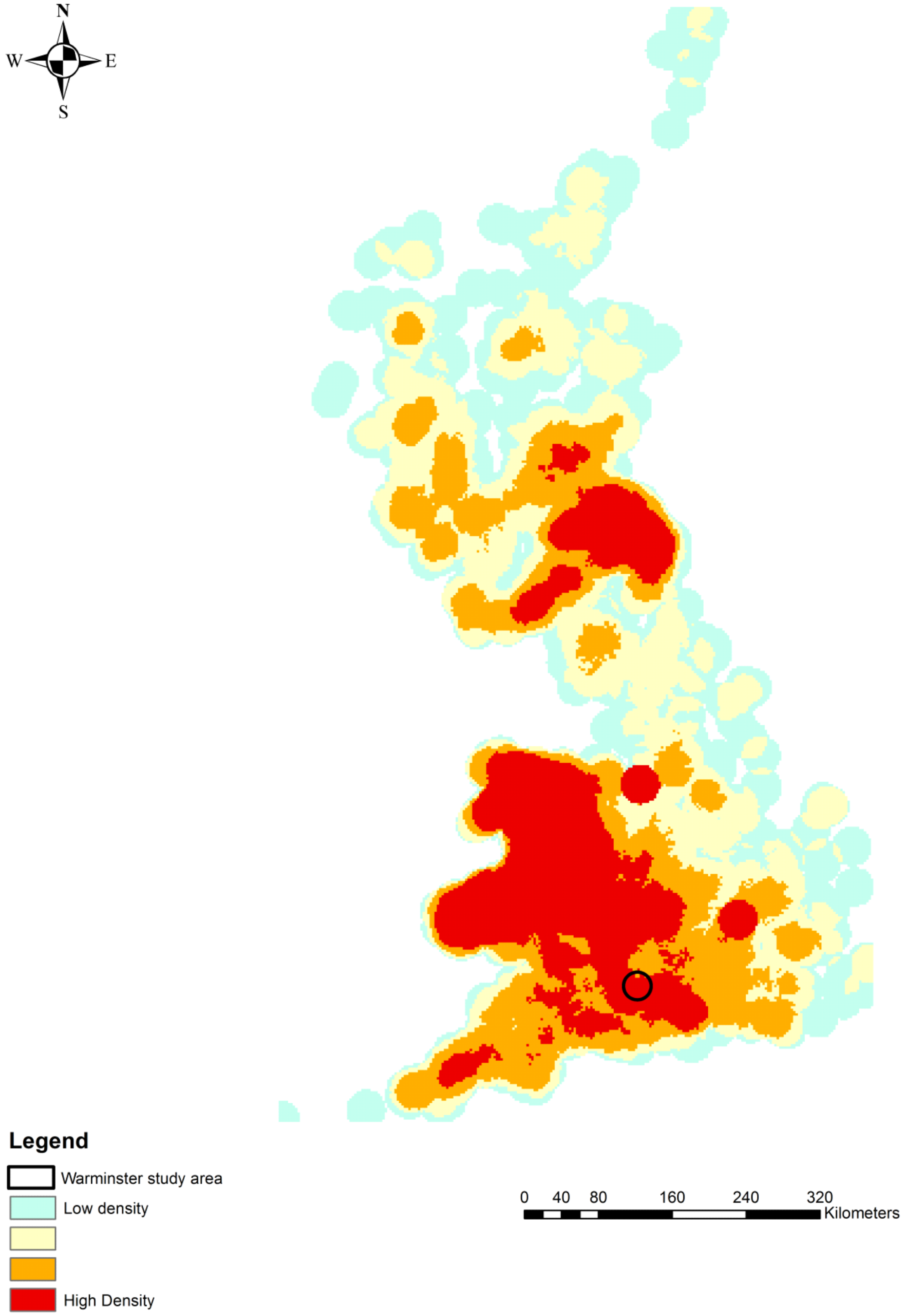
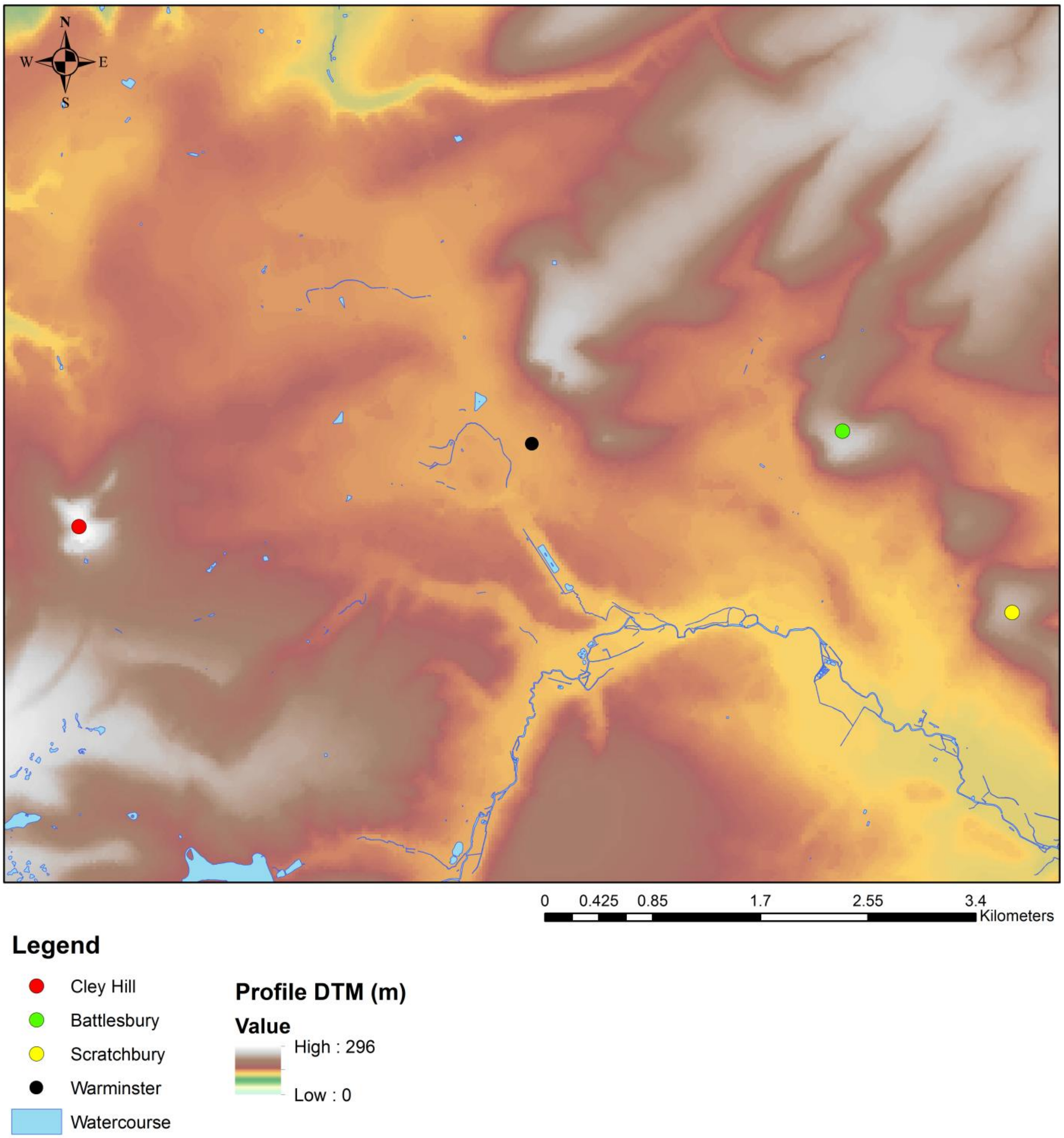


Figure 289. Distribution map of the test area hillforts on the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service)



Data

The available LiDAR data varied in resolution, Battlesbury and Cley Hill had LiDAR data at 50cm resolution whilst Scratchbury had data at 1m resolution. Due to the variable resolutions of the data the decision was made to use the 1m resolution DTM. As with many of the test areas the LiDAR data was initially processed within Landserf and then in ArcMAP, however the ArcMAP hillshade modelling was more effective. The high resolution of the LiDAR data for Cley Hill allowed a better understanding of the morphology of this site which is otherwise poorly understood.

To illustrate the landscape context of the sites in question, HER data for the sites and artefactual evidence within this area was received from the Wiltshire and Swindon Historic Environment Record office. Some of the Wiltshire and Swindon HER point data was imported from the old HER which used AutoCAD. The other data had been cleaned up and was attached to lines and polygons this meant that the graphics within the illustrations surrounding the distribution of HER data is variable.

Site visit

The sites within this test area were visited in September 2013 to undertake an analysis of their locations, morphology and visual qualities. Conditions during the site visits were good and there was relatively clear visibility and low vegetation coverage. In December 2013 the opportunity became available to gain access to the land to the north of Battlesbury, which is usually closed to civilian access.

Analysis

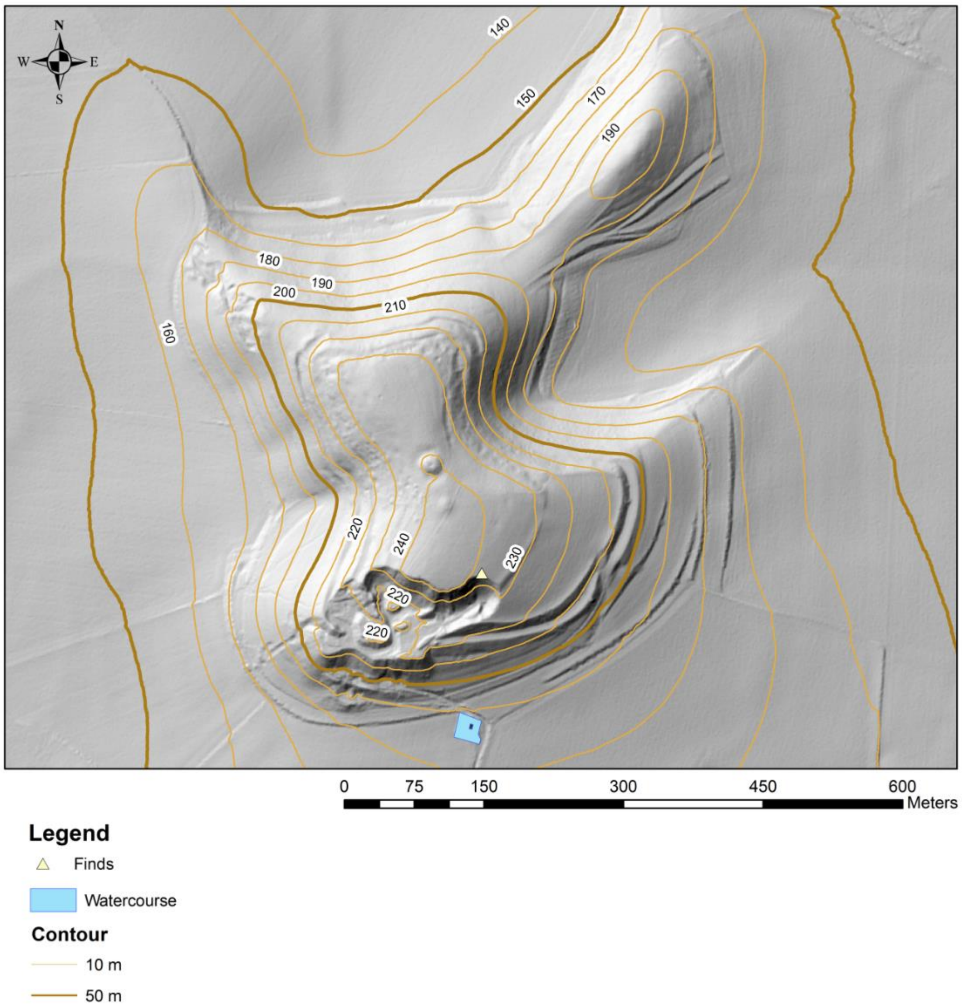
Cley Hill

Site introduction

The enclosing circuit of Cley Hill is no longer complete due to quarry destruction (Figure 290). However, Hoare noted that the site was “surrounded by a ditch and rampart, bearing the marks of high antiquity” (Colt Hoare 1821, 51). This implies that at some point the site was completely enclosed. It has no obvious entrance (Historic England 2015d) and one has never been identified.

There are two barrows in the centre of the hillfort. Grinsell argues that these are Bronze Age in origin (Grinsell 1958); whilst Hoare argued that the hillfort was constructed prior to the barrows (1821). Hoare believed that they were constructed by the same people who inhabited the hillfort and that they were later reused as a beacon (Colt Hoare 1821, 51). As this study will demonstrate, these barrows are visually prominent which meant that they could have functioned highly effective as beacons.

Figure 290. 1m resolution LiDAR hillshade model of Cley Hill, overlain by contours, HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



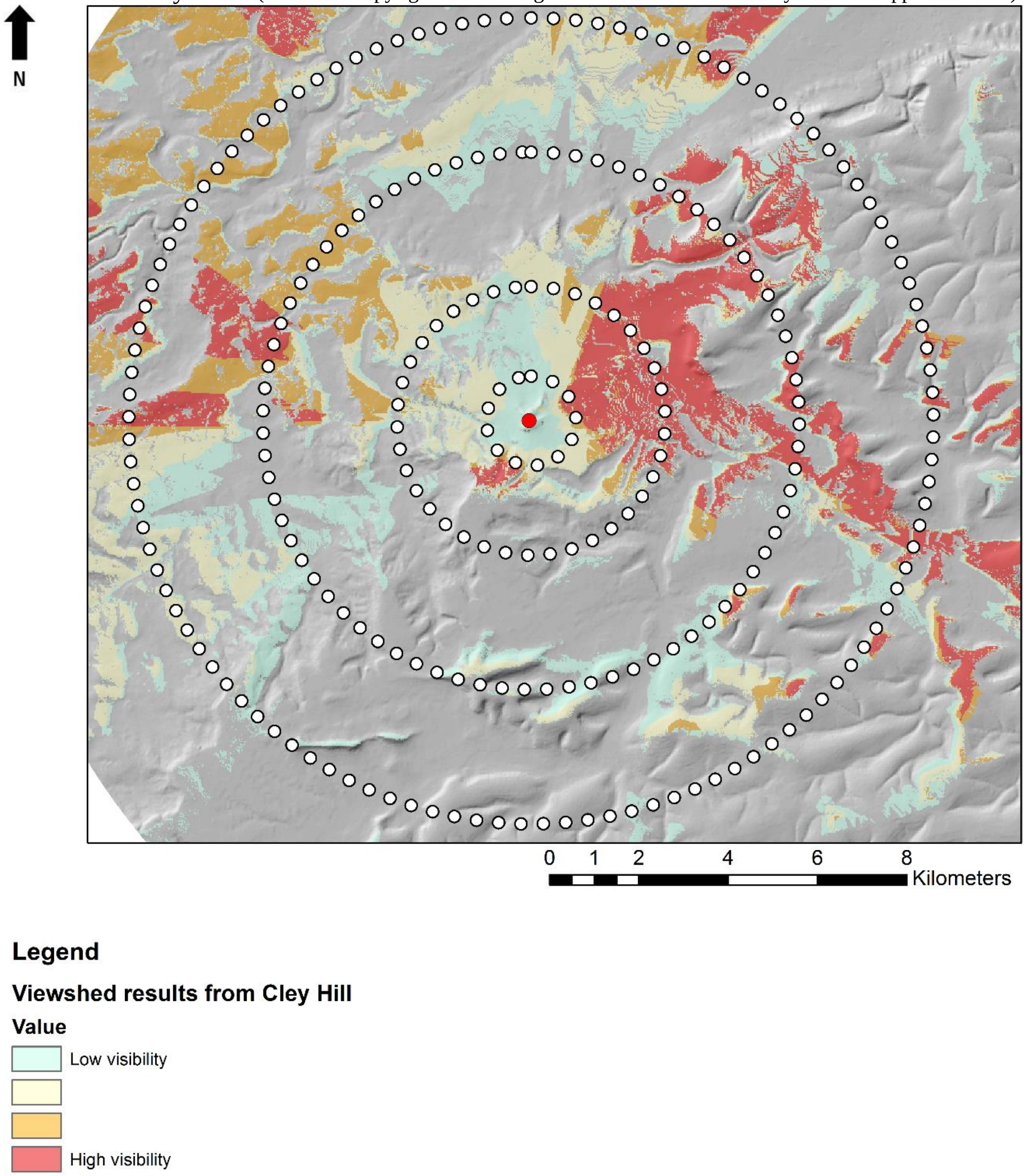
Physical and location with the landscape topography

Cley Hill encloses the entire hilltop but it does not take in the subsidiary hill of Little Cley Hill. Cley Hill is domed and the banks sit downslope from the hilltop. This position physically accentuates the visual prominence of the site's interior from the surrounding landscape. The topographical form of this hilltop also promotes intravisibility across the site, for example from the northern and southern ends of the hillfort the majority of the remainder of the enclosure is visible (Figure 291). However, the intrasite visibility is restricted by the centrally positioned barrows. These features, particularly the larger of the two, are physically and visually prominent within the interior of the main enclosure and from the wider landscape.

The site itself can see the majority of the area within the 1km radius; however it has a very low visual magnitude (Figure 289). Beyond this radius the visual magnitude of the visible areas increases, however the areas that can be seen become more scattered. The site has very limited visibility to the areas to the south of it. The most visible areas beyond the 1km radius are to the east and west of the site.

Figure 291. View to the northern remainder of the hillfort interior from the south, barrow obstructing view (Author's own 2013)

Figure 292. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Cley Hill as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service)



Image

From the 1km radius the entire site is visible (Figure 293). Although the viewshed results from this radius imply that the hillfort was highly visible from within this area, the photography which was undertaken from the surrounding landscape portrays a more fragmented image of the site (Figures 294-297). These pictures illustrate that although the banks which enclose this site were positioned downslope from the hillfort, they are the most visually imposing aspect of the site's image (Figures 295-297). Visibility into the site is restricted largely to the edge of the hilltop. The centralised barrows are also very visually dominant from Viewpoint 16, which is to the south-west of Cley Hill (Figure 295).

From the 3km radius the visual accessibility of the site increases, there is also an overall increase in visual magnitude (Figure 293). The entirety of the hillfort can be seen; however the eastern and northern halves of the site are its most visible aspect. These areas have a visual magnitude within the upper quartile range. The visual prominence of the eastern aspect of the hillfort was illustrated from Viewpoint 13 (Figure 298). Although the eastern aspect of the site is visually dominant, the actual hillfort is not the most visually imposing aspect; this is the topographical landform itself.

Figure 293. Results of viewshed analysis from the radii towards Cley Hill depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

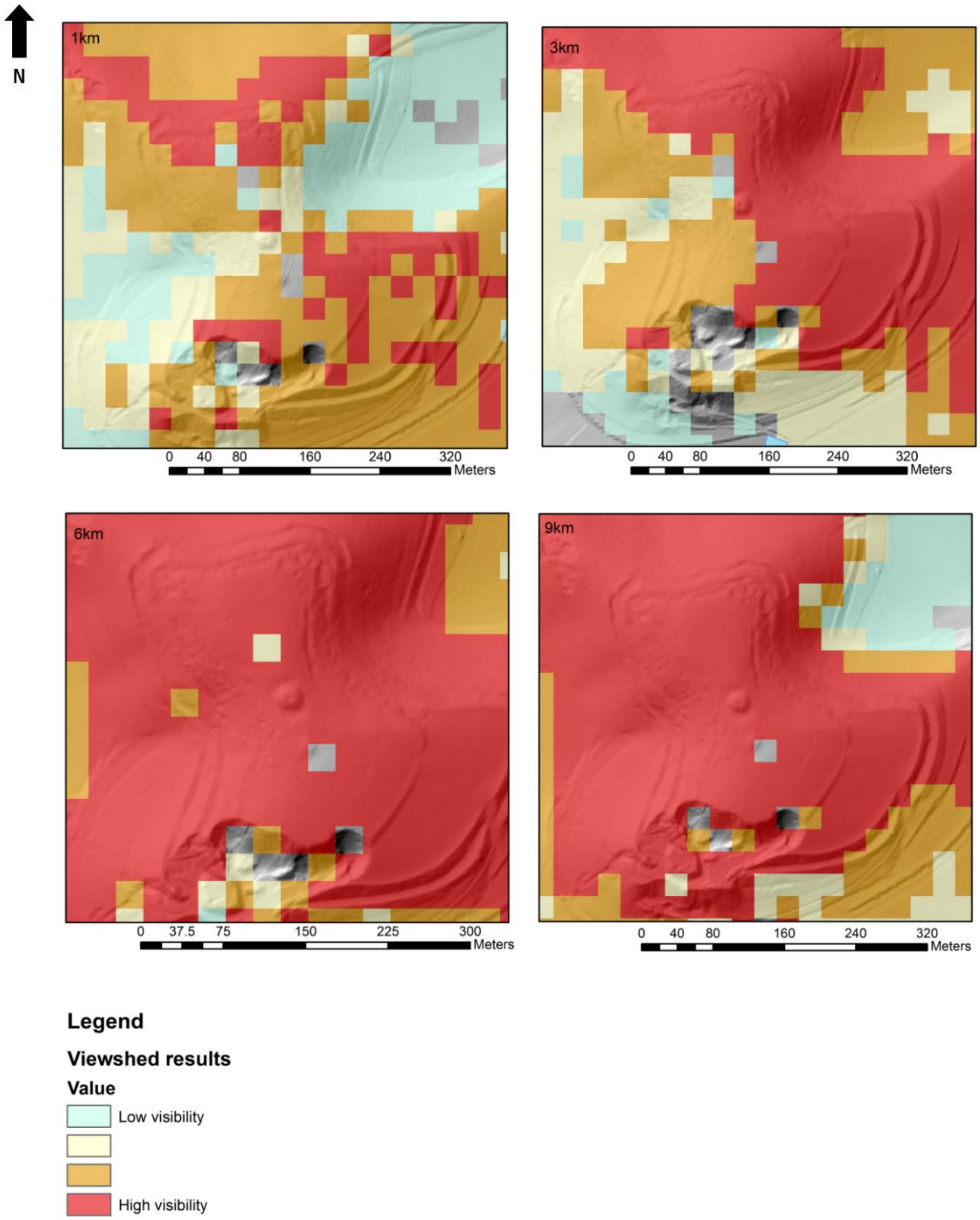


Figure 294.Location of viewpoints in relation to Cley Hill (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service)

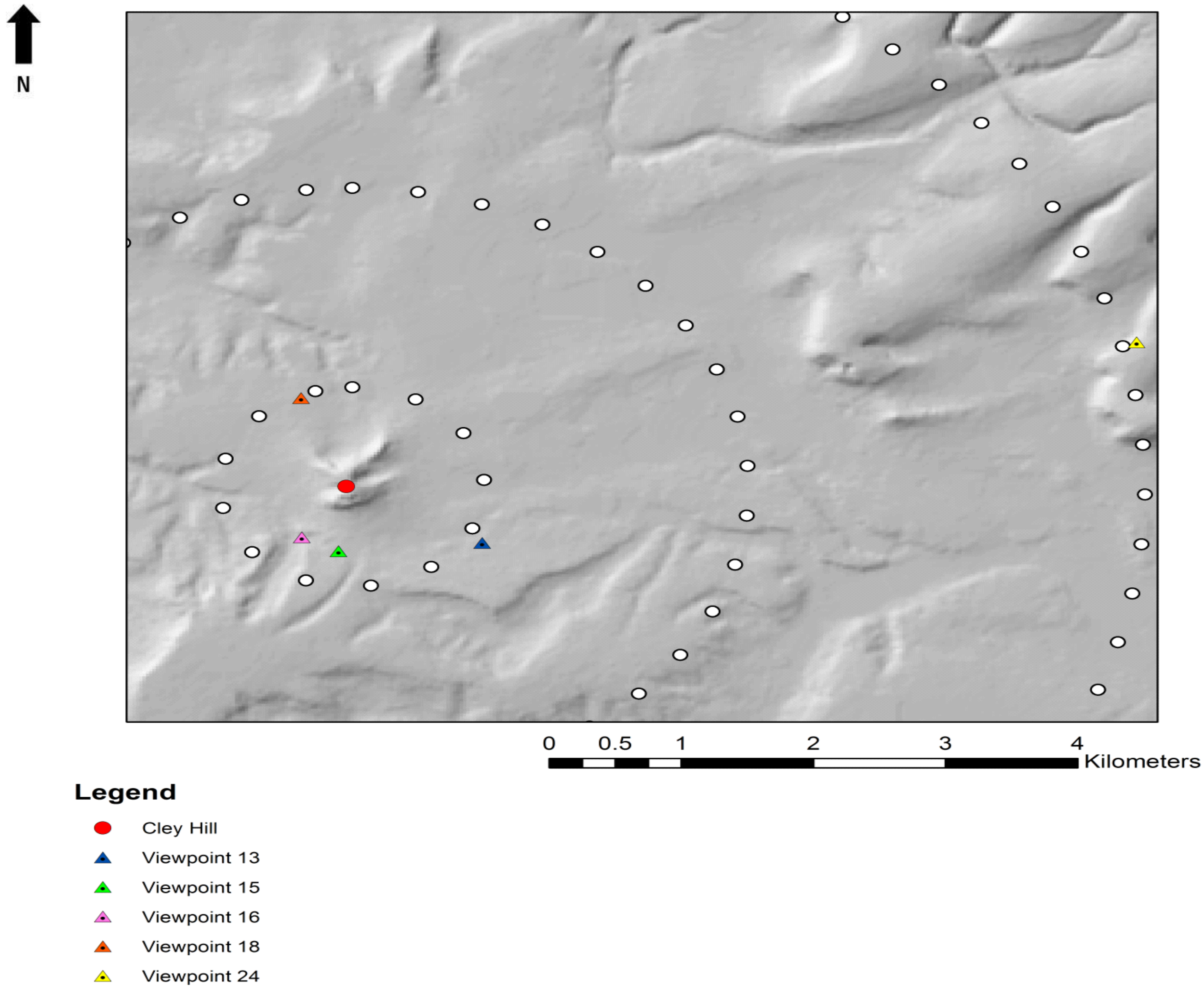


Figure 295. View of Cley Hill from Viewpoint 16, 612m to the south-west of the site (Author's own 2013)

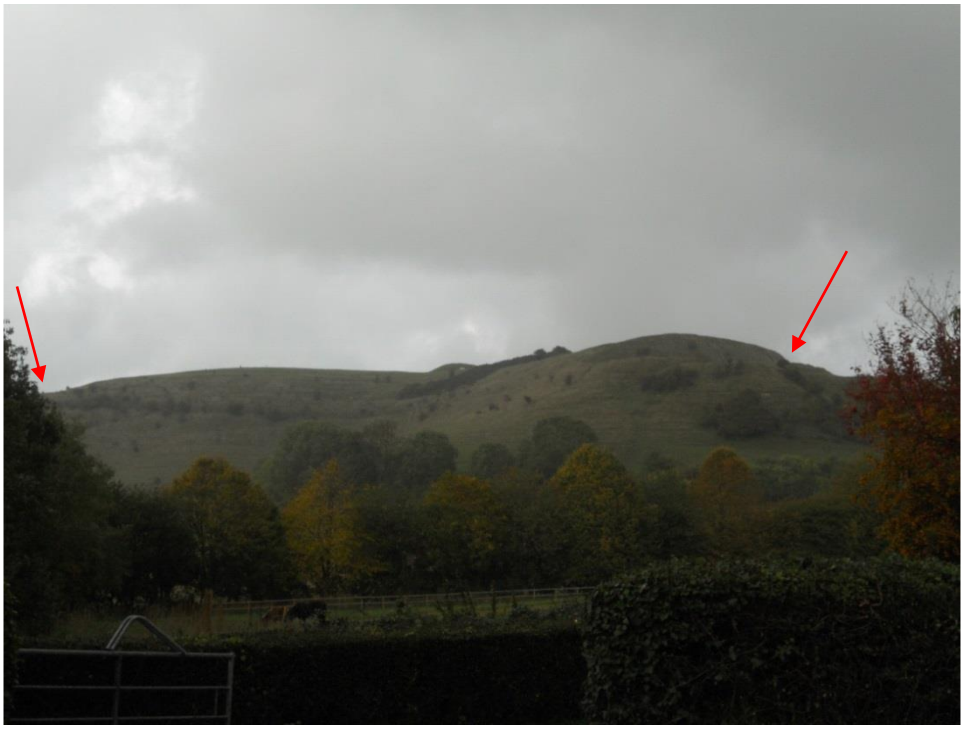


Figure 296. View of Cley Hill from Viewpoint 15, 651m to the south of the site. Quarry destruction is clearly visible (Author's own 2013)

Figure 297. View of Cley Hill from Viewpoint 18, 950m to the north-west of the site (Author's own 2013)

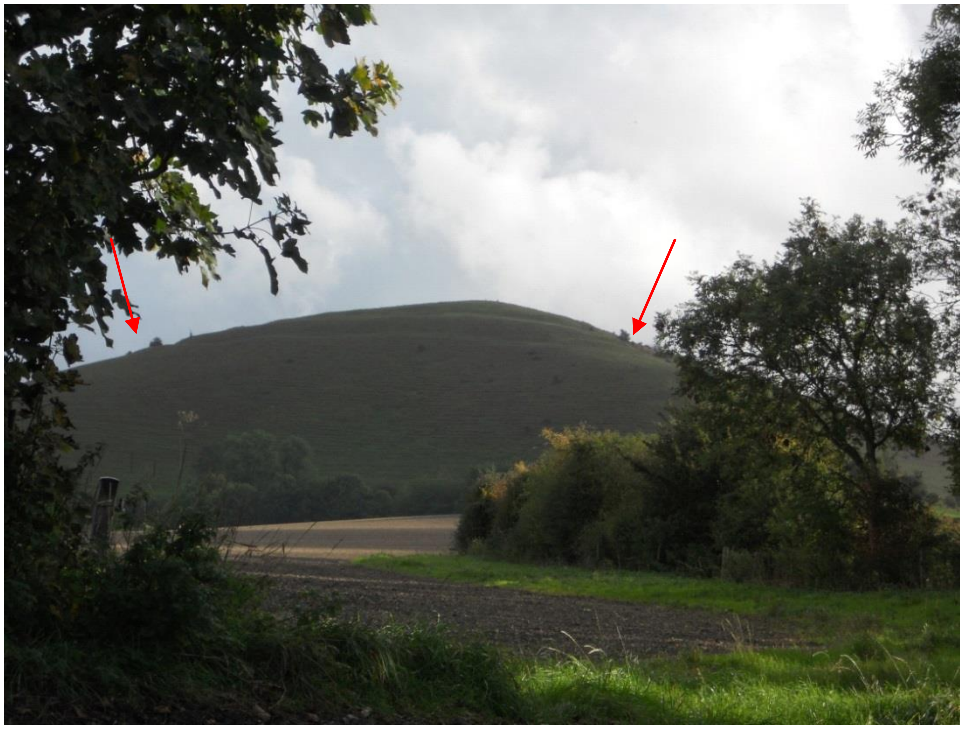


Figure 298.View of Cley Hill from Viewpoint 13, 1.2km to the south-east of the site (Author's own 2013)

Between the 3km and 6km radii the visibility of Cley Hill increases (Figure 293). From the 6km radius the majority of the site is visible and it has a visual magnitude within the upper quartile range. The area of least visibility is the quarried out south-western corner of the site, this is caused by the quarrying within this area. These viewshed results were largely supported by the observations from Viewpoint 24 (Figure 299). From this location the eastern side of Cley Hill and the central barrow are visually prominent. However, the distance between this location and the site meant that visual clarity was poor and the enclosing works were not easily discernible. The site remains highly visible from the 9km radius (Figure 293). The majority of the interior is visible and it has a visual magnitude between the 75th and 100th percentile.

Figure 299.View of Cley Hill from Viewpoint 24, 6km to the north-east of the site (Author's own 2013)

Cley Hill is also highly visible from the neighbouring hillforts of Scratchbury and Battlesbury (Figure 300 and 302). However, only the eastern aspect of this site is visible from these sites. The site photography demonstrates that although the site is visible and it is dominant in the skyline, the distance between the sites meant that the site's morphological components are not clearly discernible (Figures 301 and 303).

Figure 300. Results of viewshed analysis from Battlesbury towards Cley Hill depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

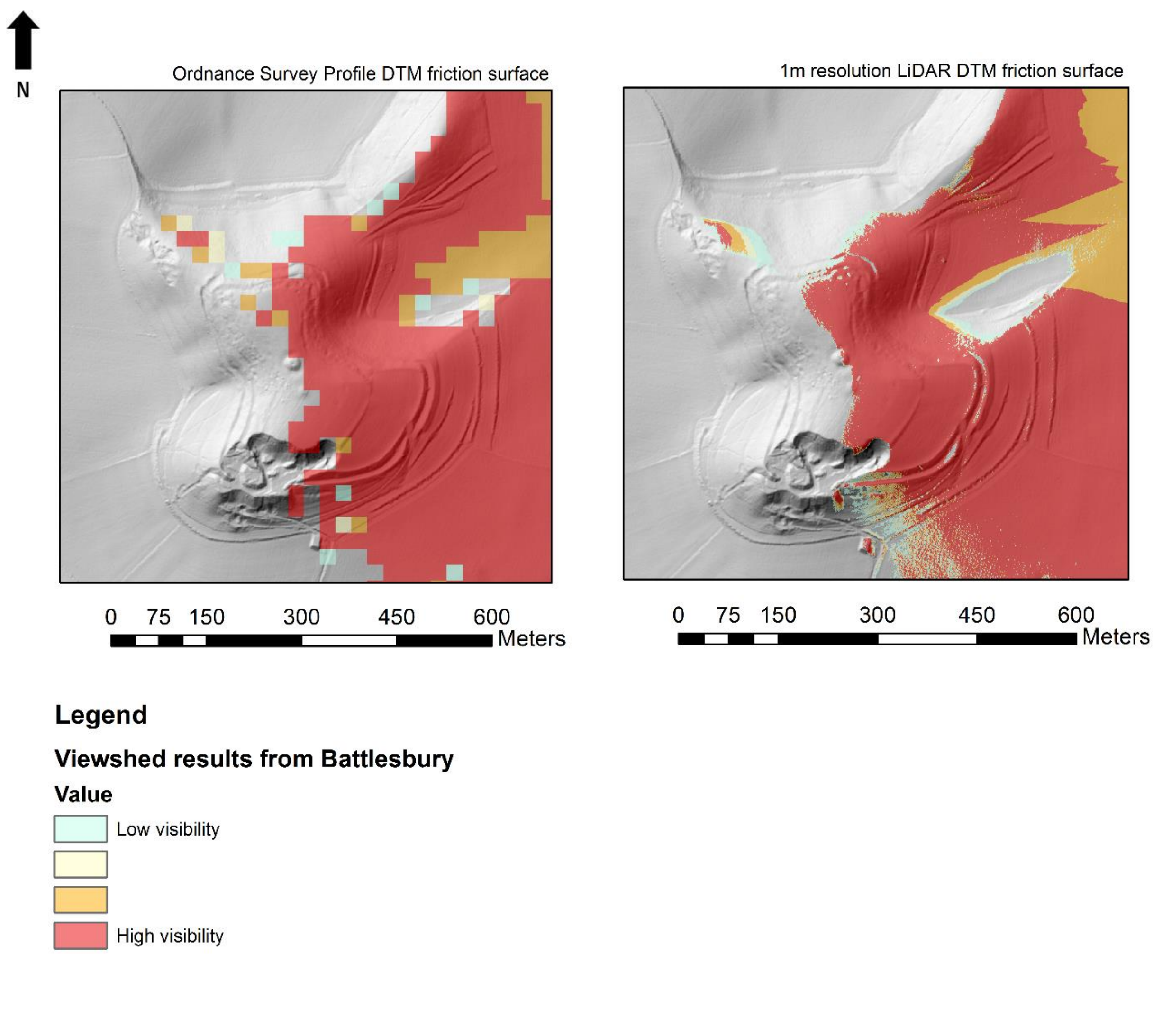


Figure 301. View of Cley Hill from Battlesbury (Author's own 2013)

Figure 302. Results of viewshed analysis from Scratchbury towards Cley Hill depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

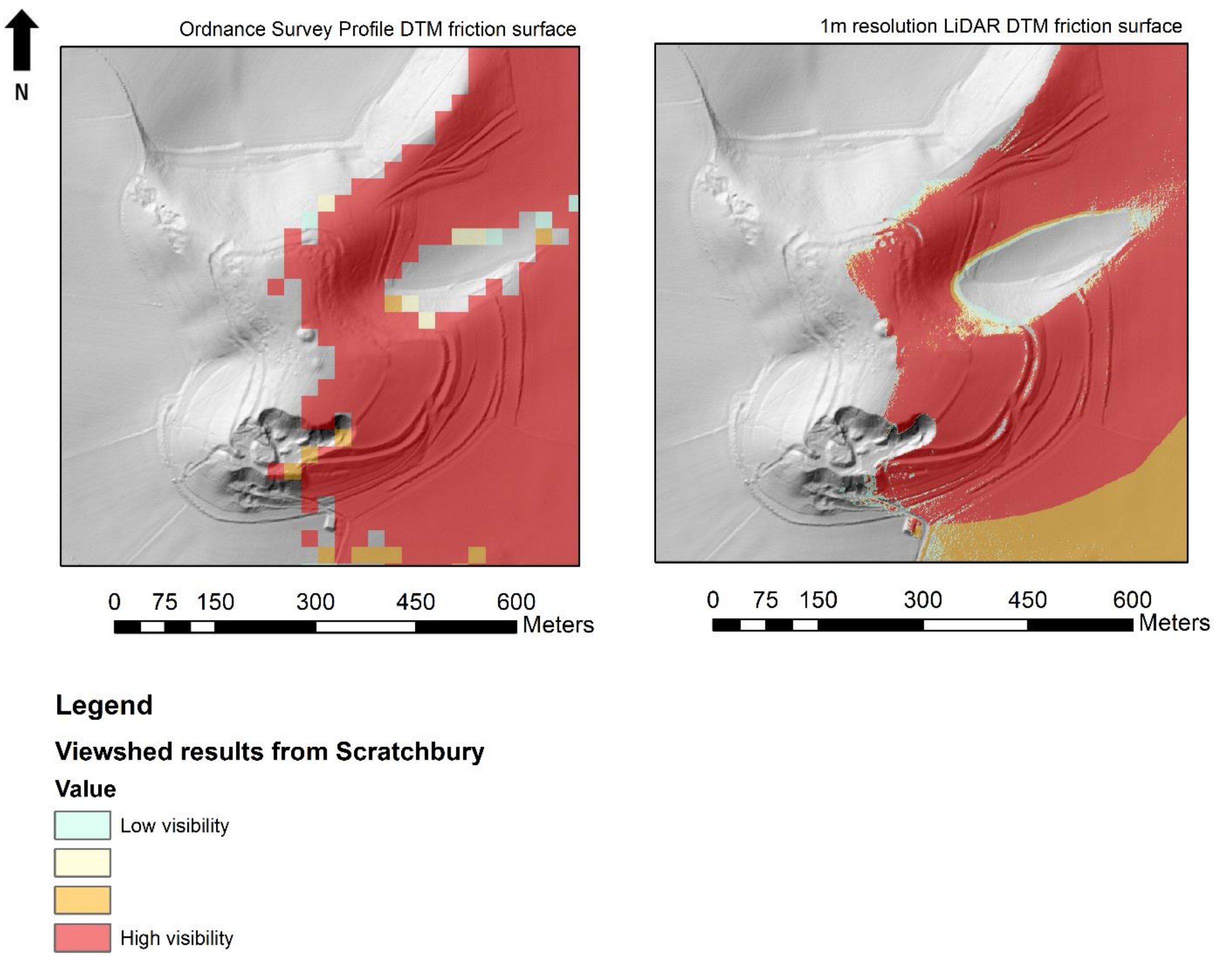


Figure 303. View of Cley Hill from Scratchbury (Author's own 2013)

Cost surface and viewshed analysis also demonstrates that this site portrays a very fragmented image to the surrounding landscape. It was not possible to travel towards Cley Hill from Battlesbury (Figure 301) and Scratchbury (Figure 302) and to maintain a complete image of the site.

Figure 304.Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of Cley Hill whilst travelling from Battlesbury overlain by HER data and watercourses (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; (© Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)

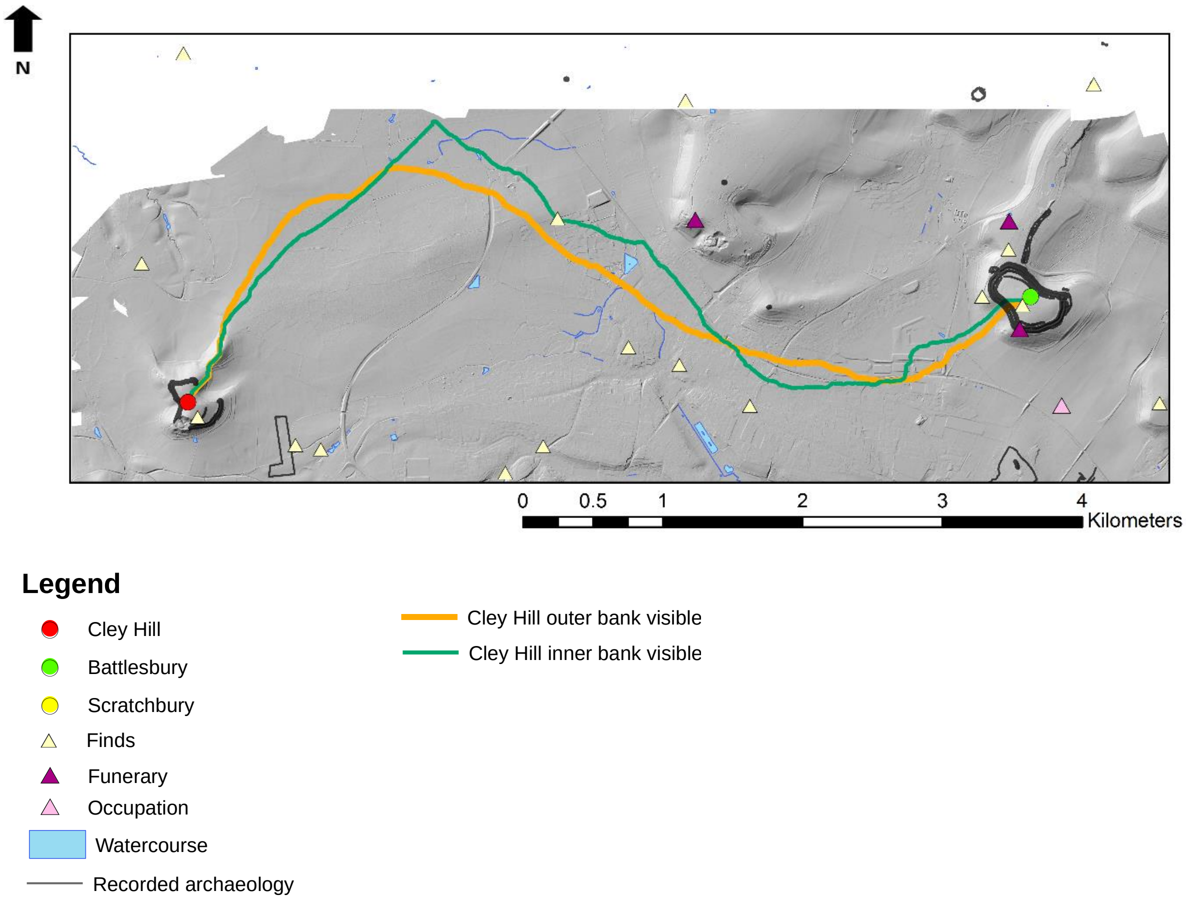
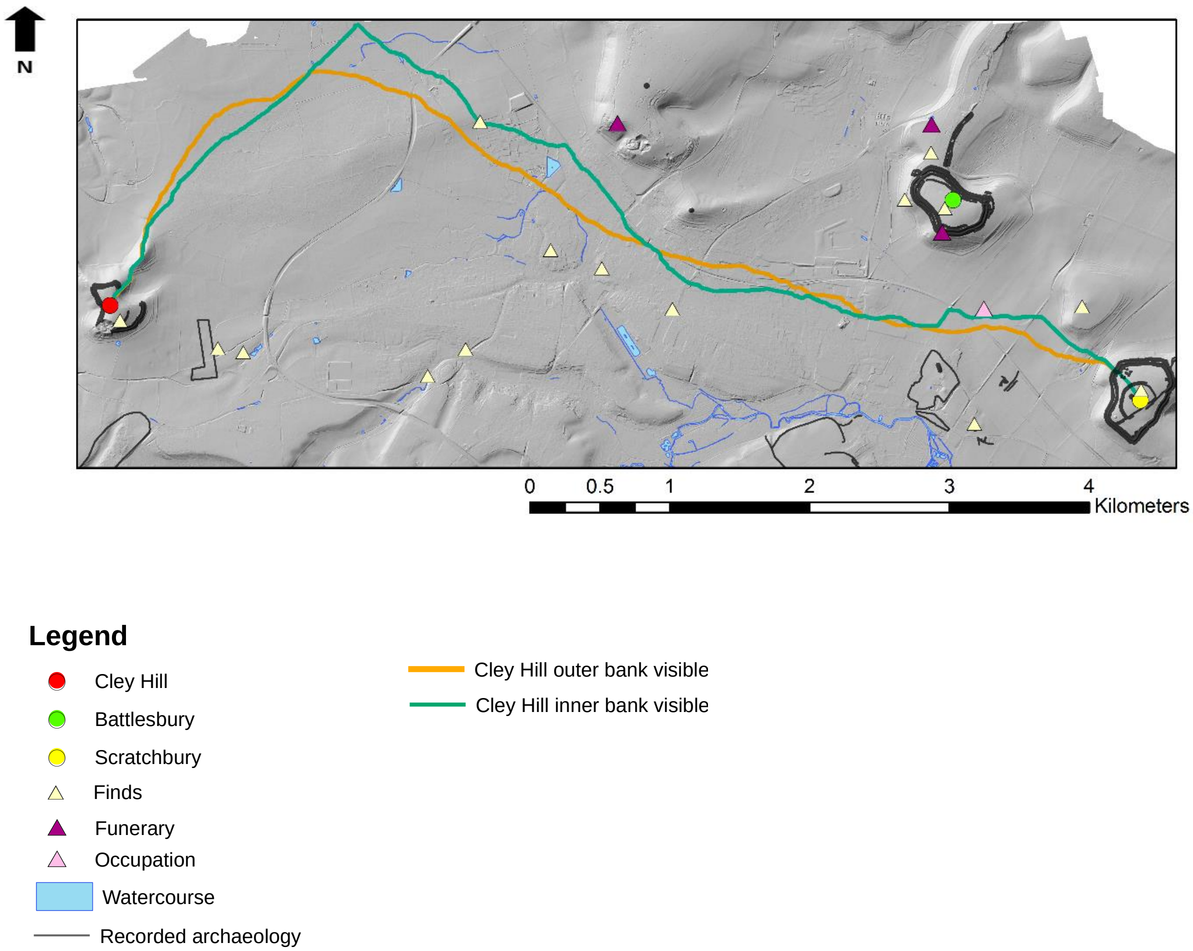


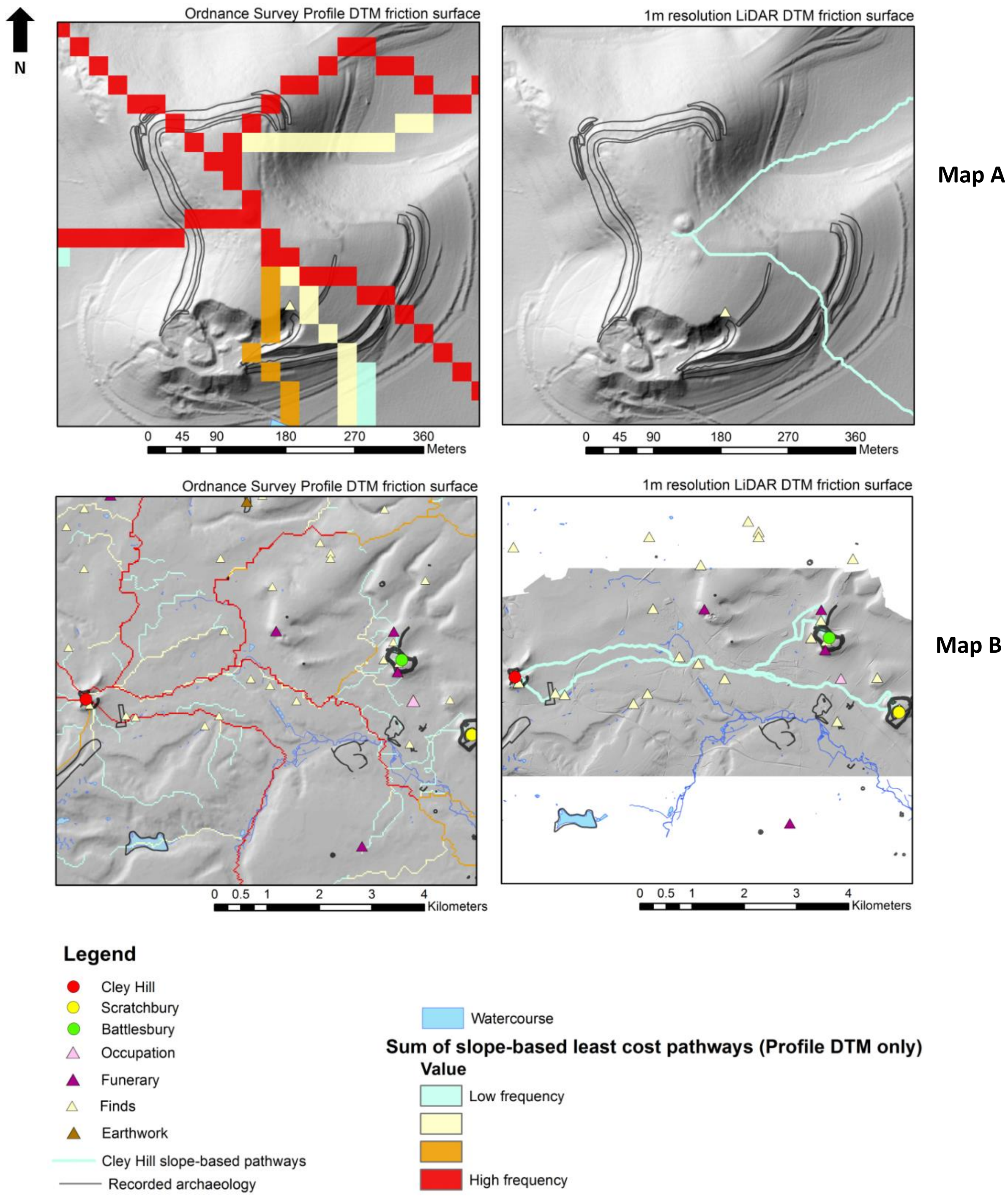
Figure 305.Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of Cley Hill whilst travelling from Scratchbury overlain by HER data and watercourses (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; (© Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



Correct pathways

Cost surface analysis demonstrates that the easiest route into or out of the site in terms of slope based pathways is via the site’s north-eastern corner. 107 out of 247 pathways use this area of the site (Figure 306). These pathways also travel past Little Cley Hill. There is no distinctive correlation of these pathways with any known, substantial archaeological features.

Figure 306. Results of slope based cost surface analysis to and from Cley Hill. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



As with the slope-based least cost pathways there is no major correlation of the visual pathways with any archaeological sites except small finds. The most visible entry and exit points to this site were from both the north-east and east (Figure 307). These points of entry and exit do not coincide with any distinct morphological features of the site. The blind pathways enter and exit the site primarily via its south-western aspect (Figure 308). This is likely to have been influenced by the fact that in the south-west there has been a lot of quarrying, which hinders the visibility to the site. This caused the pathways to favour this entry and exit point. These results therefore have to be taken with caution.

Figure 307. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Cley Hill. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)

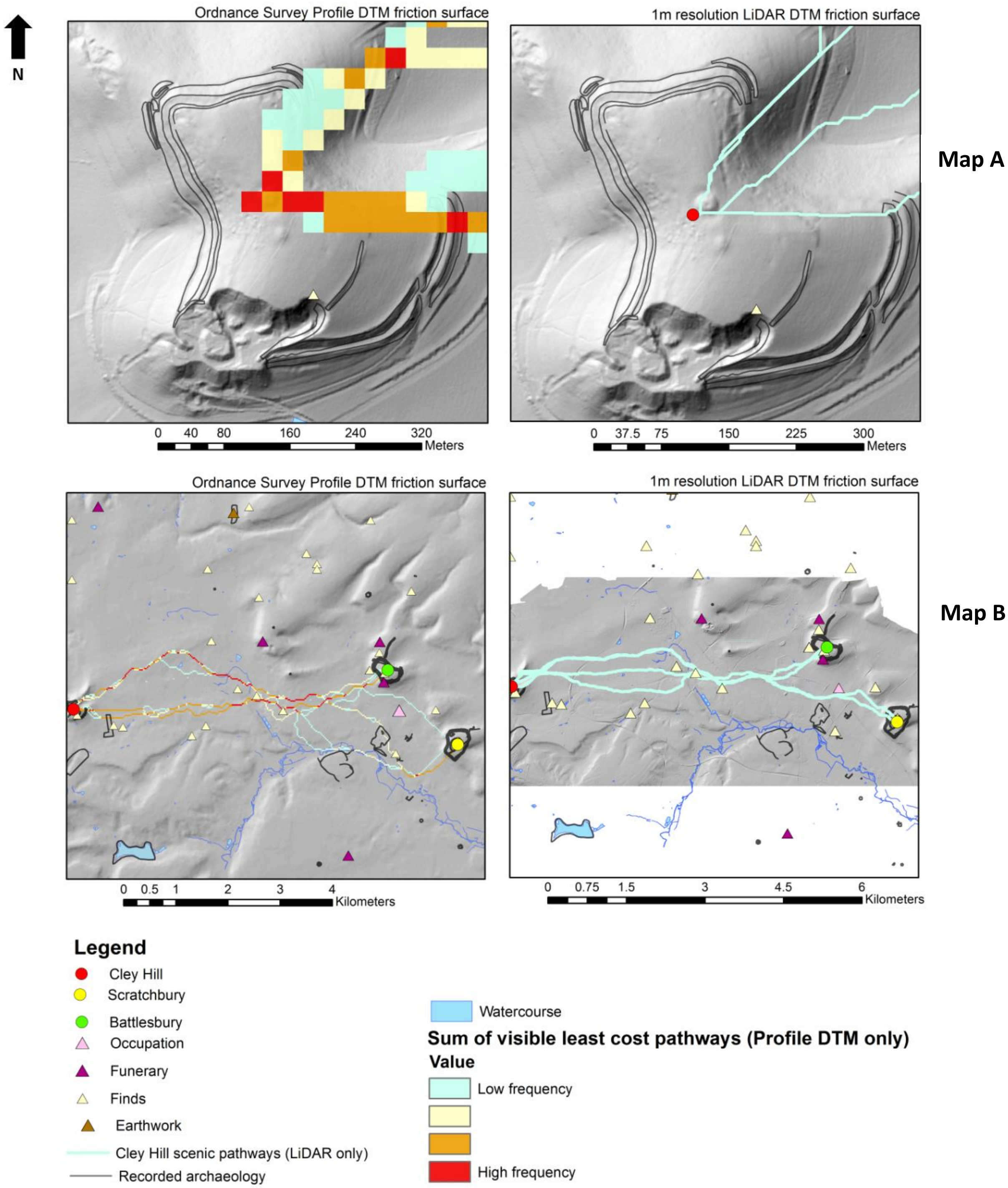
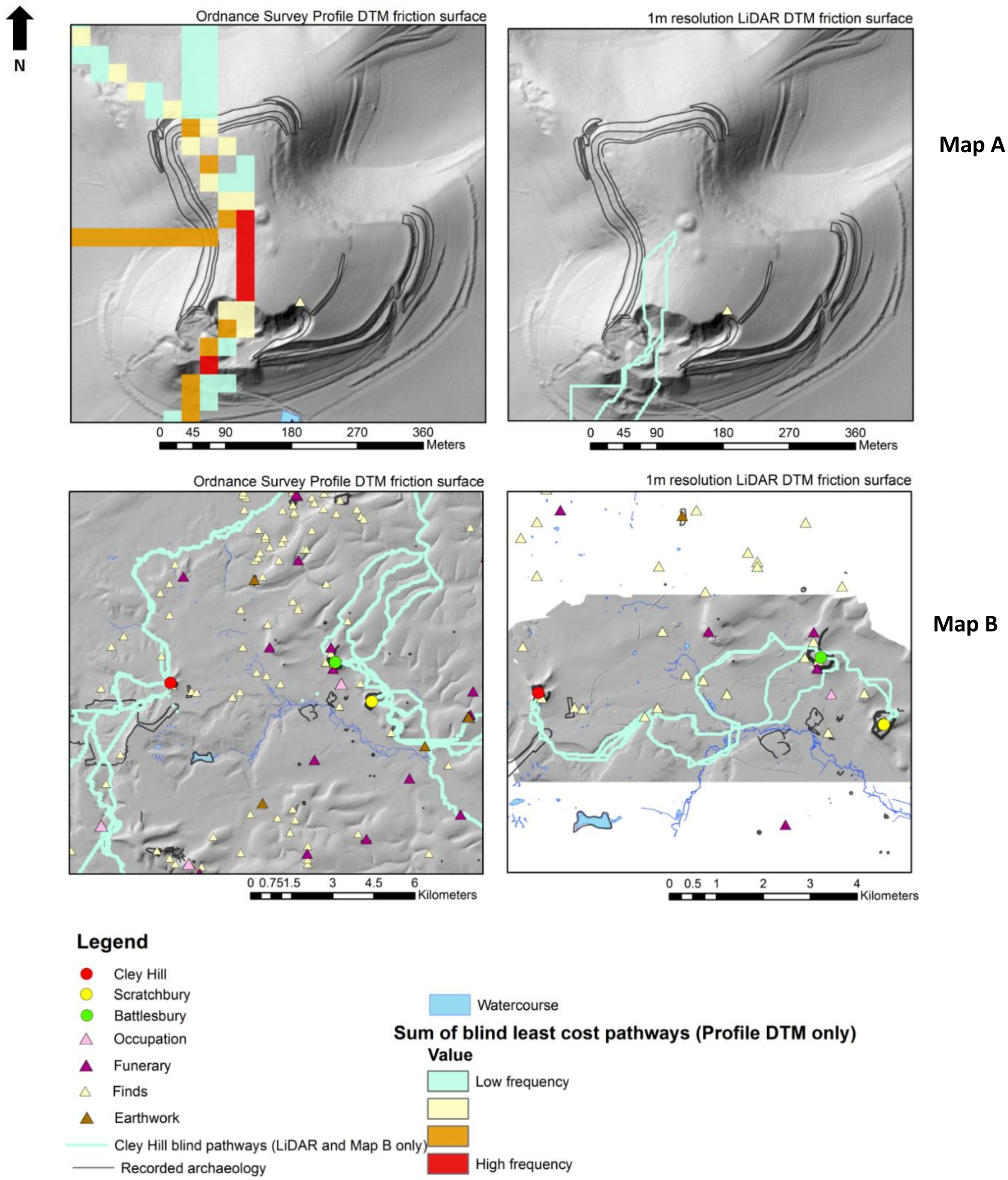


Figure 308. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Cley Hill. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



Concluding site summary

Cley Hill's survival has been affected by post-medieval quarrying which has also affected the interpretation of this site because it biased both the viewshed and cost surface analysis results.

Between the Bronze Age and Iron Age, landscapes changed from being dominated by funerary monuments in the form of barrows to settlements (Bradley 1998, 150). Bradley highlighted that in the Iron Age burials were incorporated into settlements (1998, 159). Cley Hill incorporated two barrows into the middle of its enclosure. Regardless of their chronological relationships, the barrows within the centre of the hillfort obstructed a lot of occupiable space. This demonstrates that although the enclosure of Cley Hill represents a shift in the focus of the material investment on land away from burial monuments they were still allowed to be a dominant focus at Cley Hill. They had such dominance that they detracted from the site itself. Whilst the presence of the barrows affected visibility and physical interaction within the site, they also affected visual relations across the landscape. Fieldwork observations indicate that the barrows are one of the most visually prominent aspects to the site. The knoll itself is also visually dominant. This location is an isolated upland knoll within a relatively flat downland, which meant that it was a stark visual and physical contrast to the surrounding landscape. The banks which enclose the site accentuate the site's visual prominence from the downland which surrounds the site; however they are not the site's most visually accessible aspect.

Although the fieldwork based observations indicated that the most visually prominent aspects of the site are the barrows and the topographical landform itself, the GIS based analysis did not. The results of this analysis did not conclusively indicate that there was an especially more visible aspect of the site. This implies that the hillfort construct in itself was not influenced by a desire to portray a particular image within a preferred direction. The topographical landform drew the eye of the beholder to Cley Hill.

Both the GIS based cost surface analysis and the cartographic analysis of the landscape which surrounds Cley Hill failed to identify any distinct routeways into the site. The subtle rolling nature of this landscape meant that there were no distinct topographically defined routeways through this landscape. There are also no distinct concentrations of archaeological activity on approach to Cley Hill; this may however be as a result of the heavy development which has taken place within this area.

Cost surface analysis also failed to identify any morphologically distinct entry and exit points into the site. No entrance was identified at this site. Similarly the entry points of the pathways were also influenced by the destruction of the south-western corner of the site on a friction surface basis. This topographical surface has been greatly modified since Cley Hill was in use which created a bias within the results, a bias which does not reflect the later prehistoric landscape and more specifically the true morphological extent of the hillfort at Cley Hill.

Battlesbury

Site introduction

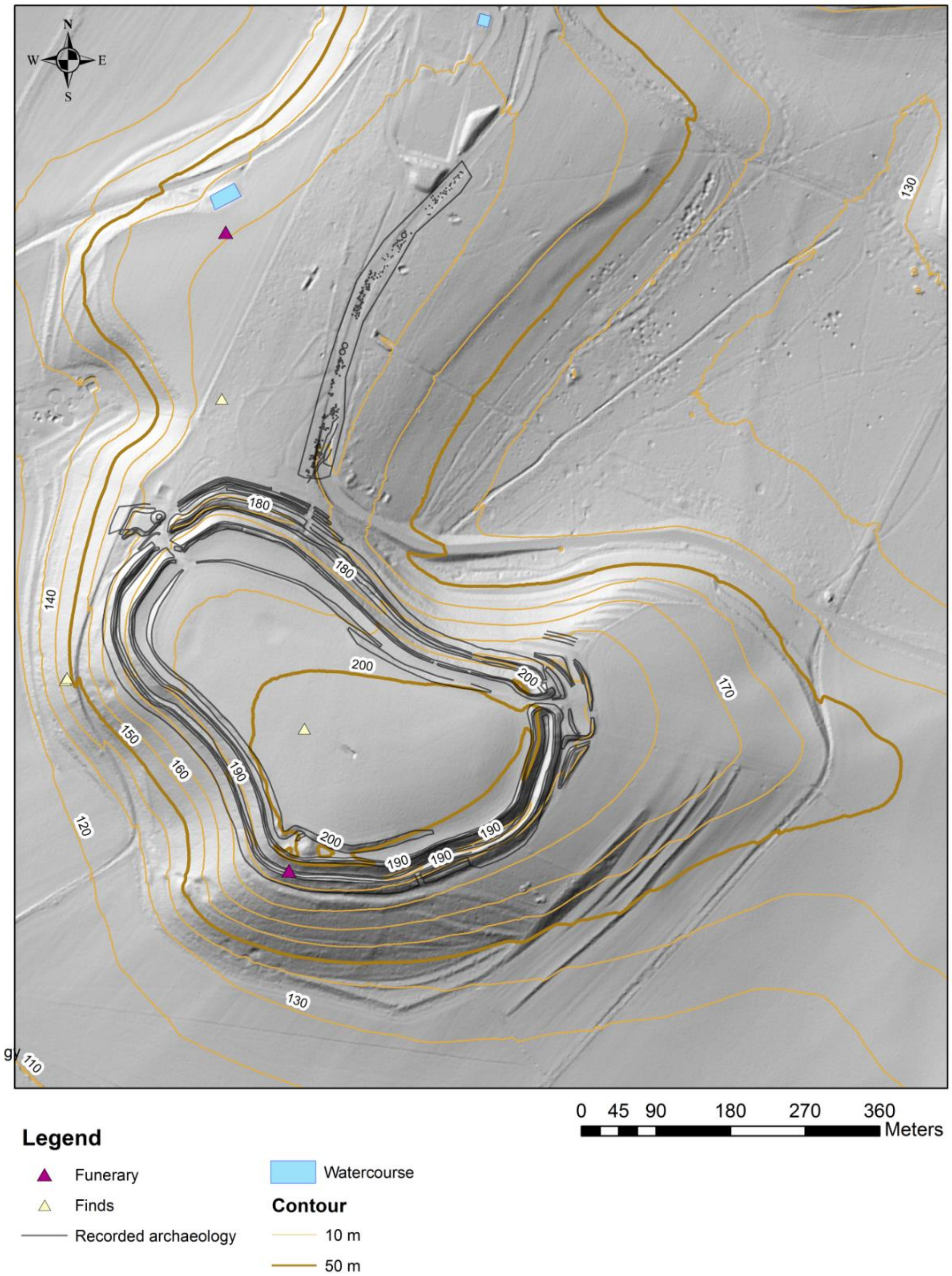
To the north-east of Cley Hill, Battlesbury Camp sits at 196m OD. This multivallate hillfort encloses 9.7ha (Historic England 2015e) and is a contour fort (McOmish et al. 2002, 77). It was surveyed by Colt Hoare as part of his investigations into Salisbury Plain

(Ellis et al. 2008, 10). The site has two entrances, one in the north-west and the other in the south-east (Figure 309).

There are several instances of pre-hillfort activity at this site. Three barrows are located within the southern corner of the site. These are located between the inner rampart and the internal lynchet (Historic England 2015e). The two smaller barrows were crossed by the inner rampart (Colt Hoare 1821, 68). Even though these barrows were constructed prior to the construction of the hillfort, the hillfort builders respected the barrows, as they did not use the material from them to strengthen the inner rampart (*ibid* 1821 69). There are also traces of Celtic field systems, which pre-dated the hillfort ramparts, within the interior of the site (McOmish et al. 2002, 78) but these are not visible on the LiDAR DTM.

There have also been several discoveries of different archaeological features in the vicinity of Battlesbury. One of these was the Celtic field systems in the vicinity of the hillfort (McOmish et al. 2002, 78). These field systems and lynchets were established prior to the construction of Scratchbury and Battlesbury (*ibid* 2002, 78). The spur of land to the north of Battlesbury was also subject to an excavation, which revealed an Iron Age settlement (Battlesbury Bowl settlement) (Ellis et al. 2008). The settlement was largely unenclosed (*ibid* 2008, 133). It is highly likely that the settlement spread across the ridge top and plateau up to Battlesbury Hill (*ibid* 2008, 133). However, the construction of the hillfort in the middle-late Iron Age led to the contraction of the ridge settlement (*ibid* 2008, 134).

Figure 309. 1m resolution LiDAR hillshade model of Battlesbury, overlain by contours, HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; (© Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



There was very little evidence for pre-Iron Age activity at Battlesbury Bowl settlement; this was restricted to residual worked flint and an early Bronze Age pit (*ibid*

2008). Excavations revealed that the settlement was established towards the end of the Late Bronze Age and occupation took place from the 8th to the 3rd century BC (*ibid* 2008, 133). The evidence for occupation across the 500 years remained consistent (*ibid* 2008, 133). The Iron Age phase of activity showed evidence for a mixed farming economy marked by the discovery of quernstones, crop remains and four-poster structures (*ibid* 2008, 134).

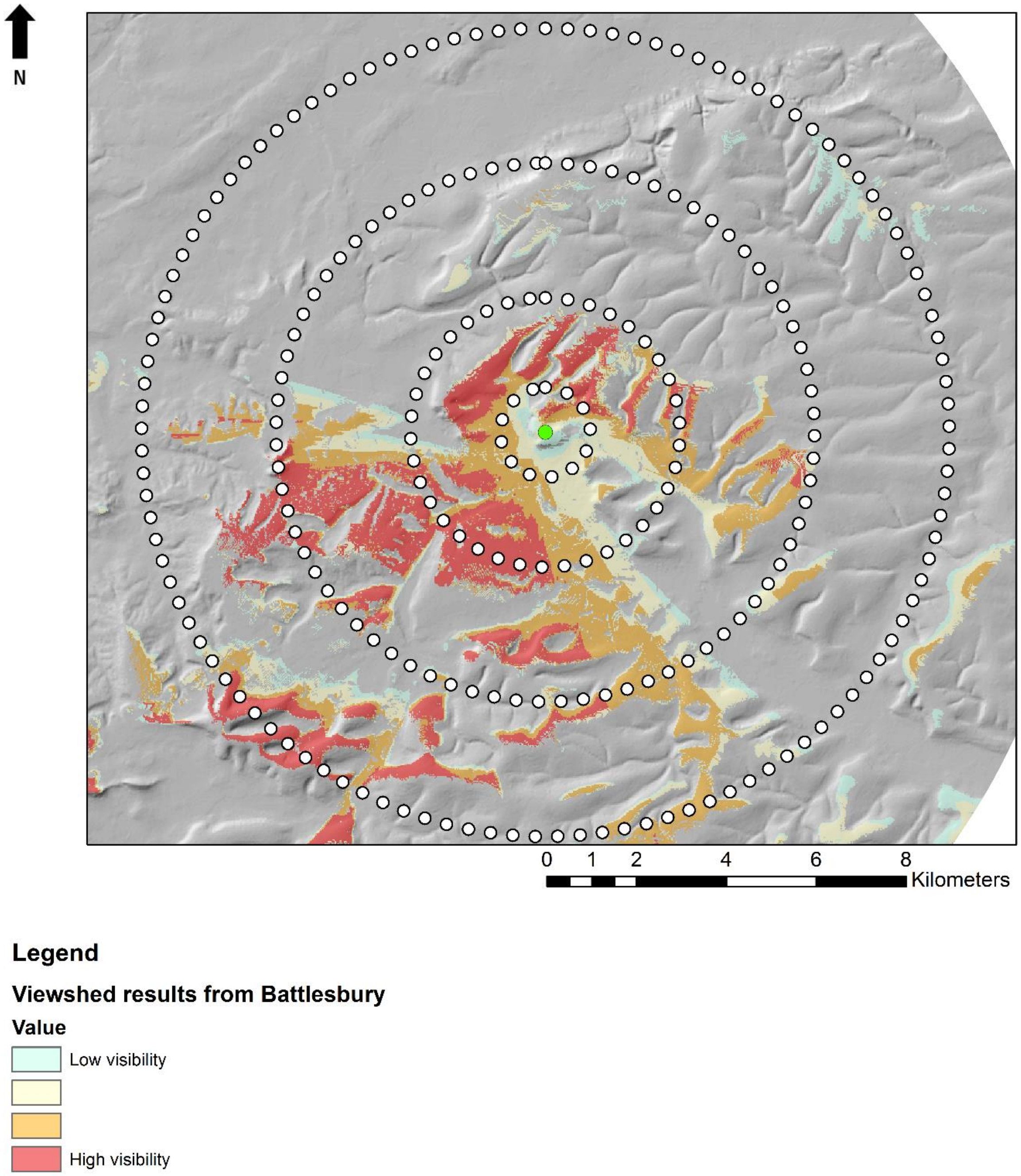
Physical relationship of the hillfort morphology and location with the landscape topography

Battlesbury is situated on the wide terminal of an upland outlier of Salisbury Plain. The site's morphology for the most part adheres to the topography of the land. However, the number of banks which enclose the site changes with the variation in the topographical form of the land. For example the numbers of banks which enclose the site is greatest at the northern end of the site, where the site is adjacent to Battlesbury's predecessor; Battlesbury Bowl settlement. The extensive enclosure of this northern sector reinforced the strength of the enclosure which implies that attempts were made to counteract the susceptibility of this area to intruders. However, extensive enclosure (3 banks) was also employed on the southern corner of the site, which is an area that was naturally defended and defined by the highly sloping topography.

The site has two entrances. The north-western entrance is situated on a straight portion of the hillfort's enclosing works and it opens out onto an area of steep slopes. If it was positioned a matter of metres to the east it would have faced the plateau. Contrastingly, the eastern entrance is situated on a corner of the site towards a relatively flat aspect of the hilltop.

Battlesbury's location promotes a high degree of visibility to the areas within a 3km radius of the site (Figure 310). Towards the 6km and 9km radii visibility becomes increasingly scattered, the western and southern aspects of the landscape are also predominantly visible.

Figure 310.Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Battlesbury as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service)



Image

Fieldwork demonstrated that the modern built up landscape and forestry cover severely inhibit visibility towards Battlesbury. However, the viewshed results indicate that the site remains of low visibility. From the 1km radius the interior of the site is of limited visibility (Figure 311). The site's north-eastern perimeter is of low visibility whereas the western, north-western and southern perimeter is of greater visibility. These areas have a visual magnitude between the 50th and 100th percentile. The prominence of the site's enclosing works is supported by the field observations from Viewpoint 21 (Figures 312 and 313). From this point the north-western enclosing banks are clearly visible and visually dominant. The north-western entrance is also visible; however the interior of the site is not.

Figure 311.Results of viewshed analysis from the radii towards Battlesbury depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

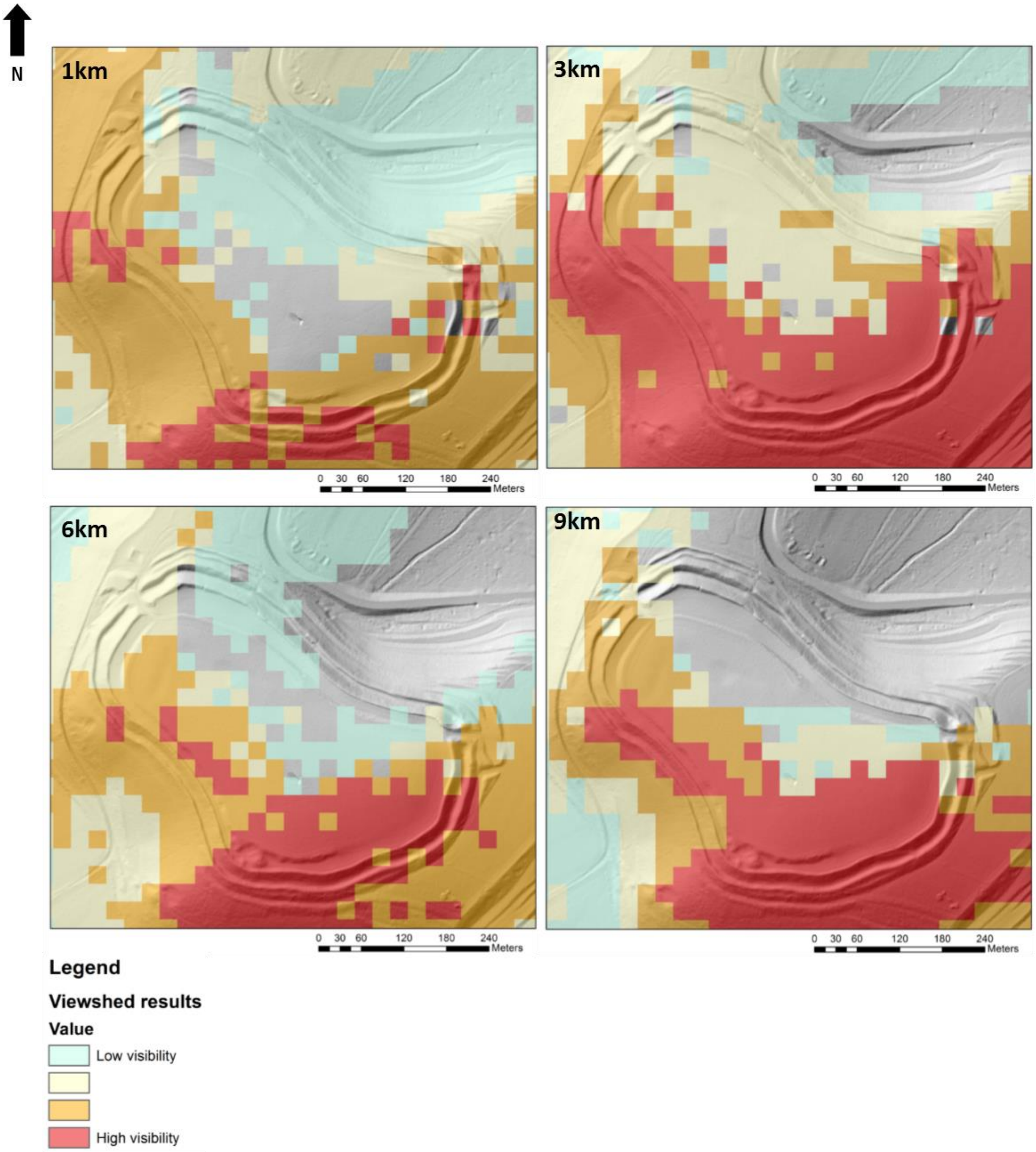


Figure 312. Location map of viewpoints (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service)

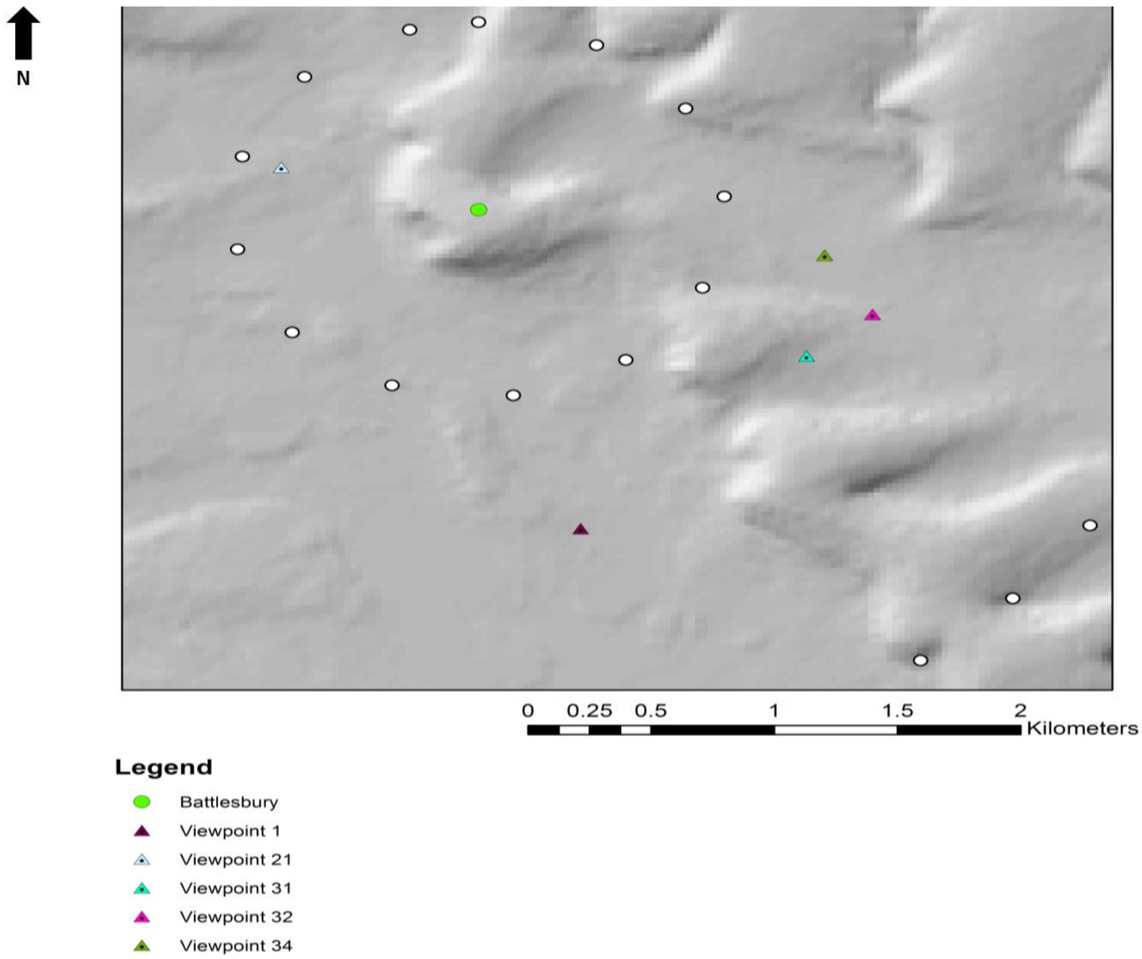


Figure 313. View of Battlesbury from Viewpoint 21, 834m to the north-west of the site (Author's own 2013)

The visibility of Battlesbury does not change significantly between the 1km and 3km radii (Figure 311). The north-western, southern and western aspects of the site remain the most visible, however their visual magnitude increases to the upper quartile range. The eastern aspect of the site is consistently its least visible area, however the site's interior does become visible. The degree to which the field work observations support the results of viewshed analysis is mixed. For example from Viewpoints 32 and 34, which are situated to the south-east of Battlesbury, the site's interior is not visible however the enclosing works are visually prominent (Figures 314 and 315). It was also mentioned earlier that the area around Battlesbury is wooded; this wooded area includes the southern and south-western slopes of the hill which obstruct the visual clarity of the banks. If these slopes were covered by forestry at the time that the hillfort was in use then this would always have been an obstructed view. However, it is likely that they were not covered by trees; consequently the banks within this area would have been prominent. Whilst the visual clarity of the enclosing banks is obstructed from Viewpoint 1, the interior of the site has become visible this supports the results from viewshed analysis (Figure 316).

Figure 314. View of Battlesbury from Viewpoint 32, 1.7km to the south-east of the site (Author's own 2013)

Figure 315. View of Battlesbury from Viewpoint 34, 1.4km to the south-east of the site (Author's own 2013)

Figure 316.View of Battlesbury from Viewpoint 1, 1.75km to the south of the site (Author's own 2013)

The visibility of Battlesbury decreases from the 6km radius (Figure 311). A large area of the eastern enclosing works is not visible. However, the site's southern corner and its southern and south-eastern perimeter become its most visible aspect. These areas have a visual magnitude within the upper quartile range. The pattern of decreasing site visibility with increasing distance from the site continues between the 6km and 9km radii (Figure 311). The entire eastern side of the hillfort fails to be visible. The southern and south-eastern perimeter of the site continues to be the site's most visible areas. The visual magnitude of these areas are within the upper quartile range.

Whilst the visibility of the different components of Battlesbury is highly variable from the surrounding landscape, this was also the case from the neighbouring hillforts. For example, Cley Hill lies 6km away from Battlesbury; however the results of viewshed analysis indicate that it ought to have good visual accessibility to Battlesbury (Figure 317).

Although visibility is defined as high, it is confined to the site's western side. The visibility of the western aspect of Battlesbury from Cley Hill was confirmed in the field. Field photography illustrates that although this aspect of the site is visible its characteristics are not discernible due to the distance between the sites (Figure 318).

Figure 317.Results of viewshed analysis from Cley Hill towards Battlesbury depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

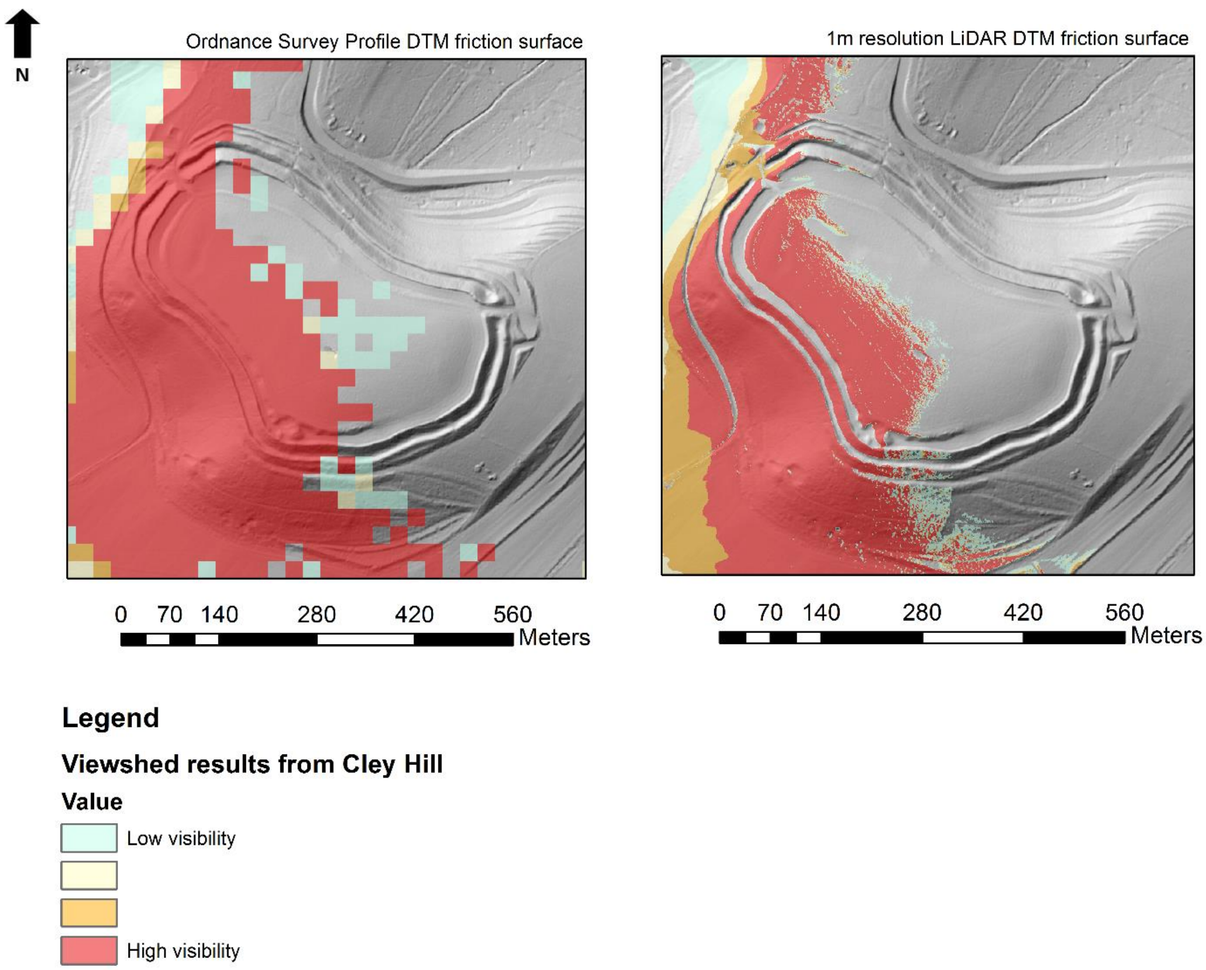


Figure 318.View of Battlesbury from Cley Hill (Author's own 2013)

Scratchbury on the other hand has a very limited degree of visual accessibility to Battlesbury. Visibility is restricted to the south-eastern end of the site (Figure 319). Fieldwork photography illustrates that although the viewshed analysis indicates that the enclosing banks are not as visible as the interior, they are visually prominent (Figure 320). This finding demonstrates the importance of using the correct terminology which has been highlighted elsewhere (Chapters 3 and 5). For example although the southern enclosing works are visually prominent; they are not the site's most visible area.

Figure 319.Results of viewshed analysis from Scratchbury towards Battlesbury depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.).

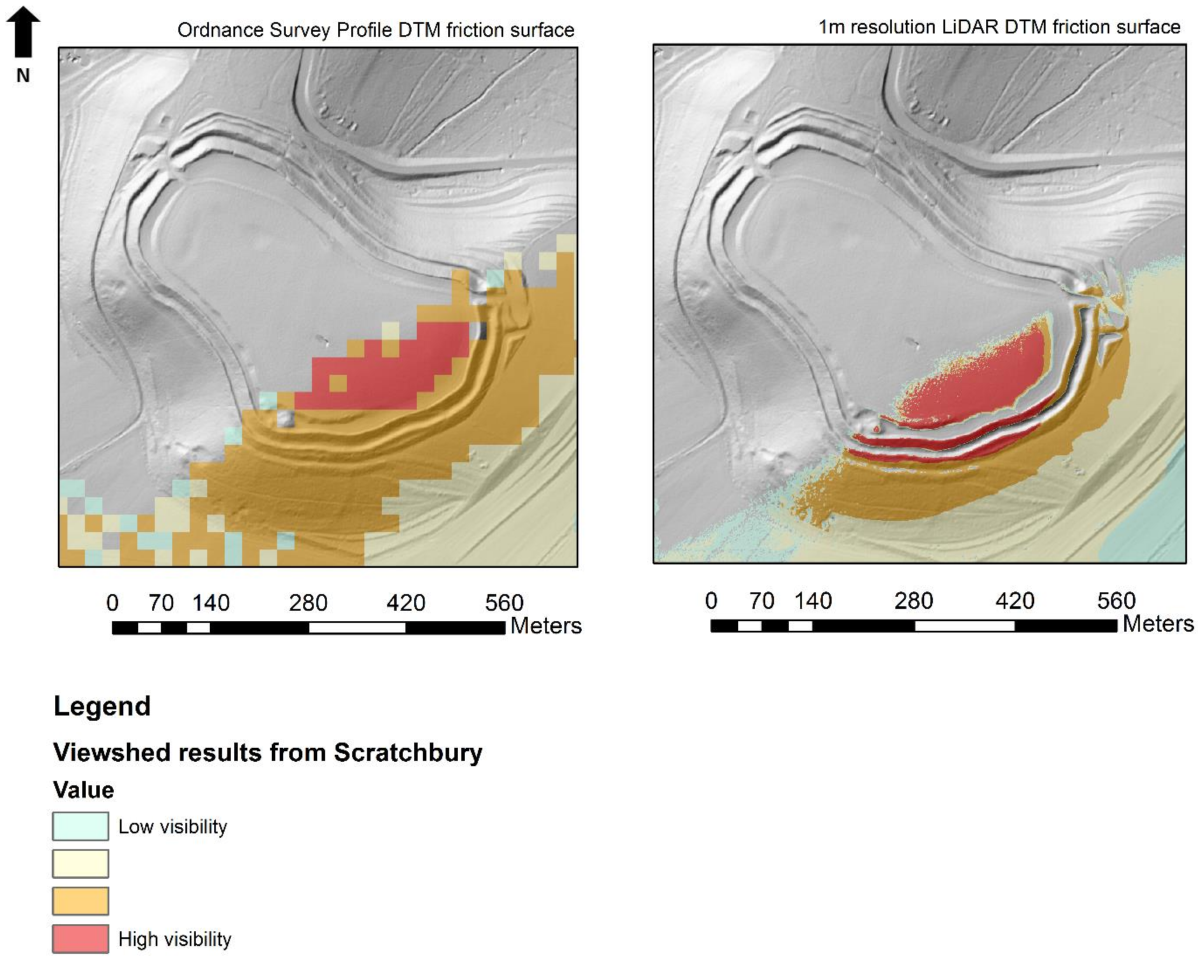


Figure 320. View of Battlesbury from Scratchbury (Author's own 2013)

A combination of viewshed and cost surface analysis demonstrated that whilst travelling between Battlesbury, Cley Hill and Scratchbury it is possible to gain a largely complete image of Battlesbury (Figures 321-322).

Figure 321. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of Battlesbury whilst travelling from Cley Hill overlain by HER data and watercourses (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; (© Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)

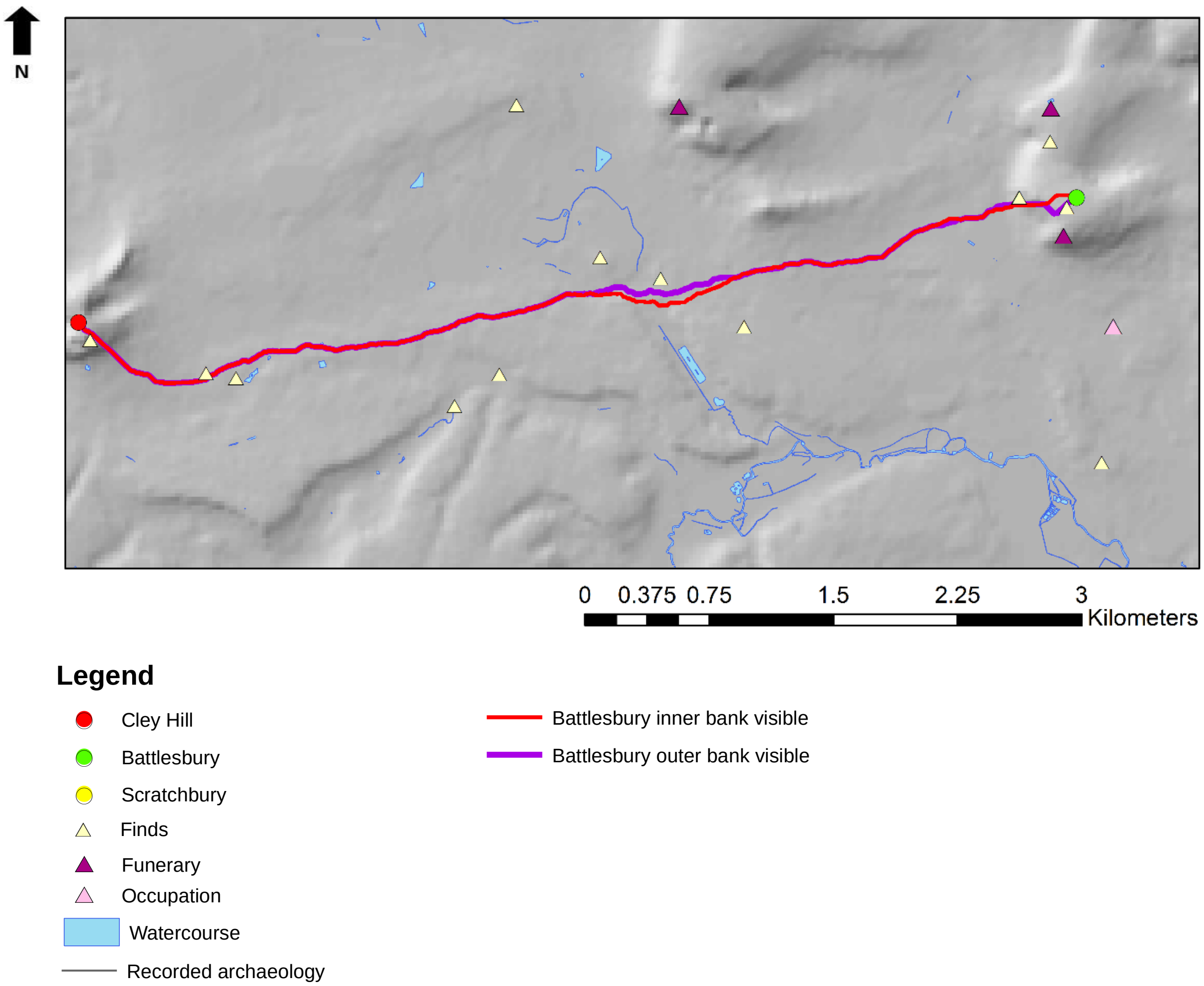
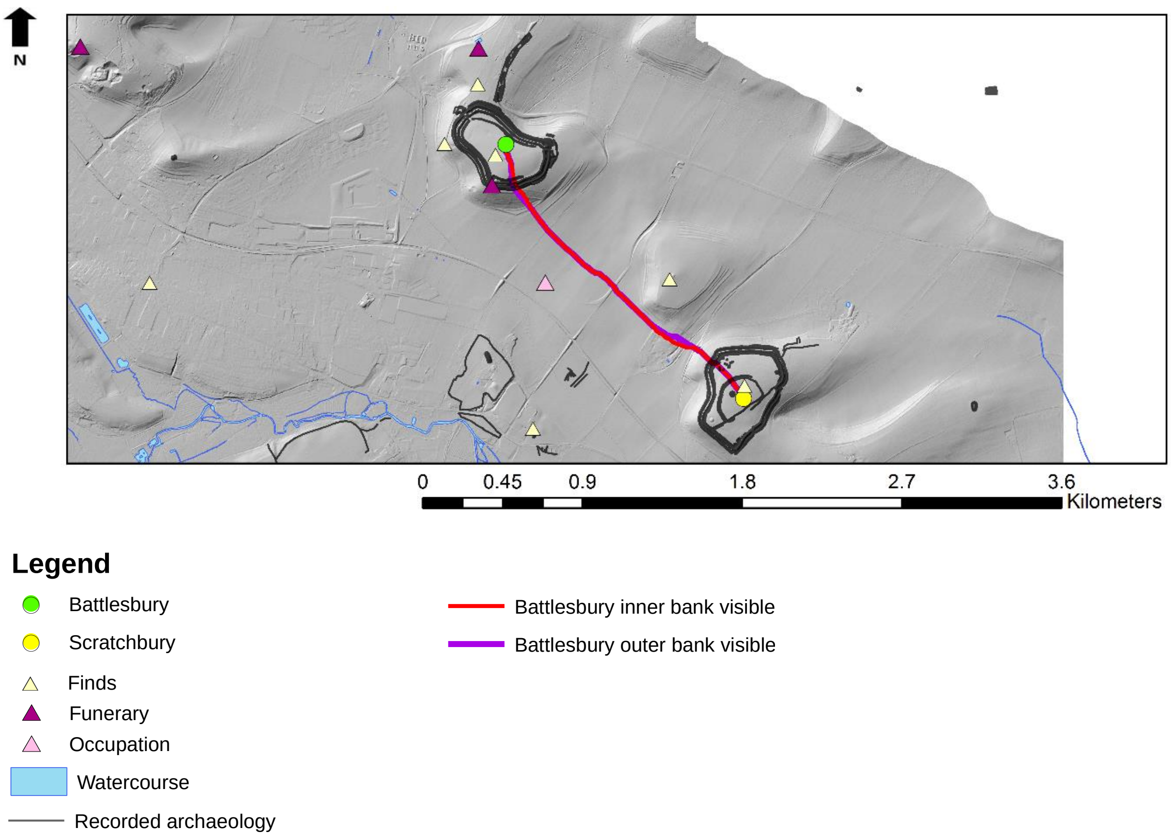


Figure 322. Results of cost surface analysis depicting the changing visual accessibility of the different architectural components of Battlesbury whilst travelling from whilst travelling from Scratchbury overlain by HER data and watercourses (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; (© Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



Correct pathways

Colt Hoare highlighted that Battlesbury is almost impossible to access from the west and north-east, it is most accessible from the north and south which is where additional ramparts were raised (1821). The high accessibility of Battlesbury's northern aspect is supported by the results of cost surface analysis as the majority of slope based least cost pathways enter/exit the site from the north (Figure 323). This area coincides with the Battlesbury Bowl settlement, but not the site's north-western entrance. Two LiDAR based least cost pathways intersect with the site's north-western entrance; one also corresponds with the south-eastern entrance. However, the sheer volume of slope based pathways (244) that disregard the north-western entrance implies that the morphology ignores the easy accessibility of the northern aspect of the site to inhibit accessibility into Battlesbury.

There is a high frequency of the blind pathways using the south-eastern entrance. This indicates that the entrance was placed where the site was least visible from approaching traffic (Figure 324). There is a much weaker pattern of the visible pathways, these tend to use the southern, south-eastern and south-western aspect of the site (Figure 325). This sector is one of the most defended aspects of the site, which is not the most accessible. The highly enclosed nature of this area may have been placed to face an area where people were known to approach from.

Figure 323. Results of slope based cost surface analysis to and from Battlesbury. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013).

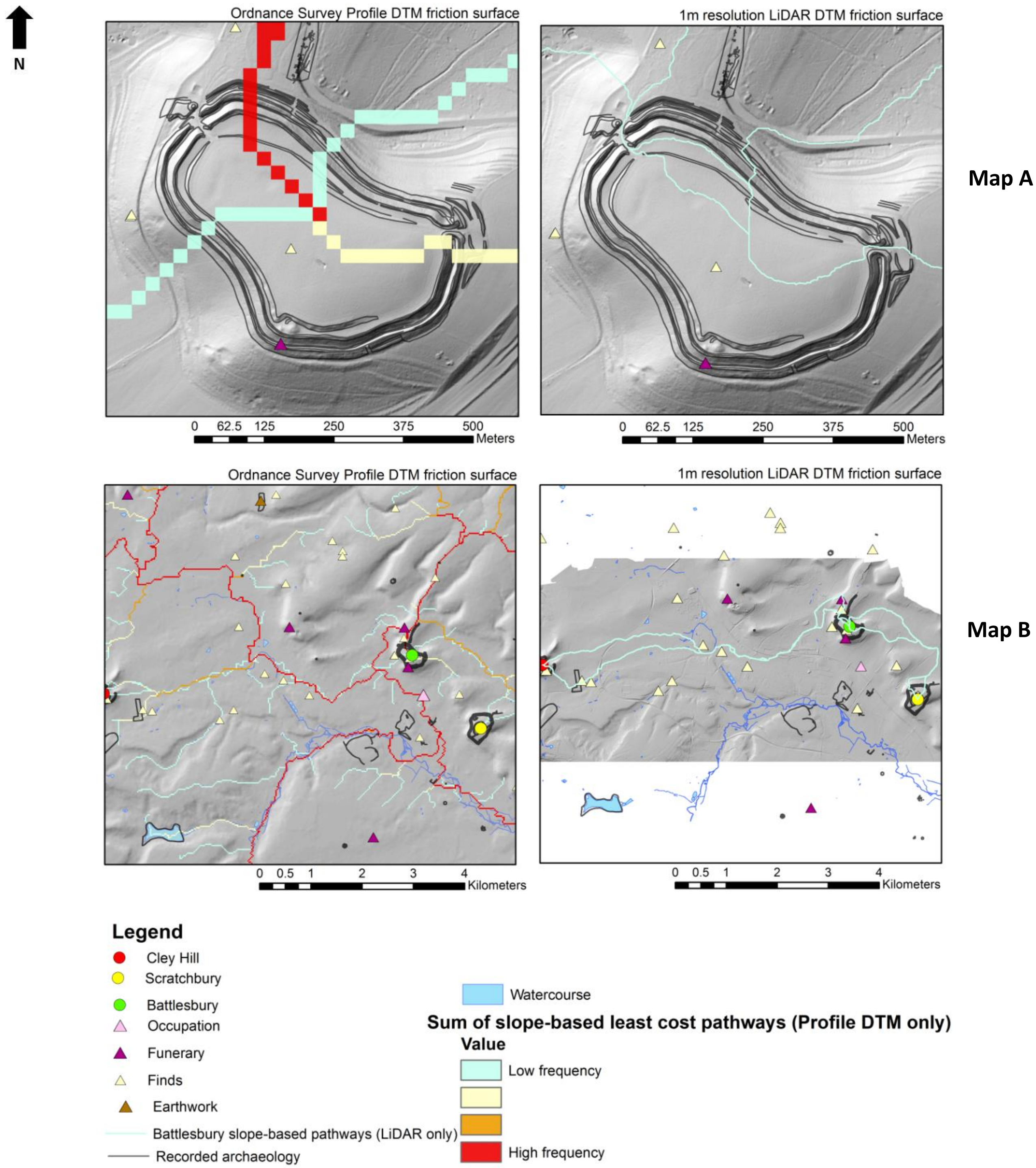


Figure 324. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Battlesbury. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)

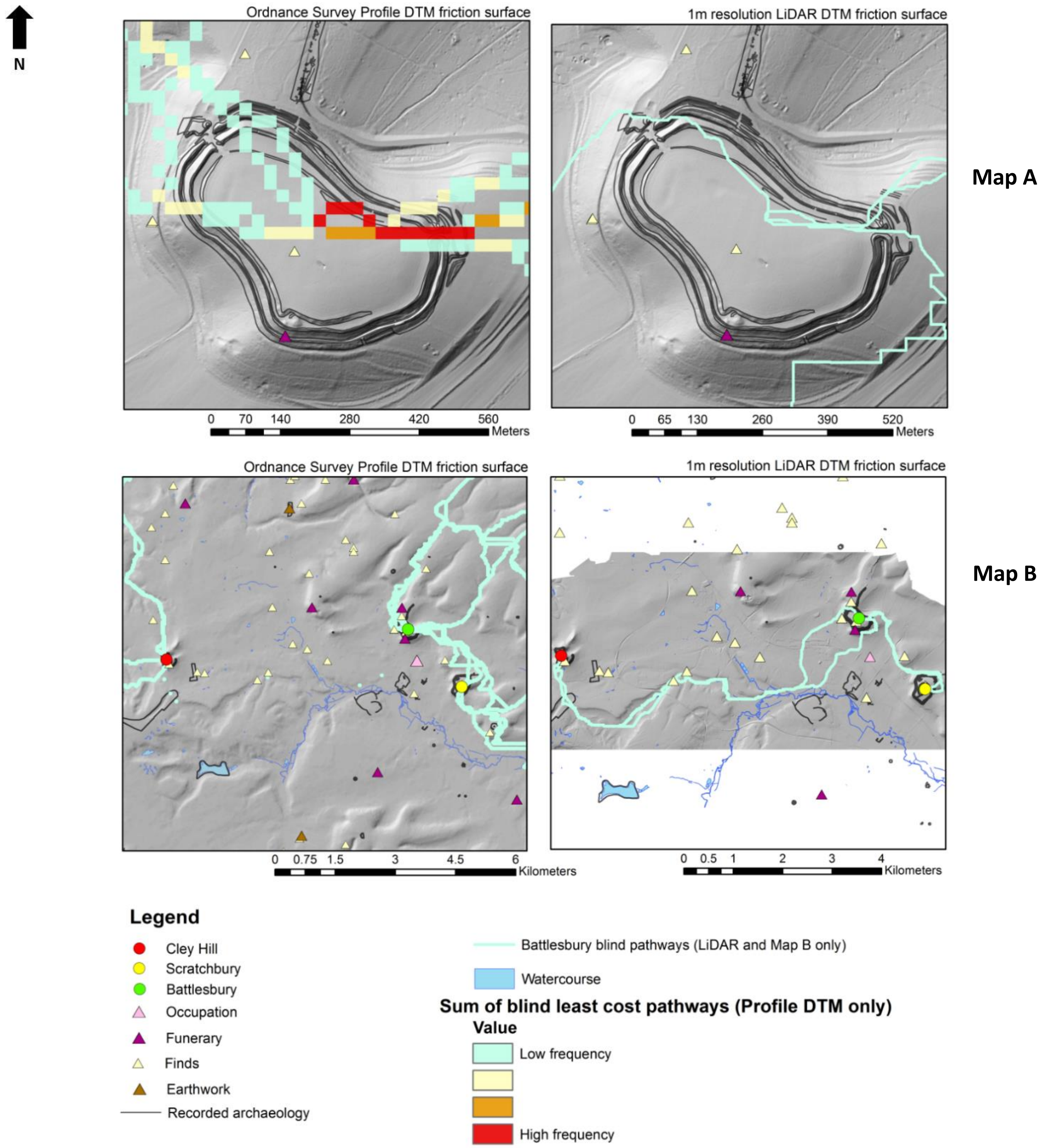
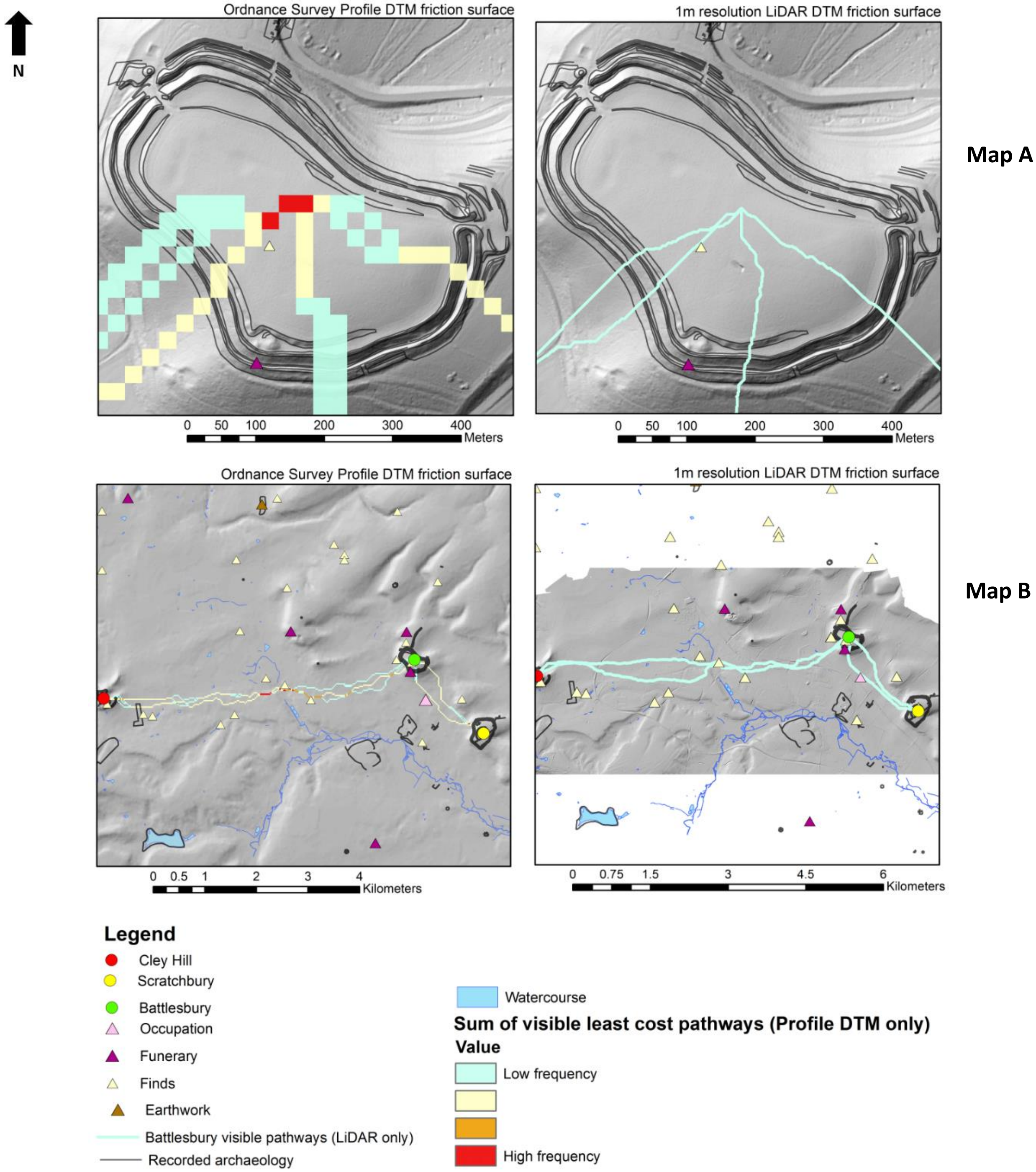


Figure 325. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Battlesbury. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



Concluding site summary

Battlesbury Camp was constructed within an area which was of established importance within this landscape. This importance is signified by the construction of at least three round barrows on this hilltop within the Bronze Age. This is a similar situation to that at Cley Hill. However in the case of Battlesbury, a barrow was preserved in the southern corner of the site, the act of preserving this barrow enhances the complexity of constructing the enclosure within this area. The preservation of this barrow demonstrates that it held a high degree of importance to those constructing Battlesbury. This importance could have stemmed from a long established understanding of activity on this hilltop as there had been earlier settlement within this area in the form of the Battlesbury Bowl settlement.

Battlesbury Bowl settlement is believed to be the predecessor to the hillfort. The construction of the hillfort led to the abandonment of this settlement, however the hillfort’s most prominent enclosing works thereafter faced this now seemingly abandoned area. This may have been a symbolic disassociation of the site with its predecessor, or a defensive response to the site’s most physically susceptible side to intruder entry. The disassociation of the hillfort from the earlier settlement compared to its incorporation of the barrows within the hillforts interior implies that the 'history' of the barrows imbued more importance than that of the earlier settlement.

The results of viewshed analysis and fieldwork observations demonstrate that the artificial enclosure of this hilltop enhanced the physical and visual prominence of this landform. These architectural components were an overt response to the need to enclose space. Their extravagance was demonstrated by the fact that extensive series of earthworks were constructed in places where they were not defensively needed, such as in the south.

This southern area is however one of the site's most visible areas from the surrounding landscape. The high visibility and the extensive enclosure of the southern aspect of the site are examples of the portrayal of an image within a particular direction. In this case it was an image of strength in the site's most visible area.

Even though the enclosure of this hilltop with an artificial earthen banked and ditched enclosure enhanced the visual prominence of a topographical region, the site as a whole is not extensively visible. The results from both viewshed analysis and fieldwork demonstrate that the site's overall visibility is poor. Its visibility is primarily obstructed by the topographical form of the hilltop in relation to the surrounding landscape, as opposed to by its artificial enclosure. Most notable is the very poor visual connectivity between this site and Scratchbury, which are situated less than 2km apart. Whilst there is poor intervisibility between these two sites, Battlesbury itself has predominantly 360˚ views to the land within a 3km radii of the site which is within a distance that visual clarity should be good.

Cost surface analysis demonstrated that the entrances to Battlesbury Camp are not situated within the site's most physically accessible aspect, which is in the north. Access through the site's north-western entrance is made more complex by a platform just outside this entrance, whilst the morphology of the entrance in itself is simple. The south-eastern entrance's morphology is more complex and consequently does not allow for direct access. This entrance was also placed within an area which has a relatively high correlation with a number of blind pathways indicating that the entrance was placed in one of the site's most poorly visible areas.

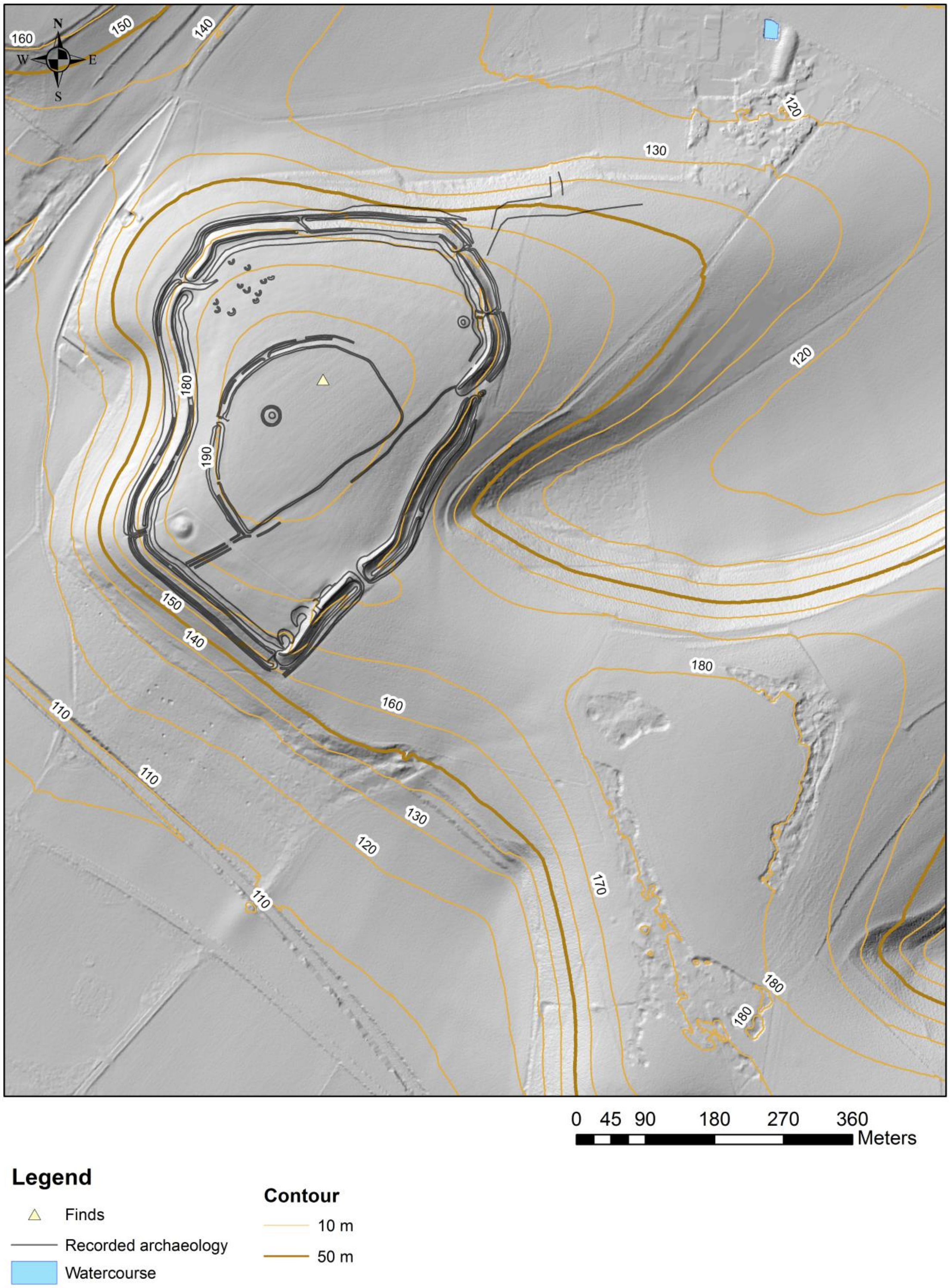
Scratchbury

Site introduction

To the south-east of Battlesbury and located on the southern extension of Salisbury Plain at 196m OD is Scratchbury. This univallate enclosure covers 17ha and has three entrances which are situated within the east, south-east and west (Historic England 2015f) (Figure 326). It is believed that Scratchbury was in existence prior to the construction of Battlesbury; this interpretation is based on the fact that Scratchbury was less heavily defended than Battlesbury (McOmish, Field et al. 2002).

There is a D-Shaped enclosure within the site. At a later stage one side of this enclosure was extended by the lengthening of the straight side towards the hillfort defences; this was later abandoned in favour of using the hillfort's outer defences (Forde-Johnston 1976, 107). The D-shaped enclosure was also truncated by a linear scarp of unknown origin and function, which is overlain by the hillfort defences close to the north-eastern entrance (McOmish et al. 2002, 75). Excavations of this feature revealed that it had a ditch on its eastern side; this feature is argued to be a cross-ridge bank that preceded the construction of the hillfort (McOmish et al. 2002, 75-76). There are also six (Historic England 2015f) or seven round barrows within Scratchbury (Colt Hoare 1821, 70).

Figure 326. 1m resolution LiDAR hillshade model of Scratchbury, overlain by contours, HER data and watercourses (© Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



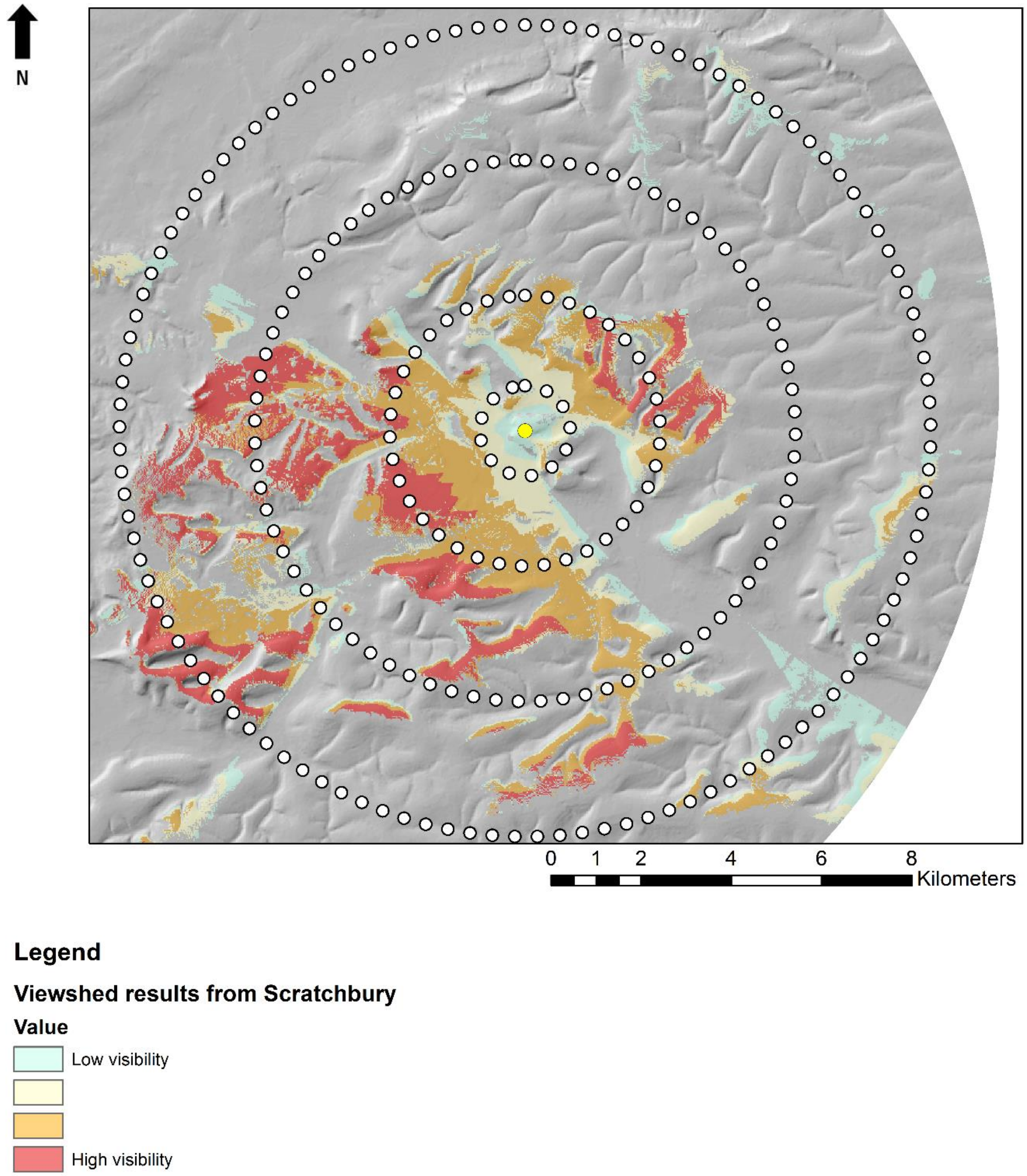
Physical relationship of the hillfort morphology and location with the landscape topography

Whilst the northern perimeter of Scratchbury occupies the hilltop termination of this plateau, the south-eastern edge of the site adjoins the remainder of it. A study of the site's morphology in relation to the topography on which it is situated reveals that the site's morphology is uniform throughout. There is however a slight differentiation in the height of the banks in relation to the topography as those on the eastern side of the site are higher and more prominent than those elsewhere on the circuit. This trait was also highlighted by McOmish and others in 2002 (75). Additionally, just like Cley Hill, the bank and ditch which surround this enclosure, particularly on the western side, are situated downslope. This meant that the site had limited defensive capabilities and its interior was highly visible (McOmish et al. 2002 75). The interior of Scratchbury is slightly domed in shape and the hill summit lies at the centre of the site.

The north-eastern and north-western entrances both have an in-turned terminal and are situated adjacent to highly sloping land. On the other hand the south-eastern entrance was formed by a simple break in the rampart circuit. This is also positioned adjacent to the flatlands of the plateau.

The site has wide ranging views out to the area within a 1km radius of the site (Figure 324). Although the site has visual access to 360˚ around the site, these visible areas are of low visibility. As distance from the site increases, the visual magnitude of the visible areas increases. However, beyond the 3km radius the span of the visible areas becomes limited and it does not cover a 360˚ vista.

Figure 327. Viewshed results from the hillfort grid, depicting the visibility of the surrounding landscape from Scratchbury as defined by the hillfort buffers. Viewshed analysis was based upon the Ordnance Survey DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service.)



Image

The positioning of the western inner bank, downslope from the site's interior means that the interior of Scratchbury is potentially highly visible from the surrounding uplands. The site's interior bank does however dominate the interior in its southern, south-eastern and north-eastern corners, within these areas a number of quarry scoops sit on the inner side of the bank. These scoops were potentially reused as hut platforms (Figures 328). The buildings within this area would have been concealed by the interior bank.

Figure 328.Quarry scoops on the inner side of the bank on the eastern side of Scratchbury (Author's own 2013)

The degree to which the results of viewshed analysis support the above hypotheses is variable. The viewshed analysis demonstrates that with an increase in distance away from the site, its visibility generally increases. For example from the 1km radius the site is less visible than from the other radii further away (Figure 329). The majority of the site, particularly the north-eastern, northern and eastern areas are of low visibility. They have a visual magnitude below the 50th percentile. The western, southern and south-eastern perimeters of the site are slightly more visible as they have a visual magnitude between the 50^{th} and 74^{th} percentiles. The centre of the site's interior is not visible. These results were supported by the field photography from within the 1km radius (Figure 330-333).

Photographs from these viewpoints illustrate that the site's enclosing works had poor visual prominence, in contrast to the high prominence of the barrow in the south-western corner (Figures 331-333).

The visibility of the site increases from within the 3km radius as the majority of the site is of high visibility from this distance (Figure 329). The least visible aspects are the central area within the D-shaped enclosure and the eastern perimeter of the enclosure. Just as the visual magnitude of the site increases with distance from the site, the fieldwork photography illustrates that the visual prominence of the enclosing banks to this site also increases from greater distances (Figures 334-336).

The visibility of Scratchbury decreases between the 3km and 6km radii (Figure 329). From the 6km radius the visibility of the northern, north-eastern and eastern aspects of the site decreases, with much of this area not being visible. The remainder is of relatively low visibility. The western, south-western and southern aspects of the site are of high visibility. From Viewpoint 8 which is the only point within the 6km radius the site’s enclosing works are prominent but not visually imposing, this is due to the distance between the site and the viewpoint (Figure 337).

Figure 329.Results of viewshed analysis from the radii towards Scratchbury depicting the visibility of the site when using the Ordnance Survey PROFILE DTM (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

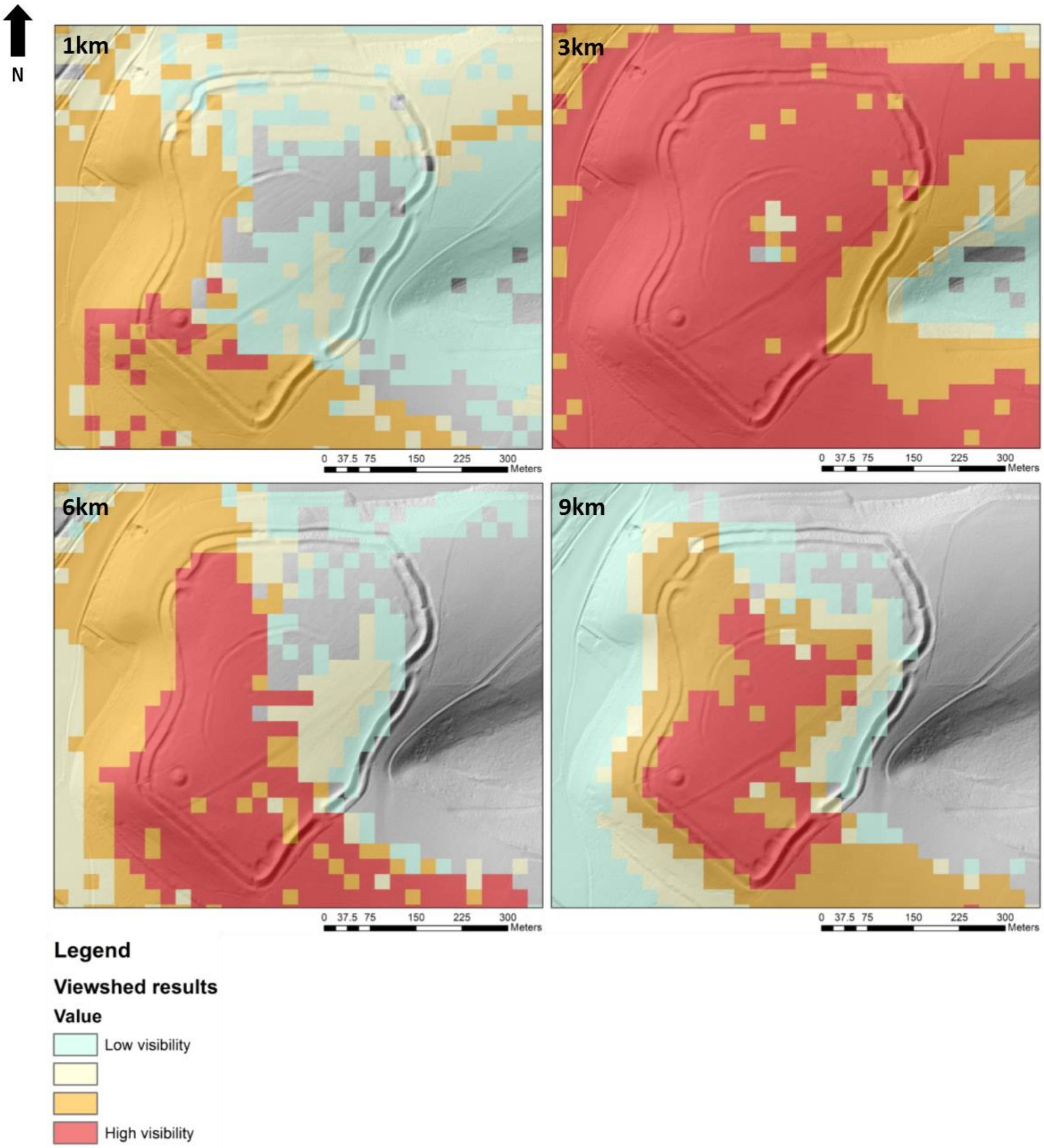


Figure 330.Location map of viewpoints (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service.)

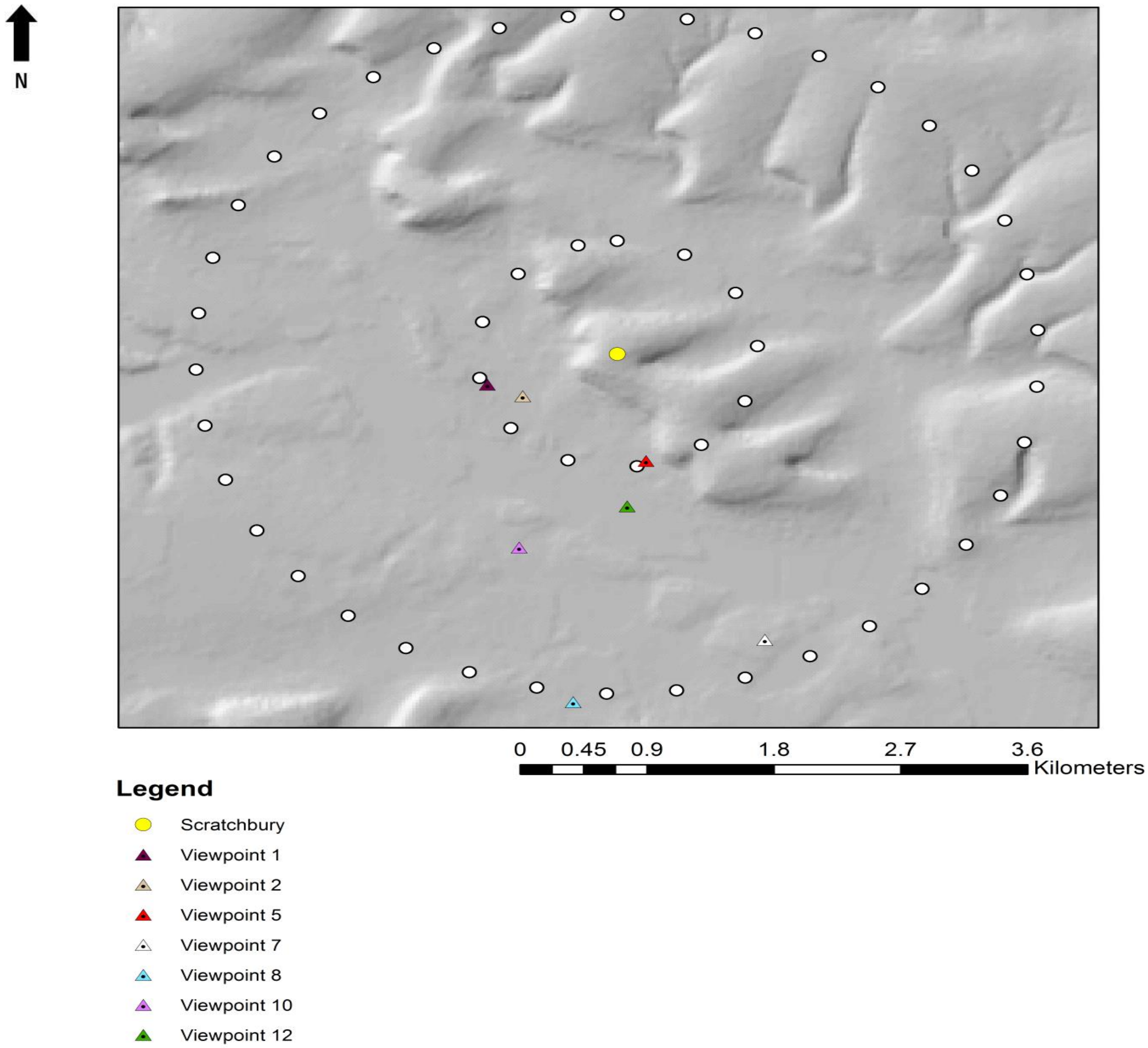


Figure 331.View of Scratchbury from Viewpoint 1, 936m to the west of the site (Author’s own 2013)

Figure 332.View of Scratchbury from Viewpoint 2, 767m to the south-west of the site (Author’s own 2013)

Figure 333.View of Scratchbury from Viewpoint 5, 965m to the south of the site (Author's own 2013)

Figure 334.View of Scratchbury from Viewpoint 7, 2.7km to the south-east of the site (Author's own 2013)

Figure 335.View of Scratchbury from Viewpoint 12, 1.3km to the south of the site (Author's own 2013)

Figure 336.View of Scratchbury from Viewpoint 10, 1.8km to the south-west of the site (Author's own 2013)

Figure 337. View of Scratchbury from Viewpoint 8, 3.1km to the south of the site (Author's own 2013)

From the 9km radius the visual accessibility of the site becomes more scattered and varied (Figure 329). The northern, north-eastern and eastern aspects of the site are still the least visible. The site's southern aspect remains most visible; however the visibility of the remaining sides of the site decreases. The visibility of the centre of the site increases and it has a visual magnitude that is largely within the upper quartile range.

The results of viewshed analysis from the various buffers indicated that as distance from the site increases the visibility of the site's interior increases. This supports the hypothesis that the site's interior was most visible from the areas further away from the site than those closest. This was further supported by the results of viewshed analysis from the hillforts within this test area. For example, Battlesbury is situated c.2km from Scratchbury and has poor visual accessibility of Scratchbury (Figure 338). This site primarily has visibility of the western side of Scratchbury. The enclosing works of this western area are less visible than the interior of Scratchbury. The poor visibility of Scratchbury from

Battlesbury is illustrated by site photography, which demonstrates that although these sites are relatively close together, the morphology of Scratchbury is not discernible from the other fort (Figure 339). This outcome may also be affected by the atmospheric conditions on the day that the photography took place.

Figure 338.Results of viewshed analysis from Battlesbury towards Scratchbury depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

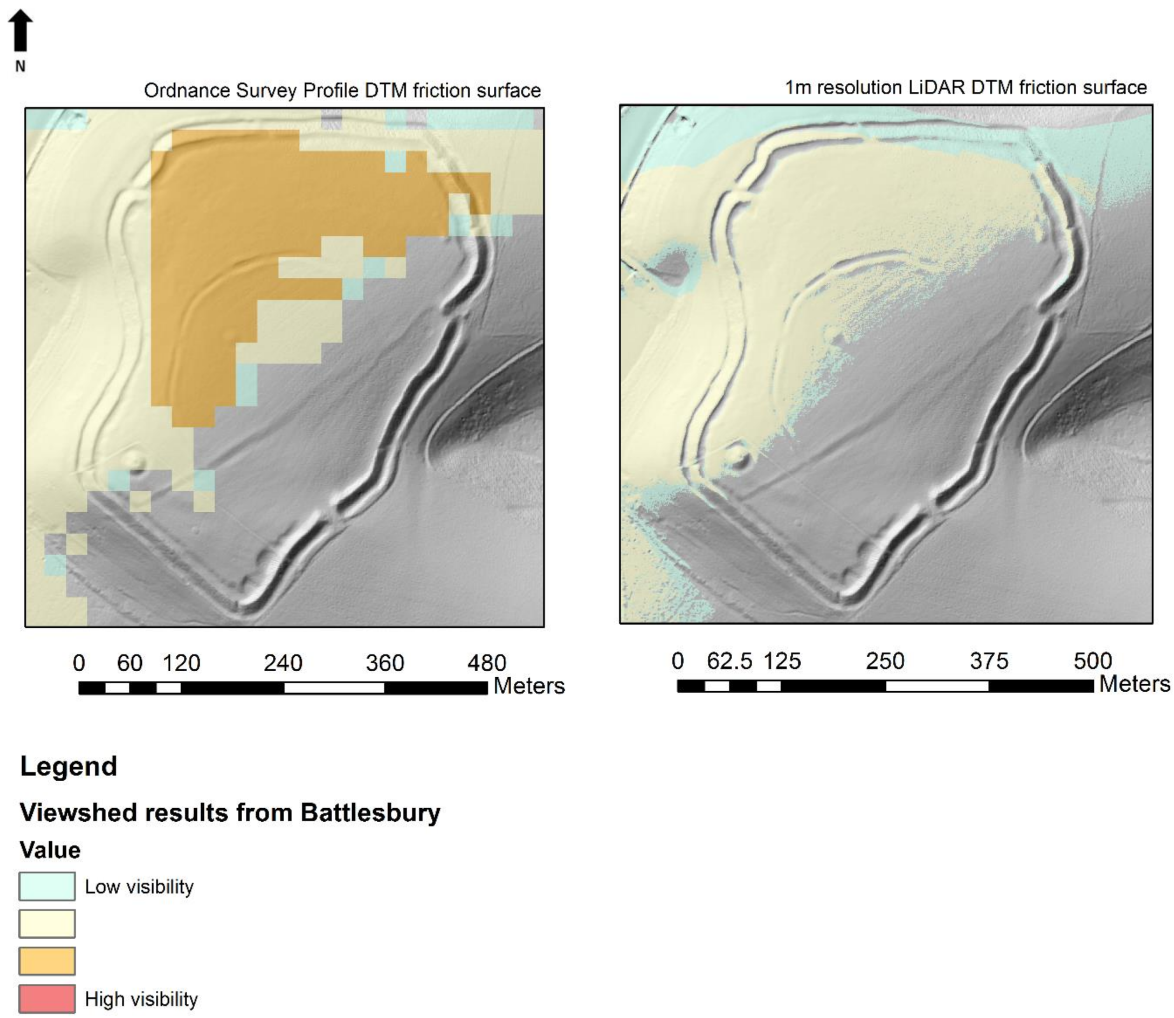


Figure 339. View of Scratchbury from Battlesbury (Author's own 2013)

The overall visibility of Scratchbury increases from Cley Hill, which is situated c.6km away. From Cley Hill, the majority of the visible areas of Scratchbury are highly visible, and are located within the site's western and southern areas (Figure 340). Although the viewshed analysis indicates that Scratchbury is visible from Cley Hill, the distance between them meant that visual clarity is poor and this is illustrated in the site photography (Figure 341).

Figure 340.Results of viewshed analysis from Cley Hill towards Scratchbury depicting the visibility of the site using both the Ordnance Survey and LiDAR DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved.)

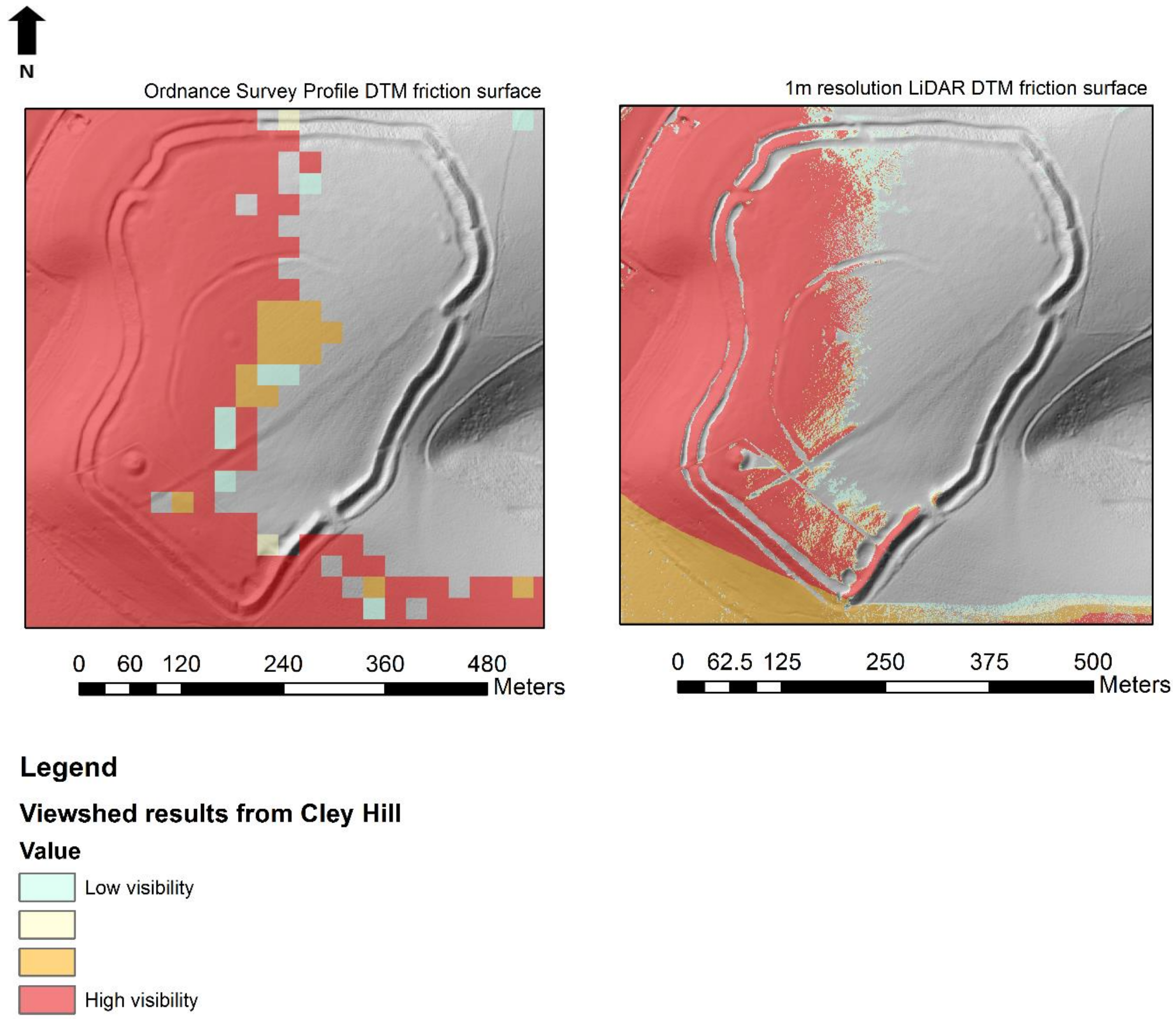


Figure 341. View of Scratchbury from Cley Hill (Author's own 2013)

Correct pathways

The slope pathways which enter or exit this site largely (107 paths Profile DTM) use the north-western corner of the site, which does not correspond with any of the entrances (Figure 342). However, a further 92 of these pathways use the south-eastern entrance. This demonstrates that the placement of the south-eastern entrance did not disregard the accessibility of the different aspects to the site.

The visible pathways enter or exit the site via the western aspect (Figure 343). The majority of these pathways either utilise or travel very close to the site's north-western entrance. These results indicate that this entrance was placed within an area where approaching or exiting traffic was most visible. On the other hand the blind pathways interact with the eastern aspect of the site and do not coincide with any of the entrances (Figure 344). These eastern areas are therefore the least visible entry and exit point into this site.

Figure 342. Results of slope based cost surface analysis to and from Scratchbury. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)

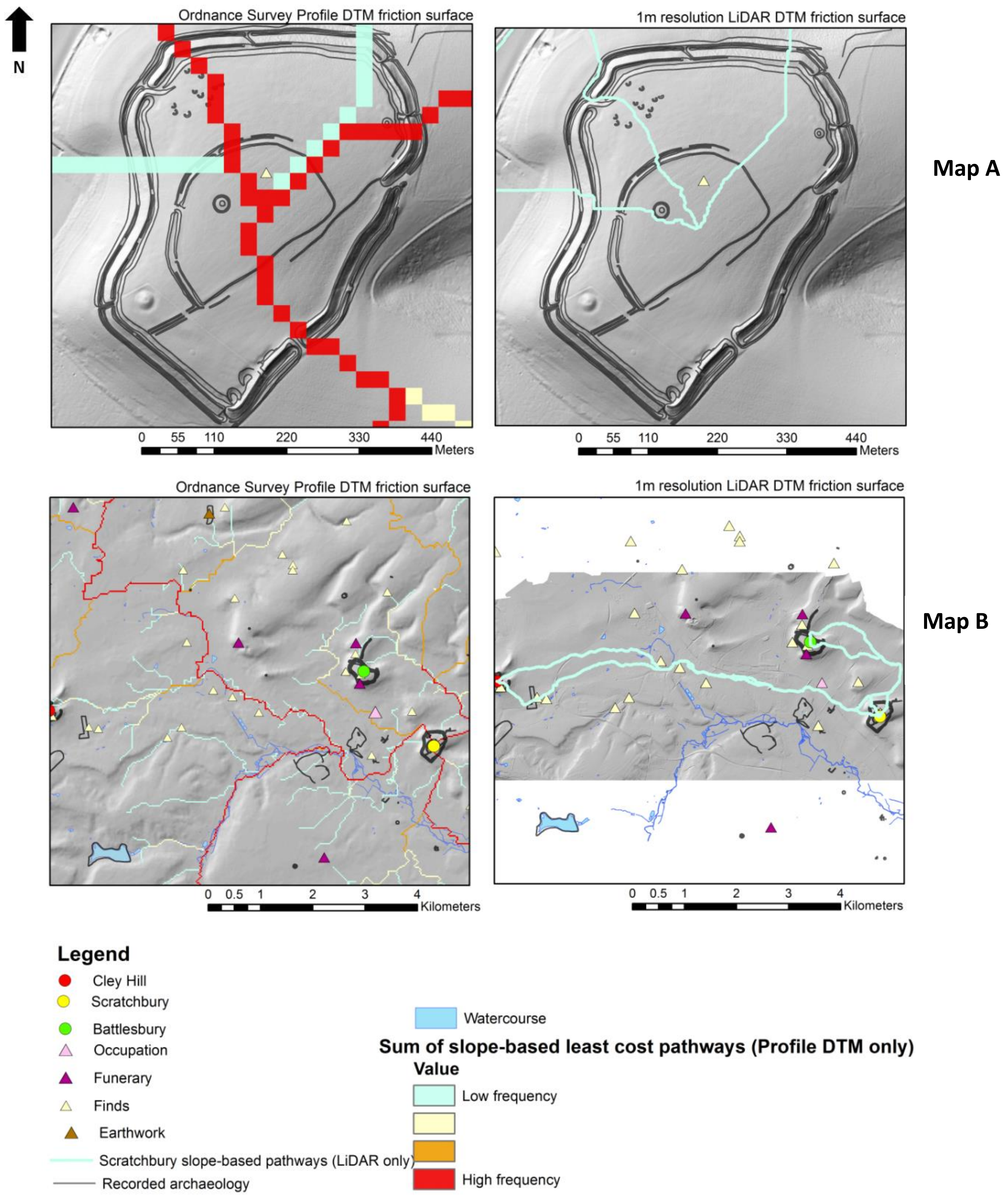


Figure 343. Results of cost surface analysis, which depicts the routes that visible pathways took both to and from Scratchbury. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013).

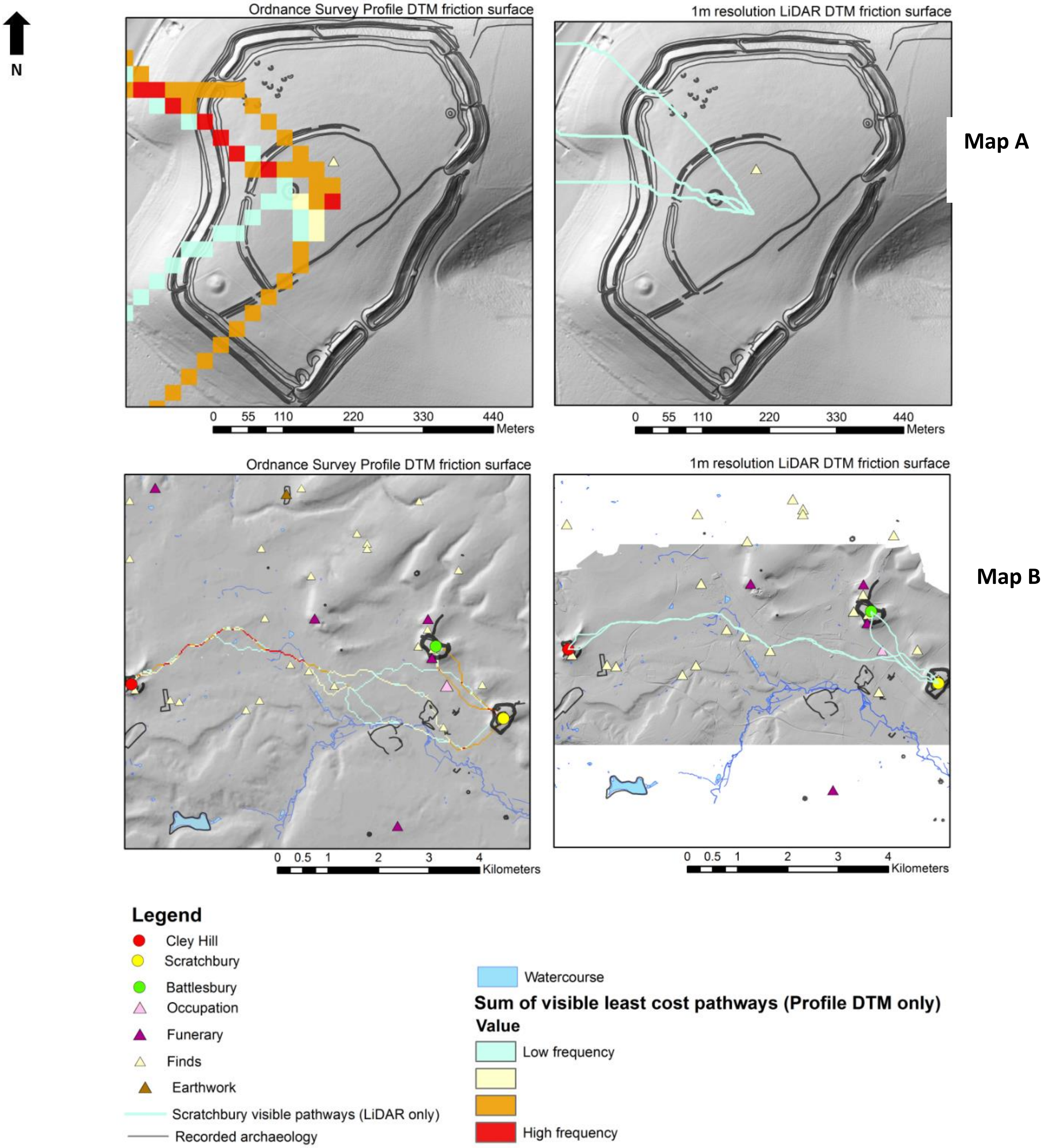
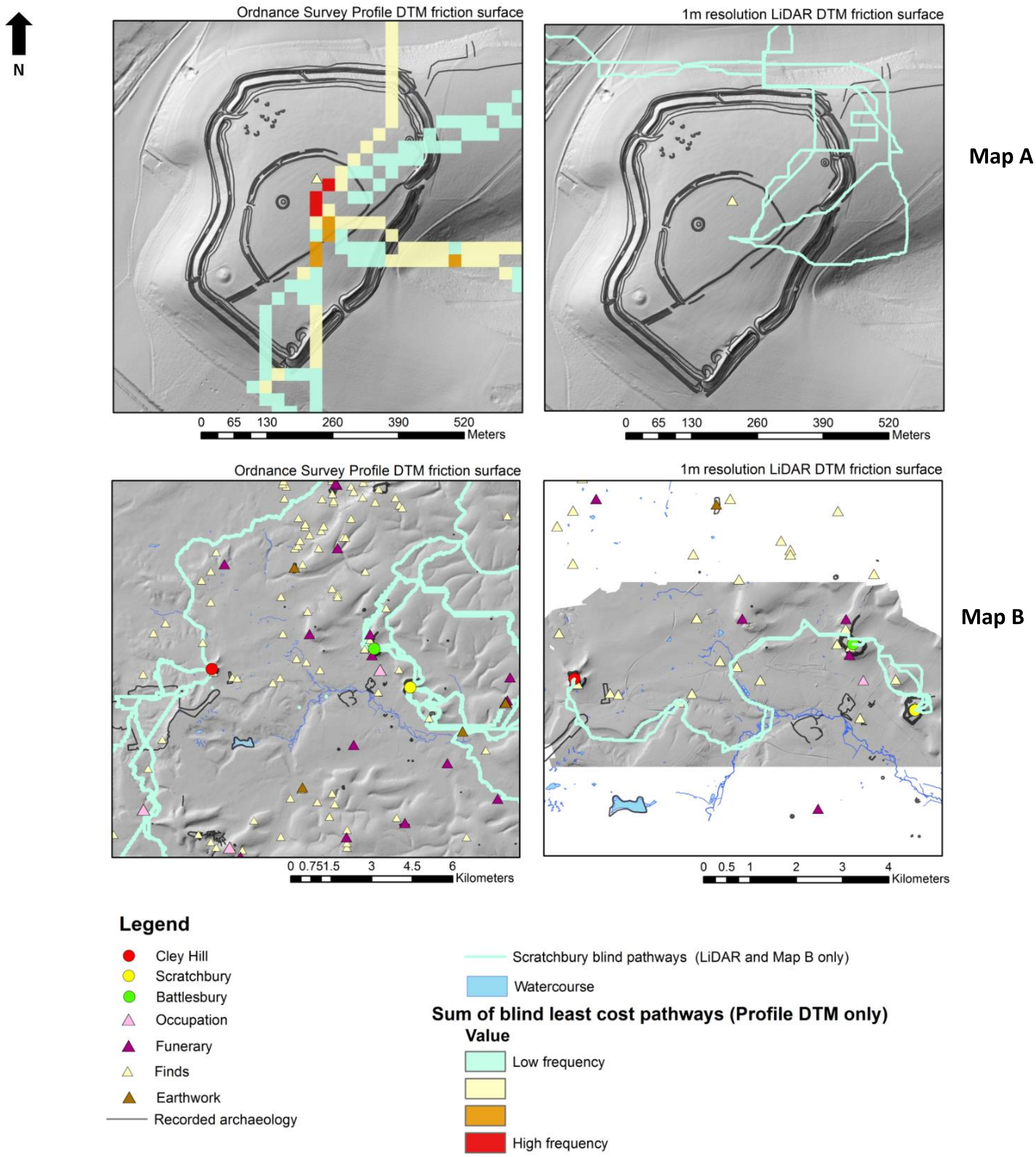


Figure 344. Results of cost surface analysis, which depicts the routes that blind pathways took both to and from Scratchbury. Map A depicts the entry and exit points of the pathways on a site scale whilst Map B depicts their routes on a landscape scale. Both maps are overlain by HER data and watercourses Cost surface analysis was based upon both the Ordnance Survey and 1m LiDAR resolution DTMs (© Crown Copyright/database right 2009 An Ordnance Survey/EDINA supplied service; © Crown Copyright/database right 2014. An Ordnance Survey/EDINA supplied service; © Environment Agency copyright and/or database right 2015. All rights reserved; © Wiltshire Council 2013)



Concluding site summary

As with the remainder of the hillforts in this test area, this site was constructed on an area which was of an established importance. This importance was demonstrated by the extant barrows and the D-shaped enclosure which are situated in the hillfort enclosure. These features evidently maintained a degree of importance on this hilltop as they are still extant to this day.

The overall visibility of the site increases as the distance from the site increases. However, this meant that the site was most visible from areas which would have had poor visual clarity of Scratchbury. The location of the site itself promotes a good degree of visual accessibility to the surrounding landscape within a 3km radius of the site. From this distance the site largely has 360˚ views; however there is a poor visual relationship between Scratchbury and Battlesbury.

The south-western aspect of the site, particularly the barrow is one its most visually prominent aspects. This was demonstrated by both GIS based viewshed analysis and fieldwork observations. The central area of the hillfort is also relatively highly visible. This is accentuated by the predominant downslope positioning of the enclosing bank in relation to the interior. The banks themselves are not clearly visible. The lack of distinctive visual dominance of any architectural component associated with the hillfort phase indicates that portraying a particular image of strength through the manipulation of space with the construction of a hillfort was not a primary intention.

GIS based analysis identified that there is a correlation between both the slope based pathways and the visible pathways, and the entrances to this site. The entrances were not randomly placed without any consideration to the degree of accessibility to the interior. The south-eastern entrance was placed in one of the site's most accessible areas, whilst the north-western entrance was placed where the site has the most visibility to approaching traffic. These correlations demonstrate that although there are no topographically controlled routeways across this landscape towards Scratchbury, or morphologically any complex entranceways which define a 'correct pathway', there are correct pathways. These were formed through the placement of the entrances within the most visible and accessible areas of the site.

Conclusion

Although the sites within this test area are spread over a greater area than those within the Gower test area, the Warminster test area still lacks any distinctive topographical features just like The Gower. This landscape is rolling downland which borders the edge of Salisbury Plain. Although the landscape as a whole is not topographically distinctive, the hillforts under investigation are situated on some of the most topographically prominent landforms within this region. This is a similar situation to that at The Gower (Chapter 6). Scratchbury and Battlesbury are both situated on the upland border of Salisbury Plain, whilst Cley Hill is situated on an isolated knoll within the lowlands. Whilst the hillforts are situated on naturally prominent topographical locations, their enclosures predominantly occupy the entirety of these naturally defined landforms. The act of constructing an artificial enclosure on these naturally prominent topographical features enhanced their prominence within an otherwise featureless landscape.

The evidence from this test area does not strongly indicate that the artificial enclosing works to these hillforts were primarily defensive. This is suggested at Scratchbury and Cley Hill where the enclosing banks to these sites are situated downslope from the main enclosure, this meant that the sites' interior were visible. If defence was the primary factor, this would not have been desirable characteristic. The high visibility of the interior of these sites due to the low-lying enclosure bank was supported by the results of viewshed analysis. Viewshed analysis demonstrated that the interiors of both Scratchbury and Cley Hill have a high visual magnitude and are consequently of high visibility from the surrounding landscape whereas Battlesbury is not. Although the interiors of Scratchbury and Cley Hill are quantitatively highly visible, fieldwork photography demonstrated that they are not visually prominent. The contradiction between visibility and visual prominence has been highlighted frequently within this study, particularly when investigating Driver's observations within North Ceredigion (Chapter 3) and it will be explored in Chapter 9 (Pages 546-7).

The banks to these enclosures primarily served to enclose and enhance the physical prominence of these locations. However, their construction went beyond satisfying a need to enclose a topographic area; they were the tools which allowed groups to portray an image of strength and prominence within an otherwise featureless landscape. In Driver's study of sites in Ceredigion (2005a and 2013) and The Bulwark (Pages 421-438) the evidence implied that there was a disproportionate allocation of resources within the construction of sites through the non-uniform application of enclosing works. This disproportionate allocation of morphological components is evidence for the portrayal of a particular image within a particular direction; however this was not seen within the

Warminster test area. These sites predominantly failed to focus their image within their most visible or accessible areas. This does not however suggest that these sites were simple constructs that adhered to the topography or that they effectively used it. For example at Battlesbury the site’s enclosure is most extensive in its southern corner where the site is most visible from the surrounding landscape. Such an extensive enclosure was not needed for defence as it is naturally defended by the steep nature of the slopes of this hillside.

A similar disregard for the topographical nature of this perimeter of Salisbury Plain was seen within the placement of the north-western entrance at Battlesbury. This was placed with a complete disregard to the high accessibility of the land to the north-east of this entrance. This in itself formed an indirect correct pathway as it ensured that access into Battlesbury from this direction was not direct and this will be explored in detail in Chapter 8 (Pages 531-532). There is, however, evidence that some entrances to sites within this test area correspond with visible and slope-based least cost pathways. For example, the blind pathways coincide with the south-eastern entrance at Battlesbury. The north-western entrance at Scratchbury coincides with the visible pathways whilst the slope based pathways intersect with the site’s south-eastern entrance.

There was also a strong degree of the hillforts both associating and disassociating themselves with the past. For example, barrows were incorporated within the enclosures of all of these hillforts, however Battlesbury physically disassociated itself with its predecessor, the Bowl Settlement. These findings are discussed in detail in Chapter 8 (Pages 532-535).

All of the observations which were highlighted in this chapter and earlier chapters have wider repercussions in terms of the investigation of hillfort location and morphology. They emphasise the affectivity and importance of this methodology, which is discussed in the concluding chapters of this thesis.

Chapter 8
Conclusion

Introduction

This study arose through the continued dissatisfaction with the term hillfort (Bedwin 1984; Harding 2012). Scholars increasingly acknowledged that there was much variation in site locations and morphologies, consequently a blanket term like 'hillfort' is more of a "hindrance than a help" (Bedwin 1984). There has also been a persistent discontentment with the typologies which have been applied to this class of monument, as scholars recognise that there is intra-site morphological variation (Rivet 1961). It was this that was examined by Driver in Ceredigion (2013) and the approach he adopted was the principal influence on this study.

Whilst this work adopted Driver's principle of investigating morphological variation at individual sites, it also develops the current trend for studies to apply GIS-based analysis to archaeological investigations thus enabling an assessment of large quantities of data in a relatively objective manner. The focus of GIS-based analysis here was on the investigation of movement and visibility. By moving away from earlier militaristic studies of hillforts (Dyer 1992; Sutton 1966; Hogg 1979; Fox 1961; Westropp 1896/1901; Crawford & Keiller 1928) this study analysed hillforts as physical entities, whose construction was potentially motivated by more fundamental factors such as movement, visibility and topography.

The theoretical underpinnings for this study's focus upon movement and visibility were based primarily on Gibson's theory that an individual's visual understanding is due to their role as a perceiver within a particular environment (1979). However, for people to be able to grasp a visual understanding of an environment there needs to be a 'will to be visible' (Gibson 1979; Wheatley and Gillings 2000). In the case of hillfort builders this manifests itself through a number of 'strategies of visibility' (Wheatley and Gillings 2000). Movement within these landscapes meant that individuals engaged with and learnt from it (Ingold 2000; Ingold 2011). Through wayfaring people acquired knowledge continuously, just as movement was a continuous process (Ingold 2011).

Although the methodology for this study is primarily a quantitative analysis, it was used to answer and investigate the qualitative elements which were raised by Driver's study (2005a; 2013):

- The physical relationship of hillfort morphologies and locations with the landscape topography

This investigation revolved around examining how topography influenced the location and morphology of the hillfort in question. For example, to examine whether topography was used to aid construction or whether it disregarded the topographical affordances.

- Image

According to Driver image was portrayed by disproportionately allocating resources within a particular direction. This thesis investigated the degree to which the concept of 'image' was visible through Viewshed and Cost Surface Analysis.

- Correct pathways

Driver defined correct pathways into and around sites on a morphological basis. This thesis investigated GIS-based correct pathways and their correlation with morphological examples.

More specifically the aim was to apply viewshed and cost surface analysis to investigate the following questions:

- *What was the degree of visibility of the surrounding landscape from the hillfort from different points on/within it? Were there long distance or short distance views?*

- *How visible was the interior of the hillforts from other hillforts? Was one area of the hillfort more visible than others? How does the variable internal visibility relate to the morphology of the hillforts?*
- *How did the orientation of least cost paths relate to the morphology of the banks, ditches and entrances of the hillforts?*
- *How did movement along such paths affect the visibility of the hillforts?*

Physical relationship of hillfort morphologies and locations with the landscape topography

> *Some hillforts occupy prominent landmarks perhaps with the express intention of making a statement through high visibility; others seem to be designed with the opposite objective of merging into the natural landscape* (Harding 2012, 15).

Driver examined how the morphology of hillforts in Ceredigion related to the topography; he investigated whether their morphologies conformed with the topography or whether their design was enforced upon the landscape (2005a; 2007; 2013). At Castell Grogwynion, he noted that in order to construct the northern façade the underlying bedrock had to be quarried which would have been a very labour intensive process (2005a; 2013). This demonstrates that in the construction of hillforts the least costly means were not always followed (Driver 2007). Driver also argued that at sites where there were instances of the rampart lines failing to conform with the topography, they symbolised a higher level of power and exclusivity (2007). However in the case of Castell Grogwynion the expensive undertaking of the northern façade was not unjustified, GIS based analysis indicated that it was placed within the site's most physically accessible area (Figure 16; Table 2). These enclosing works were placed to counteract the site's susceptibility to easy access from outsiders, which resulted from the gentle slopes of the topography.

Similarly, at Gaer Fawr the northern side of the site had an additional bank which faced the land that the site sat level with. This additional bank formed an unbroken façade which faced one of the most accessible aspects of the site as it has 103 slope paths interacting with it (Figure 31; Table 2). Viewshed analysis indicated that the construction of this bank did not increase the site's visibility, as it was no more visible than any other aspect of the site (Figure 28). Consequently, the addition of a further bank in the northern area of Gaer Fawr appears to have defensive motivations as opposed to ones of display. Similarly, at Castell Tregaron the north-eastern side of the site was enclosed by a prominent bank in the latter stages of its construction. This faced a blind hillside. Viewshed analysis indicated that this bank was not substantially more visible than that enveloping the remainder of the site, it did however, obstruct visual and physical accessibility to the entrance (Figure 22). The addition of this bank physically and symbolically enhanced its separation from the remainder of the landscape.

Another example of the superimposition of an extensive morphology onto a landscape is found at Battlesbury. This site sits on the upland edge of Salisbury Plain and overlooks the featureless downland landscape out towards Cley Hill. The southern aspect of the site is extensively enclosed by a number of banks which were not needed to effectively enclose this area as the topography slopes greatly (Figure 309). It is likely that this disproportionate allocation of resources was implemented to enhance the image of the site. The use of morphology to enhance site images is further explored later in this chapter.

The placement of sites in relation to topography also influences the visual perception of the site from those outside of it. For example, the inner fort of Tap o'Noth crowns the summit of the hill; however the enclosure itself sits slightly offset from the hilltop (Figure 165). Fieldwork photography demonstrated that from the majority of the radial directions the site superficially looks like it is highly prominent and occupying the whole summit (Figures 169-175 and 178-181). However, from the south-east its true offset and less dominant position is visible (Figures 176-177). Although the inner bank is more visually prominent than the outer bank, viewshed analysis demonstrated that the inner fort is only very slightly more visible than the outer (Figure 168). The inner fort's lack of adherence to the topography in comparison to the outer did not increase its visibility, but it did increase its visual prominence.

Conversely there are multiple examples within this study alone whereby the morphology of a site strongly adhered to the topography. In the case of these test hillforts it caused them to be less visually and physically imposing. These examples are not confined to one topographical region or regions of a similar topographical character. Sited in an upland and deeply incised topographical region the outer enclosures of Tap o'Noth (Figure 165) and Dunnideer (Figure 118) both encircle the lower slopes of the hill on which the inner enclosure is situated; in doing so they closely follow the shape of the hillside (Table 2). Field photography enabled the author to see that these outer enclosures were not visually prominent (Figures 123-129 and 170-183). GIS based viewshed analysis also found that they were not notably more visible than any other morphological component of the site (Figure 121 and Figure 168).

Similarly within the undulating and relatively featureless downland landscape of the Warminster test area the shape and extent of Cley Hill follows the contour of the upland knoll (Figure 290, Table 2). The downslope position of the enclosing works from the hilltop meant that they did not detract from or greatly add to the visual prominence of this topographical landform. GIS-based viewshed analysis also failed to confirm that these enclosing works were notably visible (Figure 293).

The enclosing banks of Prestonbury Castle also follow the gentle slope of the hill (Table 2) (Figure 96). Prestonbury Common is sharply cut by the gorge of the River Teign, consequently the banks that enclose this site occur where the site is not defined by the edge of the gorge. In the west and south where the slopes of the gorge are at their steepest, the enclosing works were minimal. The remainder of the enclosing works face the site's susceptible areas, where it is not naturally defined or defended by great slopes, however today they are not ostentatious. These banks physically define an area but they do not restrict visibility and they fail to impose upon anyone who is on the outside of them. They come across as both a physical demarcation of space and a symbolic disconnection between the site, and the remaining hilltop. This is achieved by the placement of multiple banks within an area that the site is not naturally separated from, without the banks the hillfort and non-hillfort would appear as one.

These results indicate that the placement and morphology of hillforts in relation to the topography of the majority of sites within this study was not motivated by a defensive need. The motivations behind the position and morphology of these sites appears to be primarily influenced by a desire to define a space both physically and symbolically. However, the prominence of these defined areas is also bound up with their relationship with the topography.

Topographical prominence vs. site prominence

Although there are examples where sites either adhere to or disregard the topography, when one looks closer at the form of the underlying topography particularly the matter of prominence, the sites which adhere to the topography cannot be seen as less visually powerful than those which do not. For example, although for much of its circuit the outer rampart line at Tap o'Noth is an inconspicuous feature running along the contour, the hill itself is visually powerful and imposing in the landscape that surrounds it (Pages 207-323). This site is not less visually imposing than the North enclosure on Hardings Down (Pages 385-395) or The Bulwark (Pages 421-432), which are sites that do not adhere to the topography. In fact the topographical position of the outer enclosure at Tap o' Noth makes it appear more powerful than the latter two sites as it towers over the surrounding landscape to a greater extent than the latter enclosures. Visual prominence and overall visibility creates a site's overarching image within a landscape. However, in the case of Tap o'Noth visual prominence was predominantly caused by the topography. It is therefore difficult to effectively divide and perceive the visual prominence of the hillfort from the visual prominence of the topography.

Open or closed?

The relationship between hillfort morphology and landscape topography also influenced the visual openness of sites. Driver focused upon the visibility and prominence of the core architectural components of the hillforts within north Ceredigion. However, the broad scope of this GIS-based analysis identified interesting visual characteristics surrounding the interiors of some of the test hillforts within this study. Sites were identified that were visually open whilst some appeared to be visually closed. Analysis found that regardless of the height of banks which enclosed some of these sites, the visual accessibility of their interior was highly influenced by the topography on which they stood. In these cases the enclosing works were used to monumentalise topographical features as opposed to satisfy a practicality. The use of enclosing works to monumentalise topography and enclose sites instead of obstructing the visibility of their interiors was highlighted by Hamilton and Manley in their study of south-east England (2001). Much later Kelly argued that there should be a dichotomy between “public and restricted performance sites” (2015, 27), this is mirrored in the results of this study’s analysis.

The visibility-based analysis of the hillslope enclosures within this study found that the interiors of these enclosures were highly visible but that this visibility was also unsurprisingly highly directional. For example, on the Gower, the West and North enclosures on Hardings Down were highly visible from the lowlands to the north and west due to the slopes of the hill (Figures 218 and 238). This is mirrored in the Dartmoor test area at Prestonbury Castle which is highly visible from Broadmoor Common, to the east of the site (Figure 97). The slope of the hill meant that the height of the banks which enclose this site would not have affected the visual accessibility of the site’s interior. The creation of such visually open sites formed public monuments. Even though their enclosure physically and symbolically separated them from the remainder of the landscape, the high visibility of their interior visually integrated them into it.

Conversely the degree to which sites were visually closed was highly variable. In many instances the visually closed nature of sites was caused by the underlying topography and not the form of enclosure. The examples were all in close proximity to one and other in their relative test area. At Hardings Down there was poor inter-visibility between the sites (Figures 225, 227, 246, 248, 258 and 259). Their entrances were also oriented away from each other. This evidence raises the issue that these sites may have functioned as a single entity; if they did not and they were contemporary it would have been very difficult for them to have co-existed without any shared visual or physical awareness of what could have been a threat to the group. The co-existence of these sites on Hardings Down with no immediate visual relationships amongst them implies that the access to knowledge about the people and the activities within this landscape was not gained simply through visibility.

Poor intervisibility in relation to sites within close proximity is also demonstrated at two potential pairs of sites within this study: Prestonbury and Cranbrook (Griffith and Wilkes 2011); Battlesbury and Scratchbury (Corney and Payne 2006). Viewshed analysis demonstrated that there is limited intervisibility within each pair (Figures 77, 109, 319 and 338); visibility was confined to the outer perimeters of the sites. In the case of the Dartmoor pair, the sectors of the sites which were visible from the paired site are minimally enclosed. This supports Griffith and Wilkes' argument that these sites were paired because they placed their strongest sides to their backs, which face adjoining land and not towards each other (2011). In Warminster this is not as obvious because Battlesbury's visible side from Scratchbury is highly enclosed, but even so it is not the site's most enclosed sector. These site pairs are situated within very different topographical regions. Cranbrook and Prestonbury are located within a region which was divided by a deeply incised river valley, whilst Battlesbury and Scratchbury are located on the perimeter of Salisbury plain.

However, the combination of both topography and morphology in the upland region of Aberdeenshire with Tap o'Noth's principal inner enclosure also created a visually and physically closed off site from the surrounding landscape. This site is not visible from the outer fort. Fieldwork demonstrated that it was not possible to see into the inner fort from the interior of the outer fort. This fort is also physically closed as it is not believed to have had an entrance. The lack of an entrance at the inner fort at Tap o'Noth in itself formed an incorrect pathway in that it physically refused entry.

The variability of the viewshed analysis results from this study highlights how variable the visual integration of hillforts within a landscape could be. This variability also has ramifications for our interpretations of the role of hillforts within a landscape. Hillforts have persistently been interpreted to have had a defensive role, which has more recently come under critique. GIS based studies have also investigated the defensive characteristics of sites (Mitcham 2002; Sakaguchi, Morin and Dickie 2010). The results from this thesis has highlighted that if one defined the defensive nature of hillforts in part as to having a visually closed interior, then not all of the hillforts within this thesis could have had a defensive function. The evidence is increasing pointing towards a group of sites which performed to the surrounding landscape.

Image

Image through the allocation of resources

The morphological form and orientation of these sites also formed part of this performance. Driver highlighted that at some sites in north Ceredigion there were instances of the disproportionate allocation of resources to particular sectors of their enclosure. In these instances, at sites such as Castell Grogwynion, the most impressive enclosing works were placed in an area which Driver argues was where people approached the site (2005a and 2013). This area is likely to have been the predominant route to the site as the terrain is much gentler than from other directions.

GIS-based analysis did not identify a universal trend in the disproportionate allocation of resources within the morphology of hillforts to portray a particular image within a particular direction. Only three out of the twenty-two test hillforts within this study have evidence that implies that resources were disproportionately applied to the most visible aspect. (Table 2). Eight out of the twenty-two have their most extensively enclosed area facing their most accessible area, at the remainder of the sites there is no distinct paternation.

There is, however, a balance between an adequate and an ostentatious response to site susceptibility that was mentioned earlier. Eleven out of the twenty-two test hillforts' morphologies are adequate responses to topography whilst the remainder are ostentatious (Table 2). The latter could form examples of the portrayal of a particular image within a particular direction. The degree to which sites responded had a direct correlation with the form of its topographical environs. For example, in the most prominent landscape within this study; the deeply incised Teign River Valley (Chapter 4), or the smaller micro landscapes which surround the sites in Ceredigion (Chapter 3), the sites use the natural prominence of the landscape to aid in their construction. However, these sites were inevitably exposed due to weaknesses in the topography, but their response to such weakness varied. For example at Prestonbury the site's eastern enclosing works lacked visual prominence and formed a simple physical delineator of space. On the other hand Trecoll's northern façade faced the only direction from which people could approach the site, this façade was highly visually and physically prominent. It was an ostentatious display piece which also physically separated the site from the surrounding landscape, whereas the banks at Prestonbury were an adequate response to a need to define space.

On the other hand, within the relatively subtle landscapes of both the Gower and Warminster test areas the sites are separated by low-lying featureless land (Figures 215 and 289). The sites themselves are on hills, which lack visual and physical prominence. The morphology of these sites, particularly the Warminster group strongly indicates that ostentatious forms of enclosure were used to enhance the visual and physical prominence of these sites. In the case of The Bulwark the extensive southern enclosing works were placed in the site's most visible area, in relation to those sites on Hardings Down (Figures 276, 278 and 280). The West Enclosure on Hardings Down also displayed its most extensive enclosing works towards its neighbouring sites (Figures 217, 225 and 227). Similarly the southern enclosing works at Battlesbury in the Warminster test area were placed in the site's most visible area from both the wider surrounding landscape and specifically from the nearby hillfort of Scratchbury (Figures 311 and 319).

The variable nature and motivations behind the disproportionate allocation of resources during the construction of hillforts within these test areas further demonstrates the variability in this class of monument. Variability in the morphological form and location of hillforts was identified earlier by Hamilton and Manley in south-east England on a chronological basis (2001). Even though the test hillforts within this thesis do not possess dating evidence that would enable the clarification of whether the differences in their placement, morphology and visual characteristics was as a result of chronology, variability in the directionality of the hillforts has nevertheless been identified that is mirrored in studies elsewhere.

The scale of visual prominence

Alongside visibility and morphological orientation the visual prominence of these site is also highly variable. Driver's analysis of the visual prominence of the architectural components of the hillforts of north Ceredigion primarily focused on assessing their prominence from routeways and neighbouring hillforts (2005a, 2007 and 2013). He argued that the visual prominence of these components acted as monumental and symbolic indicators of importance (2007). Speaking very broadly about the situation in Wessex, Sharples argued that visual prominence set a hillfort aside from an enclosure (2010).

However, this GIS-based analysis highlighted that the visual prominence of a hillfort in both Wessex and beyond can come in different forms.

Visual prominence can be fragmentary as represented by the disproportionate allocation of resources, with the construction of additional banks within sectors that they were not defensively needed, such as at The Bulwark and Battlesbury. In some cases, hillforts that were situated very close together had limited intervisibility between each one for example the Hardings Down group, Dartmoor hillforts, and Scratchbury and Battlesbury. Other sites were highly visible from the surrounding landscape; however the degree to which they were visible varied with distance and directionality. In some cases such as the outer enclosure at Tap o'Noth, Dunnideer, Wheedlemont and Cley Hill the visual prominence of these sites was enhanced by the topography as the enclosing works to these sites alone did not create visually prominent sites.

The highly variable evidence for the visual prominence of hillforts raises the question as to whether this characteristic can be used to define a hillfort as Sharples suggested (2010). At many sites within this study, what was visually prominent from the viewing point of one person in one place was not for another somewhere else. Consequently, just as the term hillfort covers a wide variety of sites, the means by which a site can be defined as visually prominent is also highly variable. Visual prominence is also affected by distance, direction and vegetation growth. The variability and the susceptibility of visual prominence further questions how one can define a site as a 'hillfort' compared to defining it as an 'enclosure'.

Whilst this study was in its initial stages, so too was the Atlas of Hillforts in Britain and Ireland project. In their initial discussions the difficulty of what to include or exclude within the Atlas was highlighted. It was also noted that due to the variability of these sites it would be impossible to have one single definition of what is a hillfort. Consequently, the project adopted a point system whereby a site had to satisfy two of the three criteria to be included in the database, these were:

1. Landscape setting and some notion of local 'prominence'...
2. Scale of enclosing works, includes entrances, something bigger than you would expect for a farmstead
3. enclosed area, notionally 0.2ha is a boundary.

(Atlas of Hillforts in Britain and Ireland Project 2015*)*

In the adoption of multiple criteria like this, the project acknowledged the inherent difficulties in defining such a diverse group of monuments. This thesis has also laid question to the notion of 'local dominance' in terms of site images and visibility. A site cannot be defined as locally dominant or locally visually strong because within that locality there is variability. The fact that the Atlas project adopts a multiple point system reduces the scope for critique based upon definition and widens the span of the project.

However, this thesis has also identified that the completeness of the image portrayed to the surrounding landscape by the hillforts, i.e. the amount of it that was visible was found to be highly variable (Table 2). Only two out of the nine sites that were able to have this investigated portrayed a complete image, the remainder had split images. This demonstrates that just as interpretations of visual prominence can vary with distance and direction, the visibility of a site's different components also varies. This variability demonstrates that access to knowledge of these sites is also highly variable, consequently in many respects those that are seen as 'public monuments' cannot necessarily be interpreted as 'completely' public.

The falsification of images

As it was highlighted above, several examples of the most elaborately enclosed aspects of hillforts coincided with either the most visible or accessible aspects of sites. However, several other examples were found where these elaborate architectural components coincided with the blind pathways (Table 2). These examples were discovered in Ceredigion, The Gower and Aberdeenshire. This coincidence meant that by definition the façades of Castell Tregaron (Figure 24), Trecoll (Figure 58), Pen y Bannau (Figure 65), Cairnmore (Figure 212) and Hardings Down West enclosure (Figure 235) were placed in areas where there was limited visibility into the sites. These façades manipulated site images. The effectiveness of this manipulation was accentuated by the fact that from outside of these façades there was limited visibility to the remainder of the site, so it is not readily visible.

The visual impact of these façades was limited to the people that were within the immediate vicinity of the sites, and more than likely approaching the sites. These façades manipulated initial impressions of the sites in question. They informed people's experiences of them and formed part of a performance. However, these structures were potentially constructed by a large group of people that could have come from both within the physical community of the hillfort and its wider surroundings. Consequently, the façades were not necessarily a 'surprise' to those that approached it. Even though these façades were not necessarily always thought of as a 'surprise', they would still have been an impressive sight upon approach and a great influence upon people's experiences. They formed an integral part of the performance that is the hillfort structure.

The coincidence of hillfort façades with blind pathways does not support the study's initial hypothesis that image would be portrayed through a site's most physically or visibly accessible area, which was also Driver's concept of image. In these instances the distortion of site images was far more complex; this complexity meant that such an observation is not likely to have been readily found within a non-GIS based analysis. This observation was also not visible within viewshed analysis; it was only through the integration of visibility with movement during cost surface analysis that this very important observation was made. This has ramifications for future investigations into the morphological variations at sites on a site to site basis and should not be ignored.

Correct pathways

Another aspect of Driver's research drew out the concept of correct paths of movement (2005a and 2013). He noted that at Pen Dinas Elerch and Castell Grogwynion direct access to the site was obstructed by their morphologies (2013). This obstruction meant that people were routed into the site from a particular direction that those who constructed the site intended them to take. These were therefore morphologically defined correct pathways. This GIS based analysis investigated whether or not other forms of correct paths of movement existed, for example ones, which were informed by site visibility and ease of movement. By definition the GIS based pathways followed the least effort route through the landscape which does not factor in deflection from such a route. Driver's morphological correct pathways are constructed, actual pathways which also imply regularity in movement, however in this case it was enforced regularity.

The degree to which the sites within this study exhibited evidence for the existence of correct pathways was variable. On a morphological basis, the inner fort at Tap o'Noth does not exhibit any evidence for an entrance. However, there is a high correlation of slope-based least cost pathways with the highly eroded south-eastern corner of the site (Figure 194), which could imply that this was an entry point into the site at some time.

There are also several breaks in the enclosure circuit of the outer fort. It has been postulated that some of the ten breaks in the enclosure may be ‘ancient’ (Halliday 1999; Halliday 2008) and consequently acted as access points to the huts that were found within the outer fort (Halliday 1999). Whilst there is no definitive proof that these breaks are actual entrances, the break in the north-western area coincided with several GIS-based pathways. This break was one of the most accessible points of the site; however, it is one of the most poorly occupied aspects of the site (Figure 194).

Thirteen of the test hillforts have entrances which were enhanced beyond the necessary form of a simple gap to mark the entry point (Table 2). For example, at The Bulwark the eastern entrance has outworks, which enlarge the footprint of the site without expanding its occupational area (Figure 269). These earthworks did not control movement into the site, they enhanced the site’s image to those who were approaching and entering it from the edge of the topographically prominent Llanmadoc Hill. At Wooston Castle, the site’s entrance was approached by a hollow way, which formalised movement into the site (Figure 84). This hollow way also strongly coincided with slope based pathways into the site (Figure 93). The placement of the hollow way in correlation with the easiest route into this site demonstrates that those who constructed the hollow way enhanced the topographical qualities of the land. This was in accordance with their desire to accentuate the transitional act of movement from the ‘outside’ to the ‘inside’ of this site. The experiential and morphological enhancement of entry and exit into these sites further supports this study’s findings which demonstrate that although hillforts are superficially highly variable there is an aspect of performance which underlies them all.

Even though there is a strong underlying desire to perform through architecture, in half of the test hillforts the placement of at least one of their entrances coincided with the slope-based least cost pathways (Table 2). The entrances at Prestonbury and Dunnideer coincide with both visible and slope based least cost pathways (Figures 112,114,134 and 135). The visible and accessible nature of these areas is likely due to the gentle and extended slopes of the topography. Three out of the four sites within the sample of sites that coincide with visible pathways also had morphologically elaborate entrances (Table 2). These entrances were placed within the site's most extensively enclosed area, which enhanced the prominence of the site's entry point.

In total, cost surface analysis found that seven out of the twenty-two sites within this project had entrances that coincided with visible pathways (Table 2). At The Bulwark and Battlesbury even though the visible paths do not intersect with the site's entrance, they coincide with some of the sites' most extensive enclosing works (Figure 286 and 325). These results all demonstrate that some of the most extensive and elaborate morphological aspects to these hillforts were one of the most visible points to them. This further supports the contention that at some sites there was a disproportionate allocation of resources. The manipulation of the images of these sites was likely influenced by the known visibility of approaching traffic and for the need to make an impressive first impression.

Evidence indicates that degrees of practicality, display or a combination of both influenced the placement of entrances, however in the case of Battlesbury there was a complete disregard for either. Cost surface analysis identified a deliberate disregard for accessibility in the case of the placement of the north-western entrance at Battlesbury Camp (Figure 323). This entrance was positioned offset from the plateau which is the most accessible point of the hillfort; this plateau also housed the Battlesbury Bowl settlement

(Ellis et al. 2008). The placement of the entrance slightly offset from this plateau makes entering the site more difficult than it otherwise would have been. This implies that ease of access was not the foremost influential factor with regard to the placement of the entrance; it may have been selected for more symbolic reasons. The author believes that this symbolic reasoning may have been based on the need for some fort constructions to disassociate themselves from the past; after all it is believed that the Bowl settlement was the predecessor to the hillfort.

Beyond movement, visibility and topography

Physical associations with the past

Whilst the construction of hillforts embodied ideas that were present at the commencement of their construction, it was also related to and affected by their associations with the past (O'Connor 2009, 11). Driver suggested the concept of prime and non-prime locations which were primarily defined on the basis of their accessibility, but he also related them to associations with the past (2005a). He argued that when sites were physically associated with evidence from the past, it indicated that the locations had been important for a long time (2005a). Gosden and Lock investigated the idea of "Prehistoric Histories" by exploring the concepts of history and myth (1998). They argued that "history and myth are not polar opposites, but are mutually linked" (*ibid* 1998, 11). People were aware of the past, however how that was related to and used within the present potentially differed across time (*ibid* 1998) and space. This GIS-based analysis identified several instances where hillforts were constructed in established places of importance within the landscape, however how the sites related to this differed greatly.

In the majority of cases, where sites were physically associated with evidence of previous use, this association often physically hindered the effectiveness of site construction as material had to be derived from further afield than from the immediate hilltop. For example, in the case of Battlesbury the preservation of the barrow in the southern corner of the site meant that it was incorporated within the defences (Figure 309). This made the construction of the southern bank more difficult than it had to be as material could have been sourced from the barrow. This barrow is also located within one of the site's most visible areas; consequently the contrasting form of this barrow with the relatively flat interior meant that it potentially detracted one's attention from the hillfort itself.

The position of barrows within hillforts also hindered intra-visibility at sites. This was demonstrated at Cley Hill, which has two very visually prominent barrows in its centre (Figures 290 and 291). Just like at Battlesbury these barrows also detract outsiders' attention from the hillfort due to their visual prominence. However, viewshed analysis did not indicate that the barrows were quantitatively more visible than the majority of the site (Figures 293, 300 and 302).

The associations of hillforts with earlier activity also influenced their morphology. For example at Cranbrook, an earlier arrangement of reaves provided a reference point for the positioning of the hillfort enclosure at the centre of this system. The topographical form of this hillfort was not distinctive enough to have drawn people to the site (Figure 69). The cairns and reaves within this location also indicate that people secured and invested within this landscape. The placement of reaves within this area led Fleming to argue that people had confidence in the productive potential of the land (2008).

There are also instances where sites were completely disassociated with the past and in some cases their present, this was seen on The Gower in particular. This raises a question as to whether a location was universally made 'prime' (Driver 2005a; Driver 2013) with good accessibility, access to resources and an association with the past, or whether one drew people more than the other. Good accessibility encourages movement between hillforts and their surrounding landscape; it allows resources such as food and material into and out of the site to maintain a community. Associations with the past can imbue a location with importance, the continued investment at these locations with new additions potentially inherit this importance. For example, The Bulwark was situated on the eastern edge of Llanmadoc Hill, which is a hill that is densely occupied with Bronze Age Barrows. The morphology of the site implies that although those who chose to construct The Bulwark wished to be associated with a significant place within the landscape (Llanmadoc Hill). This association was limited as the most prominently enclosed aspects of the site face this area; the eastern entrance faces away from this area (Figure 269). This meant that physical access to the remainder of Llanmadoc Hill would have been more complicated than it could have been. Viewshed and fieldwork observations also found that there was limited intervisibility between the remainder of Llanmadoc Hill and The Bulwark (Figure 270).

A similar situation also occurred on Hardings Down, which is also situated in The Gower study area. Here the entrances to the sites are all situated away from one another. GIS based cost surface analysis demonstrated that the entrances to these sites were not placed within a sector that was most accessible from each of their neighbours on Hardings Down (Figures 234, 252, 266). This meant that travel between them would have been more complicated than it might have been.

The variable nature of relationships between the test hillforts and other elements of prehistoric activity in these landscapes further demonstrates the lack of consistency in their placement and morphology, which has been resonated elsewhere within this study. There was not a singular response in hillfort morphology or locations to non-hillfort sites. However, this as with other observations needs to be set within a wider chronological context, where possible.

Wider chronological picture

The construction of hillforts came at a time when there was an increased emphasis on the definition of space (Hingley 1990; Lock 2011) which had its origins in the Neolithic (Hill 1996). This study identified sites whose morphology and location implied that they served to define, secure and dominate space. However, just as the blanket term of 'hillfort' covers a wide variety of sites, the means by which these sites defined, secured and dominated spaces also varied. Such variability may have been enhanced by topography, which was raised earlier within this chapter; however it may also have been chronological.

There is little definitive chronological understanding of the development of hillforts particularly their morphologies across Britain. This was mirrored within this study. It is broadly believed that within the Middle Iron Age (400-300 BC) many early hillforts were abandoned in central southern Britain and the remainder were refortified (Cunliffe 2006). These middle Iron Age hillforts developed from sites which were enclosed with a singular bank and ditch (Cunliffe 2006) to more morphologically complex structures. To some extent this chronological pattern could be seen within the small sample of Britain's hillforts, which were investigated within this study. For example at Warminster it is believed that because Scratchbury was morphologically very simple and poorly defended in comparison to Battlesbury that it was earlier (McOmish, Field et al. 2002; Ellis, Powell et al. 2008). Wooston Castle is also believed to have become more morphologically complex over time, however Historic England argue that this site was not established until the 1st and 2nd centuries BC (2015b) which does not support Cunliffe's model (2006).

At Dunnideer and Tap o'Noth in Aberdeenshire the morphology of the sites did not develop in the same way as those in the Warminster test area. Instead, it is believed that the oblong forts were of a later phase than the outer forts (Cook 2013a; Feachem 1966). These oblong forts were visually and physically impenetrable however their enclosing walls particularly at Tap o'Noth were visually and physically imposing. The addition of these structures to the outer fort which were such a visual and physical contrast to the earlier structures implies that the addition of the oblong forts was an indication of changing values within society. These forts formed the public face to the sites which had earlier been relatively subtle constructions on prominent topographical features. As Lock, Gosden and Daly argued the construction of a hillfort drew upon the past whilst also reassembling it within "new relationships of the present" (2005, 134). These new relationships applied value to the need to construct such a contrasting site to what had been earlier placed in this area. The creation of a hillfort was a "community project…that… helps bring a community into being" (*ibid* 2005, 134). Lock and colleagues argued that the construction of a new site such as Segsbury created a "novel community" (2005, 134), the construction of the inner forts at Dunnideer and Tap o'Noth which were such a contrast to their predecessors implies that this was also a 'novel community'.

Cook postulated that Tap o'Noth could have been reused within the Early Medieval period (2011). The visual and physical prominence of Tap o'Noth led Cook to believe that it would be 'strange' for it not to have been used within this period (2011). This site towers over Rhynie, which has a dense concentration of activity associated with the Early

Medieval period. However, as Ralston highlighted, it is unlikely that the inner fort of Tap o'Noth had any substantial occupation within this period as there are still upstanding traces of the enclosure which predates the inner fort itself (2004).

The early Medieval forts of Wheedlemont and Cairnmore had minimal visual and physical prominence from the surrounding landscape (Figures 277-284, 333 and 335). The visual and physical prominence of these sites has inevitably been affected by the degree to which they survive today. Wheedlemont sits above modern agricultural land whilst Cairnmore has had a long history of fluctuating vegetation coverage. Even though these sites are likely to be heavily eroded, the degree of this erosion would never have meant that the sites were as visually prominent as similar sized hillforts within similar topographical points such as Cranbrook Castle (Figure 69) and Castell Tregaron (Figure 20). The date of these sites is not known however it is assumed that they derive from the later prehistoric period.

Cranbrook Castle and Castell Tregaron occupy rounded hilltops as hillforts often do; however the relationship between the site morphologies and the topography indicates that the sites were superimposed upon the topography. The morphology of these sites was applied to and essentially cut into the topography in a very abrupt form whereas Wheedlemont and Cairnmore did not. Even though the morphology of Cairnmore and Wheedlemont was not elaborate, their enclosure was relatively extensive compared to their small size (Gondek and Noble 2011). This led to speculation prior to the dating of Cairnmore that these sites could have been occupied within the early Medieval period (*ibid* 2011). These early Medieval sites largely followed the topographical form of the hilltop, and whilst they did respond to the susceptibility of the site it was not ostentatiously done which mirrors what occurred at a number of the presumably prehistoric sites. Consequently morphology and location are not good dating guides.

Concluding remarks

Even though this thesis identified that there is a great deal of variability behind the location and morphology of hillforts there is an overarching similarity. Evidence indicates that there is an overarching drive in hillfort construction to employ directionality in hillfort morphologies. This directionality focuses upon the influencing of people's experiences of the hillforts, which was earlier explored by Driver through his idea of image. The morphological orientation of hillforts clearly went beyond pure practicality. As with Mitcham' s study of Hampshire hillforts (2002) this thesis did not identify sites which were overtly defensive in form and siting, their primary focus was that of display. Whilst at some point, some hillforts may have been constructed with defence in mind the visual and physical properties of these structures appears to be highly social. A characteristic which Mitcham highlighted should be investigated further (2002), the evidence from this thesis further supports this objective.

Whilst this thesis focused purely upon the analysis of the visual and physical properties of sites there is the opportunity for future studies to further explore the visual and physical qualities of hillfort sites compared to random locations. This has the potential to further our understanding of the reasoning behind hillfort placement and develops upon the work of Marsh and Schreiber (2015). Similarly visual relationships between hillforts and the surrounding landscape should also be explored, for example to and from other sites and not for the analysis to be reserved solely to hillforts.

However, without a true chronological understanding of the development of hillforts within these landscapes it will always be difficult to ascertain the depth of the visual and physical relationships within them. A priority must be made to ensure a research agenda is highlighted and implemented on a national scale to ascertain as much as it is possible the dating of hillforts. The establishment of a chronological understanding of hillforts would enhance exploratory analyses like this no end. The following chapter explores the effectivity of the methodology that was employed within this thesis and highlights how it can be developed upon for future research.

Table 2. Summary table of the thesis results (Part A)

	Morphology defined by topography	Morphology ignores topography or no definable topographical features	Adequate response to topography	Overt response to topography	Disproportionate allocation of morphology to highly visible area	Disproportionate allocation of morphology to highly accessible area	No distinct correlation	Complete image	Split image	Morphological correct pathway-defined by topography	Morphological correct pathway-defined by complex entrance	Not Applicable
Castell Grogwynion		X		X		X					X	
Castell Tregaron	X			X			X				X	
Gaer Fawr		X		X			X					X
Pen Dinas Elerch	X			X			X			X	X	
Pen Dinas	X		X				X			X	X	
Tan y Ffordd		X		X			X					X
Trecoll	X			X		X				X		
Pen y Bannau	X			X		X					X	
Cranbrook Castle		X	X				X		X			X
Wooston Castle		X	X		X	X			X		X	
Prestonbury Castle	X		X				X	X			X	
Dunnideer	X		X				X				X	
Wheedlemont		X	X			X						X
Tap o'Noth	X		X				X					X
Cairnmore		X		X		X					X	
Hardings Down West Enclosure	X			X	X	X			X		X	
Hardings Down North Enclosure	X		X				X		X		X	
Hardings Down East Enclosure	X		X				X		X		X	
The Bulwark	X			X	X				X		X	
									X			
Cley Hill	X		X				X		X			
Battlesbury	X			X	X	X		X		X		
Scratchbury	X		X				X			X		

Table 2. Summary table of the thesis results (Part B)

Slope-based pathway correlates with entrance	Slope-based pathway -correlates with extensive banks	No distinct correlation	Visible pathway-correlates with entrance	Visible pathway-correlates with extensive banks	No distinct correlation	Blind pathway-correlates with entrance	Blind pathway-correlates with extensive morphology	No distinct correlation	
X			X					X	Castell Grogwynion
X					X		X		Castell Tregaron
X			X			X			Gaer Fawr
X					X			X	Pen Dinas Elerch
	X				X			X	Pen Dinas
		X			X	X			Tan y Ffordd
X	X				X	X	X		Trecoll
X	X				X	X	X		Pen y Bannau
X			X					X	Cranbrook Castle
X			X					X	Wooston Castle
X			X					X	Prestonbury Castle
X			X					X	Dunnideer
	X				X			X	Wheedlemont
		X			X			X	Tap o'Noth
	X			X			X		Cairnmore
		X		X			X		Hardings Down West Enclosure
		X			X			X	Hardings Down North Enclosure
		X			X			X	Hardings Down East Enclosure
		X			X			X	The Bulwark
		X			X			X	Cley Hill
		X			X	X			Battlesbury
X			X					X	Scratchbury

Chapter 9
GIS approaches and British hillforts- lessons learnt and future prospects

This thesis set out to develop a GIS-based methodology to investigate the degree to which the construction and morphology of a selection of hillforts across Britain enabled or disabled an individual's ability to gain visual and physical knowledge of them whilst being within the landscape. The focus of this work was based upon and developed from the work of Driver who advocates that hillforts need to be examined as "three-dimensional 'artefacts'" by assessing them in relation to human experience and the approaches to them (2007, 86). The innovative approaches applied in this GIS-based methodology with the integration of movement and visibility alongside the utilisation of radii in both Cost Surface and Viewshed Analysis quantifies and enhances one's understanding of the potential to experience hillforts. The addition of ground-truthing field visits also meant that the scope of the GIS-based results could also be tested and enhanced humanistically.

Revisiting the aims and objectives

As with every piece of research, this study set out with a series of aims and objectives. At the beginning it had two fundamental aims:

- To develop a GIS-based methodology to investigate the morphology and location of test hillforts. Focus was put upon the assessment of movement and visibility in relation to hillfort location and morphology.
- To test the results of Driver's non-GIS based analysis of hillfort location and morphology (2005a and 2013) with a GIS-based analysis.

A critical analysis of the methodology and data

A methodology was created that enabled the author to investigate the visibility and physical accessibility of the test hillforts within this thesis. Whilst the methodology was productive in allowing effective interpretations of the results, limitations with the data and methodology were highlighted. These can be improved in future applications.

From the outset the present writer highlighted that caution was needed when using GIS-based analysis, as it can be very deterministic. Efforts were made throughout to counteract this effect by using multiple DTMs with different resolutions and multiple weightings of the friction surfaces. Field visits were also used to ground truth the results. However, the primary base map DTM for the test areas was Ordnance Survey PROFILE DTM. Small sub-areas of the test landscapes were analysed using a LiDAR based DTM as and when this was possible for a comparative exercise. However, the differences between the results were minimal. If the study was to be done again, with more time and if the LiDAR datasets were complete, then the methodology should be considered to be applied to a LiDAR based DTM. However, as it was highlighted in Chapter 2 this needs to be taken with caution as high resolution processed LiDAR DTMs can have inherent artefacts. When used with care, LiDAR based DTMs would still enable the analysis of much subtler relationships on a landscape scale particularly with regard to least cost pathways. LiDAR will also provide a greater scope to assess the individual morphological components of sites. It will also enable experimentation with the manipulation of site morphologies to factor in buildings and other architectural features that could have affected visibility.

From the outset it was acknowledged that the analysis of the Aberdeenshire test area without any LiDAR data would be difficult, however the extent of that difficulty was underestimated. Without LiDAR data the analysis of the Aberdeenshire test area was reliant upon acquiring detailed plans of the sites (Chapter 5). These subsequently had to be georeferenced within ArcGIS which greatly increased the processing time for the test area. The aim of creating this methodology was to not only answer analytical questions but to harness the ability of GIS to analyse large quantities of data within a short period of time. A test area without LiDAR data severely reduces the speed and effectiveness of using GIS for analysis. This detracts from the speedy and convenient nature of GIS based analysis.

Although this study is primarily GIS-based, in planning the methodology the need to gain an experiential understanding of the hillforts within their landscapes could not be ignored. The importance of experientially understanding hillforts was emphasised and reinforced through Driver's innovative approach to hillfort location and morphology (2005a; 2007; 2013). GIS-based analysis provides a measured and objective approach to the analysis of hillfort location and morphology, but these sites also need to be understood by seeing them within their landscape. Site and landscape visits allow one to gain an understanding of their visual prominence, which a GIS cannot effectively depict. A GIS provides a quantitative analytical environment. It is also a visualisation tool that provides what is essentially a bird's eye view of the landscape, it cannot immerse people within a landscape as being within one can, this gives you the three dimensional understanding of a site's location and morphology. Visual studies based upon GIS have been criticised as they " [reduce] the perceptual act… to the delineation of a viewshed, which is in turn presented as an aseptic zone on a flat projected mapsheet" (Wheatley and Gillings 2000, 13). Field visits add a qualitative aspect to an otherwise quantitative investigation of movement and visibility.

<u>Does the application of GIS-based analysis enhance Driver's non-GIS based analysis?</u>

GIS based analysis was applied to a subset of Driver's test hillforts, and to the investigation into three of Driver's key observations of:

- The physical relationship between hillfort morphology and topography- this focused upon analysing whether topography was used to aid the construction of the test hillforts, or whether it was disregarded in the construction process and a 'design' was essentially placed upon the landscape.

- Image- Image was defined by the disproportionate allocation of resources within the construction of hillforts in places which were exposed to large numbers of people (for example an area that was highly visible or where it was close to a routeway and consequently visually or physically accessed by a large number of people)
- Correct pathways- in terms of Driver's non GIS-based analysis, these were defined either in terms of topography i.e. a topographically defined routeway or on a morphological basis through a complex entrance arrangement. These morphological correct pathways could have been designed to reinforce or manipulate the image of a site. The current GIS-based analysis investigated how the GIS-based correct pathways as defined by least cost pathways (slope, visible and blind) corresponded with Driver's concept of a correct pathway.

The physical relationship between hillfort morphology and topography

LiDAR enabled the analysis of hillfort location and morphology in relation to the wider topography. This investigation identified how topography was incorporated in the morphology of test hillforts. The results of this analysis supported those of Driver's analysis in Ceredigion (2005a; 2013; Chapter 3; Table 1); it also strengthened and reinforced the discussions in other test areas within this thesis. However, due to the lack of available LiDAR data for the Aberdeenshire test area this analysis proved to be very difficult (Chapter 5). It was still possible to assess the physical relationship between site morphology and topography; however it was not possible to clarify the finer details of the relationships as it was in the test areas with LiDAR coverage.

Image

The visibility of the morphological components of sites such as the most extensive enclosing works or the entrances was investigated through viewshed analysis. As the earlier chapters within this thesis demonstrated the banded viewsheds from the radii and hillfort grids were able to identify which aspects of the site were most visible and from where this applied. For example the southern enclosing works of The Bulwark are highly visible from Hardings Down as opposed to the wider landscape (Figures 276, 278, 280).

However, the degree to which the results of the GIS based investigation of image compared to non-GIS based analyses of it were variable. The GIS based methodology enabled the identification of how areas of extensive enclosure related to the accessible and visible nature of the area in which they sit which was not easily done through site visits. This is likely the cause as to why there is a degree of disagreement between Driver's interpretation of a Ceredigion site's image compared to the quantified results of the GIS based investigation into the same site (Table 1). For example, in two instances (Gaer Fawr and Pen Dinas) the GIS based results disagreed with his results whilst the remainder partially agreed (Table 1).

Visual prominence is not as measurable with a GIS, but it is interpretable in the field. However, this interpretation is highly subjective and affected by the experiences of the observer. In the case of Driver's observations of his test hillforts and the author's own observations at hillforts within her multiple test areas, the judgement of visual prominence was inevitably influenced by subconscious comparisons to the sites under question with those that the author had visited previously. This subjectivity inevitably influenced the overall conclusions of studies, particularly those like Driver's who are reliant upon non GIS-based analysis (2005a and 2013). However, the combination of GIS based analysis with fieldwork observations meant that the possibility of such subjectivity placing a bias upon the study's conclusions was reduced within this thesis. The data from the quantitative GIS-basis of this study allows one to have a measurable understanding of the visual and physical qualities of sites. This also provides the study with precision and comparability, which is otherwise not readily possible within non-quantitative analysis.

Future applications of this methodology to the investigation of image will be enhanced through further GIS based analysis with applications of visual prominence calculations such as those adopted by Llobera (2003). Llobera investigated both topographical and visual prominence within different neighbourhood scales (2003). He defined visually prominent locations as those which are most visible compared to the remainder of the neighbourhood. Whilst topographical prominence was based upon the morphological character of locations within a neighbourhood. This approach is highly applicable to an investigation of hillforts as it will provide an insight into how the visual and topographical prominence of hillfort locations compared to their surrounding landscape and the impact of such prominence.

Further means by which this methodology can be enhanced include applying a quantitative analysis of how distance and visual acuity affects visual clarity within a landscape, similar to Ogburn's approach (2006). Whilst this thesis examined changes in site images with visibility studies from the buffer zones and the neighbouring hillforts, the methodology could be further enhanced by increasing the extent of viewshed analysis. This approach would see the computation of viewsheds along known and GIS generated pathways. The computation of viewsheds along routeways has already been applied by Chapman, whose results demonstrate the merit in such a study (2000 and 2003). Viewsheds could also be generated at potential waypoints/obstacles within the landscape such as barrows and settlements.

<u>Correct pathways</u>

The primary methodology for investigating the concept of correct pathways was through GIS based cost surface analysis. The results of this analysis were subsequently related to both topographical features and evidence for human activity. This enabled an investigation as to whether the least cost pathways travelled through significant places within the landscape. Areas became significant through people's successive encounters with them, which transformed them into places (Giles 2007, 110). Investment was subsequently undertaken within these areas over successive periods. Both the results of the investment and the topographical areas within themselves persistently drew people to these areas consequently they are likely to be an indicator for routeways (Driver 2005a).

The correlation of least cost pathways with products of human activity and topographical features was most visible in the Aberdeenshire test area (Chapter 5). Here there was a significant correlation between the slope-based and visible least cost pathways with extant or contemporary areas of activity at the time that the hillforts were in existence (Figures 136, 137, 160, 163, 196, 197, 211 and 214). This indicates that there was a degree of activity within these locations, people were demonstrably aware of these places. Once people became aware of these places it is likely that they became part of their consciousness and subsequently part of their world of movement. These results also imply that the GIS based pathways may indeed relate to actual pathways. However, the overall poor coincidence of least cost pathways with known routes in the majority of test areas demonstrates that movement both now and in the past is far more complex than following the least effort route.

Even though the results of these comparisons predominantly failed to confirm that the least cost pathways followed actual routes, this approach was still current as it aligned itself with current foci of GIS based studies (Güimil-Fariña and Parcero-Oubiña 2015; White and Barber 2012). The study's computation of slope based least cost pathways to and from the hillfort buffers also meant that it aligned itself with studies that use the 'from everywhere to everywhere model' (White and Barber 2012; Nolan and Cook 2012).

Slope based Cost Surface Analysis was applied to the investigation of site accessibility and how that related to morphology. This developed on Driver's concept of a correct pathway, which he defined topographically and morphologically (2005a and 2013). For example, slope-based Cost Surface Analysis within the Dartmoor test area indicated that at least one of the entrances to each of these sites was placed in the site's most accessible area (Figures 81, 93, 112; Table 2). However, it failed to support Driver's morphologically defined correct pathway at Castell Grogwynion (Figures 16-7).

There was very little agreement between Driver's correct pathways for Ceredigion and those that were generated within the GIS (Table 1). Driver's correct pathways were topographically and morphologically defined, they were both natural and constructed pathways. GIS generated least cost pathways by definition follow the least effort routes through the landscape, which were not necessarily the case with Driver's pathways. Least cost pathways also have a set origin and destination, they imply regularity in movement which was not necessarily the case. This is a potential explanation as to why there is so little correlation between Driver's correct pathways and those generated within the GIS. The value in the GIS generated least cost pathways lies in their potential to identify why routeways/entrances were placed in such a way by examining routes of least cost pathways compared to known routes such as hollow ways, braided trackways and activity areas within the landscape. This approach follows on from studies such as Symonds and Ling (2002), White and Barber (2012), and Güimil-Fariña and Parcero-Oubiña (2015).

The innovative approach of integrating viewshed results with Cost Surface Analysis allowed the investigation of how movement affected the visibility of sites. For example in the case of Prestonbury the computation of least cost pathways based upon the visibility of the individual architectural components of the sites indicated that it largely portrayed a complete image (Figures 110-1; Table 2). The integration of movement with visibility through the calculation of blind pathways indicated that the façades at Castell Tregaron, Trecoll, Pen y Bannau, Cairnmore and Hardings Down West enclosure were all placed to face an area where those people approaching had limited visibility of the site (Figures 24, 58, 65, 212 and 235; Table 2). Visible pathways in relation to Castell Grogwynion, Gaer Fawr, Cranbrook Castle, Wooston Castle, Prestonbury Castle, Dunnideer and Scratchbury all indicated that the sites' entrances were placed where those within the site had maximum visibility to approaching traffic (Figures 18, Figure 33, 82, 94, 114, 135 and 343; Table 2). Observations like this would be difficult to make objectively in the field as one is influenced by their experiences within the landscape, GIS enables the objective computation of these pathways which can subsequently be ground-truthed.

Whilst this GIS based methodology focused upon physical constraints during the computation of least cost pathways, movement in the past is also likely to have been influenced by cultural factors. Consequently further applications of this methodology will be enhanced through an investigation of how cultural factors could also influence the routes of least cost pathways. Factors such as the avoidance of field systems, non-destination/non-origin settlement areas and ceremonial landscapes could be factored into friction surfaces. Similarly whilst this thesis took steps in aligning itself with studies that use the ‘from everywhere to everywhere’ model, this methodology could be improved by undertaking least cost pathway analysis from each grid cell based upon both slope and visual friction surfaces.

The step forward and future research prospects

This study’s innovative approach to examining movement and visibility in relation to hillfort morphology made further steps in initialising the development of hillfort studies beyond discussions of defence and typologies. Further steps must be taken to continue this progression.

Firstly the GIS based methodology must be enhanced by incorporating factors such as visual acuity and social costs through friction surfaces. The addition of these components to this methodology will greatly progress studies by equipping them with the potential to widen the scope of investigating the reality of the GIS based least cost pathways compared to known routeways. It will also enable studies to identify the motivations behind routeway and hillfort location alongside hillfort morphology.

Secondly, the investigative combination of GIS based analysis alongside field visits should be applied to a singular ‘region’ of hillforts. This region ought to be defined topographically to avoid biases within the data as a result of modern cultural and arbitrary boundaries, which did not exist in the past.

Finally, the extent to which this methodology can progress is limited to the quality and nature of the data that is available. It will be enhanced greatly once a better understanding of hillfort chronology, phasing, and the distribution and density of interior buildings is established. This will enable researchers to relate the visual and physical relationships on a chronological basis, whilst also investigating the sites as functioning entities that have potentially influential interior components.

In conclusion, a number of areas have been identified where this methodology can be developed, however this list is by no means exhaustive. The potential for GIS based analysis to aid the development of a better understanding of complex monuments such as hillforts is endless.

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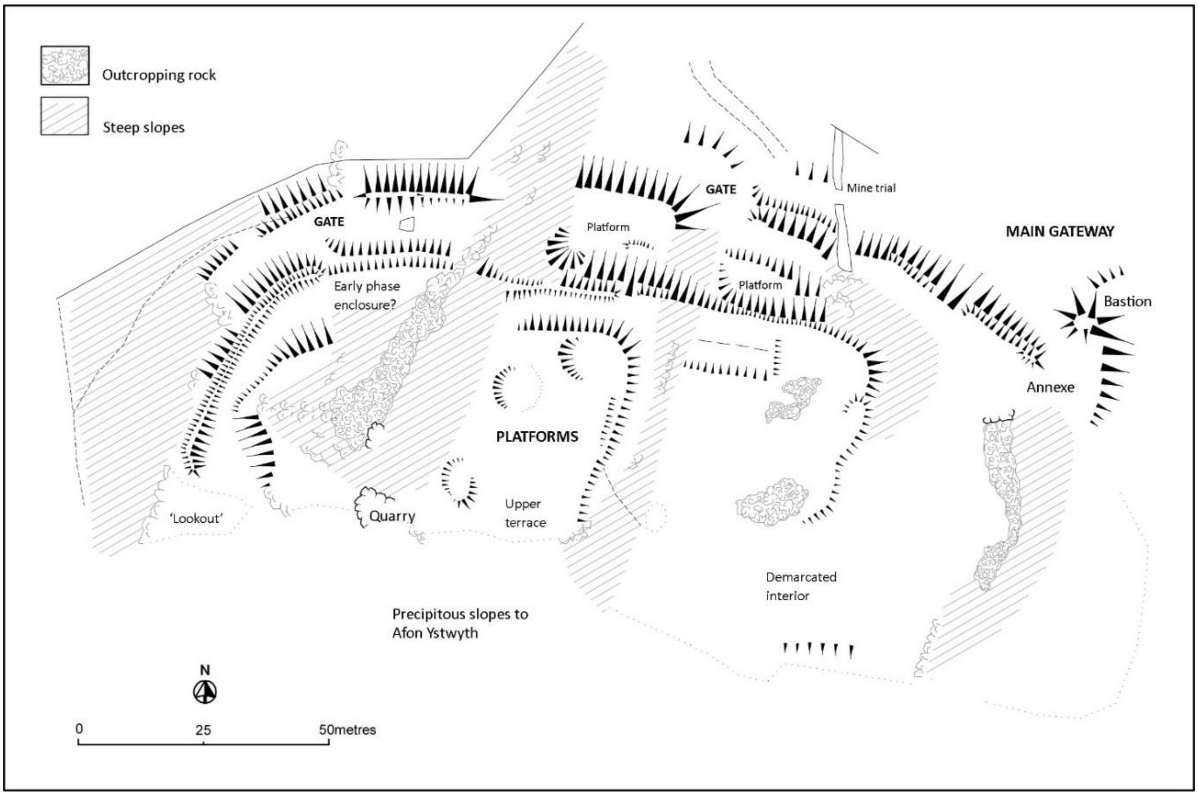
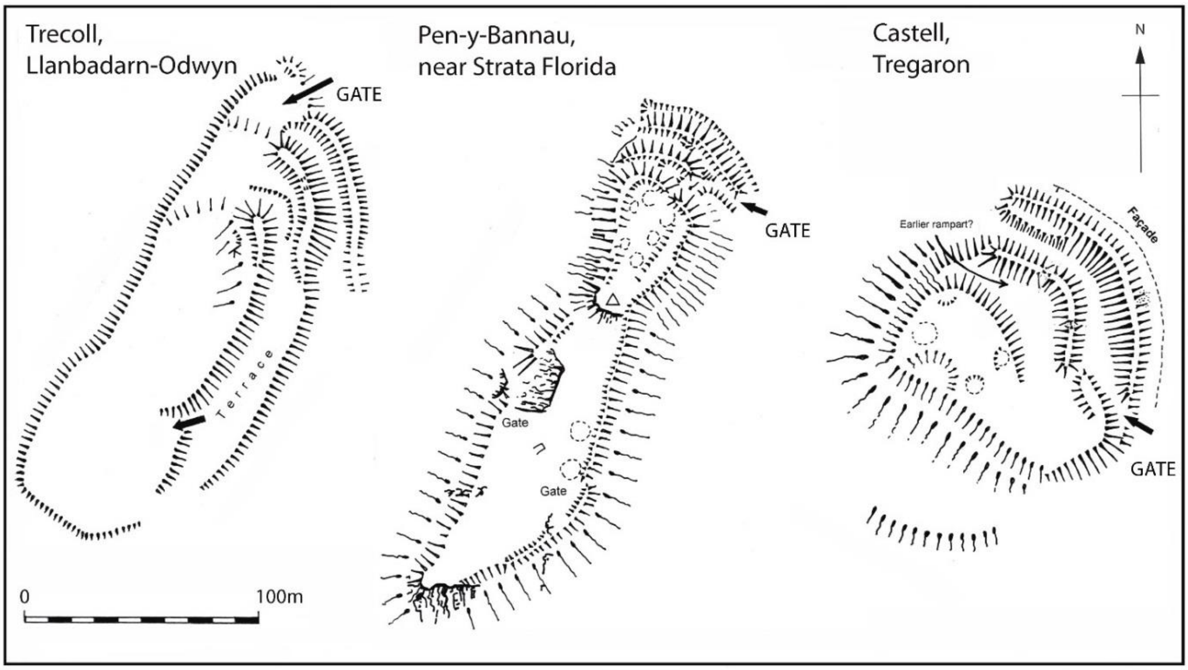
Appendix

Ceredigion

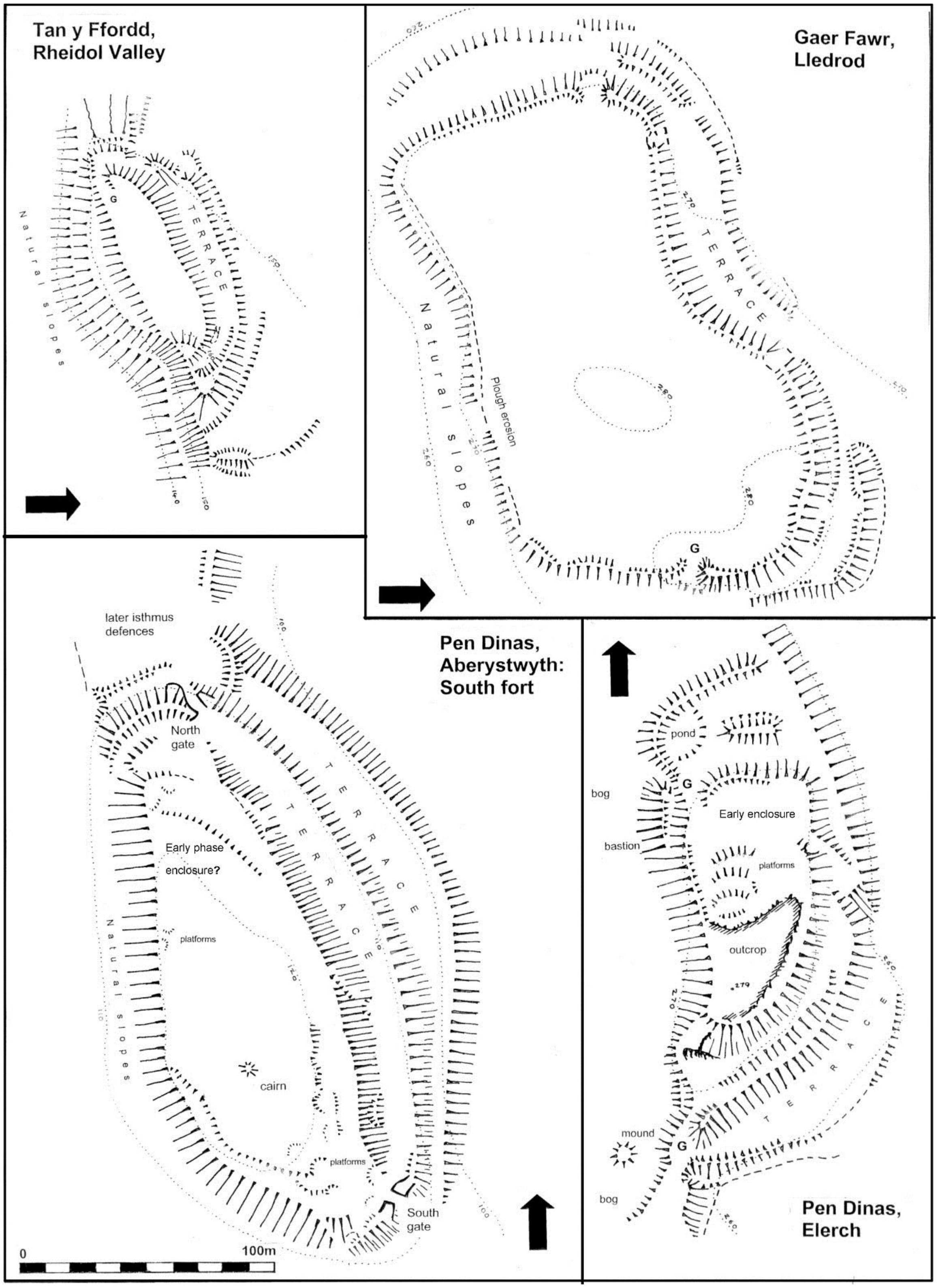
Castell Grogwynion- Draft survey plan (Crown Copyright: Royal Commission on the Ancient and Historical Monuments of Wales)



Cors Caron forts (By permission of/courtesy of Toby Driver. Sources: various)



Pen Dinas Scheme (By permission of/courtesy of Toby Driver. Sources: various)



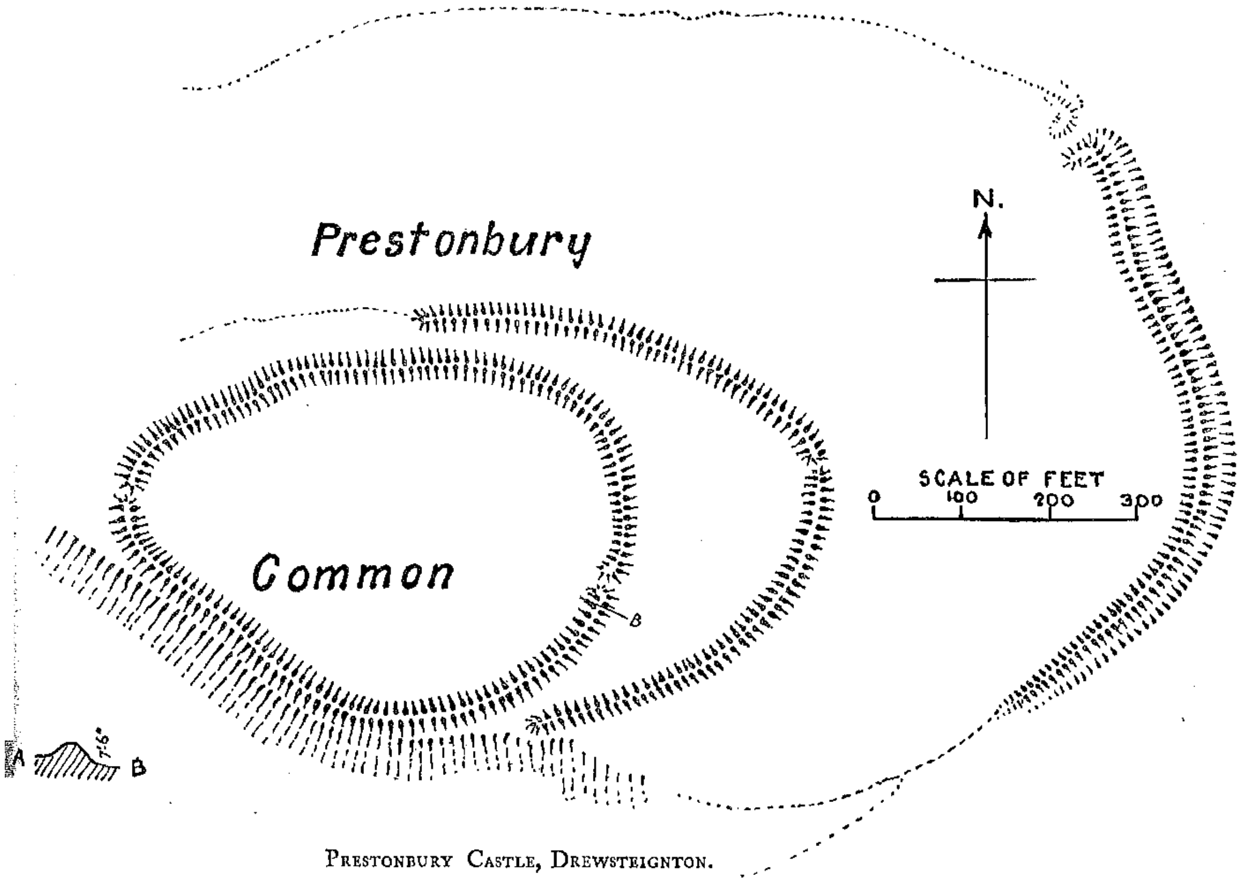
Dartmoor

Cranbrook Castle

The site plan originally presented here cannot be made freely available via ORA because of copyright. The plan was sourced at: Newman, P. (2011) The field archaeology of Dartmoor. Swindon, English Heritage.

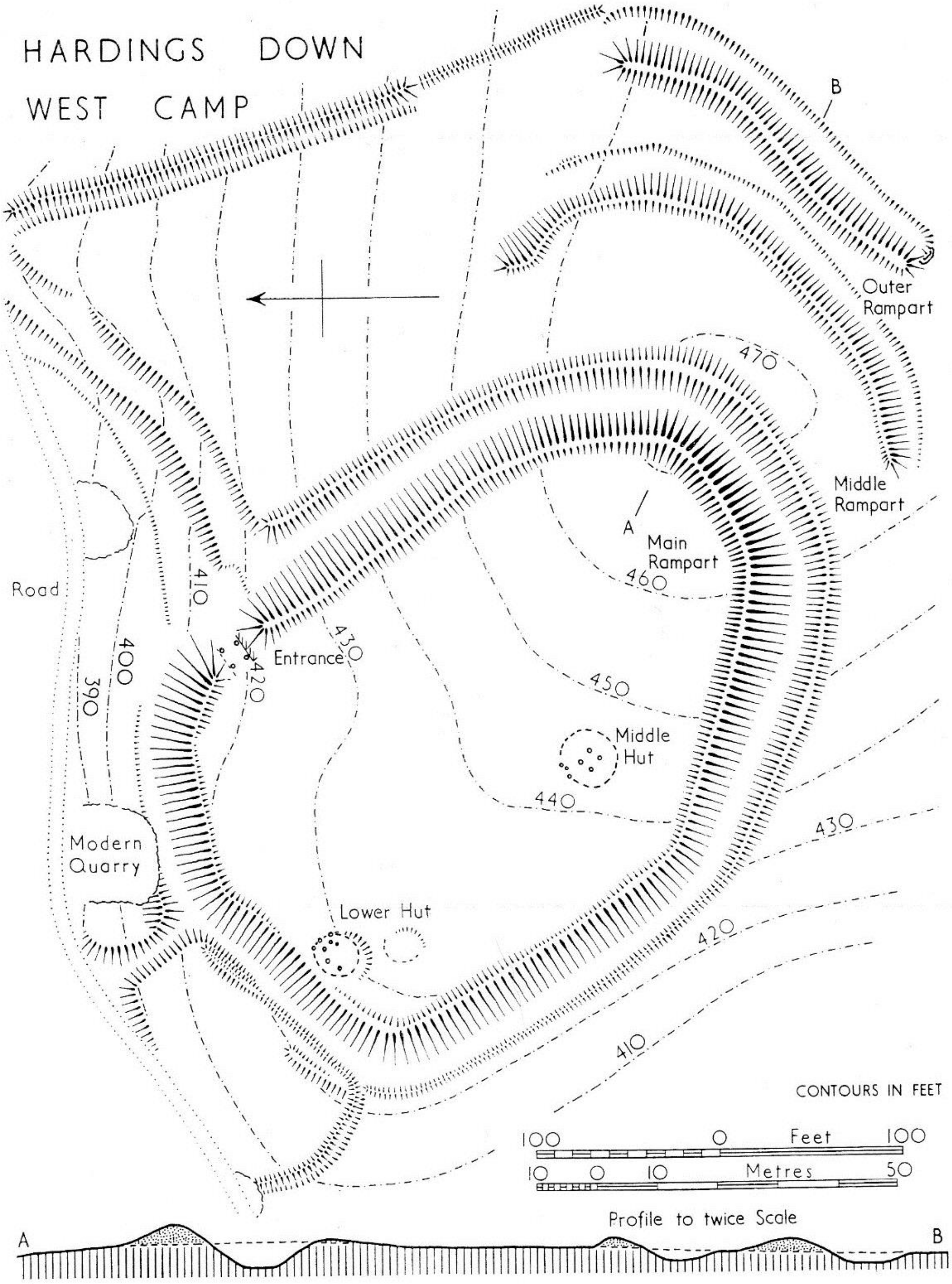
Wooston Castle- Plan unavailable

Prestonbury (*The Victoria History of the County of Devon, Vol. 1.* (James Street, 1906) p. 595 by permission of the Victoria County History, University of London.)

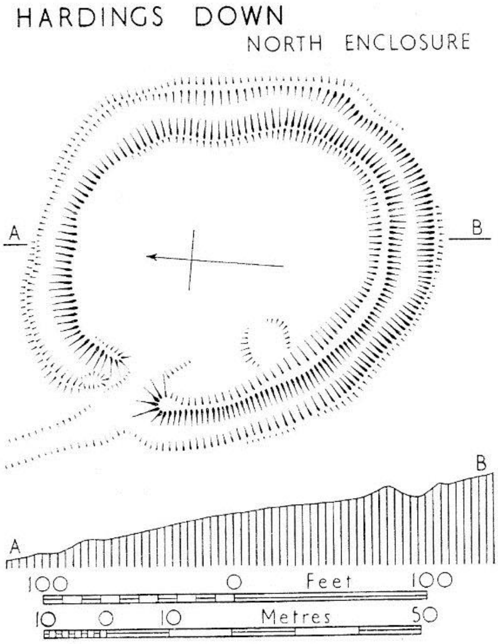


PRESTONBURY CASTLE, DREWSTEIGNTON.

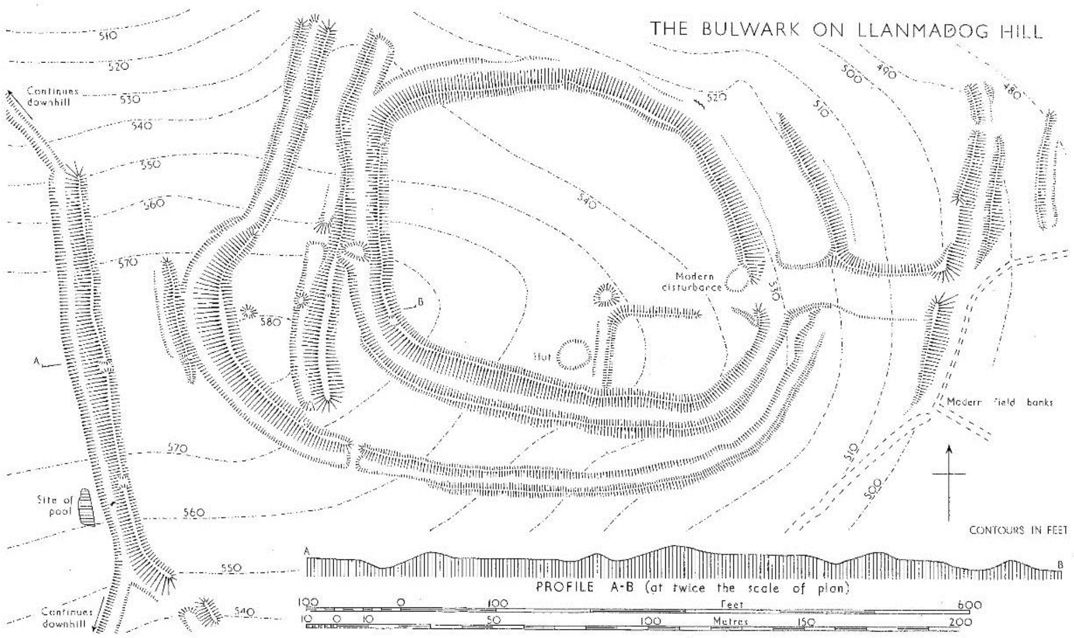
Hardings Down West enclosure (© Crown Copyright)



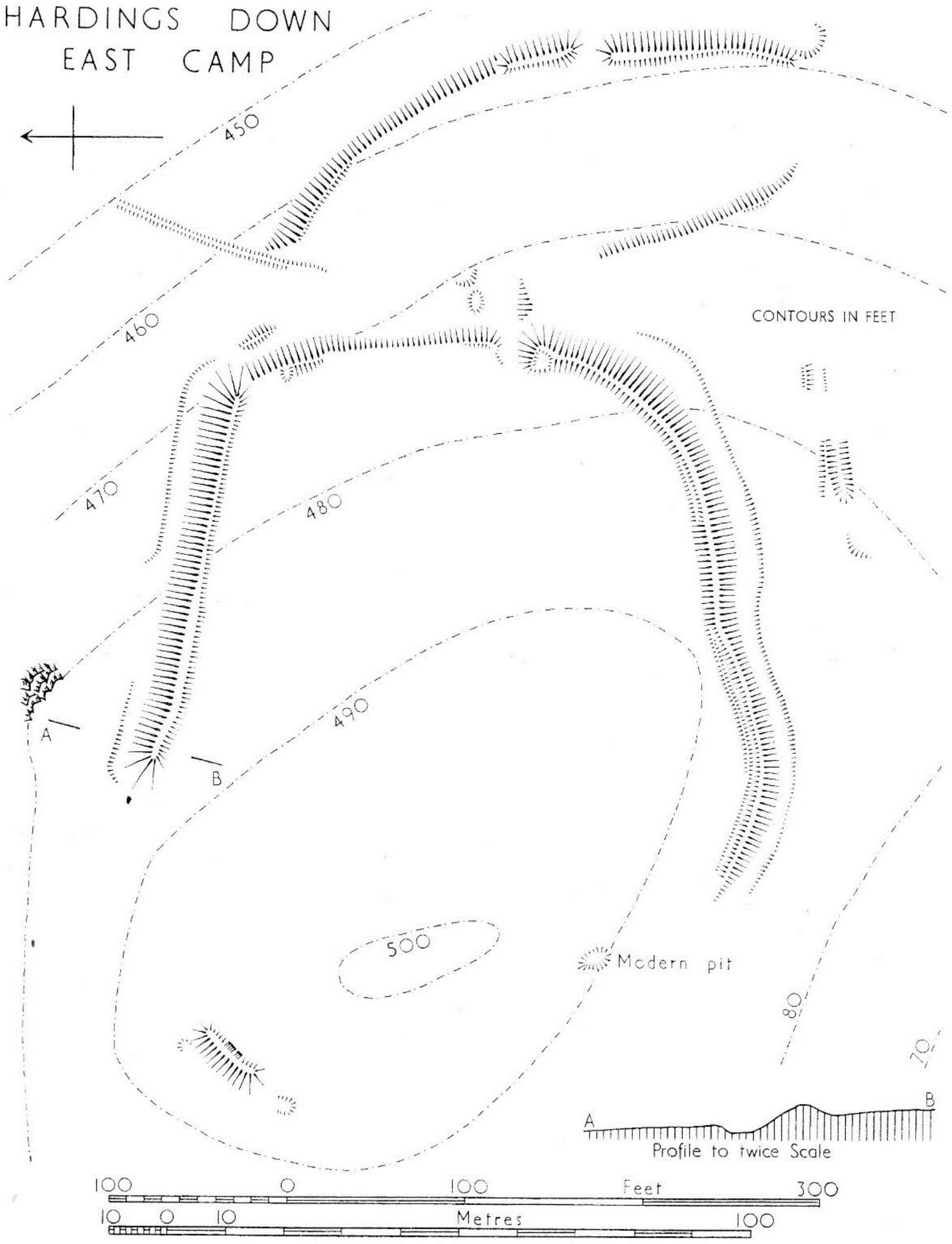
Hardings Down North enclosure (© Crown Copyright)



The Bulwark (© Crown Copyright)



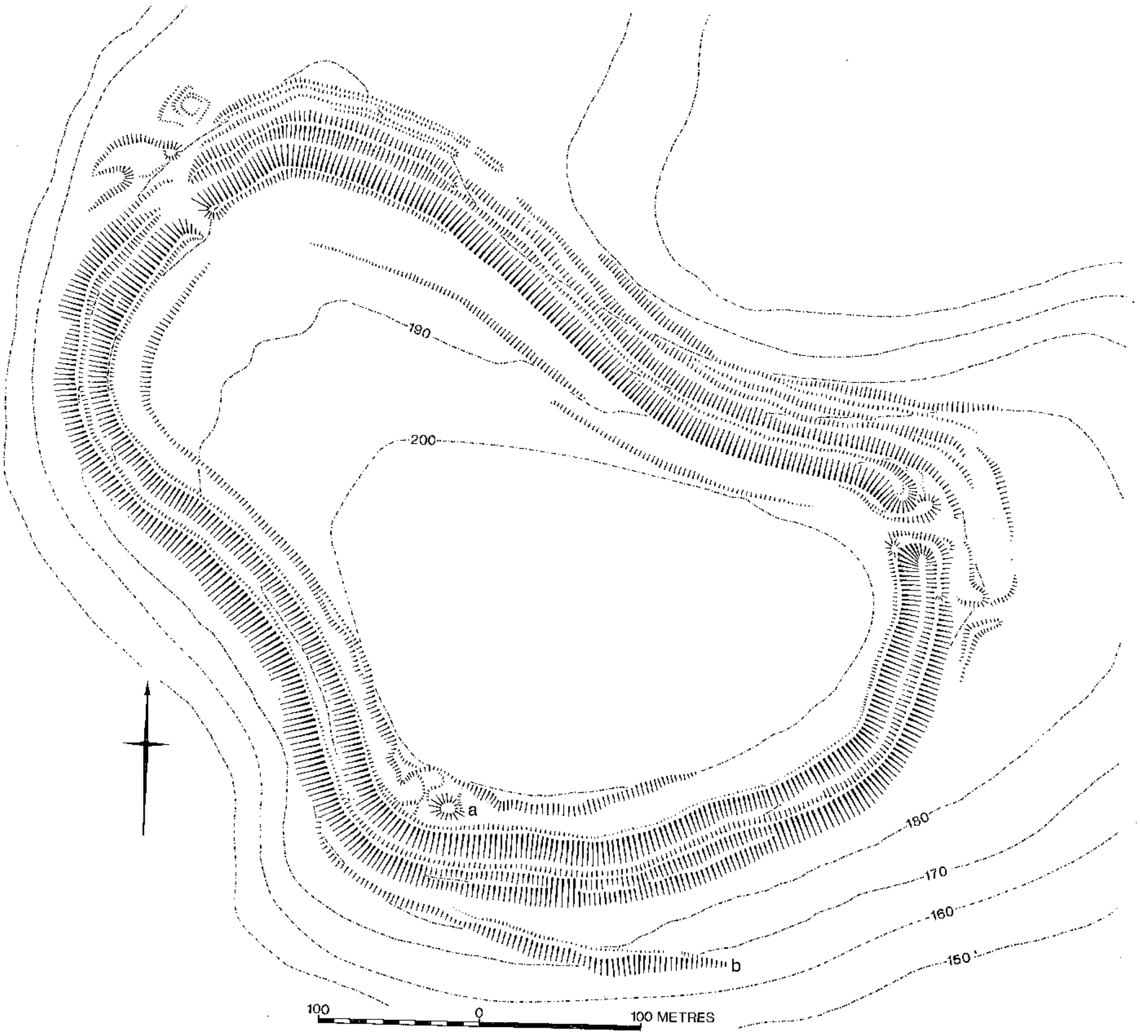
Hardings Down East enclosure (© Crown Copyright)



Warminster

Cley Hill- Plan unavailable

Battlesbury (© Crown copyright Ordnance Survey. All rights reserved; © Historic England)



Scratchbury