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Critical Applications of KOCOA in Western Europe c. 26 BC – 1745 AD

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ABSTRACT

In the thirty years since Conflict Archaeology has evolved as a discipline, it has grown exponentially in scope. In order to define a methodological and conceptual framework for the discipline, conflict archaeologists in North America have adopted standard military analytical procedures and terminology. KOCOA (or OAKOC) is the standard military terrain analysis that conflict archaeologists use to aid in defining battlefield boundaries and interpreting battlefield remains. KOCOA is a military acronym that stands for **K**ey or Decisive Terrain; **O**bservation and Fields of Fire; **C**over and Concealment; **O**bstacles; and **A**venues of Approach and Withdrawal. The KOCOA approach has been utilized with success within the United States on a number of Revolutionary War, Civil War, and American Frontier Wars battlefields. The National Park Service (NPS) requires the application of KOCOA in evaluating the preservation potential of historic battlefields as part of the American Battlefield Protection Program (ABPP).

Conflict Archaeologists have utilized KOCOA without appreciating its full potential or limitations. To date, KOCOA has mostly been applied to terrestrial battlefields that are at least partially preserved or otherwise historically documented. The majority of these projects were conducted under the auspices of the ABPP: the primary interest being the location and evaluation of defining battlefield features. Few attempts have been made to employ KOCOA in an

academic setting in order to assess the influence of terrain on the conduct of battles, on command decisions made, or as a tool in the interpretation of archaeological assemblages for the purpose of reconstructing battles that are devoid of direct historical documentation. If KOCOA is to develop as part of the methodological and conceptual framework of Conflict Archaeology, then it needs to be applicable in wider chronological and geographical contexts.

This thesis critically evaluates the applicability of KOCOA through answering a varied series of questions across a set of temporally and categorically different Western European sites. In the well documented, early modern Battle of Prestonpans (1745), KOCOA is used to rationalize how the terrain influenced where the actual engagement took place. KOCOA is then utilized to posit the location of the English siege lines and artillery fortifications from the Siege of Edinburgh Castle (1573) that have been subsumed by the urbanization of Edinburgh city center. The Second Scottish War of Independence battlefield at Halidon Hill (1333) is well known, but the battle itself is only documented in secondary chronicles, some written many years after the battle. A KOCOA analysis was conducted to evaluate the accuracy of the chronicles, as well as to show how the English selection of the terrain served as a critical factor in the Scottish defeat. The location of sparsely documented Battle of Dún Nechtain (685) has generated fierce debate among scholars. A KOCOA analysis was undertaken to evaluate the terrain of Dunnichen and Dunachton and demonstrate which may have been the site of the battle. The Roman conquest of the Cantabrian *oppidum* at Monte Bernorio (c. 26 BC) is not

documented in classical sources. Ongoing archaeological excavations at Monte Bernorio have recovered an artifact assemblage that was interpreted through a KOCOA analysis in order to reconstruct the course of the battle.

The KOCOA method itself is critically evaluated as an analytical tool based upon the case studies, and it shows that when informed by other components of METT-T, KOCOA is applicable in wide range of chronologically and categorically different sites, both directly documented and undocumented.

LAY SUMMARY

Conflict Archaeology has grown rapidly in scope during the last 30 years. In order to define a methodological and conceptual framework for the discipline, archaeologists in North America have adopted military analytical procedures and terminology. KOCOA (or OKOCA) is the standard military terrain analysis that archaeologists use to aid in defining battlefield boundaries and interpreting battlefield remains. KOCOA stands for Key or Decisive Terrain; Observation and Fields of Fire; Cover and Concealment; Obstacles; and Avenues of Approach and Withdrawal. KOCOA has been utilized within the United States on a number of Revolutionary War, Civil War, and American Frontier Wars battlefields.

Archaeologists have deployed KOCOA without appreciating its full potential or limitations. KOCOA has mostly been applied to battlefields that are partially preserved or historically documented. Few attempts have been made to employ KOCOA in an academic setting in order to assess the influence of terrain on the conduct of battles, on command decisions made, or as a tool in the interpretation of archaeological remains for the purpose of reconstructing battles that are not historically documented. This thesis critically evaluates the applicability of KOCOA through answering a varied series of questions across battlefields in Western Europe from different time periods. The battles investigated range from the well documented early modern battle of Prestonpans to the undocumented classical Roman battle of Monte Bernorio.

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Chapter 1: Introduction – The Journey of 1,000 Miles Begins with the First Step…

"The natural formation of the country is the soldiers best ally; but a power of estimating the adversary, of controlling the forces of victory, and of shrewdly calculating difficulties, dangers and distances, constitutes the test of a great general."

– *Sun Tzu The Art of War* (Giles 2009: 39).

Introduction

Conflict archaeology is still a relatively young discipline, having evolved within the last thirty years with the realization that battles are not the only form of military endeavor (Pollard & Banks 2005: III-IV; Scott & McFeaters 2010: 104). Military support facilities, camps, bases, forts, depots, barracks, arsenals, logistical and communication centers, and prisoner of war, internment, and concentration camps have all become the subject of archaeological investigation (Scott & McFeaters 2010: 104; Brown 2012: 7). Over those thirty years, Conflict Archaeology has grown exponentially in popularity and scope, maturing into an umbrella discipline for battlefield archaeology, military sites archaeology, and other aspects of the study of conflict (Scott & McFeaters 2010: 104; Sivilich 2014: 1). Although closely aligned with its subordinates, Conflict Archaeology possesses greater epistemological diversity, allowing for a more holistic approach to the study of conflict. Conflict archaeology is a hybrid discipline that embraces a diverse range of academic subjects that besides archaeology, includes anthropology, military history, military geography, landscape archaeology, material culture

studies, art history, and cultural heritage studies.[1] In order to define a theoretical and methodological framework for the discipline, conflict archaeologists have adopted standard military terminology and analytical procedures utilized by the United States Army (Scott & McFeaters 2010: 112-113; Babits 2011; Bleed & Scott 2011: 48). Scott and others saw in these analytical and planning procedures a set of standardized, clearly defined, and easily replicable set of concepts that addressed military operations at all levels and in a manner akin to how archaeologists organize information in the development of middle-range explanatory theories (Scott & McFeaters 2010: 113; Bleed & Scott 2011: 48). One of these methods, the KOCOA (OKOCA) system of terrain analysis, shows promise as an analytical and locational tool for the study of conflict landscapes, as well as the influence of those landscapes on the conduct of military operations (Scott & McFeaters 2010: 112-113; Bleed & Scott 2011: 48; McNutt 2014: Sivilich 2014).

In spite of its widespread use within the United States, conflict archaeologists have adopted KOCOA without appreciating its full potential or limitations (see Babits 2014: 263). To date, KOCOA has mostly been applied to terrestrial battlefields that are at least partially preserved or otherwise historically documented. The majority of these projects were conducted under the auspice of the American Battlefield Protection Program (ABPP); the primary interests being the location and evaluation of defining battlefield features for preservation purposes. Few attempts have been made to deploy

[1] This definition is adapted from the definition of Modern Conflict Archaeology, itself a sub-discipline of Conflict Archaeology, found in Saunders (2012: x).

KOCOA in an academic setting, to address wider anthropological, archaeological, or historical questions; to assess the influence of the terrain on the conduct of battle; on command decisions made; or as a tool in the interpretation of archaeological assemblages for the purpose of reconstructing battles devoid of direct historical documentation (McNutt 2014: 2-4, 22-3; Sivilich 2014: 1-2; Brown et al 2017: 117).

KOCOA can be applied in archaeology in a variety of ways through time and space, allowing for more detailed interpretation of a battle when historic maps or reconstructed landscapes are employed (Scott & McFeaters 2010: 115; Maio *et al* 2013: 320-321). Through this approach, archaeologists can gain a better understanding of what battle participants could have seen and how this may have influenced the conduct of a battle (Scott & McFeaters 2010: 115; Bleed & Scott 2011: 48). If KOCOA is to develop as part of the methodological and conceptual framework of Conflict Archaeology, then it needs to be applicable in wider chronological and geographic contexts than it has usually been used in the United States, as well as across sites where different types of warfare beyond those for which it was originally devised were practiced.

Aims and Objectives

The aims and objectives of this thesis, then, are simply stated. This thesis sets as its primary objective the development of a KOCOA methodology that is applicable in these wider contexts and is critically applied in a series of

case studies that assesses its potential and limitations. Secondarily, this thesis employs the full KOCOA analysis methodology gleaned from United States Army training manuals in assessing how the terrain influenced the conduct of the battle under consideration. The full KOCOA system has not been used in previous academic treatments of the method (McNutt 2014; Sivilich 2014). Through this process, the KOCOA methodology will be critically applied to wider geographical, temporal, and categorically different contexts than it has been utilized recently in the United States. The KOCOA method is assessed as a standardized, clearly defined, and easily replicable analytical and locational tool to the study of past conflict landscapes.

The Great Military Strategists, Importance of Terrain, and KOCOA

The importance of knowledge of the terrain where a battle was to be conducted was recognized early on and commented on in various ways by history's great military thinkers. The origins of several of the concepts that are utilized in KOCOA can be found among their writings. Five writers are cited here to elucidate this perspective. As the quotation that opened this chapter demonstrates, Sun Tzu writing around 500 BC recognized the importance of the interrelationship between terrain, tactics, and force composition of the enemy. Sun Tzu's tripartite concept continues to be realized in the present, is reflected in KOCOA's methodology, and is the premise underlying this thesis. Sun Tzu, in fact, discusses terrain at length in his chapter X 'Terrain' and chapter XI 'The Nine Situations' (Giles 2009: 37-

47). The latter describes nine different categories of terrain in a classification system of sorts that may have influenced KOCOA. Vegetius, likely writing between 383 AD and 450 AD, touched upon the importance of terrain in different contexts. He reiterated the importance of knowledge of the terrain in choosing a battlefield advising that the higher the ground the better (known as 'key terrain' in KOCOA) as it was easier fighting downhill rather than uphill (Vegetius & Milner 2011: 92-93). He also cautioned that infantry should be deployed on broken ground when engaging calvary, while calvary should seek open terrain, unobstructed by woodland or morass when facing infantry (Vegetius & Milner 2011: 93). Of particular interest to this thesis is Vegetius' discussion of terrain selected for fortifications of cities. Vegetius marks a clear distinction between natural terrain, 'nature' ('existing' in KOCOA) and manmade, 'by hand' ('reinforcing' in KOCOA) (Vegetius & Milner 2011: 121). Vegetius defined these terms as, "by 'nature' is meant places which are elevated, precipitous, surrounded by sea, morasses or rivers; 'by hand', fosses and a wall" (Vegetius & Milner 2011: 121). Vegetius stresses that 'nature' and 'hand' obstacles work better together and should be utilized whenever possible (Vegetius & Milner 2011: 121). Vegetius' classification of fortifications pertained specifically to cities, however, his division of fortifications into natural or manmade may have influenced the KOCOA classification of obstacles into 'existing' (natural) and 'reinforcing' (manmade).

Frederick II, known as Frederick the Great, King of Prussia 1740-1786 authored multiple works on philosophy and the conduct of war. In his *The*

Instructions of Frederick The Great for His Generals (1985), Frederick stresses the importance of terrain, likening knowledge of the country to a general as being akin to "what a rifle is to an infantryman" (Frederick 1985: 338). In his *Frederick The Great On The Art Of War*, Frederick describes what he terms the *Coup D'Oeil*, or "the ability to grasp the salient features and potential advantages of the terrain at a quick glance (Frederick 1966: 142). The *Coup D' Oeil* consisted of two components. The first, was the ability of a general to judge how many troops a given position could contain (Frederick 1966: 142). "The other and by far the most superior talent," according to Frederick, "[was] to know how to distinguish at first sight all the advantages that can be drawn from the terrain… a skillful general will know how to take advantage of the slightest height, a defile, a sunken road, a march, and so forth" (Frederick 1966: 142). This passage is interesting, not because it contains a discernable KOCOA element, but because it does seem to represent a nascent form of terrain analysis system. True, Frederick does not enumerate a detailed list of steps to be undertaken when examining the terrain prior to battle as KOCOA, but he at least codifies a two-component approach.

The 19th century military thinkers Carl von Clausewitz (1989) and Baron de Jomini (2005) have had a profound influence on military theory in the United States. Writing just after the conclusion of the Napoleonic Wars, Clausewitz touched on several aspects of terrain that are recognizable in KOCOA. Clausewitz stressed that the "geography and character of the ground bear a close and ever-present relation to warfare. They have a

decisive influence on the engagement, both as to its course and to its planning and exploitation" (Clausewitz 1989: 348). In an echo of Vegetius before him, Clausewitz saw terrain influencing military operations in three ways: "as an obstacle to the approach, as an impediment to visibility, and as cover from fire" (Clausewitz 1989: 348). Within this passage, Clausewitz is referencing what became the KOCOA concepts of obstacles, avenues of approach, and cover and concealment. Clausewitz categorized terrain according to three types: mountainous country (contours of the countryside, such as hills and valleys), sparsely cultivated forests and marshlands (natural phenomena such as forests, swamps, and lakes), and agricultural areas (farmland) (Clausewitz 1989: 348-349). Each of the three terrain types were subject to the three types of terrain effects outlined above, the combination of which, influenced the conduct of a battle (Clausewitz 1989: 349). Like Sun Tzu, Clausewitz recognized the tripartite interrelationships between tactics, force composition, and terrain. Clausewitz (1989: 350) wrote, "the influence that terrain brings to bear upon the general, and particularly the political composition of the fighting forces, is closely followed in importance by its influence on the ratio between the arms of service." Essentially, Clausewitz is referring to force composition and how the terrain influences the deployment of that force. Lastly, Clausewitz describes high ground in terms that are reflected in the concept of key terrain in KOCOA. He describes how high ground "dominates" positions or forces. According to Clausewitz the word "dominate" is encoded in military conventions such as "commanding positions," "*key positions* (author's emphasis)," "strategic maneuvers," and

the like (Clausewitz 1989: 352). High ground offers three strategic assets: greater tactical strength, protection from access, and a wider view (Clausewitz 1989: 353). These strategic assets generally accrue to the defender and are elements a researcher should consider when evaluating key terrain in KOCOA, particularly the categories of observation and avenues of approach.

Antoine-Henri Jomini (1779-1869) was an authority on the Napoleonic art of war having served as a general in the French Army and later in the Russian Army. He was Clausewitz's intellectual rival in many respects and published his own *Art of War* in 1836. Jomini developed a theory of strategy that was different from previous military thinkers. His approach depended upon the identification of the decisive points in a theater of war and then concentrating force against those points, as well as enemy lines of control (Jomini 2005: 67). Jomini began his assessment by consulting maps of the area of operations and generating a topographic and strategic description of the theater including all obstacles that were to be encountered (Jomini 2005: 67). Terrain features, troop locations, and objectives were then classified as a series of lines and points. Jomini defined strategic lines and points as having "a value from the relations they bear to the positions of the masses of the hostile troops and to the enterprises likely to be directed against them" (Jomini 2005: 67). Geographical strategic lines and points were those that owed their military value to their location, including terrain features, military institutions or fortifications, and communication centers (Jomini 2005: 67). Line and points may have been termed "decisive" based upon their influence

on operations (Jomini 2005: 68-69). The decisive point of a battlefield was determined by three factors: the features of the ground; the relation of the local factors to the ultimate strategic aim; and the positions occupied by the respective forces (Jomini 2005: 70). Jomini's influence on KOCOA can be seen in two ways. The first, is his concept of a "decisive point or line," a feature critical to the outcome of an operation. This concept correlates with the KOCOA category of decisive terrain feature, a location on the battlefield that is absolutely critical to the success of an operation. The second, is in the way Jomini carried out his investigation of the terrain of an area prior to operations commencing. The way in which Jomini recorded and categorized terrain features relative to the objective and influence on operations is rather similar to the way in which a KOCOA analysis is carried out.

The preceding discussion is a minimal sampling from military theorists throughout history. Only those pieces that mention the importance of terrain to the study of battles and thus show the antecedents of KOCOA are cited. From Sun Tzu to Jomini, Modern Military Theory has incorporated and built upon the military thinkers of the past in order to develop a comprehensive conceptual framework that archaeologists can use as a replicable and transferable lexicon for studying conflict. The situation of KOCOA within Modern Military Theory is briefly discussed in the following section.

KOCOA and Modern Military Theory

As implied by the preceding passage, Military Science, “the discipline developed to guide military conduct, rests on long history and has deep intellectual roots” (Bleed & Scott 2011: 48). Militaries throughout time have employed some mechanisms to train leadership, whether that training was based upon practical experience or the analysis of past operations. Over time the varying strategies and tactics employed in warfare have been conceptualized in terms that are easily applied to the archaeological analysis of battlefields and other types of military site (Scott & McFeaters 2010: 112). Modern militaries have codified these concepts in training manuals. The U.S. Army, for example, maintains a regular series of training publications that archaeologists can access (Scott & McFeaters 2010: 112-113; Bleed & Scott 2011: 48; Babits 2014: 263). Because the purpose of the manuals is to guide the planning and conduct of military operations, they treat combat at all levels, from basic small unit actions to the general formation of military policy. “Since they treat both concrete realities and conceptual constructs, they can address observable features and support inferential interpretations of archaeological materials” (Scott & McFeaters 2010: 113).

The concepts under consideration as described within recent U.S. Army training manuals tend to nest one inside the other, that is, one concept forms part of another. Four of these concepts: 1.) The Levels of War; 2.) METT-T; 3.) KOCOA; and 4.) Principles of War are often used to analyze the archaeological residues of conflict, providing a key for understanding human behavior during battle (Babits 2014: 263). KOCOA, the subject of this thesis

is discussed in detail in the following chapter. The remaining three concepts are summarized here in order to situate KOCOA within modern military theory. What follows is a summary only. A full review of all concepts in outside of the constraints of this thesis. For a more complete review see Babits (2014: 263); Sivilich (2014: 58-73), or the underlying US Army manuals themselves.

The Levels of War

The three primary levels of war are: strategic, operational, and tactical, although some may add logistical as a fourth level (U.S. Army 2001: 2-2; Bleed & Scott 2011: 49; Babits 2014: 263: Sivilich 2014: 61). The U.S. Army describes the levels of war as doctrine that describes the relationship between strategic objectives and tactical actions (U.S. Army 2001: 2-2). Operations undertaken within the three levels are not associated with a particular command level, unit size, or force component type. Operations are classified as strategic, operational, or tactical based on their contribution to achieving strategic, operational, or tactical objectives (U.S. Army 2001: 2-2). This relationship is visualized in Figure 1.1. Each of the levels are defined is follows.

Strategic Level: At the strategic level, a nation, often allied to a group of nations, determines national and multinational military objectives, develops policy, and allocates national resources to accomplish those objectives (U.S. Army 2001: 2-2). Theater strategy in a multi-theater war is established in

support of national objectives at the strategic level(Scott & McFeaters 2010: 113; Bleed & Scott 2011: 49-50).

Operational Level: "The operational level of war is the level at which campaigns and major operations are conducted and sustained to accomplish strategic objectives within theaters or areas of operations" (U.S. Army 2001: 2-2 – 2-3). The operational level forms a bridge between the tactical application of force and the strategic objectives that application of force is meant to achieve. The term *operational* does not refer to combat, but instead means movement to contact and generating the material requirements to engage in battle (Babits 2014: 264). In theory, KOCOA may be applicable in some instances involving operations that did not result in combat. These operations could involve resupply missions or the construction of a fort or depot.

Tactical Level: Tactics is the deployment of units in battle. Tactics includes the arrangement and maneuver of units in relation to each other, the terrain, and the enemy in order to achieve combat objectives (U.S. Army 2001: 2-5). This refers to the conduct of battles and engagements. The *Tactical Level* is where KOCOA analysis normally takes place because this level is where battles take place. In this context, a *battle* consists of a set of related engagements that last longer and involve larger forces than an engagement, typically brigade level and above (U.S. Army 2001: 2-5). The three-day Battle of Gettysburg, July 1-3, 1863 is an example of a battle. An *engagement*, then, is a small tactical conflict between combatants, usually conducted at brigade level and below (U.S. Army 2001: 2-5). Engagements

are short, lasting anywhere from a few minutes to a day. The brief fight at Lexington, April 19, 1775 is an example of an engagement.

Caution should be exercised, however, when rigidly applying the modern definitions above to past conflict. Under the above definitions, some of history's most significant battles would be relegated to being classified as engagements by virtue of the relatively small numbers engaged with real implications for cultural resource management, where battlefield protection is often accorded based upon the definition of a 'battle'.[2] Many of the battles that occurred during the Civil War era and Jacobite risings in Scotland would no longer qualify as battles under the strict application of the military definition regardless of their historical significance due to the small numbers of men engaged. Three of the battles examined in this thesis would be relegated to the classification of engagement. The Battle of Prestonpans (Chapter 3), fought on September 21, 1745, had no more than 5,000 men engaged in total and lasted only minutes. Yet, the battle represents the highwater mark, if you will, for the Jacobites during the '45. The 1573 Siege of Edinburgh Castle (Chapter 4) may have lasted two months (April-May 1573), but only had approximately 2,000 men engaged. The siege brought the Marian Civil War to an end and completely transformed the cityscape of Edinburgh in the process. The Battle of Nechtansmere (May 20, 685) (Chapter 7) marks an important point in the genesis of the Scottish Kingdom of Alba, but likely had a relatively small number of men engaged in a battle of

[2] See the discussion regarding the definition of 'battle' used by the American Battlefield Protection Program (ABPP) in the following chapter.

short duration. This thesis does not dogmatically follow the definitions of battle and engagement while considering the Levels of War.

Logistical Level: Logistics is defined as the planning and execution of the movement and maintenance of forces (Babits 2014: 264). *Logistics* refers to the supply of forces with the equipment and materials needed to conduct operations (Babits 2014: 264). Logistics is often considered as part of the operational level of war. As mentioned above, KOCOA is sometimes applicable to logistical operations.

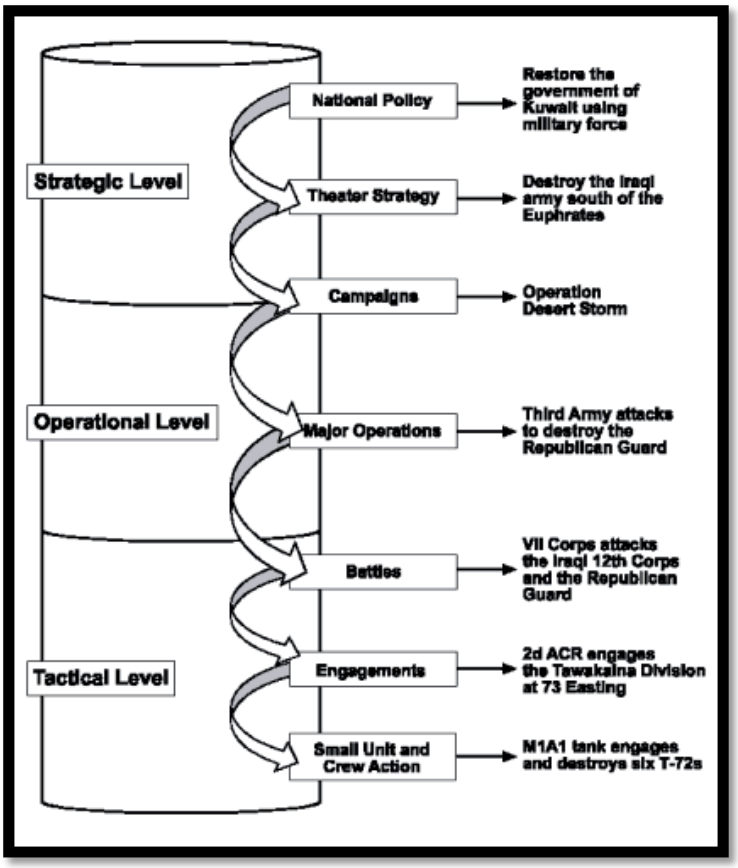


Figure 1.1 The Levels of War illustrated taken from The Gulf War (1990-1991) showing relationship and application between levels (From U.S. Army 2001: 2-3).

METT-T

METT-T or METT-Tc is a military acronym representing **M**ission, **E**nemy, **T**errain, **T**roops available (friendly forces), **T**ime, and **C**ivilian concerns (U.S. Army 2001: 5-3; Babits 2014: 264). METT-Tc is a collection of analyses used by the military in operational planning. KOCOA analysis is the terrain analysis referenced in METT-Tc. In military planning and archaeological applications of METT-Tc, the component analyses can inform one another. Within the methodology developed for this thesis, KOCOA analysis is informed by the **M**ission (Objective), **E**nemy, and **T**roops available components of METT-T. This will be discussed further in Chapter 2.

Principles of War

The U.S. Army currently recognizes nine principles of war as depicted in Figure 1.2. “The nine principles of war provide general guidance for conducting war and military operations other than war at the strategic, operational, and tactical levels (U.S. Army 2001: 4-11 – 4-12).” The nine principles are listed as:

1.) Objective: every military operation should be directed at a clearly defined, decisive, and attainable objective;
2.) Offensive: Offensive operations are the means by which a military force seizes and holds the initiative while maintaining freedom of action and achieving decisive results;

3.) Mass: mass, or direct, the effects of overwhelming combat power at the decisive place and time;
4.) Economy of Force: employ and distribute forces appropriately, no part of the force should be left without purpose;
5.) Maneuver: move and deploy your force so as to place the enemy in a position of disadvantage through the flexible application of command and unity of effort under one responsible commander;
6.) Unity of Command: For every objective, ensure unity of effort under one responsible commander;
7.) Security: do not allow the enemy to gain unexpected advantage;
8.) Surprise: strike the enemy at a time and place or in a manner for which he is unprepared;
9.) Simplicity: prepare clear, uncomplicated plans and concise orders to ensure thorough understanding (U.S. Army 2001: 4-11 – 4-15; Scott & McFeaters 2010: 113).

The Principles of War, METT-T, and KOCOA are applied by commanders prior to, during, and after an engagement or battle. While METT-T and KOCOA are concepts primarily used by the military in planning operations, the Principles of War seem more suited to after action analysis (Babits 2014: 268). Conflict archaeologists have used the Principles of War to gain a better understanding of aspects of battles not previously recognized or properly understood (see Babits 1998; Babits and Howard 2009: 13-36). In this thesis the Levels of war, elements of METT-T, and KOCOA are explicitly

used, while the Principles of War form an implicit backdrop for the evaluation of the battles investigated within the case studies.

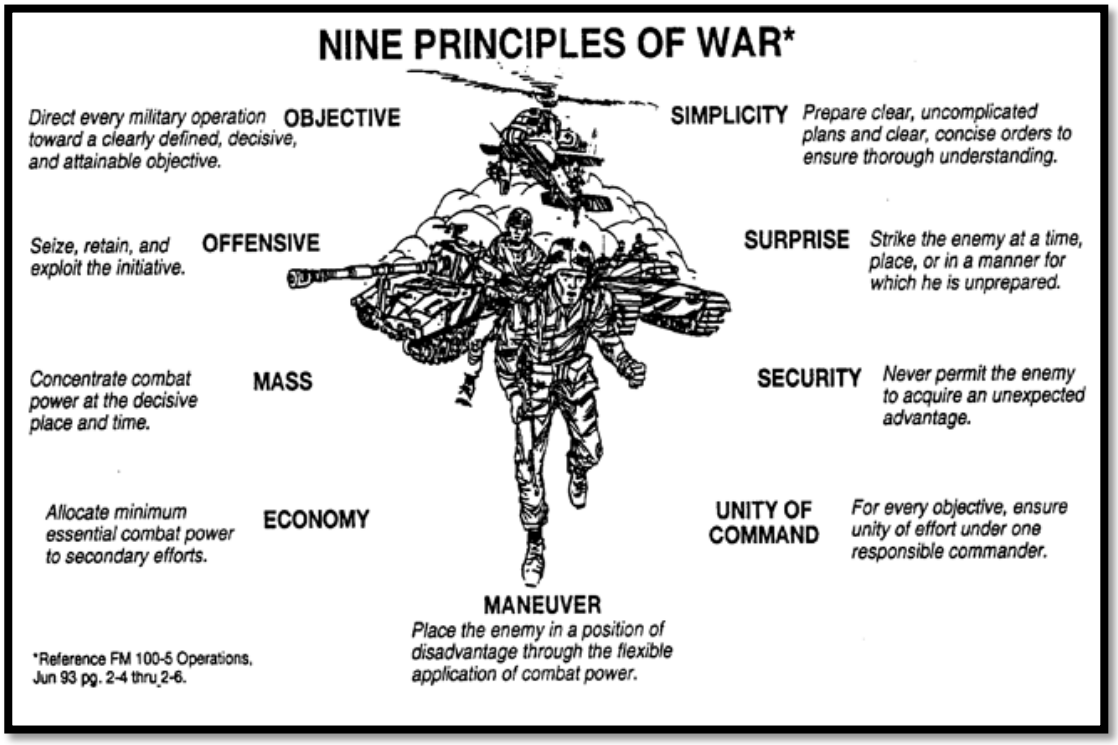


Figure 1.2 Principles of War summarized (From U.S. Army 1982: 2-4-2-6, 2001: 4-11-4-15).

Literature Review and The Methodological Competitors of KOCOA, IMP and IHMP

KOCOA has been widely applied to conflict sites in a cultural resource management setting since the creation of the American Battlefield Protection Program (ABPP) in the mid 1990s (see Chapter 2). Over that time, KOCOA has been used to locate and identify battlefield features in over 650 battles spanning 16 wars (ABPP 2016). The majority of these investigations have been conducted in accordance with the KOCOA methodology mandated by

ABPP and described in Lowe (2000). This research conducted under the auspices of the ABPP has generated a large volume of site-specific data, but due to the narrow focus of the ABPP, KOCOA has been utilized in a limited fashion as a locational and classification aid. There has been little or no engagement with KOCOA outside of the ABPP in order to ascertain its usefulness in addressing larger archaeological, anthropological, or historical questions. Scott and others have called for the adoption of standardized military planning and analytical concepts in conflict archaeology, KOCOA among them (Scott & McFeaters 2010; Bleed & Scott 2011; Babits 2011). Babits (2014: 263) likewise advocates the adoption of these concepts and stresses the need for the testing of the concepts (KOCOA included) in archaeological contexts. In spite of KOCOA's widespread use in cultural resource management, and the calls for adoption of the method, archaeologists working in academia have been slow to engage with the concept. There remains a need to test the applicability and parameters of the KOCOA methodology across a wide range of applications. In addition to this author's thesis under consideration here, there are only two doctoral dissertations that specifically test aspects of the KOCOA methodology. Each of the dissertations uses KOCOA as a locational aid but do so in different ways. Both dissertations are distinctly different from the evaluation undertaken in this thesis.

In *Finding forgotten fields: A theoretical framework for historic landscape reconstruction and predictive modelling of battlefield locations in Scotland, 1296-1650* (McNutt 2014), McNutt creates a predictive model

within GIS using a modified version of KOCOA with a reconstruction of the historic battlefield terrain to highlight key terrain features and thereby predict the location of a battle. The intent is to develop a desk-based predictive model that can be used to "*focus* and *direct* both site visits and future archaeological investigations of battlefields" (McNutt 2014: 27). In order to accomplish this objective, McNutt creates a theoretical framework based upon the concept of the location of a battlefield being at the intersection of three interrelated variables: tactics, force composition, and terrain. Tactics and force composition are temporally and culturally relative, with tactics especially being encoded within a *habitus* of the military lifeways of the contending parties. This *habitus* conditions the army commander to regard certain types of terrain as desirable in selecting terrain for battle. The terrain reconstruction is viewed through the lens of the *habitus* to identify key terrain features within the project area and predict high probability areas for the recovery of archaeological remains associated with the battle being investigated (McNutt 2014: 2-4). The concepts that McNutt adopts are not new, but they are brought together and are more holistically employed in a new way when using KOCOA as a locational aid.

McNutt's (2014: 4) discussion of the relationship between the three interrelated variables of tactics, force composition, and terrain had a profound impact on the way in which this author conceives the applicability of KOCOA. As established in this chapter, these variables, singularly and in association with one another, have been embedded within military thought at least as far back as the writings of Sun Tzu (Giles 2009: 37-47). McNutt explicitly states

the location of a battlefield is at the intersection of these three interrelated variables and makes this the central tenet of his theoretical construct (McNutt 2014: 4). McNutt devotes three chapters of the thesis, one for each era: medieval, post-medieval, and early modern, in describing the tactics (*habitus*) employed in the battles under consideration. While McNutt made the relationship between the three variables the basis for the theoretical construct, it is unknown if the full implication of the three variables was known. The realization that a battlefield exists at the intersection of tactics (*habitus*), force composition (technology/ material culture), and terrain frees a researcher from reliance on the historical record in predicting a battlefield's location or the reconstruction of a battle post-excavation in the absence of direct historical documentation. The way in which KOCOA can be applied in these circumstances is demonstrated in Chapter 6 and Chapter 7 respectively of this thesis and represents an evolution of the concept from McNutt. Essentially, archaeological remains and analogy may now be used in lieu of the historical record to infer tactics and force composition in creating a predictive model of a battle or reconstructing a battle post-excavation. This increases the number of applications where KOCOA can be applied.

The second major component of McNutt's theoretical construct is the conceptualization of *habitus* (tactics) as the first of the three variables. McNutt begins with the premise that the "military lifeway defines the individual or individuals of the command structure of any force that are responsible for the tactical conduct of war" (McNutt 2014: 16). What McNutt is saying is that the commander learns and employs tactics through military

practice. McNutt quotes Foley (1997: 10-11) in explaining that the “mental grammar of conflict, is primarily obtained through a continual process of structural coupling – the interaction of the individual with their environment” (McNutt 2014: 17). This structural coupling, then, comprises a *habitus*, a set of conditions or cultural norms that predisposes an individual to act or react in certain ways (McNutt 2014: 18). This is classic Bourdieu (1977), and this concept of *habitus* is shared by this thesis. The concept of *habitus* works well as a theoretical underpinning of KOCOA because it is part of modern military practice. KOCOA is used to plan military operations and is taught at multiple levels in military academies.

McNutt uses this theoretical construct to support a four-phased research methodology. Phase I: Due Diligence Documentary Research begins “with the earliest mention of the battlefield in the documentary record and continuing on through secondary sources – though many of them may be derivative – we can begin to build up a framework of the historiography of the battle, with successive references fleshing the skeleton of the battlescape with topography and terrain. This is accomplished by assembling a table that correlates Key Terrain and distinctive topography such as streams, rivers, woodland *et cetera*, as well as specific place names mentioned in primary sources” (McNutt 2014: 34). What McNutt is referring to in this passage is the creation of a table of the defining terrain features of a battlefield. This represents the first step in conducting a KOCOA analysis. How McNutt performs this step, however, represents a deviation from the way in which the military performs KOCOA and is a significant departure from this thesis. The

military (and this thesis) tabulates the defining features table directly from the terrain within the area of operations (U.S. Army 1994, 2001; ROTC 2002a, 2002b; U.S. Army 2008). That McNutt is basing the defining features on what is mentioned in the historical record is problematic in two ways. Firstly, it makes KOCOA historically determinative, wherein the method is dependent upon the historical record and cannot be applied to battles that are not directly historically documented. In effect, McNutt undermines the value of the three variables encoded within his theoretical construct (see above) and reattaches the metaphorical historical shackles to KOCOA that this thesis seeks to remove. Secondly, it is circular logic. McNutt's KOCOA analysis is derived from the historical record (not the terrain itself) and that KOCOA analysis is then used as an interpretation of the historical record in assigning key terrain features. When KOCOA is derived from the terrain itself, the analysis can help resolve ambiguities within the historical record. Here, McNutt is fitting the terrain to the historical sources and not fitting the historical sources to the terrain. When McNutt selects the high probability areas to focus site visits and excavation, it imparts the risk of finding only what the researcher wants to find, provided there is no provision for testing the posited negative areas. Furthermore, one of the reasons for adopting KOCOA from the military is that it represents a ready-made standardized concept that is easily replicable from one researcher to another. The way in which KOCOA is applied may change, but the method itself, the way in which it is conducted, should not.

McNutt's Phase II: Due Diligence Historical Imagery Research and Phase III Digital Datasets and Digitization are where the historical map data are collated, digitized in ArcGIS, and a reconstruction of the historical terrain is generated. McNutt's approach is not radically different than other projects, including this thesis (Mastone, Brown & Maio 2011; Maio *et al* 2013; Sivilich 2014). That said, McNutt reconstructs the historical terrain of ten different battles and does so in a way that gives the reader a good idea of what a commander could see. McNutt's demonstrations of the historical imagery and terrain reconstructions in ArcGIS are a strength of the thesis. McNutt's terrain reconstruction of the Battle of Roslyn (1303) is particularly noteworthy (McNutt 2014: 95-127). The 3D images (McNutt 2014: 120-123) accompanying the historical analysis of the battle demonstrate visually what the historical sources are describing, particularly with regard to the 'narrowed and confined' aspects of the battlefield. Sadly, it is not possible to confirm or adequately assess the results of McNutt's case studies. The lack of follow-on field work is a lament that this thesis shares with McNutt and is an all too common feature of KOCOA studies conducted in the United States. McNutt attempts to mitigate this issue by using existing battlefield inventory records as a check on the results of the KOCOA analyses (McNutt 2014: 42). The problem therein is that the inventory records have been prepared using the same historical sources that McNutt used in conducting the KOCOA analyses and likely are similar in their findings.

In Phase IV: Analysis – McNutt describes how the terrain reconstruction is manipulated in ArcGIS, in 2D and 3D, in order to locate key

terrain, avenues of approach and obstacles. While McNutt mentions KOCOA and utilizes its terminology, there is a failure to really explain that terminology and engage with the full KOCOA methodology. To be fair, McNutt is quite upfront in his intention to focus on key terrain aspects primarily: “The importance of terrain and its direct influence on the outcome of the conflict carried out upon its surface, while not being overlooked, has not necessarily been given the consideration needed to examine the full potential of its connections and correlation with battlefield locations” (McNutt 2014: 3). McNutt’s non-engagement with the full KOCOA methodology in analyzing how the terrain influence the conduct of a battle should not be taken as a criticism, rather it represents a significant departure from the current thesis where the application of KOCOA in different circumstances is aimed at this objective. In some ways, it would be fair to say that the proposed thesis picks up the testing of KOCOA where McNutt leaves off.

McNutt states in his conclusion: “There are two main contributions of this work to conflict and battlefield archaeology; the first of which is the construction and application of a theoretical framework of human agency in the selection of terrain for conflict that adapts and promulgates a modified version of the military terrain analysis KOCOA for the purpose of visualising abstract theory, and highlighting Key Terrain aspects as a means of predicting conflict locations within a wider landscape. Secondly, a phased methodology for digital landscape reconstruction within GIS with elements of memory theory in the evaluation of primary sources allowing for the predictive modelling of likely battlefield locations utilizing the modified

KOCOA to project the theoretical framework onto the digital reconstruction" (McNutt 2014: 460). In the second contribution, McNutt succeeds admirably. Although, McNutt's holistic approach is not wholly new, the resulting terrain reconstruction is presented in a more sophisticated way. McNutt moves beyond the familiar 2D map regressions traditionally utilized (including this thesis) and build a 3D model that can be viewed from a variety of angles. This makes the desk-based analysis more valuable as a locational and planning tool. The first contribution, however, is of mixed success. The theoretical construction built upon the three variables of tactics, force composition, and terrain is a strength. The idea of a modified KOCOA analysis is more problematic. As addressed above, basing the KOCOA analysis on the historical sources rather than the terrain itself is a deviation from the way in which KOCOA is conducted in the military, making KOCOA dependent upon the historical record for its application and undermining the value of the three variables construct. Conducting a KOCOA analysis in this way creates a circular feedback loop between the historical record and physical landscape. Sivilich also recognized that basing the defining terrain features on the historical record is problematic. Sivilich wrote: "the assumption that a landscape feature is salient simply because it made it into the written record may be false…" (Sivilich 2014: 140). This is correctable, however, by returning to KOCOA as practiced by the military, an approach embraced by this thesis.

In *Measuring the adaptation of military response during the Second Seminole War Florida (1835-1842): KOCOA and the role of a West Point*

Military Academy education, Sivilich (2014) applies KOCOA as a predictive model in a different way than McNutt (2014) and this thesis. Sivilich uses KOCOA to predict the location of four forts (Brooke, Foster, Dade, and King) along the Fort King Road, a central artery for the U. S. Army during the Second Seminole War (1835-1842) in Florida. Sivilich is not simply interested in the physical location of the forts, however, but is using KOCOA to evaluate the decisions made into selecting the fort locations based upon military training at West Point. Sivilich is applying KOCOA at the operational level of war rather than at the traditional tactical level. KOCOA is used not merely as a locational predictor, but also as a "method for providing a quantifiable and unified language that allows for inter-site comparisons" (Sivilich 2014: 2). This is a similar application of KOCOA to Chapter 7 of this thesis where Dunnichen and Dunachton are evaluated as possible sites of the Battle of Dun Nechtain, however, Sivilich seeks to answer larger anthropological questions as to how the military adapted or not to the unique environment of 19th century Florida. Sivilich writes: "The example used in this research focuses on how the military was trained and how this training could have affected the outcomes of conflict. KOCOA has the potential to shed light on landscape adaptation and learning, by comparing how officers were trained to respond and how they actually responded" (Sivilich 2014: 2). Rather than present multiple case studies, Sivilich examines this central theme across the four fort sites within a 50-mile zone centered on the Fort King Road. Sivilich incorporates archaeology conducted at the four fort sites; the work at Fort

Brooke and Fort Foster is contained within published archaeology reports, while Sivilich undertook work at Fort Dade and Fort King.

Sivilich's theoretical construct can be pieced together over the course of Chapters 3 - 5. In Chapter 3, Sivilich reconstructs the French based military training program at West Point, singling out the role Dennis Hart Mahan played in bringing French concepts to the academy (Sivilich 2014: 51-52). Sivilich posits that through understanding the training officers receive at this time, trends in Florida's fortified landscape, as constructed during the Seminole Wars, can be seen. Although Sivilich makes no mention of Bourdieu' Practice Theory, the concept being employed is reminiscent of the concept of *habitus* as it is used by McNutt (see above) and in this thesis. In Chapter 4, Sivilich situates KOCOA within modern military theory by presenting a similar, but more detailed summary to the discussion that can be found in this chapter. In Chapter 5, Sivilich completes the theoretical construct by incorporating landscape theory, Interaction Theory in particular (Sivilich 2014: 77-82). Sivilich begins by equating the training military officers received, discussed in Chapter 3, to Geertz's definition of culture: "a system of inherited conceptions expressed in symbolic forms by means of which people communicate, perpetuate, and develop their knowledge about and attitudes toward life" (Geertz 1973: 89, quoted by Sivilich 2014:76). As mentioned above, Sivilich's reconstruction of the training officers received is reminiscent of *habitus* as employed by McNutt and this thesis, but the application of Geertz's definition of culture makes sense especially if you consider the entire set of practices employed by the military in total as a

military lifeway or military culture. Sivilich, then, is using the fortified landscape of Florida to investigate the interaction between the U.S. Military culture and that of the Seminoles as well. Sivilich reasons that since these interactions occurred on the frontier, which for the military was seen as dangerous and hostile, that significant investment in protection was necessary (Sivilich 2014: 102). This investment took the form of roads, camps, supply depots, etc. Sivilich is using KOCOA as aid in testing whether the military adhered to its training, or adapted to the local environment, as part of the interactions with the Seminoles and semi-tropical conditions in 19th century Florida.

The pedigree of KOCOA and that way in which the analysis is conducted is discussed in detail in Chapter 7 (Sivilich 2014: 132-178). Sivilich laments that in spite of KOCOA's widespread use, it is difficult to find clear discussions of the methodology (Sivilich 2014: 136) and that relatively little has been written on how to perform this type of analysis in an archaeological context (Sivilich 2014: 149). These gaps Sivilich identifies in the literature relative to KOCOA are precisely what the present thesis is designed to address. Sivilich, however, appears to conduct the KOCOA analysis in a manner consistent with the method as presented in published declassified U.S. Army manuals. The first step was the selection of a project area encompassed by a 50-mile buffer around Fort King Road (Sivilich 2014: 156) This was an arbitrary decision based upon the importance of the road during the Second Seminole War. A terrain reconstruction was then created using the 1838 Map of Florida. This map was digitized and the KOCOA analysis

conducted on the project area being mindful of the fact that objective is a factor in KOCOA analyses (Sivilich 2014: 159). The importance of objective is addressed in this thesis as well. Sivilich appears to derive the defining terrain features from the terrain reconstruction and then consults the historical sources as an aid to assigning them to their proper KOCOA classifications (Sivilich 2014: 160). Sivilich elaborates on why primary sources should be used cautiously. In reference to key terrain features mentioned in primary sources, Sivilich (2014: 140-141) writes: “It could simply mean that the army stopped for a rest and a bored soldier decided to jot down the day’s events and describe his surroundings-while the truly significant features were never described because the army was on the move and there was no time to stop and record them”. Sivilich analyzed the four fort locations and their immediate surroundings. The forts were classified as key terrain based on the assumption that only important features would have been fortified and as cover and concealment because they provided protection during an attack. Sivilich also found they were associated with roads which were classified as avenues of approach (Sivilich 2014: 165).

When Sivilich compared the KOCOA analysis to the archaeologically proven fort locations, however, it was found that none of the forts were constructed on the highest terrain elevations in the area (Sivilich 2014: 165-166). This prompted the hypothesis that the military departed from its training based upon interactions with the local environment. As the forts were in association with the roads, Sivilich posits that the forts served more as supply depots, however they were more than a days march apart, meaning that a

detachment would have to camp overnight in hostile terrain (Sivilich 2014: 168). The archaeology that was conducted shows that the soldiers did not adapt to their surroundings, rather they imported goods and materials in order to make their day-to-day life as comfortable and as much like home as possible (Sivilich 2014: 179-205, 210). There are many themes that emerge when the archaeology of the forts is discussed that is beyond the focus of this thesis and the KOCOA methodology. Sivilich mentions, for instance, the dual role the forts played as both conflict oriented and peace oriented living spaces (Sivilich 2014: 211-212). The important point to remember here is the role KOCOA played as part of Sivilich's overall research plan. KOCOA was used as a predictive model positing the location of the forts in a way that is similar to both McNutt and Chapter 4 and Chapter 5 of this thesis. Sivilich then uses the results of the KOCOA analysis to infer adaptations or consistencies in military practice based on interaction with the local environment.

Whereas this thesis can be said to pick up the testing of the KOCOA methodology where McNutt left off, Sivilich (2014) moves KOCOA beyond this thesis and begins applying the method as part of a larger examination into more anthropological questions involving conflict. Sivilich moves KOCOA from a tactical level single site methodology and applies the method at the operational level of war as a predictive model in locating fortified sites and assessing those locations relative to training the officers received at West Point. McNutt and Sivilich leave many areas of exploration with regards to the KOCOA methodology untouched. McNutt does not engage with the entire

KOCOA methodology, instead he focuses on terrain reconstruction and the location of key terrain within that reconstruction. KOCOA is only partially applied as a locational predictor on generally known historical sites. In doing so, McNutt deviates from the KOCOA methodology as it is practiced by the military. This makes McNutt's use of KOCOA entirely dependent on the historical record and counters the standardized replicable aspects of the method that are responsible for its adoption in the first place. Sivilich in some ways rectifies this by adopting the military version of KOCOA but applies the method in a new way as part of a research strategy that operates on the operational level of war in examining larger anthropological questions relative to cultural adaptations resulting from interactions with a challenging local environment. Along the way, Sivilich points out the need for more discussion on how the KOCOA method is conducted. This thesis sits in the middle of the continuum established by McNutt and Sivilich. This thesis returns to the KOCOA methodology practiced by the military and applies it completely across a diverse set of conflict sites that are temporally and technologically distinct from one another. The applicability of KOCOA in being used to locate, reconstruct, and understand, not only a historically documented battle, but battles that have no direct documentation as well, is critically evaluated. The focus of this thesis is on the KOCOA methodology itself.

There are other methods that conflict archaeologists have adopted that serve a similar function to KOCOA, namely Inherent Military Probability (IMP) (Burne 1950: xiii-xiv) and Inherent Historical Military Probability (IHMP) (Foard 2008: 23; Foard & Morris 2012: 18). IMP and IHMP are approaches

which are primarily used retrospectively to resolve ambiguities in battle participant accounts with reference to where the events described took place on the landscape. This is, in fact, one of the functions that KOCOA performs.

Inherent Military Probability is a term coined by military historian Lieutenant Colonel Alfred H. Burne to describe a conceptual process that he developed to resolve ambiguities he encountered in the historical sources that he was working with. In the Preface to his 1950 *The Battlefields of England*, Burne explained how he conducted IMP:

> "My method here is to start with what appear to be undisputed facts, then to place myself in the shoes of each commander in turn, and to ask myself in each case *what I would have done* (emphasis mine). This I call working on Inherent Military Probability. I then compare the resulting action with the existing records in order to see whether it discloses any incompatibility with the accepted facts. If it does not, I then go on to the next debatable or obscure point in the battle and repeat the operation (Burne 1950: xiii-xiv)."

The emphasis above, "*what I would have done*" (Burne 1950: xii), lay at the heart of criticism of Burne's Inherent Military Probability concept. Burne attempted to resolve ambiguities in conflicting battle accounts by examining the circumstances and then judging what he would have done as a trained officer had he been the commander. While it can be said that Burne's experience as an artillery officer during World War I and as a commandant of an officer training corps during World War II made him a qualified analyst of military engagements of the early and mid-20th Century, his lack of knowledge and appreciation of historical tactics and weapon systems left him an ill judge of conflict before that time. McNutt rightly castigated Burne for his lack of temporal acumen in failing to recognize the tactics employed at the

Battle of Flodden in 1513 as the standard military practice of the day (McNutt 2014: 23). In the end, Burne resolves contradictions in the historical record by reference to what made sense to Burne as an artillery officer trained in the military theory of the early and mid-20th Century. Burne's IMP then is highly subjective, and culturally and temporally relative, according to the training and experience of the practitioner. IMP is distinctly different from KOCOA because it lacks the standardization and replicability that KOCOA possesses through its use of codified categories (see Chapter 2), making it unsuitable as a conceptual construct and as a check on KOCOA. This thesis aims to demonstrate that KOCOA, when taking into consideration the tactics and weapon systems of the combatants during the time period in question, will produce consistent analyses among different researchers and resolve locational ambiguities in the historical record.

English battlefield archaeologist Emeritus Professor Glenn Foard recognized the temporal shortcomings in Burne's concept and attempted to make corrections. In his 2008 doctoral dissertation, Foard put forward what he called Inherent Historical Military Probability (IHMP). In essence, Foard is trying to solve the problem of Burne's lack of understanding of historical tactics and technology by attempting to resolve ambiguities in battle accounts according to what he believes a commander of the time period in question would have done (Foard 2008: 23; Foard & Morris 2012: 18). Foard's attempt to correct the shortcomings of Burne's IMP is commendable, but ultimately IHMP falls prey to the same subjectivity and lack of replicability as its predecessor. IHMP. addresses the lack of temporal awareness exhibited by

Burne, however, it encodes the same circular logic as IMP, namely “the result of the analyses is the location of a battlefield is where the researcher says, because the researcher says so” (McNutt 2014: 25). In all fairness, it must be admitted that there is some subjectivity present within KOCOA, however, this subjectivity is mitigated and constrained by the KOCOA process itself as will be seen in the following chapter. The main drawback of IMP and IHMP is that they are dependent upon primary battle accounts and therefore, the methods are not applicable to undocumented or prehistoric battles. As will be demonstrated in this thesis, KOCOA can be applied to undocumented battles.

Construction of Thesis

In order to accomplish the objectives listed above, this thesis is organized into 8 chapters (including this introduction). Each chapter is comprised of a case study specifically chosen to critically evaluate the applicability of KOCOA in diverse contexts. The case studies were selected to be arranged along a temporal continuum beginning with the early modern Battle of Prestonpans (1745) progressing back through time and military period the classical era Roman storming of Monte Bernorio (c. 26 BC) at the origin of Imperial Rome. This continuum also applies to the level of documentation regarding the conduct and location of each battle. Prestonpans represents a well documented battle with the engagement site confirmed by archaeology. Each subsequent case study sees a reduction in documentation until you

arrive at Dún Nectain (rather little documentation and no site location) and Monte Bernorio (no documentation but confirmed site location). The case studies were also chosen to represent a cross-section of battle types ranging from open field set piece battles (Prestonpans, Halidon Hill), to sieges (Edinburgh Castle, Monte Bernorio), and a potential example of irregular warfare in the form of an ambush (Dún Nechtain). Lastly, the case studies were chosen in order to present different applications of KOCOA, demonstrating how the methodology can be used to form initial hypotheses regarding the conduct of a battle or location of battlefield events, and how it may be used as a post-excavation interpretive framework for reconstructing battles based upon archaeological remains. The chapters are arranged as follows:

Chapter 2: KOCOA By Any Other Name Is OAKOC details the pedigree of KOCOA, how it is used by the National Park Service (NPS) in the United States, and the methodology used in this thesis. Each of the following 5 case studies will adhere to the methodology outlined in this chapter.

Chapter 3: “Hey, Johnie Cope, are ye waking yet?” The Battle of Prestonpans, September 21, 1745 serves as the inaugural case study for this thesis. The battle is well documented in eyewitness and participant accounts written within a few years of the battle taking place. Prestonpans was an early modern battle (1745 Jacobite Rebellion) conducted using familiar gunpowder weapons and linear tactics. Until recently, a controversy existed as to exactly where the engagement was fought. KOCOA is deployed to

address this question and through an examination of the terrain posits a likely explanation as to why the engagement was fought where it was.

Chapter 4: “We Dout Not Bot Your Lordship Is Sore Offended With Us”: The Siege of Edinburgh Castle April 25 – May 29, 1573 provides an examination of the final phase of the Lang Siege (1571-1573) during The Marian Civil War (1568-1573). This case study moves 200 years back into the past from Prestonpans, to a time when early gunpowder weapons were beginning to see widespread use on the battlefield (Era of Pike and Shot/ Trace Italienne). The siege represents a different type of battle from the open field battle of the first case study. The landscape surrounding Edinburgh Castle has become heavily urbanized in the four centuries that have passed since the siege. KOCOA is utilized to locate the likely positions of the English artillery mounts within the present cityscape.

Chapter 5: The Battle of Halidon Hill, July 19, 1333 was conducted using the Edwardian tactic of dismounted knights and massed archery. KOCOA is informed by 14th Century Chronicles recording the battle generating a likely hypothesis of how the battle was conducted based upon the landscape and terrain locations named in the sources. The battlefield is generally known as having been fought on agricultural land outside of Berwick Upon Tweed, England during the Second War of Scottish Independence (1332-1357). Questions regarding the influence of cultural norms, in this case the role of Chivalry, in command decisions emerge. This application of KOCOA is analogous to the way in which KOCOA is usually used in the United States.

Chapter 6: Scotland's Lost Battlefield: The Battle of Dún Nechtain, May 20, 685 applies KOCOA to consider whether Dunnichen, Angus as advocated by Chalmers (1887: 210) and Dunachton, Badenoch as hypothesized by Woolf (2006: 185-187) is the likelier location for this engagement. There is rather little historical information regarding the battle and the location is unknown. KOCOA is used to test existing hypotheses. Tactics and force composition are posited through analogy and the interpretation of artistic depictions. KOCOA is then applied to each of the hypothesized locations. The comparison of two sites in this context represents a new way in which KOCOA can be used in locating battlefields. Assumptions are made regarding Dún Nechtain being an ambush type encounter conducted in lowland hill versus highland mountain terrain. Through the KOCOA analysis the importance of the dialectic between observation and cover and concealment in investigating irregular warfare is demonstrated.

Chapter 7: *Oppugnatio repentina*: The Roman Conquest of the Cantabrian *Oppidum* of Monte Bernorio, c. 26 BC represents a new application of KOCOA to a classical Roman battle from the Cantabrian War (29 BC-19 BC). The assault on Monte Bernorio is not mentioned explicitly in classical texts, however, a reasonable overview of Roman and Cantabrian warfare can be gleaned from classical and archaeological sources. This overview informed the KOCOA analysis that was utilized to interpret the archaeological assemblage from excavations undertaken over many years at Monte Bernorio and reconstruct the battle. Unlike the 1573 Siege of

Edinburgh Castle, the Roman siege of Monte Bernorio was conducted in a semi-arid mountainous environment.

Chapter 8: Conclusion – The End is Nigh…, this chapter summarizes key findings from the 5 case studies, establishes the parameters for the use of KOCOA in different historical contexts and critically assesses the utility of the KOCOA method.

This thesis begins by addressing the primary objective of establishing a KOCOA methodology that can be deployed in the wider geographically, temporally, and categorically different types of sites discussed above in the following chapter.

Chapter 2: KOCOA By Any Other Name Is OAKOC

Introduction

KOCOA Component	Definition	Example
Key or Decisive Terrain	Any locality or area the seizure, retention, or control of which affords a marked advantage to either combatant.	High Ground, Bridge Over Unfordable River, Mountain Pass
Observation and Fields of Fire	Observation is the ability to see the threat either visually or through the use of surveillance devices. A field of fire is the area that a weapon or group of weapons may effectively cover with fire from a given position.	High Ground with good Line-of-Sight, Open Fields.
Cover and Concealment	Cover is protection from the effects of direct and indirect fires. Concealment is protection from observation.	Ditches, Buildings, Fortifications, Woods, Underbrush, Snowdrifts, Tall Grass, Cultivated Vegetation.
Obstacles	Any natural or manmade terrain features that stop, impede, or divert military movement.	Buildings, Steep Slopes, Rivers, Lakes, Cities, Minefields, Trenches
Avenues of Advance	An air or ground route of an attacking force of a given size leading to its objective or to key terrain in its path.	Roads, Railroads, Paths, Dry Riverbeds
Weather	Military aspects of weather: Visibility, Wind, Precipitation, Cloud Cover, Temperature and Humidity	Ambient Light, Temperature Inversions, High Heat, Extreme Cold, Fog.

Table 2.1. KOCOA Terrain Analysis Definitions (Based on U.S. Army 1994 FM 34-130 Intelligence Preparation of the Battlefield; 2007 FM 3-21.8 (FM 7-8) The Infantry Rifle Platoon and Squad)

KOCOA is an acronym that originated within the United States Army as a mnemonic device used to describe a military terrain analysis system that classifies terrain characteristics relative to the mission objective (Babits 2011; 2014: 263). The letters constituting the KOCOA acronym denote: **K**ey or Decisive Terrain; **O**bstacles; **C**over and Concealment; **O**bservation and

Fields of Fire; and **A**venues of Approach (U.S. Army 1994: 2-10; 2007: 5-10; 2008: 5-6). Also contained within the terrain analysis, though not implicitly stated as part of the acronym, are climate variables such as weather, light, and tides. The definitions of these terms are summarized in Table 2.1 and are discussed in detail below (U.S. Army 1994: 2-9, 2-23; 2007: 5-13; 2008: 5-6). There have been several permutations of the KOCOA acronym over the years, beginning with OCOKA (U.S. Army 1994: 2-10), to the modern military usage of OAKOC (U.S. Army 2007: 5-10; 2008: 5-6), to the variant KOCOA as adopted by conflict archaeology. No matter the order of the individual letters, the definition of the terms remains the same (Babits 2014: 265).

KOCOA analysis is one module within a suite of anal**y**ses used to plan tactical operations making it an essential component within the Intelligence Preparation of the Battlefield (IPB) process (U.S. Army 1994: 2-8; ROTC 2002a: 248). “IPB is a systematic, continuous process of analyzing the threat and environment in a specific geographic area (U.S. Army 1994: 1-1).” In order to accomplish this analysis, the Army has adopted another acronym: METT-Tc, where the constituent letters denote: **M**ission; **E**nemy; **T**errain and Weather; **T**roops and Support Available; **T**ime; and **C**ivil Considerations (U.S. Army 2007:5-8 – 5-15). KOCOA comprises the Terrain and Weather analysis, the first ‘T’ of METT-Tc. A proper estimation of the effects of terrain and weather relative to the objective, for not only friendly troops, but those of the enemy in anticipating possible courses of action, is critical for mission success. KOCOA analysis “can be very important even after a battle is over because combat action can significantly alter the terrain, requiring an update

of the previous terrain analysis" (ROTC 2002a: 248). Post-battle terrain analysis will also aide in the evaluation of unit performance.

As part of the United States Army's troop leading procedures, KOCOA is taught at the most basic unit levels, that of platoon and squad leader (U.S. Army 1986: 2-1; ROTC 2002a: 248; Babits 2014: 263). At these levels, personal ground reconnaissance is preferred, but often unobtainable leaving the platoon and squad leaders to rely upon maps. When the operational order is received from battalion and company command the unit objective and unit area of operations will be given. It is then incumbent upon the platoon or squad leader to conduct a KOCOA analysis in order to familiarize themselves with the terrain and weather variables within their area of operations. "At the tactical level, the platoon leader must be able to analyze terrain primarily to determine objectives, specific avenues of approach (AA), routes or infiltration lanes that support attacks, and terrain that supports defense" (ROTC 2002b: 188). This will not only allow the platoon or squad leader to make the best use of the terrain and anticipate enemy courses of action but will also allow for enhanced understanding of the overall commander's intent and the activity of other units operating within the larger area of operations. KOCOA is covered in several Army field manuals and ROTC courses (U.S. Army 1986; 1994; 2001; 2007; 2008; ROTC 2002a; 2002b). This ensures a standard codification of KOCOA that is easily replicated from one generation of officers to the next. Although periodically updated and changed out, the texts are readily available in libraries and on the internet. This ease of access, standardization and replicability make

KOCOA attractive as a conceptual framework for conflict archaeologists (Scott & McFeaters 2010; Bleed & Scott 2011: 48-49).

KOCOA Adopted By The ABPP/NPS

The origin of KOCOA as a concept is obscure, but it is safe to say that the modern use of KOCOA in the historical sciences emerged following World War II as an instructional aide for U.S. Army War College staff rides at historic battlefields (McMasters 2011). In 1991, the Secretary of the Interior gave the initial impetus to the creation of the American Battlefield Protection Program (ABPP). It was not until 1996, however, when Congress signed into law the American Battlefield Protection Act that the ABPP received funding and official sanction (ABPP 2016). The ABPP became a program within the National Park Service (NPS), a bureau within the Department of the Interior, that had been managing park lands and historical sites owned by the Federal Government since 1916 (ABPP 2016).The year 1996 also saw the first use of KOCOA analysis as a cultural resource tool at Gettysburg National Military Park (McMasters 2011). In 2000, David W. Lowe compiled the ABPP's *Battlefield Survey*, a manual marking the first real attempt at establishing a replicable survey process utilizing KOCOA in an archaeological context (Lowe 2000). In 2004, KOCOA became a formal requirement of battlefield surveys funded by the ABPP (McMasters 2011; Sivilich 2014: 3). Since its creation in 1996, the ABPP has been the primary fiduciary agency for battlefield investigation funding the survey of over 650 battlefields spanning 16 wars (ABPP 2016). The requirement to adhere to the survey methodology

outlined by Lowe means that the vast majority of these surveys utilize KOCOA in varying degrees. In this capacity, KOCOA is used to delineate battlefield boundaries and identify defining battlefield features for preservation planning purposes (McMasters 2011).

At present, there is no equivalent governmental regulatory and funding agency in the United Kingdom that is comparable in size to the ABPP whose focus is strictly battlefields. Historic Environment Scotland (HES) (2019) maintains an Inventory of Historic Battlefields that is available for consultation for planning and regulatory purposes, but HES is the umbrella organization charged with the care of all historical and archaeology sites in Scotland not just battlefields. English Heritage (n.d.) maintains its own Register of Historic Battlefields, but like HES it functions as the umbrella organization tasked with care of all cultural sites within England. Both organizations advocate for the protection of battlefields, but unless they own the battlefield in question, they can only perform an advisory role (a trait they share with ABPP). The inventories above are an excellent resource for researchers, informing the chapters on Prestonpans and Halidon Hill in this thesis.[3]

ABPP Survey Methodology

The American Battlefield Protection Program is by far the largest grantor of funds supporting battlefield research within the United States today (Sivilich 2014: 3). ABPP's stature and required methodology mean that they have profoundly influenced the way in which KOCOA has been applied in conflict

[3] The individual records contain battle histories, reports, maps and lists of sources.

archaeology. Given this, it is necessary to critically examine the ABPP survey methodology, keeping in mind that their primary objective is to assess the integrity of a battlefield as it exists today for possible preservation purposes. The ABPP is only interested in battlefields as “places where fire was given or exchanged” (McMasters 2011). This, of course, omits all military related sites that did not see action that would be of interest to conflict archaeologists.

The ABPP seeks to establish four categories of maps that they will then use for cultural heritage planning: 1. Defining Features, which are essentially natural and cultural landmarks or key points on the battlefield; 2. Study Area, which should contain all defining features or places related to or contributing to the battle; 3. Core Area, which is the area of direct combat containing those defining features where fighting actually occurred; 4. Potential National Register Boundary (PotNR), which includes “those portions of the historic battlefield landscape that continue to retain integrity as of the date of ground survey (Lowe 2000: 24).” The PotNR is ultimately what the ABPP is interested it. They are not looking to gain understanding of any battle in and of itself or seeking to answer larger anthropological questions relating to conflict; their motivation, their reason for being, is to locate sites relative to a battle, that still possess historical integrity, on the present-day landscape for nomination to the National Register of Historic Places. The National Register Nomination can then be used to facilitate preservation.

To generate these four maps, ABPP still uses essentially the same research methodology outlined by Lowe (2000: 11-26). The survey process consists of five main steps with component parts: 1. Research the Battle

Event; 2. Develop a List of Defining Features; 3. Visit the Battlefield; 4. Take Photographs; 5. Prepare Maps and Survey Form. Researching the battle is essentially archival and historical research of primary documents, secondary accounts, aerial photographs, and historical maps. Each of these sources is evaluated relative to time removed from the battle event, intent, bias in the description and general usefulness. Defining features are derived from locational clues that appear within the historical sources. Once plotted on a map, the location of these defining features begins to delineate the boundaries of the battlefield upon the modern landscape. When a list of defining features has been generated, ABPP methodology advises a visit to the battlefield.

Visiting the battlefield as termed by Lowe is an odd way of characterizing terrain analysis. What should be the main component of any battlefield survey is broken down into four sub-steps: 1. Plan the Visit; 2. Windshield Tour; 3. Terrain Study; and 4. Use “Inherent Military Probability” to Ground-Truth Battle Accounts (Lowe 2000:19-21). Planning the visit in Sub-Step 1 is commonsense. The inclusion of Sub-Step 2 Windshield Tour is a bit interesting as this step is out of place when considering that Step 4 above is where you tie the defining features to the landscape and photo-document their current condition. Mastone, Brown and Maio (2011: 53, 55, 84) demonstrated that being in the field without the KOCOA analysis finished can impart false interpretations of landscape features. This is evidenced by the initial inclusion of Mount Bellingham, a prominent hill in Chelsea, Massachusetts as key terrain when, in fact it may have served as an

observation point or provided concealment during the approach of colonial forces, but otherwise had no role in the fighting during the Battle of Chelsea Creek (May 27-28, 1775) (Brown 2012: 52-72; Brown, Mastone, and Maio 2013: 415-418). Sub-Step 3 Terrain Study is where you would expect KOCOA to be carried out, but in this instance, Lowe is using the term 'terrain study' to mean essentially field walking and public outreach. This is where a researcher is expected to contact landowners and interested stakeholders and conduct field inspections where permission is granted. Again, this seems out of place relative to the field work undertaken as part of Step 4 above. In Sub-Step 4 Use Inherent Military Probability to Ground-Truth Battle Accounts, Lowe describes Inherent Military Probability as "an important concept for assessing the value of eyewitness accounts. The battlefield researcher must view the terrain with a soldier's eye (KOCOA) and determine whether the events described in the accounts are indeed reasonable and plausible" (Lowe 2000: 21). The equation of KOCOA with Inherent Military Probability is extremely problematic, not the least because they are, in fact, two separate and incompatible concepts. The issues with Inherent Military Probability are discussed in the previous chapter. To further complicate this issue, Lowe (2000: 7) did not adopt his definitions of the constituent elements of KOCOA straight from the U.S. Army field manuals (as in Table 2.1 above). Lowe's simplified definitions were not well stated and injected a bias toward high ground in surveys following this methodology. In 2011, McMasters corrected this by returning to the KOCOA definitions as stated in Army field manuals and by properly divorcing KOCOA from Inherent Military Probability

as a concept. McMasters, however, retained the use of Inherent Military Probability as a check on KOCOA (McMasters 2011).

Once Step 3 Visit the Battlefield is complete, the researcher is required to visit the battlefield in order to photo-document the present condition of defining features and of the battlefield itself. This form of documentation allows a researcher to establish the present condition of a location in order to assess integrity for preservation planning. This applies to both natural and cultural features. Lowe suggests that panoramic photographs 180º and 360º be taken of the battlefield to prevent "unconscious 'editing' of the scenery" (Lowe 2000: 22). He does not specify where these photographs should be taken, but in order to establish viewsheds consistent with the line-of-sight from identified points of observation, the photographs should be taken at those points of observation. Step 5 is where the analysis is concluded and a report generated including the four maps delineating the defining features, the study area, the core area, and the potential National Register (PotNR) boundary (Lowe 2000).

Criticism of ABPP Survey Methodology

The ABPP methodology detailed in the preceding section is still currently being used today with some upgrades due to McMasters's (2011) clarification of KOCOA terminology and the advent of GIS mapping. Keeping in mind that the ABPP's purpose is to delineate battlefield boundaries on the present-day landscape and assess the integrity of defining features therein in order to

secure nomination to the National Register, this process works fairly well. A National Register Listing is an honorific title and by itself does not guarantee preservation but is nonetheless a desirable and powerful tool in achieving preservation.

The ABPP survey process provides a further positive benefit in the quest for preservation. The methodology, through its combination of historical and archaeological research, promotes a more holistic interpretation of the battlefield landscape allowing the archaeologist to assign value to the battlefield over and above just the artifacts (McMasters 2011). Raising awareness of the integrity and fragility of the battlefield landscape is becoming increasingly important as a plethora of television shows like National Geographic's *Diggers* and Spike TV's *Savage Family Diggers* in the United States, together with *Battlefield Recovery* shown in the United Kingdom depict teams that use metal detectors to recover artifacts for sale. The individuals that present these shows and many more just like them "contribute little or nothing to issues of meaningful historic preservation or interpretation" (Espenshade 2014: 250). They ignore context, do not allow researchers access to their collections, and do not write reports of their findings, while reputable hobbyists who are interested in the history of a site often provide valuable services to researchers (Espenshade 2014: 250). Unscrupulous diggers negatively impact not only cultural heritage, but historical identity based upon that cultural heritage and are part of a greater devaluation of archaeology as a science, particularly within the United States. ABPP's preservation activities provide some redress for this.

In spite of the good work performed by the American Battlefield Protection Program, academic researchers are able to level criticism at their survey methodology and the way in which KOCOA is applied. As mentioned above, the ABPP's narrow congressional mandate to focus only on battlefields omits the entire assemblage of historically significant military sites that did not see hostile action. In some cases, this means that some locations relative to the battle under consideration, but that are disassociated from the battlefield itself, are left out of the survey. Battlefields that are part of the same campaign or conflict as the battlefield under consideration are likewise excluded depriving the battlefield of its context within the wider conflict. This episodic, micro level approach as McNutt (2014: 2) terms it, has generated a large amount of data, in hundreds of reports, which cannot easily be related to one another. Little attempt has been made to address larger anthropological questions regarding humanity's approach to conducting and engaging in conflict. The data generated by these surveys has yet to be truly utilized in moving the discipline forward.

ABPP's narrow focus is likewise reflected in their desire for a National Register nomination. A successful nomination is predicated upon establishing historical significance and integrity. Historical significance is established by the historical record as is the list of defining features to which KOCOA is then applied. These defining features are then located on the present-day landscape and their integrity is assessed. If the battle is historically significant and the defining features possess integrity, then it is included in the National Register of Historic Places. As laudable as this is, it reduces KOCOA to a

mere locational and categorization aide (Sivilich 2014: 2). ABPP's emphasis is on understanding the battlefield as it exists today. Any interpretation of the battle itself is secondary. This focus on the present day means that any attempt to reconstruct the battlefield landscape at the time of the battle is an interesting diversion. Reconstructing the historical landscape, however, provides valuable insights into the conduct of the battle and can be a powerful locational and interpretive tool when battlefield integrity is compromised (Mastone, Brown, and Maio 2011). Reconstructing the historical landscape also provides researchers with as close to an emic perspective as possible (Sivilich 2014: 11).

The desire for integrity imparts a bias against intensive archaeological survey and overreliance on the historical record in ABPP methodology. In many ABPP surveys, the photographic documentation of defining features is the only fieldwork that the archaeologist gets to perform. This raises a rather serious question and exposes a flaw in the ABPP use of KOCOA. After the archival research has been done, after the defining features have been collated and the KOCOA analysis done to determine battlefield boundaries and develop a narrative, how do you verify if the interpretation of the data is correct? Without verification, the analysis risks supplying what Espenshade (2014: 254) calls "myths." This mythmaking has serious real-world consequences. KOCOA is used primarily as a locational and interpretive tool for preservation planning purposes. Battlefields are large and it is rare for them to be preserved in full. Without archaeological verification of the

analysis, it is possible to protect the wrong location and supply a false narrative of the battle (Brown 2012: 116; Espenshade 2014: 254).

KOCOA Laid Bare, or "The Full Monty"

When KOCOA was appropriated from the U.S. Army into Conflict Archaeology, it was done on an ad-hoc basis with no real understanding of how to correctly perform a KOCOA analysis or what the capabilities of KOCOA in conflict archaeology really are (Babits 2011). Unfortunately, the KOCOA studies generated by ABPP funding reside within the so-called "gray literature" housed within various governmental agencies (Strezewski, et al. 2006; Stull 2008; Fonzo 2008; Butler 2008; McBride 2009). This information is not always easily accessible, although ABPP has recently undertaken an initiative to publish their holdings on-line. Stephen Fonzo's (2008) *A Documentary And Landscape Analysis of The Buckland Mills Battlefield (VA042)* is a readily available study of the American Civil War engagement between Union and Confederate cavalry at Buckland Mills, Virginia in 1863. Fonzo uses KOCOA to delineate battlefield boundaries and locate defining features on a known battlefield. Another example of a KOCOA study is Kate Kenny and John G. Crock's (2010) *Burlington Vermont War of 1812 Cultural, Landscape, Research and Archaeology Project (ABPP Grant GA 2255-07-004) City of Burlington, Chittenden County, Vermont.* Kenney and Crock used KOCOA to catalog terrain features related to an 1813 engagement between American and British forces during the War of 1812 in a study area that was compromised by shoreline facilities and urban growth. Mastone,

Brown, and Maio's (2011) *Chelsea Creek – First Naval Engagement Of The American Revolution Chelsea, East Boston, Revere, And Winthrop Suffolk County, Massachusetts* utilized KOCOA to recover the "forgotten" battlefield at Chelsea Creek amidst the sprawl of East Boston. Together, these reports are indicative of the varying uses KOCOA has seen as part of the ABPP methodology. As mentioned in the opening chapter, academic researchers have been slow in their adoption of KOCOA. The common link between all of these studies is that none of them have fully understood or utilized the full KOCOA process as used by the United States military. Until now, there was no full guide for implementing the entire process.

Dissertation Methodology

The method put forth here is not uniquely new, nor can it be if the replicability that sets KOCOA apart from IMP and IHMP is to be maintained (McNutt 2014: 23-25). What it does represent is the author's enhanced understanding of the KOCOA methodology used by the United States military gained by returning to Army field manuals and ROTC training materials. It bears similarity to the ABPP method from which it was born but seeks to correct the deficiencies academic researchers find in it. This methodology is likewise similar to that used by McNutt (2014: 27-41) and Sivilich (2014: 132-177) but differs from each in that it returns to the "micro-level" disdained by McNutt in order to move the discipline forward by gaining a fuller, more comprehensive understanding of the KOCOA process. The methodology presented here has

been broken down into a number of steps, each considered in turn: 1. Historical Research; 2. Historical Map Research/ Landscape Reconstruction; 3. KOCOA Analysis; and 4. Field Work/ “Ground Truthing.”

Step 1: Historical Research

The range of sites under consideration here have a wide range of primary sources associated with them from the nonexistent documentation of Monte Bernorio and Dún Nechtain to the unexpectedly rich documentary record of Prestonpans and Edinburgh Castle. All primary documentation will be examined in light of research goals using “Internal Source Analysis” as described by Barber and Berdan (1998). Essentially, “Internal Source Analysis” allows for the evaluation of the credibility of a primary document based upon an investigation of who the author is and their relation to the event being described. This method does not differ substantially from, and to a degree codifies, the approach described by James Fraser (2014: 1-11) in his seminal work *From Caledonia To Pictland Scotland To 795*. All primary source documentation will be examined for locational information and battle narrative. Secondary sources will be consulted for context.

“Internal Source Analysis” is meant to guard against the ‘historicizing’ encountered by Fraser (2014: 5-6) in early historical texts and the memory rationalization and biases described by McNutt (2014: 31-35) in later battle accounts. It does this by asking a series of questions. Was the author in a physical position to report events or conditions? This is perhaps the most

basic question that one can ask about a document. Was the author an eyewitness to the event? If not, how far removed from the event were they? The more times a tale is told it loses accuracy. How much time elapsed between the events discussed and the writing of the account? Time dulls the memory, and the author may begin to rationalize their participation, adding in details or distortions that they acquired later. Did the writer of the document have the cultural experience and language to understand the event observed? The author should have the background, attitude, and experience to be able to understand and report the event being witnessed. What are the writer's biases and how might they affect the recording of the event? Biases can affect anyone's judgement even though steps may be taken to reduce them. All ethnohistoric accounts have been filtered in one way or another through the biases of their authors. Biases include the vested interests of the author. What parts of the account are formulaic or indicative of the genre of the account? A genre is defined as a category of a recurrent pattern of presentation among accounts. These categories serve to structure the expectations of the reader. Recognizing that an account falls within a certain genre, the researcher can then expect characteristics of that genre. A pertinent example would be the early historical ecclesiastical writings that Fraser cautioned us to be wary of 'historicizing" in. 'Historicizing' is characteristic of that genre of ecclesiastical writing. Is the account inherently plausible? The researcher must make sure that the account sounds possible given what is known about the time period and circumstances surrounding the event recorded. Is the account supported by other accounts or lines of

evidence? Quite simply, the researcher must check the account being examined against other accounts or lines of evidence to see if there is support (Barber & Berdan 1998:160-168).

Step 2: Historical Landscape Reconstruction

The historical landscape reconstruction begins with an archival search looking for any and all historical imagery and cartography relative to the battlefield and its hinterland. The focus is on cartographic sources, but anything visual that can aid in reconstructing the topography of the battlefield on the day of the battle will be of use. Early maps are wonderful sources of information but embody distortions and the biases of the maker as they struggled to render the three-dimensional world onto a two-dimensional plain. As McNutt (2014: 35) observes, "ultimately, they are an art form that transmits a filtered view of the world, not an accurate visual construction of information." Texts also can aid historical landscape reconstruction, not just the battle accounts examined above, but letters, diaries, town records, and parish records may contain locational and topographical information. The 'Old' Statistical Account of Scotland (1791-1799) and the 'New' Statistical Account of Scotland (1834-1845) may prove useful in this regard. All historical imagery and textual sources will be subject to the same critical evaluation as above. Reconstructing landscapes has been a staple of the earth sciences. The methods used for dating sediments, however, lack the precision required to reconstruct the topography of a battlefield on the day of

battle. Tipping *et al* (2014) used radiocarbon dating and regression formulas in their attempt at reconstructing the historical landscape at the Bannockburn Battlefield. Although they achieved mixed results at best, they did manage to confirm the true course of Bannock Burn at the time of the battle in 1314.

The first set of historic maps to consult is the Pont Maps of Scotland drawn between c.1583 – 1614. These maps were later included, along with textual descriptions, in the Blaeu Atlas of 1654. These maps are not terribly precise in terms of geographic coordinates, but nonetheless contain a wealth of data. Major towns, rivers, lochs, churches, roads, bridges, and mountain ranges are exquisitely rendered with appropriate place names. Of particular interest are the Roy Military Survey Maps drawn by William Roy between 1747 and 1755. Roy was tasked with producing a survey that could be used in the event of another Jacobite rebellion like the one that took place in 1745. All of these maps are easily accessible on the National Library of Scotland's website.

From the historic maps, we move on to the modern Ordnance Survey Maps of Scotland. Ordnance Survey Maps are periodically updated, and the different additions allow a researcher to track changes in the landscape over time. This is useful in Cultural Heritage planning in assessing the rate of landscape change as is happening now. Digital versions of these maps appear in a variety of scales that can easily be imported into GIS software and form the basis of basic Digital Terrain Models (DTM). Ordnance Survey DTMs at the 1:10,000 scale, with a spot height every 10 meters, are available

from the Ordnance Survey's Edina DigiMap Service.[4] The Ordnance Survey DTMs were imported into QGIS, version 3.6.3, for processing into the maps used for this thesis. Mapping data and aerial photographs that were used in Chapter 6 *Oppugnatio repentina:* The Roman Conquest of the Cantabrian *Oppidum* of Monte Bernorio, c. 26 BCE were obtained from the *Institudo Monte Bernorio De Estudios De La Antiguedad Del Cantábrico* (IMBEAC). Additional maps were drawn using Google Earth Pro, version 7.3.3.7786 (64 Bit) and Edina Digimap. A summary of the historical image research accompanies each of the following case studies.

Step 3: KOCOA Analysis

McNutt (2014: 3-4) recognized that a battlefield's theoretical location lay at the intersection of three interdependent variables of terrain, tactics, and force composition (Figure 2.1). This conception of three interlinked variables marking a battlefield's location echoes the tripartite relationship between terrain, tactics, and force composition mentioned by Sun Tzu (Giles 2009: 39) and Clausewitz (1989: 350). McNutt reasoned that these variables "have a distinctly weighted impact on the selection of deployment within a given geographical area (McNutt 2014: 3)." Like Foard (2008: 23), McNutt (2014: 3) also acknowledged that the tactics and weapon systems (force composition)

[4] For sites located in the United Kingdom the project CRS used was EPSG: 27700 OSGB 1936 British National Grid. Chapter 6 *Oppugnatio repentina:* The Roman Conquest of the Cantabrian *Oppidum* of Monte Bernorio, c. 26 BCE used a project CRS of ESPG: 4326 WGS 84.

used by the combatants were temporally and culturally relative, and that this affected how the terrain was approached. In a manner similar to Sivilich (2014: 7), McNutt saw that tactics, even as they evolved over time, constituted a set of concepts that could be taught as part of military lifeway (McNutt 2014: 17). This military lifeway, then, constitutes a *habitus* that is a "set of dispositions which incline[d] agents to act and react in certain ways" (Bourdieu 1977; McNutt 2014: 18) with respect to the terrain.

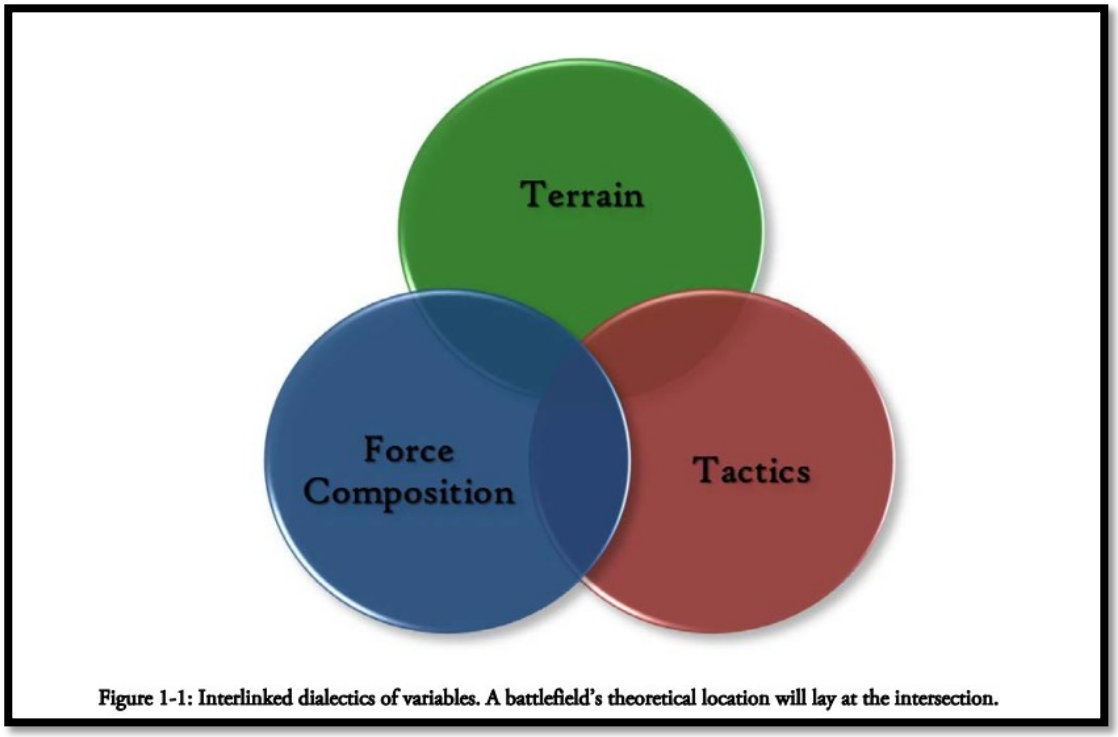


Figure 2.1. Three Interdependent KOCOA Variables. A battlefield's location is at the intersection of all three variables (From McNutt 2014: 4).

This thesis recognizes the *praxis* of war implied above, the tactics and force composition, as integral to the performance of KOCOA, especially where the battle has not been historically documented. Therefore, a section summarizing the tactics and weapons, a portion of the *habitus* used by the combatants, as gleaned from historical sources (when available),

archaeological investigations, and artistic depictions will be presented preceding each KOCOA analysis.

It is important to note that the KOCOA definitions given in Table 2.1 above are summary definitions. They lack the nuances and sub-categories of the full terms found in U.S. Army field manuals *FM34-130 Intelligence Preparation Of The Battlefield* (1994) and *FM 3-21.8 The Infantry Rifle Platoon and Squad* (2007), as well as ROTC course materials *Introduction To Terrain Analysis* (2002a) and *Terrain Analysis* (2002b). The definitions initially used by Lowe (2000) and later clarified by McMasters (2011) likely came from an earlier variant of *FM3-0 Operations* which only utilizes the summary terms found in Table 2.1. This project returns to the full definitions found in *FM34-130*, *FM3-21.8*, and the ROTC course materials. Each component of KOCOA is discussed below and provides a detailed guide of how the analysis is performed.

There are two important caveats that must be understood before beginning a KOCOA analysis. The first is that the analysis must be carried out for all sides engaged in the battle. The second is that the selection of key terrain is made working backwards from the objective to the starting position of the combatants (ROTC 2002b: 197; U.S. Army 2007: 5-12). The analysis of all other components flows from there. Carrying out the KOCOA analysis for all combatants is commonsense, but the importance of objective is not mentioned outside of military manuals. Objective, then, is where to begin a KOCOA analysis.

Objective is defined as “the clearly defined, decisive, and attainable goal toward which every operation is directed; or the specific target of the action taken” (U.S. Department of Defense 2001: 337). This rather straightforward definition masks a couple of complexities for the researcher. Objective is assigned relative to the Levels of War discussed in the preceding chapter. KOCOA is primarily used to plan or analyze battles and engagements, therefore it is more properly assigned to the Tactical Level. Objective is relative to command level or the unit being researched. An army is a sum of smaller constituent units. The army will select a target, be it a location on the terrain, an enemy unit, or a support task, but it will assign subordinate objectives that its constituent units must accomplish in order for the army to obtain its objective. Inferring what the objective was of the unit you are researching, how it related to the objectives of other units and how these all fit together is the key first step in KOCOA. The objective defines the area of operations for a unit and that area of operations is where the KOCOA analysis is to be performed. Objective is either stated in or deduced from the historical record, but it can also be inferred from the archaeological remains recovered from a battlefield. Inferring objective from archaeology can be challenging. Artifact distributions and contexts revealed through excavation can encode objective. This is exemplified in the Roman conquest of Monte Bernorio in Chapter 7. Excavations revealed that the Cantabrian occupation ended in a conflict with a Roman army who subsequently constructed their own fortifications on the summit of the mountain. It can be inferred that reduction of the Cantabrian *oppidum* was the objective. Pre-excavation

interpretation of objective is more difficult. As can be seen in Chapter 6 regarding the Battle of Nechtansmere, objective can be interpreted from ethnographic sources regarding tactics and analogy derived from weapons caches and burials that can facilitate an interpretation of how combatants approached the terrain. When inferred pre-excavation objective becomes part of a testable hypothesis of how a battle was conducted. Once the objective and area of operations is known you begin KOCOA by examining Key Terrain working back from the objective to the unit's starting point.

Key Terrain or Decisive Terrain: Key Terrain is "any locality or area the seizure, retention, or control of which affords a marked advantage to either combatant" (U.S. Army 1994: 2-17). A researcher must assess which terrain was key to accomplishing mission objectives. Key Terrain is often selected for use as battle positions or objectives. Key Terrain "may also be enemy oriented," meaning that if the enemy controls the terrain it could prevent the accomplishment of mission objectives (ROTC 2002b: 197; U.S. Army 2007: 5-12). "You identify key terrain starting at the objective or main battle area and working backward to your current position," or in the case of historical research to the unit's starting position (ROTC 2002b: 197; U.S. Army 2007: 5-12). In spite of what Lowe (2000) says, "high ground is not necessarily key terrain (U.S. Army 2007: 5-12)." "Key terrain is not always the obvious hilltop, bridge, or intersection" (ROTC 2002a: 252). If high ground is designated as key terrain, one must keep in mind the distinction between "the 'topographic crest' (the highest point of elevation) and the 'military crest' (the highest point from which terrain all the way to the base is visible)" (Collins

1998: 29). Once these are understood, there are guidelines in determining what makes key terrain.

Evaluate potential key terrain by assessing the impact of its control by either force upon the results of the battle. A force can control key terrain in one of two ways. "'Seizing' key or decisive terrain requires attacking it and defending it with troops on the ground. 'Securing' requires only that you use or array your forces in a manner that denies the enemy the opportunity to seize or secure the terrain – that is, you prevent the enemy from using or destroying the key or decisive terrain" (ROTCa: 252).

Key terrain may be assessed by thinking in terms of offense and defense. If the unit being researched is operating on the offensive, key terrain is usually located forward of the unit's starting position and is often a sub-objective that facilitates accomplishment of the main objective. If the objective is the destruction of enemy forces, "Key Terrain may include areas whose seizure helps ensure the required destruction" (U.S. Army 1994: 2-17). Ground which gives the enemy effective observation along a line of advance may be designated as key terrain if the enemy must be denied its control in order to secure the line of advance for the unit or adjacent friendly units (U.S. Army 1994: 2-17). If the unit being researched is operating defensively, key terrain may be located anywhere within the area of operations. Sometimes, key terrain may be located within a designated defensive area that could be located behind the unit start point. Terrain which gives good observation over avenues of approach, either of the enemy or following friendly forces, may be key terrain. Important road junctions or

transportation hubs that facilitate the movement of forces may be key terrain. Major obstacles are rarely considered to be key terrain. Terrain that permits the defender to cover an obstacle by fire is key terrain (U.S. Army 1994: 2-17 – 2-18).

It is important to keep in mind that the “tactical use of terrain is often directed at increasing the capability for applying combat power and at the same time forcing the threat into areas which result in reduction of his ability to apply his combat power” (U.S. Army 1994: 2-17). Terrain that facilitates this may be designated as key terrain. Key terrain may permit or deny movement. As with objective above, key terrain varies with the level of command (U.S. Army 1994: 2-17). For researchers, it is sometimes useful to examine the other components of KOCOA first and integrate those results in determining which terrain should be designated key terrain.

Decisive Terrain is a little used term designating key terrain that “has extraordinary impact on the mission” (U.S. Army 1994: 2-18). Decisive terrain is the sole key terrain that is crucial to the success of the operation. “While there may be several key terrain features in your area of operation, not every mission will have decisive terrain. If there is decisive terrain, only one piece of decisive terrain will be critical to mission success” (ROTC 2002a: 252). If there is decisive terrain then that terrain would have been the focus of efforts to seize or secure it.

Observation and Fields of Fire: Areas around key terrain, objectives, avenues of approach, and obstacles are analyzed to determine if they

provide clear observation and fields of fire for both friend and enemy forces (ROTC 2002b: 189; U.S. Army 2007: 5-12). Observation is the ability to see the threat visually or through the aide of surveillance devices, including scouts or forward observers (U.S. Army 1994: 2-10). An ‘unaided’ direct observation is how far you can see visually with the naked eye. An ‘aided’ direct observation is using an aid to increase visual range from the same position, such as binoculars, telescopes, infrared or thermal imagers, and night-vision devices. An ‘unaided’ indirect observation is a report from a scouting party, a forward observer, or a listening post (ROTC 2002a: 249). Terrain that offers good observation and fields of fire generally favors the defense. The evaluation of observation points and fields of fire allows you to identify potential engagement areas and ‘kill zones’, as well as defensible terrain and where maneuvering forces are most vulnerable (U.S. Army 1994: 2-10).

A field of fire is the area that a weapon or group of weapons may effectively cover with fire from a given position (U.S. Army 1994: 2-10). Fire may be either direct or indirect. Direct fire is defined as “fire delivered on target using the target itself as a point of aim for either the weapon or the director” (U.S. Department of Defense 2001: 141). Indirect fire is “fire delivered on a target that is not itself used as a point of aim for the weapons or the director” (U.S. Department of Defense 2001: 226).

Observation and Fields of Fire are the opposite of Cover and Concealment and are often described in terms of a Line of Sight (LOS) or Viewshed Analysis discussed below.

Cover and Concealment: Cover is defined as “protection from the effects of direct and indirect fires” (U.S. Army 1994: 2-11). Concealment is protection from observation (U.S. Army 1994: 2-11). Concealment does not provide protection from direct or indirect fire, it only masks visibility (ROTC 2002a: 255). How well a position offers cover and concealment is dependent upon the capabilities of the weapons systems being used by the enemy (ROTC 2002b: 190). The evaluation of cover and concealment aids in identifying defensible terrain, possible approach routes, and assembly areas. A well selected covered and concealed position may result in the enemy entering the engagement area or ‘kill zone’ before detecting the presence of friendly forces. Cover and concealment can favor offensive operations if an attacker can utilize a covered and concealed route to the objective or defender (ROTC 2002b: 190).

Line of Sight (LOS) or Viewshed Analysis: A Line of Sight (LOS) analysis can be used as an aid in determining observation, fields of fire, cover, and concealment for both friendly and enemy forces. A masked area lies behind terrain that is level with or higher than your position (Figure 2.2). The masked area provides “the attacker cover from the defender’s direct fire and concealment from a defender’s observations” (ROTC 2002a: 256). You cannot see into the masked area or fire directly into it. You do not have observation or fields of fire within the masked terrain. For archaeologists, this is easily accomplished through the use of a digital elevation model in GIS

and provides a proxy for what an individual could see from that location (Maio et al 2013).

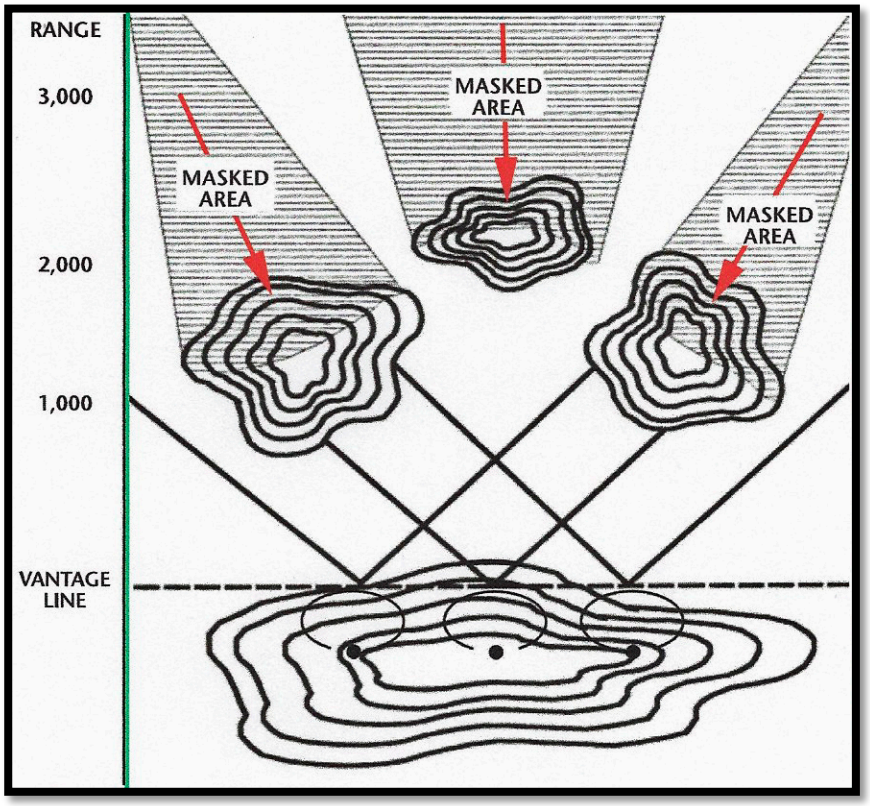


Figure 2.2. Line of Sight (LOS) Analysis (From ROTC 2002a: 257).

Obstacles: Obstacles are any natural or manmade terrain features that stop, impede, or divert military movement (U.S. Army 1994: 2-14). There are two kinds of obstacles: 'existing' and 'reinforcing'. 'Existing' obstacles are natural obstacles or obstacles that are considered permanent. Buildings, rivers, creeks, stonewalls, hedgerows, depressions and the like are considered 'existing' obstacles. 'Reinforcing' obstacles are typically manmade obstacles that are usually used to augment 'existing' obstacles. These include minefields, booby traps, abatis, barbed-wire, downed trees, and so on (ROTC 2002a: 253; 2002b: 192; U.S. Army 2007:5-10).

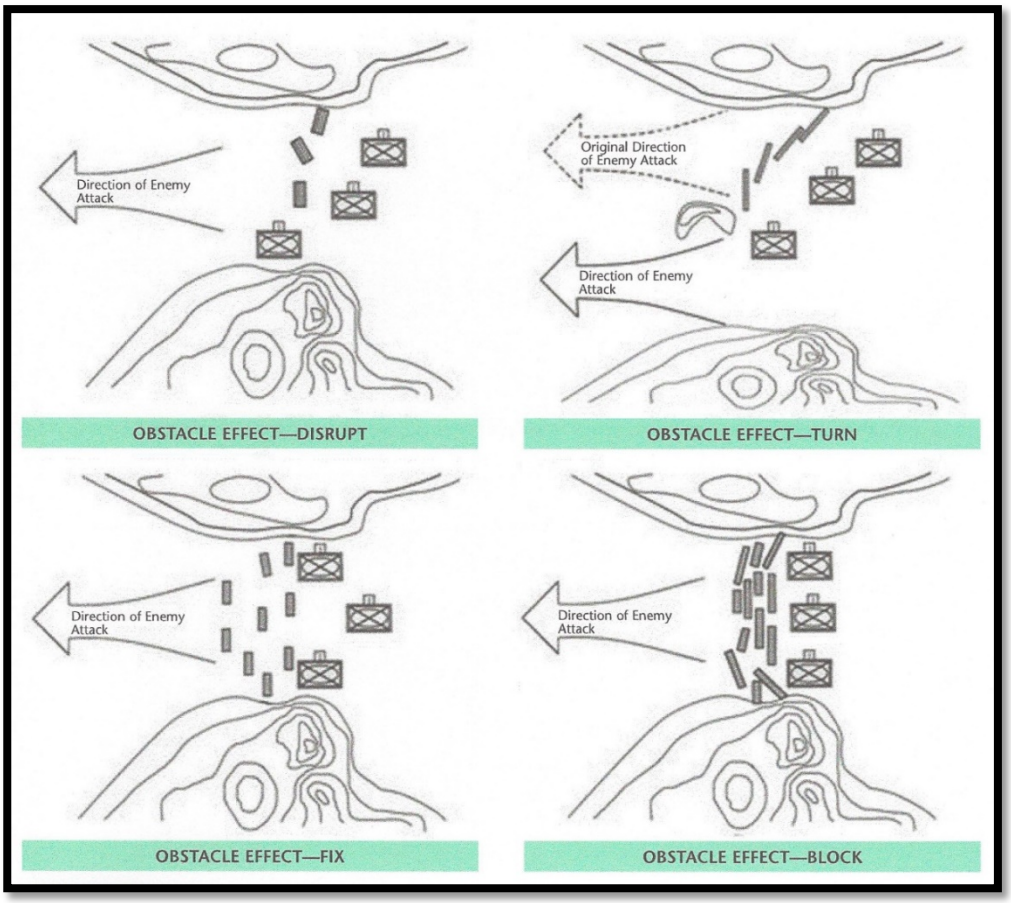


Figure 2.3. Obstacle Effects (From ROTC 2002a: 254).

In order to analyze the effects of obstacles on military operations, you must first understand the purposes such of obstacles on the offensive and defensive. For obstacles to be truly effective, they must be covered by direct or indirect fire, although this is not always the case. There are four tactical purposes or effects of obstacles: to 'disrupt', 'turn', 'fix', or 'block'. These are discussed in turn and summarized in Figure 2.3 above.

'Disrupting' obstacles are used to break up enemy formations and tempo, throw off their timetable, make them commit breaching assets prematurely, and cause them to launch their attack piecemeal (ROTC 2002b:

194). ‘Existing’ obstacles that disrupt movement would be things like hedgerows, streams, or rocky ground. An example of a ‘reinforcing’ obstacle would be a minefield placed behind a hedgerow (ROTC 2002a: 253). ‘Disrupting’ obstacles should be concealed at a distance but should be easily identifiable as an attacking force approaches. In this way, the attacker is forced to slow their movement and deploy resources to defeat the obstacle making them vulnerable to attack themselves. If the ‘disrupting’ obstacle is seen too soon, the attacker can adapt and avoid it (ROTC 2002b: 194).

A ‘turning’ obstacle is one which forces an attacker to deviate from their current avenue of approach onto an avenue of approach of the defender’s choosing (ROTC 2002b: 194). An example of an ‘existing’ obstacle that turns would be a steep slope of a hill or an urban area, while an example of a ‘reinforcing’ obstacle that turns might be building rubble or downed trees across a road (ROTC 2002a: 253). ‘Turning’ obstacles expose the attacker’s flank to defensive fire or attack and funnel the attackers into an engagement area or kill zone. Ideally, ‘turning’ obstacles are employed subtly with the attacker not recognizing the obstacle’s effect until they are already committed to the move (ROTC 2002b: 194).

‘Fixing’ obstacles prevent an enemy from moving any part of his force from a particular location for a particular period. A fordable river is an example of an ‘existing’ obstacle that fixes. A combination of barbed-wire and a minefield arranged in depth would be considered a ‘reinforcing’ obstacle that fixes (ROTC 2002a: 253). The ‘fixing’ obstacle does not have to prevent continued movement and can be used with engagement areas and kill zones.

“The fixing obstacle slows, harasses, or interdicts the enemy’s movement so that the defender has time to concentrate and mass direct and indirect fires on the enemy in the engagement area” (ROTC 2002b: 194). A ‘fixing’ obstacle can also be used to give the defender time to break contact and maneuver into a more favorable position.

‘Blocking’ obstacles act to deny the enemy access to an area or prevent advance along a particular direction or avenue of approach. Examples of ‘existing’ obstacles that block are ravines, cliffs, or wide rivers, while a ‘reinforcing’ example could be an in-depth defensive system tied to existing terrain (ROTC 2002a: 253). “The best blocking obstacles tie reinforcing obstacles to impassable terrain in a depth and concentration that prevents the attackers from defeating the obstacle or bypassing it” (ROTC 2002b: 193). A correctly situated ‘blocking’ obstacle will prevent the enemy from leaving the engagement area or kill zone and gives the defender the opportunity to attack in a manner most favorable to them.

The situation and nature of the obstacles identified within the area of operations necessitates the classification of the terrain into one of three levels of restriction to movement: 1. ‘Unrestricted’ Terrain; 2. ‘Restricted’ Terrain; or 3. ‘Severely Restricted’ Terrain. ‘Unrestricted’ Terrain is free of any significant obstruction to unmounted or mounted movement and offers flat to moderately sloping terrain with wide maneuver areas supported by a well-developed road network. ‘Restricted’ Terrain hinders movement to some degree and typically consists of moderate to steep slopes or moderate to densely spaced obstacles. ‘Severely Restricted’ Terrain severely hinders or

slows movement in combat formations unless some effort is made to enhance mobility. ‘Severely Restricted’ Terrain typically consists of steep slopes and large or densely spaced obstacles with little or no supporting road network (U.S. Army 1994: 2-15; ROTC 2002b: 196).

Avenues of Approach: An avenue of approach is “an air or ground route of an attacking force of a given size leading to its objective or to key terrain in its path” (U.S. Army 1994: 2-18). The identification of avenues of approach is critical because all maneuver is dependent upon them. Avenues of approach must be identified for both friendly and enemy units. The attacker generally will look for avenues of approach that offer the best cover and concealment from enemy observation and fire. The defender will generally attempt to identify the most likely enemy avenues of approach through the Line of Sight (LOS) Analysis and may set obstacles to interdict movement along them. Additionally, the defender should identify avenues of approach that facilitate counterattack or withdrawal should the need arise. The avenue of approach must be large enough to accommodate the size and composition of the force conducting operations (U.S. Army1994: 2-18; ROTC 2002a: 251; 2002b: 198-199).

Identifying proper avenues of approach depends upon the evaluation of Obstacles discussed above. To develop avenues of approach, the analyst must: 1. identify ‘mobility corridors’; 2. categorize ‘mobility corridors’; 3. group ‘mobility corridors’ to form avenues of approach; 4. evaluate avenues of approach, and; 5. prioritize avenues of approach. Each term is discussed below and visualized in Figure 2.4. The use of ‘mobility corridors’ in

developing avenues of approach was added to the ABPP KOCOA methodology by McMasters (2011).

Identifying Mobility Corridors: Mobility corridors are areas where a maneuvering force will be funneled due to terrain constrictions or canalization. The mobility corridor itself will be relatively open and free of obstacles allowing military forces to move at speed. Identification of mobility corridors requires knowledge of force composition, doctrine, and weapons systems for both friendly and enemy forces. Mobility corridors are relative to the type and function of these forces and must be able to accommodate them. Mobility corridors tend to follow existing roads and trails. The best mobility corridors utilize 'unrestricted terrain' that provides enough open space for a force to maneuver in its preferred doctrinal formations (U.S. Army 1994: 2-18).

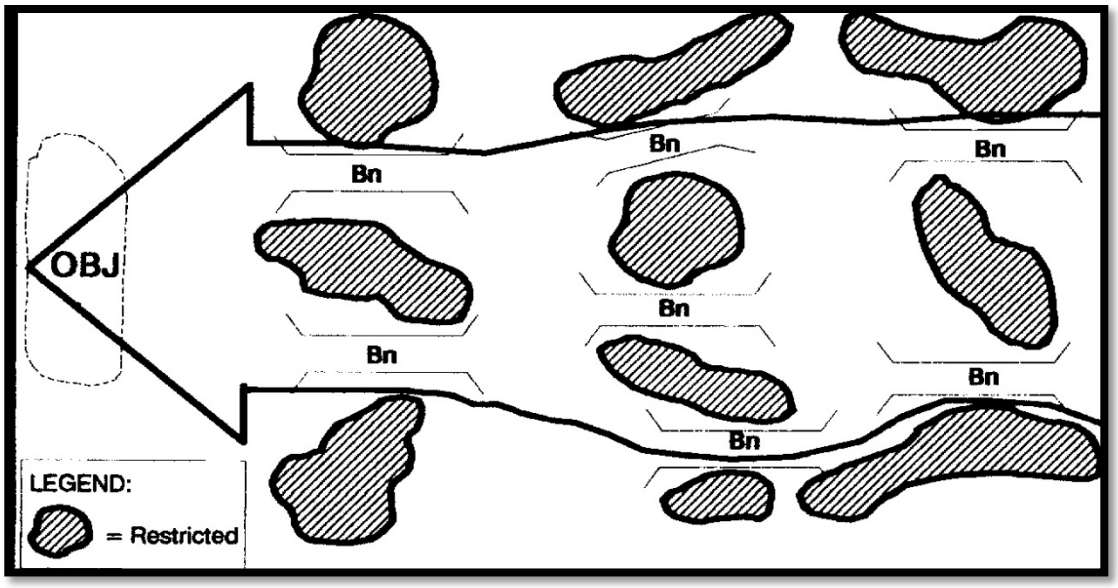
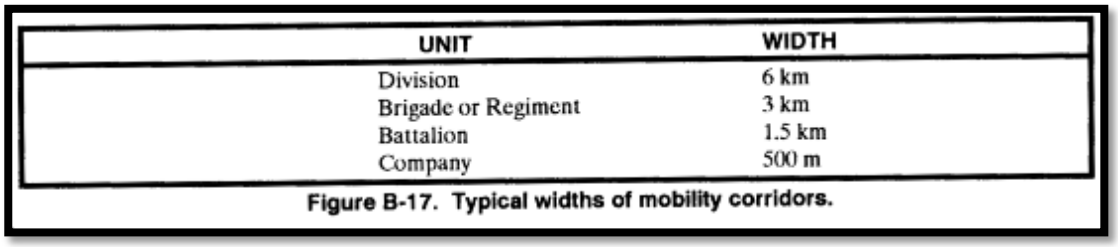


Figure 2.4. Mobility Corridors (From U.S. Army 1994: 2-19).

Categorize Mobility Corridors: Once identified, mobility corridors are categorized by their size or type of force that they can accommodate. They may also be prioritized in order of their likely use. It must be kept in mind that all military units require some form of logistical support and this influences the selection of mobility corridors (U.S. Army 1994: 2-19). The categories are shown in Figure 2.5.



UNIT	WIDTH
Division	6 km
Brigade or Regiment	3 km
Battalion	1.5 km
Company	500 m

Figure B-17. Typical widths of mobility corridors.

Figure 2.5. Categories of Mobility Corridors based on typical width of a unit in line (U.S. Army 1994: Figure B-17).

Group Mobility Corridors to Form Avenues of Approach: Mobility corridors are then grouped together to form avenues of approach (illustrated by the Bn in Figure 2.4 above). As mentioned above, an avenue of approach must be able to accommodate the size and type of the units moving through it. The identification of mobility corridors and avenues of approach are based on the maneuver requirements of tactical formations (U.S. Army 1994: 2-19 – 2-20)

Evaluate Avenues of Approach: Avenues of Approach are evaluated to identify which best support maneuver capabilities. Their suitability is judged by: 1. Access to Key Terrain and adjacent Avenues of Approach; 2. Degree of constriction and ease of movement; 3. Use of Cover and Concealment; 4. Use of Observation and Fields of Fire; 5. Sustainability of

Logistical Support and; 6. Directness to the Objective (U.S. Army 1994: 2-20).

Prioritize Avenues of Approach: Avenues of Approach are then ranked according to how well each supports the maneuver of tactical formations based upon the above evaluation (U.S. Army 1994: 2-20).

Weather: Weather is not useful as a locational aid and therefore is not part of ABPP methodology. For those researchers interested in the battle itself, however, weather, and general environmental conditions that existed at the time of a battle can have a profound effect on the outcome of that battle. At the Battle of Chelsea Creek, fought on May 27-28, 1775, astronomically hide tides in Boston Harbor allowed the HMS Diana to proceed much further up Chelsea Creek than was normal. Lieutenant Graves, the Diana's commander, was unfamiliar with local waterways and did not realize he was taking his ship into a dangerous cul-de-sac with strong currents. These conditions ultimately doomed Graves and his ship (Mastone, Brown, and Maio 2011; Brown, Mastone, and Maio 2013). John M. Collins (1998) spends a great deal of time discussing local environmental conditions in his work *Military Geography For Professionals And The Public*. Weather and environmental conditions are not always recoverable archaeologically and historically speaking, but the effort expended in the attempt is likely to be rewarded with valuable insights.

U. S. Army (1994: 2-23 – 2-26; 2007: 5-13 – 5-14) field manuals and ROTC (2002a: 261; 2002b: 200-203) course materials break down the 'Five

Military Aspects of Weather' as follows: 1. Visibility; 2. Winds; 3. Precipitation; 4. Cloud Cover; and 5. Temperature/ Humidity. Each component is examined qualitatively and discussed in turn below.

Visibility: Battlefield commanders must assess visibility conditions (light, fog) and the presence of battlefield obscurants (smoke, dust) before initiating tactical operations. Light is a major factor in assessing visibility. Phases of the moon, moonrise and moonset affect nighttime operations. The timing of sunrise, sunset and twilight are important considerations during the day. Obscurants, such as dust, dirt, or even the fogging of glasses, can impair visibility, especially with optical devices. Low visibility can aid offensive operations by concealing movement but can impair the ability to identify defensive positions. Low visibility hampers a defender's monitoring of engagement areas and kill zones. Visibility can have an effect on morale and combat readiness of the soldiers themselves.

Winds: Wind of sufficient strength can affect the combat effectiveness of a force downwind as a result of windborne obscurants such as dust, smoke, sand, or precipitation. A force positioned upwind, however, may have greater visibility. Wind may also mask the sounds of movement. The effects of wind are more of a concern in assessing modern airborne operations but can have an effect on missile weapons systems in antiquity as well.

Precipitation: Precipitation in all its forms affects soil trafficability, visibility, and optical equipment. Heavy precipitation can also rot supplies in storage and cause flash flooding that affects avenues of approach. Constant

exposure to wet conditions can cause health issues. Extended exposure to wet and cold can result in frostbite. Generally speaking, prolonged exposure to soggy conditions can affect troop morale and equipment. Poor weather conditions generally favor the offensive as defenders tend to hunker down and seek shelter from the elements.

Cloud Cover: Has more impact on modern battle research with the advent of air operations and electronic surveillance and guidance systems. Cloud cover can funnel aircraft approach much like ground obstacles funnel surface movement. Cloud cover can impair the effectiveness of illumination fires and flares. Indirect fire or air bombing may also see reduced effectiveness. Cloud cover can aid visibility by shielding eyes from the sun during direct visual surveillance, but in some cases may create low visibility.

Temperature and Humidity: Extremes of temperature and humidity reduce personnel and equipment effectiveness and may necessitate the use of special shelters or equipment. In modern engagements, temperature and humidity can likewise play havoc with targeting and surveillance systems. During the time periods under examination for this dissertation, the effects of shifts in temperature and humidity can be of concern for man and animal. Access to potable water is also a critical consideration.

Step 4: Fieldwork/ "Ground Truthing"

While McNutt (2014: 40) demonstrates that it is possible to produce a historic landscape reconstruction and KOCOA analysis from a desktop, he

acknowledges that “archaeological ground truthing through geophysics, metal detector surveys, and excavation must occur to test the assertions and conclusions arrived using the theoretical and methodological frameworks.” Sivilich (2014) clearly demonstrated the value of excavation when the actual placement of U.S. Army forts during the Second Seminole War (1835-1842) differed from where they ought to have been placed according to KOCOA, indicating that adaptation to local environmental conditions superseded Army training. The Battle of Chelsea Creek (May 27-28, 1775) shows the usefulness of KOCOA in rediscovering lost landscapes heavily impacted by urban development, but ultimately the findings went unproven due to a lack of follow up fieldwork (Brown 2012: 115-116). It is as Espenshade (2014: 254) says, that by not following up with intensive survey, “we run the risk of simply replacing one myth with another.”

Unfortunately, time and funding do not permit this project to undertake intensive survey on its behalf, save perhaps for the hillfort at Monte Bernorio. Instead, this dissertation will rely on the published reports of extant excavations and treasure trove finds. This project will, however, undertake field walkovers to photograph and document current conditions at the defining features relative to each site under consideration.

Final Considerations

The summary form of KOCOA employed by ABPP fails to utilize the full range of terrain classifications and retains some of the subjectivity embodied

within Inherent Military Probability and its counterpart Inherent Historical Military Probability. If KOCOA is to have value as a theoretical and methodological concept it must limit subjectivity and be replicable, not just from one researcher to the next, but also diachronically across time and site type. The methodology described in this chapter accomplishes this by returning to the original military manuals and adopting KOCOA in full. A complete KOCOA analysis allows for a more detailed examination of the terrain where an engagement took place. This more nuanced terrain analysis can enhance the understanding of the ways in which landscape has influenced the conduct, or practice, of war. The application of this methodology to the varying circumstances in the case studies that follow demonstrates the applicability of KOCOA to answering a variety of questions regarding the research of conflict over and above its use as a locational tool.

Chapter 3: “Hey, Johnie Cope, are ye waking yet?” The Battle of Prestonpans, September 21, 1745

“Hey, Johnie Cope, are ye waking yet,
Or are ye sleeping, I would wit;
Haste ye get up for the drums do beat,
O fye Cope rise in the morning.”

– *Hey Johnie Cope (Robert Burns Adaptation)* (Burns n.d.: 34-36).

Introduction

In the predawn mist of 21 September 1745, a 2,400 man army of Scottish Highland Jacobites, under the command of exiled Prince Charles Edward Stuart engaged a British Regular Army of similar size, under the command of Lieutenant General Sir John Cope on the plain outside of Prestonpans (Gladsmuir), 10 kilometers east of Edinburgh (Figure 3.1) (Grant 1946: 160; Reid 2001: 32-34; Cadell 2008: 183, 199; Margulies 2013: 126; Johnston 2017: 126-131). During the night, the Jacobites had utilized a concealed defile to march through a morass protecting Cope’s front and left flank and had emerged in the open field in the rear of the British position. Cope had been forced to hurriedly redeploy his army to counter this threat and had just completed this maneuver when the Jacobites attacked. Cope’s army was overrun in a matter of minutes. The Jacobites advanced to within pistol shot of Cope’s line before firing a volley. Casting aside their muskets, they charged Cope’s soldiers brandishing claymores and Lochaber axes in their distinctive Highland Charge. The British line broke and the soldiers fled

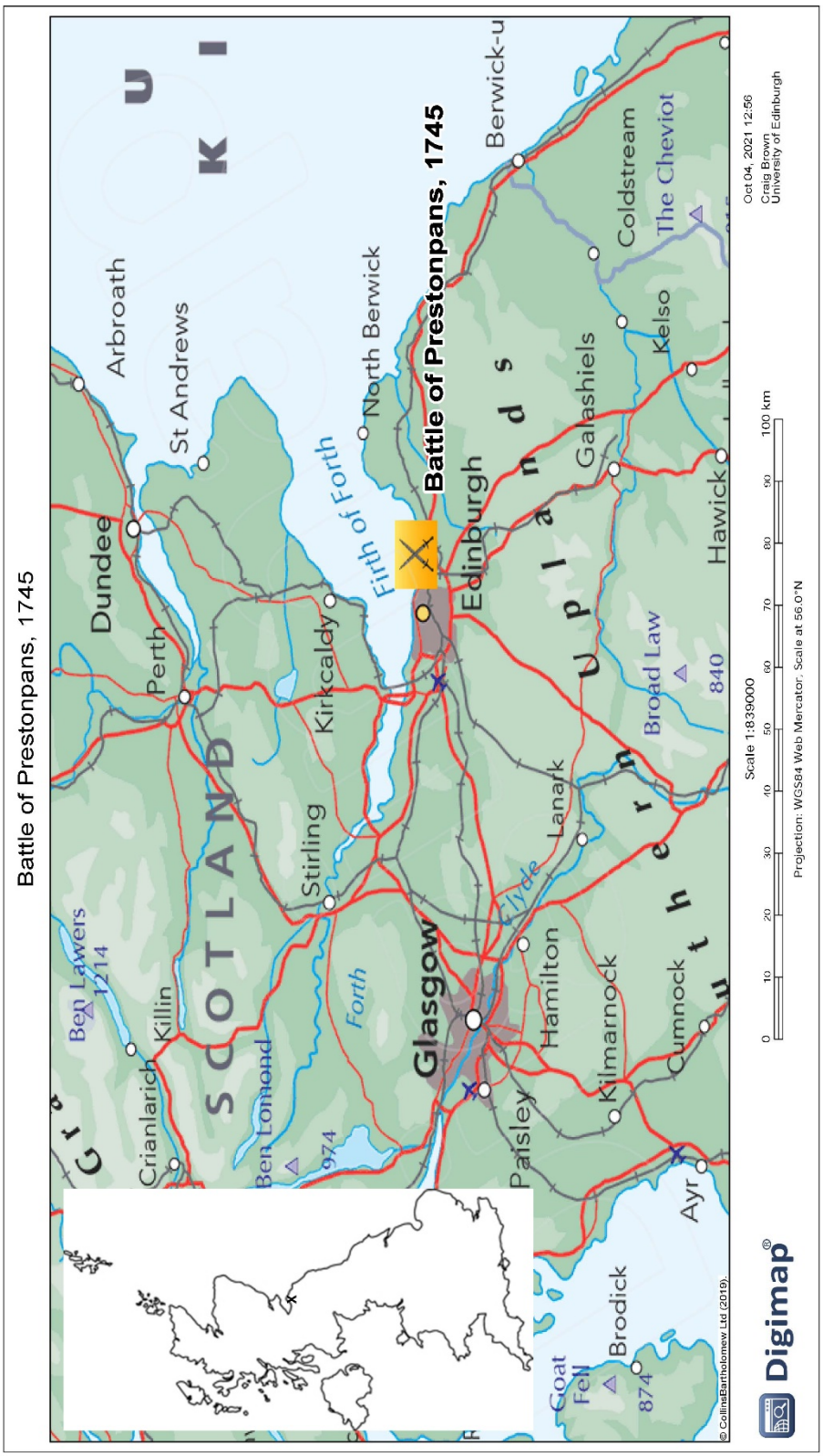


Figure 3.1. The location of the Battle of Prestonpans, September 20-21, 1745 (Drawn by ©Craig J. Brown ©Edina Digimap).

in a disorganized fashion to the west. The Jacobites pursued and managed to trap the British in a narrow road that ran between the stone walls of Bankton House and Preston House. The majority of Cope's army, an estimated 1,800 men, were killed or captured at that location.

The Battle of Prestonpans gained historical significance through being the first set piece battle of the 1745 Jacobite Rebellion (Historic Environment Scotland 2012: 1; Margulies 2013: viii). The battle was a resounding Jacobite victory that gave Prince Charles political control over much of Scotland (Historic Environment Scotland 2012: 1; Margulies 2013: vii; Johnston 2017: xiii). This political control translated into the signing of the Treaty of Fontainebleau with France in October 1745, in which France renounced King George II as ruler of Great Britain in favor of recognizing James Edward Stuart, Prince Charles's father, as the rightful king (Roberts 2002: 101; Riding 2016: 204-205). The Treaty of Fontainebleau revived the Auld Alliance between Scotland and France.

In Scotland, the victory at Prestonpans produced tangible results for the Jacobite cause. The battle itself provided the relatively untried Jacobite army with practical experience facing British artillery and cavalry in the field (Duffy 2015: 137). Some British Regular Army officers, true or not, believed that the Highlanders were deathly afraid of cannon and horses (Cadell 1898: 134; Crichton 1907: 22; Margulies 2013: 58). The victory at Prestonpans also boosted Jacobite morale (Duffy 2007: 11; Environment Scotland 2012: 1; Margulies 2013: ix; Duffy 2015: 137-138) and spurred recruitment. Previously uncommitted Highland Clan Chiefs joined Prince Charles, adding their

retainers to increase the size of the Jacobite army (Home 1802: 128-129; Roberts 2002: 102-105; Duffy 2007: 206; Johnston 2017: xiii).

The Battle of Prestonpans Case Study

Prestonpans was selected as a case study for several reasons. It was a set-piece battle fought with linear tactics and Early Modern gunpowder weapons at a time known colloquially as the 'Age of Musket and Horse'. Militarily it represented the zenith of the Jacobite cause and is well-researched historically and archaeologically (Duffy 2007; Pollard and Ferguson 2010; Historic Environment Scotland 2012; Margulies 2013; Johnston 2017). A large number of primary accounts written by participants within a few years of the engagement have survived.

These primary sources identify terrain features and placenames that allow battlefield locations and boundaries to be fixed in the present landscape. Archaeological survey conducted by GUARD (Glasgow University Archaeological Research Division) (Pollard and Ferguson 2010) and the subsequent Historic Environment Scotland (HES) Inventory of Historic Battlefields Record (BTL16) consolidates this information (2012). In 2019, the 1722 Waggonway Project conducted the first in a series of archaeological excavations that revealed new information regarding the construction of the Waggonway.[5] The primary documentation and recent archaeological

[5] I took part in this excavation as a volunteer. The features that I personally observed during that excavation confirmed my interpretation of the Waggonway as a KOCOA obstacle.

excavations were used to inform the KOCOA analysis and provide independent verification of battlefield locations and boundaries derived from the analysis. The GUARD (Pollard and Ferguson 2010) report and HES battlefield inventory were not consulted prior to the completion of the KOCOA analysis in order to avoid the introduction of bias based on their findings. Site visits to the battlefield were conducted after the initial map-based KOCOA analysis was completed in order to correlate map-derived terrain features with those on the landscape (Figure 3.2).

Pollard and Ferguson (2010) resolved a long-standing dispute over exactly where the Jacobites engaged Cope's Army on the morning of 21 September. Primary documents describe the location where the engagement took place as being an open field approximately one-mile square. Nearly all omit mention of the 1722 Waggonway, a significant man-made feature in the local topography. Historians came to identify the field to the west of the Waggonway as the location where Cope deployed his line of battle just prior to the Jacobite attack (Figure 3.3 and Figure 3.22) (Home 1802: 108-109; Tomasson and Buist 1978: 62; Duffy 2007: 17, n.d.: 12-13; Margulies 2013: 136). Their interpretation was based largely upon the writings of Reverend Alexander Carlyle (1910) and Brigadier William Blakeney (Blakeney to Pelham 18 October 1745), neither of whom were eyewitnesses to the battle.

Figure 3.2. The Battle of Prestonpans Project Area depicting battlefield locations and boundaries derived for the KOCOA analysis and participant accounts (Drawn by ©Craig J. Brown ©Google Earth).

The idea that Cope deployed his line in the western field leaving the Waggonway between him and the approaching Jacobites remained the most accepted view of the location of the engagement until GUARD conducted its excavations in 2009. During those excavations, a metal detector outing attended by the Scottish Artefact Recovery Group (SARG) and the Scottish Detector Club (SDC) found expended munitions associated with the battle in a field hundreds of yards east of the Waggonway. Pollard and Ferguson (2010: 25-29) plotted the artifact distribution identifying the position of the engagement in the fields east of Seton West Mains Farm. Their work, however, did not explain why Cope shifted his deployment to the east. The KOCOA analysis will focus on why the engagement took place at Seton Mains West Farm and not west of the 1722 Waggonway as traditionally thought. In doing so, this case study will also demonstrate how KOCOA could have estimated the location of the engagement had it been used at the outset.

Historical Context – The Armies Move into Position

Lieutenant General John Cope received word that Edinburgh had fallen to the Jacobite Army of Prince Charles Edward Stuart[6] as his transports entered the mouth of the Firth of Forth on 17 September 1745. Cope and his

[6] To his detractors, Bonnie Prince Charlie was known as the Young Pretender to distinguish him from his father, James Edward Stuart, or the Old Pretender. Accompanying Prince Charles were the so-called Seven Men of Moidart, Aeneas MacDonald, Sir John MacDonald, George Kelly, Francis Strickland, Sir Thomas Sheridan, John William O'Sullivan and the Duke of Atholl (Duffy 2015: 165).

army had been operating in the Highlands for weeks in an unsuccessful attempt to engage the Jacobites and put an end to the nascent rebellion. Rather than pursue an engagement with Cope, Prince Charles opted to march on Scotland's capital at Edinburgh, capturing the city in the early morning of September 17th just as Cope reached the Firth of Forth. Rather than proceed further up the Forth, Cope disembarked his troops at Dunbar, where he was united with the 13th Dragoons under Colonel Gardiner and the 14th Dragoons under Colonel Hamilton. Both regiments were somewhat the worse from wear after their flight from Edinburgh ahead of the Jacobite advance (Reid 2001: 27; Duffy 2007: 199-200; Margulies 2013: 115; Duffy 2015: 120-123).

Cope spent all day on 18 September disembarking his men and artillery from the naval transports (Cope 1749: 47-48; Cadell 1898: 181). Between 8 AM and 9 AM the following morning, Cope marched his army west from Dunbar 11 miles to Haddington (Duffy 2015: 121). He decided to halt and make camp for the night at Haddington as there was no source of drinking water further west that he could reach that day (Tomasson and Buist 1978: 40-41; Reid 2001: 28; Duffy 2007: 11, 2015: 121; Riding 2016: 152). By 9 AM the next morning, 20 September, Cope's Army had resumed its westward march along the Post Road (Cadell 1898: 189; Tomasson and Buist 1978: 41; Reid 2001: Duffy 2015: 121). Between Frabroun and Elivingston, Cope turned his army to the right to march along a minor road closer to the coast. Rev. Carlyle found this change of course to be inexplicable (Carlyle 1910: 136) as he thought the high ground along the Post

Road at Tranent to be desirable, however, Cope likely wanted to avoid the broken ground at Tranent and, perhaps, keep in contact with naval vessels operating in the Forth. Shortly after leaving the Post Road, Cope dispatched the Earl of Loudon, Earl of Home and Major Caulfeild[7] to scout ahead in the direction of Musselburgh. Cope intended to reach the River Esk before nightfall and establish a defensive line from Smeaton and Inveresk to Musselburgh (Duffy 2007: 12, 2015: 121). The River Esk would have acted as a natural obstacle protecting Cope's front by denying the Highland Jacobites the use of their preferred tactic, the 'Highland Charge,' At noon, as Cope's Army was clearing Seton and entering the plain between Seton and Preston, Cope's scouts returned with word that the Jacobites were approaching (Cope 1749: 37; Margulies 2013: 122). Cope decided that the field his army was moving through would suit his purpose, recalling that: "In this Field there is no Ditch except that of the Morass, nor a Bush, Hollow-way, nor Marsh. There is not in the whole of the Ground between *Edinburgh*, and *Dunbar*, a better spot for both Horse and Foot to act upon" (Cope 1749: 37). Cope marched his army across the fields and deployed a short distance to the east of Preston House. The line was formed fronting westward, but a little obliquely so as to cover both defiles on either side of Preston House. The left of the line rested towards the ditch and morass, while the right was toward the sea (Cope 1749: 37-38). There Cope's Regulars waited for the Jacobites to come up (Figure 3.3; Figure 3.4).

[7] His own spelling.

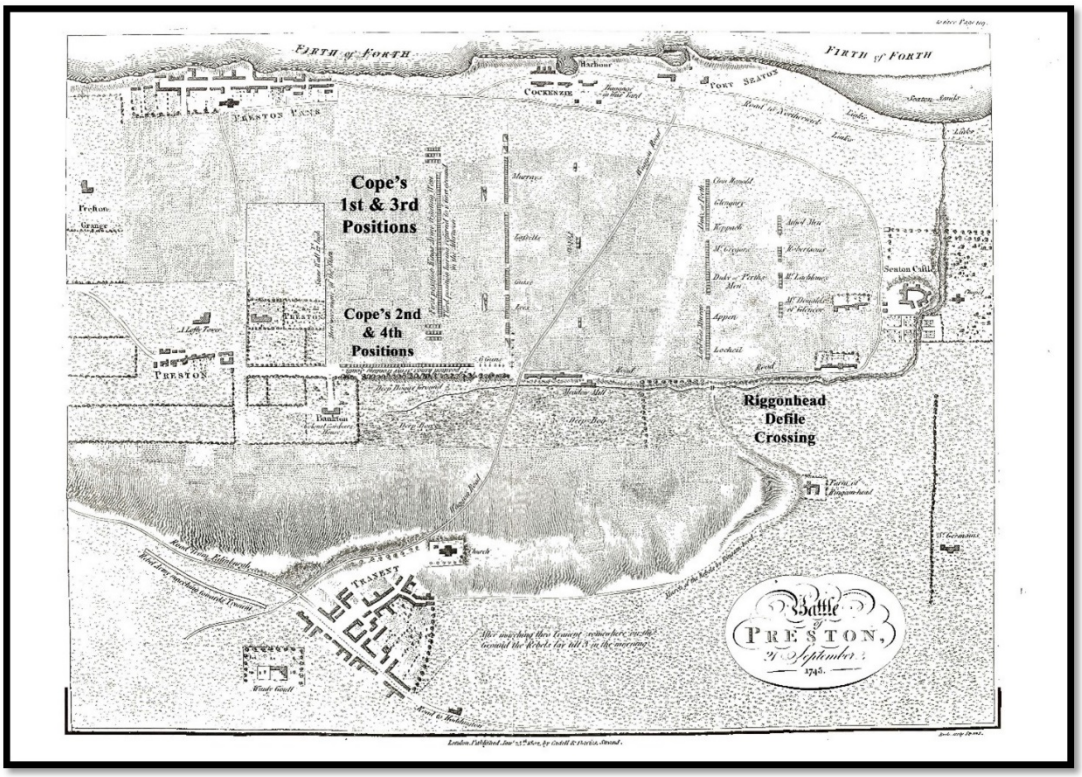


Figure 3.3. Battle of Preston, 21 September 1745 (From Home 1802: 110-111). Idealized image showing the positions Cope's Army occupied on 20-21 September 1745. The 1722 Waggonway is inaccurate. It travelled to Cockenzie before turning and going to Port Seton. Cope's 2nd & 4th positions are accurate. Cope's 1st and 3rd positions should be inclined to the southwest. The Riggonhead Defile Crossing is reasonably accurate. Margulies (2013: 143) uses this map to depict the battle.

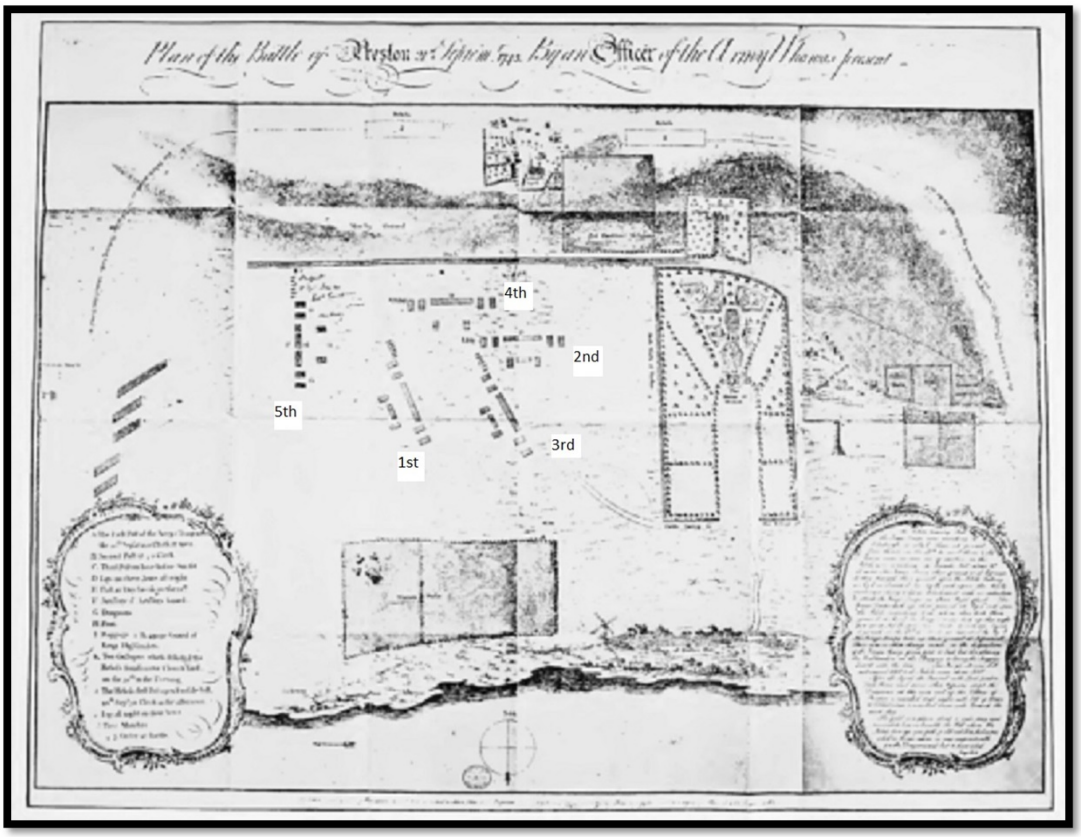


Figure 3.4. Plan of the Battle of Preston 21 Septembre 1745 By an Officer of the Army Who Was Present. Idealized version of a sketch map by an unknown officer. Appears to be a more accurate depiction of the location of Cope's various lines of battle. The numbers denote sequence of deployments (Anon n.d.a.; ©Microsoft Bing Images https://www.bing.com/images/).

Once the Jacobites took possession of Edinburgh on 17 September, they established their main camp at Duddingston (O'Sullivan 1747: 72-73; Cadell 1898: 173; Duffy 2007: 197-198, 2015: 118-119; Riding 2016: 133-134). There they set about distributing the 1200 stand of arms and ammunition discovered during a search of the town (O'Sullivan 1747: 74). On 18 September while Cope was disembarking his army at Dunbar, Prince Charles read a proclamation from the Mercat Cross that declared his father to be king with he, himself as regent (O'Sullivan 1747: 73-74; Riding 2016: 145-148). During the day of 19 September, scouts brought word of Cope's

Army marching from Dunbar. Prince Charles convened a council of war, where it was determined that the Jacobites would march to meet Cope and give battle (O'Sullivan 1747: 74-75; Elcho 1907: 265-266; Tomasson and Buist 1978: 43; Riding 2016: 151). The next morning[8] 20 September, the Jacobites marched from Duddingston. They crossed the River Esk at Musselburgh and continued east on the Post Road. As the vanguard under Lord George Murray reached Pinkie House, scouts brought word that Cope's Army was deployed in the fields outside of Prestonpans. Murray led the van across country in an attempt to reach the key terrain at Tranent before Cope. The Jacobites marched up Falside Hill, regained the Post Road and formed a line of Battle on Birsley Brae just west of Tranent by 2 PM (O'Sullivan 1747: 75-77; Murray 1834: 36; Johnstone 1821: 30; Home 1802: 109; Tomasson and Buist 1978: 45-46; Riding 2016: 152-153).

Results of Historical Documentary and Image Research

The Battle of Prestonpans was recorded in a collection of personal letters, reports, and memoirs, most written within a few years of the battle. A number of these accounts contained maps that depict troop positions during 20-21 September. Primary accounts and maps were selected for this case study and subjected to Internal Source Analysis (Barber and Berdan 1998). Results are summarized in Table 3.1 and 3.2. These primary sources form the core of most modern histories of the battle (Tomasson and Buist 1978; Reid 2001;

[8] Elcho (1907: 266) says 6 AM and Murray of Broughton (1898: 199-200) says 9 AM.

Duffy 2007; Margulies 2013; Duffy 2015; Johnston 2017), but they are not without controversy.

Table 3.1 Primary Historical Source Analysis Battle of Prestonpans, 20-21 September 1745			
Date Written (Published)	**Author**	**Title**	**Comments**
1745 (2006)	Brigadier William Blakeney	Blakeney to Pelham, 18 October 1745	The Blakeney Letter including his map of the battle. Blakeney was the commander of Stirling Castle and not an eyewitness. He based his account on secondhand information likely obtained from Rev. Carlyle. His errors have been picked up and transmitted by historians.
1745 (1996)	John Maclean	*A Journall of the Travells and Marches of John Maclean in his Highness's Army 1745*	Role at battle unclear. Member of Jacobite horse left to guard Waggonway avenue of retreat. Attached to MacLauchlan's Regiment after battle?
1745 (1950)	Lt. Col. Shugbrough Whitney (P. Summer, Ed.)	*The 13th Dragoons at Prestonpans, 1745: A contemporary account by Lieutenant-Colonel Shugbrough Whitney*	Letter from Whitney to Col. Peregrine Lascelles dated October 11, 1745. Rebukes Lascelles for claims that dragoons ran. Written 20 days after battle.
c. 1745 (1907)	P. Crichton (?)	*The Woodhouselee Ms.*	Was an ironmonger living in Canongate during Jacobite occupation. Not proven completely it was his diary. Writer was pro-government (Cope). Second-hand account.
c. 1745-1746 (1895)	Anonymous (J. Allardyce, Ed.)	*Cope's Battle, 1745*	Author says that he was a staff officer on leave in Scotland when he reported to Cope for service. Stayed close to Cope during battle. Letter found among Lord Forbes Papers. Author likely of that family.

c. 1746 (2002)	Anonymous (A. Howes, Ed.)	An account of Prestonpans, 1745. (A Relation of the Battle of Prestonpans 1745 by an officer concerned and taken prisoner by the Rebels)	Unknown officer in infantry placed in right center of Cope's line of battle. He relates battle and capture by Duke of Perth. Letter likely written around 1746. Good Terrain detail.
c. 1746 (1907)	David Wemyss, Lord Elcho	*A short account of the affairs of Scotland in the years 1744, 1745, 1746*	Aid-de-camp to Prince Charles. A shorthand account based upon his journal. Intended to be complete and accurate account, but he seems to have developed a dislike of Prince Charles. Likely written after 1746.
1746 (1749)	B. Robins, Ed.	The report of the Proceedings and opinion of the Board of General Officers, on their examination into the conduct, behaviour and proceedings of Lieutenant-General Sir John Cope, Knight of Bath, Colonel Peregrine Lascelles, and Brigadier-General Thomas Fowke	Record of official Court of Inquiry into defeat at Prestonpans. Includes eyewitness testimony from many officers that were present. At least 13 accounts. Good terrain and battle detail.
1746-1760 (1834)	Lord George Murray	Marches of the Highland Army	Second in command of Jacobite Army. Unsure of when it was written. It was written to a friend and rebuts charges of malice and disloyalty levelled at him by supporters of Prince Charles. Good battle account. Not much terrain info.

c. 1747 (1792)	Phillip Doddridge	Some remarkable passages in the life of the Hon. Col. James Gardiner	Close secondary source. Friend of Gardiner. Used Gardiner's letters and papers. Account of battle and death of Gardiner related to Doddridge by Gardiner's manservant who was present. Good battle detail.
1747 (1938)	Col. John W. O' Sullivan	O' Sullivan's narrative	Adjutant General to Prince Charles. Written in 1747 and sent to exiled King James Stewart as a sort of report. Terrain descriptions.
c. 1757 (1898)	John Murray of Broughton	*Memorials of John Murray of Broughton*	Murray's personal papers destroyed at Culloden. Memorials seem to have been written c. 1757 and may have been intended as vindication as well as history. Contains terrain detail.
c. 1760 (1821)	Chevalier De Johnstone	*Memoirs of the rebellion in 1745 and 1746*	Aid-de-camp to Lord George Murray and Assistant Aid-de-camp to Prince Charles Edward Stewart during Battle. Possibly written 15 years after battle. Contains terrain detail.
c. 1796 (1802)	James Home	*The history of the Rebellion in the year 1745*	Home says he was eyewitness. In College Guards with Carlyle at time of battle. Book is written as traditional history, difficult to know what he witnessed and what he did not. Recorded events as he saw them, but also used other accounts.
1800-1805 (1910)	Alexander Carlyle	*Autobiography of the Rev. Dr. Alexander Carlyle. Minister of Inveresk*	Member of College Company attaching themselves to Cope following Jacobite capture of Edinburgh. Was asleep at his father's neighbor's home in Prestonpans during battle. Good terrain detail but his relation of battle is second hand and he makes mistakes as to where it happened. Account written c. 55 years after battle.

Table 3.1. Source Analysis Battle of Prestonpans.

Table 3.2 Historical Image Source Analysis Battle of Prestonpans, 20-21 September 1745			
Date Drawn	**Cartographer**	**Title**	**Comments**
c. 1745	Anonymous (Figure 3.3)	*Plan of the Battle of Preston 21 Septembre 1745 By an Officer of the Army Who Was present*	Idealized map showing deployments of Cope's Army. Good detail of Preston House, Tranent and Bankton House. No Waggonway. Incorrectly Named in Guard report. Pg. 9.
c. 1745 (1745)	Anonymous (Figure 3.13)	*A Plan of the Battle of Preston Panns fought 21st September 1745*	National Library Scotland (EMS.s.90 a) Stylistically similar to Roy's Military Survey. Shows terrain and approaches. Shows flight of Cope's Army to the west. No Waggonway. This is map from Guard Report pg.9.
c. 1745	Anonymous (Figure 3.11)	*A Plan of the Battle of Tranent fought Sept. 21st 1745*	Shows surroundings villages and built environment. Positions of the armies and approaches National Library of Scotland (Acc 8392).
1745 (2006)	Brigadier William Blakeney (Figure 3.4)	*Plan of the positions of the opposing troops at the Battle of Preston Pans*	Included in Blakeney's letter to Pelham, 18 October 1745. One of the few maps of the battle to include the 1722 Waggonway. Based on second hand information received from Rev. Carlyle and is erroneous. Picked up by later historians.
c. 1746 (1907)	David Wemyss, Lord Elcho	*Battle of Gladmuire or Preston Pans Fought on Saturday the 21 September 1745*	Sketch map not to scale and missing some terrain features- notably the 1722 Waggonway. Included in his 'A Short Account' mentioned above. Eyewitness participant. Accurately shows deployment and relative position of salient terrain features.
c. 1746 (?)	John Elphinstone	*Plan of the Field of Battle near Preston Sept. 21, 1746*	Idealized watercolor map of battlefield correctly showing Waggonway and army deployments to east.

1747-1755	William Roy	*Roy's Military Survey*	Survey shows battlefield and surrounding area. Although Roy did not minutely survey the area or record topography, other than hillshading, he represents the terrain accurately.
c. 1802 (1802)	Anonymous	*Battle of Preston, 21 September 1745*	Included between pgs. 110-11 of John Home's 'The History Of The Rebellion In The Year 1745.' Idealized Engraving showing terrain and built environment. Shows Cope well west of Waggon Road. Also shows nice linear deployment of Cope's Army. All Incorrect.
c. 1870	John Bartholomew	*Map to Illustrate The Battles Of Pinkie 1547 And Prestonpans 1745.*	Large scale map showing both battles, but lacking terrain detail. However battle lines at Prestonpans shown east of Waggonway.

Table 3.2. Historical Image Source Analysis

What remains contentious is the actual location of the engagement that occurred during the pre-dawn twilight on 21 September. In general, the primary sources contain detailed, mutually supportive accounts of the battle. The majority of these sources, however, omit mention of the wagonway and, by extension, the location of Cope's line of battle at the moment of contact with the Jacobites relative to it. Several of the histories written prior to 2010 depict the 21 September engagement with Cope's Army deployed in a line of battle in the field immediately to the west of the 1722 Waggonway with the Jacobites attacking over it from the east (Tomasson and Buist 1978: 62; Duffy n.d.: 12-13, 2007: 17; Margulies 2013: 114, Figure 3.3). For many years, this deployment had dominated interpretations of the battle. Then in

2009, metal detectorists from the Scottish Artefact Recovery Group (SARG) and the Scottish Detector Club conducted on outing at Seton West Mains Farm, hundreds of yards east of the 1722 Waggonway. They recovered lead projectiles (British Regular and Jacobite), buttons, buckles and other objects in a density and patterning that indicated that the engagement on the morning of 21 September took place at Seton West Mains Farm. The discovery of the engagement taking place at Seton West Mains Farm caused a reinterpretation of the battle with it now taking place east of the 1722 Waggonway (Pollard and Ferguson 2010: 25-28; Duffy 2015: 125; Johnston 2017: 160; A. P. Johnston, personal communication, 23 January 2020).

The origin of the misidentification of the fields immediately west of the 1722 Waggonway can be traced to the writings of Brigadier William Blakeney (Blakeney to Pelham, 18 October 1745) and Reverend Alexander Carlyle (1910: 138), neither of whom actually witnessed the battle. At the time of the battle, Blakeney was the commander of the garrison at Stirling (Duffy 2015: 106; Johnston 2017: 50). In a letter written on 18 October 1745 to Henry Pelham, Blakeney included a sketch map (Figure 3.5) of the battle depicting Cope deployed west of the Waggonway with the Jacobites marching over it from the east. Blakeney's map is the only contemporary map to include a depiction of the 1722 Waggonway (Pollard and Ferguson 2010: 30), so it is understandable why historians would depend upon it in order to locate the engagement. Blakeney, however, did state within the body of the letter that he received his account of the battle "from a very Intelligent Clergy man who road over the field of Battle, and was well informed of everything that

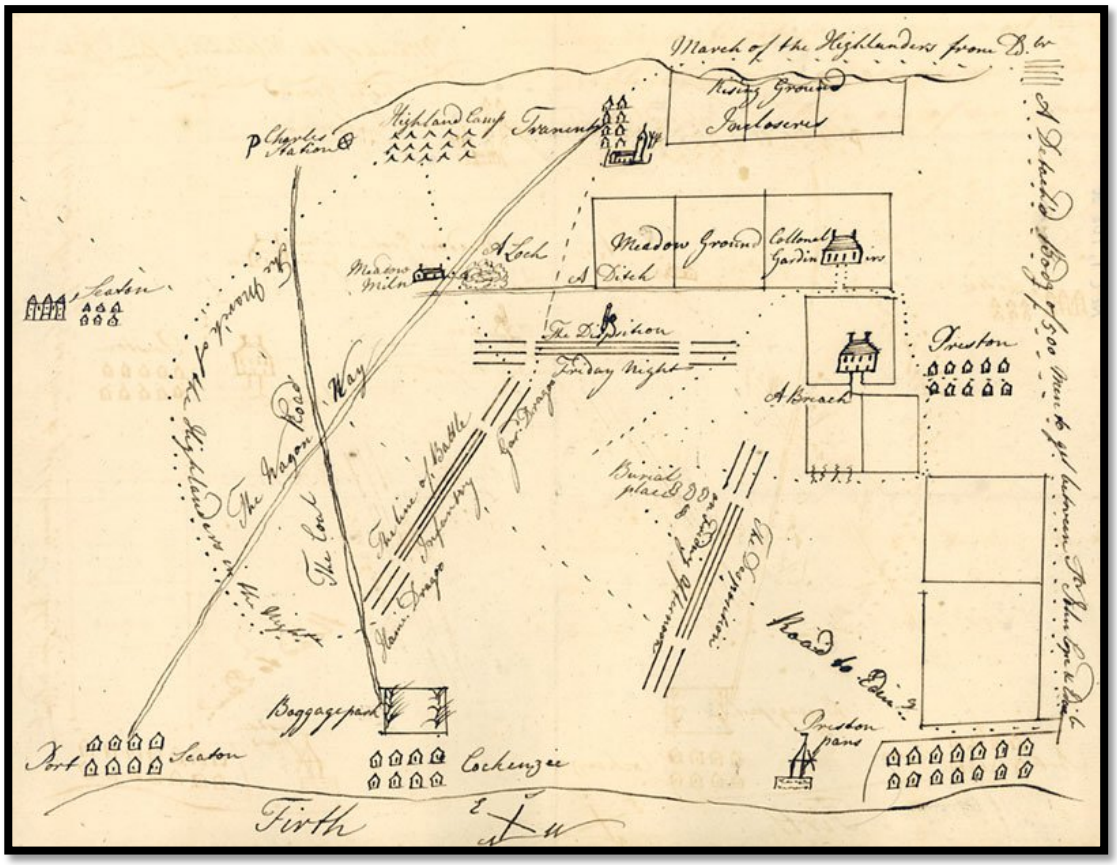


Figure 3.5. Blakeney's Map. Blakeney drew his map in the days after the battle based up an account, he likely heard from one of the Carlyles. Notice the 1722 Waggonway. The route is incorrect. It first went to Cockenzie before turning for Port Seton. Interestingly, The Coal Road seems to be fairly accurate. The depiction of the battle is inaccurate. The position of Cope's Army and the several Jacobite columns are incorrect. Nonetheless, this is the map several historians used to locate the battle (From Blakeney to Pelham, 18 October 1745; ©Microsoft Bing Images https://www.bing.com/images/).

happened" (Blakeney to Pelham, 18 October 1745), making his information second-hand at best. Pollard and Ferguson (2010: 30) have rightly deduced that the clergyman referred to by Blakeney is likely Alexander Carlyle or his farther, Reverend William Carlyle. They point out that Alexander was not ordained until 1748, opening the door for William, who was the minister of Prestonpans to be Blakeney's source (Pollard and Ferguson 2010: 30). If one of the Carlyles were indeed the source, it was likely William, for Alexander left on a trip to Holland on October 9th (Carlyle 1910: 156). Although he

describes riding over the field of battle with his father, Alexander likely did not have the opportunity of speaking with Blakeney. Alexander's departure for Holland does not relieve him of responsibility for his own misidentification of the location of the 21 September engagement, however. Alexander's own account in his autobiography is fraught with errors when speaking of the actual engagement. In describing the field of battle, Carlyle unequivocally states, "The army marched straight to the west end of this field till they came near the walls of the enclosures of Preston… This was properly the field of battle…" (Carlyle 1910: 137-138). Carlyle, by his own admission, was asleep at the home of a neighbor in Prestonpans when the battle began and by the time he was dressed, it was over (Carlyle 1910: 141). Carlyle predicated his account of the battle on the position the respective armies occupied at the time he retired for the night of 20-21 September, making no allowance for them having moved:

> "The rebel army had before day marched in three divisions, one of which went straight down the wagon-way to attack our cannon, the other two crossed the Morass near Seaton House; one of which marched north towards Port-Seaton, where the field is broadest, to attack our rear, but over-marched themselves, and fell in with a few companies that were guarding the baggage in a small enclosure near Cockenzie, and took the whole. The main body marched west through the plains, and just at the break of day attacked our army (Carlyle 1910: 142-143)."

Of Carlyle's summary of the battle, only the last sentence is accurate as there was only one Jacobite column that crossed the morass near Seton House. The whole, however, resembles Blakeney's depiction of the battle in his map included with his letter to Pelham. This resemblance between

Blakeney's map and Carlyle's autobiographical account can be taken as evidence that the misidentification of the fields west of the Waggonway as the site of the battle ultimately originated with the Carlyles.

The British Regular Army and Jacobite (Highland) Way of War: Tactics and Force Composition

The British Regular Army

The army that General Cope led on 20 September 1745 was not prepared to fight. Cope's regiments were recently raised, the majority having been formed in 1741. They were young, under strength, ill-trained and inexperienced. Only a few men in Guise's 6th Regiment of Foot had seen combat. Cope's Army was comprised of some of the youngest units in the British Army (Duffy 2007: 131, 142; Margulies 2013: 50). They had seen hard service in the run up to Prestonpans. While the officers seemed generally dismissive of the fighting ability of the Highlanders, the morale of the British rank and file was low (Carlyle 1910: 133).

Generally speaking, the officers of the mid-18th Century British Army came from upper or middleclass and were competent in the discharge of their duties. At this time, the King appointed officers to the rank of General (Colonels would eventually become an appointed rank as well) (Reid 2001: 186-187; Duffy 2007: 132; Margulies 2013: 36-37). Cope had been appointed Commander-in-Chief of Scotland by King George II shortly before the rebellion of 1745. (Brumwell 2004: 1). Officers below the rank of General

could purchase their commissions (Reid 2001: 186-187; Duffy 2007: 132; Margulies 2013: 36-37). There was no formal officer training school. Officers were required to undertake the study of military treatises and army regulations on their own initiative. The most relied upon treatise of the period was Lieutenant-Colonel Humphrey Bland's 1727, *Treatise of Military Discipline* (Houlding 1981: 179-184; Margulies 2013: 37). By 1740 (5 years before the Battle of Prestonpans), officers from the rank of ensign to lieutenant-colonel had held their commissions from 3 to 8 years (Houlding 1981: 109-110; Margulies 2013: 37).[9] This author infers from this that the officers serving under Cope were competent.

A full regiment of foot consisted of 815 men organized into 10 companies (Reid 2001: 189; Margulies 2013: 42).[10] Cope's regiments of foot, however, were badly understrength. Cope had under his command an estimated 1,441 rank and file infantryman allotted unevenly in 3 ½ regiments (Jarvis 1971b: 31; Reid 2001: 32; Margulies 2013: 49; Johnston 2017: 131).[11] The regiments had been hastily cobbled together from billets across Scotland in response to news of the Jacobite rising on August 19, 1745 (Jarvis 1971b: 27; Reid 2001: 185; Margulies 2013: 50).[12]

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[9] Cope's papers, including records for his army, were lost at Prestonpans, so we do not know service records of the majority of officers.

[10] A full regiment of foot consisted of 815 men, in 10 companies, one of which was a grenadier company. Each company had a captain; lieutenant; ensign; 3 sergeants; 3 corporals; 2 drummers; and 70 privates. 3 Regimental officers: Colonel; Lieutenant-Colonel; and Major. 4 staff officers: adjutant; quartermaster; surgeon; and chaplain (Reid 2001: 189; Margulies 2013: 42).

[11] Colonel Thomas Murray's 46th Foot (580 men, Lt. Col. Jasper Clayton commanding); 8 companies of Colonel Peregrine Lascelles's 47th Foot with 2 companies of Sir John Guise's 6th Foot under the command of Major John Severn (570 men total); 5 companies of Colonel John Lee's 44th Foot (291 men; Lt. Col. Peter Haklett commanding).

[12] Home regiments were often broken down into small detachments and dispersed (Reid 2001: 185; Margulies 2013: 42). Lascelles's: Edinburgh and Leith; Lee's: Dumfries, Stranraer, Glasgow and

The rank and file men were recruited or pressed from the lower rungs of British society. Most were poor and some were vagrants, debtors or criminals (Duffy 2007: 132; Margulies 2013: 39). Training of the men was up to the officers and was conducted per 1728 regulations, using the same military texts that the officers used to train themselves (Houlding 1981: 179-184; Reid 2001: 186, 190). Recruits were first taught how to march and only after mastering battlefield evolutions on the parade ground were the recruits issued a weapon (Houlding 1981: 260-262). The weapon issued to the infantry of Cope's army was likely the Long Land Pattern Musket (Brown Bess). The Brown Bess possessed a 46 inch long barrel (Darling 1971: 19) with a 0.75-0.76 inch bore that fired a 0.71 calibre lead ball that weighed 1 ½ ounces. The 0.05 inch difference between the diameter of the bore and the diameter of the ball (Windage) allowed for continuous rapid loading even as the barrel became fouled from prolonged firing A 17 inch, triangular bayonet could be fixed to the outside of the muzzle to be used in hand to hand combat (Reid 2001: 190, 2016 25). There was not enough ammunition or gunpowder for any real marksmanship training (Houlding 1981: 262). This was not really a problem as the maximum effective range of a Brown Bess was 100 to 200 yards (Hughes 1974: 10; Reid 2016: 34). The Brown Bess, however, was only accurate when deliberately aiming to a distance of 50 yards (Reid 2001: 190-191, 2016: 14; Margulies 2013: 41). To offset the lack

Stirling; Guise's: Aberdeen and coastal locations; Murray's: the Highlands (Jarvis 1971b: 27; Reid 2001: 185).

of accuracy, the British Army developed tactics that depended upon unaimed volley fire and an increased rate of fire (Houlding 1981: 262).

Once a recruit was issued a musket, he was introduced to platoon exercise and firing by platoon. This was learning how to keep up a sustained, rapid and synchronized fire with the men in three-deep ranks: first rank kneeling; second rank crouching over the first, slightly to the right; the third standing a half step to the right; the arrangement known as 'locking' (Houlding 1981: 263-264; Reid 2001: 191; Duffy 2007: 140). 'Locking' may have been introduced into the British Army through Bland's 1727 *A Treatise Of Military Discipline* (Bland 1743: 72)[13], although Chandler (1990: 119) claims an older pedigree used by Marlborough. The effect of 'locking' was to essentially increase the volume of fire by reducing the interval between files, as well as making the act of firing safer for the ranks in front of the shooter (Houlding 1981: 194, 281). In battle, the regiment was reconstituted into one or two battalions. It was usually one battalion given that most regiments were under-strength at this time (Duffy 2007: 132; Margulies 2013: 42-43). The battalion was then separated into 4 grand divisions with each grand division normally comprised of three or four platoons of at least 30 men (Margulies

[13] "…the Men of the Front Rank are to kneel down on their right Knees, placing the Butt-end of their Firelocks on the Ground, keeping their Thumbs on the Cocks, and their Fingers on the Trickers. The Center and Rear Ranks close forward at the same Time with recover'd Arms, the Men of the Center Rank placing their left Feet on the Inside of the right Feet of their File-leaders, bringing their right Feet to the Right, but not in a Line with their Left, only in the same Position as when they Rest. The Men in the Rear-rank place their left Feet on the Inside of the right Feet of those in the Center-rank, bringing their right Feet to the Right as those in the Center-rank did…For by Locking as aforesaid, the Men of the Center-rank present their Firelocks over the right Shoulders of their File-leaders; and those of the Rear-rank present to the Right of the Center-rank Men, which bring their Firelocks, when they present, to the Intervals between the Files" (Bland 1743: 72).

2013: 43-44).[14] This author suggests that this arrangement would be detrimental to unit cohesion if the men did not go into battle with their commander. There is no way of knowing how the platoons were constituted at Prestonpans or if it was a factor in the loss of tactical stability. Under ideal conditions, the enemy would be between 30 to 60 yards distant before firing by platoon commenced. The right-hand platoons in each grand division would fire first, with all three locked ranks firing on command. Then the platoons to the immediate left would fire and so on. The platoons that had fired would reload to be ready to fire upon command again (Houlding 1981: 281, 318-321; Reid 2001: 190). While engaging in platoon firing, the infantrymen averaged 2 to 3 shots per minute (Reid 2001: 190; Margulies 2013: 44). Platoon firing, when executed properly, resulted in a continuous rolling fire brought to bear upon the enemy.

The 18th Century British Army relied on the mass concentration of firepower with little concern for accuracy. Its infantry could deliver fire from tightly packed, or 'locked' formations at a range of as little as 30 yards. Against continental armies, they would have been pitted against adversaries using similar formations and tactics. Battles were often decided when one side wilted under the barrage. Despite the availability of the bayonet, infantry charges culminating in hand-to-hand combat were rare (Margulies 2013: 56-57). It is unknown if Cope's men had their bayonets fixed at the time the Jacobites attacked. Cope's intent was to use his horse and foot offensively to

[14] In the 18th Century British Army, the company was merely an administrative unit. In battle, a platoon could be made up of men from different companies (Reid 2001: 189; Duffy 2007: 141; Margulies 2013: 44).

sweep the Jacobites from the field. Normally, their bayonets would have been fixed in preparation. However, they had only established their line of battle mere minutes before the Jacobites attacked, so they may not have had time.

Dragoons of the mid-18th Century were expected to fight mounted, as proper cavalry, or dismounted, as akin to mounted infantry (Reid 2001: 192-193; Margulies 2013: 45). This duality of purpose was reflected in their training and equipment. New recruits had to master the same exercises as the infantry, while learning how to care for their mounts. When this was accomplished, the recruits were taught basic horsemanship before advancing on to more complex cavalry maneuvers, such as opening and closing ranks and wheeling (Houlding 1981: 264-265; Margulies 2013: 45). Dragoons were armed with the Short Land Pattern Musket, which had a 42-inch-long barrel (only 4 inches shorter than an infantry Brown Bess) with a 0.75 calibre bore (Darling 1971: 26-28; Bailey 1986: 16, 31; Reid 2016: 17-20).[15] The ballistic characteristics of the Long and Short Land Pattern muskets were likely rather similar. The Short Land Pattern Musket would have been cumbersome to use on horseback due to its size, so it was likely used when fighting dismounted. Dragoons were also armed with a basket-hilted broadsword, similar to the

[15] There is some confusion regarding the calibre of the Short Land Pattern musket that was likely carried by the dragoons at Prestonpans. The 1722 version was simply a shorter version of the Long Land Pattern musket carried by the infantry and was .75 calibre. There was, however, a 42 inch .65 calibre carbine in use around the time of Prestonpans (Darling 1971: 46-47). Reid (2001: 193) and Margulies (2013: 45-46) have transposed the .65 calibre of this carbine onto the 1722 Short Land Pattern musket.

Highlanders' weapon of choice, and a pistol or two (Reid 2001: 193; Margulies 2013: 45-46).

A fully manned Dragoon regiment was organized into 6 troops of 59 men each, amounting to 435 men total including officers. In battle, the troops were paired into squadrons, 3 squadrons per regiment. When fighting mounted, Dragoons would adopt loose formation keeping enough room between individual troopers to allow the horse to maneuver. Before breaking into a charge, they would advance at a trot with broadswords drawn. The pistol was used during mounted fights and while pursuing retreating enemies (Reid 2001: 193; Duffy 2007: 142; Margulies 2013: 46). During battle, the dragoons were used to support the infantry or provide the shock necessary to break an enemy line. In the event of victory, the dragoons headed up the pursuit of a fleeing enemy (Chandler 1990: 27).

Cope had two regiments of dragoons at Prestonpans, Colonel James Gardiner's 13th Dragoons and the 14th Dragoons under Colonel Archibald Hamilton, totaling approximately 567 men. There is little doubt, based upon his deployment, that Cope intended to use the dragoons in the conventional manner. Cope placed 2 squadrons of the 13th on the right and 2 squadrons of the 14th on the left. The remaining 2 squadrons formed a general reserve. In this deployment, the dragoons were expected to support the infantry by keeping its flanks clear and be ready to assume the offensive should the opportunity present itself. Neither expectation was fulfilled.

Gardiner's and Hamilton's regiments, men and horses, were in appalling condition. Although the regiments themselves were created in 1715, the men and horses were newly raised (Corsar 1941: 95; Duffy 2007: 131, 142; Margulies 2013: 50). Hamilton's men were recruited in Ireland and probably were Catholic, despite it then being against army regulations to admit Catholics into the army (Duffy 2007: 131, 142; Margulies 2013: 50). The whole were inexperienced. Both regiments were broken up with troops billeted at different locations around Scotland at the time of the outbreak of the rebellion on 19 August 1745.[16] While on station the horses had been put to grass, meaning that if any training at all took place, it was foot rather than mounted drills (Johnston 2017: 55). The animals were likely out of condition and the men out of practice. On 15 September, the dragoons were brigaded under the command of Brigadier Thomas Fowke. The following morning Fowke inspected his new command at their camp at the Coltbridge: "I found many of the Horses Backs not fit to receive the Riders, many of the Mens and some of the Officers Legs so swelled, that they could not wear Boots; and those who really were to be depended upon; in a manner overcome for want of Sleep" (Fowke 1749: 70).

The author of the Woodhouselee Manuscript (Anon 1907: 19) also attended Fowke's inspection and spoke with Gardiner. He came away from the meeting noting that Gardiner himself was not well and had lost confidence in his regiment. He noted that Hamilton's troopers were in a bit

[16] Gardiner's troopers were billeted at Stirling, Linlithgow, Musselburgh, Kelso, and Coldstream. Hamilton's troopers were stationed at Haddington and its surroundings (Jarvis 1971b: 27; Reid 2001: 85; Margulies 2013: 50).

better shape, but “alas were Irishmen” (Anon 1907: 19). Sometime after the inspection, the Jacobite advance guard was spotted marching past Corstorphine Hill. The appearance of the Jacobites set off a precipitous withdrawal (an incident known as “The Coltbridge Canter”) first for Leith, then on to Prestonpans, and finally to Dunbar. Along the way, the troopers discarded much of their equipment (Corsar 1941; Duffy 2015: 115-116; Riding 2016: 114-115). At Dunbar, Carlyle dined with Gardiner who reportedly remarked on the “foul flight” as he called it and his lack of confidence in his men (Carlyle 1910: 131-132).

The artillery should have been a strength for Cope, but it was ill served. Cope brought with him a battery of six 1 ½ pounder galloper guns, four Coehorn mortars (4 $^{2}/_{5}$ in.) and two Royal mortars (5 ½ in.), a respectable train of artillery for the size of his army (Whiteford 1749: 43-44; Griffith 1749: 54; Thomasson and Buist 1978: 27, 31). A fully manned gun crew likely consisted of two gunners and six matrosses (gunners’ assistants). There may have been a reserve to bring the total to twelve men for each gun (Chandler 1990: 226). Hughes (1974: 16) put the number of men in an average gun crew at five. Cope initially had with him one old man who had been a gunner in the old Scots Train and three invalids. At Dunbar, Cope borrowed six gunners from the navy (Cope 1749: 40; Whiteford 1749: 49; Griffith 1749: 54). Cope had a total of nine gunners with no assistants; all of whom fled at the start of the battle, leaving Col. Whiteford and Maj. Griffith to fire each piece once (Cope 1749: 40; Whiteford 1749: 49; Griffith 1749: 54).

The artillery had been loaded during the previous night but could not be reloaded as the gunners took the tools with them.

The 1½ pounder galloper guns were light cannon that could be rapidly moved on the battlefield by a single horse or two men. Instead of the single trail that most field artillery had, the galloper gun carriages had two parallel shafts or rails to fix to a horse (Hughes 1969: 64-65). The tube was brass and measured six feet in length. The 1½ pounders in use during 1745 likely weighed approximately 668 lbs (5 hundred weight 3 quarters 24 pounds) (McConnell 1988: 51). The maximum range of the 1½ pounders solid shot is unclear and dependent upon the elevation of the muzzle.[17] At a distance to target of 300 yards or less, however, gunners switched to case shot (cannister) or grapeshot (McConnell 1988: 319; Reid 2001: 194). Case or cannister shot consisted of a tin cylinder filled with iron balls, the size and number of which depended upon the calibre of the artillery being used (McConnell 1988: 319). This was an anti-personnel munition that in effect turned a cannon into a large shotgun. The case would break apart upon leaving the muzzle causing the shot to spread out in a fan-shaped field of fire. The case shot used in the 1½ pounder contained 17 pieces of shot weighing 1½ ounces a piece (Caruana 1990: 13). Caruana (1990: 13-15) was unable to locate data from a test firing of the 1½ pounder for his study of

[17] For example, for a 9-pounder field artillery piece, a much heavier gun, at 0° elevation solid shot travels 400 yards before first bounce (First Graze), at 800 yards it bounces again (Second Graze) and lands at 900 yards. At just 1° of elevation, First Graze comes at 700 yards and Second Graze at 1000 yards. At 2° of elevation, you get a parabolic or plunging trajectory where the solid shot lands at 900 yards (Hughes 1974: 33). I was unable to locate data from a test fire of a 1 ½ pounder, but I estimate at least 100 to 200 yards difference. This is speculation on my part, however.

18th Century case shot. Caruana did include data from a 1773 test fire of a brass 3 pounder that indicated that the spread of the shot at 400 yards was 96 feet. The same study recorded that at 200 yards,[18] about the same distance the Jacobites were when they were fired upon by Cope's artillery, 49% of the shot found its target (Caruana 1990: 15-16). Case shot fired by a 1½ pounder would likely have a similar, if slightly, less of a spread. At 200 yards or less, the case shot would have been an effective anti-personnel weapon.

Grapeshot is also an anti-personnel munition whose end effect is similar to case shot, but it is distinguishable by its size and the construction of its cartridge. Grapeshot consisted of a spindle, made of wood, that had a flat button with the cylinder in the center. The shot were packed around the cylinder, usually in three tiers of three, the size and weight of the shot varying with the size of the artillery piece.[19] Although there is no extant data for the 1½ pounder, I estimated based upon the data available for the 3 pounder, that it had 9 shot, weighing approximately 2 ounces, arranged in 3 tiers of 3. This assemblage was wrapped in a canvas sack and tied off with a quilting line to keep them in place. When turned upside down the cartridge resembled a bunch of grapes, hence the name. Unlike case shot, upon firing the canvas sack would either burst or burn off, freeing the grapeshot while

[18] There is a good deal of information written about the physical characteristics of the 1 ½ pound galloper gun. It was not, however, a popular gun. There appears to be no extant ballistic information about the gun. In 2018, I spent time with the artillery reenactors at the Battle of Prestonpans reenactment. At that time, they informed me that the effective range of the case shot was between 200 yards and 250 yards.

[19] Larger artillery could have a greater number of smaller shot (McConnell 1988: 315-318).

still inside the cannon's muzzle. Upon exiting the muzzle, grapeshot would fan out (Hughes 1974: 35; McConnell 1988: 315). The use of grapeshot in light brass field artillery, like the 1½ pound gallopers, was discouraged as the shot would damage the bore of the tube during firing (Hughes 1974: 35; McConnell 1988: 315). The recovery of a piece of grapeshot at Prestonpans is interesting (Pollard and Ferguson 2010: 53). Land use grapeshot was still being used during the mid-18th Century, particularly in larger iron cannon (McConnell 1988: 315), but the Prestonpans evidence may reflect Cope's use of naval gunners. Lighter grapeshot was often used at sea for holing ships' boats and cutting sails and rigging (Hughes 1974: 35).

The mortars that Cope brought with him to Prestonpans were of two types. The 4 ⅖ inch Coehorns were brass, 1 foot 1½ inches long, and weighed approximately 84 pounds. They could easily be moved by a crew of two to four men. Their elevation was fixed at 45° and could fire an 8½ pound shell 800 yards (Hughes 1969: 37; McConnell 1998: 113). The 5½ inch Royals were brass, 1 foot 4¼ inches long, and weighed approximately 112 pounds. Its elevation was also fixed at 45°. The Royals could fire a 16 pound shell 1000 yards (Hughes 1969: 37). The mortars were not a factor at Prestonpans, because they suffered from the same lack of service as the 1½ pound gallopers and their fuses were apparently defective after long storage in Edinburgh Castle.

The Highland Jacobite Army

The Jacobite army that fought at Prestonpans on 20-21 September 1745 was almost exclusively a Highland army, the clans having been called out during the interval since Prince Charles landed on Eriskay on July 23rd. The clan structure of Highland society resulted in troop contingents of differing size each with their own officers. O'Sullivan complained that "they must go by tribes; such a chife of a tribe had sixty men, another thirty, another twenty, more or lesse; they wou'd not mix nor seperat, & wou'd have double officers, yt is two Captns, & two Lts, to each compagny, strong or weak" (O'Sullivan 1938: 61). Pittock (2009: 81-86), however, rightly points out that the practice of double officers was common to armies of the period as a type of expedited training method. McCann's research into the organization of the Jacobite Army clearly shows the familiar regimental staff of a single colonel and lieutenant colonel for all 16 Highland regiments that took part in the war (McCann 1963: 2-3). Pittock (2009: 85) suggests that O'Sullivan was simply unfamiliar with Highland companies raised by tacksmen on an obligatory or associational basis which may have been smaller than the regular French companies that he was accustomed to. It would seem, then, that although Highland companies could vary in size, the Jacobite Army as a whole was organized and officered in a manner that was consistent with British Regular Army adversaries and other armies of the period (Duffy 2007: 100, 105; Reid 2006: 13; Pittock 2009: 65-109).

The organization of a Highland regiment mirrored the clan structure from which it was raised. In times of conflict, the primary function of the chief

was to lead the clan in battle. Subordinate to the chief were the heads of septs, chieftains themselves, into which the clan was divided. If the chief could not actively lead the clan in the field, then a brother, son, or perhaps the eldest chieftain could lead in his stead. Lesser officer positions (company officers) were the tacksmen, gentlemen, or lesser nobility of the clan. The fighting men that made up the majority of a Highland regiment consisted of the general body of the clan, the tenants and newcomers who could claim no direct bond with the clan chief (Hill 2018: 18). How much practical experience the men possessed varied a great deal. There were those like Lord George Murray who had seen service in the British Army or in the 1715 Jacobite Rebellion (Pittock 2006), but the majority of men may not have seen serious combat with multiple service arms, infantry, artillery, and cavalry. The bulk of their experience may have come from cattle raids, or *creachs*, which may have involved two or three tacksmen and their tenants (Reid 1997: 8). The clans also held *wapenschaws*, which was a muster type gathering conducted periodically where athletic contests and weapon inspections took place (Moncreiffe 1982: 23). This perceived lack of organized military experience was offset to a degree by the close kinship ties and associational obligations to the clan, honor and physical bravery, and the tactics adopted by the Highlanders.

The Highland Army could move with speed and agility that the British Regular Army could not match. The Highlanders marched unencumbered, carrying no baggage with them and possessing no artillery before the Battle of Prestonpans. They often jogged at a dog trot in long columns, three

abreast. When in the presence of the enemy they could form a three-deep line of battle simply by each individual soldier completing a 45° turn to the right or left. The Highlanders could keep to narrow tracks, maneuver quickly and avoid obstacles; traits that served them well during the march through the Riggonhead Defile during the night of 20-21 September (Murray 1834: 39; Duffy 2007: 109-117, 2015: 328).

When the Jacobites captured Edinburgh on September 17th, some if not most of the Jacobites seem to have been armed with some sort of firearm, although an eyewitness described "guns of diferent syses, and some of innormowows length, some with butts turned up lick a heren, some tyed with puck three to the stock, some withowt locks and some matchlocks" (Anon. 1907: 26). This hodge podge collection of muskets may have been redressed by arms confiscated within the city (Reid 2001: 206), so that by the time the Jacobites marched for Prestonpans most may have been armed with the same Long Land Pattern Brown Bess musket carried by Cope's Army. The weapons most associated with the Highlanders, however, were the broadsword and targe. Pittock (2009: 165) demonstrates that the broadsword was likely carried by the *fine* of a Highland regiment, the officers and gentry. The broadsword was intended for one-handed use, with a double-edged blade approximately 85 cm to 95 cm long. It possessed a basket-hilt to protect the hand while slashing or hacking (Oakeshott 2000: 126, 156-157, 173-190). The targe was a circular shield 20 inches in diameter carried in the off-hand. It was constructed of two layers of wood laid with the grain crossways. The exterior was covered in leather with a large

spike protruding from the center which was surrounded by circular arrangements of studs (Pittock 2009: 173-174). The targe could be used offensively or defensively to thrust or parry. The rank and file Highlanders likely carried 30 cm to 50 cm long straight dirks (Pittock 2009: 97). Some highlanders may have carried fishtailed-handled pistols. Those that did not obtain muskets carried Lochaber axes, a halberd-like polearm with a blade on one side and a hook on the other for unseating and disemboweling cavalry. Some carried scythes fixed to long poles, an improvised and nasty weapon capable of removing limbs (Anon. 1907: 26).

The Highlanders favored offensive tactic, the one employed at Prestonpans, was their iconic ‘Highland Charge’. Hill (2018: 2) has demonstrated a form of the charge was a feature of Gaelic warfare with a long pedigree, but the manifestation it took at Prestonpans may have been derived from the innovations made by Alasdair Mac Colla to accommodate the use of firearms during the British Civil Wars (1639-1653, also known as the Wars of the Three Kingdoms) and used at the Battle of Tippermuir (1 September 1644) (Stevenson 1980: 82-83; Hill 2018: 46). The Highlanders preferred dry, open ground, either flat or on a downslope, to conduct the charge as it relied upon speed and mass at the point of contact. Moving over broken terrain might have caused delay, disrupting cohesion and breaking momentum, while exposing the Highlanders to musket and artillery fire.

The Chevalier De Johnstone, aide-de-camp to Lord George Murray (Lieutenant General, Jacobite Army) and eyewitness, described the Highland Charge:

"They advance with rapidity, discharge their pieces when within musket length of the enemy, and then, throwing them down, draw their swords, and holding a dirk in their left hand with their target, they dart with fury on the enemy through the smoke of their fire. When within reach of the enemy's bayonets, bending their left knee, they, by their attitude, cover their bodies with their targets, that receive the thrusts of the bayonets, which they contrive to parry, while at the same time they raise their sword-arm, and strike their adversary. Having once got within the bayonets, and into the ranks of the enemy, the soldiers have no longer any means of defending themselves, the fate of the battle is decided in an instant, and the carnage follows…" (Johnstone 1821: 113-114).

The Chevalier relates one of the best descriptions of the Highland Charge as it was employed during the 1745 Jacobite Rebellion, but it is misleading in at least one aspect. The phrase 'bending the left knee' may be interpreted as dropping down on one knee while shielding themselves with their target. This would have stopped the momentum of the charge and reduced the effect. The effectiveness of the Highland Charge derived from its speed, momentum, and power at the point of contact. As Pittock points out the "Highland Charge would surely be difficult to carry out with bent knee" (Pittock 2009: 97). Pittock goes on to suggest that the phrase may have referred to the "stabbing of horses in the belly" as at the Battle of Falkirk (Pittock 2009: 97). This author believes, however, that the phrase is referring to how a Highlander may have covered himself with his target in preparation for deflecting a bayonet thrust and countering with his broadsword. This

would have been a rapid, fluid motion that would not necessarily have broken the momentum of the charge.

British Lieutenant General Henry Hawley, himself destined to be defeated by the Jacobites at the Battle of Falkirk (17 January 1746) within five days of writing the following, added more detail:

“They Commonly form their Front rank of what they call their best men, or True Highlanders the number of which being allways but few, when they form in Battlallions they Commonly form four deep, and these Highlanders form the front of the four, the rest being lowlanders and arrant scum, when these Battallions come within a large Musket schott, or three score yards this front Rank gives their fire and Immediately thro’ down their fire-locks and Come down in a Cluster with their Swords and Targets making a Noise and Endeavouring to pearce the Body, or Battallions before them becoming 12 or 14 deep by the time they come up to the people they attack” (Hawley to Willson, 12 January 1745/6).

By combining the accounts of Hawley and De Johnstone we may gain a fuller description of how a Highland Charge was conducted in 1745. Hawley provides additional details absent from the Chevalier’s description. Hawley’s statement regarding the front rank being comprised of “their best men, or True Highlanders” is likely a reference to the *fine* of a Highland regiment made up the clan elites (MacInnes 2015: 31). The “lowlanders and arrant scum” (Hawley’s words, not this author’s) were likely the crofters, tenants, or newcomers who owed allegiance to clan leadership (Moncrieffe

1982: 27). These passages provide a glimpse into how the charge was composed. The passage “Endeavouring to pearce the Body, or Battallions before them becoming 12 or 14 deep by the time they come up to the people they attack” is significant in demonstrating the intent of the Highland Charge and how it was conducted. After firing their muskets, the Highlanders appear to have gathered into clusters of 12 to 14 men to complete the charge. They may have adopted a wedge-shaped formation, so that when the point of the formation breeched the enemy line, the wedge would widen the gap. The effect, as Pittock (2009: 97) describes it, “was to create multiple flanking of the enemy’s line, which was then destroyed as it tried to flee”. De Johnstone (1821: 114-115) wrote of the effect: “Their attack is so terrible, that the best troops in Europe would with difficulty sustain the first shock of it; and if the swords of the Highlanders once come in contact with them, their defeat is inevitable”. The Chevalier may have had memories of Prestonpans in mind when he wrote the passage.

KOCOA Analysis

The KOCOA analysis was conducted using a digital geo-referenced copy of Roy’s Military Survey of Scotland (1747-1755) from the National Library of Scotland (NLS). Roy’s original survey took place just a couple of years following the battle. Roy did not intend to record every detail of the landscape (Roy 1785: 386-387), but it was his intention to record features of military significance (Fleet and MacCannell 2014: 61). Drawn so close in time to the

battle, Roy undoubtedly identified and located terrain elements useful to the KOCOA analysis. The geo-referenced map includes 3-dimensional modelling of the battlefield terrain making this map an accurate terrain reconstruction. The primary sources used for the KOCOA analysis are listed in Table 3.1. A modern map of the battlefield printed at 1:20,000 scale from the Ordnance Survey 1:50,000 Color Roster was obtained from Edina Digimap (https://digimap.edina.ac.uk) and consulted during the KOCOA analysis.

Objectives

Cope's orders to put an end to the nascent rebellion by killing or capturing its leaders and dispersing their army were preemptory and had not been superseded by the time of the Battle of Prestonpans (Tweeddale to Cope, 15 August 1745; Tweeddale to Cope, 22 August 1745; Jarvis 1971a: 12). Cope's objective, then, was to defeat the Jacobites in battle. The Jacobites' overall strategic objective was the restoration of the Stuart monarchy, but they needed to eliminate Cope's Army as one of the operational objectives to achieve that end. Defeating Cope in battle would have had an immediate propaganda and recruitment benefit (Home 1802: 128-129; Roberts 2002: 102-105; Duffy 2007: 206; Johnston 2017: xiii). Cope's defeat would have also secured control of much of Scotland for the Jacobites by removing the only British Regular Army from the country. With Scotland secured, the road south into England would have been open, the defeat of Cope's army would

have removed opposition to the Jacobite advance and protected their lines of communication.

The Battlefield

Several sources describe the battlefield at Prestonpans (O'Sullivan 1747: 77; Cope 1749: 37; Murray 1898: 207; Carlyle 1910: 137-138; Howes 2002: 33-34; see Table 3.1 and 3.2 for critical assessment). The best contemporary description is that of Cope himself:

> "The Field is about a Mile in Length, and three Quarters of a Mile in Breadth. It is bounded on the East by *Seaton*, on the West by *Preston*, on the North by the Sea, *Cockenny* lying on the Shore about the Middle of it, and on the South-side towards *Tranent*. It is guarded on the West-end by the Park Walls of *Preston*, and from thence Eastward to *Seaton* by a Morass, with a deep Ditch between the Plain and it, through which there run two very narrow Cart-ways. On the South of these Park-Walls of *Preston*, there is a Defile leading by Colonel *Gardiner's* House; from whence there is a Road leading to the Village of *Preston*, and on the North of them, there is another Defile leading to the same Village, by Mr. *Erskine of Grange's* House, and to an open Field lying North and West of it, bounded on the North by the Village of *Prestonpans*, lying on the Sea-shore.
>
> In this Field there is no Ditch except that of the Morass, nor a Bush, Hollow-way, nor Marsh. There is not in the whole of the Ground between *Edinburgh* and *Dunbar*, a better Spot for both Horse and Foot to act upon."

Cope's description of the battlefield resembles closely Roy's Military Survey of Scotland maps (Figure 3.7 and Figure 3.8). The park walls of Preston House (Figure 3.7 No. 1) and Bankton House (Gardiner's House) (Figure 3.7 No. 2) formed a defile, or chokepoint, through which ran the Road to Edinburgh (Figure 3.8 No. 5) to become the Road From Seton to Preston (Figure 3.8 No. 6). Most of the movement to and from the engagement site

took place along this avenue of approach. Cope's inclusion of "two very narrow Cart-ways" is rather interesting as this author believes that he is referring to the Waggonway (Figure 3.8 No. 1) and Coal Road (Figure 3.8 No. 3). Neither feature is spoken of in participant accounts of the battle, but it would seem that their inclusion in Cope's description of the field meant that he was aware of their existence. With regards to the Waggonway, the implication is that if participants knew the Waggonway was present on the field, but did not describe the engagement as occurring there, than it is rather likely that the engagement took place somewhere else. This will be discussed further below.

Table 3.3 KOCOA Analysis – Battle of Prestonpans September 20-21, 1745

Terrain Feature	KOCOA Classification	Reason for Classification	Sources
Birsley Brae (Figure 3.2, 3.6, 3.7, 3.8)	Key Terrain	94 m (310 ft) above sea level ridge occupied by Tranent. Area where Jacobites first appeared was open field west of Tranent at 79 m (260 ft) elevation. East side of Tranent also open field. Good observation point.	O' Sullivan 1747: 77; Robins 1749: 38; Home 1802: 109; De Johnstone 1821: 32; Murray 1834: 36; Allardyce 1895: 280; Murray 1898: 200; Crichton 1907: 33; Carlyle 1910 138; Howes 2002: 33
	Observation and Field of Fire	Position occupied by Jacobites offered excellent observation over entire battlefield below Birsley Brae. Field of fire out to maximum effective range of Brown Bess at 100 m (109 y) to 300 m (328 y). Maximum range was 1100 m (1203 y) at 60° angle. Jacobites did not have artillery at this battle.	

Jacobite Night Camp, Fields East of Tranent	Cover and Concealment	The Jacobite camp for the night of Sept. 20-21 behind a ridge of 94 m (310 ft) elevation in fields east of Tranent. Ridge offered some cover from direct artillery fire, but not the plunging fire of mortars. Completely concealed from British observation behind the ridge.	Home 1802: 114; De Johnstone 1821: 33; Murray 1834: 38; Allardyce 1895: 280; Murray 1898: 201; Elcho 1907: 268; Carlyle 1910: 140
Darkness and Mist	Concealment	The Jacobite movement to contact began after midnight on Sept. 21. Darkness and mist concealed this movement from visual observation. British outposts did hear march early on. Jacobites not seen until pre-dawn light exposed them 200 yards from Cope.	O' Sullivan 1747: 79; Robins 1749: 40; Home 1802: 116, 118; Murray 1834: 38; Allardyce 1895: 280; Murray 1898: 202; Elcho 1907: 269, 271; Summer 1950: 144; Howes 2002: 34
Preston House (Walls) (Figure 3.7)	Obstacle	Existing- Turning height and thickness in 1745 unknown. McNeil (1902: 221-223) says it was a parapet wall enclosing 4 or 5 acres of gardens. Younger (2012: 27) says 3 m (10 ft) high, but unclear where he got that information. De Johnstone says 6 or 7 feet. These walls funneled into two defiles on north and south of Preston House. Cope may have blown holes in walls to deny their use as fortifications.	Robins 1749: 37-38; Home 1802: 110; De Johnstone 1821: 32; Murray 1898: 203; McNeill 1902: 221-223; Elcho 1907: 266; Allardyce 1895: 279; Carlyle 1910: 138; Howes 2002: 33; Younger 2012: 27
Bankton House (Walls) (Figure 3.2, 3.7)	Obstacle	Existing- Turning. Home of Colonel James Gardiner, 13th Dragoons, at time of battle in 1745. Like Preston House above, height and thickness of walls at time of battle are unknown. De Johnstone estimates 6 or 7 feet. They formed the southside of the defile Cope's army attempted to retreat through. Train tracks now occupy the location of the defile and may have obliterated remains of walls.	O' Sullivan 1747: 77; Robins 1749: 37; De Johnstone 1821: 32; Allardyce 1895: 279, 282; Elcho 1907: 266; Carlyle 1910: 138;

Tranent Village (Figure 3.7)	Obstacle	Existing- Disrupting. Built environment of Tranent possessed several defensive attributes. Provide cover and concealment, as well as several choke points. Attacking army would have to resort to urban operations. Cope avoided for these reasons.	Robins 1749: 37-38; Home 1802: 109; Murray 1834: 37-38; Allardyce 1895: 279; Murray 1898: 201; Elcho 1907: 267; Carlyle 1910: 136, 138-139; Howes 2002: 33
Tranent Church Churchyard (Figure 3.2, 3.7)	Obstacle	Existing- Disrupting. Church present in 1745 likely built c. 15th century and replaced in 1800. The churchyard acted as an outpost for Jacobites during portion of 20th September 1745. Present walls reach 5 ft in height in spots- cover from muskets, but Cope's artillery drove Jacobites out. Intended to warn of English approach via the Heuch. Observation may have been better than today. Jacobites did not occupy for long.	Murray 1834: 37; Allardyce 1895: 280; Murray 1898: 200; Crichton 1907: 33-34; Elcho 1907: 267; Carlyle 1910: 139
Morass/Deep Bog/Ouyly Stabb (Roy)/Meadows and Ditch (Figure 3.2, 3.7)	Obstacle	Large area of marsh at base of ridge below Tranent. Included a 2 m deep and 2 m wide stream. This stream continued east past the Meadows Mill for 1.8 km (1.1 m) to the vicinity of Riggonhead Farm where it turned north to flow through Seton and into the Firth of Forth. This stream was crossed by bridge at several points and could have been avoided altogether by moving through Preston or Prestonpans. Jacobites found a place to cross. A ditch ran along north classified as a bank of Morass. Existing (natural)- turning obstacle.	O' Sullivan 1747: 77; Robins 1749: 37-39; Home 1802: 110, 113; De Johnstone 1821: 32; Murray 1834: 37; Murray 1898: 200; Elcho 1907: 267; Carlyle 1910: 143; Howes 2002: 33; Younger 2012: 27

1722 Waggonway (Figure 3.2, 3.7, 3.8)	Obstacle	Scotland's first railway built in 1722 by York Buildings Company. It was used to haul coal in wagons from Tranent to the harbor at Cockenzie. It extended 4 km (2 ½ m) beginning near the Heuch and running through the plain. Was made with wooden rails. Excavation in 2019 revealed that railway ran alongside an existing cart road on a slightly elevated bed. A ditch estimated at a meter wide and a meter deep ran along east side. Classified as existing and disrupting obstacle. Dragoons and artillery would have had difficulty crossing it. Existing – Turning/ Disruptive.	
	Avenue of Approach	The causeway that carried the Waggonway through the Morass acted as an avenue of approach into Cope's position on September 20th. Cope positioned his artillery straddling the Waggonway so that they could enfilade this approach. O' Sullivan called it the Coak Road.	O' Sullivan 1747: 77; Home 1802: 114; Murray 1834: 41; Carlyle 1910: 139, 143
The Heuch/ Heugh (Figure 3.2, 3.8)	Avenue of Approach	A natural valley or cut running north-south adjacent to Tranent church on the west. It ran from the top of Tranent ridge south to the Morass. The 1722 Waggonway passed through it. The Heuch acted as an approach for both armies. Jacobites tried to place an outpost in Tranent churchyard to warn of English movement through the Heuch. Cope placed his artillery at the Waggonway.	O' Sullivan 1747: 77; McNeill 1884: 242-243
The Coal Road (Figure 3.8)	Avenue of Approach	Some maps of the Battlefield show the presence of the Coal Road used to transport coal to the harbors at Cockenzie and Port Seton. The Coal Road was approximately 278 m (304 y) east of the Waggonway. The Coal Road provided another crossing of the Morass. It was more likely that Cope would have used this road to aid in deploying his army rather than the Waggonway if he was planning to use his dragoons defensively.	

Riggonhead Defile (Figure 3.3, 3.8)	Avenue of Approach	A possible faulted outlier of the index limestone group resulting in a dry ridge breaking up water flow. A locally known narrow point in Marsh/Morass crossed by farm bridge near Riggonhead Farm. Provided approach across Morass for Jacobites during early morning hours Sept. 21st. March was detected, but Cope thought the Jacobites were heading for crossing at Seton.	Home 1802: 116; Elcho 1907: 269-270; Younger 2012: 31-32
Road from Edinburgh (Figure 3.8)	Avenue of Approach	Main road from Edinburgh to London divides just west of Preston. Main road passed through Tranent. A branch passed through defile between Preston House and Bankton House to become road from Seton to Preston. Jacobites marched along this road before Murray moved the vanguard to Birsley Brae.	O' Sullivan 1747: 78
Road from Seton to Preston (Figure 3.8)	Avenue of Approach	This road ran along the Morass and connected Seton with Preston. Route was similar to present rail line. Cope may have intended to use this road to march toward Edinburgh instead of marching through Tranent. He may have used it to help deploy army.	Robins 1749: 37; Home 1802: 107; De Johnstone 1821: 32; Allardyce 1895: 280; Carlyle 1910: 139
Road from Seton to Cockenzie (Figure 3.8)	Avenue of Approach	In predawn darkness on Sept. 21st. De Johnstone estimates 22-foot-wide in defile. Road running from Seton northwest across plain to Cockenzie. Crossed both Coal Road and Waggonway. Provided access to roads along coast through Prestonpans. Cope may have intended to use this road to march to Edinburgh, especially if he continued his contact with naval ships.	
Johnnie Cope's Road (Present Name) (Figure 3.2, 3.8)	Avenue of Withdrawal	Road leading south from Preston west of Bankton House. Led up over Birsley Brae and away from battlefield. Cope and remaining dragoons retreated along this road at the end of the battle. They reached Berwick-Upon-Tweed the next day.	

Table 3.3. KOCOA Analysis of the Battle of Prestonpans

Figure 3.6. Observation looking northeast from Key Terrain of Birsley Brae. Bankton House is on the left. Fields west of the 1722 Waggonway where Cope positioned his army on September 20, 1745 is in the center. Actual engagement site to the east. Morass was where the A1 is passing Bankton House (Photo by ©Craig J. Brown)

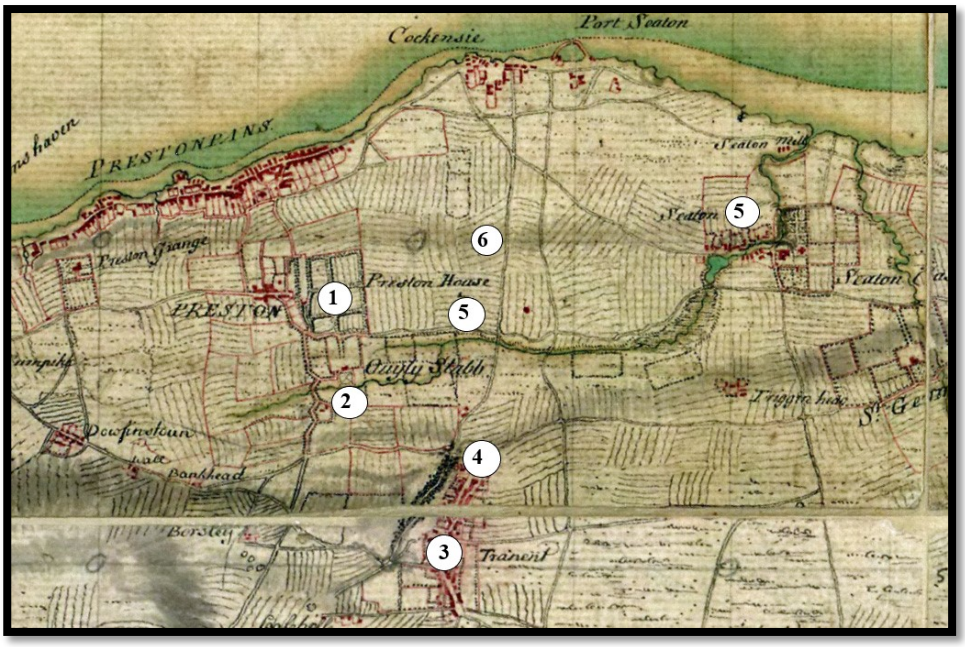


Figure 3.7. Obstacles. 1. Preston House (Walls); 2. Bankton House (Walls); 3. Tranent Village; 4. Tranent Churchyard; 5. Morass; 6. 1722 Waggonway (Drawn by ©Craig J. Brown).

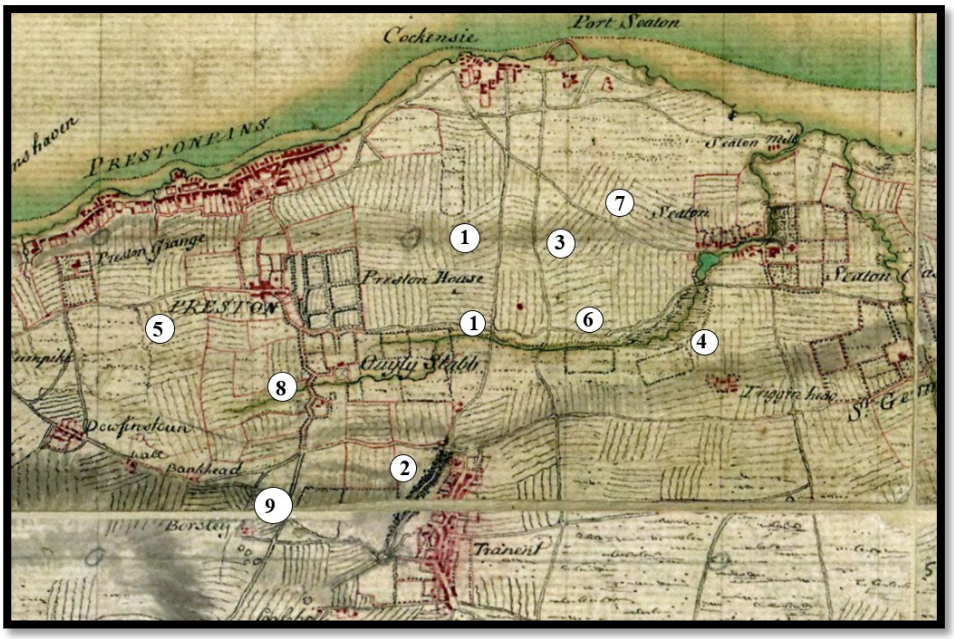


Figure 3.8. Avenues of Approach. 1. 1722 Waggonway; 2. The Huech/ Huegh; 3. The Coal Road; 4. Riggonhead Defile Crossing; 5. Road to Edinburgh; 6. Road Seton to Preston; 7. Road Seton to Cockenzie; 8. Johnnie Cope Road; 9. Birsley Brae, Post Road (Drawn by Craig J. Brown).

Ground-Truthing

Site visits to the Prestonpans Battlefield were conducted on several occasions from March 2016 through September 2019. Two further visits to the site scheduled for April 2020 and September 2020 were cancelled due to the Covid-19 pandemic quarantine lockdown. The purpose of the site visits was to corelate the KOCOA derived terrain features with their locations in the modern landscape and assess their influence on the conduct of the battle. The KOCOA derived locations were documented and assessed for preservation or archaeological potential according to the methodology outlined in Chapter 2. Although KOCOA was not used, much of this correlation was already performed by GUARD (Pollard and Ferguson 2010), during their investigations in 2009, and by the Battle of Prestonpans [1745]

Heritage Charitable Trust, as a preliminary to their placement of interpretive signage and exhibits at battlefield locations. Historic Environment Scotland's (HES) battlefield inventory record, Battle of Prestonpans (BTL16) (2012), delineates battlefield boundaries and locations that corelate well with the KOCOA analysis. In September 2019, the 1722 Waggonway Project undertook the first in a series of excavations on the 1722 Waggonway. I took part in these excavations as a volunteer: new information regarding the construction of the 1722 Waggonway came to light and has influenced this case study.

The Battle of Prestonpans was fought in an industrialized landscape. The industrial development has continued during the 275 year since the battle. This industrial activity has wrought wholescale changes in the landscape of the battlefield. Although the actual site of the engagement that took place in the predawn light of September 21, 1745 remains relatively intact, the majority of the KOCOA derived features from the remainder of the two day battle have been obliterated or else a mere vestige remains. Ground-Truthing for the majority of the KOCOA derived features is summarized in Table 3.4 below. The 1772 Waggonway is discussed following Table 3.4.

KOCOA Ground - Truthing Battle of Prestonpans September 20-21, 1745		
Terrain Feature	**O.S. Map Coordinates**	**Comments**
Birsley Brae (Figure 3.2)	339104, 672928	Ridge west of Tranent, open high ground grass and scrub. Place where Jacobites were first seen by Cope's Army. Murray with Jacobite vanguard seized to prevent Cope from occupying high ground. Jacobites detachments (Athol Brigade) back and forth throughout 20 September 1745. Some skirmishing below ridge with Cope's men at Bankton House. Today the Jet Petrol Station on the A199 marks the approximate spot where Jacobite flag was first planted. Low archaeological potential relative to battle.
Jacobite Night Camp, Fields East of Tranent	341426, 673470 (Estimated)	Jacobite camp east of Tranent village near Tranent mains. Behind crest of same ridge as Birsley Brae and Tranent likely marched along High Street on Post Road (A199). Open field. Wheat had just been cut. Sheaves still in field. Still open field. Scheduled field visit April 2020 cancelled due to Covid-19 lockdown.
Preston House (Walls)	339406, 673900	Excavations conducted by GUARD (Pollard and Ferguson 2010: 14-22) revealed that the house was removed by the end of the 18th Century. Current Preston Road runs through where much of the house stood. The garden walls were not located. Many of the casualties suffered by Cope's Army occurred along the East Wall. Any battle remains in this area were likely obliterated.
Bankton House (Walls) (Figure 3.2)	339417, 673833	Walls no longer exist but may have corresponded to current fence line and retaining walls. Defile that carried road to Edinburgh and road from Seton to Preston obliterated by East Coast Railway. GUARD conducted a metal detector survey along west fence line in 2009. Spill over from railroad construction and nearby coal colliery contaminated site (Pollard and Ferguson 2010: 23). GUARD did not survey area north of house. Skirmishing evening of 20 September occurred in these areas.

Tranent Village	340478, 672881	The village played no real role in battle. Jacobites marched along High Street to reach night camp to the east.
Tranent Church Churchyard (Figure 3.2, 3.9)	340294, 673402	Church and churchyard were a Jacobite outpost guarding the approach across the 1722 Waggonway and up the Heuch. Position was bombarded on 20 September. Present church constructed in 1800. Unknown if present churchyard covers same footprint as it did in 1745. GUARD conducted a metal detector survey in a field north of the church to search for evidence of bombardment, but no battle related finds were recovered (Pollard and Ferguson 2010: 23).
Morass/Deep Bog/Oyly Stabb (Roy)/Meadows and Ditch (Figure 3.2)	340283, 674043 (1722 Waggonway Causeway)	The Morass and Ditch below Tranent that were such formidable obstacles on 20 September have been drained and filled. Today the East Coast Rail Line and B1361-A198 roughly occupy the route of the Morass and Ditch. The only things remaining are some ponds and the Meadowmill placename.
1722 Waggonway (Figure 3.2, 3.10, 3.11)	340298, 674586	See Below
The Heuch/ Heugh (Figure 3.2)	340238, 673308	The valley of the Heuch served as an avenue of approach between the armies on 20-21 September. The valley remains as a walking path. The Waggonway and “Sparkling Burnie” (McNeill 1884: 242) are gone. Low potential for remains related to Tranent Church Bombardment.
The Coal Road	340436, 674530	The Coal Road that cut across the field connecting the east side of Tranent with Cockenzie did not follow the track indicated by Roy. Blakeney shows Coal Road intersecting Waggonway. This intersection appears on O.S. 1853 6-inch Haddingtonshire map sheet 9 at 340276, 674752 (EPSG: 27700). Either it joins the Waggonway here or crosses to the west to run parallel. There appears to be a lane on the map. Road Jacobites marched to

		Prestonpans on roughly corresponds to A199-B1361.
Riggonhead Defile (Figure 3.2)	341204, 674660	The Riggonhead Defile with its crossing of the marsh was mapped by John Adair (c. 1685-1687) (Figure 3.11). I had actually located this crossing using Home (1802: 116), who wrote that the crossing was 200 paces west of the stone bridge built over Seaton Mill-Dam many years after the rebellion. I used a geo-referenced copy of 1853 6-inch O.S. map of Haddingtonshire and measured 500 ft (152.5 m; 1 pace=2.5 feet) upstream from Seton Bridge. That spot corresponds to Adair. Obliterated by East Coast Railway.
Road from Edinburgh	337675, 673177	Road Jacobites marched to Prestonpans on roughly corresponds to A199-B1361
Road from Seton to Preston	340406, 674260	This road ran from Seton along north side of Ditch and Morass west to Preston and through Defile of Preston House and Bankton House to connect to road to Edinburgh (Post Road). Roughly corresponds to the B1361 and A198.
Road from Seton to Cockenzie		This road apparently never existed. It is not clear why Roy drew this road on his survey. He may have mistaken a road to Port Seton. There is no evidence of a road connecting Seton to Cockenzie that cut across the field.
Johnnie Cope's Road (Present Name) (Figure 3.2)	339305, 673687	Road west of Bankton House connecting Preston with Post Road west of Tranent. Cope and remaining Dragoons retreated from battlefield via this road. They made their way to Lauder, then to Coldstream and on to Berwick

Table 3.4. Ground-Truthing the KOCOA Analysis

Figure 3.9. Tranent Church and Churchyard. Site of Jacobite outpost that acted as a disrupting obstacle for enemy soldiers moving through The Huech/ Huegh on September 20, 1745. The Churchyard was bombarded by Cope to force withdrawal of Jacobite outpost. This church is not the same as the one that was here in 1745 (Photo by ©Craig J. Brown).

The 1722 Waggonway requires more extensive treatment than could be accorded to it in Table 3.4. The Waggonway was constructed in 1722 by The York Buildings Company at a cost of 3500 pounds. Its purpose was to transport coal from the mine at Tranent to the harbors of Cockenzie and Port Seton. The Waggonway ran for 2 ½ miles and was constructed of oak tracks set upon timber sleepers. The land between Tranent and Cockenzie tended to be waterlogged. The wooden rails and sleepers were less apt to sink than iron and stone (Donaldson and Bethune n.d.: 2-3). The 1722 Waggonway did not run directly to Port Seton as depicted in the Blakeney Map (1745). Subsequent maps such as that used by Home (1802: 110-111) (Figure 3.3)

duplicated Blakeney's mistake. The 1722 Waggonway, in fact, ran from Tranent, north through the Heuch and straight to Cockenzie (Figure 3.8 No. 1) (Donaldson and Bethune n.d.: 2-3).[20]

In September 2019, the 1722 Waggonway Project conducted the first in a series of excavations, whose aim is to assess the level of preservation of 1722 Waggonway and subsequent railways that replaced it.[21] The spot the project chose was an area about midway along the undisturbed portion of the Waggonway that is bracketed by the B1361 and B6371. This is an area where several maps place the Battle of Prestonpans. I joined the excavation in order to assess the Waggonway as a KOCOA obstacle relative to the battle. The results of the 2019 excavation clearly demonstrated why Cope, if he were intending to use his horse and foot offensively, would not deploy his army with the Waggonway in his front.

The 2019 excavations revealed that the 1722 Waggonway remains *in situ* approximately one meter below present ground surface (Figure 3.10). The oak rails have rotted away, but their shadows were observed in the north and south profiles. The stone packing between the rails remains intact. Adjacent to the Waggonway on the west was a cart-path. It makes sense in that the Waggonway would have been built along an existing route connecting Tranent and Cockenzie Harbor. The width of the Waggonway and

[20] The route was approximately: 1. Tranent (340289, 672973); 2. The Heuch (340234, 673378); 3. Across the Morass (344115, 675440); 4. Straight to Cockenzie Harbor (344305, 676575); 5. Then to Port Seton (340499, 675923). Coordinates in parentheses are estimated British National Grid EPSG: 27700.

[21] There was at least one other railway constructed in 1815 that followed the original course of the 1722 Waggonway over a majority of its route, but took an alternate path near the coast

associated cart-path corresponds to the parallel stone walls delineating the pathway today. It appears that the rails were either set on the 1722 ground surface or were slightly recessed. Outside the present stone wall, to the east, the excavation uncovered a drainage ditch dug into the same 1722 ground surface. This ditch measured a meter deep and over a half meter wide at the bottom (Figure 3.11). The excavation trench did not actually reach the eastern edge of this ditch, but it did reveal some evidence of an upcast bank in the form of erosional deposition back into the ditch. While no finds related to the battle were recovered during the excavation, the combination of the newly discovered ditch and associated upcast bank with the 1722 Waggonway made these a more substantial obstacle than has been appreciated. It is rather unlikely that Cope would have deployed his army west of the Waggonway fronting east if he expected to have to charge the Jacobites with his horse and foot in the pre-dawn twilight (Table 3.3). If Cope desired to operate of the defensive, then he would have remained in

Figure 3.10. The 1722 Waggonway from 2019 Excavation. Position of wooden rails is denoted by the red lines. The gravel was packing between the rails. The packing was a walking surface for horses bring wagon back to Tranent (Photo by ©1722 Waggonway Heritage Group).

Figure 3.11. Drainage ditch bordering 1722 Waggonway on the east. Ditch over a meter wide at the top and approximately a meter deep. The possibility of an upcast bank to the east (right of photo) is indicated by some erosional deposition in the eastern corner of test trench (Photo by ©1722 Waggonway Heritage Group).

the area of the Waggonway and would have not rushed his army east to Seton West Mains Farm. Cope needed solid, flat open ground on which to

maneuver his army, and activities began when it was still dark: the recent discovery of the engagement site at Seton West Mains Farm is logical. The absence of battle related finds from the Waggonway excavation is also rather significant as it indicates the position was not involved in the engagement. Clearly, Cope marched his army from the position it had occupied during the night, west of the Waggonway fronting south, to the site where the engagement took place.

The Battle of Prestonpans, September 20-21, 1745

At the beginning of the battle, the Jacobite position on the key terrain at Birsley Brae provided them with a good observation point overlooking the fields outside of Prestonpans. Cope occupied a strong position, about ½ mile distant, just to the east of Preston House and fronting to the west-southwest in anticipation of the Jacobites approaching from that direction (Figure 3.12). Murray described seeing them, "drawn-up in the plain betwixt Preston Grange and Tranent; but there was meadows,[22] and deep broad ditches, betwixt us and them (Murray 1834: 37)." Murray's seizure of Birlsey Brae had the fortuitous effect of turning Cope out of his advantageous position, but it created a problem. In order for the Highlanders to be able to utilize their preferred tactics, they needed an unobstructed approach to Cope's Army. For the moment, the Jacobites established their line of battle on Birsley Brae. Their right flank rested near the Heuch, the "very hollow road wch the call the

[22] By "meadows" Murray means the morass.

Coak [sic] road" referred to by O' Sullivan (1747: 77). Their left extended to the west.

The arrival of the Jacobite Army on Birsley Brae at 2 PM had not gone unnoticed by men in Cope's Army. As the Jacobites established their line of battle there, Cope ordered his army to change front facing them to the south (Figure 3.13). The artillery was posted on the left flank with the line of infantry extending to the west. The whole line advanced approximately 100 paces (250 feet, 76 meters) to within 200 yards (183 meters) of the ditch and morass (Figure 3.21) (Cope 1749: 38; Anon. 1895: 280; Howes 2002: 33). Cope expressed his frustration with the Jacobite position, "because they could not be attacked in it; it is so much broken by hollow Roads, Coal-Pits and Inclosures, that Horse cannot act there (Cope 1749: 38)."

The Jacobites on Birsley Brae observed Cope's Army change position to front their own. Jacobite accounts are somewhat contradictory about what followed next later that same afternoon. Lord Elcho claims that after having Tranent reconnoitered, Prince Charles ordered a detachment of 300 men to take possession of Tranent Churchyard near the base of the Heuch and overlooking Cope's left flank (Elcho 1907: 267) (Figure 3.14). John Murray of Broughton confirms that Prince Charles gave the order and seems to suggest that Jacobite officers were contemplating an attack across the morass at the time (Murray 1898: 200). Lord George Murray claimed that the order, in fact,

came from O'Sullivan for 50 men from Lochiel's regiment to take possession of the churchyard[23] for what reason he could not understand (Murray 1834: 37). Murray further states that at this time he ordered Colonel Ker to reconnoiter the meadows (morass). Ker carried out his orders while under fire and reported that "it was impossible for men to pass those ditches in a line (Murray 1834: 37)."

Whether or not the Jacobites were contemplating an attack across the morass, it was prudent to place a small detachment of men in the Tranent Churchyard. The Church occupied a portion of the eastern ridge bordering the base of the Heuch near to where the 1722 Waggonway and associated cart-path crossed the morass on a causeway. The causeway and Heuch formed an avenue of approach to the Jacobite right flank, and conversely, to the left flank of Cope's British Regulars. The Churchyard could have acted as a picket post, a sort of obstacle that could have disrupted infiltration of the Jacobite right flank by Cope's army and warn of their approach. Cope must have decided that the Jacobite position at the Churchyard was a threat to his left. Cope ordered two of his 1½ pound gallopers forward to bombard the Churchyard, wounding a few of Lochiel's men (Figure 3.14) (Cope 1749: 38, Murray 1834: 37; Elcho 1907: 267). Convinced by Ker's report that neither side would be willing to attack across the morass, Murray saw no point in

[23] A 50 man detachment sent to the churchyard as forward observation post or picket line for the Waggonway was a prudent disposition to have made. A 300 man detachment, in effect a regiment, moving on Cope's flank would likely have drawn more of a response than what actually happened.

further exposing Lochiel's men at the Churchyard and recalled them (Murray 1834: 37; Elcho 1907: 267).

At approximately 4 PM, Prince Charles, concerned that Cope might attempt to march to Edinburgh during the night, ordered the Atholl Brigade under Lord Nairne, to take up a position near the west side of Preston to block the road to Edinburgh (Figure 3.15) (O' Sullivan 1747: 78; Murray 1898: 201; Elcho 1907: 268; Carlyle 1910: 139). Alexander Carlyle, who had been detailed to occupy the church steeple in Prestonpans in order to observe Jacobite movements, stated that Nairne took up position in the Thorny Loan between Preston and Dolphingston, a movement that he dutifully reported to Cope (Carlyle 1910: 139). Cope had already seen the Atholl Brigade march off Birsley Brae and expecting an attack through the defile between Preston House and Bankton House, he ordered his army to return to its first position (Cope 1749: 38; Home 1802:111). The Atholl Brigade was not long in Thorny Loan as a dispute among the Jacobite officers led to their being recalled to the main body on Birsley Brae (O' Sullivan 1747: 78). They would ultimately take up a position on Birsley Brae just above Bankton House, where they could protect the army's left flank and move to interdict Cope should he attempt to reach Edinburgh (Figure 3.16) (Margulies 2013: 131-132; Johnston 2017: 146-148). Upon seeing this Cope ordered his army to resume their previous position fronting to the south with the ditch and morass serving as an obstacle in his front (Home 1802: 111).

It was now approaching sunset, which would have been 6:40 PM – 6:45 PM in late September taking the Julian calendar into account, and Cope

set about securing his army for the night (Figure 3.16). Cope ordered pickets placed along the edge of the morass. Detachments of Hamilton's 14th Dragoons were sent as out-guards as far as Seton. Detachments of Gardiner's 13th Dragoons patrolled near Prestonpans. Two platoons of infantry were posted in the defile between Preston House and Bankton House. A detachment of 100 dragoons was posted in the defile that came to be called Johnnie Cope's Road. Large fires were kindled along the front and the baggage was sent under guard to Cockenzie (Cope 1749: 39: Home 1802:113; Anon. 1895: 280). The artillery was placed near the 1722 Waggonway and guarded by a company of Lee's Regiment (Home 1802: 114). The battery likely straddled the Waggonway fronting to the south as it was intended to sweep the causeway and protect the avenue of approach across the morass.

During this time, Lord George Murray ordered his vanguard to march through Tranent and take up a position in the fields on the east for the night (O' Sullivan 1747: 78; Johnstone 1821: 33; Murray 1834: 38). The main body, except the Atholl Brigade, followed along shortly (Figure 3.16). There they made camp for the night with the men laying down in rank and file behind a little rise that offered some cover and concealment (Murray 1834: 38). At about 10 PM, the Atholl Brigade, still west of Tranent, engaged in a short sharp skirmish with a dragoon patrol, perhaps killing some of them (Figure 3.17) (Lascelles 1749: 64; Elcho 1907: 269). There was a brief moment of excitement at the Jacobite camp east of Tranent as well: Cope had ordered Lt. Col. Whiteford fire his mortars in its direction. The shells failed to

detonate; their fuses were likely damaged from long storage in Edinburgh Castle (Whiteford 1749: 48; Murray 1898:201).

Following an earlier council of war, Robert Anderson, a local man serving in the Jacobite army, approached Lord George Murray about using a little-known crossing of the morass located on Riggonhead Farm. Murray described what Anderson told him as “there was, indeed, a small defile at the east end of the ditches; but once that was past, there would be no stop, and though we should be long on our march, yet when the whole line was past the defile, they had nothing to do but face to the left, and in a moment the whole was formed, and then to attack (Murray 1834: 38-39).” The ditches referred to by Anderson were the continuation of same morass and ditch features at the base of Tranent in front of Cope’s army. At a council of war held at midnight the plan was agreed upon. Orders were sent to the Atholl Brigade to leave their post on the left at 2 AM and rejoin the army for the march (Murray 1834: 39; Johnstone 1821: 33-34; Elcho 1907: 269). Before 4 AM the Highlanders marched out on the approach to Riggonhead Farm (Figure 3.18) (Murray 1834: 39).

The Jacobites set out from their camp east of Tranent in one column composed of three lines. At the head of the column, the first line was comprised of the ring wing under the command of the Duke of Perth. Accompanying the Duke was Robert Anderson, who guided the Highlanders through the Riggonhead Defile. In order, the right wing was composed of the regiments of Clanranald, Glengarry and Keppoch. Following close behind was the second line under the command of Price Charles himself. With him

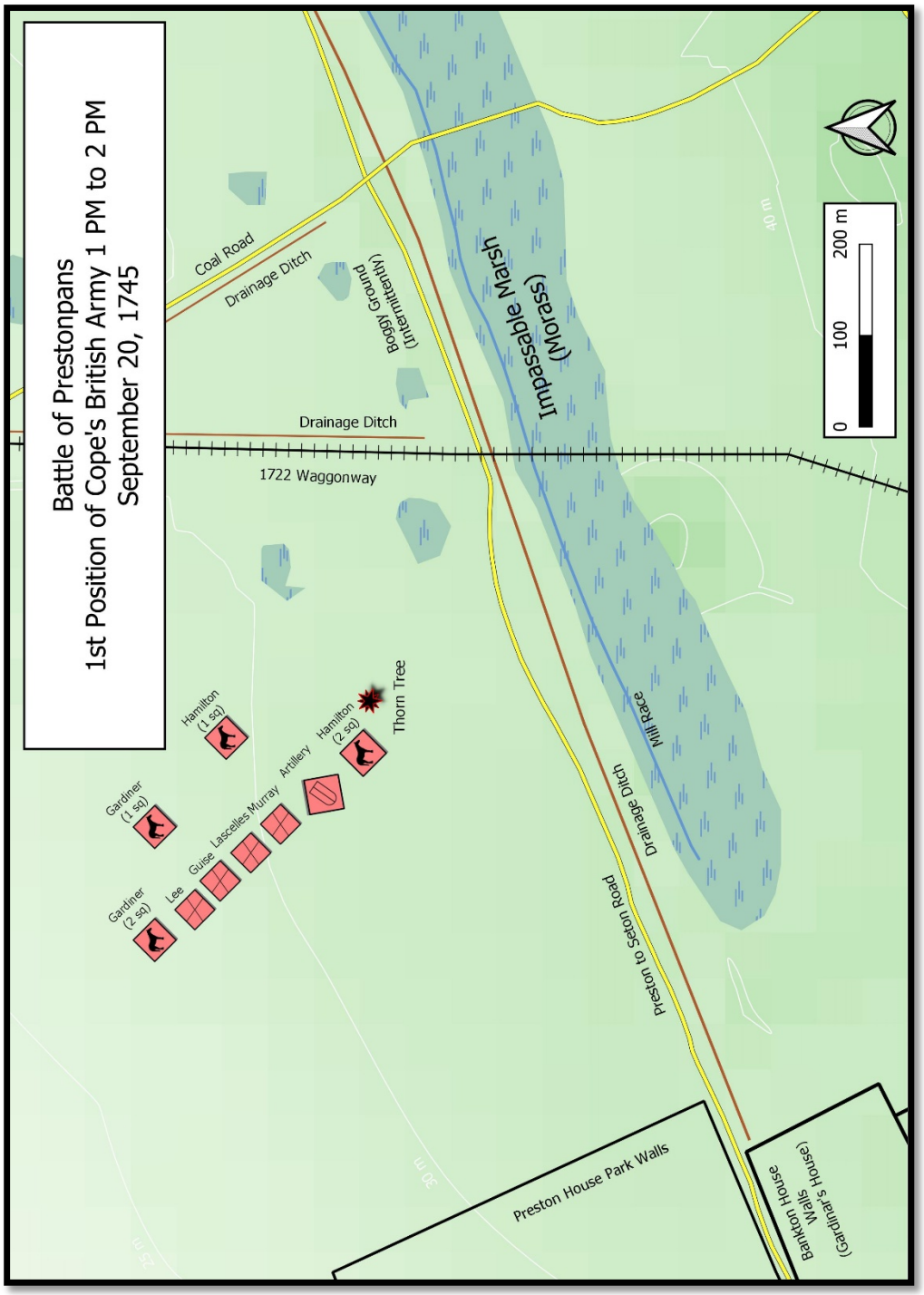


Figure 3.12. Cope's 1st Position c. 1 PM to 2 PM. Jacobites approaching along Edinburgh Road (Drawn by ©Craig J. Brown)

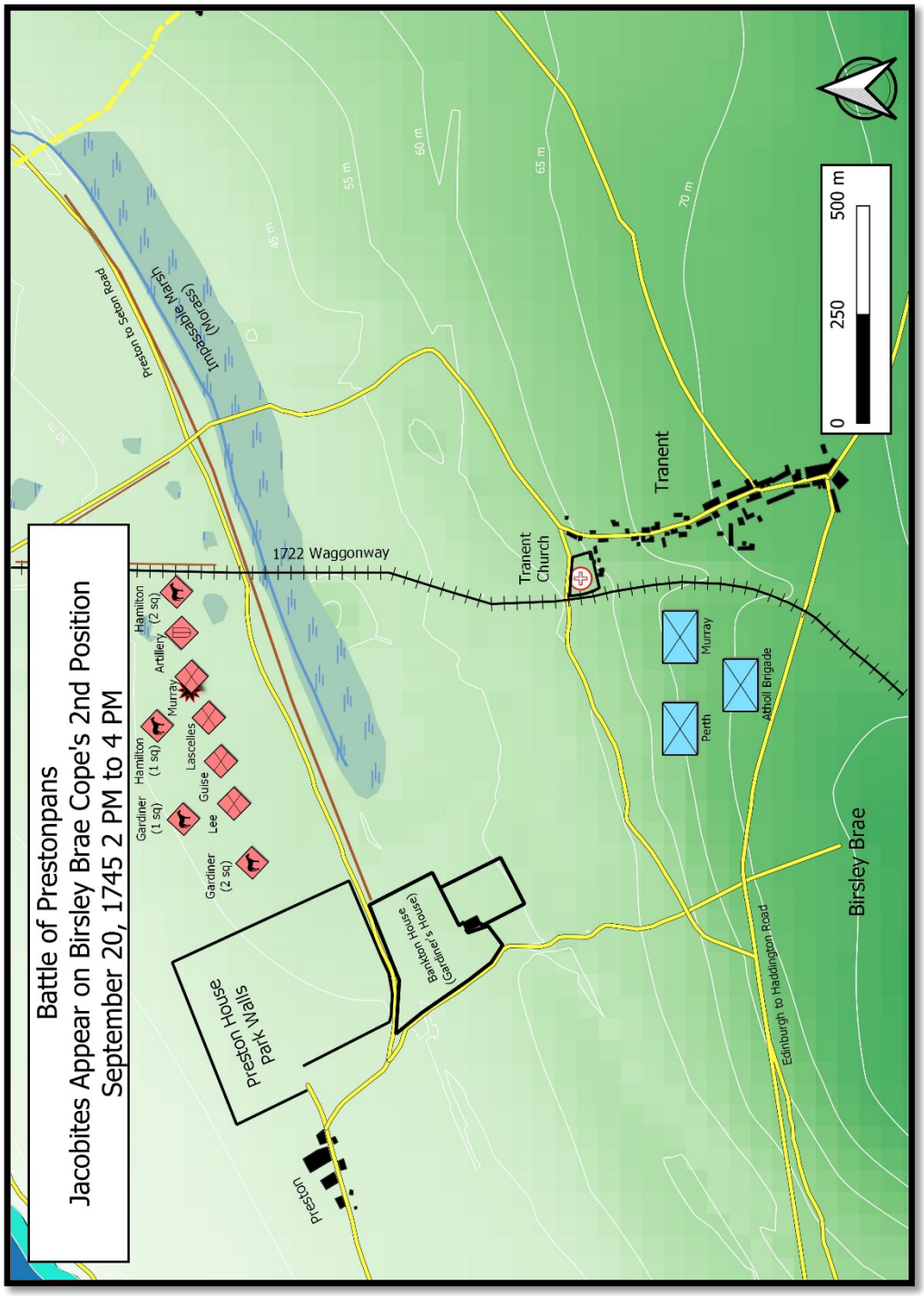


Figure 3.13. Jacobites appear on Birsley Brae c. 2 PM causing Cope to adopt his 2nd position fronting south (Drawn by ©Craig J. Brown)

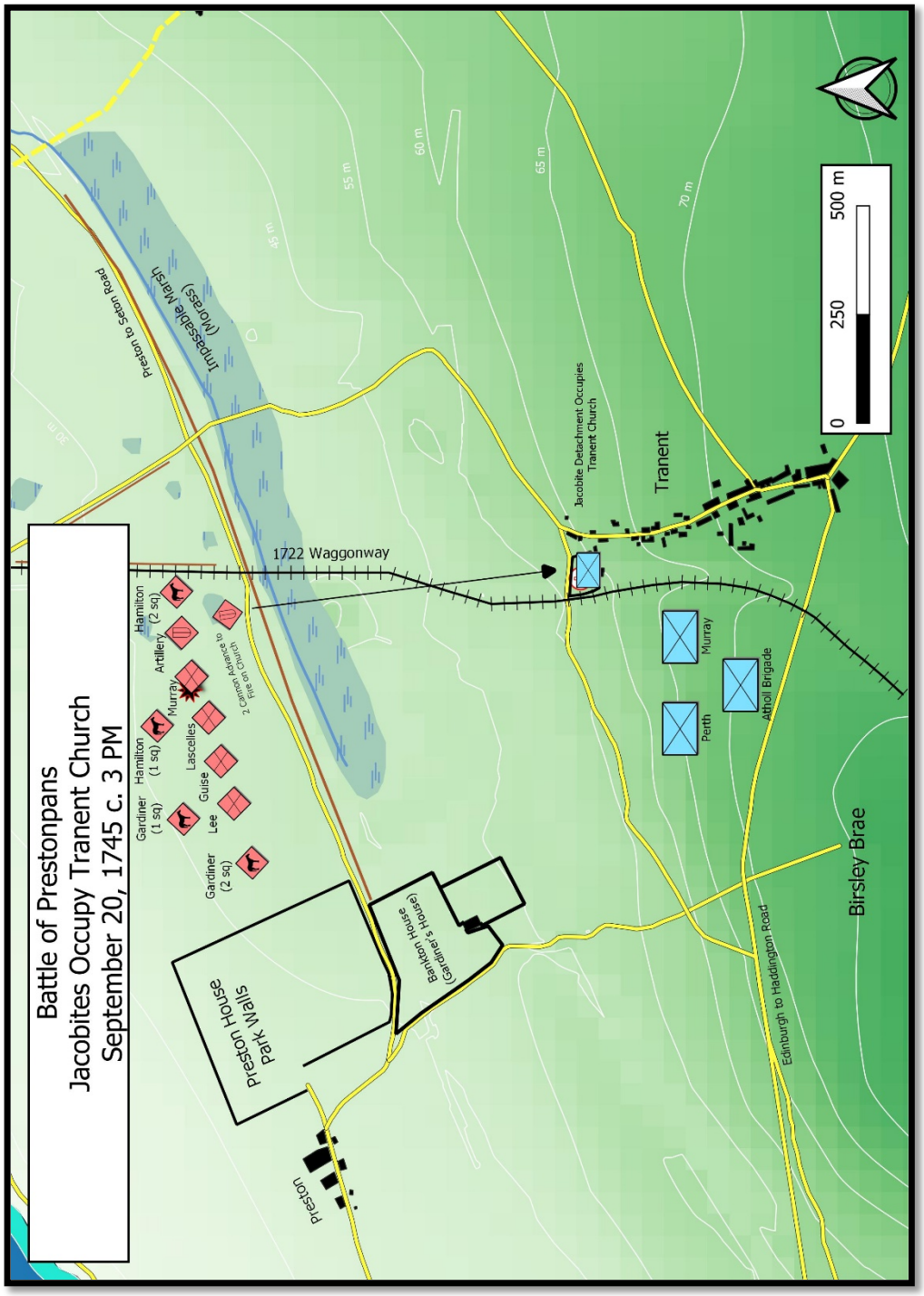


Figure 3.14. Jacobites occupy Tranent Churchyard causing Cope to advance 2 artillery pieces to shell their position c. 3 PM (Drawn by ©Craig J. Brown).

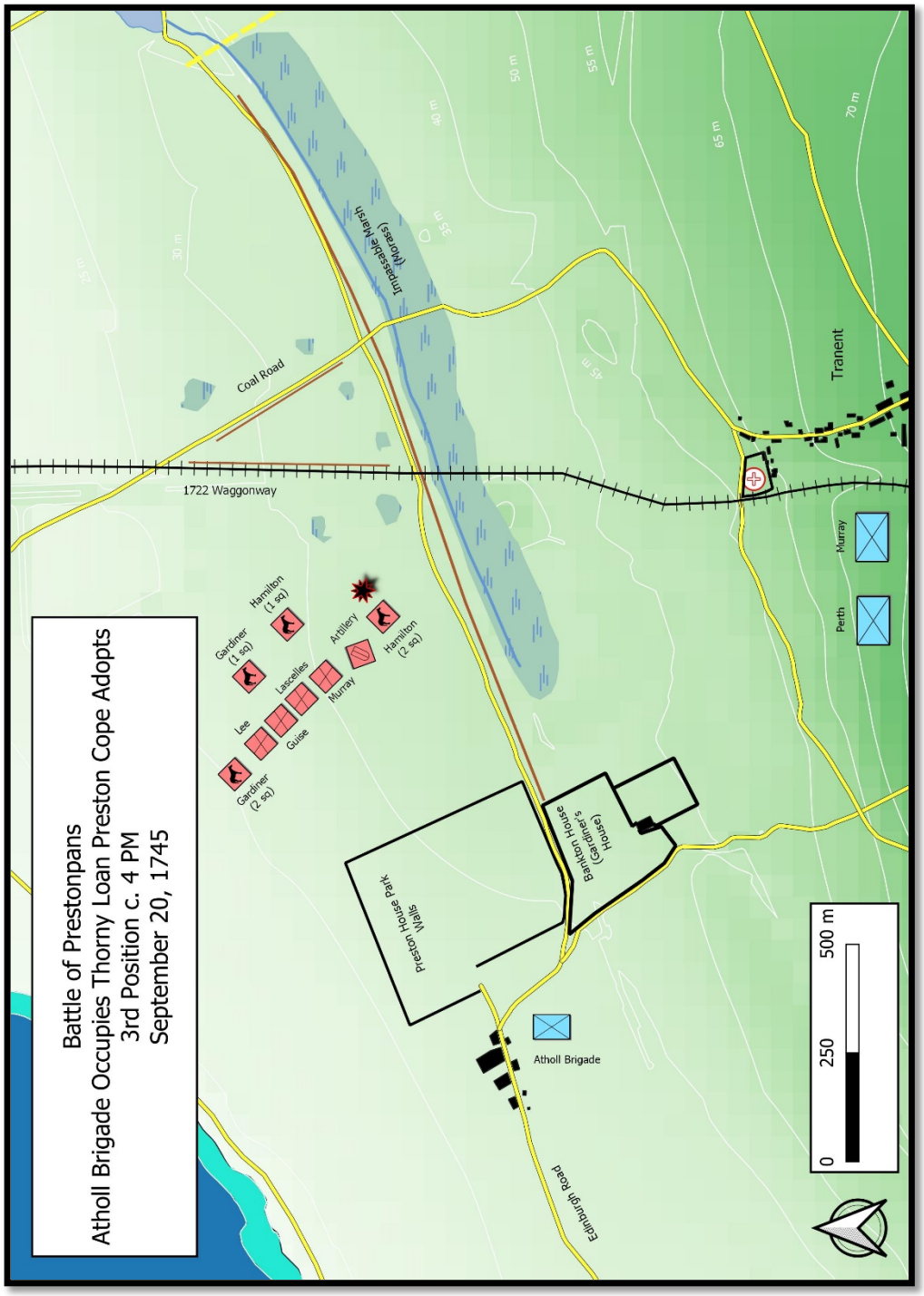


Figure 3.15. Following the action at Tranent Church Prince Charles dispatches the Atholl Brigade to block the Edinburgh Road (Drawn by ©Craig J. Brown).

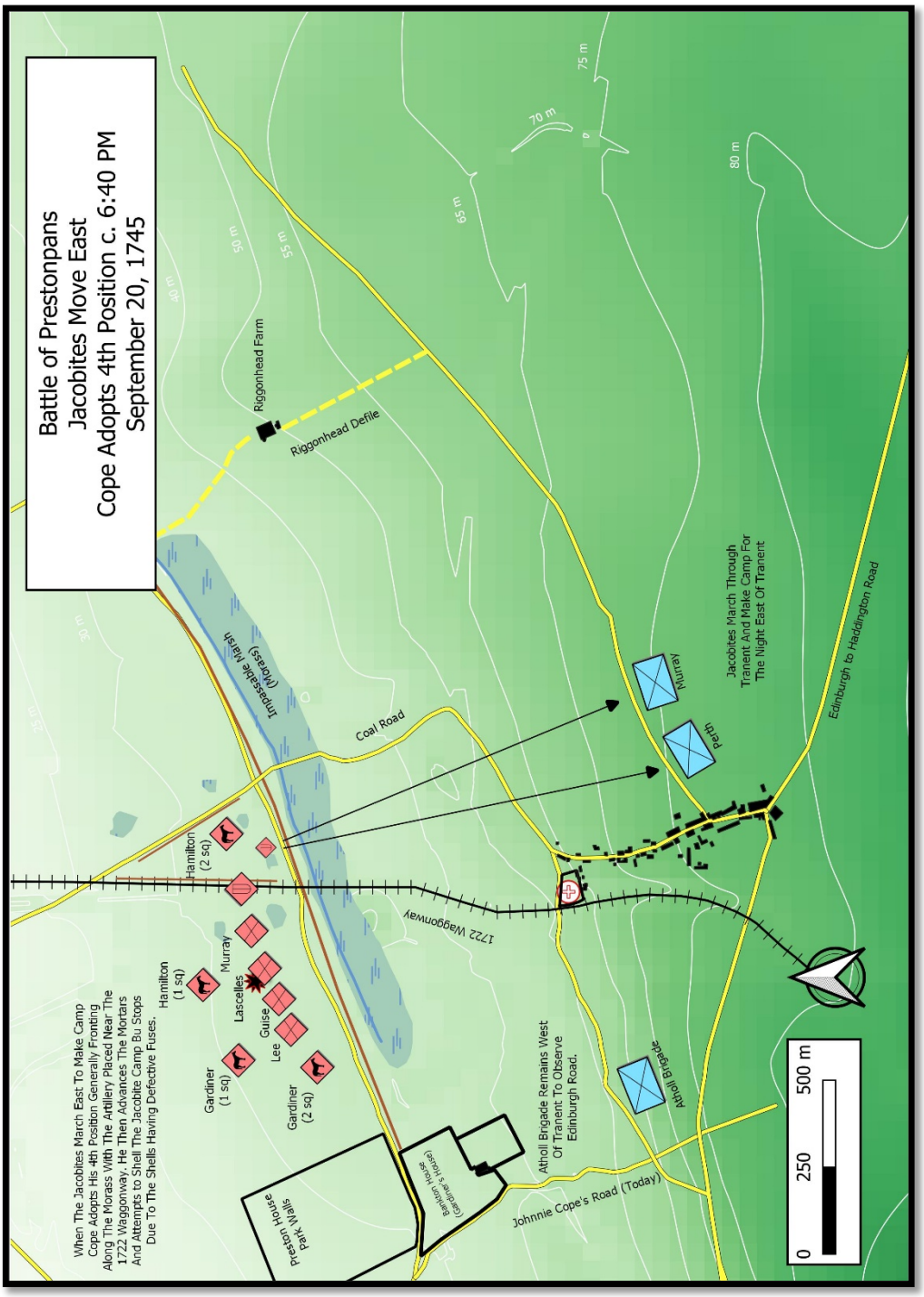


Figure 3.16. Atholl Brigade is recalled to Birsley Brae above Bankton House c. 6:40 PM as Jacobite main body marches through Tranent to camp east of town (Drawn by ©Craig J. Brown).

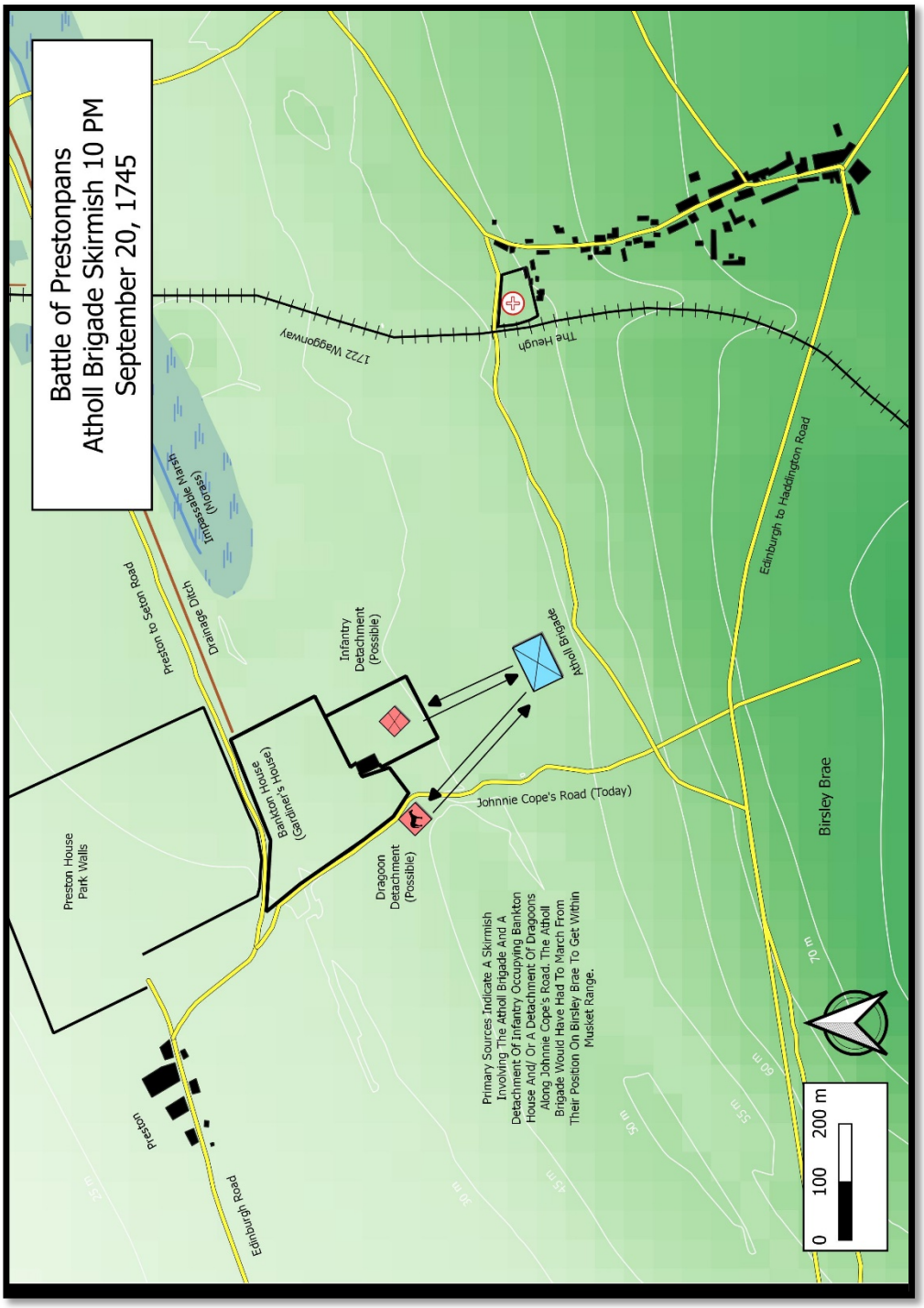


Figure 3.17. Atholl Brigade skirmishes with Cope's Infantry at Bankton House and/ or a dragoon detachment operation along what is today Johnnie Cope's Road (Drawn by ©Craig J. Brown).

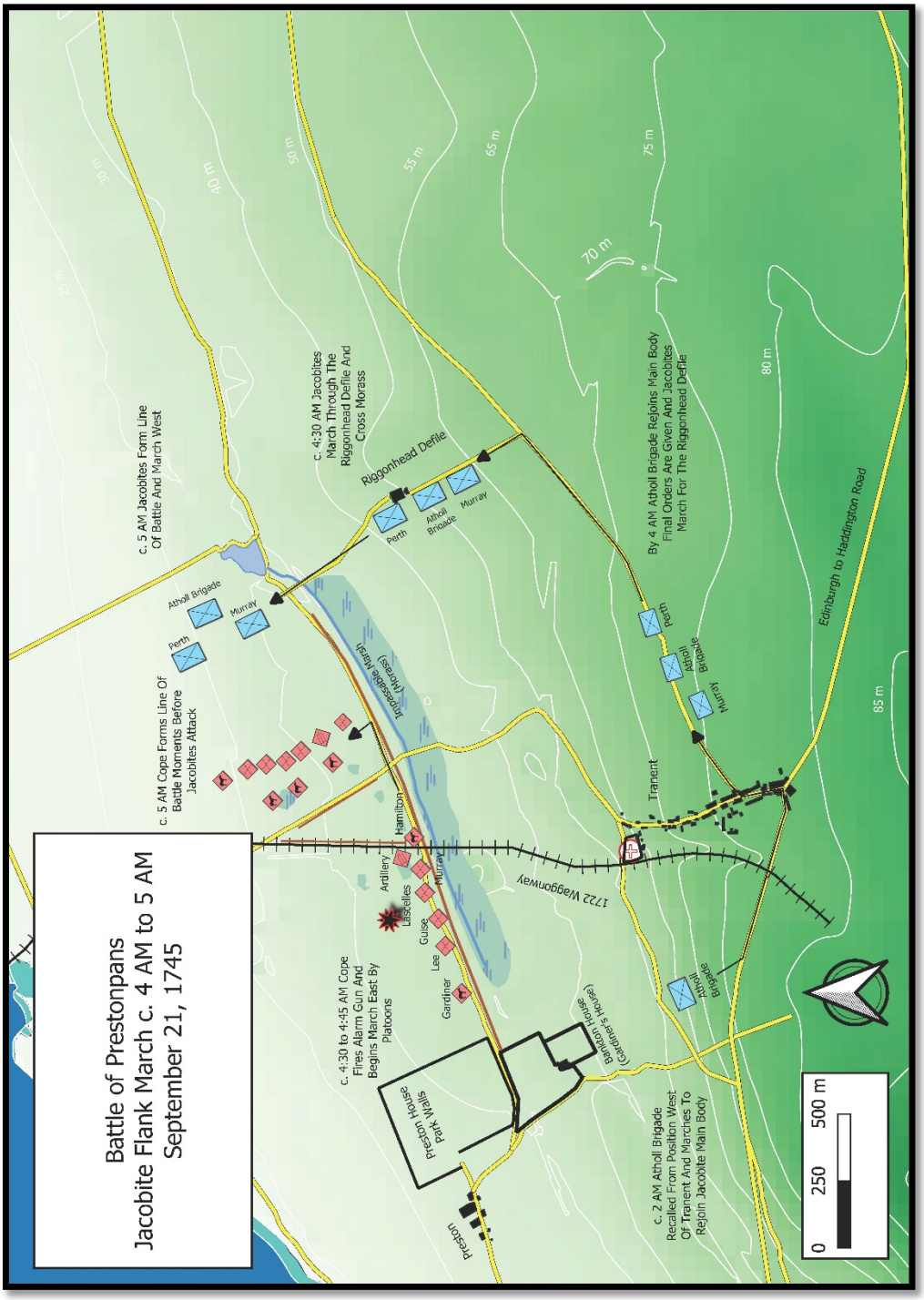


Figure 3.18. At c. 4 PM the Jacobites begin their flank march through the Riggonhead Defile to cross the Morass east of what is today Seton West Mains Farm causing Cope to redeploy east as well to avoid 1722 Waggonway and drainage ditch obstacles (Drawn by ©Craig J. Brown).

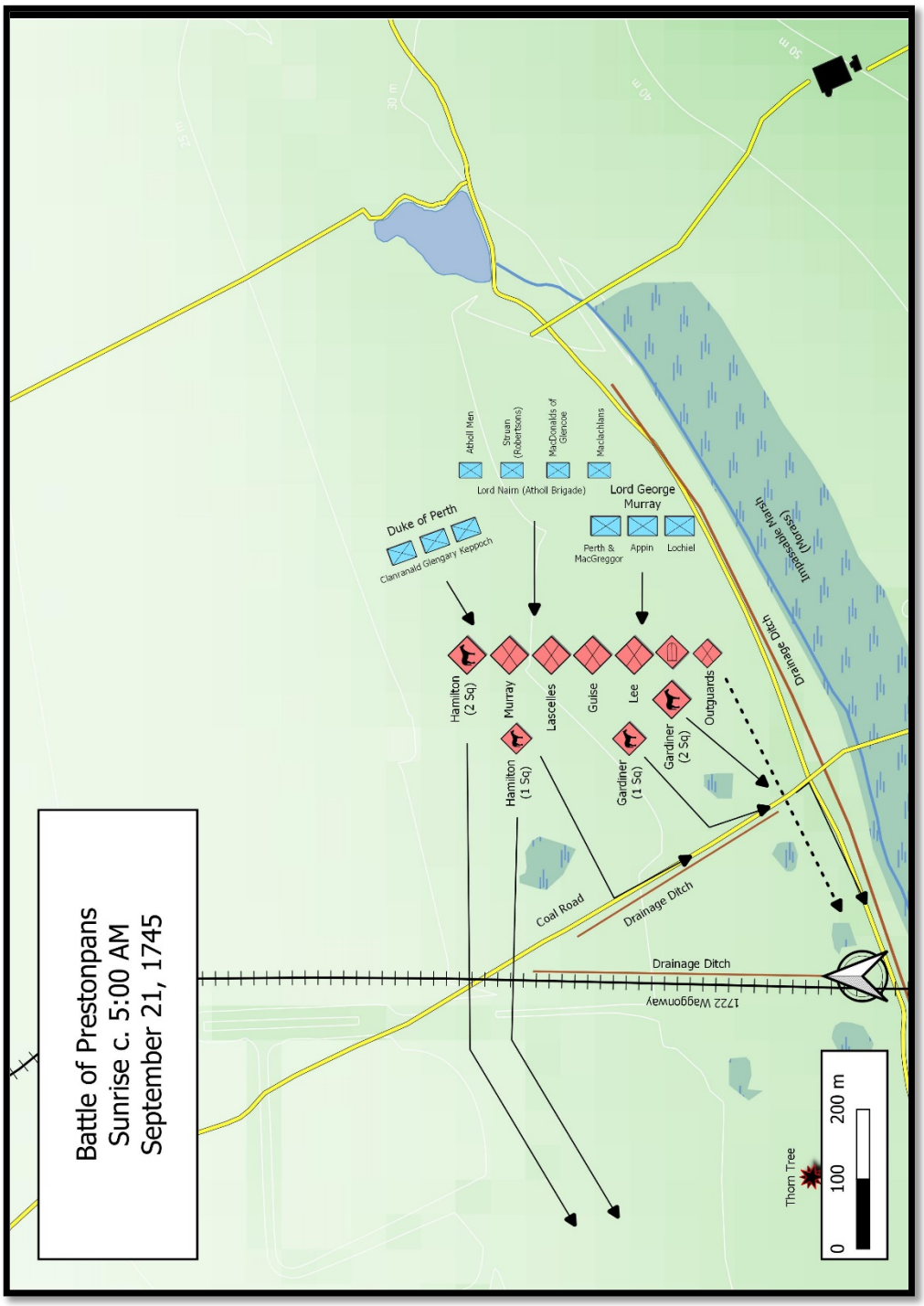


Figure 3.19. The Battle of Prestonpans c. 5 AM September 21, 1745. Jacobites emerge from mist 200 yards from Cope. The outguards retreat rapidly followed by Gardiner's Dragoons allowing Murray to overrun the artillery. At the same moment Perth makes contact with Hamilton's Dragoons who also retreat. The infantry holds out for a few minutes longer but also retreats. The battle is over in a few minutes (Drawn by ©Craig J. Brown)

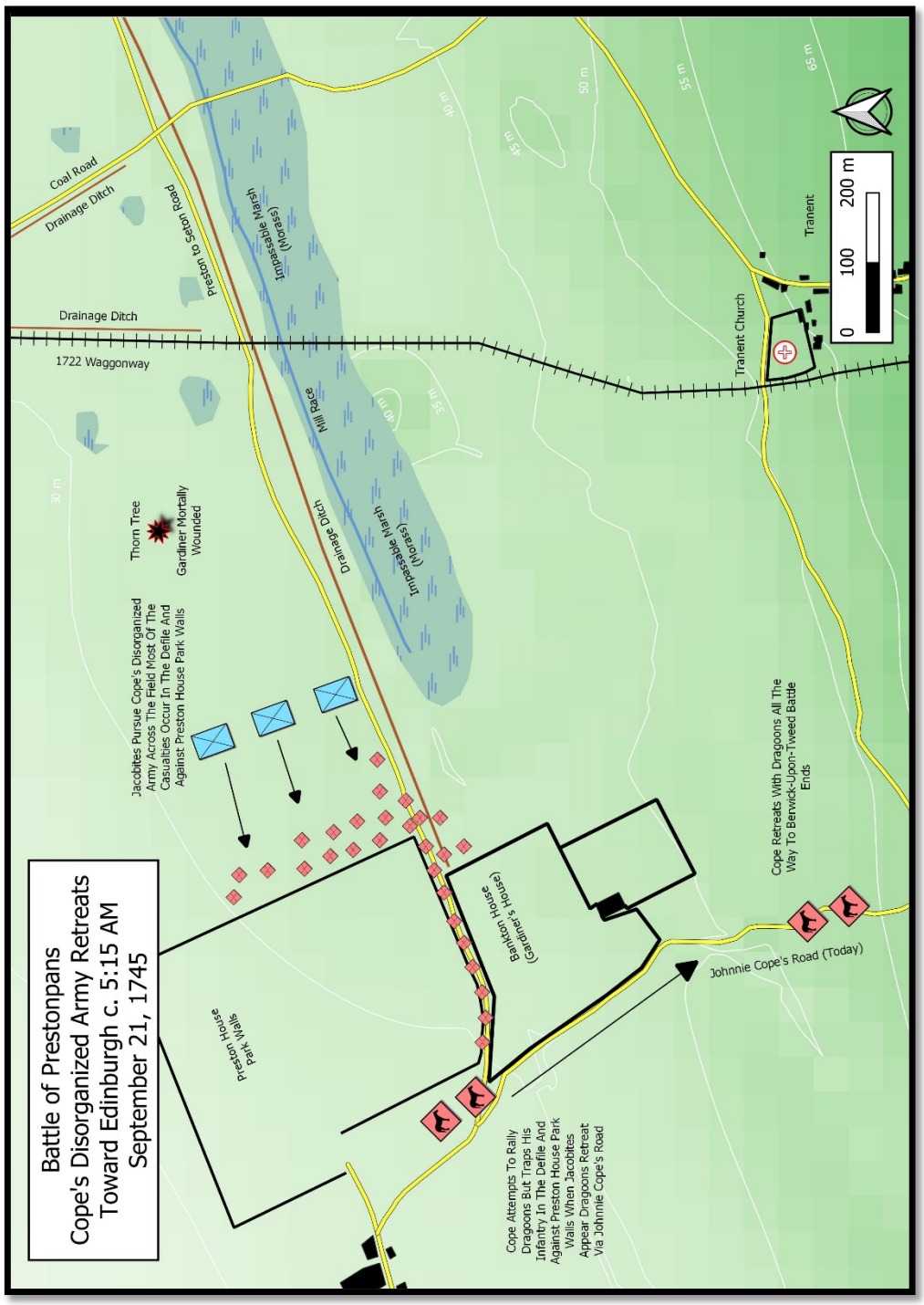


Figure 3.20. Cope's disorganized army retreats west over the 1722 Waggonway making for the Edinburgh Road. Cope attempts to rally the Dragoons near Preston trapping the infantry in the defile between the walls of Preston House and Bankton House. Most of the casualties occur there. Cope retreats with remaining dragoons away from the battlefield on the road that now bears his name (Drawn by ©Craig J. Brown).

were the Atholl Brigade under Lord Nairne and Lord George Murray's Regiment. The third line was comprised of the left wing under Lord George Murray with the Duke of Perth's Regiment, Appin and Lochiel (Murray 1898: 202; Elcho 1907: 269-270; Johnston 2017: 157, 213). Anderson led them down off the higher ground (key terrain) east of Tranent, likely using a farm lane to get to Riggonhead Farm. A little past the farm the track turned to the northwest to cross a narrow spot in the marsh over an old wooden bridge. This trackway was an old locally used crossing of the morass that was mapped by John Adair (1685-1687) (Figure 3.15, 3.23) in the late 17th Century. Once they had crossed this bridge, the Jacobites entered the fields west of Seton. O' Sullivan could not believe their good fortune writing "happily for us, found no opposition, so y^{t} we had time to form before the enemy appersaived [sic] us (O' Sullivan 1747: 80)." Lord Elcho (1907: 270) and Murray of Broughton (1898: 202) both expressed their belief that they had passed the defile unobserved.

The Jacobite flank march through the Riggonhead Defile did not go unobserved, however. Patrols, likely dragoons from Hamilton's Regiment, had discovered the Jacobite march almost as soon as it began. Officers on duty that night recalled that the Jacobite movement was discovered at 3 AM and reported to Cope (Anon. 1895: 281; Howes 2002: 34). Cope himself acknowledged that "About three in the Morning, the Patrols reported, that the Rebels were moving towards the East (Cope 1749: 40)."[24] Cope waited at

[24] There is a consistent 1 hour discrepancy between Jacobite and British times in relation to the Riggonhead Defile march. Jacobites times are given 1 hour in advance of British times. It is possible that the discovery of the march happens when the Atholl Brigade vacates Birsley Brae to rejoin the

least another hour before making a move to counter the approaching Jacobites. Reports of the Jacobite's eastward movement continued to come in until 4 AM, when it was reported that they were now moving northward (Cope 1749: 40; Anon. 1895: 281). "The General immediately order'd the Line to stand to their Arms," one officer wrote, "and wheel to the Left, The Dragoons by Squadrons and the Foot by Platoons, which they Performed very Quickly and with great order (Anon. 1895: 281)." Cope also ordered that one cannon be fired as an alarm gun to notify his outguards that it was time to return to their regiments (Figure 3.18).

What the officer above is describing is how Cope's army moved from line of battle into a marching column. The officer is not describing a left wheel of the whole army in line of battle. What is taking place here is a left wheel of each individual platoon, the formation described earlier in the chapter. The left of the platoon acts as a pivot point with the rest of the platoon swinging to the left by 90°, similar to a door. This results in a marching column of platoons lined up one behind another. They marched off one at a time. In this case, based upon the information related to the configuration of the Waggonway with its associated ditch feature as revealed by the by the 2019 excavation, this author believes that Cope marched his army east along the road between Seton and Preston, passing over the Waggonway to reach open ground so his dragoons could maneuver. Cope likely needed to use the road in order to redeploy his artillery and dragoons to the eastward, because

main body east of Tranent. Either way, the point is that Cope knew about the march as soon as it began and waited before redeploying his army.

neither could pass over the ditch feature.[25] Once they reached the area of Seton Mains West Farm, Cope left the road and had his army march north. He then would have his platoons execute a right wheel to form his battle line facing east (Figure 3.18, 3.19, 3.22).

Some of the Jacobite officers mention hearing Cope's alarm gun being fired (Johnstone 1821: 35). Lord Elcho wrote that, "as the Second line was passing, Sir John Cope fired an Alarm Gun and formed so as to front the Princes Army" (Elcho 1907: 270). It was still quite dark, and the field

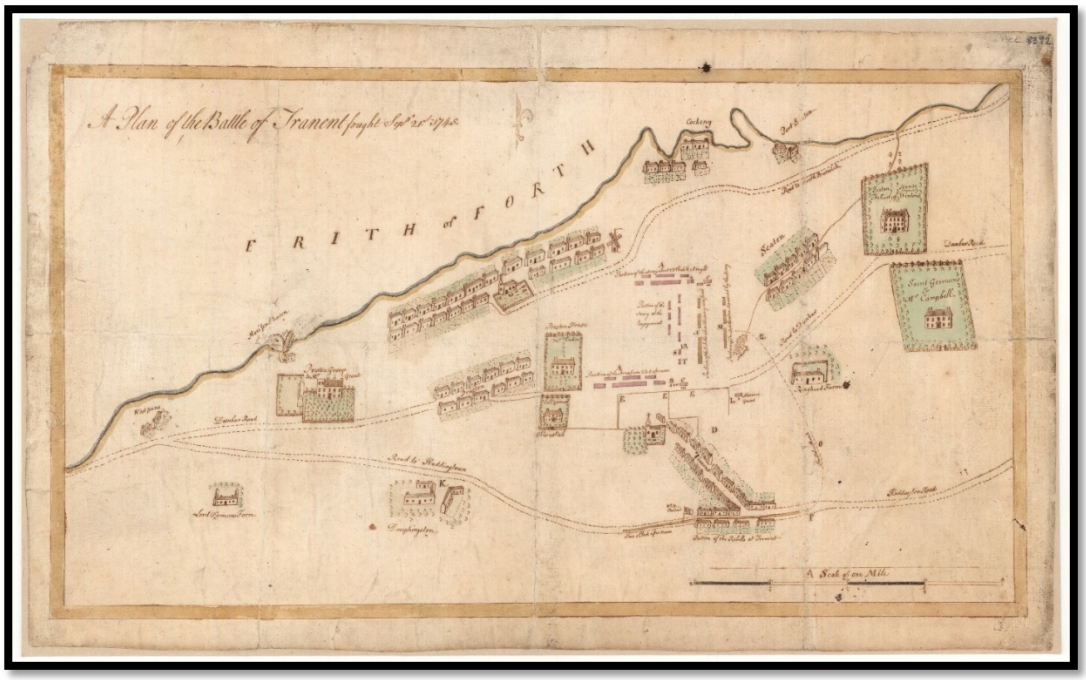


Figure 3.21. A Plan of the Battle of Tranent fought Sept. 21st 1745. A general summary depiction of the Battle of Prestonpans showing the positions of the two armies. Also depicted is the Jacobite flank march via the Riggonhead Defile. Interestingly, if the cartographer had drawn the 1722 Waggonway in its proper position, then the map would be correct in locating the engagement in the area of Seton West Mains Farm (Anon n.d.b.; ©National Library of Scotland Acc8392).

[25] In terms of KOCOA, the Waggonway and ditch are classified together as a turning obstacle, because Cope needed to use the road to pass over them. That need to use the road is considered 'turning'.

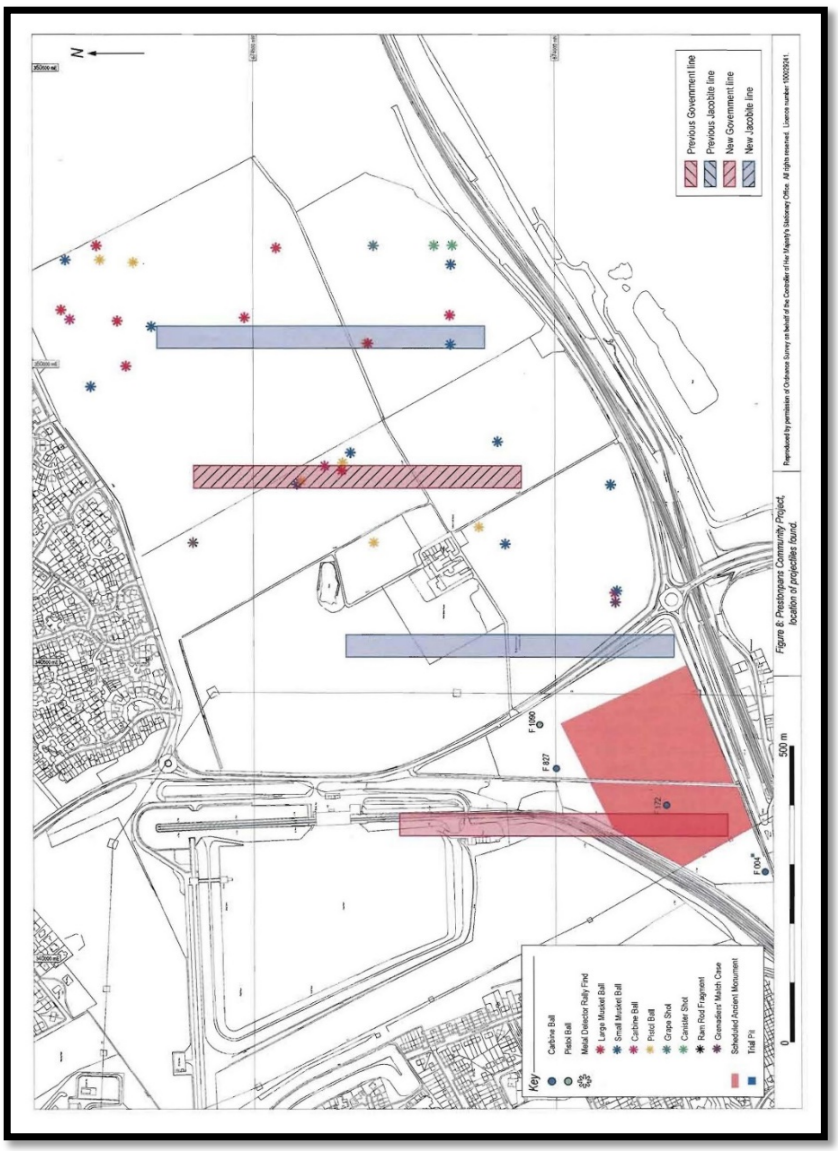


Figure 3.22. GUARD map of the distribution of munitions associated with the Battle of Prestonpans recovered by SARG and SDC. The density of finds and their patterning indicate the position of the armies. The cluster of shot at the top right (northeast) represents British firing upon Perth's Right Wing, which had outflanked their line on the left. Shown in relation to 'traditional' site at the Waggonway (From Pollard and Ferguson 2010: 27).

was blanketed in a heavy mist. Both armies had some difficulty in getting into position. Lord George Murray described that “after we had all passed the defile, I found (being in the rear, and to have the left) that the front had advanced too far, which proceeded from not being able to distinguish the line, as day was but just beginning to dawn” (Murray 1834: 39). After advancing 100 paces (250 feet, 76 meters) beyond the Riggonhead Crossing, Murray decided to form his line, believing that if he advanced further, he ran the risk of his line being flanked on the left. He sent word to Perth on the right wing and ordered his men to halt and face to the left (Murray 1834: 39). When formed, the Jacobite line of battle consisted of two lines. The front line consisted of, from left to right, the regiments of Lochiel, Appin, Perth (Murray’s Left Wing), Keppoch, Glengarry and Clanranald (Perth’s Right Wing). Following approximately 50 yards (46 meters) behind, came the second line with the reserve under Prince Charles consisting of Nairne’s Atholl Brigade and Murray’s Regiment (Margulies 2013: 140). As the Jacobites formed their line, I estimate[26] that they were approximately 600 yards (550 meters) from where Cope was deploying his men. In the inky pre-dawn twilight and cloaked by a heavy mist, it is unlikely that the two armies could clearly see each other. Murray immediately ordered his men forward, inclining to the left in order to rest their left flank on the morass (Murray 1834: 40).

[26] Accomplished by measuring the location of Cope’s line as established by Pollard and Ferguson (2010: 27) to a line running due north from the Riggonhead Defile Crossing (Figure 3.22) using a georeferenced OS 1: 25,000 color raster map from Edina Digimap. The process was repeated using Google Earth Pro. The relationships between the features can be seen in Figure 3.2.

Across the field to the west, Cope was establishing his line of battle a short distance east of Seton West Mains Farm (Figure 3.18, 3.19, 3.22). On his left, fronting east, Cope placed two squadrons of Hamilton's Dragoons. To their right, Cope placed Murray's and Lascelles' regiments. To their right came Lee's 5 companies with 2 from Guise's regiment. The outguards who had returned to the main body of the army, but not their units, formed a battalion on Guise's right. Next came the artillery "dress'd straight with the Line" (Cope 1749: 40). This meant the artillery field of fire fronted directly eastward and was not inclined, to sweep the entire battlefield to the northeast. The last unit in line was a 100-man artillery guard. Two squadrons of Gardiner's Regiment formed behind the artillery guard (Cope 1749: 38, 40; Elcho 1907: 272). Cope ordered two artillery pieces to be moved to the left but found that their civilian drivers had run off (Whiteford 1749: 49).

The rising sun began to burn off the mist revealing that the advancing Jacobites were by then at about 200 yards distance (Whitney 1950: 144-145; Drummore 1749: 37). Whiteford ran to fire the cannon, while Griffith fired the mortars (Whiteford 1749: 54; Griffith 1749: 54). The six naval gunners, the old man and the invalids from Edinburgh Castle who manned the guns ran off as soon as the firing began, taking the powder flasks with them (Whiteford 1749: 54; Griffith 1749: 54). The artillery action seems to have given the Highlanders pause. Murray had yet to close the space between his left and the morass, but his attempt to do so created a gap between his wing and Perth's. Noting this, the British Army reacted: Lt. Col. Whitney's squadron of Gardiner's Regiment was ordered into the gap to wheel right and charge.

Whitney was however immediately shot and his dragoons panicked and fled. (Whitney 1950: 144-145; Whiteford 1749: 49). The panic spread to the artillery guard, who promptly turned and ran (Whiteford 1749: 49). They likely made off in the general direction of the Edinburgh Road. Hamilton's Dragoons on Cope's left were outflanked by Perth's wing and quickly fled too (Drummore 1749: 37) following after Gardiner's men. The infantry stood for a few moments longer, while the Jacobites were assailing both their flanks. Prince Charles's second line had made up the ground and hit the center of Cope's line. The foot fled as well, retreating back toward the west and thus over the Waggonway (Figure 3.19, 3.20) (Lascelles 1749: 66; Cope 1749: 41).

In an attempt to stop the rout, Cope and the senior officers who still remained tried to get out in front of the fleeing troops. He managed to catch up with Lord Loudon and the Earl of Home who had managed to round up approximately 450 dragoons in a field west of the defile between Preston House and Bankton House (Cope 1749: 42; Home 1749: 55; Loudon 1749: 31; Margulies 2013: 152; Johnston 2017: 169-170). Rallying in this spot, however, created a logjam of dragoons in the defile with the walls of Preston House and Bankton House forming a chokepoint. The slower infantry were trapped outside the defile along the walls of Preston House, unable to retreat further. Most of the British dead were recovered near the walls (Figure 3.20).

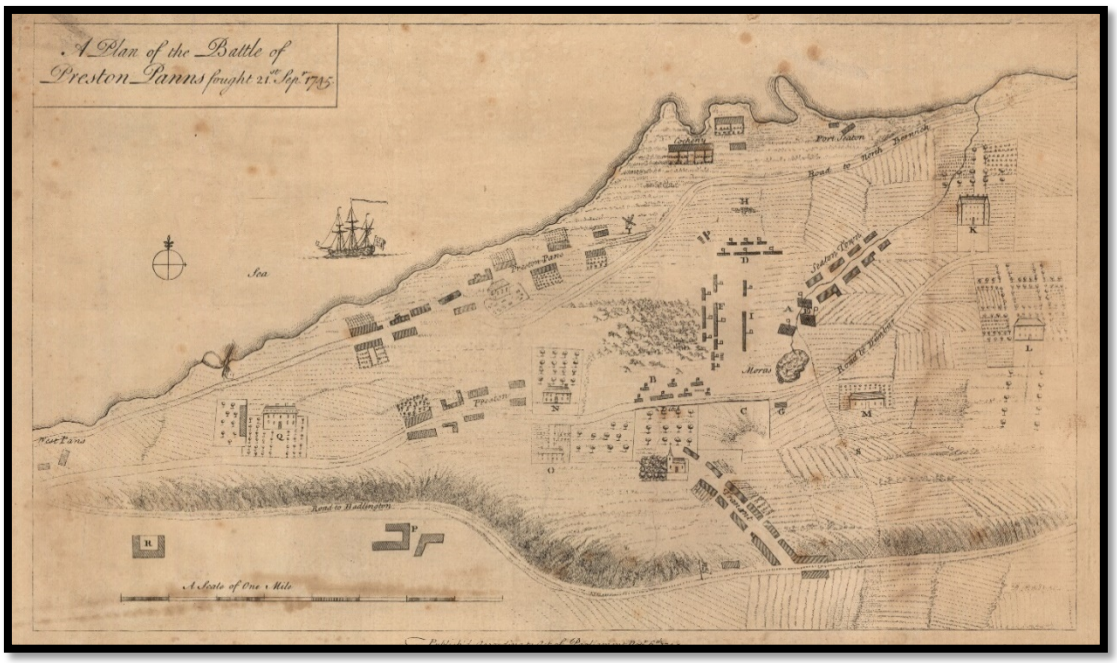


Figure 3.23. A Plan of the Battle of Preston Panns fought 21st Sept 1745 depicting engagement and subsequent flight of Cope's Army British dead were recovered near the walls. The walls that Cope had used to in his attempt to trap the Jacobites the previous day, now worked against his army (Anon n.d.c.; ©National Library of Scotland EMS.s.90a).

The walls that Cope had used to in his attempt to trap the Jacobites the previous day, now worked against his army. The dragoons fled once again, Cope with them, south along the road that now bears his name and away from the battlefield (Johnston 2017: 170).

Casualty figures for Cope's Army put forward by the eyewitness accounts vary. This author follows Margulies (2013: 15) in accepting Murray of Broughton's (1898: 205) estimate of the casualties as the most plausible based upon the numbers of troops engaged in the battle. Murray records of Cope's Army that 300 privates and 7 or 8 officers were killed, while 400 to 500 men were wounded, and the rest were taken prisoner. Only the 450 dragoons with Cope and perhaps a few others who could have that gotten

away along the coast managed to escape. The tallies of Jacobite casualties vary as well, but between 34 and 54 dead and 70 to 80 wounded seems to be the average figures put forward (Margulies 2013: 151).

Conclusion

The Battle of Prestonpans was selected as the initial case study because it represented a well-documented early modern battle using a form of linear tactics which required open ground. The mid-18th Century is a period where KOCOA is applied to engagements in the United States, and this serves as a bridge for importing its use into the United Kingdom. In the U.S., KOCOA is primarily used by the National Park Service to locate battlefield features within the modern landscape for heritage management purposes. In the case of Prestonpans, that objective, although not the primary aim of this research, was accomplished through the ground-truthing of the KOCOA derived features. KOCOA, however, can also be used to address academic questions. In the case of Prestonpans, there had been a long-standing dispute regarding the site of the actual engagement relative to the Waggonway. Many historians (Home 1802: 108-109; Tomasson and Buist 1978: 62; Duffy 2007: 17, n.d.: 12-13; Margulies 2013: 136) had identified the fields immediately west of the Waggonway as the engagement site, based primarily on Blakeney's Map (Blakeney to Pelham, 18 October 1745). The metal detector outing previously conducted by SARG and SDC found conclusive evidence for the positioning of the engagement site near Seton

West Mains Farm (Figure 3.22). The recovered munitions could not have been over-shots based upon the number and distribution relative to the duration of the conflict. There is no scope to dispute the physical evidence recovered from this location, but how did the two armies end up there?

In order to answer this question, the KOCOA analysis derived its list of defining terrain features from the accounts written by participants in and eyewitnesses to the Battle of Prestonpans (Table 3.3). These defining terrain features were located on historical maps (Table 3.2; Adair 1685-1687; Ordnance Survey 1850) and classified according to the KOCOA methodology detailed in Chapter 2. A georeferenced copy of the c. 1850 O.S. Map of Tranent in Haddingtonshire (Ordnance Survey 1850) is available from Edina Digimap. The map coordinates of the KOCOA terrain features were obtained from this map and transferred to a georeferenced OS 1: 25,000 color raster map of Prestonpans obtained from Edina Digimap and Google Earth Pro (Figure 3.2). There was not a one to one correlation between georeferenced historical and modern maps, however the margin of error was under ten meters in all cases. This process was performed to fix the KOCOA terrain features in the modern landscape. The coordinates derived from the c. 1850 O.S. Map of Tranent in Haddingtonshire (Ordnance Survey 1850) were also applied to a georeferenced copy of Roy' Military Survey obtained from the National Library of Scotland (Table 3.2, Figure 3.7, Figure 3.8). Roy's Military Survey of the Prestonpans area was completed within a few years of the battle and used as a terrain reconstruction during the KOCOA analysis (Table 3.3). When the initial KOCOA analysis and maps were complete

several visits to the battlefield were undertaken in order to ground-truth the analysis. During these visits to the battlefield, KOCOA features were located and photographed, microtopography was observed, and the course of the battle followed through the landscape. In 2019, the first excavation of the 1722 Waggonway was undertaken and the findings incorporated into the ground-truthing phase of the KOCOA analysis. Interruptions due to the Covid 19 pandemic precluded further excavation and prevented additional visits to examine the eastern portion on the battlefield. Throughout this process an interpretation was developed explaining why the armies engaged at Seton West Mains Farm as revealed by Pollard and Ferguson (2010).

A review of participant accounts as part of the KOCOA analysis revealed that few mention the 1722 Waggonway at all and none in relation to the engagement on the morning of September 21st. If the engagement had been fought over the Waggonway that morning, it would likely have been mentioned in at least one account. The Waggonway was identified as an existing disruptive or turning obstacle during the KOCOA analysis (Table 3.3). This means that an army would experience delay or disruption of its linear formations in moving over the Waggonway; or they would redirect (turn away) their movement onto the unobstructed Road from Seton to Preston (Table 3.3, Figure 3.8). Cope was using conventional tactics as described previously, tactics he used as a dragoon commander at the Battle of Dettingen in 1743 (Brumwell 2004: 1). Cope needed solid, open, level ground as a “spot for both Horse and Foot to act upon” (Cope 1749: 37). Cope needed terrain that would not hinder the maneuvering of his army. He would

not have deployed them behind an obstacle that would disrupt or turn his own movement, especially in the dark. The ground-truthing phase of the KOCOA analysis, however, revealed new information, from the 2019 1722 Waggonway Project excavation, showing that the Waggonway would have formed a more substantial obstacle than had been expected (Table 3.3). The construction of the Waggonway alongside an existing cartway that ran from Tranent to Cockenzie makes sense, but what was unexpected was the drainage ditch and probable associated upcast bank on the east side (Figure 3.11). This was a substantial construction that could not readily have been been negotiated by dragoons or artillery. Using conventional tactics, Cope would never have put this obstacle in his front. Also, no battle related artifacts were recovered during the excavation, indicating that engagement took place elsewhere. Further support came from the subsequent consultation with Pollard and Ferguson (2010: 25), which detailed the results of a metal detector survey adjacent to the Waggonway on the west. The survey recovered a few musket balls and pieces of a soldier's kit, but these artifacts were widely distributed, which would be more indicative of the retreat rather than the engagement (Pollard and Ferguson 2010: 25). Pollard and Ferguson (2010: 25) provides independent confirmation for the KOCOA derived suggestion that the engagement, given that the general locality in which it occurred was known at that time, had taken place in the fields to the east of the Waggonway.

The actual point where the Riggonhead Defile crossed the morass and its proximity to the engagement also suggests that the engagement took

place in the eastern fields. Home (1802: 116) gave specific directions to this crossing point. Home was present at the battle himself and familiar with the landscape. Although Home published his account 50 years after the battle, he had conducted extensive research by interviewing and corresponding with participants who augmented his own experience. Of the Riggonhead Defile Crossing, Home wrote:

> "The place where the rebels passed through the morass, is about 200 paces to westward of the stone bridge built over Seaton mill-dam, many years after the Rebellion. The Highlanders crossed the ditch with the run of water, upon a little narrow timber bridge which still stands. The ground on both sides of this bridge was then so soft and boggy, that several Highlanders sunk a good way, and Charles himself fell upon one knee (Home 1802: 116)."

Using a geo-referenced, c. 1850 O.S. Map of Tranent in Haddingtonshire, from Edina Digimap, it was possible to locate the stone bridge over Seton Mill Dam. Then, this author measured 200 paces or 500 feet (a pace = 2.5 feet) (152.5 meters) upstream from the stone bridge. This ended up being a spot a short distance to the northwest of Riggonhead Farm. My location of the crossing point based upon Home's account was confirmed by a map drawn by John Adair (1685-1687) titled, *A Mapp Of The Parioch Of Tranent With The Port Of Seaton Belonging To The Right Honorable The Earl Of Wintoun* (Figure 3.24). Judging from Adair's map, the Riggonhead Defile was a well-known and frequently used crossing in the late seventeenth century at the time Adair mapped it. The path formed an avenue of approach that proceeded from the east of Tranent, to Riggonhead Farm and crossed the morass over a wooden bridge (Table 3.3, Table 3.4, Figure 3.2, Figure 3.8,

Figure 3.24). The path may have fallen out of general use by the time of the battle, but clearly is was still within local knowledge. The Jacobite line of battle formed on a north-south line beginning at a point 100 paces (250 feet/ 76 meters) north from the crossing (Murray 1834: 39). This fact alone puts the Jacobites in the fields east of the present Seton West Mains Farm.

Battle eyewitness, Lord Drummore provided two additional clues. Firstly, Drummore stated to the effect that the Jacobites appeared advancing out of the mist at about 200 yards from Cope's line (Drummore 1749: 37). Drummore's account did not consider the distance the Jacobites had already marched (that would have been concealed by darkness and mist (Table 3.4)), but it does provide an estimate of where archaeologists should have begun searching for the engagement site. Two hundred yards west from the Riggonhead Defile Crossing is approximately 400 yards east of Seton West Mains Farm, well east of the Waggonway.

Drummore's second clue more appropriately belongs to another analysis of MET-Tc (the same collection of analyses that KOCOA is a part of): Time. Drummore states specifically that the moment of contact came at about 5:15 AM (Drummore 1749: 36). Murray (1834: 39) stated the Jacobites began their flank march through the Riggonhead Defile before 4 AM. This leaves approximately 1¼ to 1½ hours to move their entire army an estimated 1.6 miles (2.6 km), while crossing a narrow timber bridge, a chokepoint on the avenue of approach. It is unknown how wide this bridge was, but it may have only allowed a single man, or pair of men, to cross at a time.

Figure 3.24. Detail of Riggonhead Defile Crossing from John Adair's (1685-1687) A Mapp Of The Parioch Of Tranent With The Port Of Seaton Belonging To The Right Honorable The Earl Of Wintoun. Map depicts the bridge over the stream, as well as the Riggonhead Defile pathway. Judging by this map, the Riggonhead Defile Crossing was one several such crossings that existed in the 17th Century (Photo by 1722 Waggonway Project).

That is very little time to move an entire army in the dark over unfamiliar terrain and most of that time would have been taken up by crossing the bridge. Even accepting Cope's estimate that the Jacobite's marched at 3 AM, that is still a short time to move an army forward in darkness under such conditions (Cope 1749: 39). This author considers that the estimate of the duration of time that the Jacobite's marched to contact Cope as established by Drummore, means that the two armies had to have engaged in the eastern fields closer to the crossing. Another time clue was given by an unknown officer in Cope's infantry. This officer estimated that it took Cope's army 15 minutes to complete its redeployment to meet the Jacobite army (Howes 2002: 34). Cope's left, with the artillery, rested on the Waggonway, or more likely a short distance over it to the east (based upon the aborted

attempt at shelling the Jacobite night camp east of Tranent). Even in the dark, Cope did not need 15 minutes to reposition his army along the west side of the Waggonway, but he did if he moved into the fields to the east (Figure 3.2 – 3.4).

The evidence developed through the conduct of the KOCOA analysis provides a terrain based explanation for Pollard and Ferguson's (2010) identification of the engagement site at Seton West Mains Farm. The evidence demonstrates that Blakeney and Carlyle were wrong in the proposed location of the engagement site based primarily upon the analysis of the 1722 Waggonway as a KOCOA feature. By its nature, the KOCOA analysis could not have located the engagement site with the same precision as the metal detector outing did, but it did establish an area of interest that would have likely located the engagement site had KOCOA been used at the outset of the GUARD project.

Chapter 4: "We Dout Not Bot Your Lordship Is Sore Offended With Us": The Siege of Edinburgh Castle April 25 – May 29, 1573

"That performed, hee mounts 30 brasse pieces, with which he batters the walls for foure days together without any intermission, so that in fine Davids Tower receiving many wounds, yields it selfe captive to ruin, and with an hideous noyse layes its airy head on the ground, leaving the defendant naked to the enemies fury."

– *Robert Johnston* (1826: 384).

Introduction

The Marian Civil War (1568-1573) was a period of conflict and political turmoil which followed the abdication of Mary Queen of Scots and her subsequent escape from imprisonment in Lochleven Castle prior to the Battle of Langside in May 1568. Believing the Queen's abdication to have been forced, a group of loyal supporters coalesced in opposition to a series of English backed regents appointed to rule Scotland on behalf of Mary's infant son, James VI. The Scottish capital of Edinburgh (Figure 4.1) became the epicenter of the conflict, although engagements occurred in other parts of the country, most notably at Dumbarton and Stirling. Edinburgh Castle, with its valuable artillery and armory, was garrisoned in the Queen's name under the command of Sir William Kirkaldy of Grange. From the Castle, Grange directed the defense of Edinburgh throughout the 1571-1573 'Lang Siege', surrendering the Castle only after decisive English intervention in April-May 1573 (Cowan 1991: 95-112; Dawson 2011: 264-282; Glozier 2014: 236-238).

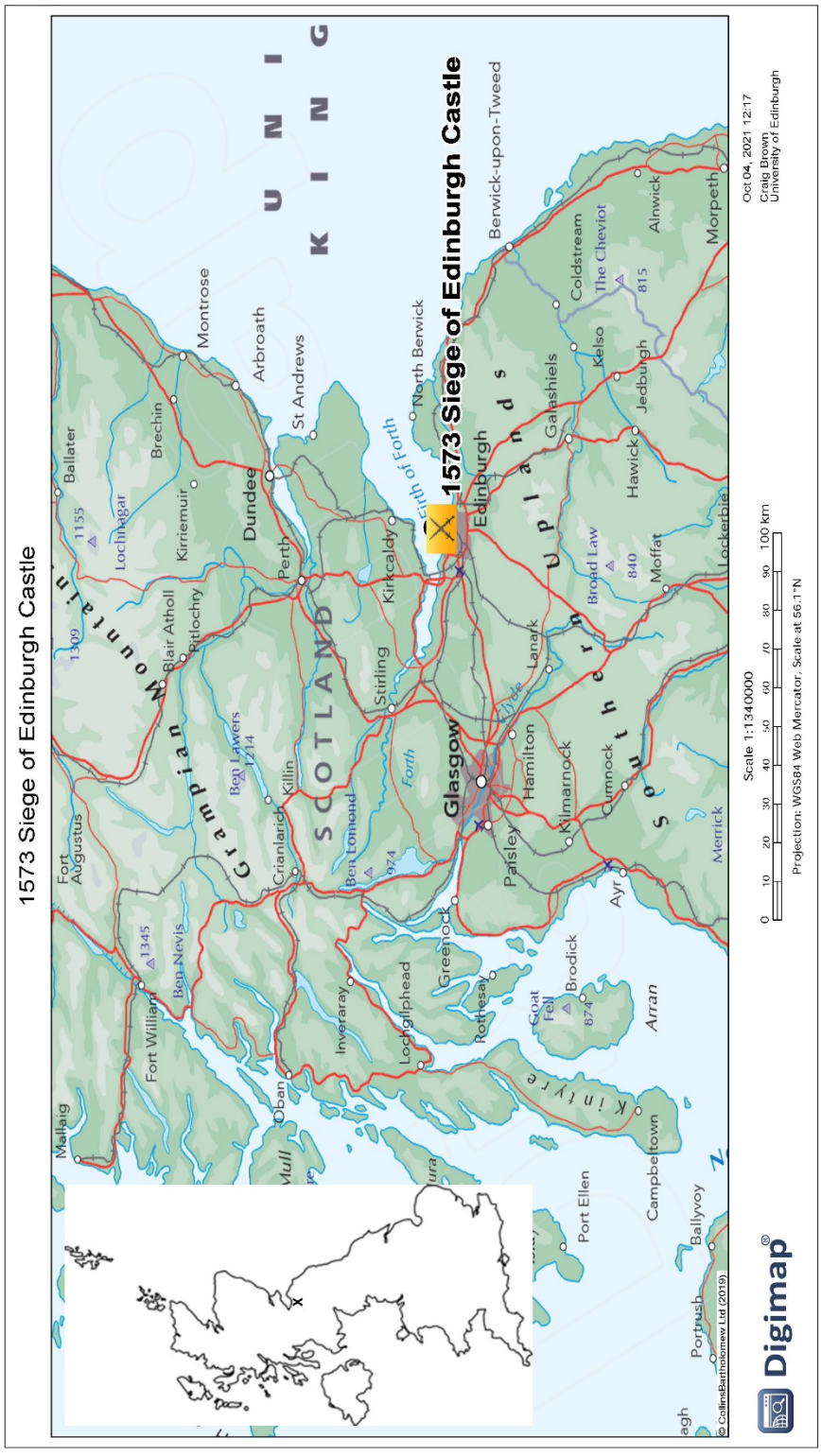


Figure 4.1. The Location of the 1573 Siege of Edinburgh Castle (Drawn by ©Craig J. Brown ©Edina Digimap).

The ‘Lang Siege’, lasting eighteen months from May 1571 until the formal surrender of Edinburgh Castle on May 28, 1573, proved to be a significant transformational episode in the long history of the city of Edinburgh and its Castle. Military operations during the ‘Lang Siege’ altered Edinburgh’s built environment as neighborhoods were burned and street layouts changed when rows of buildings were incorporated into the defenses or razed altogether to create open fields of fire.

The April-May 1573 Siege of Edinburgh Castle that brought the ‘Lang Siege’ to a close is fairly well represented in the documentary record. The archaeological record is less robust. Urban development within the project area (Figure 4.2) surrounding Edinburgh Castle has masked or obliterated features associated with the English trench system and artillery fortifications before archaeological investigation could take place. Archaeological excavations undertaken within Edinburgh Castle, however, have uncovered architectural features that were present during the 1573 siege (Skene 1822; Oldrieve 1914, 1913; Driscoll and Yeoman 1997; Ewart and Gallagher 2014). This documentation provides an excellent opportunity to critically examine the application of the KOCOA terrain analysis methodology to a siege in a heavily urbanized environment at the onset of the widespread adoption of gunpowder weapons.

This case study, then, will focus on the final two months of the ‘Lang Siege’, from the arrival of the English army under Sir William Drury on April 20, 1573 until the formal surrender of Edinburgh Castle on May 28, 1573. KOCOA will be utilized to generate a hypothesis that will delineate the

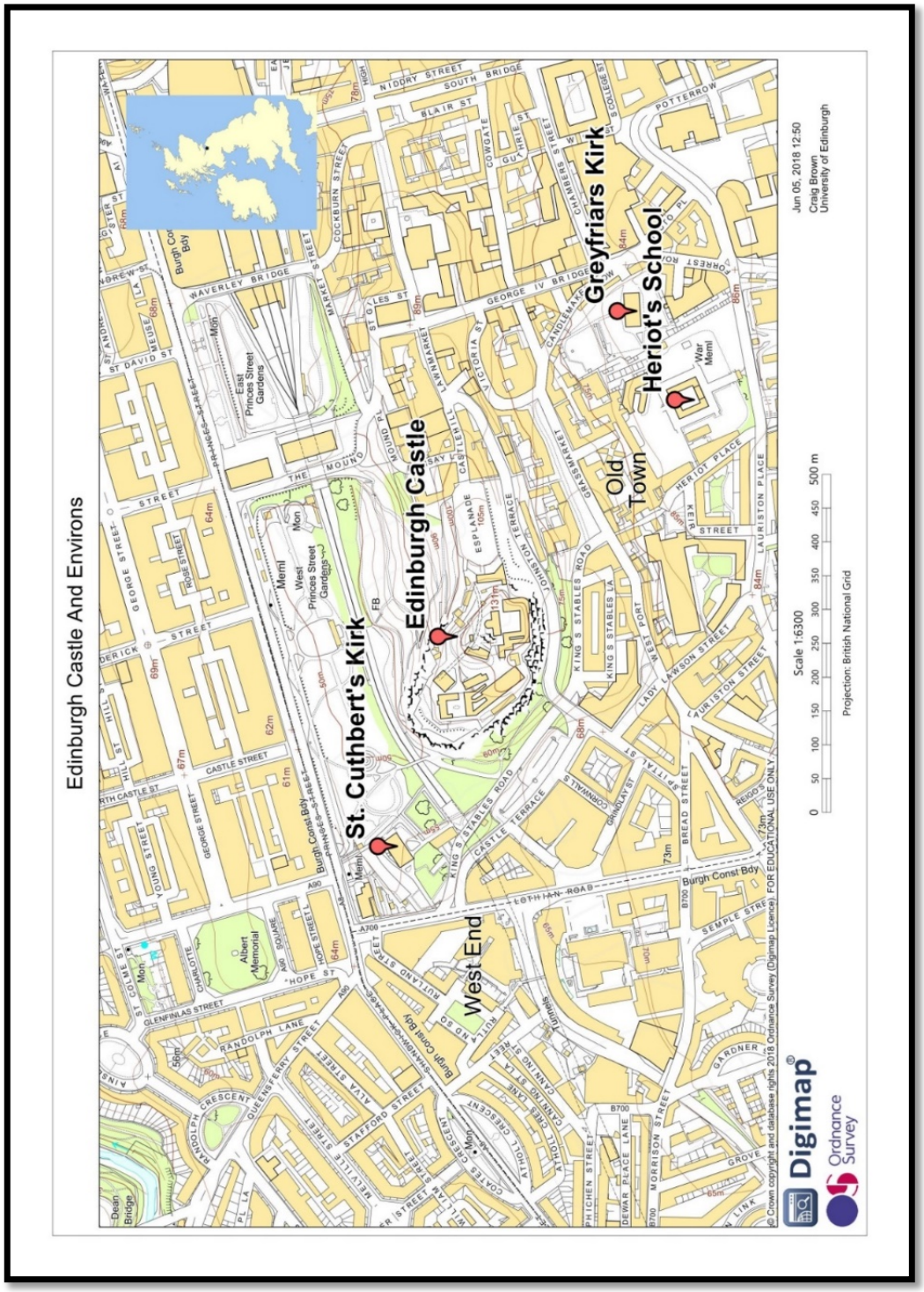


Figure 4.2. 1573 Siege of Edinburgh Castle Project Area (Showing modern placenames used in text) (Drawn by ©Craig J. Brown ©Edina Digimap).

battlefield boundaries of the 1573 siege, locate probable locations of English artillery fortifications and provide an interpretation of the conduct of the siege as influenced by terrain elements embodied within the KOCOA analysis. The posited locations of the English batteries derived from the KOCOA analysis will be tested against the documentary and archaeological record allowing for a critical evaluation of the KOCOA methodology.

Historical Context: The 1573 Siege of Edinburgh Castle

On Friday, 20 April 1573, an English army under the command of Sir William Drury, Marshall of Berwick, marched into the outskirts of Edinburgh (Potter 2003: 131; Thompson 1833: 329). Estimates based upon primary historical sources vary as to the exact size and composition of this force, but it likely consisted of between 500 and 1000 infantry armed with ‘hagbuts’ (likely the caliver), a contingent of 140 pikemen and a group of 300 pioneers (Anon 1573: 72, 80; Thompson 1833: 330). An earlier detachment of 100 pioneers had been in the city since March working with a Scottish force building trenches ringing Edinburgh Castle (Grant 1850: 111). After the fashion of the day, a number of gentlemen volunteers joined Drury on the march to Edinburgh, including Sir Henry Lee of Ditchley, Queen Elizabeth I’s anointed champion (Anon 1573: 79-80; Fernie 2004). A train of 26 artillery pieces accompanied Drury’s army, arriving by sea at Leith on 27 April (News from Scotland, 27 April 1573). Sources differ as to the size and type of artillery, but the train likely consisted of 6 double cannon, 14 culverins, 2 sakers, 2

bombards and 2 mortars (Anon 1573: 80; Thompson 1833: 330; Grant 1850: 111). Morton commanded a further 500 to 700 Scottish troops, with 3 culverins and 1 demi-culverin. (Killigrew to Burghley 14 April 1573; Killigrew to Burghley and Leicester 13 May 1573). Grange had a total of just 197 people to defend Edinburgh Castle, 55 of which were women and children (Killigrew to Leicester, 2 May 1573).

On 25 April, following the conventions of Sixteenth Century siege warfare, Drury issued a formal summons to Grange for the surrender of Edinburgh Castle. Grange was accused of holding the castle ‘for a receptacle of forraine forces, to the manifest daungers both of the Realme, and of my soueraignes”, making it “therefore necessarie to remove so perilous a danger to both the realms” (Anon 1573: 72-73; Holinshed 1808: 669-670). If Grange were to surrender the castle, along with all those inside, Drury promised the Queen Elizabeth would intercede on their behalf, but if they were to “continue in your former obstinacie, abiding the canon, then no further to looke for grace or favour” (Anon 1573: 73; Holinshed 1808: 670).

Grange refused. He was, in fact, holding the castle in expectation of French aid due to arrive by the third Sunday in May (Killigrew to Burghley, 27 April 1573). Edinburgh Castle itself occupied a formidable position perched atop Castle Rock, where it could only be approached from the east, where the burgh of Edinburgh lay, and through a small postern on the west. The castle was well armed with over forty cannons of various size with good lines of sight and fields of fire in 360 degrees (see reconstruction below) (Grant 1849: 376-377). Grange, however, lacked the gunners to service all of his

ordnance effectively. The garrison was also short on gunpowder and, more crucially, food and water (Killigrew to Burghley, 17 April 1573). In spite of these disadvantages, Grange believed the garrison could hold out until the French arrived.

With Grange's refusal of the summons to surrender, the siege of Edinburgh Castle began in earnest. The construction of the trench system and artillery platforms represented a major engineering and logistical effort, one that would have left its mark upon the landscape of Edinburgh. In addition to the fortifications, there would have been support structures, depots, blacksmith forges, barracks and stable areas that did not warrant mention in the historical record. "The circuit is large and the trenches and platforms great," wrote one contemporary observer (Browne to Burghley, 5 May 1573). A mine was likewise dug from Castle Hill to under the Spur, although it would never be used. The ground was found to be rather rocky, slowing progress (Killigrew to Burghley, 12 May 1573). When the English artillery arrived in Leith on 27 April, the tubes were offloaded from the ships, mounted on carriages, and taken to Holyrood Palace, where they waited for their battery mounts to be prepared (Browne to Burghley, 5 May 1573).

In all, five artillery batteries were constructed, each positioned on key terrain encircling Edinburgh Castle with excellent line of sight into the castle and interlocking fields of fire. Command of each battery was given to one of the gentlemen volunteers and so named (Anon 1573: 79). The first battery was under the command of Regent Morton and called 'The King's Mount'. The second battery was allotted to Drury and was likely 'The Generals

Battery' located on Castle Hill. The remaining three were given over to the command of Sir George Carey, Sir Henry Lee of Ditchley and Thomas Sutton (Anon 1573: 74; Holinshed 1808: 670; Grant 1849: 335, 1850: 111-112; Potter 2003: 135). Historians do not agree on where these batteries were located (Grant 1849: 335, 1850: 111-112; Potter 2003: 135). Contemporary witnesses, however, place them on Castle Hill, Greyfriars' burial ground, Scotts Land at West Port, Saint Cuthbert's Kirk and north of the Nor' Loch (Birrel 1605: 20-21; Thompson 1833: 331-332). The position of the artillery batteries will be discussed in detail as part of the KOCOA analysis below.

Sunday 17 May, Drury gave the order and all available cannons[27] opened fire, concentrating on David's Tower. The bombardment continued without respite. On 21 May, the 'Generals Battery' on Castle Hill was ready and fire was adjusted to target the entire Castle (Cotton to Burghley, 23 May 1573). A breach had already been made in the outer wall of the castle at a postern gate on the northwest side and several buildings had been severely damaged (Killigrew to Burghley and Leicester, 22 May 1573; Drury to Burghley, 23 May 1573). Grange replied as best as he was able, managing to inflict a handful of casualties, but the effort proved to be ineffectual.

On 22-23 May, the northern wall of David's Tower collapsed along with the Curtain Wall, with its six cannons, the head wall behind St. Margaret's Tower, and the Constable's Tower beyond (Thompson 1833: 332; Grant 1849: 338, 1850: 112). Collapsed masonry completely blocked the

[27] The General Battery on Castle Hill was not yet ready.

Portcullis cutting off and isolating the Spur from the interior of the Castle. The Forewell, the principal source of water for the Castle, became clogged with fallen debris (Grant 1849: 338,1850: 112; Potter 2003: 137). The collapse crippled the Castle's eastern defenses, virtually eliminating artillery placed to cover the approaches from that side and leaving the Spur vulnerable to assault.

The assault on the Spur came at seven o' clock in the morning on 26 May. Earlier that morning, Drury and Morton divided their infantry into two columns, one to attack the Spur from the south and east, and the other to move around to the northwest to launch a feint on the breach opposite Lee's Battery (Anon 1573: 76; Thompson 1833: 332). This feint was intended as a diversion to compel Grange to divide his meager force and draw pressure away from the assault on the Spur. Details of this feint attack were not recorded, but Drury recorded relatively light casualties of eight English and Scottish soldiers hurt and slain (Drury to Privy Council, 28 May 1573).

The attack on the Spur was led by the Scottish companies of Captain Hume and Captain Crawford. Hume and Crawford carried scaling ladders and, finding a spot at the point of the Spur that offered some cover from musket fire coming from the rubble of the Curtain Wall and David's Tower, were able to gain access to the interior of the Spur. The twenty men Grange had assigned to defend the Spur held out for several hours before being overrun (Hume 1644: 327; Thompson 1833: 332-333). Drury reported that storming the Spur cost "20 soldiers or thereabouts was hurt and slain" (Drury to Privy Council, 28 May 1573).

The loss of the Spur broke the morale of those still inside the Castle. Many of them were injured or sick from drinking bad water. Too few men remained that could mount any kind of effective defense. All by now realized that the expected French aid was not going to arrive. Several men slipped over the walls to surrender on their own (Anon 1573: 77; Names of those in Edinburgh Castle when it Surrendered, 28 May 1573; Potter 2003: 138-139;). Edinburgh Castle was formally surrendered on 28 May 1573. The private men were allowed to go free, while Grange and ten others were held pending judgement (Conditions of the Surrender of Edinburgh Castle, 28 May 1573). The castle's surrender brought the 'Lang Siege of 1571-1573' and Marian Civil War 1568-1573 to a close (Anon 1573: 77; Surrender of Edinburgh Castle, 29 May 1573).

Historical Document and Image Research

The 1573 Siege of Edinburgh Castle is mentioned in a series of participant and eyewitness accounts written at the time of the battle. The spatial restraints governing this thesis do not permit for a detailed discussion of these sources here, but this may be found in Appendix 4.1. The participant accounts, however, are summarized below in Table 4.1. Each source was evaluated using Internal Source Analysis (Barber and Berdan 1998). The two most important to this study are "A Survey Taken Of The Castle And Towne Of Edinburgh In Scotland, By Us Rowland Johnson And John Fleminge" (Johnson and Fleminge 1573: 69-71), dated 27 January 1572-3 and "Journal

Of The Siege Of The Castle Of Edinburgh, April And May, 1573" (Anon 1573: 72-80), written by an unknown author, both are reprinted in the 1836 edition of *The Bannatyne Miscellany*, Volume 2 (Anon 1836). Together, these documents constitute what remains of Drury's report of the siege.

The historical image research revealed a large body of cartographic and image sources depicting old Edinburgh and Edinburgh Castle. Unfortunately, many of the early images are not useful in reconstructing the terrain that existed at the time of the 1573 siege. Scales and place names are often omitted. Many of the images are artistically rendered depictions of Edinburgh Castle and Edinburgh viewed side on obscuring terrain features that would be useful in terrain reconstruction. This focus on Edinburgh Castle and Edinburgh is transferred to early maps leaving the surrounding area filled with map furniture. The surrounding area is important for locating the trenches and battery mounts constructed by the Scottish and English forces besieging Edinburgh Castle. Historical image sources are summarized in Table 4.2. A detailed discussion can be found in Appendix 4.1.

Primary Historical Source Analysis 1573 Siege of Edinburgh Castle			
Date Written (Published)	**Author**	**Title**	**Comments**
1573 (1836)	Anonymous (Thomas Churchyard?)	*Journal Of The Siege Of The Castle Of Edinburgh, April and May 1573*	A diurnal narrative likely written by an eyewitness present with the English forces. Good knowledge of English movements contrasted by lack of knowledge of Morton's Scottish forces.
1573 (1836)	Roland Johnson and John Fleminge	*A Survey Taken Of The Castle And Town Of Edinburgh In Scotland, etc.*	Johnson (Deputy Surveyor) and Fleminge (Master Gunner) under Drury. Sent to conduct reconnaissance of Castle and town. Contains terrain description and proposed plan of attack. Note proposed does not mean what actually occurred.
1575 (1833)	Anonymous (Thomas Thompson, Ed.)	*A Diurnal Of Remarkable Occurrents That Have Passed Within The Country Of Scotland, etc.*	Author apparently resident of Edinburgh during 1573 Siege. Mentions some of same incidents as Birrel. Provides English battery locations and cannon types.
1577 (1808)	Raphael Holinshed	*Holinshed's Chronicles of England, Scotland, Ireland (Volume 5 Scotland)*	Close secondary source based on eyewitness accounts. Contains the engraving a 'Facsimile'.
1605 (1798)	Robert Birrel	*The Diarey Of Robert Birrel, Burgess Of Edinburgh, etc.*	Birrel kept a diary during the 1573 Siege. Not a dedicated recorder of events, but witnessed what he did record. Locates English batteries in 1573 landscape.
The Following Is A Collection Of Personal Letters From Participants OF The Siege Found In Crosby (1876) And Boyd (1905)			
29 January 1573	Anonymous	News Out Of Scotland, 29 January 1573	Water on southeast of Castle is St. Margaret's Well location. Secured by Kingsmen. (Boyd 1905: no. 536)
25 April 1573		Siege Of Edinburgh Castle	Broadside. (Crosby 1876: no. 916)
27 April 1573		News From Scotland	News of English artillery arrival at Leith. Shipped without carriages. (Crosby 1876: no. 922; Boyd 1905: no. 631)
28 May 1573		Names of those in Edinburgh Castle when it Surrended, 28 May 1573	List of Grange's Queensmen who survived to surrender. (Boyd 1905: no. 666)
28 May 1573		Conditions of the Surrender of Edinburgh Castle, 28 May 1573	Terms of surrender. (Crosby 1876: no. 987; Boyd 1905: 665)
29 May 1573		Surrender of Edinburgh Castle, 29 May 1573	Announcement of the surrender of Edinburgh Castle. (Crosby 1876: no. 991; Boyd 1905: no. 667)
5 May 1573	Sir Valentine Browne	Browne to Burghley, 5 May 1573	Eyewitness with English. Relates arrival of artillery tubes at Leith and assembly of carriages at Holyrood Palace. Relates trench circuit is large and battery mounts large. (Crosby 1876: 949)
23 May 1573	Thomas Cotton	Cotton to Burghley, 23 May 1573	Castle Hill battery now ready and manned by Drury himself. All of Castle being targeted now. (Boyd 1905: no. 657)

Table 4.1 Historical Source Analysis Summary (Part 1 of 2).

4 April 1573	Sir William Drury	Drury to Burghley, 4 April 1573	Commander of English forces allied to Morton's Scots. William Cecil, Baron Burghley Queen Elizabeth's Lord High Treasurer in charge of financing siege. Drury unhappy with construction of trenches. Too low and too narrow. (Crosby 1876: no. 872; Boyd 1905: no. 606)
17 April 1573		Drury to Ruthven, 17 April 1573	Lord Ruthven was a Scottish diplomat working with Regent Morton. Terms of English alliance with Kingsmen. (Crosby 1876: no. 897; Boyd 1905: no. 623)
11 May 1573		Drury to Burghley, 11 May 1573	First battery planted sees action against party sent by Grange for water St. Margaret's Well. Likely west end of High Riggs. (Crosby 1876: no. 958; Boyd 1905: no. 646)
13 May 1573		Drury to Burghley, 13 May 1573	All batteries placed except for Drury's on Castle Hill Esplanade. All batteries to fire at same time when ready. (Boyd 1905: no. 649)
18 May 1573		Drury to Burghley, 18 May 1573	1 pm all batteries fired at once on David's Tower. People inside shriek. (Crosby 1876: no. 969; Boyd 1905: 653)
23 May 1573		Drury to Burghley, 23 May 1573	Drury's battery fires on Curtain Wall. (Crosby 1876: no. 978; Boyd 1905: 664)
28 May 1573		Drury to Privy Council	Castle stormed. Kingsmen casualties. (Crosby 1876: no. 986; Boyd 1905: no. 664)
27 March 1573	Nicolas Errington	Nicolas Errington's Report	Condition of Castle's defenses. (Boyd 1905: no. 598)
25 January 1573	Sir Henry Killigrew	Killigrew to Burghley, 25 January 1573	Killigrew was Queen Elizabeth I's Ambassador. St. Margaret's Well poisoned. English pioneers already present and working on trenches. (Boyd 1905: no. 528)
14 April 1753		Killigrew to Burghley, 14 April 1573	Alliance with Regent Morton. (Crosby 1876: 890; Boyd 1905: 616)
17 April 1573		Killigrew to Burghley, 17 April 1573	Shortages of gunpowder, food and water in Castle. (Crosby 1876: no. 895; Boyd 1905: no. 621)
27 April 1573		Killigrew to Burghley, 27 April 1573	Reference to expected French intervention to aid Grange. Grange refuses summons to surrender. (Crosby 1876: 923; Boyd 1905: no. 632)
2 May 1573		Killigrew to Leicester, 2 May 1573	Sir Robert Dudley, Earl of Leicester aid or council to Queen Elizabeth I. Letter contains forces available to Grange in Castle.
5 May 1573		Killigrew to Burghley, 5 May 1573	Planting of first battery to deny water and dismount some of Grange's cannon across from main battery. High Riggs. (Crosby 1876: no 950)
12 May 1573		Killigrew to Burghley, 12 May 1573	Progress on trenches slow due to bedrock. (Crosby 1876: no. 960; Boyd 1905: no. 646)
22 May 1573		Killigrew to Burghley and Leicester, 22 May 1573	Breach on northwest by Lee's Battery. Drury's Battery firing on Curtain Wall. Grange asked for Parley gave conditions he wanted for surrender. (Crosby 1876: no. 976; Boyd 1905: no. 656)
25 April 1573	James Douglas, Earl of Morton, Regent of Scotland	Summons by James VI to Grange, 25 April 1573	Summons to surrender tendered to Grange on behalf of King James VI. (Boyd 1905: 630)
31 May 1573		Morton to Burghley, 31 May 1573	Opposition to clemency. (Boyd 1905: no. 672 & no. 673)

Table 4.1 Historical Source Analysis Summary (Part 2 of 2).

Historical Image Source Analysis 1573 Siege of Edinburgh Castle			
Date Drawn	**Cartographer**	**Title**	**Comments**
1544	Richard Lee	*English Spy's Drawing of c. 1544 (A Coloured Plan, or Bird's Eye View, of the Town of Edinburgh)*	Drawn during Hertford's 1544 attack side on view of Castle from north looking south shows David's Tower not much else
1560	Petworth	*Drawing of the Siege of Leith, May 1560*	Shows Castle in background. Similar to 1544 '*English Spy's Drawing* ' but now includes the Spur.
1577	Anonymous or Raphael Holinshed	*Facsimile of a Plan of the Siege of the Castle of Edinburgh, May 1573*	An idealized image composed of several different images and based on a lost sketch made by Johnson and Fleminge during their Survey in 1753. An image of their suggested plan of attack, not what actually happened.
1582	Georg Braun/ Franz Hogenburgh	*Edenburgum, Scotiae Metropolis*	Map compilation of images for Vol. 3 '*Civitates Orbis Terrarum* '. Idealized image
c. 1610	Timothy Pont	*A New Description of the Shyres Lothian and Linlithquo.*	County maps showing roads and general area around Edinburgh not as detailed as Adair
1647	James Gordon of Rothiemay	*Edinodunesis Tablum*	One of the first true town plans of Edinburgh detailed, with scale and north arrow main buildings appear accurate.
c. 1682	John Adair	*Map of Midlothian*	Similar to Pont but more detail
1747 - 1755	William Roy	*Area Around Corstorphine and Southward to Pentlands in Edinburghshire*	Both of Roy's maps piece together to show Edinburgh and surroundings. Although not surveyed, but a type of sketch it shows many terrain features relative to Siege of 1573.
1759	Andrew Bell	*A Plan Of The City Of Edinburgh With Adjacent Grounds*	Depicts landscape surrounding town
1773		*A Plan of the City of Edinburgh, with all the New Streets, Avenues, Buildings, Squares, Courts &c. Within & Round the City, since 1741 till this Present Year 1773*	Depicts changes in built environment between 1741 and 1773. Assists in matching old landmarks in relation to today's.
1780	John Ainslie	*City of Edinburgh - Earlier State*	Shows Old Town and Newtown with present and planned construction
		City of Edinburgh - Later State	Same basic view different buildings shaded in Newtown, no circus there, shows Mound.
1784	Alexander Kincaid	*A Plan of the City and Suburbs of Edinburgh*	Detailed town plan similar to Ainslie

Table 4.2 Historical Image Analysis Summary

Tactics and Technology: 16th Century Siege Warfare and Weapons

As mentioned in Chapter 1, battlefields exist at the intersection of 3 variables: Tactics (Military Doctrine, the Practice or Habitus of war); Technology (Weapon Systems or Force Composition); and Terrain. These three variables form a reciprocal relationship with each other. In order to better understand how terrain was used, or influenced a battle, knowledge of the tactics and technology used by the combatants is needed. In this section, standard siege tactics used during the Sixteenth Century are reviewed, followed by the

capabilities of the weapons present during the 1573 siege as mentioned in the historical record.

Tactics

Siege warfare is a specific type of combat that is engaged in when an attacker is tasked with the objective of capturing an enemy stronghold that refuses to surrender and that cannot be carried by direct assault without incurring unacceptable casualties. Sieges are characterized by an encirclement of the target designed to cut off supply and reinforcements. This encirclement is usually coupled with attempts at reducing the defender's fortifications through bombardment and mining operations (Duffy 1979: 93-100). Siege warfare has a long history with innumerable examples from the ancient world. The Romans, though disdaining having to resort to a siege, were masters of siege warfare (Levithan 2013). During the Middle Ages, sieges became the most effective means of capturing castles (Hull 2004: 34-46).

Sixteenth Century warfare was characterized by extensive changes in military theory, organization, equipment technology and siege warfare (Roberts 1956: 13-14; Eltis 1998: 2; Parker 2016: 1-2). Historians are divided over the issue of whether or not these changes constituted a true 'military revolution', and if so, exactly the date this revolution began (Oman 1937; Roberts 1956; Parker 1976; Black 1991; Eltis 1998; Parker 2016). What is certain, however, is that technological improvements in, and widespread

adoption of, gunpowder artillery and firearms coinciding with the construction of new fortifications, designed to both resist and utilize these weapons, profoundly affected the practice of siege warfare during the period. The development of iron projectiles and iron and bronze cast cannon cast during the fifteenth century proved to be the catalyst for change. Cast as a single piece, the newer cannon allowed for a powder to shot ratio of 1:2 over the older bombards constructed of a series of iron bands with a powder to shot ratio of 1:13 (Eltis 1998: 77). The greater powder to shot ratio meant that a larger quantity of gunpowder could be used to fire a denser, heavier iron cannonball with greater force over a longer distance than the stone firing bombards without bursting the cannon. The tall, thin defensive walls that were constructed as part of medieval castle and town fortification systems were rendered obsolete by the new artillery by the end of the fifteenth century. The high, flat walls offered a large target to opposing gunners and became dangerously unstable if damaged (Lynn 1991: 173; Eltis 1998: 77). Cannon fire caused significant damage to the medieval walls and buildings of Edinburgh Castle, with many collapsing, during the 1573 siege (Potter 2003: 137).

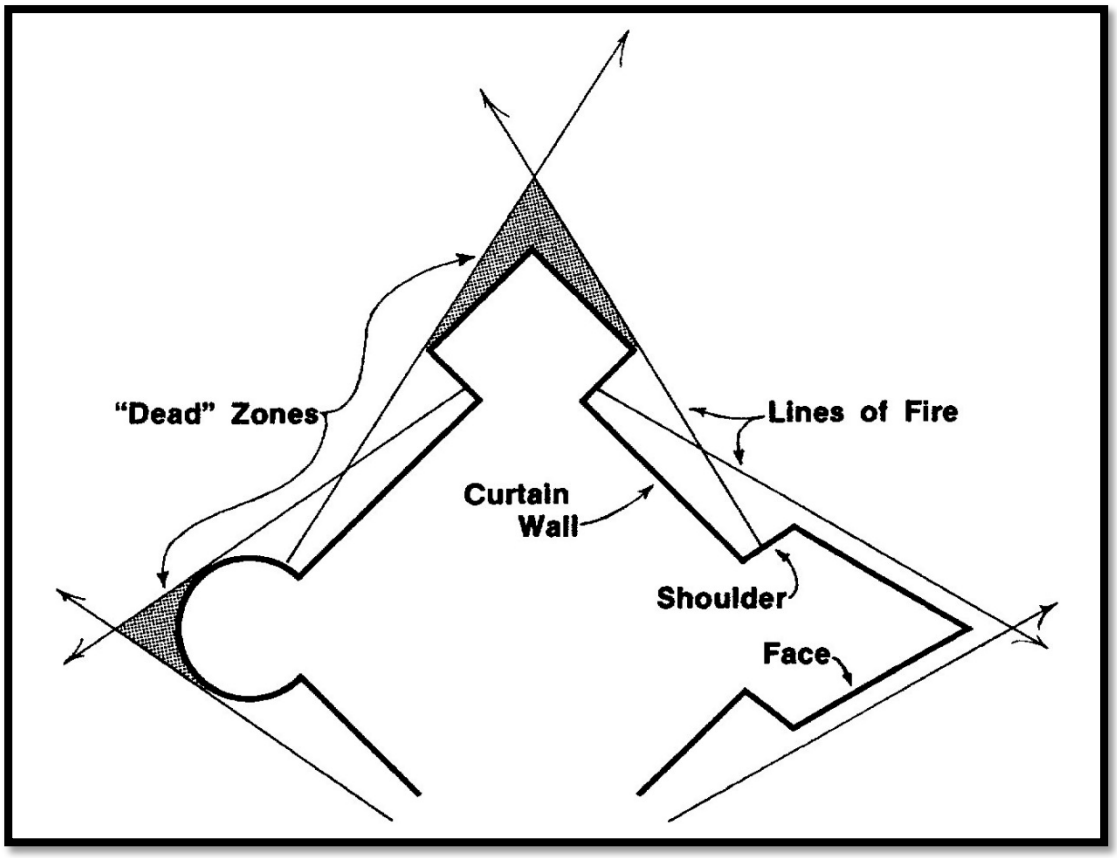


Figure 4.3. Drawing demonstrating 'Dead Zones' in front of square and round Medieval towers. (From Lynn 1991: 173).

Between circa 1485 and 1530, Italian military engineers developed fortifications systems that could both resist bombardment by the new artillery and maximize its firepower defensively. High medieval round and square towers provided flanking positions, from which defenders could fire upon attackers attempting to breach or scale the walls but left 'dead zones' at the base of the towers where fire could not be brought to bear upon attackers (Figure 4.3). In order to correct this deficiency, the Italians developed the angle bastion, or *trace italienne* after its place of origin. The angle bastion was essentially a short arrowhead-shaped artillery tower, whose shape provided fields of fire that swept the ground in front of the walls eliminating

'dead zones' (Figure 4.3). The first angle bastions appeared during the decade prior to the 1494 French invasion of Italy and were gradually improved during that conflict. The angle bastion evolved from the earlier medieval towers through a series of manifestations, beginning with the addition of a scarp to the base of the tower, before angling the tower wall and then gradually reducing its height. The initial angle bastions tended to be small masonry constructions. Later incarnations could be large fortifications in their own right and could be built of earth, stone, or a combination of the two (Hale 195: 466-494; Lynn 1995: 171-174; Eltis 1998: 76-80). Once the *trace italienne* proved itself as an artillery fortification, the design was adopted throughout Europe. The spur fortification at the entrance to Edinburgh Castle, that played a key role in the 1573 siege, was constructed in 1548 in the *trace italienne* style.

By the 16th century, siege warfare had become formalized, the general progression of the siege changing little, at least superficially, from its Roman and Medieval antecedents (Hull 2004: 45; Nicholson 2004: 130). Upon arriving at the fortress or city to be besieged, the besieging army would first surround the town and formally summon its garrison to surrender (Norman and Pottinger 1966: 53; Hull 2004: 36; Nicholson 2004: 130). The terms proposed were usually lenient, something to the effect that the garrison would be permitted to leave unmolested with all arms and personal baggage intact. The besieged commander could accept these terms, but in doing so he ran the real risk of being charged with cowardice or treason and executed by his own government. If there was a reasonable expectation that the

besieged garrison could successfully defend itself, at least until relief arrived, then the summons to surrender was usually refused (Nicholson 2004: 130-131).

When the formal summons to surrender was refused, the attacker constructed a series of fortifications encircling the town or fortress out of artillery range that were designed to protect against sorties by the defender and prevent any form of relief getting in. This is a process termed ‘countervallation’ (facing the enemy). ‘Circumvallation’ (facing the country), a term that is often used in place of ‘countervallation’ properly refers to a series of fortifications built at this stage that protect the siege lines from attack by a relief force (Duffy 1979: 93). When the countervallation was complete, the attacker then moved to a point just within artillery range of the garrison and constructed a line of trenches parallel to the defenses of the garrison. Their ‘First Parallel’ was dug approximately three feet deep and three feet wide, with the earthen spoil deposited on the side of the defender on put in wicker baskets called ‘gabions’ in order to form a parapet (Duffy 1979: 93-95). The attacker would mount his own siege artillery in a series of ‘batteries’ or ‘mounts’. During much of the 16th century, the attacker placed their artillery in a single ‘batterie royale’ or ‘Generalbatterie’ opposite the point chosen to affect a breach of the defender’s fortifications. As the 16th century progressed, the ‘Generalbatterie’ was reduced in size to create smaller supplemental batteries positioned to produce crossfire on the anticipated breach or aid in reducing the garrison’s defenses (Duffy 1979: 96). Edinburgh Castle in 1573 was an early example of this change in tactics, along with the

sieges of Leith in 1560 (Petworth 1560; Thompson 1833: 57-58; Harris 1991: 365; Pollard 2008) and Malta in 1565 (Oman 1937: 709-716).

Once the ‘First Parallel’ was complete, the attacker would begin constructing a series of zig-zag trenches, or ‘saps’, approaching perpendicular to the defenses of the garrison. The intent was to provide a protected path approaching the defender’s fortifications to a point close enough where mining operations could be undertaken, or an assault launched upon a breach (Duffy 1979: 95). Mining operations consisted of a tunnel dug to a point underneath the defender’s fortifications where an explosive mine was placed and detonated to create a breach.

Offensive siege operations were influenced by the nature of the terrain and enemy action. It was not uncommon for additional ‘parallels’ and ‘saps’ to be required or some other alteration to normal siege practice to be undertaken due to these factors. Once a breach in the defender’s fortifications was created, however, the success of the siege was usually assured. It was considered proper at this point for the garrison commander to request a parley to inquire into the terms of surrender. At this juncture, the terms of surrender offered could not be expected to be as lenient as those proposed at the outset. A variety of outcomes was possible, but while the leaders were often imprisoned and executed, the private soldiers were usually allowed to leave after some small concession (Hull 2004: 45). Surrender at this time, however, was usually considered to be acceptable. If the defender did not surrender at this point, and the siege concluded through assault, no mercy could be expected. Custom dictated that the attacker be

allowed three days to sack and plunder the captured town or fortress (Nicholson 2004: 133). This condition was, in fact, written into the agreement negotiated by Regent Morton and Sir William Drury as part of the potential payment for English aid in reducing Edinburgh Castle (Drury and Lord Ruthven, 17 April 1573). The principal officers involved on both sides of the 1573 siege of Edinburgh castle were all experienced soldiers well acquainted with siege tactics of the mid to late 16th century (Bonner 2008; Hewitt 2008; Kelsey 2008).

Tactics constitute the first of three variables that allow KOCOA to be used to delineate battlefield boundaries, locate areas of archaeological interest, and interpret battle events. The tactics discussed above represent the ideal, or 'textbook' procedure followed for Sixteenth Century siege warfare. In practice, these tactics were often altered to suite existing terrain and circumstances at the time of the siege. The ideal siege tactics provide a baseline against which such deviations can be assessed (Sivilich 2014: 155-178). We will see that during the 1573 siege, the allied English and Scottish Kingsmen did not utilize saps or a true line of circumvallation as described above.

Technology

Technology, the force composition and capabilities of the weapon systems employed by the combatants, is the second of three variables comprising a KOCOA analysis. Tactics and Technology are interdependent

variables. An advance made in one will prompt an adaptation in the other. The way in which Tactics and Technology are utilized in a battle is influenced by the third variable: Terrain (McNutt 2014: 3-5).

Artillery

Sixteenth Century siege warfare primarily utilized artillery to breach castle walls preparatory to an infantry assault. Artillery of the Sixteenth Century varied in size and capability across cannon types from different nations. The artillery trains of both combatants at the 1573 siege of Edinburgh Castle contained cannon from multiple countries. The number, type and basic specifications of the artillery utilized by each side during the siege are listed in Table 4.3 and Table 4.4, respectively. Each gun should have been crewed by a minimum of three men: gunner; gunner's mate and helper (Norman and Pottinger 1966: 214).[28] Aiming was by direct sight along the barrel of the cannon with the target, cannon mouth and breech forming three points in a straight line (Bourne 1587: 15-30).[29] Elevations were acquired by placing a quadrant in the gun's mouth and adjusting the barrel with either wedges or elevation screw (Bourne 1587: 23-30). The attributes of range and elevation provide a geometric means of estimating artillery

[28] A three-man minimum gun crew seems too small to effectively operate a cannon, however that number appears accurate. In writing of the operation of 16th century artillery, Walton (1999: 179) wrote: "Common laborers were used to move the cannon and their *materiel*, and gunners operated them, usually in two to four man crews, depending on the calibre of the gun". Aside from the gunner and his mate, the remaining men were likely taken from the pioneers who had constructed the fortifications (Wood 2002: 165).

[29] Aiming took into account the tapering of the cannon barrel by making allowance for the difference in thickness, or outside diameter at the breech and at the mouth; a process called 'disparting' (Bourne 1587: 15-18).

positions using KOCOA. The number of gunners available to Morton and Drury cannot be discerned from primary documents (Anon 1573: 72, 80; Holinshed 1808: 670; Thompson 1833: 330). Kirckcaldy of Grange had just nine gunners available to him while defending Edinburgh Castle (Killigrew to Leicester, 2 May 1573).

Infantry

The majority of men serving on both sides of the 1573 siege of Edinburgh Castle were infantry, lightly armored and armed with either a 'hagbutt' (Killigrew To Leicester, 2 May 1573; Thompson 1833:330) or 'arquebus' (Grant 1850:111). Both of these terms are derived from the German 'Hackenbüchse', an early type of smoothbore matchlock firearm descended from the 'hook guns' mounted on European castle walls during the late 15th century (Held: 1957: 29; Chase 2009:24,61). By the latter half of the 16th century, the term 'arquebus' had come to be used interchangeably to refer to three different firearm types: arquebus, caliver and musket (Petersen 1956: 13; Held 1957: 29). The attributes of these weapons are summarized in Table 4.5. Sixteenth Century writers disagreed over the performance of these firearms with regard to accuracy, range, and rate of fire (Smythe 1590; Barwick 1594). Ballistic tests conducted during the late 1980's by Peter Krenn, Paul Kalaus and Bert Hall (1995) seems to confirm these firearms were not accurate. Targets placed at intervals of 30 meters and 100 meters recorded hits from slightly over half of the shots fired from 16th century

firearms (Krenn, Kalaus and Hall 1995:105). However, their penetration analysis showed that unarmored or slightly armored targets sustained massive damage, 146 mm to 93 mm of penetration respectively, at the same intervals. This seems to suggest that volleys fired at the above ranges noted could have devastating effect on formations of men. All three-gun types may have been present at the 1573 siege of Edinburgh Castle; however, it is likely that the primary shoulder firearms used were the arquebus and caliver. Illustrations of the English army in Ireland in 1581 show a firearm with a downward curving stock that may be the caliver (Norman and Pottinger 1966:190). Although fairly common on the continent, particularly among Spanish armies, by the 1560s, the musket did not see widespread use in Britain until the late 1580s (The Alderney Maritime Trust 2017). Drury brought an estimated 1000 to 1500 ‘arquebusiers’ with him to Edinburgh (Anon 1573: 72; Thompson1833: 330; Grant 1850: 111). Morton commanded a further 500 to 700 Scottish troops (Killigrew to Burghley 14 April 1573; Killigrew to Leicester 13 May 1573). Kirkcaldy could muster less than 145 men armed with ‘hackbut’ and halberds to defend the Castle (Killigrew to Leicester 2 May 1573).

The smallest armed contingent serving during the 1573 siege of Edinburgh Castle was the 140 pikemen in the English army (Thompson 1833:330; Grant 1850:111). The pike was a long thrusting spear that was a regular infantry weapon used in European warfare from the early Middle Ages until around 1700 (Peterson 1956: 99). Pikemen were deployed in close order formation to present a front bristling with spearheads.

Table 4.3 Estimated Cannon Types and Specifications, English/ Scottish Kingsmen under Drury and Regent Morton, Siege of 1573

Artillery Piece	Nationality	Calibre Inches	Shot Diameter Inches	Shot Weight Pounds	Powder Charge Pounds	Point Blank or Effective Range Paces/Yards	Maximum Range Paces/Yards
Double/ Royal Cannon	England	8.5	8.25	66	30	320/267	1930/1608
Cannon	England	8	7.75	60	27	340/283	2000/1667
	Scotland	6.25	6	33			2040/1700
	France	6.33	6	33-33.25			2040/1700
Great Carthoun	England			48		420/350 est.	2340/1950 est.
Doble Cañon	Spain			48			
Demi Cannon	England	6.5	6.25	30.25	18	340/283	1700/1417
Culverin (Gross)	England	5.5	5.25	17.33	12	400/333	2500/2083
	Scotland	4.67	4.33	16		400/333 est.	2400/2000
Demi Culverin	Scotland	4.5	4.25	12.5			2160/1800
Saker	England/ Scotland	3.5	3.25	5-6	4-5	340/283	1700/1417
Bombard*							
Mortar							

Pace = 2.5 Feet *Stone Projectiles

Sources: Cannon types derived from (Grant 1850: 111, 1849: 335; Thompson 1833: 330; Holinshed 1808: 670; Killigrew to Burghley 27 April 1573; Anon 1573: 80). Cannon specifications compiled from (Guérout and Liou 2001: 231; Caldwell 1981: 60; Hogg 1963: 15-34; Manucy 1949: 34-35; Sheriffe 1592).

Table 4.4 Estimated Cannon Types and Specifications, Edinburgh Castle under Kirkcaldy of Grange, Siege of 1573

Musket Type	Overall Length Inches (cm)	Calibre Inches	Shot Diameter Inches	Shot Weight Pounds	Powder Charge Pounds	Effective Range Yards	Maximum Range Yards
Double/ Royal Cannon	Denmark						
Cannon	Scotland	6.25	6	33			2040/1700
	France	6.6535	6.4035	33-33.25			2040/1700
Gross Culverin (Grande Couleuvrine)	France	5.1969	4.9375	15.125-15.25			2400/2000 est.
Demi Culverin	Scotland	4.5	4.25	12.5			2160/1800
	England	4.5	4.25	9.33		400/333	2500/2083
Battarde (Couleuvrine Bâtarde)	France	4.06	3.81	7.2-7.3			
Moyan Culverin	Scotland	2.75	2.5	3			1560/1300
(Couleuvrine Moyenne)	France	2.913	2.663	2			
Saker	England/Scotland	3.5	3.25	5-6	4-5	340/283	1700/1417
Double Falcons	England/Scotland	3.11	2.86	4			
Quarter Falcons	Scotland			0.5			
Hacquebuts á croc		1	0.75				
Cutthroats	Scotland	1.75	1.5				
Galley Cannon	France						
Double Slangs*							
Slangs*			2.5				
Bombard (Mons Meg)*	Belgium (Mons)	19.685	19.2913	286-375	65-75		3791/3159
Pace = 2.5 Feet	*Stone Projectiles						

Sources: Cannon types derived from (MacIvor 1993: 60-62; Grant 1849: 335; Thompson 1833: 330; Holinshed 1808: 670; Killigrew to Burghley 27 April 1573; Anon 1573: 80). Cannon specifications compiled from (Lewtas et al 2016: 59-60, 63; Guérout and Liou 2001: 231; Caldwell 1981: 60; Hogg 1963: 15-34; Manucy 1949: 34-35; Sheriffe 1592).

Table 4.5 Estimated Attributes of Musket Types Present at the Siege of 1573

Musket Type	Overall Length Inches (cm)	Weight Pounds	Shot Calibre Inches	Shot Weight Ounces	Effective Range Yards	Maximum Range Yards
Arquebus	43 in (109 cm)	7-9 lbs	.58 in	0.64 oz	30-40 y	160-240 y
Caliver	55 in (140 cm)	10-12 lbs	.76-.80 in	1.5 oz	60-80 y	360-400 y
Musket	64-68 in (163 cm-172 cm)	20 lbs	.80-.92 in	1.8 -2.7 oz	To 200 y	To 600 y

Sources: Smythe 1590; Barwick 1594; Petersen 1956; Held 1957; Norman and Pottinger 1979; Krenn, Kalaus and Hall 1995; The Alderney Maritime Trust 2017

They were primarily used on the offensive against enemy infantry and as a defensive counter against enemy cavalry. The pike varied in size from ten feet (3 meters) to twenty feet (6 meters) long, with some exceeding twenty-two feet in length. Ash was a preferred wood for the shaft, a hard wood being needed to prevent the ends from sagging due to the pike's length. The iron spearhead was mounted on the end with reinforcing strips called langets or 'cheeks' (Peterson1956: 98). For armor, the pikemen wore a comb-morion helmet, a full cuirass with full arms and carried an additional sword and dagger for added defense (Norman and Pottinger 1979: 183)

With the basic tactical doctrine of Sixteenth Century siege warfare and the technical capabilities of the weapon systems available it is possible to perform KOCOA on the 1573 to gain valuable insight into 1573 siege of Edinburgh Castle and estimate the location of combatant positions and critical terrain features.

KOCOA Analysis

Terrain Reconstruction

Terrain is the third variable of a KOCOA analysis. KOCOA functions at its best when used in conjunction with a reconstruction of the terrain as it existed at the time of the battle in question (McNutt 2014; Maio *et al* 2013; Mastone, Brown and Maio 2011). The terrain reconstruction of for the 1573 Siege of Edinburgh Castle is presented in Figure 4.4. This terrain reconstruction utilizes an OS Terrain 50 digital terrain model (DTM) obtained from the United Kingdom Ordnance Survey open-source library. A mosaic of the Edinburgh SE and Edinburgh SW map sheets of Roy's Military Survey of Scotland, obtained from SCRAN, was georeferenced and overlain onto the DTM. My initial map research showed that the built environment along the north and west portions of the battlefield remained stable until the construction of Edinburgh's Newtown during the later Eighteenth Century. Urban development related to Portsburgh had overtaken much of area outside the West Port and along the High Riggs-Lauriston Rise by the time Roy conducted his survey circa 1750. Accurate records needed to reconstruct the built environment as of April 20, 1573 (keeping in mind that the Lang Siege had been going on for 16 months by this date with attendant destruction) could not be located. Roy's Survey is used as a proxy with this caveat.

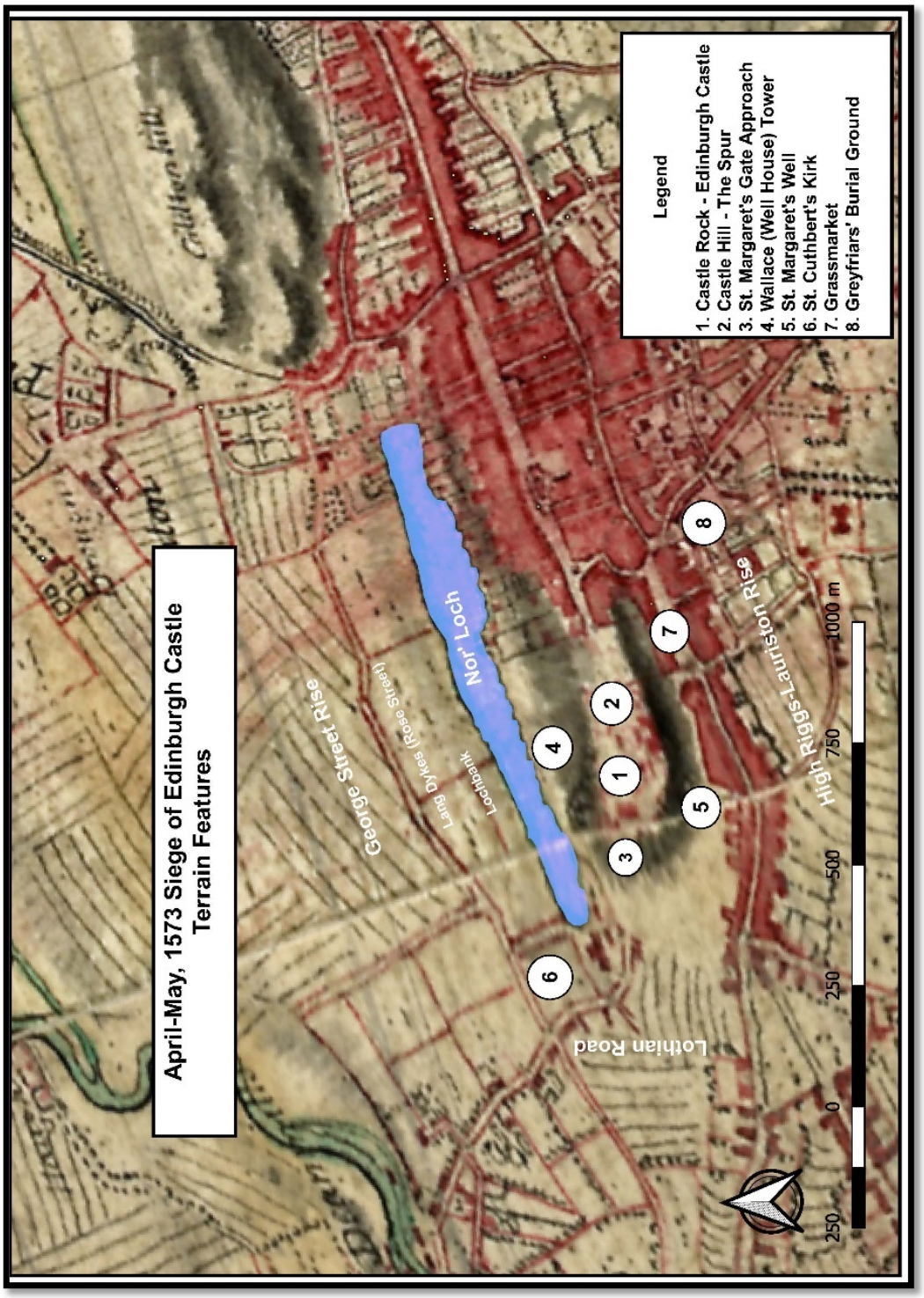


Figure 4.4. 1573 Edinburgh DTM Terrain Reconstruction showing siege locations using Roy's Military Survey as proxy (Drawn by ©Craig J. Brown).

1573 Siege of Edinburgh Castle KOCOA Analysis - Castle Rock and Edinburgh Castle			
Terrain Feature	**KOCOA Classification**	**Reason for Classification**	**Sources**
Castle Rock and Edinburgh Castle	Key Terrain	Basalt Plug. Elongated oval in plan, 300 m (984 ft) x 200 m (656 ft) oriented northwest to southeast. Summit 111 m (364 ft) above sea level. Strong defensive position. Location of Edinburgh Castle. Dominates surrounding terrain. Summit is 84 m (275 ft) above valley floor, military crest 40 m (131 ft) to 60 m (197 ft) above valley floor. Steep cliffs near vertical or 90° in spots. Good 360° observation and fields of fire. Only 3 highly restrictive avenues of approach. Basalt resistant to mining operations. No source of potable water. In 1573, Castle was a garrisoned fortress that acted as the seat of government and royal residence in times of emergency.	
	Observation and Field of Fire – Edinburgh Castle	Castle walls and towers enhanced natural observation and fields of fire. David's Tower tallest structure. 360° viewshed, north to the Firth of Forth 3.6 km (2.25 m), east to Calton Hill, Salisbury Crags, Arthur's Seat 1.6 km (1 m), south to Burgh Muir (Boroughmuir) .8 km (.5 m) and beyond to Pentland Hills 6 km (3.75 m), west to Corstorphine Hill 4.43 km (2.75 m). 360° field of fire out to maximum range of weapon used.	
	Cover and Concealment – Edinburgh Castle	Castle provided cover and concealment for Castle Rock. English artillery used during 1573 siege could direct fire onto all of Castle Rock. Only the Castle's walls provided any form of protection from enemy fire. All of Castle Rock could be observed from points on Arthur's Seat, Calton Hill, High Riggs, George Street Rise, and area west of the Castle. Walls and buildings of the Castle offered protection from observation.	
	Obstacle – Cliff Faces	Nearly vertical on north, west and south diverted traffic onto 3 avenues of approach. Classified as existing and turning. Intrinsic hardness of the basalt made it resistant to mining operations.	

Table 4.6 KOCOA Analysis – Castle Rock and Edinburgh Castle (Part 1 of 2)

	Obstacle – Edinburgh Castle	Classified as both existing (permanent urban cityscape) and reinforcing (built to augment natural defensive attributes of Castle Rock). Further classified as a blocking obstacle intended to control occupation of Castle Rock providing a refuge in time of emergency.	
	Obstacle – Nor' Loch (North Marsh, West Marsh)	Existing, turning obstacle north of Castle Rock and Castle Hill – Esplanade. Artificial loch created by damming of Craig Burn c.1450. Lasted more than 300 years to 1816. Extent and depth of loch depended upon water level. Generally, extended west from area of what is now North Bridge to the Well House Tower and near St. Cuthbert's Kirk. Marshy border. Traffic diverted onto roads around loch. Nor' Loch intended to serve as a fortification.	Maitland 1753: 172
	Avenue of Approach - East	Primary approach into Castle was from east via Castle Hill – Esplanade, through the gate in the south wall of the Spur, then northwest through Porter-Humes Blockhouse to the Portcullis Gate at Constable's Tower. Only viable approach for large body of armed men although highly restricted.	
	Avenue of Approach - West	Secondary avenue of approach via a postern gate on west side of Castle above what is now King's Stables Road. May have been a set of stairs leading from Castle to Stables and St. Margaret's Well. Highly restricted.	
	Avenue of Approach - North	A little-known approach that originated in the Well House Tower and provided communication with the Castle above via a ladder up Wallace's Cradle. Highly Restricted.	

Table 4.6 KOCOA Analysis – Castle Rock and Edinburgh Castle (Part 2 of 2)

1573 Siege of Edinburgh Castle KOCOA Analysis - Castle Hill - Esplanade			
Terrain Feature	**KOCOA Classification**	**Reason for Classification**	**Sources**
Castle Hill - Esplanade	Key Terrain	Location of Spur fortification of Edinburgh Castle. Part of tail formation making up High Street/ Royal Mile. Slopes from 97.5 m (320 ft) above sea level on west to 93 m (305 ft) above sea level on the east. Present ground surface result of fill deposited in 1750's to bury remains of Spur. 1573 ground surface 9 m to 10 m below present surface on North and South edges, 3 m on avenue in interior over Spur. Bedrock here consists of alternating sequences of sandstone averaging .30 m to .60 m thick. Due to bedding mining operations could have been (and were) undertaken here.	
	Observation and Field of Fire	Observation from Castle Hill Esplanade (hereafter Esplanade) depended on the position of the observer and could have been augmented by being on walls of Spur. In 1573, walls of Spur estimated at 6 m (20 ft) high. Present ground surface a good analog. View to west interdicted by Castle. View to east interdicted by Edinburgh. View to north 180° panorama taking in northern portion of Nor' Loch, Loch-Bank (Princes Street), most of the length of the Lang Dykes (Rose Street), south face of the George Street Rise and out to Firth of Fourth. Similar 180° panorama to the south taking in all of Grassmarket and northern face of High Riggs (Lauriston Place). Fields of fire would follow suit out to maximum range of the weapon used. Much depends on the shape and configuration of the Spur. As to how many cannons were deployed and direction they faced.	
	Cover and Concealment	Cover and concealment similar to Castle Rock and Edinburgh Castle above. Esplanade was observable from key terrain around it: Castle Rock, Castle, High Riggs, and the northern portion could be seen from the George Street rise. Artillery fire could have been directed from the same locations. The Spur offered the only protection from observation and enemy fire.	

Table 4.7 KOCOA Analysis Castle Hill – Esplanade (Part 1 of 3)

	Obstacle – The Spur	'Trace Italienne' style artillery fortification originally constructed in 1548 and augmented for 1573 siege. Intended to serve as permanent artillery fortification integrated into Castle's eastern defenses. Controlled access to Castle via main entrance in south wall. Classified as existing-blocking obstacle. Exact configuration of Spur in 1573 is unclear. Most likely corresponded to depictions in 'The Facsimile' and 'Plan of the Repaired Spur'.	Anon 1573: 75; Ewart and Gallagher 2014:102
	Obstacle – The Ravine	A shallow north-south ravine near tip of Spur is depicted on some historical maps and was confirmed by bore hole testing. The ravine possessed a shallow convex profile that slope toward the west. Dimensions are unknown. Its impact on the 1573, if any, is not known. Descriptions of the Esplanade by Johnson and Fleminge and Errington made in 1573 do not mention the ravine. The ravine is classified here as an existing-disrupting obstacle.	Johnson and Fleminge 1573: 69; Errington 1573: 533-534; Rothiemay 1647; Donnelly *et al* 2005: 120-125; Tabraham *et al* 2014: 99
	Obstacle – Northern Slope	Slope gradient in 1573 is unknown. It may have been similar to today at 26% gradient consisting of a gentle slope that abruptly steepens. There may have been a path, but it would likely not accommodate a large body of troops. The close proximity would have left little space for deployment. The Well House Tower if manned may also have been a deterrent. Easier avenues of approach existed east and south. Classified as an existing-turning obstacle.	Rothiemay 1647; Maitland 1753: 172
	Obstacle – Nor' Loch	Please see Nor' Loch Obstacle for Castle Rock and Edinburgh Castle above.	

Table 4.7 KOCOA Analysis Castle Hill – Esplanade (Part 2 of 3)

	Obstacle – The Spur	'Trace Italienne' style artillery fortification originally constructed in 1548 and augmented for 1573 siege. Intended to serve as permanent artillery fortification integrated into Castle's eastern defenses. Controlled access to Castle via main entrance in south wall. Classified as existing-blocking obstacle. Exact configuration of Spur in 1573 is unclear. Most likely corresponded to depictions in 'The Facsimile' and 'Plan of the Repaired Spur'.	Anon 1573: 75; Ewart and Gallagher 2014:102
	Obstacle – The Ravine	A shallow north-south ravine near tip of Spur is depicted on some historical maps and was confirmed by bore hole testing. The ravine possessed a shallow convex profile that slope toward the west. Dimensions are unknown. Its impact on the 1573, if any, is not known. Descriptions of the Esplanade by Johnson and Fleminge and Errington made in 1573 do not mention the ravine. The ravine is classified here as an existing-disrupting obstacle.	Johnson and Fleminge 1573: 69; Errington 1573: 533-534; Rothiemay 1647; Donnelly *et al* 2005: 120-125; Tabraham *et al* 2014: 99
	Obstacle – Northern Slope	Slope gradient in 1573 is unknown. It may have been similar to today at 26% gradient consisting of a gentle slope that abruptly steepens. There may have been a path, but it would likely not accommodate a large body of troops. The close proximity would have left little space for deployment. The Well House Tower if manned may also have been a deterrent. Easier avenues of approach existed east and south. Classified as an existing-turning obstacle.	Rothiemay 1647; Maitland 1753: 172
	Obstacle – Nor' Loch	Please see Nor' Loch Obstacle for Castle Rock and Edinburgh Castle above.	

Table 4.7 KOCOA Analysis Castle Hill – Esplanade (Part 3 of 3)

1573 Siege of Edinburgh Castle KOCOA Analysis – High Riggs			
Terrain Feature	**KOCOA Classification**	**Reason for Classification**	**Sources**
High Riggs – Lauriston Rise	Key Terrain	95 m (312 ft) above sea level ridge of high ground south of the Castle across Grassmarket. Corresponds to the line of Teviot Place and Lauriston Place today. In 1573, it was occupied by farming estates along the north shore of Borough Loch. Possessed superior observation and fields of fire into Castle than the George Street Rise. Same sandstone bedrock as Castle Hill and George Street Rise.	
	Observation and Field of Fire	Observation - Ridge possessed a 180° panoramic observation of the southern half of Castle Rock, the Castle, and the Castle Hill-Esplanade. The majority of Grassmarket and Portsburgh were also in view. The built environment would have partially obscured observation into those locations. Fields of Fire – Summit of ridge was within 219 m (240 y) of the Castle and Spur, well within effective artillery range of both combatants. Entire southern and western face of the Castle was exposed. The southern and eastern face of David's Tower and the Royal Lodgings were dangerously exposed. St. Margaret's Well would have exposed.	
	Cover and Concealment	The ridge itself provided the only natural cover and concealment. Movement behind the ridge was screened from Observation by those in the Castle. The same lee behind the ridge would have protected from artillery fire from the Castle and Spur.	
	Obstacles	There appear to have been no natural obstacles associated with the High Riggs ridge. The Flodden Wall occupied a portion of the northern slope of the rise enclosing Grassmarket. The wall interdicted travel to and from the rise. It is classified here as an existing-blocking obstacle.	

Table 4.8 KOCOA Analysis High Riggs (Part 1 of 2)

	Avenues of Approach	The Rise was easily accessible or circumvented by the road network south of Edinburgh. Bristo Port Gate in the Flodden Wall at the top of Candlemaker Row allowed access from town. Thieves' Raw (Present Drummond Street and West College Street connected with Old Dalkieth Road. This allowed communication with Holyrood Palace, Leith and Dalkieth. The Vennel connected the ridge with the West Port and Portsburgh.	

Table 4.8 KOCOA Analysis High Riggs (Part 2 of 2)

1573 Siege of Edinburgh Castle KOCOA Analysis – Lothian Road Area (Ancient Castle Gardens)			
Terrain Feature	**KOCOA Classification**	**Reason for Classification**	**Sources**
Lothian Road Area (Ancient Castle Gardens)	Key Terrain	Saddle type ridge of higher elevation connecting High Riggs and George Street Rise west of the Castle. Elevation at High Riggs 80 m (262 ft) above sea level; descending to 72 m (236 ft) directly opposite the Castle; rising slightly to 71 m (233 ft) at the base of George Street Rise. This ridge passes close to the Castle Rock averaging about 110 m (120 y) but is closer in the area of the present car park on King's Stables Road. Classified as key terrain because it completed the Kingsmen contravallation of the Castle. Provided good observation into west-northwest area of Castle but was dangerously exposed to artillery fire from Castle.	
	Observation and Field of Fire	Observation - Good observation into interior of west-northwest area of Castle. Ability to observe King's Stables Road may have depended upon where the observer was in relation to the military crest of the ridge. The military crest adjacent to the Castle was exposed to musket and artillery fire from the Castle. Fields of Fire – Depended upon proximity to the Castle. Differences in elevation between Castle and Ridge resulted in different angles of fire. Depending on proximity to the Castle, the Castle's artillery and musketry may have been able to fire directly into the Kingsmen trench. There was a small knoll of higher elevation near to present day Usher Hall that was 78 m (256 ft) above sea level that may have been used as an artillery position. It would have been 219 m (240 y) from western defenses of the Castle, this was in the effective range of artillery present.	

Table 4.9 KOCOA Analysis Lothian Road (Ancient Castle Gardens) (Part 1 of 2)

	Avenues of Approach	In 1573, this area was open fields, gardens and orchards that once belonged to the Castle. The nature of the gardens allowed slightly restricted cross-country movement.	

Table 4.9 KOCOA Analysis Lothian Road (Ancient Castle Gardens) (Part 2 of 2)

1573 Siege of Edinburgh Castle KOCOA Analysis – George Street Rise			
Terrain Feature	**KOCOA Classification**	**Reason for Classification**	**Sources**
George Street Rise (Newtown, Edinburgh)	*Key Terrain*	*Ridge of high ground currently occupied by George Street. Designated as Key Terrain for Kingsmen based on line of sight and field of fire toward Edinburgh Castle. In 1573, this area was open farm and park land traversed east to west by the 'Lang Dykes'. Summit of ridge is 75 m (246 ft) above sea level. Same sandstone bedrock as Castle Hill Esplanade. Used by Kingsmen for artillery battery and contravallation trench.*	
	Observation and Field of Fire	*Observation- From George Street rise would have been impaired by the Northern Curtain Wall of the Castle and the military crest of the rise itself. Curtain Wall and tops of castle buildings such as David's Tower would have been visible. Top half of northern cliff of Castle Rock visible, but military crest would have blocked view to valley floor.* *Fields of Fire- Summit provided good field of fire for artillery directed at north side of Castle. 75 m (246 ft) summit elevation provided a flatter ballistic trajectory. Artillery on summit 329 m (360 y) from Castle still within effective range of Great Carthoun, Culverins and Demi-Culverins of Kingsmen artillery.*	
	Cover and Concealment	*Only cover and concealment provided by Lee on backside or north side of summit.*	
	Avenues of Approach	*George Street Rise easily accessible via road and across country from Leith. Main east-west road was Lang Dykes approximately 60 to 70 yards south of summit but was within Castle's field of fire. Lang Dykes connected with several roads providing access to Edinburgh and points south.*	

Table 4.10 KOCOA Analysis George Street Rise (Newtown, Edinburgh)

The KOCOA terrain features summarized in the above tables correspond to the sections and maps that follow.

Key Terrain

In 1573, the area surrounding Edinburgh Castle, just as it does today, consisted of three parallel ridges of higher elevation (Figure 4.5, 4.6).

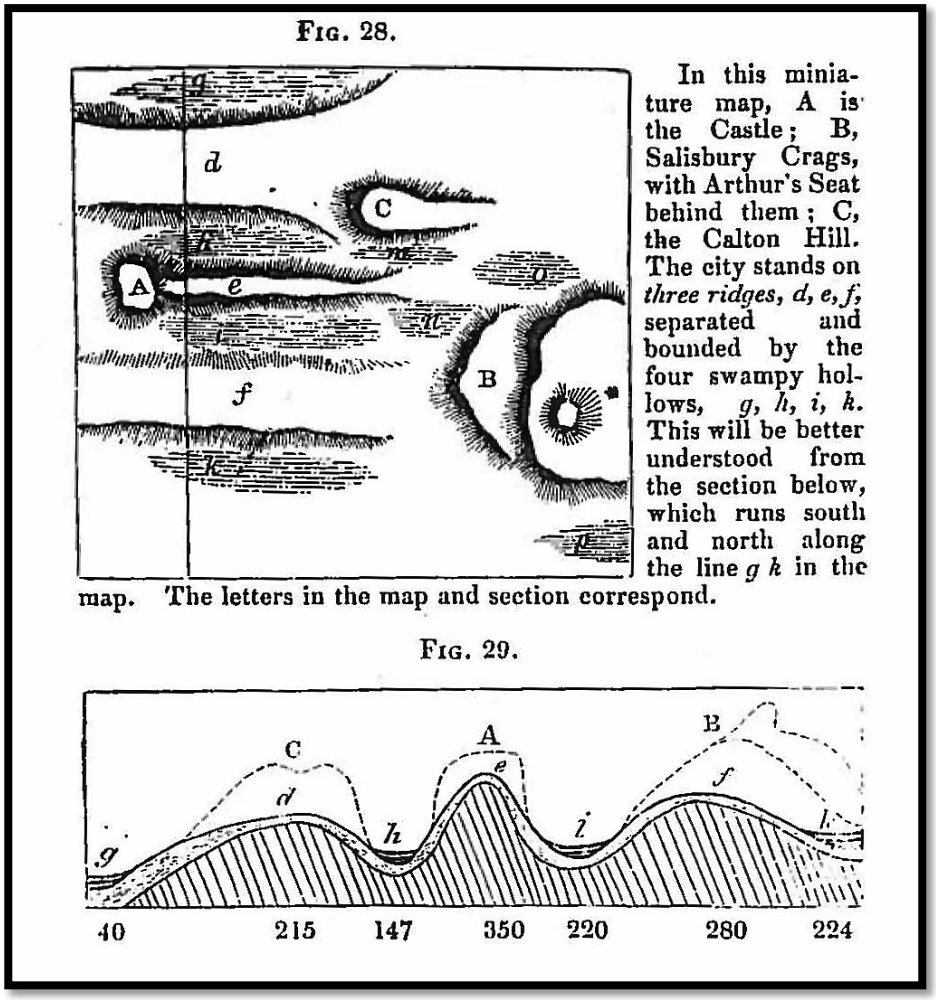


Figure 4.5. Illustration from MacLaren (1984: 20) showing the three ridges that comprise the 1573 Siege of Edinburgh Castle battlefield.

This broken topography accentuated the importance of control of the high ground to siege operations. Edinburgh Castle occupied an easily defendable position atop Castle Rock with steep cliff faces on three sides.

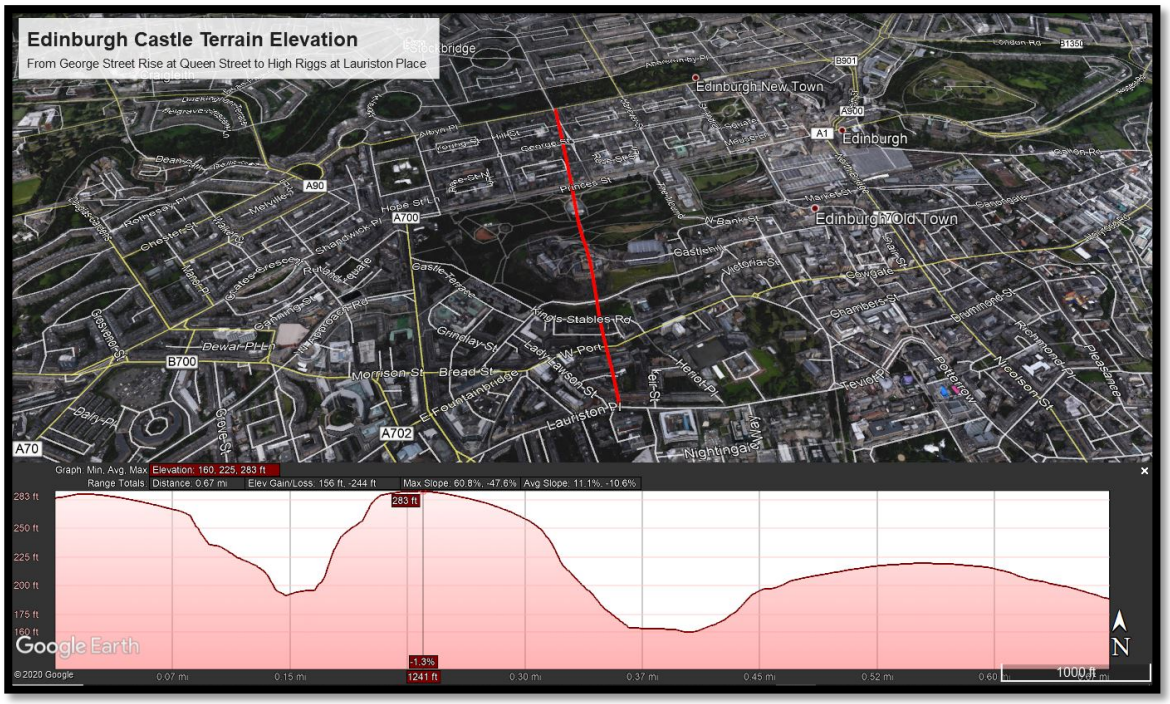


Figure 4.6. Edinburgh Castle Terrain Elevation. Line from base of Frederick Street at Queen Street, to the summit of Castle Rock, and finishes at top of Lady Lawson Street at Lauriston Place. Compare to Figure 4.4. (Drawn by ©Craig J. Brown ©Google Earth).

A horseshoe-shaped valley system borders Castle Rock on the north, west and south that split the battlefield into areas of drastically differing elevations. The Castle dominated the lesser elevations around it, acting as an excellent observation point with a nearly 360º viewshed and field of fire. This can be seen in the modern terrain elevation depicted in Figure 4.6.

As protector to the Scottish Capital, Edinburgh Castle possessed strategic and symbolic value as key terrain (Table 4.6). In order to have proper line of sight to bring artillery to bear on the Castle, as well as to ensure siege fortifications were adequately protected from return fire, the high ground surrounding Edinburgh Castle became key terrain for a besieging army. Key Terrain is shown in Figure 4.7.

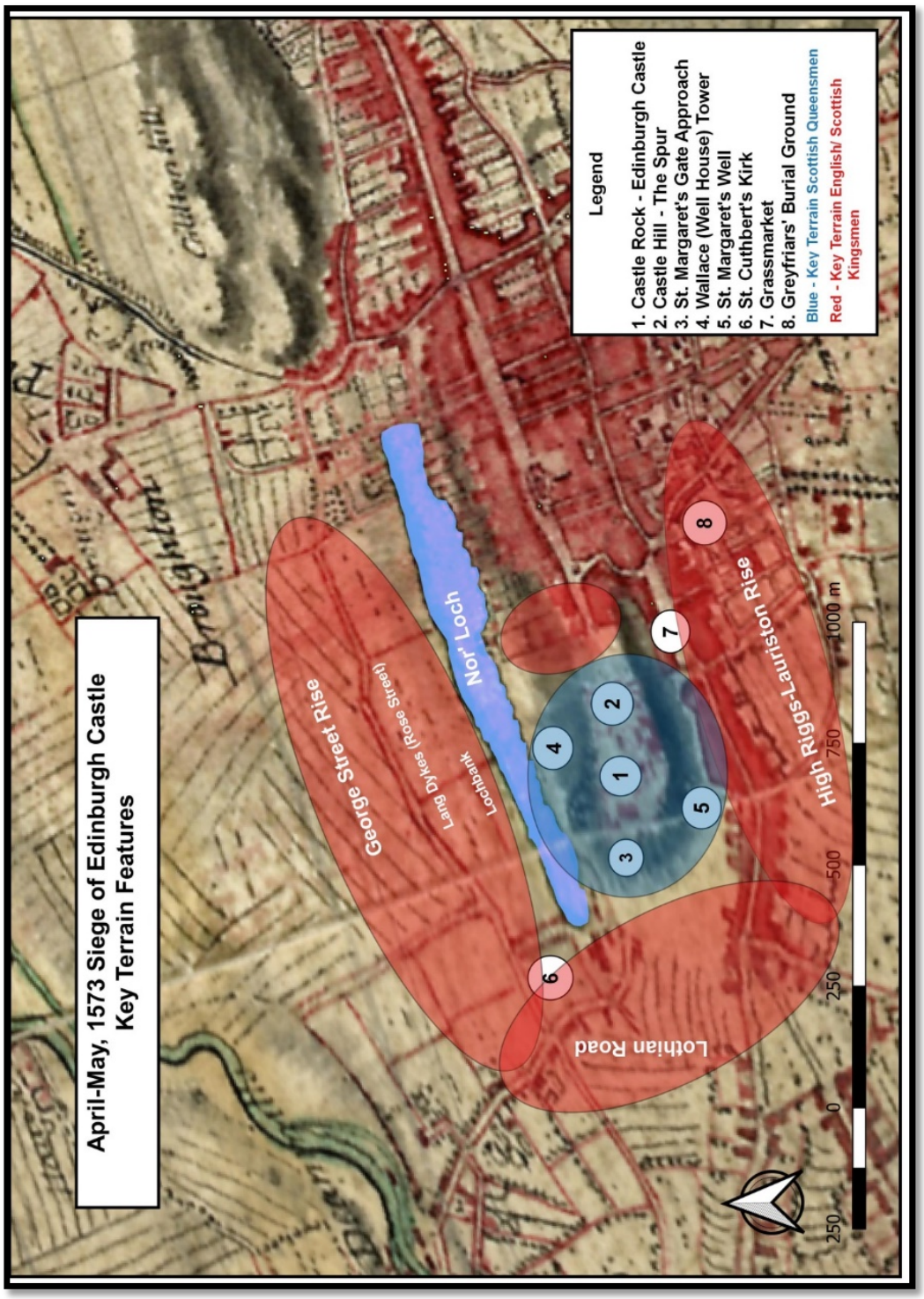


Figure 4.7 Key Terrain Features 1573 Siege of Edinburgh Castle (Drawn by ©Craig J. Brown)

Observation and Fields of Fire

Observation and fields of fire varied considerably depending upon the position of the observer on the battlefield Table (4.6 – 4.10). A detailed discussion of observation and fields of fire can be found in Appendix 4.2. The observation and fields of fire for Edinburgh Castle are presented here (Figure 4.8).

Castle Rock (140 meters/ 460 feet) possesses a comprehensive natural 360º viewshed that is unrivalled by that from the nearby elevations of Calton Hill (100 meters/ 328 feet) and Arthur's Seat (251 meters/ 823 feet) to the northeast and southeast respectively (Ordnance Survey 2016). This vista, in combination with other defensive characteristics of the site, is likely what first drew people to Castle Rock during the Late Bronze Age or Early Iron Age (Driscoll and Yeoman 1997: 220). What can be observed within this viewshed, however, is dependent upon where the observer is within Edinburgh Castle. This is as true today as it was in 1573. Generally speaking, the buildings and fortifications of the Castle would increase elevation and improve observation. Although, these same structures could also completely obscure observation depending on the individual's position. For purposes of discussing the observable viewshed of 1573, it will be assumed that the observer would occupy the best point within the Castle to see the surrounding landscape. In this case (Figure 4.8) the observer is assumed to be occupying the roof position on David's Tower, approximately 65 feet above the summit. The Castle's fields of fire would extend out to the range of the individual weapon being used (see Table 4.4

and 4.5). Cover and Concealment from the Castle can be inferred by the negative areas in Figure 4.8.

Cover and Concealment

Cover

Edinburgh Castle in 1573 provided excellent protection from small arms fire (Table 4.6). An enemy shooter would have to be dangerously close, within 100 yards or so, of the Castle walls to have a realistic chance of hitting a target with an aimed shot. Volley fire could be more effective and extend the range by virtue of increasing the volume of fire. The Castle's walls were thick enough to withstand the shot from a harquebus and caliver of the time and, if crenellated and loop-holed, would have greatly reduced the risk of exposure of an individual on the parapet.

Protection from artillery fire was another matter. The Edinburgh Castle of 1573 was in many respects still a medieval castle, construction beginning in 1336 after having been razed by forces loyal to Robert the Bruce in 1314 (MacIvor 1993: 35-37). The curtain walls and towers were tall, thin, and rose perpendicular to the ground surface, providing inadequate cover from artillery of the sixteenth century. This weakness was recognized, and steps taken to ameliorate it by thickening the base of David's Tower and some of the walls. Oldrieve (1913: 1, 1914: 236) found that the walls at the base of the tower measured 8 feet to 8 feet 3 inches in thickness. Ewart and Gallagher (2015: 45) found that Oldrieve had

excavated through Grange's defensive additions without recognizing their significance. Grange apparently added 2.5 meters of material to the interior of the wall on the east side to effectively double its thickness to 16 feet. The measures taken were not enough, however, to withstand concentrated bombardment for more than a few days. Oldrieve (1913: 3,1914: 235-236) exposed the southern face of David's Tower and found masonry that had been shattered by cannon fire, likely from the battery at Heriot's School. Two 6 inch iron cannon balls were found at the base of the wall indicating that full cannon were in battery at Heriot's School (below). The walls and buildings of the 1573 castle are shown in Figure 4.9. A detailed discussion of cover for all key terrain features is presented in Appendix 4.2.

Concealment

In terms of protection from enemy observation, the Edinburgh Castle of 1573 would have differed little from what we see today (Table 4.6). The Castle's Inner Ward upon the summit of Castle Rock is completely concealed from view by the walls and buildings of the Castle. Even with the aid of a spy glass, an observer on the summit of Arthur's Seat could not see into the Inner Ward. The Outer Ward, where in 1573 the Humes-Porter Blockhouse was located below Constable's Tower on the northern side, was likewise concealed behind a curtain wall. Although, this area was lower in elevation than the summit the height of the curtain wall blocked line of sight into the area. The slope outside the curtain wall, however, was

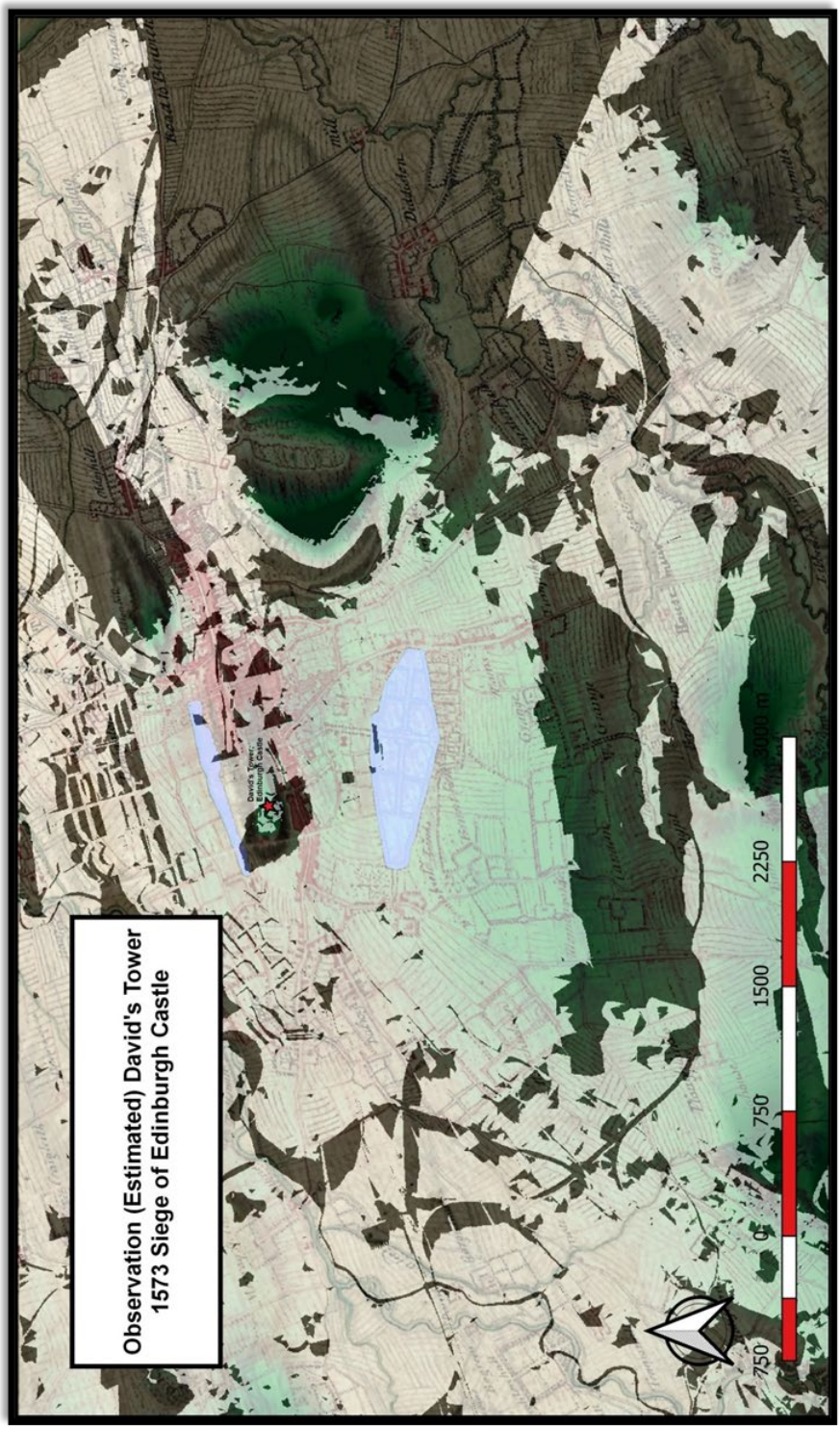


Figure 4.8. Estimated Observation from David's Tower in 1573 (Drawn by ©Craig J. Brown).

open down to Wallace's Cradle (Crane Bastion). This entire section could be observed from the heights across the Nor' Loch from Lochbank to the George Street Rise. Concealment can be inferred by walls and buildings of the 1573 castle as shown in Figure 4.9. A detailed discussion of concealment for all key terrain features is presented in Appendix 4.2.

Obstacles

Edinburgh Castle as it existed in 1573 was a formidable fortification constructed in a way that took advantage of natural existing obstacles of its position. These obstacles are discussed in detail in Appendix 4.2 and summarized in Table 4.6 – 4.10 above. The summary here is concerned with the reinforcing obstacles presented by the castle walls and buildings themselves (Table 4.6). These are synonymous with cover and concealment above (see Figure 4.9).

Avenues of Approach

People visiting Edinburgh Castle today can pick out the two primary approaches that were used in the assault on the Castle on May 26, 1573: the Main Entrance on the east and a secondary entrance through a postern gate on the west side (Figure 4.10).[30] The Avenues of Approach

[30] In 1573, however, there may have been a third approache into the Castle. The third approach originated within the Well House Tower on the shore of the Nor' Loch and made its way into the Castle via a ladder attached to the northern cliff face. This approach was hazardous and likely not in

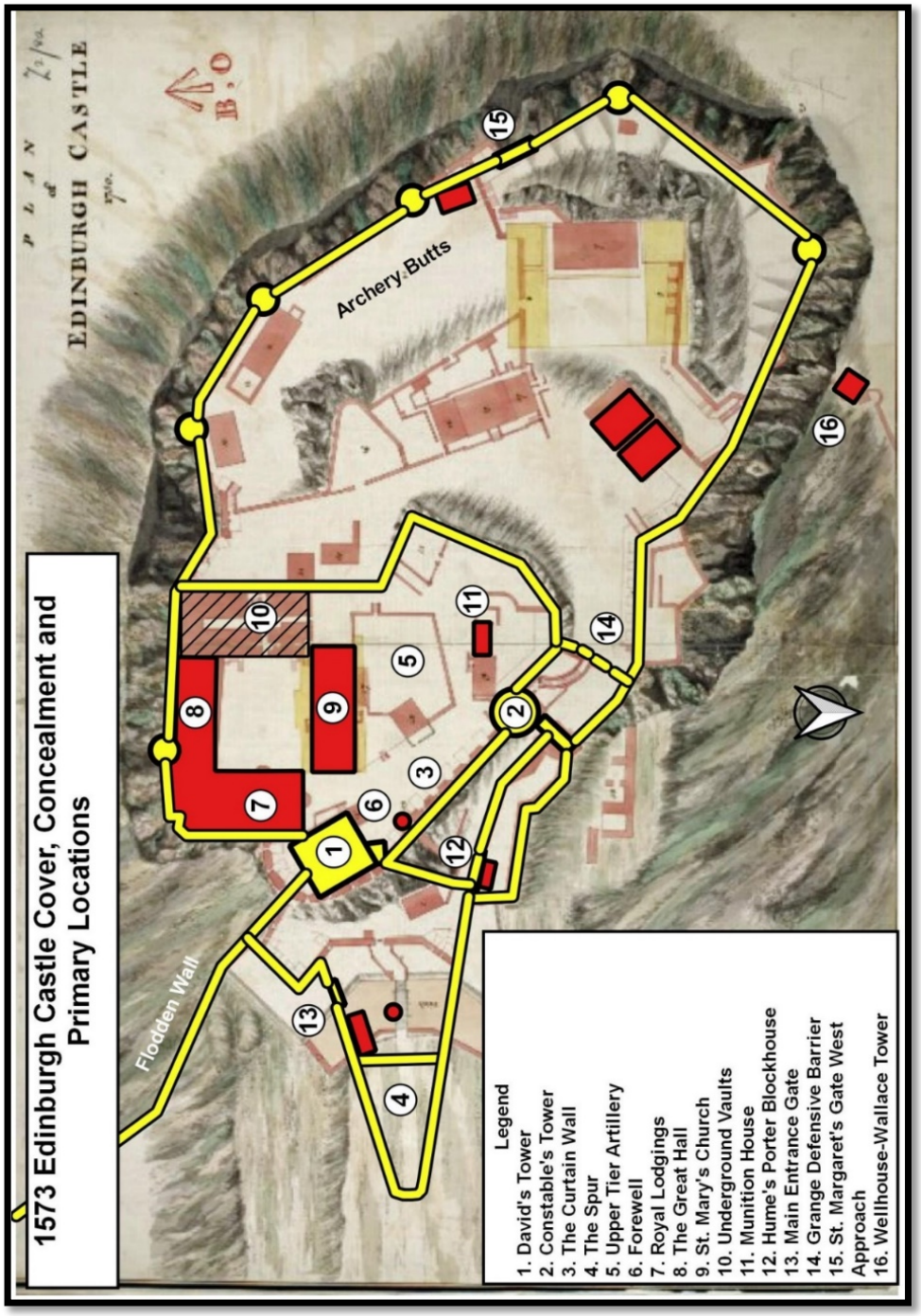


Figure 4.9. Reconstruction Of 1573 Edinburgh Castle Showing Primary Locations Cover and Concealment (Drawn by ©Craig J. Brown).

general use. At the time of the attack on May 26, 1573, it was likely blocked by debris from the collapse of the Curtain Wall and Constables Tower.

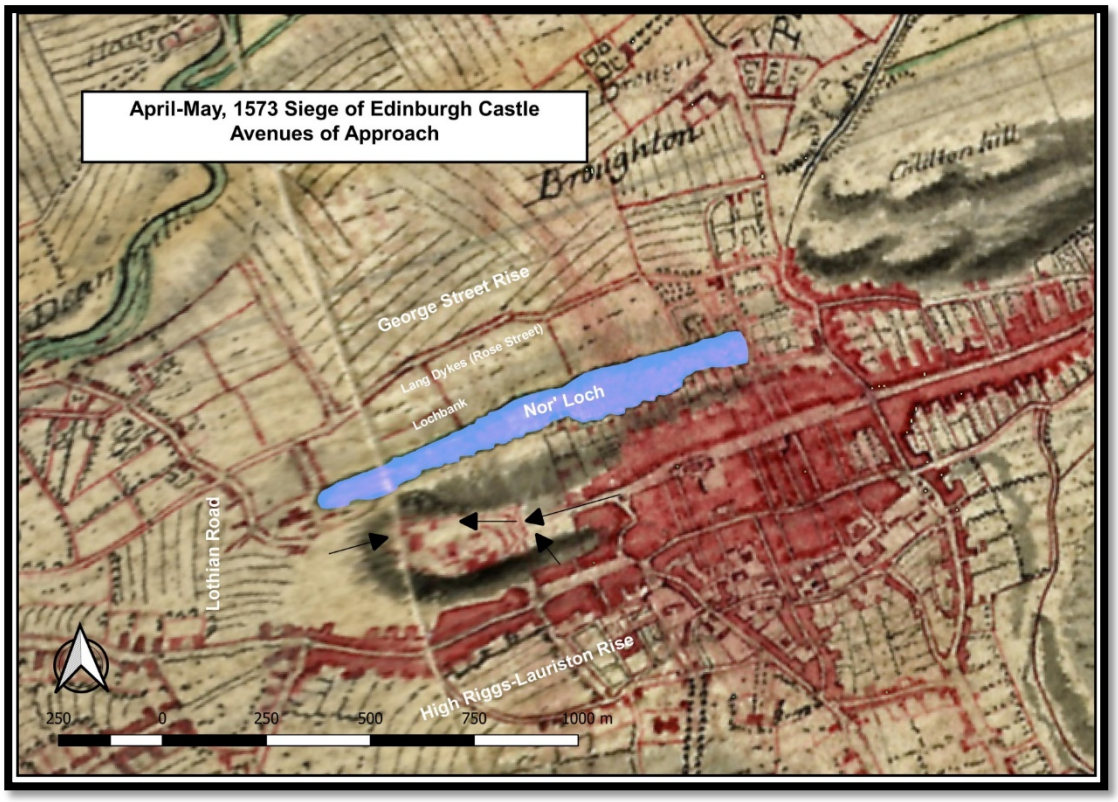


Figure 4.10. Principal Avenues of Approach into Interior Of 1573 Edinburgh Castle (Drawn by ©Craig J. Brown).

are classified as highly restricted for purposes of KOCOA (Table 4.6). Avenues of Approach for all key terrain features are summarized in Tables 4.6 – 4.10 above and discussed in detail in Appendix 4.2.

Discussion KOCOA Analysis

The above KOCOA analysis qualitatively assesses and categorizes the defining terrain features as they likely existed at the onset of the siege on 20 April 1573. This analysis can be used to generate a hypothesis that: delineates battlefield boundaries; locates the English artillery fortifications; and assesses the influence of terrain on the conduct of siege operations.

The locations derived from the KOCOA analysis will be situated within the present Edinburgh cityscape to assess archaeological potential. This model can then be verified with the historical and archaeological record.

The KOCOA analysis establishes that the core of the battlefield associated with the 1573 Siege of Edinburgh Castle corresponds to a box delineated by the modern streets of Queen Street (north), Lauriston Place (south), George IV Bridge/ The Mound (east), and Lothian Road (west) (Figure 4.2). This box encloses the area occupied by the Scottish/ English fortification system and the area where combat relative to the 1573 Siege occurred. Secondary areas of interest exist outside of the core of the battlefield that encompass Kingsmen camps or depots, at or near Leith, Holyrood Palace, and Dalkeith, as well as the avenues of approach to the core battlefield from those locations. Although the core of the battlefield is the primary area of interest to this case study, the proper battlefield boundaries should also include the secondary areas of interest.

The above KOCOA analysis provides a means to locate the English battery positions within the present Edinburgh cityscape through the examination of the 1573 terrain. The January 1573 survey by Johnson and Fleminge (1573: 69-71) proposed a course of action that included the placement of multiple artillery mounts. Johnson and Fleminge suggested that the main, or breaching, battery should be placed on the eastern side of the Castle Hill Esplanade, with a secondary or flanking battery placed to the south on the High Riggs (Lauriston) Rise. They further suggested that movable batteries utilize the Lothian Road area and George Street Rise to

silence the remaining artillery within the Castle (Johnson and Fleminge 1573; 70-71). Johnson and Fleminge's proposed plan utilized a crossfire by artillery batteries to reduce the Castle defenses (Johnson and Fleminge 1573: 70-71). In a letter written on 25 January 1573, Sir Henry Killigrew also stressed the importance of artillery crossfire (Killigrew to Burghley, 25 January 1573). The need for crossfire suggests a particular placement for the artillery mounts where they could have provided overlapping fields of fire or mutually supporting fire to converge on a selected point. The terrain present within the core of the battlefield limits where the English battery mounts could have been placed to affect this crossfire. The core of the battlefield contained a series of three parallel ridges (Figure 4.5, 4.6). Edinburgh Castle occupied an area of superior elevation at the western terminus of the central ridge. In order to have a proper line of sight and angle of fire, the English battery mounts would have likely been placed on the opposing ridgelines.

Due to the considerations above, this author infers that there were five artillery batteries placed on the ridges within the battlefield core. In plan view, these batteries would have taken the form of an underlined 'X', with fields of fire that intersected at David's Tower (Figure 4.11). David's Tower was the highest building within 1573 Edinburgh Castle and could have been easily seen from these positions. Drury himself gives the impression that fire was initially concentrated on David's Tower (Drury to Burghley, 18 May 1573). The primary breaching battery, or 'General Battery' occupied the eastern portion of the Castle Hill Esplanade, near

present Ramsay Gardens (see above). Its field of fire would have been directed toward the Spur, David's Tower, and the Curtain Wall (Figure 4.11 Feature 1). This was the underline of the 'X'. The second battery was placed in a flanking position on the High Riggs (Lauriston) Rise near what is now George Heriot's School (see above). The battery could direct its fire at the Spur, David's Tower, and the Royal Lodgings. The battery would have also overlooked Grassmarket (Figure 4.11 Feature 2). A third battery could have been placed on High Riggs, just above the West Port. This battery could direct fire upon the west and southwest portions of the Castle. A battery here would have also controlled access to the West Port and St. Margaret's well (Figure 4.11 Feature 3). A fourth battery could have been placed near St. Cuthbert's Kirk at the base of the George Street Rise. A battery at this location would have had an excellent line of sight and field of fire toward the northwestern part of the Castle, where St. Margaret's Tower/ Gate stood atop the western approach (Figure 4.11 Feature 4). This position would also be able to observe and fire upon the Well House Tower at the base of the northern side of Castle Rock. The final battery could have been placed on the summit of the George Street Rise in a similar flanking position as the second battery located at Heriot's School. This would place the battery on present day George Street, likely near its intersection with Frederick Street. A battery here would have had a good field of fire toward the northern side of the Castle, including the Spur, David's Tower, the Curtain Wall, and Constables Tower (Figure 4.11

Feature 5). A trench line linking these battery mounts would have provided cover for infantry, as well as completed the encirclement of Edinburgh

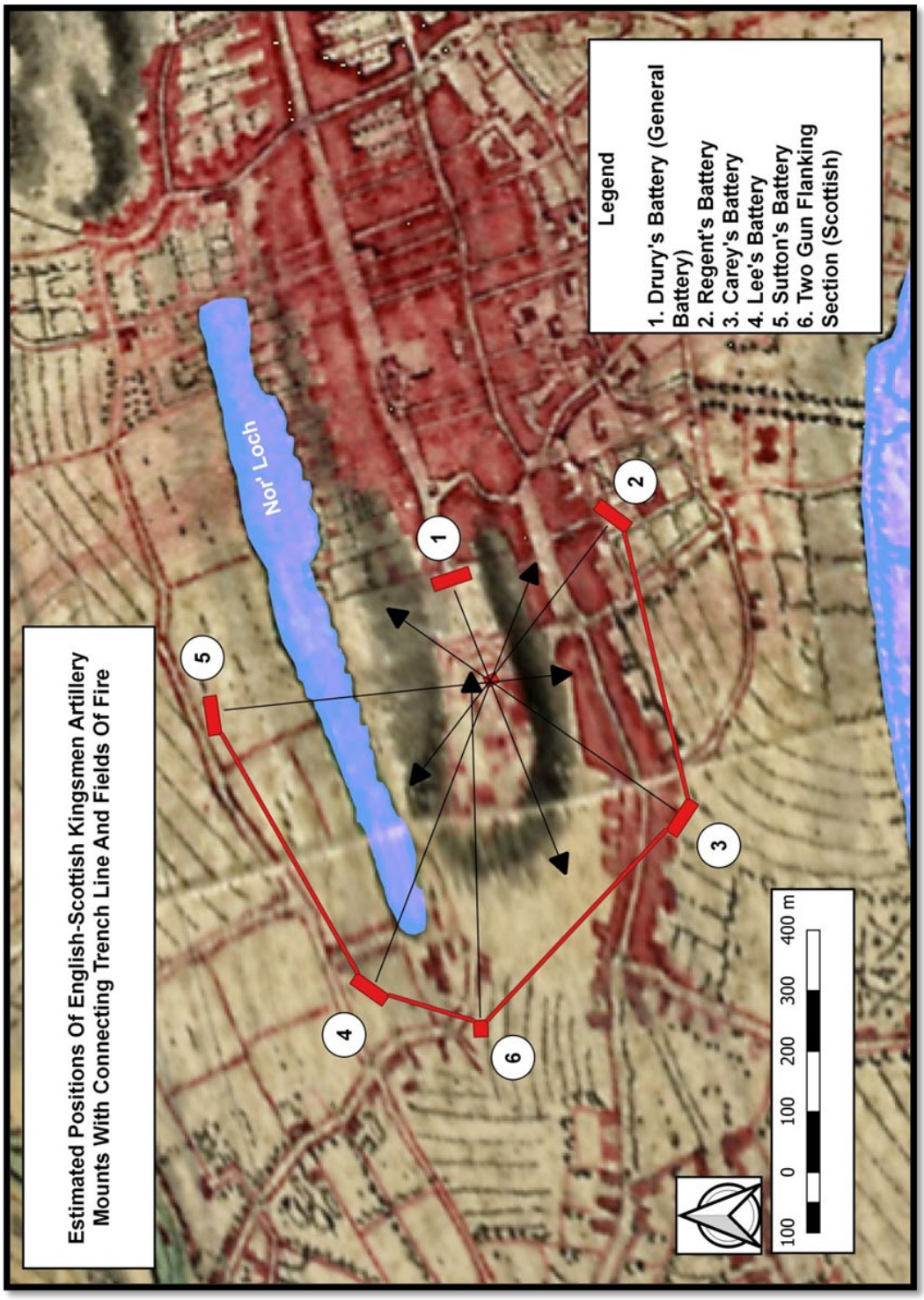


Figure 4.11. Estimated Location of Kingsmen Artillery Mounts, Trench Line and Fields of Fire Initially Concentrating on David's Tower (Drawn by ©Craig J. Brown).

Castle. In this configuration, the battery mounts would have been roughly equidistant from each other along the trench line. This author has eliminated the placement of a battery due west of the Castle due to the elevation and distance considerations described in the analysis. This differs from Figure 4.26 (see Appendix 4.1) due to the fact that the drawing is a suggested placement of artillery and not what actually may have occurred. Historical sources mention a two-gun artillery section west of St. Cuthbert's Kirk that was directed to flank a breech in the Castle wall near St. Margaret's Gate (Figure 4.11 Feature 6). The placement of these batteries within the present landscape of Edinburgh will be considered in the next section.

The above KOCOA analysis evaluates the influence of the terrain on siege operations through the qualitative assessment of the individual terrain features. The objectives of the combatants are explicitly stated in the historical record. The Kingsmen intended to return control of Edinburgh Castle to King James VI (Drury and Ruthven, 17 April 1573; Killigrew to Burghley, 17 April 1573; Anon 1573, 72-73). The Queensmen hoped to retain control of the Castle long enough for aid to arrive from France that was expected by the third Sunday in May (Killigrew to Burghley and Leicester, 7 April 1573, 27 April 1573). Johnson and Fleminge (1573: 69) established that the primary entrance to the Castle was on the eastern side in the southern wall of the Spur. The obstacles associated with Castle Rock dictated that an attack by massed infantry could only have been

directed against the main entrance from the Castle Hill Esplanade avenues of approach. This was where the majority of the Castle's defense were located. Over half of the Castle's usable cannon had been mounted to protect against an attack from the east. A smaller, secondary approach existed on the west side of the Castle but was too small and the approach too steep to accommodate massed infantry. The abrupt changes in elevation surrounding the Castle precluded the use of traditional sapping operations used to breach castle walls. Johnson and Fleminge (1573: 70) determined that mining operations directly against the Castle were impracticable due to the hardness of the rock. In order to breach the Castle walls, a preliminary bombardment would have been necessary. To affect this breach, a ring of artillery batteries would likely have been established as described above. The breach would still need to be on the east side of the Castle to accommodate an infantry assault. The infantry would likely have had to move into position by marching through Edinburgh itself to the Castle Hill Esplanade. The English artillery fortifications are located within the present landscape of Edinburgh below. The 1573 Siege of Edinburgh Castle is reconstructed in Appendix 4.2.

Ground-Truthing The KOCOA Analysis

The terrain features and locations developed in the KOCOA analysis were then located within the present landscape of Edinburgh. Locations in the field were photographed and are herein assessed for archaeological, or

cultural resource management potential. The field assessment of the KOCOA features associated with Castle Rock (Edinburgh Castle) and the Castle Hill Esplanade are contained in Appendix 4.2. The English artillery mounts are assessed below (Figure 4.12).

English Battery Positions

Castle Hill Esplanade (Drury's Battery/ General Battery) (325354, 673552) (Figure 4.12 Feature 1; Figure 4.13)

The battery on eastern side of the Castle Hill Esplanade is one of the only two specifically suggested by Johnson and Fleminge (1753: 70). This battery came to be named for Drury himself. The location of this battery was confirmed by eyewitness Robert Birrel (1605: 20) as containing 5 cannon "at Egers hous in the Castell Hill." The writer of '*A Diurnal*' confirms that 'Patrik Eggaris' owned land on Castle Hill (Thompson 1833: 199). James Grant (n.d.: 89-90) established that the Edgars house occupied the same site as the present Cannonball House Restaurant at the corner of High Street and Castle Wynd. '*A Diurnal*' places only three artillery pieces at this location including the cannon royal, and two cannons (Thompson 1833: 331). The position was described as strongly fortified with gabions (Thompson 1833: 331). This area has seen repeated construction episodes, possibly including those associated with the construction of the present Esplanade. However, archaeological investigation targeting the

1573 siege may identify features associated with Drury's Battery if the fill used to cover the 1573 ground surface also covered the battery location.

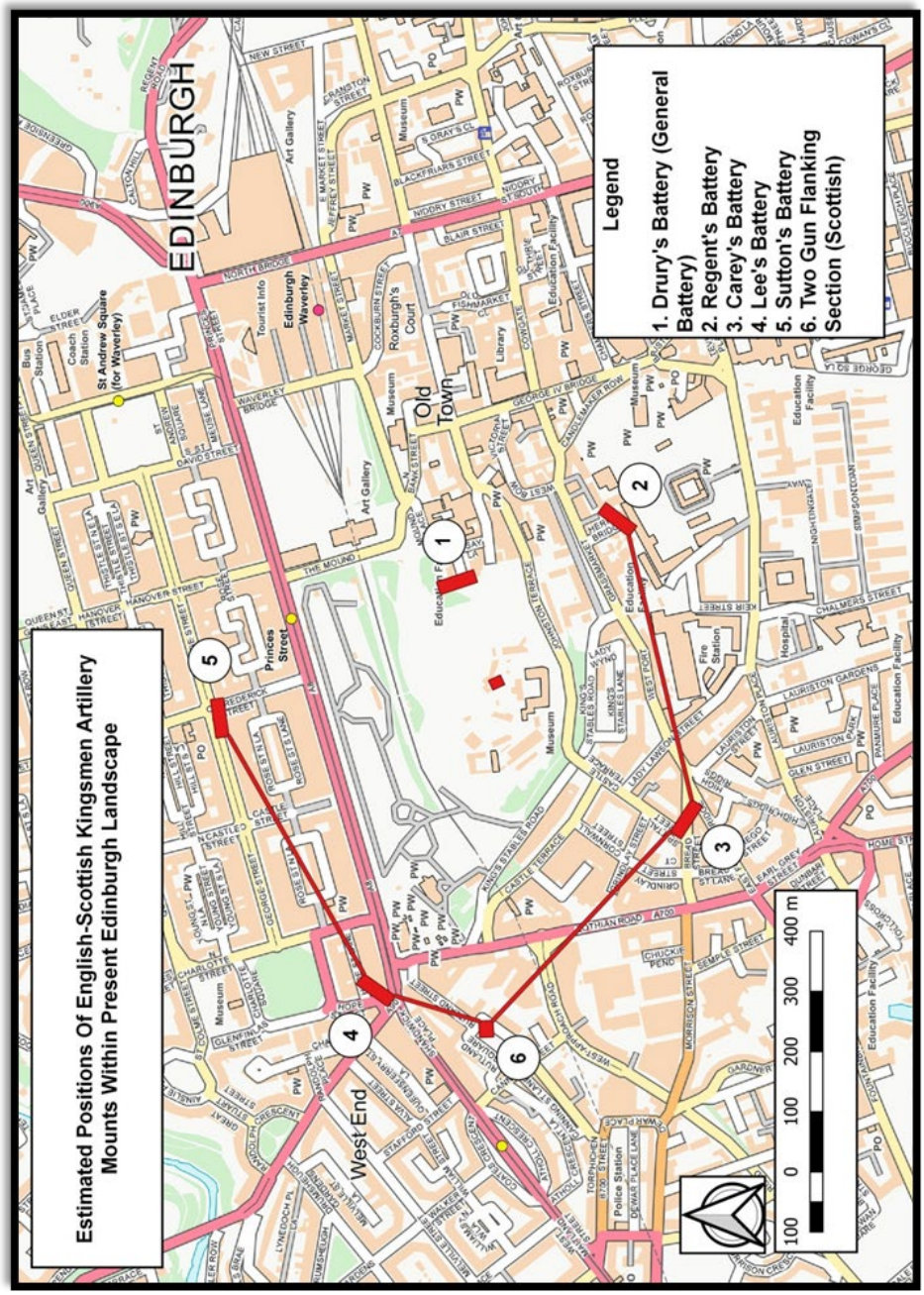


Figure 4.12. Estimated Location of Kingsmen Artillery Mounts and Trench Line in Present Day Edinburgh (Drawn by ©Craig J. Brown).

Figure 4.13. Photo Showing the Eastern End of The Castle-Hill Esplanade the Location Drury's Mount, Kingsmen Trench and Bulwark (Photo by ©Craig J. Brown).

Heriot's School, High Riggs (Regent's Battery) (325455, 673300) (Figure 4.12 Feature 2; Figure 4.14)

Johnson and Fleminge (1573: 70) suggested a battery on the ridge to the south across from the Castle's Royal Lodgings. '*A Diurnal*' places 3 gross culverins at Greyfriars on the Lawson croft (Thompson 1833: 331). Birrel (1605: 20) places five cannon at Greyfriars. Both diarists are likely referring to the plot of land immediately west of the present Greyfriars Kirk now occupied by the George Heriot School. As described above, this position was a good observation point and possessed a good field of fire toward the Spur, both the east and south face of David's Tower and the Royal Lodgings. The artillery mount placed here was likely obliterated by the

construction in 1628 of the present school building and Heriot's Bridge extending north into Grassmarket. The Flodden Wall across the south of the plot was likely removed at the time of initial construction of the school. This site has been severely impacted by building construction and associated landscaping activities that have likely obliterated any trace of the English trench line and artillery fortification that was part of the 1573 siege.

Figure 4.14. Photo of George Heriot's School the Likely Location of The Regent's Battery on The Lauriston-High Riggs Rise (Photo by ©Craig J. Brown).

West Port, High Riggs (Carey's Battery) (324955, 673186) (Figure 4.12 Feature 3; Figure 4.15)

A battery placed above the West Port possessed a good field of fire toward the west and southwest parts of the Castle. This field of fire included the Royal Lodgings, Gun House, and the west and southwest part of the outer curtain wall. '*A Diurnal*' places a battery of six 'gross culverins' at 'Scottis croftis' (Thompson 1833: 331). Birrel agrees stating that 5 cannons were "at Scotts land near ye West Porte (Birrel 1605: 20)." The croft was likely near where the road from the West Port branched into three roads. This intersection lies just west of the present Sainsburys grocery store at the corner of Lady Lawson Street and West Port. Further confirmation of the presence of a battery at this location, and its importance to the conduct of the siege, came from a note written after the surrender of the Castle. This note states that the number one reason for the surrender was a lack of water occasioned in part by a battery placed above what was likely St. Margaret's Well (Holinshed 1808: 680). This area today is heavily urbanized. Most buildings in this area date from the latter half of the 20th Century. Survival of archaeological features associated with the 1573 Siege of Edinburgh Castle is unlikely.

Figure 4.15. Photo of West Port Road Showing Likely Location of Carey's Mount, Where the Building on The Right Is Located (© Photo by Craig J. Brown).

Figure 4.16. Photo of Lothian Road-Princes Intersection. Lee's Mount Was Likely Located Here (Photo by ©Craig J. Brown).

St. Cuthbert's Kirk, George Street Rise (Lee's Battery) (324674, 673701) (Figure 4.12 Feature 4; Figure 4.16)

Birrel does not place an artillery mount near St. Cuthbert's. The anonymous author of '*A Diurnal*' describes either two battery positions, separated by St. Cuthbert's Kirk, or one large position built in an arc above the church. '*A Diurnal*' states that this battery mount was "abone the weft fyid of Sanctcuthbertis kirk lay tua Scottis iyrone peicies; at the north fyid, the Scottis grofs culveringis, and my lord Ergylis cannoun, with four pott pieces" (Thompson 1833: 331-332). The structure of this written passage leads this author to infer that there were, in fact, two separate battery positions. The bigger of the two batteries was on the north side of St. Cuthbert's, likely on Princes Street between Lothian Road and South Charlotte Street. A battery here would have had a good field of fire along

Figure 4.17. Photo Approximating Observation and Field of Fire from Lee's Mount to Edinburgh Castle (Photo by ©Craig J. Brown).

the majority of the northern side of the Castle and, particularly, the area of St. Margaret's Gate (Figure 4.17). The 'pot pieces' were either mortars and bombards or simply mortars. These artillery pieces were capable of firing shells, that detonated via a fuse, in a plunging arc rather than direct fire. The mortars in this battery are likely responsible for the shell fragments recovered from the Well House Tower and David's Tower (see Appendix 4.2). Lord Argyll's cannon is not mentioned elsewhere in the historical records, but it is possible that it was a 'great carthoun' (Table 4.3). The remaining artillery pieces were likely two of the three culverins known to belong to Morton's contingent. The two iron pieces west of St. Cuthbert's were likely the remaining Scottish culverin and demi-culverin (324605, 673513) (Figure 4.12 Feature 6; Figure 4.18; Figure 4.19). These pieces were likely positioned to flank St. Margaret's Gate and cover the western

Figure 4.18. Two Gun Flanking Section Was Likely in The Area Now Occupied by The Caledonian Hotel, Across from The Bus Stop (Photo by ©Craig J. Brown).

Figure 4.19. Approximate Observation and Field of Fire from Two Gun Flanking Section. This photo was taken approximately 50 meters from intended location due to Police activity at the intersection near the Caledonian Hotel (Photo by Craig J. Brown).

avenue of approach. The field work in this area revealed a possible position for these two cannons near the intersection of Castle Terrace and Lothian Road. This position is almost directly opposite the western approach and likely spot of St. Margaret's Gate. The area around St. Cuthbert's is likewise heavily disturbed from urban construction. The old Caledonian Hotel constructed from 1899 to 1903 dominates this area. The Caledonian Railway tunnel also cuts through the embankment in this location. This intensive construction has likely obliterated the archaeological remains relative to the 1573 siege in this area. The two guns west of St. Cuthbert's may not have had a prepared position but may

have been moved there to flank and expose a breach at St. Margaret's Gate.

North Parks, George Street Rise (Sutton Battery) (325128, 673964) (Figure 4.12 Feature 5; Figure 4.20)

Birrel places a battery of five cannon beyond the Nor' Loch (Birrel 1605: 21). '*A Diurnal*' mentions three small pieces to the east of the mortars, at the 'Lang Gait' near 'Buckcleuches' (Thompson 1833: 332). For the reasons described in the KOCOA analysis above, I believe this battery occupied a position at, or near, the summit of the George Street Rise, likely near the present intersection of George Street and Frederick Street. This site provides excellent Observation and Fields of Fire toward the Spur, David's Tower, and Constable's Tower (Figure 4.21). Fife also places a battery at this location, but why he does is unknown (Fife 2004: 13). The 'three small pieces' mentioned in '*A Diurnal*' casts doubt on Skene's interpretation that the 48-pound cannon ball recovered from the Well House Tower was fired from this location (Skene 1822: 472). It is possible that the cannon ball recovered by Skene came from the batteries near St. Cuthbert's Kirk. This area has seen intense urbanization since c. 1767, being in the heart of Edinburgh's Newtown. The likely site for the battery is currently occupied by the intersection and is surrounded by buildings whose core is Neoclassical and Georgian. It is unlikely that archaeological remains associated with the battery mount have survived.

Figure 4.20. Photo of Frederick Street and George Street Intersection (George Street Rise), Likely Location of Sutton's Mount (Photo by ©Craig J. Brown).

Figure 4.21. Approximate Observation and Field of Fire from Sutton's Mount. The Spur, David's Tower and Constable's Tower Would Have Been Clearly Visible (Photo by ©Craig J. Brown).

Conclusion

The application of KOCOA to the 1753 Siege of Edinburgh Castle accurately relocated architectural and terrain features important to the conduct of the siege. This data was used to delineate battlefield boundaries, locate the English battery mounts within the present landscape of Edinburgh, and develop an interpretation of the conduct of the siege. This information can be used in Historical Resource Management, archaeological planning and in answering anthropological or historical questions relative to the influence of terrain to the conduct of war.

The lack of battlefield delineation and identification of its associated archaeological resources constitutes a major threat to the preservation of any battlefield. The lack of accurate location and condition data inhibits the ability to assess potential adverse impacts to archaeological resources. Within an urban setting, continuous development activities obscure, damage and destroy landscape features of the battlefield, archaeological resources associated with the battle and hamper recovery and restoration of the historic landscape of the battlefield (Mastone, Brown and Maio 2015: 173). The core battlefield boundaries relative to the 1573 siege as delineated above were based upon the clustering of terrain and architectural features derived from the KOCOA analysis (Figure 4.2). All combat relative to the 1573 siege, and the archaeological resources associated with it, was contained within the core battlefield boundaries. Invasive ground disturbance within the boundaries of the core battlefield has a high probability of adversely impacting archaeological remains

associated with the 1573 siege. Secondary areas of interest were identified outside of the core battlefield boundaries. One of these, the Observation point of St. Catherine's Convent at Sciennes was assessed (Appendix 4.2).

The KOCOA analysis establishes the location of five English battery mounts with a sixth two cannon section opportunely placed to flank St. Margaret's Gate above the western approach (see above). This placement contradicts the depiction in Figure 4.27 'Facsimile of a Plan of the Siege of the Castle of Edinburgh', but it must be recalled that the drawing was a suggested placement of artillery and may not have been what actually took place. The field verification of the locations of the artillery mounts within the present landscape clearly demonstrates the danger of urban development to non-delineated battlefield archaeological remains. All battery positions and associated trench lines have likely been obliterated by the urbanization of the battlefield as part of Edinburgh's city center. The likely destruction of these critical archaeological features should serve as a stark warning to other Scottish battlefields facing development pressures, notably those at Prestonpans and Culloden.

In spite of the likelihood of the English trench system ringing Edinburgh Castle being obliterated by the urbanization of the city center, there is an analog that demonstrates how the battery fortifications may have appeared and, incidentally, offers some hope for the survivability of their remains. A 'Drawing of the Siege of Leith, May 1560' (Petworth 1560) depicts a large English artillery battery known as 'Somerset's Mount'

(Figure 4.22). Harris (1991: 364) places the construction of 'Mount Somerset' near the later location of Pilrig House (built in 1638) during 'the second approach' near the end of April 1560. 'Somerset's Mount' may have been initially constructed as a field fortification with bastions and artillery with four cannons deployed to fire on Leith and two additional cannons positioned to protect the flank of the siege line. A second battery of nine field guns was constructed to fire on Leith (Harris 1991: 366). The 1560 Siege of Leith took place only thirteen years before the 1573 Siege of Edinburgh Castle and employed the same tactics and armament. The appearance of 'Somerset's Mount' as depicted in the 'Drawing of the Siege of Leith, May 1560', the manner of its construction, its function, and position within the English siege line likely approximates the English siege line and artillery fortifications at Edinburgh Castle. In 2006, Tony Pollard excavated Pilrig Park as part of larger investigating the archaeology of Leith's green spaces (Pollard 2008: 159). In an area that the 'Drawing of the Siege of Leith, May 1560' indicated a possible entrance to fort, the excavation uncovered a ditch feature filled with sand and fill that was capped by soils associated with the gardens of Pilrig House (Pollard 2008: 167-170). This ditch contained two additional contemporaneous features. The first was a feature cut into the ditch that contained a high density of coal and clinker which was interpreted as the remains of a forge or blacksmith (Pollard 2008: 170). The second was a foundation slot for a wall or partition that contained two sherds of 16th century pottery (Pollard 2008: 170). Although, there was some mixing of contexts, perhaps due to

Figure 4.22. Detail from 'Drawing of the Siege of Leith, May 1560' showing Somerset's Mount circled in white. Its appearance and placement within the English siege line may be analogous to the artillery mounts constructed during the 1573 Siege of Edinburgh Castle (Petworth 1560 image retrieved from https://www.bing.com/images/).

animal burrowing and demolition of the fort, the ditch was interpreted as being associated with ‘Somerset’s Mount’ (Pollard 2008: 178-179). Pollard’s excavation demonstrates the survivability of earthen artillery fortifications of the relevant time period at depth in an urban environment. It also provides a hint of structures and activities carried on in support of the siege that was associated with artillery mounts (i.e., blacksmith). The artillery fortifications were substantial earthworks, and when demolished and buried may have survived in urban locations where subsequent construction activity was additive or not overly intrusive. This does provide some hope that similar remains from the English artillery fortifications and trenches associated with the 1573 Siege of Edinburgh Castle survive in some pockets of the city center (the grounds at Heriot’s School for example).

The KOCOA derived locations of the English artillery mounts also helps to correct the most recent historical reconstruction of the 1573 siege. Potter based his reconstruction of the English artillery fortifications and trench system on the depiction in ‘A Facsimile’ (Potter 2003: 129) (Figure 4.27). KOCOA cast doubt on the reliability of that depiction. Further investigation of the engraving itself revealed that it was likely drawn from Johnson and Fleminge’s sketch of proposed battery positions that accompanied their survey and was not a truly accurate rendition of the siege (Johnson and Fleminge 1573: 169-71) (see Appendix 4.1). The KOCOA derived location of the artillery mounts provided an alternative

interpretation for the origin of the munitions recovered by Skene (1822: 472) from the Well House Tower (Appendix 4.2).

During the KOCOA analysis surviving architectural features associated with the 1573 castle were identified through published excavation reports. The most important elements belong to the eastern defenses and the Well House Tower. The rediscovery of the basal stories of David's Tower beneath the Half Moon Battery by W. T. Oldrieve (1913,1914) during excavations in 1912-1913 revealed that the structure survives to a height of 40 feet in the south-east corner. Oldrieve's (1913: 3-4, 1914: 235-236) exposure of the southern face of the tower in particular showed masonry shattered by cannon fire and recovered two 6 inch solid shot iron cannon balls from the base of the tower that likely came from the battery placed near Heriot's School. The interior of the tower base still retains the additional walling added to protect against artillery particularly on the eastern side (Ewart & Gallagher 2014: 45).

Oldrieve (1913: 5-6, 1914: 243-249) also excavated the remains of a gun platform set within the section of Curtain Wall immediately adjacent to David's Tower on the north. The loophole of this embrasure was sighted with a field of fire directly east down High Street. This embrasure likely housed one of the French 6 ½ inch calibre cannon (Balfour *et al* 1566: 166). Several 6 inch iron cannon balls were recovered from a water tanks below this gun position (Oldrieve 1914: 249). The French 6 ½ inch calibre cannon, however, fired a 6.4 inch diameter shot (see Table 4.4). The initial interpretation was that the 6 inch cannon balls recovered by Oldrieve were

intended for use by this battery, the difference in size being the windage, however, upon further reflection, the difference in shot size raises some interesting questions. It is possible that the 6 inch shot (Oldrieve did not record 6.4 inch shot being recovered) represents Grange being short of ammunition, or that Oldrieve may have been rounding his measurements. It is possible that the 6 inch shot belonged to another battery nearby or represents shots fired by the English battery placed at the eastern end of the Castle Hill Esplanade. It is entirely possible that the 6 inch shot has no association with the 1573 siege.

Oldrieve's (1913: 6, 1914: 256-258) published excavation reports conclude with his investigation of the Fore Well. The Fore Well is located 16 yards to the north of the remains of David's Tower. The 1573 well lies 24 feet below the present floor of the Fore Wall Battery. The well consists of an irregular square cut into the rock to a depth of 110 feet (Oldrieve 1914: 256). A sponge head for a rammer of a 4 inch calibre cannon and a 4 inch iron cannon ball were recovered from the well (Oldrieve 1914: 258). The Fore Well was buried by debris when the eastern defenses collapsed, and this may be when the sponge head and cannon ball were deposited in the well. Fleminge and Johnson (1573: 69) noted the presence of a battery placed some 26 feet above the Curtain Wall. This battery was recorded as early as 1566 as being comprised of 2 'cannon' and 2 'bastard culverins' (Balfour *et al* 1566: 166). The 'bastard culverin' being referred to may have been the French 'couleuvrine battarde' firing a 3.81 inch shot (see Table 4.4). The presence of the sponge head and 4 inch shot may be associated

with the higher battery being positioned between St. Mary's Church and the Munition House (St. Margaret's Chapel). This battery was also positioned with a field of fire to the east covering the Castle Hill Esplanade and High Street.

Remains of the Spur were uncovered during excavations of the Castle Hill Esplanade from 2009-2011 (Tabraham, Suddaby & Neighbour 2014). The south wall of the Spur appeared in the western two trenches. In all over 8 meters of wall was exposed fronting onto Grassmarket to the south. The Spur was found to be constructed primarily of yellow sandstone with ashlar facing. At least a portion of this facing on the south was made up of black basalt. The majority of the tip of the Spur was located in the centermost trench (Tabraham, Suddaby & Neighnour 2014: 106). The configuration of the point failed to definitively establish the configuration of the Spur in 1573 and consequently did not inform the evaluation of fields of fire from the Spur. However, it must be acknowledged that the Spur uncovered during the excavations correspond to the final configuration of the Spur as it went out of use. It had seen action and repair subsequent to the 1573 siege.

In addition to locating the English artillery mounts and architectural features belonging to the 1573 castle, the KOCOA analysis relocated two additional terrain features: St. Margaret's Well and St. Catherine's Convent at Sciennes (Appendix 4.2). The Well House Tower had been incorrectly identified as St. Margaret's Well, when the well was, in fact, along Kings' Stables Road to the south – southwest of the Castle. Access to the well

had been contested through several skirmishes. The relocation of St. Margaret's Well corrects the location of these skirmishes from the north side of the Castle to Kings' Stables Road. St. Catherine's Convent was an observation point, where the detachment of English troops assigned to the assault on the Castle's western approach passed on the morning of 26 May 1573. The discovery of this observation point corrected the avenue of approach of a portion of the infantry assaulting the Castle that morning.

The KOCOA analysis located several architectural and terrain features associated with the 1573 siege that are of archaeological and historical interest. The evaluation of these features proved integral in assessing the influence that the terrain of the battlefield had on the conduct of the siege. KOCOA demonstrated that the terrain surrounding Edinburgh Castle necessitated an adaption on the part of the Kingsmen to the conventional Sixteenth Century siege tactics. The evaluation of the KOCOA derived locations of architectural and terrain features allows for a more accurate and complete historical reconstruction of the siege (Appendix 4.2). The surviving architectural features relocated through the KOCOA analysis provide a tangible link to the 1573 Siege of Edinburgh Castle.

Chapter 5: The Battle of Halidon Hill, July 19, 1333

"Now the Scots marching in the first division were so grievously wounded in the face and blinded by the host of English archery, just as they had been formerly at Gledenmore, that they were helpless, and quickly began to turn away their faces from the arrow flights and to fall."

– *The Chronicle of Lanercost* (Maxwell 1913: 279).

Introduction

On July 19, 1333, a Scottish army under the command of the Guardian, Sir Archibald Douglas, engaged the combined armies of England's King Edward III and Edward Balliol, claimant to the crown of Scotland, at Halidon Hill in an attempt to raise the siege of Berwick-on-Tweed (Figure 5.1). The Scottish attack was made over unfavorable terrain, first having to negotiate a bog or marsh at the base of the hill before climbing the slope to reach the English position. English archers inflicted heavy casualties as each of the Scottish schiltrons cleared the bog and began their ascent up the hill. An intense period of hand-to-hand fighting ensued before the Scots broke and began to withdraw back down the hill in the direction from whence they came. The English pursued, turning the withdrawal into a rout, leaving thousands of dead, including Douglas and much of the Scottish nobility.

The Battle of Halidon Hill came at a critical time during the Second War of Scottish Independence (1332-1357). The loss of a large portion of the Scottish nobility, coming as it did a year after the defeat at the Battle of

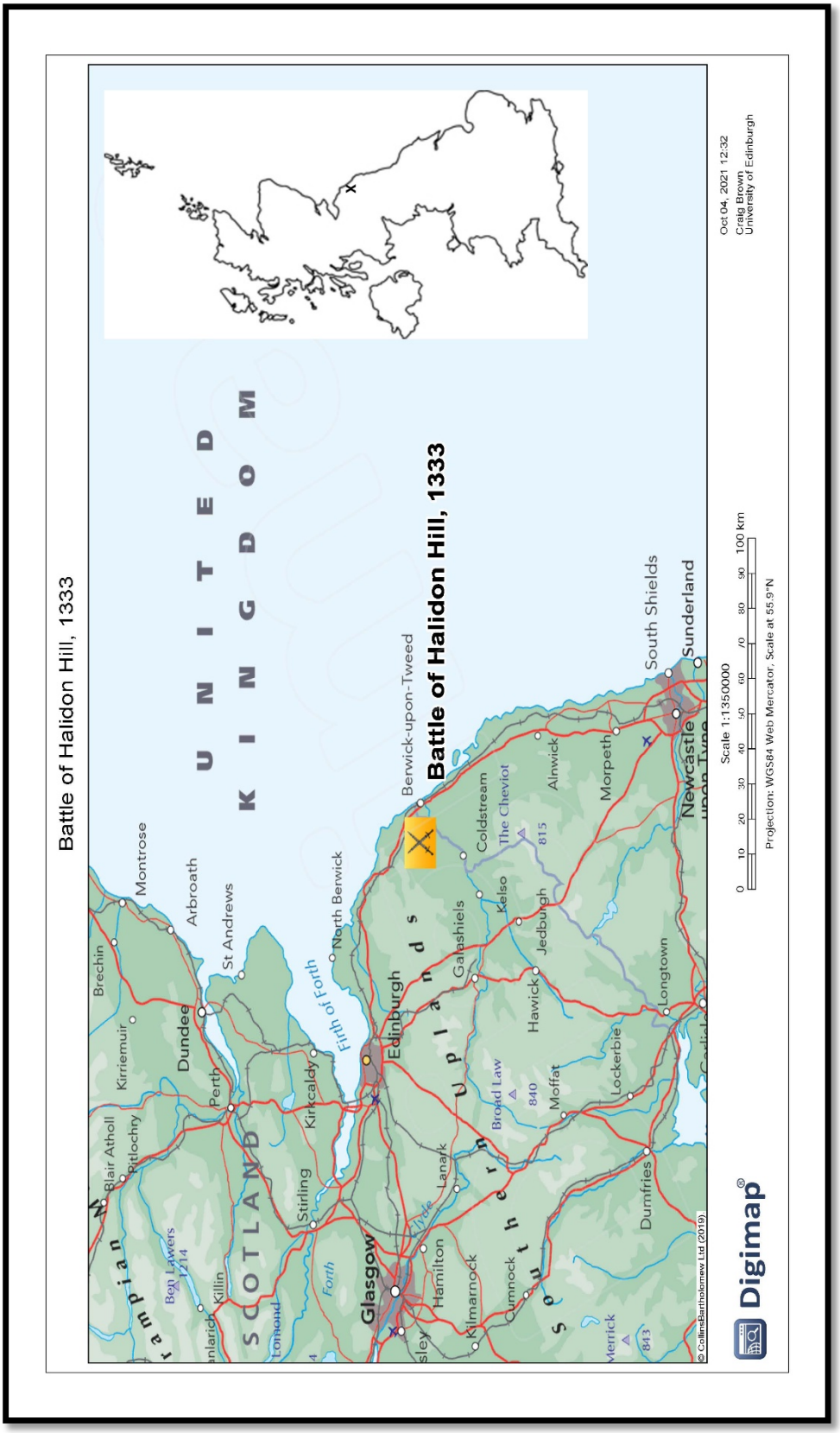


Figure 5.1 Battle of Halidon Hill Location (Drawn by ©Craig J. Brown ©Edina Digimap).

Dupplin Moor threatened to undo the success of Robert the Bruce during the First War of Scottish Independence (1296-1328). The defeat at Halidon Hill prompted the Scottish King David II to flee into exile to Château Gaillard in France, from which he would not return for seven years (Webster 1998: 223). The battle had wider geopolitical ramifications: as payment for Edward III's assistance, Balliol ceded to him a large portion of southern Scotland including the capital city of Edinburgh (Campbell 1965: 185). Berwick, which had been captured by Robert the Bruce in 1318 (Brown 2004: 216), was also included in that cessation. At the time, Berwick was Scotland's most lucrative commercial port generating £640 in customs revenue annually (Campbell 1965: 184-185). Halidon Hill was also where the young King Edward III first adopted the tactics of flanking his dismounted knights and men-at-arms with archers that would make him a successful commander during the Hundred Years War (1337-1453) (Oman 1924: 106-107; Balfour-Melville 1954: 8; Nicholson 1961: 37, 1965: 8; Bennett 1994: 4-5; Verbruggen 1997: 108, 180; Reid 2007: 128).

There are several reasons why this particular engagement is worthy of KOCOA analysis. The Battle of Halidon Hill represents a traditional application of KOCOA to a classic set-piece engagement conducted according to the chivalric conventions of the Late Medieval Period, a time

prior to the widespread adoption of gunpowder weapons.[31] At Halidon Hill, the Scots and the English practiced different tactics, utilized different weapon systems and sought to use the terrain in a way that favored them. In terms of the geographical situation, the location and boundaries of the battlefield are reasonably established in the landscape of today, having been recorded in a number of period chronicles written within 150 years of the battle. The KOCOA analysis was prepared in consultation with the chronicle sources. Placenames within the chronicles identified those KOCOA features directly associated with the battle and provided context of what occurred at those locations. No intensive archaeological survey has been conducted at Halidon Hill (Elizabeth Williams, *personal communication*, March 8, 2018), but a battlefield inventory conducted by English Heritage (1995) and a descriptive inventory record by Historic Environment Scotland (n.d.) record battlefield boundaries and terrain features. The battlefield inventories can serve as independent verification on the boundaries and terrain features derived from the KOCOA analysis. KOCOA features should generally fall within the designated battlefield inventory area. The inventory was prepared using traditional methodology used in the United Kingdom and offers a comparison to the KOCOA methodology used in battlefield surveys in the United States.

[31] The presence of early cannons used in the bombardment of Berwick is recorded in a passage in *The Brut* (Brie 1906: 281), but there is no mention in any of the chronicle sources that those guns were used at Halidon Hill.

Historical Context

The Treaty of Edinburgh-Northampton of 1328 officially brought the First War of Scottish Independence to a close but left certain issues unresolved. The most prominent issue concerned the claims of a group of disinherited nobles whose lordships and lands had been confiscated by Robert the Bruce during that war (Murimuth 1889: 66; Nicholson 1965: 47-59; Brown 2004: 231-232; Preest 2012: 49). Diplomatic attempts to redress the claims of 'The Disinherited', as they became known, failed (Balfour-Melville 1954: 6; Nicholson 1965: 69; Sadler 2005: 184-185). The death of Robert the Bruce on 7 June 1329 left the crown of Scotland in the hands of his infant son, David II. The Disinherited saw this as an opportunity to press their claims for redress through military action. They selected Edward Balliol, whose father had been defeated by Robert the Bruce in the First War of Scottish Independence, as their presumptive king and petitioned Edward III, King of England, for aid (Brown 2004: 232; Nicholson 1965: 71-73).

Edward had his own reasons for wanting the overthrow of the House of Bruce. He regarded the Treaty of Edinburgh-Northampton as disgraceful (Nicholson 1965: 52-56; Brown 2004: 229). The treaty had forced Edward to renounce his own claim to lordship over Scotland (Brown 2004: 229). Edward offered The Disinherited aid covertly by allowing them to organize and recruit for their invasion of Scotland, with the provision that the invasion force was not to enter Scotland by land from England. Three years later, in August 1332, The Disinherited led by Edward Balliol launched a seaborne invasion that culminated in the Battle of Dupplin Moor on 10 - 11 August. Balliol

defeated a much larger Scottish army by deploying his dismounted knights and men-at-arms, with his infantry, in three divisions on high ground. Balliol flanked each division with a strong detachment of archers, deployed so they could rake the front of each division with crossfire. Scottish losses were staggering, perhaps as high as 13,000 (out of 15,000 engaged), providing a preview of what was to come at Halidon Hill a year later (Balfour-Melville 1954: 6-7; Nicholson 1965: 84-90; Sadler 2005: 186-188; DeVries 2006: 117-120).[32] Following his victory at Dupplin Moor, Balliol had himself crowned King of Scotland at Scone on 24 September 1332 (Balfour-Melville 1954: 7; Brown 2004: 234; Sadler 2005:188). Balliol's campaign in Scotland, however, ultimately ended in defeat at the Battle of Annan, 16 December 1332, where he was forced to retreat back into England and seek additional aid from Edward (Balfour-Melville 1954: 7; Brown 2004: 235; Sadler 2005: 189).

Edward allowed Balliol and The Disinherited to refit and launch a second invasion of Scotland, although he was not yet ready openly to commit himself to the cause (Balfour-Melville 1954: 7; Nicholson 1961: 20-21, 1965: 108-109). Early in March 1333, Balliol led a force of The Disinherited and English volunteers across the River Tweed. They raided along the north bank of the river before opening siege operations at Berwick later that month (Nicholson 1961: 22-23, 1965: 110). Balliol spent the remainder of the month constructing trench lines to cut off the landward approaches to the town. In the process of that construction, several pipes supplying water to Berwick

[32] These losses should be treated with caution, however. See discussion related to the accuracy of chronicle sources below.

were located and cut in order to deprive the inhabitants of fresh water (Sadler 2005: 189-190).

In an attempt to relieve the siege of Berwick, Douglas launched a series of raids into the English Marches, Northumbria and Gilsland (Bridlington 1883: 115; Nicholson 1961: 23-24, 1965: 112; Sadler 2005: 190). These raids provided Edward III with the excuse that he had been seeking to turn his covert support of Balliol into open alliance. Throughout the month of April 1333, Edward III assembled his army. On 9 May, he crossed the Tweed with his army and joined Balliol at Berwick (Balfour-Melville 1954: 7; Nicholson 1961: 24, 1965: 112-113; Sadler 2005: 190). Edward brought with him a navy as well, which he employed ferrying supplies and siege engines, perhaps including some early gunpowder cannons (Brie 1906: 281; Nicholson 1961: 27, 1965: 121). These operations continued over subsequent months.

On 27 June, Edward and Balliol launched a combined land and sea assault on Berwick. This attack failed to breach the town defenses but did set fire to a large portion of the city. As a result of this attack, the first of two truces that would ultimately set the stage for the Battle of Halidon Hill was concluded. This first truce stipulated that if Berwick had not been relieved by 11 July, it would be surrendered the following day. Several hostages, including Thomas Seton, son of Berwick's commander, were turned over to Edward to secure the truce (Nicholson 1961: 28, 1965: 123-124).

Upon receiving word of the attack and truce of Berwick, Douglas again marched his army across the River Tweed into Northumbria. He raided along the river's southern bank, reaching the village of Tweedmouth opposite Berwick on 11 July. While there, he burned the village and sent a company of men across the river and into Berwick. Considering Berwick to have been relieved in accordance with the truce, Douglas occupied a nearby hill and waited, clearly offering battle. After several hours, Douglas marched in the direction of Bamburgh Castle (where Edward's wife Queen Philippa happened to be) in the hope of drawing Edward away from Berwick in pursuit (Nicholson 1961: 29-31, 1965: 125; Sadler 2005: 191).

Edward declined to raise the siege and demanded that Berwick immediately surrender. He contended that Douglas's relief of the city was invalid because he had approached from the south, or English bank of the Tweed. When Berwick refused to surrender, Edward hanged Thomas Seton in full view of his parents and threatened to hang two additional hostages each day until the town capitulated. A new truce was quickly agreed upon on 15 July. This second truce stipulated that Berwick would be surrendered at sunrise on 20 July if the town had not been relieved by Vespers the previous evening. Edward listed three ways in which the town could be relieved, the most important of which was through pitched battle on ground between the Tweed and the sea, in other words at Halidon Hill (Figure 5.5) (Nicholson 1961: 31-33, 1965: 126-127; Sadler 2005: 192; Rymer 2006: 864-866). Riders were sent to bring word of this truce to Douglas.

Douglas was located in Northumbria near the town of Morpeth. Upon receiving word of the stipulations of the 15 July Truce, Douglas marched his army north. By 18 July, he had forded the Tweed and made camp at Duns Park (Duns) 13 miles west of Berwick. At sunrise the next morning, 19 July, Douglas marched his army toward Berwick along the Duns Road (now the A6105). English scouts sighted the approach of the Scottish army at approximately 9:00 AM and notified Edward (Bridlington 1883: 115; Nicholson 1961: 33, 1965: 129-132). A reconstruction of the Battle of Halidon Hill follows below.

Historical Document and Image Research

Historical Documents

A number of chronicles written during the 14th and 15th Centuries record the Battle of Halidon Hill in some form. Seventeen chronicles were consulted in the preparation of this case study and have been listed in Table 5.1. Ten of the chronicles that were consulted contained place names and terrain descriptions that were utilized in performing the KOCOA analysis. These chronicles are marked with an asterisk in Table 5.1.

The chronicle sources must be used with caution. Several of the chronicles were written many years after the 1333 battle or were compiled from oral accounts and other chronicle sources. The chronicles vary in the level of detail they contain with several only mentioning the Battle of Halidon Hill in passing (Fordun 1871: 356; Murimuth 1889: 68; Gray 1907: 96;

Walsingham 2012: 196). A number of chronicles eschew details of the battle in favor of recording the names of those who died in the fighting (Hamilton 1849: 308-309; Lumby 1889: 468-470).

The accuracy of accounts of the battle within the chronicles should not be taken at face value due to their didactic nature, moral purpose, and narrative structure. As Given-Wilson (2004: 2-3) has demonstrated, medieval chroniclers conceived the idea of 'accuracy' in three different ways. The first was what we would commonly understand the term to mean today: a precise, accurate conformity to fact, an authentic account of the names, dates, chronology, and events of a battle. The second, according to Given-Wilson, was the belief among medieval chroniclers that "history must have didactic significance, in other words, that the 'universal truths' from any specific episode were just as important as the need to provide an incontestably factual account of that episode (Given-Wilson 2004: 2)". This can be detected in the seemingly formulaic way battles are often depicted. The victorious side is often shown to have been disciplined, to have conducted themselves with valor after being moved by a rousing speech from their leader and committing themselves to God. Providence or God's favor is to be seen in victory. The loser is often portrayed in the opposite light. The third way in which 'accuracy' may have been understood was plausibility, or the degree to which the events of the battle being related and its demonstrated 'truths' correlated with other battles and 'universal truths' encoded therein. The reconstruction of the Battle of Halidon Hill presented in this case study takes

a minimalist approach in its presentation while taking the didactic nature of the chronicles into account. The focus is primarily on terrain.

A brief discourse regarding terrain descriptions will demonstrate the consideration given in evaluating the chronicle sources. Of the ten chronicles marked with an asterisk in Table 5.1, three contained terrain descriptions that facilitated the KOCOA analysis and historical battle reconstruction (Wyntoun 1872: 401; *The Book of Pluscarden* 1880: 202; Bower 1996: 91-93). The chronicles of Burton (1867: 369), Fordun (1871: 356), Higden (1882: 331), Malmesberiensis (1883: 291), Bridlington (1883: 114), *The Brut* (Brie 1906: 286, 287-289) and Le Baker of Swinbrook (Preest 2012: 46) all explicitly name Halidon Hill as the site of the battle but give no physical description of the terrain itself. KOCOA may still be performed using maps or a site visit, but landscapes can change over time and having a description of the terrain itself at the time of the battle aids in providing a more accurate KOCOA analysis.

Table 5.1 Chronicle Source Analysis Battle of Halidon Hill			
Date Written (Published)	**Author**	**Title**	**Sources Used By Chronicle [1]**
c. 1346 (1913)	Unknown (Multiple)	*The Chronicle of Lanercost*	Compiled by multiple authors over time (Wilson 1913: xviii). Was an eyewitness to battle or account was taken from an eyewitness (Maxwell 1913: 279-280).
1347-1360 (2012)	Geoffrey Le Baker (Pachon)	*Chronicon Angliae temporibus Edwardi II et Edwardi III (The Chronicle of Geoffrey Le Baker of Swinbrook)** [2]	Unique account of the battle of Halidon Hill. Possibly eyewitness or taken from an eyewitness.
c. 1347 (1889)	Adam Murimuth	*Continuato Chronicarum*	Chronicle between 1303-1337 is based on personal notes and memory (Thompson 1889: xiv).
Post 1348 (1883)	Unknown (Auctore Malmesberiensi)	*Monachi Cujusdam Malmesberiensis Vita Edwardi II**	Based on Higden (Malmesberiensis 1883: 229).
c. 1350 (1849)	Walter of Hemingburgh (Guisborough)	*Chronicon Domini Walteri De Hemingburgh*	Chiefly derived from personal knowledge and contemporary reports (Hamilton 1848: xii).
c. 1350 (1991)	Unknown (St. Mary's Abbey)	*The Anonimalle Chronicle*	Unknown, but may have used eyewitness or second hand accounts (Childs and Taylor 1991: 19-20).
c. 1357 (1907)	Sir Thomas Gray	*Scalacronica*	Second and third hand accounts augmented by library in Edinburgh Castle (Gray 1907: ix; Thioler 2004).
c. 1377 (1883)	Auctor of Bridlington	*Gesta Edwardi de Carnarvan**	Sources unknown, based on two manuscripts now lost (Stubbs 1883: xix). Higden and Trivet may have been sources (Stubbs 1883: xxvi-xxvii).

Table 5.1 Chronicle Source Analysis Halidon Hill (Part 1 of 2)

1384-1387 (1871)	John of Fordun	*Chronica Gentis Scotorum**	Sources unclear for Scotland (Skene 1871: xxxv). Possibly Higden (Skene 1871: xxxiv).
c. 1388 (2012)	Thomas Walsingham	*Historia Anglicana*	Based on Higden and Hemigburgh (Riley 2012: xviii).
c. 1397 (1889)	Henry Knighton	*Chronicon Henrici Knighton*	Knighton himself states he relied upon Higden (Lumby 1889: 2). Also relied upon Hemingburgh (Taylor 1997: 68; Breslow 1997: 276).
Late 14th Century (1882)	Ranulph Higden	*Polychronica Ranulphi Higden Monachi Cestrensis**	Higden himself lists 40 sources, but these seem to be outside the time and location of Halidon Hill. I infer that since he was alive at the time, he used personal memory and accounts from witnesses.
c. 1400 (1906)	Unknown (Multiple)	*The Brut or the Chronicles of England**	Multiple authors compiled over time. Mostly original and oral accounts augmented by a lost chronicle of William Pakington (Taylor 1957: 425).
c. 1400 (1867)	Thomas of Burton	*Chronica Monasterii de Melsa, a fundatione usque ad annum 1396**	Used Bridlington (Stubbs 1883: xxvi-xxvii), Higden, *Brut*, and John of Brompton (Bond 1867: lxxvi-lxxix).
c. 1426 (1872)	Andrew of Wyntoun	*The Orygynale Cronykil of Scotland**	Own knowledge, eyewitness reports and "lost" records (Macpherson 1795: xviii).
1441-1447 (1996)	Walter Bower	*Scotichronicon**	Continuation of Fordun (Skene 1871: xii; Watt 1991: 289). Account of battle at Halidon Hill is unique (Bower 1996: 90-93). Bower often added items interesting to him (Watt 1991:293). Possible sources include libraries of the Dominican Friars and Edinburgh Castle (Watt 1991: 290-291).
1. Chronicle sources consulted by author relative to Battle of Halidon Hill time period.			
2. Chronicles marked by asterisk contain terrain description and place names used in KOCOA analysis.			

Table 5.1 Chronicle Source Analysis Halidon Hill (Part 2 of 2)

The fullest overall terrain description is that from *The Book of Pluscarden* (1880: 202), which described the…

> "…battle-ground at Halidon Hill, where there was a marshy hollow between the two armies, and where a great downward slope, with some precipices, and again a rise lay in front of the scots before they could reach the field where the English were posted."

This description is not wholly original. In his Introduction to his translation of *The Book of Pluscarden* (1880: 2-3), Skene states that it was the author's intention to write an abridgement of Bower's *Scotichronicon*. This appears to be the case, or at least Bower may have been a source for his description is rather similar:

> "For between the two armies there was then a morass in a little valley, and first the Scots faced a descent and then a steep ascent before they could reach the field of battle (Bower 1996: 91-93)."

Bower's *Scotichronicon* is a continuation of Fordun's *Chronica Gentis Scotorum* (Skene 1871: xii; Watt 1991: 289). The account of Halidon Hill was originally included in the portion of the combined work written by Fordun (1871: 356-357), but Bower's account in *Scotichronicon* is different from Fordun. Bower often revised or rewrote portions of Fordun's work that was of personal interest to him (Skene 1871: xi; Watt 1991: 293) and the passage regarding the Battle of Halidon Hill appears to be one of his revisions. It is not clear what sources Bower consulted in writing about Halidon Hill. As Abbot of Inchcolm, Bower had access to the libraries in Edinburgh (Skene 187: xi; Watt 1991: 290-291) and the Augustinian Priory at St. Andrews. It would

have been possible for him to visit the battlefield. Sources that the chronicle authors consulted are summarized in Table 5.1.

The problem is not that the accounts are similar in *The Book of Pluscarden* and *Scotichronicon*, or that the author of *The Book of Pluscarden* based his account on Bower. The problem is with the inclusion of the phrase: “with some precipices.” *The Book of Pluscarden* is the only one of the three chronicles containing terrain descriptions to use this term. Wyntoun (1872: 401) describes the morass as a “gret syke” and remarks on the climb to reach the English position but does not mention a precipice. It is unclear why the author of *The Book of Pluscarden* chose to include the term precipice in his terrain description for there are no precipices present on the battlefield at Halidon Hill. An examination of aerial images (Figure 5.2, 5.5), topographic maps (Figure 5.3) and a visit to the site (Figure 5.10) confirms this. This discussion of the inclusion of the term “precipice” in *The Book of Pluscarden* is not discursive. A precipice, if present on the battlefield, constitutes a form of obstacle that must be evaluated during a KOCOA analysis.

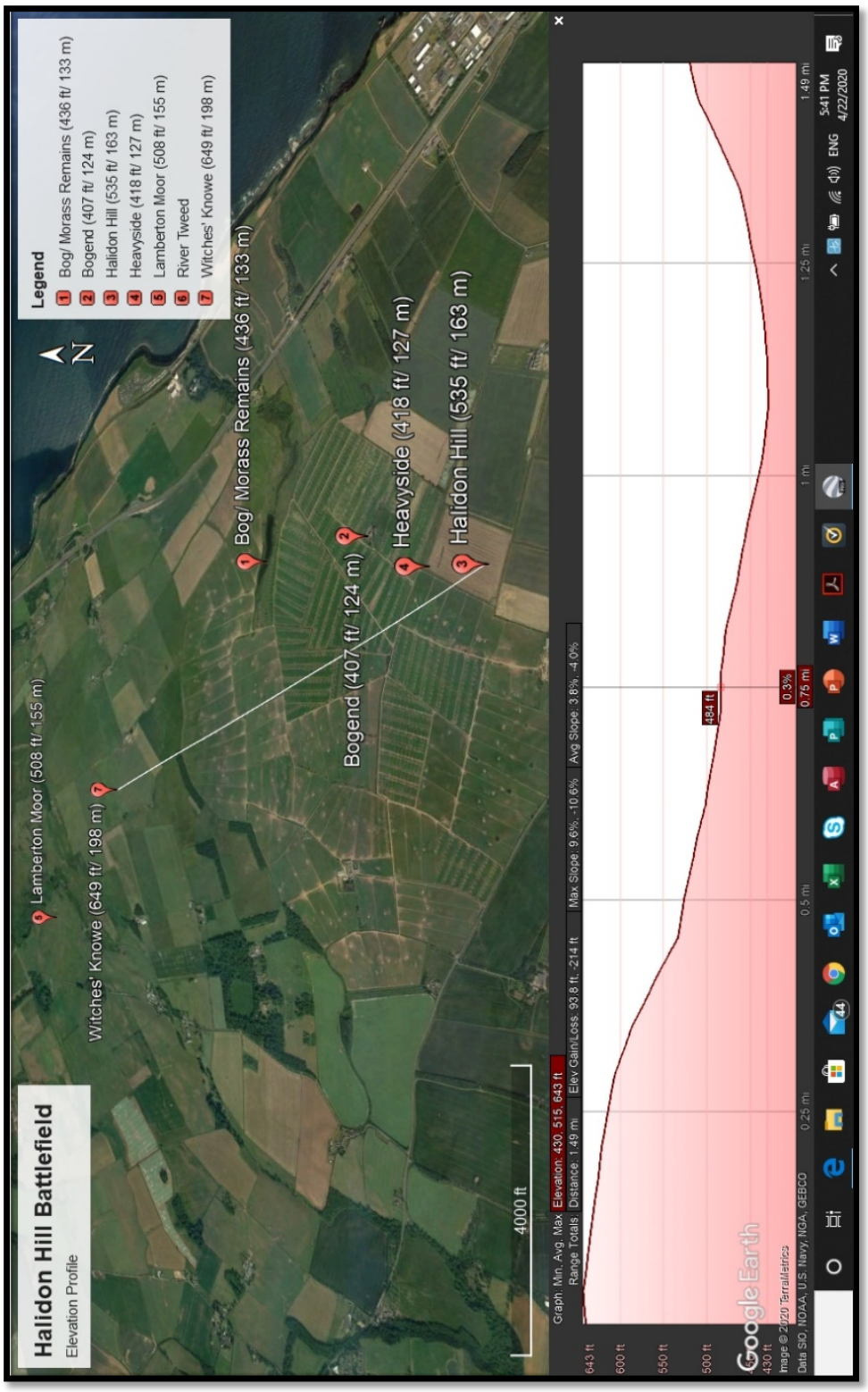


Figure 5.2. Halidon Hill Battlefield Elevation Profile. Showing elevation profile from the summit of Witches' Knowe to summit of Halidon Hill. (Drawn by ©Craig J. Brown ©Google Earth).

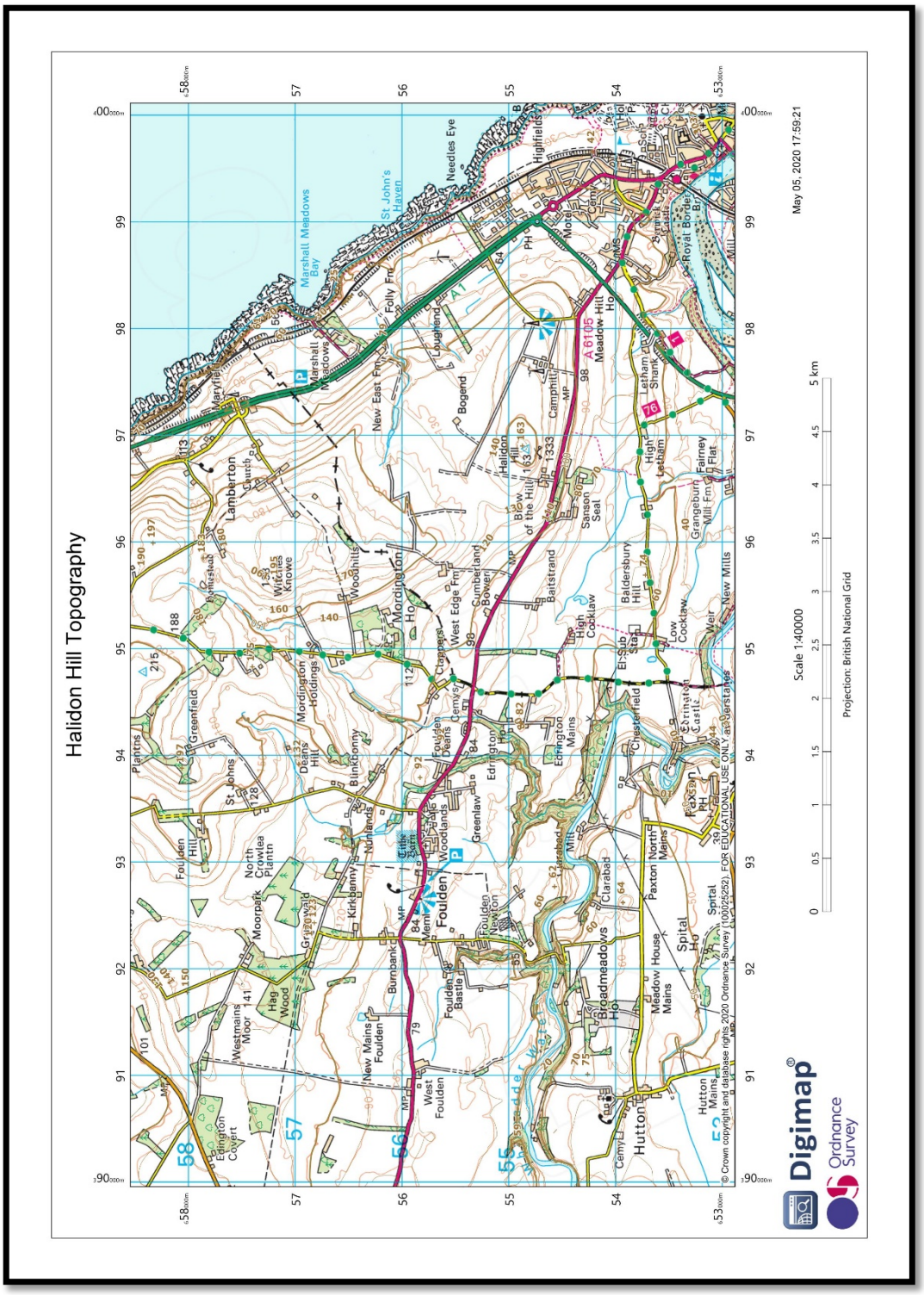


Figure 5.3. Ordnance Survey Topographic Map of Halidon Hill Battlefield Area. (Drawn by ©Craig J. Brown ©Edina Digimap).

Historical Images

One map drawn close to the time of the Battle of Halidon Hill was consulted during the course of this project. The origins of the so-called "Gough Map of Great Britain" are unknown. The map is currently identified by the name of one of its former owners, Richard Gough (1735-1809). Research carried out by The Linguistic Geographies Project posits a date for the drawing of the map, based upon the earliest writing on the map some of which has been overwritten, during the latter part of the reign of King Edward III c. 1370 (Linguistics Geographies Project n.d.). The Gough Map depicts the location of townships in all of Great Britain. Berwick is clearly depicted from the west at the mouth of the Tweed (Figure 5.4). The area of the battlefield does not depict terrain features named in the chronicle sources, such as Halidon Hill, Witches' Knowe and the bog in between. The Great North Road and Duns Road are likewise omitted. The absence of terrain detail in the Gough Map precluded its use in reconstructing terrain for the KOCOA analysis.

KOCOA Analysis

The Battle of Halidon Hill KOCOA analysis project area was established using the bounds called out in the 15 July Truce (see below) (Figure 5.5). The KOCOA analysis for the Battle of Halidon Hill was performed utilizing a terrain reconstruction representing the 1333 landscape (Figure 5.5) and in

Figure 5.4. Close up of Gough Map section showing Berwick-Upon-Tweed from the west. Notice the three streams to the west of Berwick, but no other topography in area of the battlefield as indicated by white circle. (©Linguistics Geography Project n.d.).

consultation with ten of the chronicles (marked with an asterisk in Table 5.1) obtained during the historical documents research.

Objectives

The Battle of Halidon Hill was conducted in accord with the chivalric conventions of the Late Medieval Period and in compliance with a truce concluded between Edward III and the Scottish defenders of Berwick, Patrick Dunbar and William Keith, on 15 July to last until sunrise on 20 July (Rymer 2006:864-866). The 15 July Truce stipulated three ways in which the siege of Berwick could be relieved:

1. The Power of Scotland forced its way across the Tweed by the fishery called the Berwick Stream toward the west; 2. The Scots should win a battle on ground between the River Tweed and the sea by Vespers on 19 July; 3. A

Scottish detachment of 200 men-at-arms could force its way through the English siege lines and into Berwick between sunrise and sundown on 19 July, with a loss of no more than 30 men-at-arms (Burton 1867: 368-369; Brie 1906: 283; Nicholson 1961: 31-33, 1965: 127; Rymer 2006: 864-866).

As there is reason to consider that the terms of the July 15 Truce were adhered to, the second stipulation formed the basis for establishing the Project Area as depicted in Figure 5.5, as it has to lie between the Tweed and the sea. The northwestern boundary of the Project Area was set at Ayton based upon a number of dead from the battle being located there (Scott 1880: 55). The Defining Terrain Features were derived from modern topographic maps and then located on the 1333 terrain reconstruction. The KOCOA analysis was then performed using the terrain reconstruction in consultation the ten chronicle sources and is tabulated in Table 5.2. The force composition and tactics utilized by the combatants formed an interdependent relationship with the KOCOA Terrain Features that greatly influenced the conduct of the battle. The force composition and tactics derived from the chronicle sources are discussed below where appropriate. Walkovers of the battlefield were conducted, during which the Defining Terrain Features, which had been identified during the KOCOA analysis were located on the ground and assessed for their archaeological and historical preservation potential. A historical reconstruction of the Battle of Halidon Hill was then generated using the results of the KOCOA analysis to inform it. The results of this analysis were compared with the English Heritage Battlefield Report: Halidon Hill 1333 (English Heritage 1995) and Historic Environment

Figure 5.5 Battle of Halidon Hill Project Area as established by the Truce of 15 July 1333 (Rymer 2006: 864-866) and Scott (1880: 55) (Drawn by ©Craig J. Brown ©Google Earth).

Terrain Reconstruction Battlefield of Halidon Hill

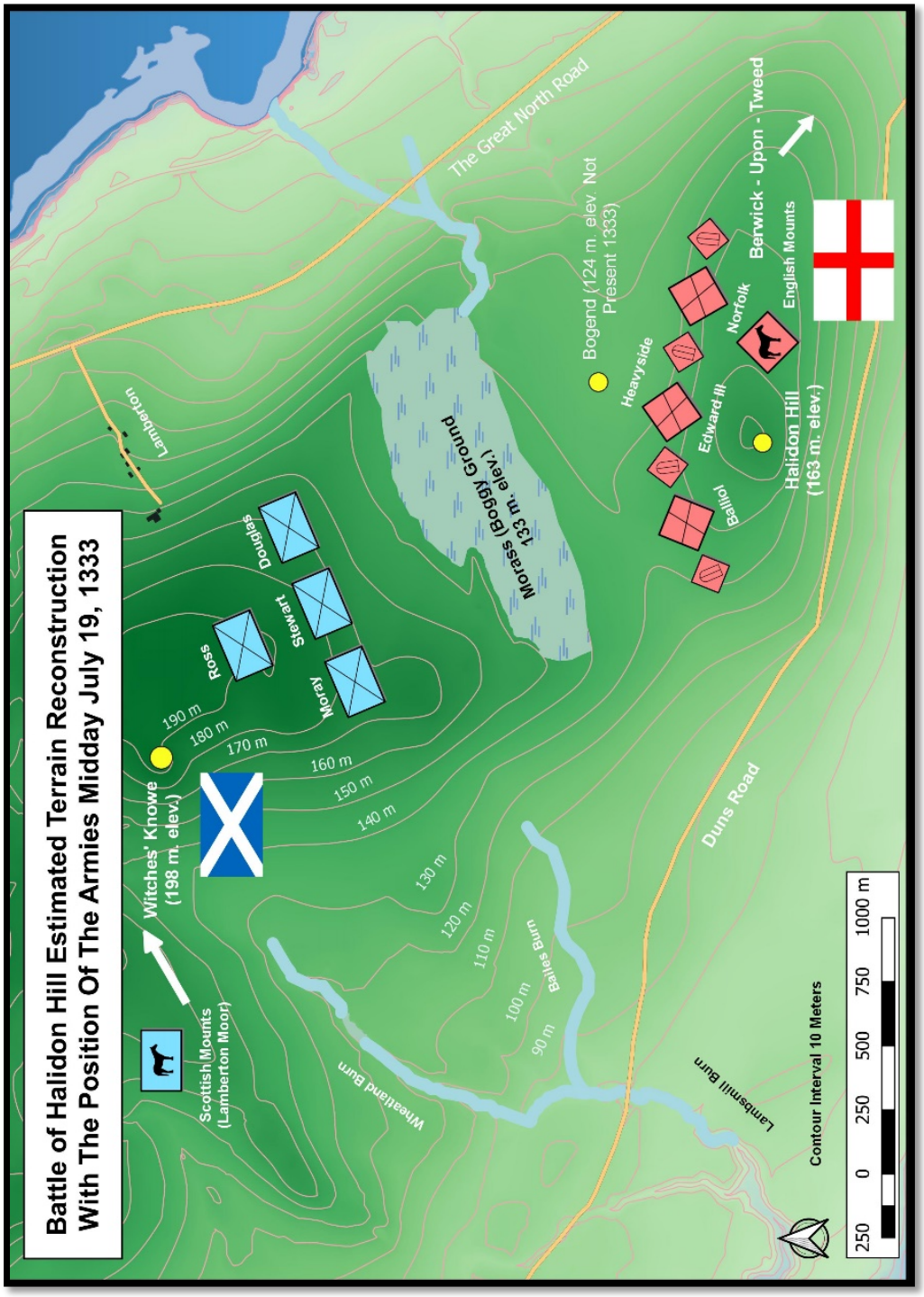


Figure 5.6. Battle of Halidon Hill Estimated Terrain Reconstruction. Showing basic topography at the time of the battle with the estimated start position of each army using NATO symbols. X is infantry. Bullet is archers or missile. Horse is mounted or cavalry. (Drawn by ©Craig J. Brown)

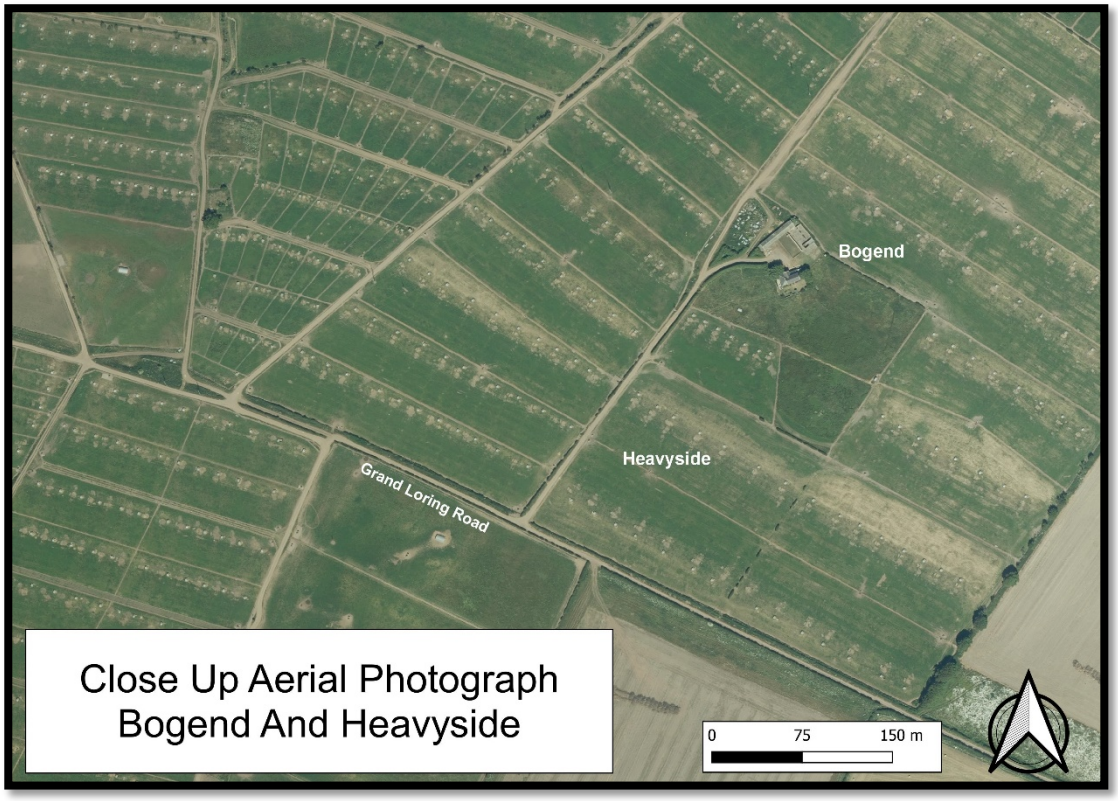


Figure 5.7. Close Up Aerial Photograph of Bogend and Heavyside. Looking for buried walling or burials associated with the battle that may appear as cropmarks (Drawn by ©Craig J. Brown ©Edina Digimap Aerial Imagery 25cm Resolution 1:20,000 Scale).

Scotland: Canmore – Witches Knowe, Lamberton inventory record. Detailed consideration follows in the Discussion below.

Halidon Hill is a 163-meter elevation that lies approximately 2 km to the northwest of Berwick (Figure 5.5). The hill forms one side of a natural, horseshoe-shaped amphitheater that opens to the east. The 198-meter elevation of Witches' Knowe lies approximately a kilometer beyond Halidon Hill and forms the amphitheater's northern side (Figure 5.5). A small unnamed ridge connects the hills on the south along the current alignment of Duns Road (A6105). The low-lying ground between the hills contained a bog

or marsh that drained to the east. This bog is the morass mentioned in the chronicle sources (Wyntoun 1872: 401; *The Book of Pluscarden* 1880: 202; Bower 1996: 90-93), a remnant of which still exists as a stream today. Aerial images (Figure 5.7) do not seem to indicate the presence of field divisions prior to the Parliamentary Enclosures established in the Nineteenth Century.[33] The chronicle sources do not mention the presence of walls or fencing. It is likely that this land was open agricultural or pastureland at the time of the battle.[34] The battlefield comprises a portion of The Liberties of Berwick belonging to the Freemen of Berwick. This land was used for agriculture and pasture, possibly at least as far back as the formation of the Guild during the reign of King David I (1124-1153) and was not divided into parcels until 1605-1608 (Scott 1888: 242-243, 284). A small grove of trees may have been present near the backside of the summit of Halidon Hill (Oman 1924: 106; Sadler 2005: 192), but this is not mentioned in the chronicle sources and has been omitted. The 'Heavyside' placename mentioned in Bridlington as the location of heavy fighting corresponds to the slope of Halidon Hill opposite Bogend as has been included in the terrain reconstruction (Figure 5.6) (Bridlington 1883: 116; Nicholson 1961: 39, 1965: 120, 135).

[33] LiDAR images were also consulted; however, the available tiles only contained the extreme northern and eastern edges of the battlefield. They added little to this study.

[34] A second Battle of Halidon Hill was fought in 1558 when a French detachment from Eyemouth attacked an English garrison stationed on the hill to guard people of Berwick, who were there cutting hay (Scott 1888: 138). Today, the land is used for pig farming and hay fields. This could be evidence of a long tradition of land use that could extend back in time before the battle.

The terrain reconstruction for the 1333 Battle of Halidon Hill is presented, along with the initial deployments of the contending armies derived from the chronicle sources, in Figure 5.6. The base of this reconstruction consists of a mosaic of five OS Terrain 5 DTM map sheets (NU05SW, NT95NE, NT95NW, NT95SE, NT95SW). The five-meter contour lines are an overlay of the OS Terrain 5 contour shape files for the NT95 and NU05 map sheets. The modern alignments of the Great North Road (A1) and Duns Road (A6105) were digitized from the OS Open Map Local NT95 and NU05 map sheets. Shoreline and watercourses were imported as shape files from the same source. The medieval burgh of Lamberton was present in 1333 (Milne 1902: 223-227)[35], but the configuration of its buildings is unknown. The buildings present in the reconstruction were digitized from the OS Open Map Local NT95 map sheet and are intended as a representation only. The extent of the Morass in 1333 is unknown. The size of the bog is estimated here based upon elevation contours and remnant water drainage.

[35] Lamberton appears in a series of conveyances transcribed in Milne (1902: 223-227), the earliest of which dates to 1190-1200.

Battle of Halidon Hill KOCOA Analysis			
Terrain Feature	**KOCOA Classification**	**Reason for Classification**	**Sources**
Halidon Hill (Figure 5.3, 5.5, 5.8)	Key Terrain	163 m (535 ft) elevation 2km NW of Berwick at intersection of Great North Road (A1) and Duns Road (A6105). Open with grass and scrub. Possible grove of trees near summit at time of battle. Strong	Burton 1867: 369; Fordun 1871: 356; Wyntoun 1872: 400; *Pluscarden* 1880: 202; Bridlington 1883: 114-115; Malmesberiensi 1883: 291; Preest
		defensive position protecting land avenues of approach to Berwick. Good observation of surrounding terrain.	2012: 46.
	Observation and Field of Fire	Good line of sight to south and southeast overlooking River Tweed and Berwick. Good line of sight to west overlooking Duns Road. Good line of sight east overlooking Great North Road. View to the north is interdicted by Witches' Knowe 1 km distant. Archers occupying military crest had a field of fire out to at least 230 m (250 y) or the effective range of the English Longbow (Figure 5.12, 5.14, 5.15)	
Witches' Knowe (Boothulle, Bothul or Bothulle) (Figure 5.3, 5.5, 5.8)	Key Terrain	198 m (650 ft) elevation 3.5 km NW of Berwick and 1 km NW of Halidon Hill. Open upland with grass and scrub cover. May have been farmland or hay fields at time of battle (as it is today). Strong defensive position fronting to the	Higden 1882: 331; Malmesberiensi 1883: 291.

		southeast with moderate slopes. Poor observation.	
The Morass, Bog or 'Gret Syke' (Figure 5.5, 5.6. 5.8)	Obstacle	Existing, Fixing Obstacle in the form of a morass in the valley between Halidon Hill and Witches' Knowe, near the base of Witches' Knowe. Extent of the morass and soil conditions at the time of the 1333 battle are unknown. Remnant of the morass still exists today in the form of a dammed stream with containment.	Wyntoun 1872: 401; *Pluscarden* 1880: 202.
River Tweed (Figure 5.5)	Obstacle	2.5 km south of Halidon Hill. Navigable by small watercraft only above Berwick or Berwick Castle. Can be crossed at several fords along its length. Existing blocking, fixing or disruptive obstacle depending upon tidal fluctuations. Average depth change 3.83 m (12.57 ft). Crossing on foot had to be coordinated with low tide.	Childs and Taylor 1991: 167.
Bailes Burn (Figure 5.6, 5.8)	Obstacle	Small stream west of Halidon Hill. Tributary of Lambsmill Burn. Existing, disruptive obstacle depending on water flow and soil conditions. More of an obstacle to cavalry than to foot.	
Wheatland Burn (Figure 5.6, 5.8)	Obstacle	Small stream west of Halidon Hill. Tributary of Lambsmill Burn. Existing, disruptive obstacle depending on water flow and soil conditions. More of an obstacle to cavalry than to foot.	
Lambsmill Burn (Figure 5.6, 5.8)	Obstacle	Small stream west of Halidon Hill. Tributary of Lambsmill Burn. Existing, disruptive obstacle depending on water flow and soil conditions. Personal observation showed steep banks near Duns Road. More of an	

		obstacle to cavalry than to foot.	
Duns Road (A6105) (Figure 5.3, 5.6, 5.8)	Avenue of Approach	Principal east-west road from Berwick to Duns and Fouden. Scottish Army likely used this road to march from their camp at Duns to the battlefield at Halidon Hill. Provided a sub-company (less than 500 m/y wide) mobility corridor through restricted terrain characterized by hills with steep slopes and ravines in the area of the battlefield.	*Pluscarden* 1880: 202.
The Great North Road (A1), or simply North Road (Figure 5.3, 5.6, 5.8)	Avenue of Approach	The main road connecting London and Edinburgh. The North Road is not mentioned in chronicle sources but is included due to proximity to the battlefield. It appears that the routed Scottish Army attempted to reach the North Road via Lamberton Moor (where their horses were kept) and Ayton Village. The North Road Provided a sub-company (less than 500 m/y wide) mobility corridor through restricted terrain characterized by hills, with steep slopes on the oceanside, and streams in the area of the battlefield.	
North Sea, Sea, Ocean (Figure 5.5, 5.8)	Obstacle	Existing, Blocking Obstacle. Mentioned as battlefield boundary in July 15 Truce. No mention further mention in chronicles. Likely no influence on battle.	Rymer 2006: 864-866.

Table 5.2 KOCOA Analysis Battle of Halidon Hill

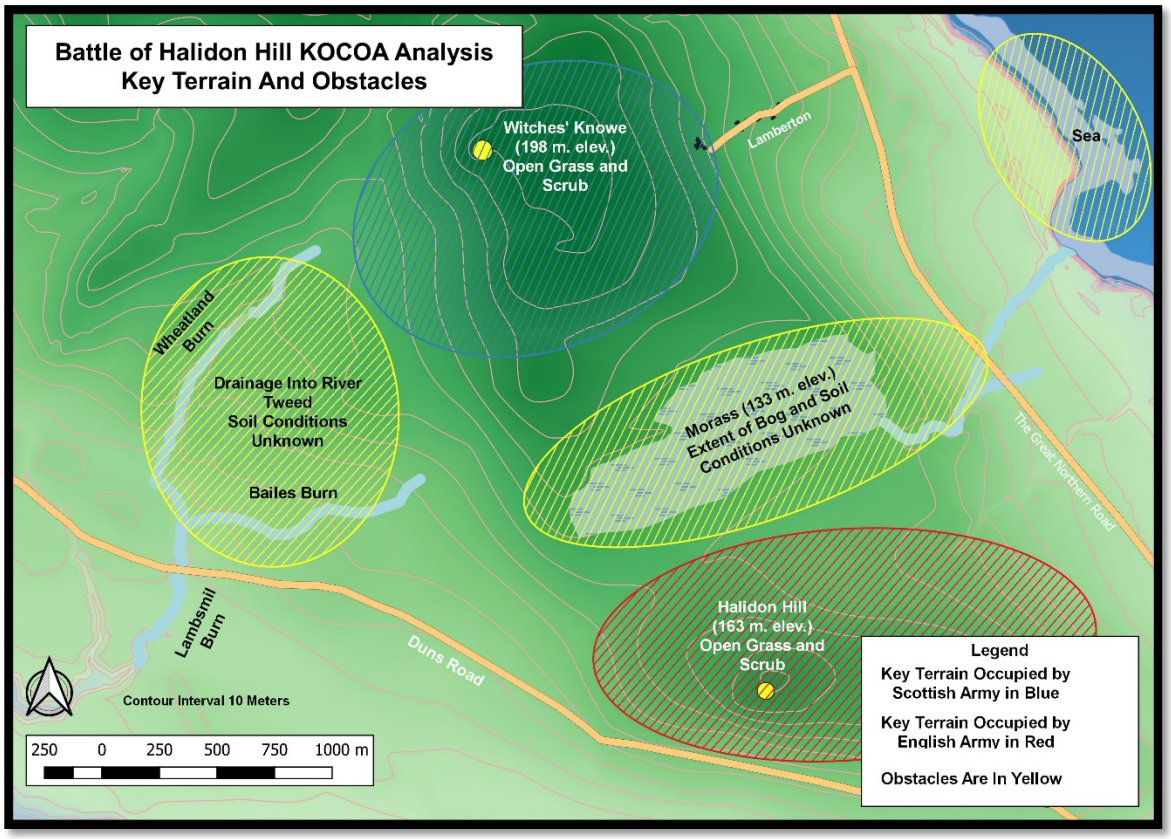


Figure 5.8. Battle of Halidon Hill KOCOA Analysis Key Terrain And Obstacles. Showing key terrain features and their occupants at the start of the battle, obstacles and the two avenues of approach, Duns Road and the North Road. (Drawn by ©Craig J. Brown).

Ground-Truthing The KOCOA Analysis

Site visits to the Halidon Hill Battlefield were conducted from December 2018 through February 2019. The purpose of the site visits was to correlate the KOCOA derived terrain features with their locations in the actual landscape. These locations were documented and assessed for preservation or archaeological potential according to the methodology outlined in Chapter 2. The battle reconstruction provided historical context relative to the battle events that occurred at each of the KOCOA derived locations.

In the nearly 700 years since the battle occurred, the landscape of the battlefield has undergone some changes. Stone walls indicative of the Parliamentary Enclosures of the first half of the Nineteenth Century subdivide what was once open field. The dirt farm tracks that crisscross the landscape often in association with the enclosure walls were not present in 1333. The morass or bog that played so important a role in the battle has been all but drained. The name of the farmstead at Bogend commemorates the possible extent of the historical marsh. The western slope of Halidon Hill, as well as the valley floor on that side, is an active pig farm (W. Punton & Son Ltd.). Witches' Knowe appears to be permanent pasture or hay fields.

Ten of the chronicle sources explicitly name Halidon Hill as the site of the English position and battle (Burton 1867: 369; Fordun 1871: 356; Wyntoun 1872: 400; The Book of Pluscarden 1880: 202; Higden 1882: 328-331; Bridlington 1883: 114-115; Malmesberiensi 1883: 291; Brie 1906: 286-289; Bower 1996: 90-91; Preest 2012: 46). The summit of Halidon Hill (396856, 654823; 163 m (535 ft)) is located near Duns Road (A6105) in the vicinity of Brow of the Hill Farm (Figure 5.3, 5.5, 5.6, 5.8). The summit, like the rest of the hill, is open grass and low scrub. There is no evidence today of the woodland that was mentioned by Oman (1924: 106) that might have been present at the time of the battle in 1333. The chronicles sources do not mention a woodland being present and it is unclear what Oman is basing his description on. A stone Bronze Age mace head was recovered during plowing on Halidon Hill (NT96865483). Below the summit, on the south face of the hill there exists the remains of a hillfort (396780, 654800; 152 m (499

ft)) in the form of a sub-oval cropmark measuring 69 meters by 47 meters (Lock and Ralston 2017b; Historic England 2019b).[36] Another, slightly larger, hillfort exists approximately 660 meters to the east on Camp Hill (397460, 654710; 142 m (466 ft)) (Lock and Ralston 2017a; Historic England 2019a).[37] The hillforts appear to be undated any association with the mace head is unknown. The find of the mace head and existence of the hillforts, although not relative to the Battle of Halidon Hill, is indicative of the general survivability of archaeological remains on the hill, (Elizabeth Williams, *personal communication*, March 8, 2018).

Figure 5.9. Photograph of a portion of Heavyside, or the northwest slope of Halidon Hill. Edward's line of battle occupied the military crest on the left and extended south-southwest toward the communication tower in the distance. The heaviest fighting occurred here. View is toward southwest. (Photo by ©Craig J. Brown).

[36] The Halidon Hill hillfort has been interpreted as a univallate hillslope fort with two banks separated by a ditch enclosing an area of 0.26 ha. Two entrances, one on the southeast and one on the southwest, have trackways leading from them. A line of pits may exist to the north (Lock and Ralston 2017b; Historic England 2019b).

[37] The Camp Hill hillfort exists as a set of cropmarks on the south face of the hill. It consists of three concentric ditches measuring 105 meters by 90 meters, enclosing an area of 0.78 ha (Lock and Ralston 2017a; Historic England 2019a).

Figure 5.10. Photograph of Witches' Knowe looking northwest from Heavyside on Halidon Hill. Photo shows the initial position of the Scottish Army shortly after 9 o'clock on the morning of 19 July 1333. The remains of the Morass or Bog exists as a drainage at the base of Witches' Knowe. (Photo by ©Craig J. Brown).

The principal area of interest on Halidon Hill is the northwest facing slope, the area known as 'Heavyside' (396860, 655374) in 1333 (Figure 5.5, 5.6, 5.9). Edward III is likely to have deployed his army along the military crest on the northwestern side of the hill, fronting the Scottish position on Witches' Knowe. Edward's right flank likely rested in the area once known as 'Heavyside' opposite the bog at the base of Witches' Knowe. The open, grass and scrub covered hillside, did not provide cover from archery. Due to the effective range of the longbow, English archers possessed an excellent field of fire out to 250 yards or more (Figure 5.8, 5.9, 5.10).[38] Bridlington

[38] The effectiveness of the English Longbow has generated a substantial body of literature (Hardy 1994; Bourke and Whetham 2007; Mitchell 2008; Whetham 2008). These works establish an effective range of 250 to 300 yards with a rate of fire of 10 to 12 arrows per minute. Effectiveness also depends on the draw strength of the bow and the type of arrowhead used. The field of fire is indicated by the black arrows in Figures 5.11, 5.13, 5.14.

(1883: 116) records that the fiercest fighting occurred at ‘Heavyside’ where 500 Scots fell. Consequently, this area may contain the greatest archaeological potential because the intense fighting that occurred may have resulted in a greater concentration of artifacts from the battle being deposited there. The slope in this vicinity descends gently at an estimated 2.9% to 3% gradient into the valley toward Witches’ Knowe (Figure 5.2, 5.9, 5.11).[39] Edward’s right flank may have rested near to a present-day battlefield marker (397414, 655016) (Figure 5.11) placed to mark the position of Edward’s army. Soil acidity is unknown, and this will affect the survivability of archaeological deposits. Taking soil acidity into consideration, however, a metal detector survey may prove fruitful at ‘Heavyside’. Treatment of the rank-and-file dead after the battle is not mentioned in the chronicle sources. They may have been interred in mass graves near to where they had fallen. If true, then the area of ‘Heavyside’ is a potential location for burials associated with the battle. More investigation in the treatment of the Halidon Hill battle dead is required.

[39] Slope gradient derived from elevations taken from Google Earth.

Figure 5.11. Photograph of present battlefield marker at Heavyside on Halidon Hill. Marker is for a public access trail that has fallen into disuse. Edward's right under Norfolk was likely deployed here. Douglas would have assaulted this point with his schiltron. View is to the north-northeast. (Photo by ©Craig J. Brown).

Edward's battle line would have extended along the military crest to the left, or southwest, from the battle marker mentioned above. The center is estimated to have been located at or near coordinates 39684, 655077 based upon the estimated length of Edward's line and assuming that each of his divisions are roughly equal in size. Edward's left division under Balliol may have extended the battle line to at or near coordinates 396366, 6554893. This area also possesses a high probability for containing archaeological

remains associated with the Battle of Halidon Hill. Metal detector surveys undertaken in these areas could assess the nature of surviving archaeological remains and could accurately establish the extent and position of the English battle line. Artifacts related to the fighting should reflect the point where the two battle lines met.

Witches' Knowe is a 198-meter (650 feet) Key Terrain elevation (Figure 5.6, 5.6, 5.8, 5.10) that lies approximately 3.5 km northwest from Berwick. In 1333, the hill was likely open upland with grass and scrub cover, its appearance may have looked similar to today with the land being used as hay field (English Heritage 1995: 1-2). Higden (1882: 331) identifies "Boothulle, besides Halyngdoun" as the site of the battle.[40] 'Boothulle', 'Bothul' or 'Bothulle' has fallen out of use as a placename on modern maps, but likely represents an earlier name for what is today Witches' Knowe. Nicholson (Nicholson 1961: 36; 1965: 132) was the first to identify 'Bothull' as Witches' Knowe based on Higden (1882: 331) and Malmesberiensis (1883: 291). There is no real reason to dispute Nicholson's identification as Witches' Knowe is the next ridge northwest of Halidon Hill and is the only hill from which the Scots could attack the English across the marsh on Halidon Hill. The Scottish Army reached Witches' Knowe shortly after nine o'clock in the morning on 19 July (Bridlington 1883: 115). The men dismounted and left their horses in the care of their grooms and valets perhaps at a position northwest of the summit near Lamberton Moor (395634, 657178) (Figure 5.5)

[40] Malmesberiensi (1883: 291) bases his identification of the battlefield on Higden (1882: 331): "in loco qui dicitur Bothull juxta Halidoun" (in the place which is called Bothulle near Halidon).

(Bridlington 1883: 115; Scott 1888: 54). The Scots army then deployed in line of battle on the southeast slope opposite Halidon Hill (Figure 5.6, 5.10).[41] From here, the ground slopes at an estimated 4.5% gradient down to the valley floor (Figure 5.2).[42] Douglas waited until high tide in the Tweed and, just before midday, moved to attack the English on Halidon Hill (Childs and Taylor 1991: 167; Preest 2012: 46). When the attack failed, the subsequent retreat passed over Witches' Knowe as fleeing Scottish soldiers attempted to require their mounts or reach the presumed safety of the Great North Road (A1) via Ayton Village.

Assessing the archaeological potential of Witches' Knowe relative to the battle is a challenge due to the hill being occupied during two distinctly different phases of the battle. Witches' Knowe (Boothulle) is a significant position associated with the Battle of Halidon Hill; however, it is unlikely that organized fighting took place there. The arrival and deployment of the Scottish army would likely leave a different artifact depositional pattern than the subsequent retreat. This period of time would have been one of low-level activity resulting in the deposition of items like horse picket pins and tack, dropped coins or other personal items and, perhaps, the remains of cook fires. The subsequent retreat and pursuit of the Scots at the end of the battle likely passed over Witches' Knowe. This last phase of the battle would be

[41] The Scots operated essentially as mounted infantry using their horses on the march and fighting predominately on foot (MacInnes 2008: 54). I believe that Douglas would have acted prudently and arranged his army in a defensive posture while he waited for high tide in tweed. Douglas may have hoped that Edward would attack him on Witches' Knowe, but he would have known that it was unlikely. Due to the adherence to the 15 July truce, Edward could simply wait for Vespers (Approximately 6 PM, or dinner time). If not relieved by that time, Berwick would surrender the following morning by agreement.

[42] Slope gradient derived from elevations taken from Google Earth.

likely to leave a different depositional pattern, but one that would overlay and mix with the earlier phase. Presumably, archaeological remains associated with this phase would show evidence of fighting and flight, such as broken pieces of armor and weapons, bodkins and discarded surplus equipment. Metal detector surveys near the summit and along the southeastern slope would access these potential remains. The condition, or amount of damage to the recovered items may indicate which phase of occupation they belonged to. As interesting as this would be, it must be considered a secondary priority to testing 'Heavyside' and the Morass, because of the presumed intensity of activity at those locations.

The Morass, or bog, that existed in the valley between Halidon Hill and Witches' Knowe in 1333 still remains in the form of a natural stream and old reservoir at the base of Witches' Knowe (397135, 656064) (Figure 5.3, 5.5, 5.6, 5.7, 5.10).[43] The stream drains to the east near the modern New East Farm, reaching the ocean at a place called the Meadows. The extent of the bog and the soil conditions at the time of the battle in 1333, however, are unknown. Andrew of Wyntoun called the marsh a "gret syke," implying that the bog was extensive" (Wyntoun 1872: 401).[44] *The Book of Pluscarden* simply states that "there was a marshy hollow between the two armies" (The Book of Pluscarden 1880: 202). If this statement is to be interpreted as the marsh covering the floor of the valley, or even a majority of the valley, then it may have been extensive. The degree of water saturation is important to

[43] The reservoir and associated dam were built by the Berwick-Upon-Tweed Water Works. It does not appear on maps until the Ordnance Survey (1862) Berwickshire County map.
[44] "Gret syke" or "gret syk" Old Scots meaning great boggy ground.

consider when assessing the influence of mud in the bog on progress by armored soldiers.[45] Soldiers in full armor may have had difficulty navigating the muddy bog, expending a great deal of energy during the midday heat of a July day. The bog would have likely caused delays as the Scottish schiltrons moved through it disrupting the line of battle, or perhaps fixing individual units in place. The morass is best classified as an existing disrupting or fixing obstacle in terms of KOCOA.

The area that once was the morass has the potential to contain archaeological remains relative to the Battle of Halidon Hill. Elements of the Scottish army may have become trapped in the bog during the retreat, where they were massacred by pursuing English infantry and archers.[46] A copper finger ring dating to the time of the battle was recovered in this area as a chance find (Elizabeth Williams, *personal communication*, March 8, 2018). That this ring survived indicates the strong possibility that other archaeological deposits relative to the battle are present. The historical extent of the marsh could be recoverable as part of a larger archaeological investigation of this area of the battlefield. Soil coring or test pits may reveal

[45] The question of whether or not the Scots chose to wear their armor is an interesting one as it has a direct affect upon the effectiveness of the English archery. Reid (2007: 124) is of the opinion that the Scots did not don much of their armor if any. I support Reid's opinion that the Scots wore partial armor, if any at all. I believe that the knights and men-at-arms may have retained their aketons, or gambesons, and bascinets, but left their heavy mail and plate behind. The rank-and-file infantry may not have possessed much in the way of armor to begin with. MacInnes (2008: 106) quoting a 1318 law issued by Robert the Bruce, notes that only those men possessing an estate of greater than £10 were required to have armor. Those below £10 were only required to have a spear or bow.

[46] The Scots did pass through the bog on their approach to assault Edward's position on Halidon Hill, but were not under attack at this time, unlike their retreat. The fighting during the retreat would likely leave a distinctly different artifact distribution than the initial pass through. I would expect a greater concentration of English bodkins leading into the bog and bog itself based on the description of the battle in the chronicle sources and KOCOA analysis described above.

the extent of the marsh through examination of the soil characteristics. The ^{14}C radiocarbon dating methodology employed by Tipping *et al* (2014: 122-130) at Bannockburn could be used if organic material is present. Ground penetrating radar could recover historic channels through the marsh.

The River Tweed lies approximately 2.5 km south of the Halidon Hill Battlefield outside of the core battlefield area (Figure 5.5). An English translation of the *Anonimalle Chronicle* states that Douglas waited to engage the English "until the River Tweed was at full tide, because then they well imagined that they might drive the king of England and his men into the River Tweed or into the sea to drown them" (Childs and Taylor 1991: 167). This passage indicates that Douglas was intending to use the Tweed to block the retreat of Edward III and Balliol to the south in the event that the Scots had been successful in driving the English from their position on Halidon Hill. In the immediate vicinity of Berwick, fording of the Tweed must be coordinated with low tide. Recent tidal data indicates that the depth of the River Tweed at Berwick normally fluctuates from -0.97 meters below sea level to 2.86 meters above sea level. This is a change in depth of 3.83 meters or 12.57 feet on average (River Levels UK n.d.; Flood Information Service n.d.). The Tweed is characterized as an existing obstacle, but tidal fluctuations cause the river to function as either a disrupting or blocking obstacle depending upon the time of day. The river is not included within the battlefield boundaries established through KOCOA because the Scottish attack was unsuccessful and no action relative to the battle took place along the river.

The three streams present in the southwestern area of the terrain reconstruction (Figure 5.6) are not mentioned in the chronicle sources. These watercourses are included in this KOCOA analysis as an obstacle due to their presence in the project area in association with the battlefield (Figure 5.3). The Bailes Burn and Wheatland Burn meet to form the Lambsmill Burn, which itself is a small tributary of the White Adder Water, a stream that is itself a tributary of the River Tweed (Berwickshire O.S. Name Books 1856-1858: 28-29, 39) What influence, if any, the three burns had on the Battle of Halidon Hill is unknown. The streams can be classified as existing disrupting obstacles based upon them being a natural terrain feature and need to negotiate their banks. Personal observation of Lambsmill Burn on the north side of Duns Road showed that the banks could be steep in spots making them difficult to traverse.

Neither Duns Road (A6105) nor the Great North Road (A1) are mentioned by name in the chronicle sources, but their influence on the battle can be inferred. Duns Road (A6105) was likely the Avenue of Approach utilized by the Scottish Army as it marched toward Berwick on the morning of 19 July 1333 (Figure 5.3, 5.6, 5.8). On the previous day, the Scots had crossed the River Tweed at an unknown location on their march to Berwick and “halted that night in a certain park of Donamis (Duns)” (*The Book of Pluscarden* 1880: 202). At sunrise the following morning, Douglas resumed the Scottish march to Berwick. Andrew of Wyntoun (1872: 400) mentions that

the Scots set out “Fra Dwns Park”[47] to march to “Halydown,” 13 km distant. Duns Road may have been the most direct road linking Duns with Berwick in 1333. The Great North Road has been mentioned above in connection with Witches’ Knowe as the likely route the defeated Scottish Army tried to reach in order to retreat from the battlefield. In both cases, the roads provided a sub-company, or under 500 yards wide, mobility corridor through restricted terrain. The terrain through which the roads passed was hilly, cut by streams and ravines and possessed steep slopes along their borders for part of their route.

Through the completion of the KOCOA analysis the boundaries of the battlefield were established and are depicted in Figure 5.17. The area represented includes the initial positions of both armies, where they left their horses as well as the area of the main battle and the known extent of the retreat. The area represented could be refined through intensive battlefield archaeological survey. It should be noted that the pursuit of the remnants of the Scottish army may have continued for several miles beyond the battlefield presented in Figure 5.17. The KOCOA analysis was not extended beyond the battlefield core.

[47] “From Duns Park” – Duns Castle was built in c. 1320 by Sir Thomas Randolph, Earl of Moray, the first Guardian and Regent of Scotland following the death of Robert The Bruce (MacGibbon and Ross 1892b: 265-267). His son, John, the then Earl of Moray, commanded a schiltron under Douglas at Halidon Hill. This may have had an influence on where Douglas chose to camp the night of 18 July 1333, or more likely he wanted to put some distance between his army and that of Edward III to guard against attack during the night.

Battle Reconstruction

At approximately nine o' clock on the morning of 19 July 1333, English scouts brought word to Edward III of the approach of the Scottish army along Duns Road (Bridlington 1883: 115). This confirmed for Edward that Douglas intended to relieve the siege of Berwick in accord with the second and possibly the third stipulations of the 15 July Truce (Rymer 2006: 864-866). At some point previous, Edward had moved the bulk of his army to occupy the key terrain at Halidon Hill. I believe that Edward would have chosen to deploy along the southern crest of the hill at this time. From the south side of Halidon Hill, Edward could observe the Tweed River crossings near to Berwick and move to intercept Douglas should he try to cross in accord with the first stipulation of the 15 July (Rymer 2006: 864-866). When he deployed his army on Halidon Hill, Edward left a detachment of 500 men in the trenches at Berwick to guard against a sortie from the town. Edward also designated a detachment of 200 knights and men-at-arms to oppose the expected attempt of a like number of Scots to enter Berwick and relieve the burgh in accord with the third stipulation of the 15 July truce (Rymer 2006: 864-866). Estimates vary as to the size of the English Army, but between 8,000 and 10,000 seems a reasonable approximation given the subtractions due to sickness, desertion and the detachments left at Berwick (Sadler 2005: 192; DeVries 2006: 122). This total likely included an estimated 1,500 knights and men-at-arms, with another 3,000 or 4,000 billmen and the remainder being archers. When the scouts had brought word of the Scottish army approaching from the west, it is likely that Edward moved his army over the

summit and deployed them along the military crest facing northwest and west opposite Witches' Knowe (Figure 5.6, 5.9). Adopting the arrangement that Balliol had used with success at the Battle of Dupplin Moor, Edward dismounted his knights and men-at-arms and combined them with the billmen (Oman 1924: 106; DeVries 2006: 122; Preest 2012: 46). He then divided the infantry into three divisions and placed strong contingents of archers on each flank (Brie 1906: 285). The right division was commanded by the Earl Marshal, Thomas Earl of Norfolk: this battle was placed opposite of what is now Bogend in the area of Heavyside. The center division was under the personal command of Edward III and likely occupied a portion of Heavyside with its left extending to the southwest or south. The left division was under the command of Edward Balliol (Bridlington 1883: 114; Nicholson 1961: 37, 1965: 132-133). Halidon Hill was a good defensive position. The large bog in the valley below would likely disrupt the line of battle of an approaching army. The long gradual slope below the crest of the hill was devoid of cover offering an excellent field of fire, out to 250 or 300 yards, for Edward's massed archery.

As the English were taking up their position on Halidon Hill, Douglas had turned the Scottish Army off of Duns Road and marched them across country to the key terrain of Boothulle (Witches' Knowe) (Higden 1882: 331; Malmesberiensi 1883: 291). The army dismounted on the NW side of the hill, leaving their horses in the care of valets and grooms near Lamberton Moor (Figure 5.5, 5.6) (Bridlington 1883: 115; Scott 1888: 54). It is possible that the Scots left some or all of their armor behind given the distance they would

have to march (and had already covered) and the extent of the bog they would have to traverse (Reid 2007: 124). The Scots then moved over the crest and occupied the southeast facing slope across from Halidon Hill. Douglas deployed his army into three or four schiltrons, with each schiltron occupying a front that was as wide as it was deep. Douglas may have had 1,200 to 1,500 knights and men-at-arms, with the remaining troops, up to 13,000, being pikemen. He placed his knights and men-at-arms at the front of each schiltron. Douglas, himself, took command of the left most schiltron. Command of the center schiltron went to Sir James Stewart. The right schiltron was under the command of the Earl of Moray. Hugh, Earl of Ross, commanded the fourth schiltron (Hamilton 1849: 308-309; Brie 1906: 283-285; Childs and Taylor 1991: 165-167; Sadler 2005: 193). This schiltron may have been deployed in the rear of the battle line as a reserve (Figure 5.6).

The Scottish position on Witches' Knowe was at least as strong defensively as that of the English on Halidon Hill. Douglas, however, could not afford to wait in the hope that Edward would move to attack him. According to the 15 July Truce, Berwick had to be relieved by Vespers on the evening of 19 July or the burgh would have to surrender at the following sunrise (Rymer 2006 864-866). All Edward had to do was wait, in effect forcing Douglas to assume the offensive. Douglas waited only long enough for high tide in the River Tweed. He likely intended to use the Tweed as a blocking obstacle to prevent Edward's escape to the south should the Scots be successful in driving his army off Halidon Hill (Childs and Taylor 1991: 197). Although Douglas had been forced into fighting on bad ground, ground

of Edward's choosing, it is apparent that he was still thinking in terms of success. Douglas likely did not envision success simply in terms of raising the siege of Berwick, but it appears likely that he intended to decisively trap and eliminate Edward's army. While waiting for the tide to come up, an incident of individual combat may have occurred (Preest 2012: 46). Just before midday the Scots began their assault.

The Scottish Army made their way down the slope of Witches' Knowe in good order with their battle line dressed. The Scots likely advanced in their typical echelon formation as they had at Bannockburn in 1314 (Moffat 2014:114-115). In this formation each battle advances a short distance behind the one next to it, so that the battleline looks like a set of stairs. They soon encountered problems upon entering the marsh between the two hills. The bog at Halidon Hill appears to have acted much like the mire at Flodden in 1513 (Goodwin 2013: 201-202; Sadler and Serdiville 2013: 161) in having upset the timing of the Scottish advance. It appears that the left (Douglas) and center (Stewart) schiltrons had difficulty negotiating the bog, becoming fixed in place while the right schiltron under Moray cleared the marsh well in advance of the other two (Maxwell 1913: 280). Moray's schiltron may have advanced across drier ground than the others.

Moray's schiltron began the climb up Halidon Hill to make contact with Balliol's division on the English left. Having advanced ahead of the main Scottish line of battle, Moray was dangerously exposed. While still 250 to 300 yards from Balliol's line, Moray's schiltrons came under massed archery shot into its front and flanks (Figure 5.12). *The Chronicle of Lanercost* records that

"…the Scots marching in the first division were so grievously wounded in the face and blinded by the host of English archery, just as they had been formerly at Gledenmore, that they were helpless, and quickly began to turn away their faces from the arrow flights and to fall" (Maxwell 1913: 279). *The Anonimalle Chronicle* relates that "the English archers destroyed and injured them so that they were in a short time as if choked and blinded, and soon they were thrown into confusion" (Childs and Taylor 1991: 167). In spite of the heavy losses inflicted by the English archers, Moray managed to reach and engage Balliol in hand-to-combat. With the front ranks of Moray's schiltron fighting with the front ranks of Balliol's division, the English archers turned their attention to the men in the rear of the schiltron. It was not long before the Scots began to withdraw back down the hill out of archery range.

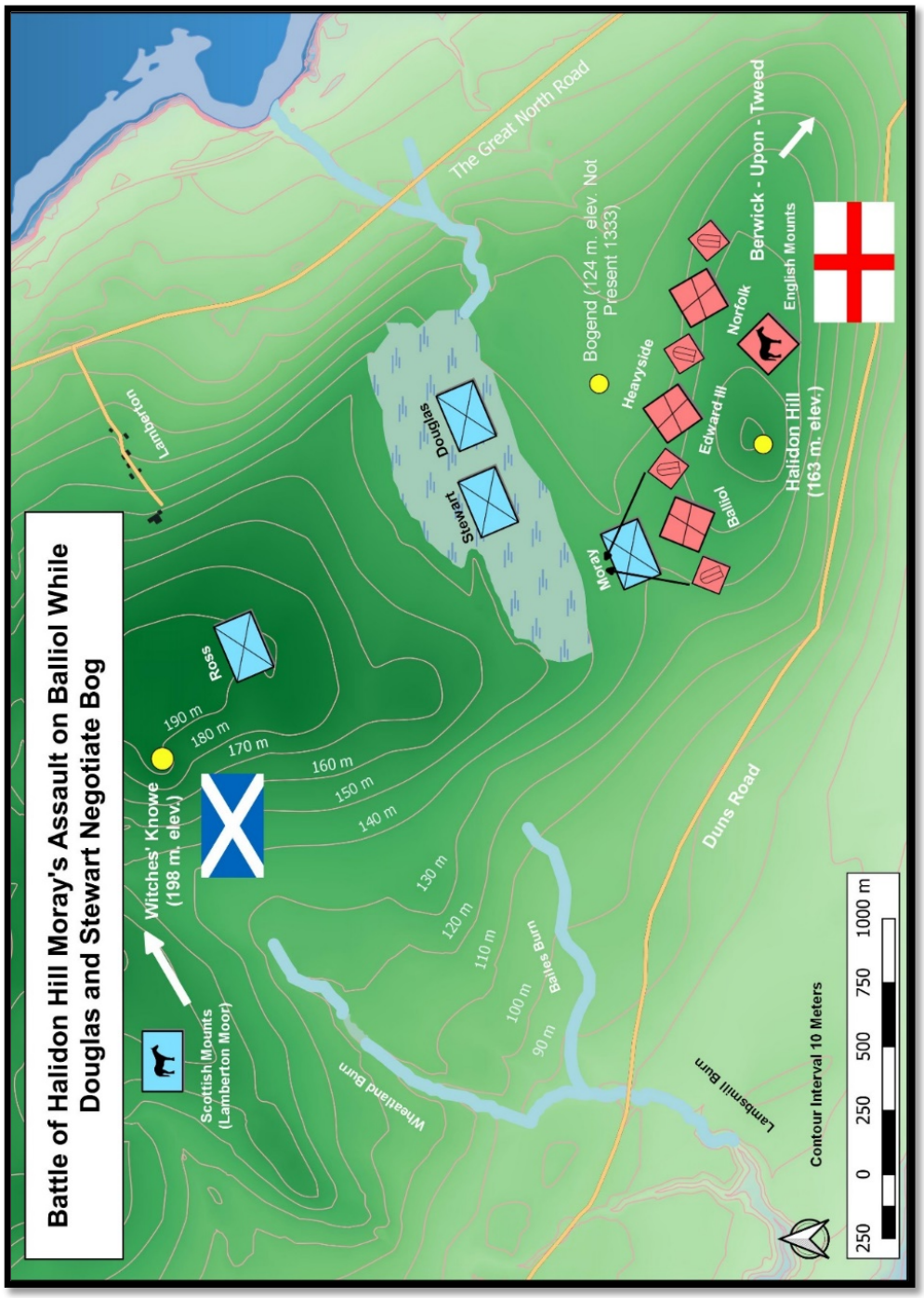


Figure 5.12. Moray's assault on Balliol as Stewart and Douglas move through the morass. Symbols are estimated to be at scale with black arrows indicating fields of fire. (Drawn by ©Craig J. Brown).

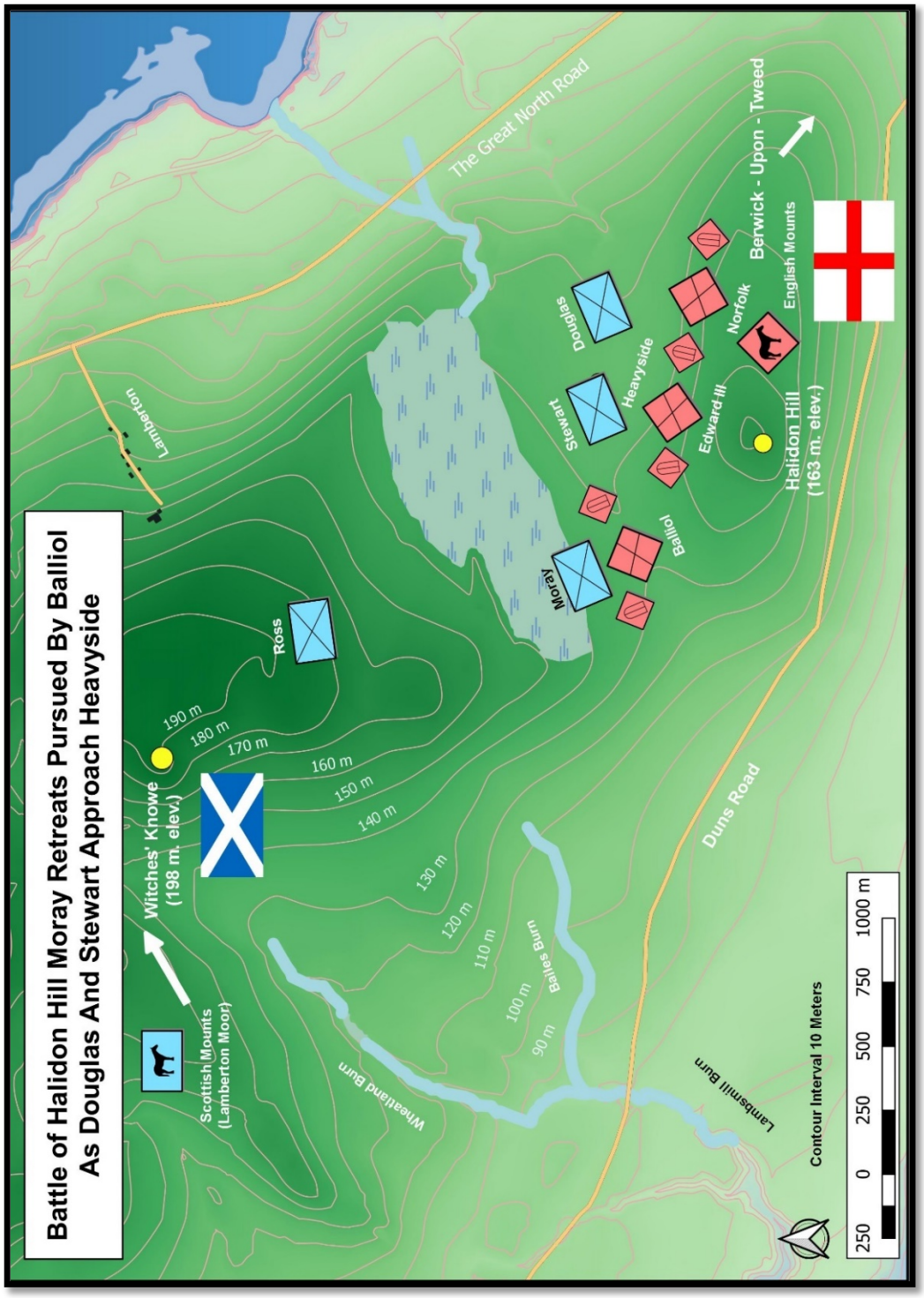


Figure 5.13. Moray begins to withdraw back down Halidon Hill pursued by Balliol. Stewart and Douglas have cleared the morass and are moving to assault Edward and Norfolk. Ross begins his move to relieve Moray. (Drawn by ©Craig J. Brown).

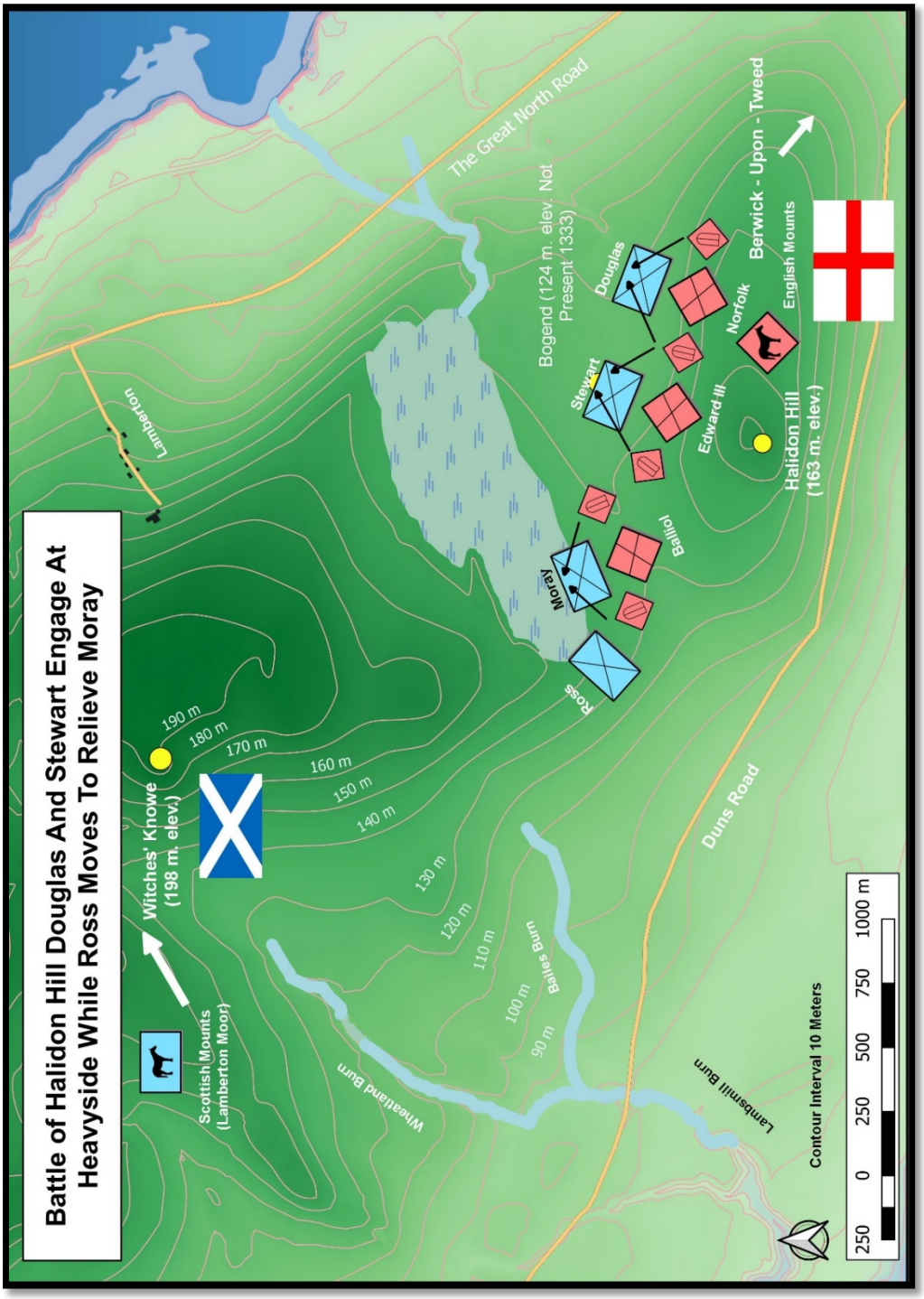


Figure 5.14. Stewart and Douglas have engaged Edward and Norfolk at Heavyside. Black arrows indicate fields of fire. Ross assaults Balliol in an attempt to relieve Moray. It is conjecture on my part as to where and how Ross attacked Balliol, but this hypothesis can be tested archaeologically. It is possible that Ross made a stand on Witches' Knowe. (Drawn by ©Craig J. Brown).

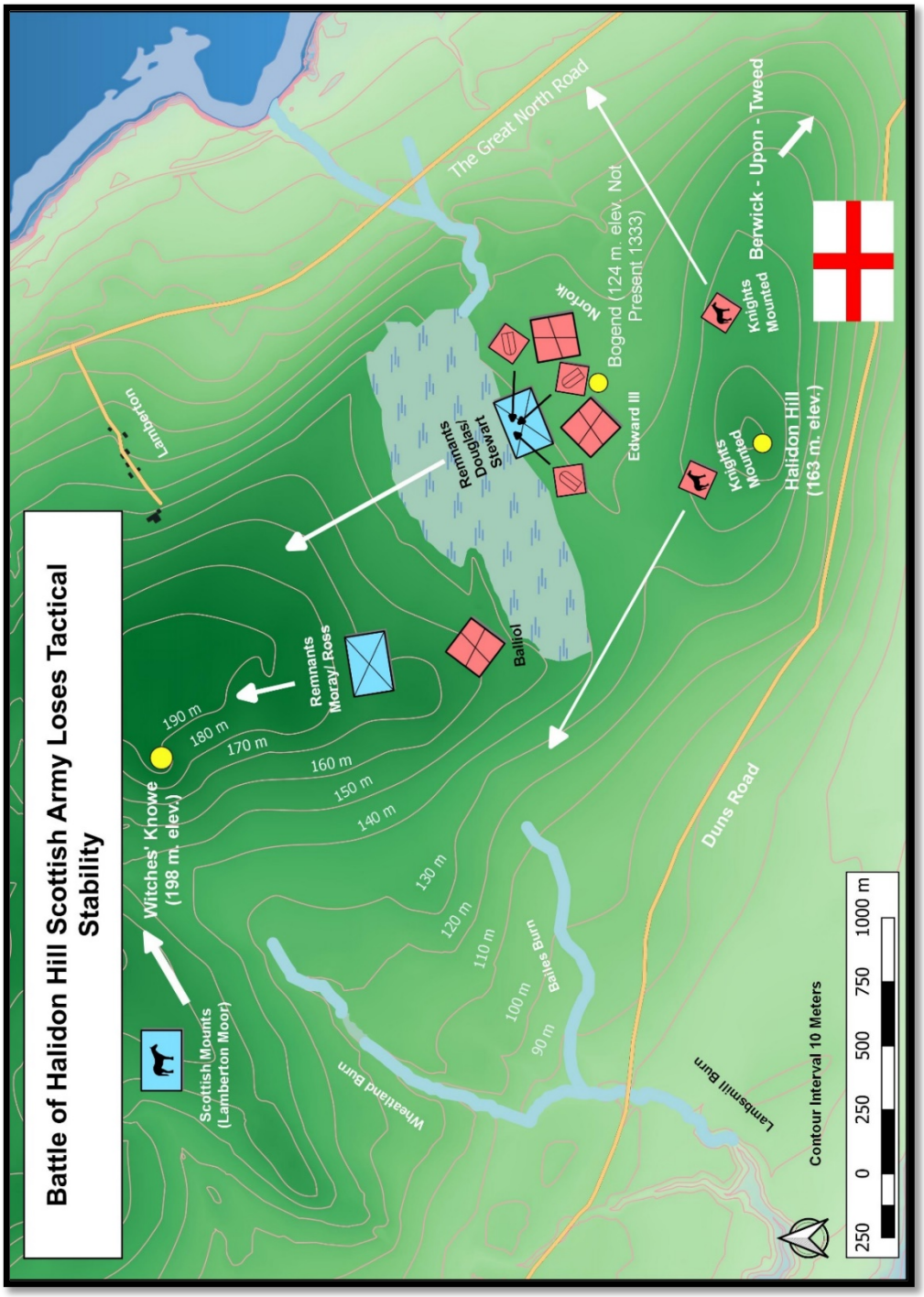


Figure 5.15. Scottish Army loses tactical stability. Remnants of Moray and Ross have crowded together and try to flee toward their horses. Balliol pursues. The remnants of Stewart's and Douglas' schiltrons have crowded together at the edge of the morass. Edward and Norfolk pursue. English knights and men-at-arms are retrieving their mounts to begin pursuit. (Drawn by ©Craig J. Brown).

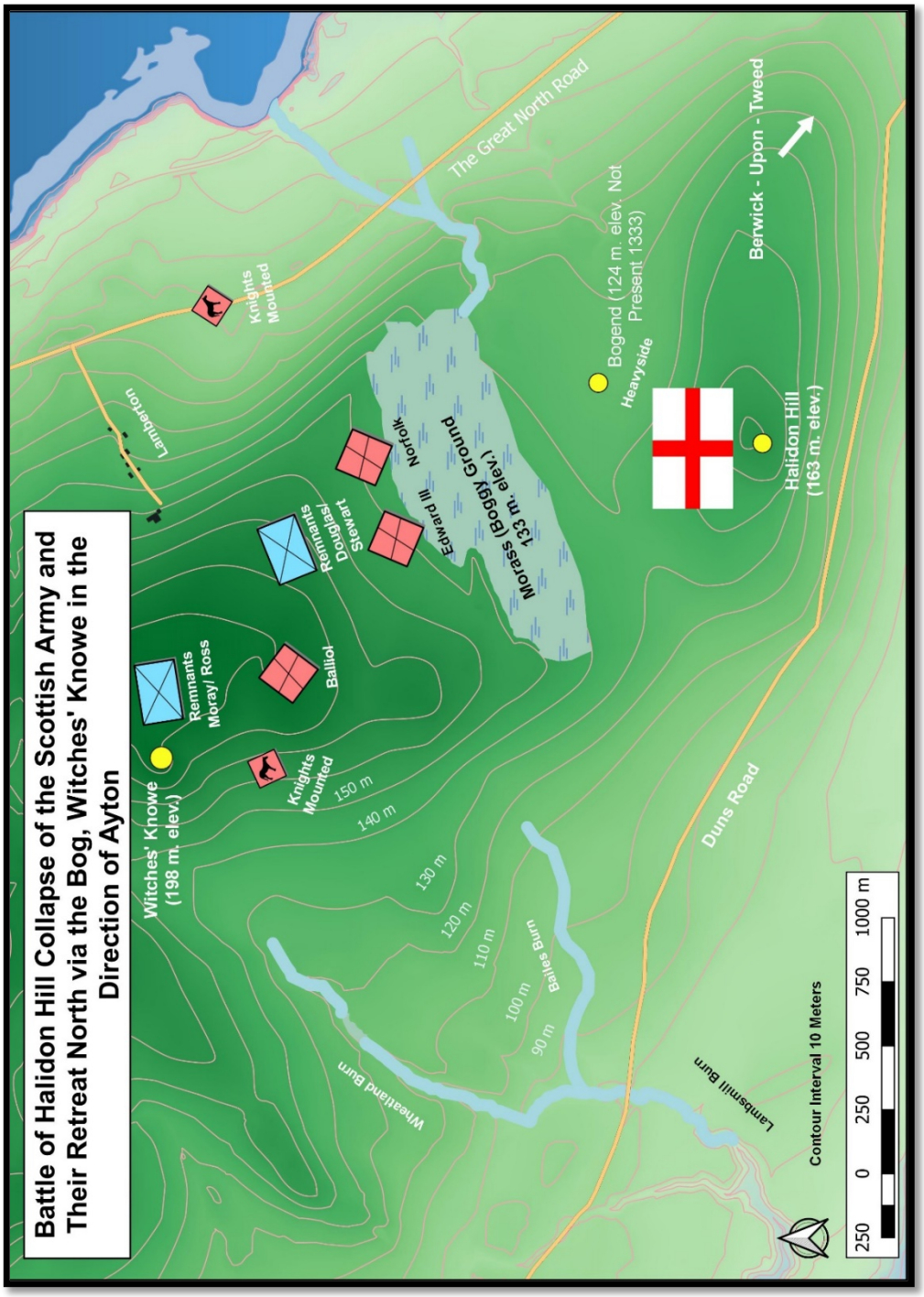


Figure 5.16. The final collapse of the Scottish Army came when the grooms and valets in charge of their horses saw what was happening and fled the battlefield with the mounts. The remnants of the Scottish Army are forced back through the morass and perceiving the North Road as the way to escape, they fled in that direction. They are closely pursued by the English and are cut down in flight at least as far as Ayton. (Drawn by ©Craig J. Brown).

As Moray's schiltron began its withdrawal, the schiltron's of Douglas and Stewart cleared the bog and began their ascent up the long slope of Halidon Hill in the area that was then known as 'Heavyside' (Figure 5.13) (Bridlington 1883: 116; Maxwell 1913: 280). At 250 to 300 yards from the English battle line, Douglas and Stewart entered the English archers' field of fire and were met with the same massed archery Moray's men had faced. Pressing on, Douglas and Stewart succeeded in engaging the English right and center divisions under the Earl Marshal and Edward himself respectively (Figure 5.9, 5.14). Bridlington (1883: 116) recorded that the struggle at 'Heavyside' lasted a long time. Ultimately, The Scots were forced to withdraw leaving over 500 dead, likely including Douglas and Stewart, in front of Edward's lines at 'Heavyside' (Figure 5.15) (Bridlington 1883: 116).

The Scottish grooms and valets in charge of the horses back on Witches' Knowe saw what was happening. They apparently panicked and mounted their masters' horses. They promptly fled the battlefield, most likely attempting to gain the Great North Road. The Scots still struggling in the valley saw the grooms flee. They became demoralized and bunched together losing what tactical stability they had managed to maintain to that point (Figure 5.15) (Preest 2012: 46).[48] The rear ranks, those closest to Witches' Knowe, broke and fled (Maxwell 1913: 280). The English knights and men-at-arms retrieved their horses from the summit of Halidon Hill and gave chase (Figure 5.16). The English pursued the remnants of the Scottish army for

[48] Crowding behavior under fire is often indicative of a loss of morale as soldiers seek safety with their comrades. It can be a herald of tactical disintegration (Fox 1993: 47-49; Marshall 2000: 145).

seven or eight miles, likely killing those that they caught (Burton 1867: 370; The Book of Pluscarden 1880: 202; Bridlington 1883: 116; Preest 2012: 46).

The Battle of Halidon Hill was a devastating defeat for Scotland. The number of dead is not known, and estimates vary considerably (Nicholson 1961: 41; Sadler 2005: 194). The losses among the nobility, however, were staggering. The Guardian, Archibald Douglas, 5 other earls, 3 members of the house of Fraser, scores of knights and lesser nobles were lost, along with hundreds of men-at-arms, and thousands of pikemen perished. The English reported the loss of only one knight, one squire and ten or twelve foot soldiers (Hamilton 1849: 308-309; Lumby 1889: 468-470; Maxwell 1913: 280; Balfour-Melville 1954: 8; Nicholson 1961: 41, 1965: 137; Childs and Taylor 1991: 167-169; Sadler 2005: 194; Reid 2007: 126). Berwick surrendered the next morning at sunrise.

Discussion

There have been no known intensive archaeological investigations designed to recover relevant material culture or burial locations conducted on the Halidon Hill Battlefield (Elizabeth Williams, *personal communication*, March 8, 2018). Therefore, it was decided to use the English Heritage Battlefield Report: Halidon Hill 1333 (English Heritage 1995) inventory record and the Historic Environment Scotland (n.d.): Canmore-Witches Knowe, Lamberton inventory record to provide independent verification of the results of the KOCOA Analysis. The KOCOA derived battlefield boundaries and terrain

features should correlate well with those described in established battlefield and inventory records. Comparison and verification were undertaken following the completion of the KOCOA analysis and thus did not inform the analysis in any way. There is precedent for verifying KOCOA results in this way. McNutt (2014: 63, 92-93, 125) used the procedure to verify his KOCOA analyses for Dunbar 1296 and Roslin 1303. In both cases, he found that his KOCOA derived battlefield boundaries generally fit with those established by the inventory records. The same is true in the case of Halidon Hill.

The KOCOA derived battlefield boundaries for Halidon Hill (Figure 5.17) correlated well with the boundaries established by English Heritage and with those described by Historic Environment Scotland. A minor discrepancy does exist with regard to the avenue of approach that the Scottish army utilized to reach Witches' Knowe after departing from the Duns Road. Heritage Environment Scotland recognizes an area "between Witches Knowe and the border may contain evidence of both the Scottish march and rout" (Historic Environment Scotland n.d.). Presumably, this area encompasses that part of the battlefield that "lies west of Mordington House and extends south of the Cockit Hat plantation" (Historic Environment Scotland n.d.). Historic Environment Scotland's jurisdiction stops at the Anglo-Scots Border preventing their inventory from continuing. The KOCOA derived boundary continues the avenue of approach from the Anglo-Scots

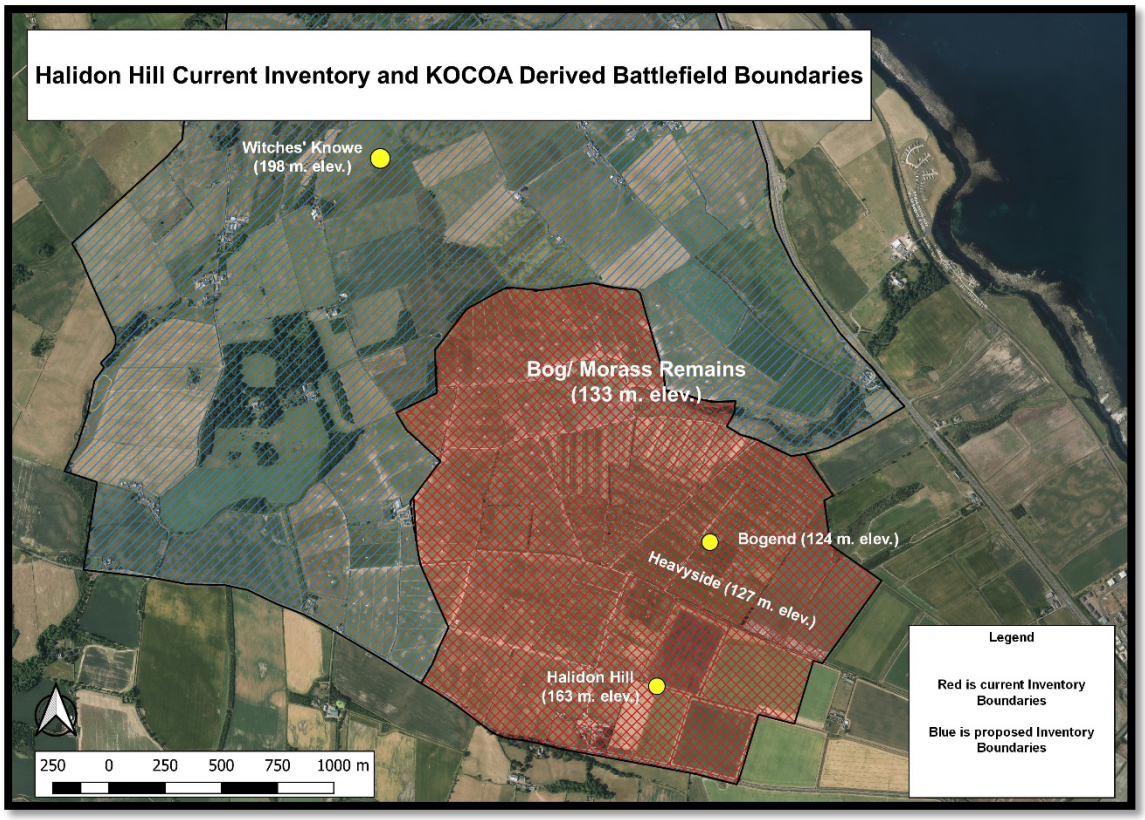


Figure 5.17. KOCOA derived battlefield boundaries compared to English Heritage Inventory Record Battlefield Boundaries. (Drawn by ©Craig J. Brown)

Border to the Duns Road (Figure 5.17). This area falls outside the battlefield boundary established by Heritage England.

While the KOCOA analysis correlated well with the English Heritage and Historic Environment Scotland inventory records, another issue arose when consulting the secondary historical sources related to the battle. The northern extent of the Scottish retreat is not geographically established with precision in the chronicle sources and not accounted for in the inventory records. Oman (1924: 107), Nicholson 1965: 136-137) and Sadler (2005: 194) put the English pursuit of the fleeing Scots at 5 miles. Bridlington (1883:

116) wrote that the retreat ran to 7 miles.[49] Scott (1888: 55) was likely relying on folklore or tradition when he wrote that: “All the way to Ayton the ground was strewed with their bodies.” Further research did not locate independent verification of Scott’s statement; however, it is plausible as Ayton Hill is the next hill north of Witches’ Knowe and along the avenue of withdrawal leading to the North Road. Examination of aerial photographs (Figure 5.18)[50] did not reveal obvious traces of mass graves, but that does not disprove Scott’s statement. Consequently, this author has placed the northern boundary of the battlefield at Ayton.

The KOCOA analysis also demonstrates that although there have been significant changes to the landscape in the nearly 700 years since the battle, the battlefield retains remarkable integrity.[51] These changes manifest themselves primarily in the alterations to the bog caused by the construction of the reservoir and the parliamentary enclosure walls of the Nineteenth Century. Chronicle sources do not indicate the presence of obstacles other than the bog at the time of the battle. This integrity of the battlefield Halidon Hill makes it a good candidate for future archaeological research. This is

[49] Before Queen Elizabeth I established the statutory mile (5280 feet or 1760 yards) in 1593, the distance referred to as a mile varied at times and from country to country. It is a complex subject, but the English Mile in use in 1333 seems to have been based in part upon the Roman Mile (5000 Roman feet) comprised of 8 furlongs (625 Roman feet). This is not clear, however, as it would seem that the English Mile prior to 1333 could have been comprised of either 8 or 10 furlongs and measure on average 1.3 statutory miles today. The Scottish Mile was likewise composed of 8 furlongs, but a furlong consisted of 40 falls made up of 6 ells (37 inches) each. The Scottish Mile was therefore equivalent to 1,973.33 yards today or approximately 1.12 statute miles. See Close (1930), Zupko (1977: 6-7), Connor (1987: 68-78), Klein (1988: 69), and Connor & Simpson (2004: 36, 94).
[50] Aerial and LiDAR imaged were obtained through Edina Digimap. As mentioned earlier LiDAR was also consulted but the available tiles did not cover the battlefield.
[51] The integrity of the battlefield at Halidon Hill is in stark contrast to the changes due to urbanization of the area around Edinburgh Castle encountered in the previous chapter.

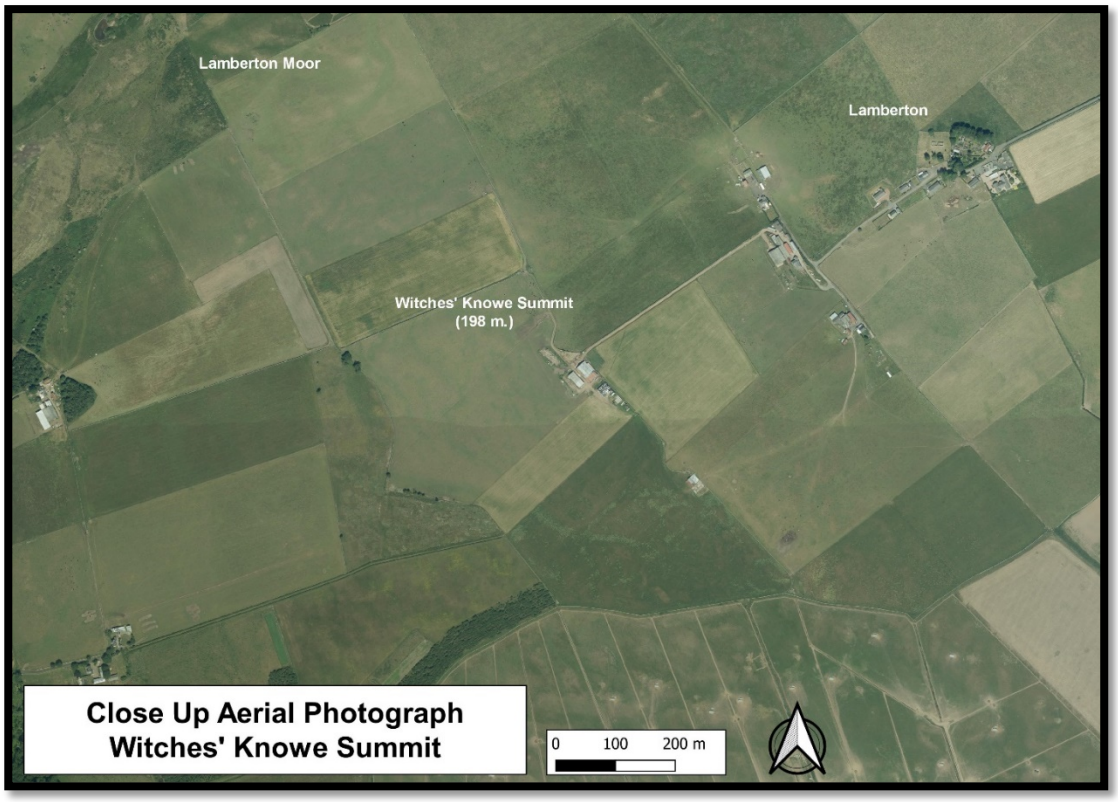


Figure 5.18. Close up aerial photograph of the summit area of Witches' Knowe looking for indication of mass burials associated with the battle that could appear as cropmarks. (Drawn by ©Craig J. Brown ©Edina Digimap Aerial Imagery 25 cm Resolution 1:20,000 Scale)

because the key locations of the battle can be plausibly correlated between the chronicle sources and actual terrain, through the KOCOA analysis. This is particularly true because adherence to the terms of the 15 July Truce meant that Douglas had little choice as to where to fight the battle once Edward's army was deployed on Halidon Hill. While the chronicles do not suggest that there may be structural elements recoverable related to the battle,[52] it is unlikely that scavengers clearing the battlefield will have removed all the discarded or lost military equipment. Mass graves containing

[52] Ditches, or other protective features, or cook fires.

battle dead are presumed to be present within the battlefield boundaries, perhaps as far as Ayton, though graves were not located through the KOCOA analysis.

Conclusion

The Battle of Halidon Hill was chosen as a case study because it was a classic set-piece engagement conducted according to the chivalric conventions of the Late Medieval Period prior to the widespread adoption of gunpowder weapons. The location of the battle and the boundaries of the battlefield are generally known; and are constrained by adherence to the conventions of the truce of 15 July. No intensive archaeological investigation has been undertaken at Halidon Hill, but the battlefield has been documented in an English Heritage battlefield inventory report and Historic Environment Scotland inventory record. The inventory records were prepared from a battlefield survey conducted using standard methodology in use in the United Kingdom. It was expected that these inventory reports would provide a comparison or verification of the KOCOA Analysis. The comparison demonstrated that The KOCOA derived battlefield boundaries closely mirror those delineated by English Heritage and described by Historic Environment Scotland. Only a minor difference in the results emerged, due in part to the presence of the Anglo-Scottish Border and termination of the jurisdictions of the relative regulatory agencies. This comparison is discussed in the previous section.

The utilization of Halidon Hill as a case study involved a change in the historical documentation of the previous case studies, from battles with good primary source documentation to a battle that is recorded only in close secondary sources. These secondary sources took the form of a set of chronicles written during the century following the battle. The results of the internal source analysis (Table 5.1) seem to suggest that the chronicle sources should be used with caution. The original sources consulted by Bridlington and John of Fordun, for example, are unknown. Also, several chronicles appear to be based upon Higden's (1882) *Polychronica* (written during the late 14th century), having the effect of recycling the same basic account in several works. That said, the terrain descriptions contained within the chronicles showed good correlation with the terrain features derived from the KOCOA analysis.[53] This correlation lent confidence to the battle accounts as related in the chronicles.

The major contribution of this case study to the literature relating the Battle of Halidon Hill is a more thorough understanding, gained through the application of KOCOA, of the importance of the terrain in the conduct of the battle. The Scots and English practiced different tactics and used different weapon systems, which caused them to approach the landscape in different ways. It can be inferred from his actions prior to the battle that Douglas did not want to fight on the ground chosen by Edward III at Halidon Hill. The Scottish Army fought as mounted infantry. The knights and men-at-arms

[53] The only real discrepancy concerned the inclusion of the descriptor "precipices" in *The Book of Pluscarden*.

dismounted to join with the pikemen in deploying schiltrons. Schiltrons, as a densely packed rectangular formation, depended upon open ground, preferably moving downhill, in order to use the formation's mass and momentum to break an enemy line. They proved to be at a severe disadvantage moving through the marsh before marching uphill at Halidon Hill. Still, it appears that Douglas was thinking in terms of success when waiting for the tide to come up in the River Tweed to use as a blocking obstacle to trap Edward III and Balliol once they had been dislodged from Halidon Hill. The deployment utilized by Edward III and Balliol was an evolution in tactics brought on by Balliol's success at the Battle of Dupplin Moor the year before. Edward dismounted his knights and man-at-arms and formed them into three divisions, or battles. He then flanked each of these divisions with a strong contingent of archers. The ground that Edward chose to deploy his army, the northwest military crest of Halidon Hill, was well suited to the use of massed archery. It was key terrain, open high ground with a long slope down to the bog, that presented an excellent field of fire for the massed archery. As the Scottish schiltrons exited the bog, the timing of their march having been disrupted, the density of that formation left them exposed and vulnerable to the archers. The massacre that resulted was the outcome of the tactical evolution employed by Edward III and his choice of the terrain that best suited the utilization of those tactics.

Chapter 6: Scotland's Lost Battlefield: The Battle of Dún Nechtain, May 20, 685

"A.D. 685. The battle of Dun-Nechtain was fought on the 20th day of May, on Saturday, in which Etfrith, son of Oswy, King of the Saxons, the 15th year of his reign being ended, was slain, together with a great multitude of his soldiers..."

– *The Annals of Ulster* (AU685[54])."

Introduction

The Battle of Dún Nechtain (Nechtansmere, Linn (Llyn) Garan, Dunnichen) was fought between the Picts, led by Bridei Mac Beli, King of Fortriu, and the Northumbrians, under King Ecgfrith (son of Oswiu), on May 20, 685 (Cruickshank 1991; Fraser 2002, 2006). Northumbrian hegemony over northern Britain had been challenged since Ecgfrith ascended to the kingship upon the death of Oswiu in 670.[55] In the years prior to the battle, Ecgfrith led or dispatched a number of punitive expeditions against the Picts, Mercians and Irish that met with mixed success. Bridei had also been leading raids, possibly as a means of expanding Fortriu's influence, during the same period. Bridei was recorded as having "destroyed" the Orkneys in 681 or 682 (AT682.5; AU681) and may have been responsible for the sieges of Dunnottar (Dun Foither) (680 or 681) and Dundurn (Dun Duirn) (682 or 683)

[54] Hennessy, W. M. (Ed.) (1887) *Annals Of Ulster*. Dublin: Alexander Thom & Co., 134-137.

[55] *The Annals of Tigernach* (AT640.1) record the 638 siege of Etan. This entry has been interpreted as a Northumbrian siege of Din Eidyn (Edinburgh), the successful prosecution of which extended Northumbrian hegemony to the Forth of Firth (Cruickshank 1991: 6, 14; Fraser 2014: 171). This control may have been reinforced by Ecgfrith's victory over the Picts at the Battle of Two Rivers in 671 (Colgrave 1985: 41-43; Fraser 2002: 20, 2006: 23-24).

(AT682; AU682; Fraser 2002: 27, 2014: 214-215). Ecgfrith's expedition against the Picts in 685, which culminated in the Battle of Dún Nechtain, may have been intended as a punitive foray meant to reassert Northumbrian suzerainty over the Pictish people. The battle was a decisive Pictish victory. Ecgfrith was killed, along with most of his men, and Pictish (Fortriu's) independence from Northumbrian hegemony was established.

The site where the Battle of Dún Nechtain was fought is unknown. The scant historical references that are available refer to the Picts feigning a retreat, possibly to lure the Northumbrians into an ambush near Dún Nechtain (Nechtain's Fort), or perhaps to draw them into marshy ground along Nechtansmere (Nechtain's Lake) (Cruickshank 1991: 15; Bede 2008: 221). Since the 19th Century, Dún Nechtain has traditionally been associated with Dunnichen Hill outside the village of Dunnichen, east of Forfar in Angus (Chalmers 1887: 210, 255; Cruickshank 1991: 4; Fraser 2002: 12). In 2006, however, historian Alex Woolf published a paper that posited a new location for the battle at Dunachton in Badenoch, along the western shore of Loch Insh (Woolf 2006: 185). This new northern site is in some respects a better fit with the available historical sources than is Dunnichen, however, more research is needed before one of the two contending sites for the battle is definitively named. In this case study, KOCOA is utilized in an attempt to discern which of the two proposed locations is a better candidate for the site of the Battle of Dún Nechtain (Figure 6.1).

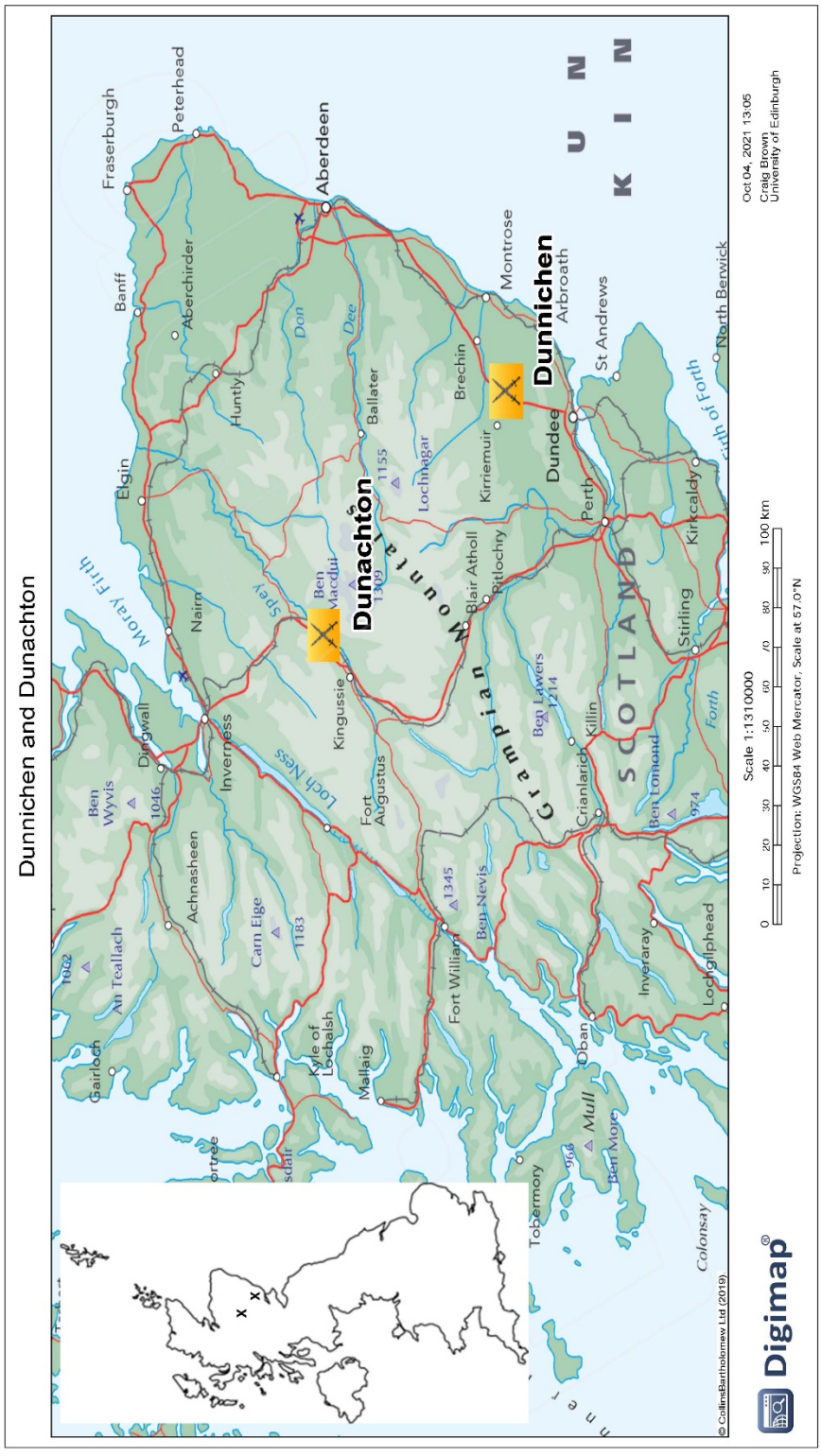


Figure 6.1. The location of the Dunnichen and Dunachton, the two main sites proposed for the Battle of Dún Nechtain, May 20 685 (Drawn by ©Craig J. Brown ©Edina Digimap).

The Battle of Dún Nechtain presents a set of significant obstacles to the application of KOCOA. The three interdependent variables (tactics, force composition, terrain) that delineate the site of a battlefield, as established by McNutt (2014: 3-4) are compromised in this case study. The role of warfare in Pictish society is largely unremarked upon by scholars and nowhere is this more keenly felt than in reconstructing their tactics or *praxis* of war. This case study is forced to infer what preferred Pictish tactics might have been through analogy using primarily neighboring Saxon and Welsh societies. Force composition of both contending parties, but especially of the Picts, is inferred from artistic representations found on Pictish stones. The battle scene depicted on the reverse of the Aberlemno 2 stone (Figure 6.2), for example, has been interpreted as being a representation of the Battle of Dún Nechtain, but this interpretation is by no means definitive.

In this case study, KOCOA was applied to the two most commonly proposed sites for the Battle of Dún Nechtain, Dunnichen (Chalmers 1887: 210, 255) and Dunachton (Woolf 2006: 185-187) (Figure 6.1). The intention was to ascertain if a KOCOA analysis of the terrain at each location could inform the debate between the two and possibly identify the site of the battle. Dún Nechtain was also chosen because it represents a poorly documented, Early Middle Ages battle, where the force composition and location are unknown. The results of the KOCOA analysis were intriguing, showing a definitive preference for Dunachton based on the dialectic of observation and concealment.

***Figure 6.2. Aberlemno* 2 Pictish Stone (©Historic Environment Scotland n.d.d)**

Historical Context

The causes that led to the Battle of Dún Nechtain likely come from the dynastic struggles that occurred in northern Britain during the latter half of the 7th Century.[56] Talorcan (son of Eanfrith, who was a brother of Oswiu) became king of the Picts in 658, apparently after a few years in which the crown was vacant, and possibly through Oswiu's influence (Smyth 1984: 61; Cruickshank 1991: 8; Fraser 2002: 23, 2014: 184-186; Higham 2015: 106).

[56] The historical context presented here was prepared with the same caution recommended when consulting chronicles sources regarding the Battle of Halidon Hill in the previous chapter.

Fraser (2014: 184-186) suggests that Talorcan reigned over the southern sector of Pictish territory. This supposition makes sense given that the southern territory of the Picts (Fife – Perthshire – Angus) bordered Northumbrian controlled territory south of the Firth of Forth. It is unclear if Oswiu's influence was due solely to kinship, or if it included tribute or *comitatus* obligations, but Talorcan apparently received Northumbrian military support in a foray against the Scots of Dalriada (Duncan 1975: 53; Cruickshank 1991: 8; Higham 2015: 106). This type of mutual support is indicative of the ties that likely existed between the two kingdoms.

Talorcan died in 662 and the Pictish crown passed to the brothers Gartnait and Drest in turn. The brothers were sons of Domnall Brecc, king of Dalriada (Smyth 1984: 70; Higham 2015: 107, 148) and their ascension to the kingship of the southern Pictish zone may have been due to the dynastic politics Oswiu had been engaged in (Cruickshank 1991: 8; Higham 2015: 107). The extent of Oswiu's influence in the southern Pictish zone is unclear, but it seems likely that he controlled at least a significant portion of it. Bede stated that "Oswiu subjected the greater part of the Pictish race to the domination of the English" (Bede 2008: 152). Bede described Bishop Wilfred's administration of the See of the Church of York around the year 669 as covering "all the Northumbrians and Picts, as far as Oswiu was able to extend his power" (Bede 2008: 174). This would seem to imply a measure of direct control over a large portion of the southern Pictish zone. Higham (2015: 107) and Fraser (2014: 200-203) have suggested the presence of a Northumbrian sub-kingdom along the north shore of the Firth of Forth.

Fraser, in particular, points to the Bernician district of Niuduera in Fife, that may have been ruled by the sub-king Beornhaeth, as evidence of Northumbrian control of the region (Fraser 2014: 200-203).

In 670 Oswiu died, passing the crown of Northumbria to his son, Ecgfrith (AU670; ASC 670[57]). It was not long before the new king was forced to contend with challenges to the established Northumbrian hegemony in northern Britain. Eddius Stephanus[58] described how, in c. 671, the Picts having possessed "a fierce contempt for subjection to the Saxon," gathered together a coalition from "every nook and corner in the north" (Colgrave 1985: 41). Ecgfrith had been informed of Pictish intentions and, having gathered a warband of horsemen, marched north accompanied by the sub-king Beornhaeth. Stephanus related that Ecgfrith encountered a "vast" and "concealed" host, which he attacked and "slew an enormous number of the people, filling two rivers with corpses" (Colgrave 1985: 43). Where exactly the Battle of Two Rivers took place is unknown. Cruickshank (1991: 9) has suggested that the two rivers are the Avon and Carron, which come within 2 miles of each other where they empty into the Firth of Forth at Grangemouth, Falkirk. Higham has suggested a more northerly location near the River Almond, a tributary of the Tay, outside Perth (Higham 2015: 148).

The Battle of Two Rivers marked the end of the reign of Drest as king of the Southern Picts. Following the failure of this Pictish uprising, Drest was

[57] ASC - King Alfred The Great. (2016). *Anglo-Saxon Chronicle*. Ingram, J. and Giles, J. A. (Trans.). Pantianos Classics.
[58] Colgrave, B., (Trans.) (1985). *The Life of Bishop Wilfrid by Eddius Stephanus*. Reprint 1927. Cambridge: Cambridge University Press.

expelled from the kingship and exiled (AU671; Fraser 2002: 20, 2006: 23-24, 59-60, 2014: 201). The expulsion of Drest from the throne allowed Bridei Mac Beli to have assumed the kingship by the year 674 (Chalmers 1887: 206; Higham 2015: 149; Grigg 2018: 39). The Irish Annals refer to Bridei as having been the king of Fortriu (Fortrenn) (AT686.4; AU692). Until recently, Fortriu was thought to have been synonymous with the southern Pictish kingdom, but Woolf has demonstrated that Bridei's kingdom likely was in the north beyond The Mounth (Woolf 2006: 188-200). This may indicate a shift in power from the Pictish kings in the south to those in the north.

Bridei and Ecgfrith may have been related. Nennius (HB57[59]) refers to them as cousins, but research by Cruickshank (1991:11-12), Fraser (2002: 22-23) and Higham (2015: 149) shows that they were more likely grand-nephew and grand-uncle respectively. To what extent this familial relationship influenced the events leading to the Battle of Dún Nechtain is unknown, but it demonstrates that Northumbrian influence may have extended into the Pictish heartland north of The Mounth. It was possible that following the expulsion of Drest and the Pictish crown passing to his grand-nephew Bridei, Ecgfrith may have felt that the situation in the north was secure enough that he could turn his attention to other matters. In 679, he led an expedition into Mercia that ended in a disastrous defeat at a battle near Trent (ASC679; Cruickshank 1991: 11; Fraser 2006: 29; Higham 2015: 179-182).

[59] Nennius. (2008). *The History Of The Britons (Historia Brittonum)*. Giles, J. A. (Trans.). Forgotten Books, 40.

Bridei appears to have taken some time to consolidate his power and build up his forces in the north (Cruickshank 1991: 10). However, Bridei may have seen an opportunity in Ecgfrith's defeat at Trent in 679 to further his own ambitions (Fraser 2014: 214). Ecgfrith's loss of men and prestige at Trent would likely have required some time to rebuild just as the Picts themselves likely had to rebuild after their defeat at the Battle of Two Rivers in 671. The *Annals of Ulster* record a siege that had taken place at Dunnottar, on the coast of Kincardine and the Mearns near what may have been the frontier of the southern Pictish zone, in 681 (AU681). The name of the contending parties are not given, but the attacker may have been Bridei beginning to expand his own area of influence (Fraser 2002: 27, 2006: 31, 2014: 214-215). This interpretation makes sense given that the Irish Annals explicitly name Bridei as the one who conducted a devastating raid on the Orkneys in 682 (AT 682.5; AU681; Duncan 1975: 53; Cruickshank 1991: 10; Fraser 2002: 27, 2006: 31).

It is possible that Bridei's raids of 681 and 682 were made in order to exert his control over fractious warlords on the edges of his own kingdom. Higham (2015: 206), however, has suggested that Bridei's raids were part of a series of attacks on Northumbrian clients undertaken in alliance with Dyfnal, king of the Strathclyde Britons and with support from the Province of Brega in Ireland. Higham's suggestion would seem to be supported by subsequent events. The Irish Annals record the siege of Dún Att (Dunadd), a fortified capital of Dalriada in southern Argyle, and Dún Duirn (Dundurn), a Pictish hillfort in upper Strathearn, in 683 (AT682; AU682). The implication is

that although the aggressor in these attacks was not named, it was in fact Ecgfrith retaliating for attacks made on Northumbrian clients in the north (Fraser 2002: 27, 2006: 31; 2014: 214-215; Higham 2015: 206).[60] There is no doubt that Ecgfrith dispatched the expedition that had been sent against Brega in 684 (ASC684; AT685.2; Cruickshank 1991: 11; Fraser 2006: 43-47; Bede 2008: 221; Higham 2015: 206-207). The following year, 685, Ecgfrith led his army north from Northumbria and into Pictish territory (AT686.4; AU685). Duncan (1975: 53) has written that Ecgfrth's motives in leading an expedition against the Picts are unclear. It seems likely that having retaliated against Strathclyde and Brega, for possible challenges to Northumbrian hegemony, he was now looking to engage Bridei himself (Fraser 2002: 34, 2006: 39-40, 49-50). Ecgfrith and Bridei met at Dún Nechtain, Saturday, 20 May 685, with disastrous consequences for the former.

The Location of Dún Nechtain: Dunnichen vs. Dunachton

The search for the Dún Nechtain battlefield has evolved into a debate between two general locations (Figure 6.1). The first, or traditional site, is associated with Dunnichen, which lies approximately 3 miles southeast from Forfar in Angus. The second site was proposed by Alex Woolf in a 2006 paper, in which he identified Dunachton on the western shore of Loch Insh in Badenoch as the site of the battle (Woolf 2006: 185-187). Before applying

[60] It is unclear how an attack on the Scots of Dál Riata would chastise Dyfnal of Strathclyde and Bridei of Fortrui, unless Strathclyde was in possession of Dunadd.

KOCOA to the above locations, it may be useful to summarize the debate and the evidence as it relates to each site.

Dunnichen first came to be identified as the site of the battle of Dún Nechtain through the scholarship of George Chalmers in 1807 (Chalmers 1887: 210, 255). Chalmers surmised that the name Dunnichen was a derivation of Dún Nechtain. Support for his identification of the site came in the form of a royal charter granted by William the Lion to the Abbey of Arbroath. One copy of this grant dated to c. 1178 refers to the place as *Duneicht*, while a second copy dated 1213 names it *Dunechtyn* (Barrow 1971: nos. 197, 513; Alcock 1996: 131). As further support for his identification, Chalmers referenced a passage in *The Statistical Account of Scotland* in stating that the "remains of the ancient fort [Dún Nechtain] may still be seen on the southern side of the hill of Dunnichen" (Chalmers 1887: 210).[61] A closer examination of the passage in question, however, refers simply to the "visible remains of the foundation of some ancient building" (Sinclair 1791: 419). Whether the ancient building was indeed a hilltop fort, or was in fact some other structure, is unclear. Chalmers clearly did associate the ancient building with Dún Nechtain, or Nechtain's Fort. However, the structure being referred to may be the enclosure situated on Castle Hill, which is a spur of Dunnichen Hill on the south. It is possible that researchers have been mistaking the Castle Hill enclosure for a hillfort near the summit of Dunnichen Hill proper. Chalmers also identified Dunnichen Moss, "a small lake near the church of Dunnichen on the east, which was drained for its

[61] Castle Hill just west of Dunnichen Village.

marle" (Chalmers 1887), as being the *Nechtanesmere* identified by Simeon of Durham (Stevenson 1855: 697) as the site of the battle.[62] This identification was, as Woolf (2006: 184) noted, "accepted, with varying degrees of caution, by all scholars working in the field."

Although it would appear that Chalmer's historical scholarship was sound there are issues with his identification of Dunnichen as the site of the battle of Dún Nechtain. Perhaps the most significant of these issues is that the terrain at Dunnichen does not correspond to Bede's description of the battle as having taken place in "some narrow passes in the midst of inaccessible mountains (*quidam inter angustias montium inaccessa*)" (Bede 2008: 221). Bede never mentioned the presence of a loch but was quite specific in stating that the battle was fought in mountainous terrain. At 232 meters above sea level (approximately 761 feet), Dunnichen Hill is hardly an inaccessible mountain. In order to accommodate Bede, researchers looked at the landscape adjacent to Dunnichen. During the nineteenth century, Thomas Arnold had first suggested that the battle had likely been fought a short distance to the north of Dunnichen Hill near Rescobie Loch.[63] In 1996, Leslie Alcock proposed Restenneth Loch, just to the west of Ressobie Loch. Actually, Alcock proposed two additional sites as well; 1) a site somewhere to the northeast approaching the South Esk River; and 2) a narrow pass running between Turin Hill and Finavon Hill. (Alcock 1996: 141). Alcock

[62] By extension, Dunnichen Moss would have been the *Linn Garan* mentioned by Nennius (2008: 40). In 1948, F. T. Wainwright reconstructed the boundaries of the vanished loch using field survey and aerial photographs (Wainwright 1948: 91-93).

[63] Arnold is quoted in Woolf (2006: 185) but the passage in question can be found in: Arnold, Thomas (Ed.) (1882-5). *Symeonis Monachi Opera Omnia*. Volume 1 Rolls Series London, p. 32.

predicated his choice of sites on the hypothesis that Ecgfirth was marching his Northumbrians east toward the South Esk, when they were drawn into an ambush at one of the three locations (Alcock 1996: 140-141). In 2002, James Fraser developed a theory that added support to Alcock. Fraser pointed out that, at the time of the battle in 685, the lochs of the upper Lunan were likely a single stretch of open water (Fraser 2002: 58-64; 2006: 68-70). Fraser further suggested that Restenneth Priory was constructed on an earlier ecclesiastical site that was built to commemorate the battle (Fraser 2002: 101, 2006: 126). In Fraser's scenario, the valley between Dunnichen Hill and Turin Hill, in which the large loch sat, was the narrow pass of Bede. Ecgfirth, then, had been lured into battle along the north side of Dunnichen Hill (Fraser 2002: 58-60). The south side of Turin Hill, however, slopes gently 179 meters (587 feet) from the valley floor, hardly the inaccessible mountains mentioned by Bede. During the nineteenth century, as Fraser (2002: 62-64) admitted, Restenneth Loch may have been part of the Dunnichen estate, but it lay within Forfar parish and not Dunnichen parish, putting the battle outside the limits of William the Lion's charter to the monks of Arbroath.

In 2006, Alex Woolf proposed a new location near Loch Insh in Badenoch as the site of the battle of Dún Nechtain (Woolf 2006: 185-188). Woolf pointed out that Dunnichen was not the only placename derived from Dún Nechtain and that Dunachton, approximately 4 miles northeast of Kingussie, was a more likely site for the battle. Woolf found that the site was recorded c. 1380 as the "chapel of Nechtain" (capelle de Nachtan) in a dispute between Alexander Stewart (Earl of Buchan and Lord of Badenoch)

and Alexander Bur, bishop of Moray (Innes 1837: 184; Woolf 2006: 186). There was an early medieval chapel dedicated to St. Drostan on the site with an associated burial ground (Barrow 1989: 8; Historic Environment Scotland n.d.b).[64] A short distance from the chapel, the present Dunachton Lodge sits atop the remains of Dunachton Castle (Historic Environment Scotland n.d.a). That Dunachton was of importance to the Picts is evidenced by the presence of an inscribed Pictish symbol stone. Allen and Anderson (1903: 100) described the stone as a Class I type, with a carved beast's head symbol, likely dating from the sixth to eighth centuries. Woolf strengthened his identification of Dunachton by noting the strong similarity of the terrain to Bede's description. The River Spey opens into Loch Insh at Dunachton and is bordered by mountains. The valley, then, forms a narrow pass through inaccessible mountains just as Bede described (Woolf 2006: 187). This, in turn, would have meant that Loch Insh and the nearby ground to the south, was Nechtansmere or Linn Garan. While Woolf's identification of Dunachton as Dún Nectain would seem to be a better fit with the available evidence than Chalmers' identification of Dunnichen, Fraser cast doubt on Woolf's proposal. Fraser cites the Aberlemno 2 Pictish symbol stone, which depicts a scene of battle that is generally accepted as being Dún Nectain. The stone stands in the Aberlemno Kirkyard some five miles from Dunnichen. Fraser reasons that the proximity of this stone to Dunnichen would seem to indicate that the

[64] Present ruined chapel is a faux ruin erected in 19th century to commemorate original (Macbain 1891: 189; Historic Environment Scotland n.d.b)

battle was fought there (Fraser 2014: 215-216). There are, however, questions concerning the relationship of the Aberlemno 2 stone to the battle.

Pictish and Northumbrian (Saxon) Way of War

As with the previous case studies, a general understanding of the tactics and force composition of the contending armies will inform our view of how they may have approached the landscape of Dún Nechtain. Reconstructing the Pictish *praxis* of war and its role in society, however, is especially challenging. The Picts left no written records of their own, appearing only as brief mentions in the historical sources of their neighbors (Aitchison 2003: 44). Archaeology provides little information regarding Pictish warfare. The Picts had adopted Christianity by the time of the battle and burials containing weapons as grave goods, similar to those found in Saxon burials, are absent (Aitchison 2003: 44). The Picts have left a rich artistic tradition in the form of the Pictish symbol stones that do depict scenes of warfare and this iconography provides a valuable source of information (Aitchison 2003: 45-46). The Northumbrians, or Saxons, are better represented in historical and archaeological sources (Evans 1997: 4). Bede, for example, was himself Northumbrian having been born at Jarrow some ten years before the battle he chronicled (Campbell 2004). Saxon burial practices included warrior inhumations that contained associated weaponry, providing an interpretive link to the battlefield (Evans 1997: 4). The available sources seem to indicate that the Picts and Northumbrians shared the same general military system

that was common throughout Britain during the Early Middle Ages (Evans 1997: 1; Aitchison 2003: 29). This allows the military *praxis* of the Picts and Northumbrians to be considered together.

The *comitatus* or warband military structure was prevalent throughout Great Britain throughout the Early Middle Ages, a time known colloquially as the Dark Ages (Pollington 1996: 26-33; Evans 1997: 1, 10; Hollister 1998: 9-11; Aitchison 2003: 2, 26). The *comitatus* or warband was the bodyguard or retinue of a king or nobles (Evans 1997: 2, 51; Aitchison 2003: 14, 26-27). This retinue was made up of kin and warriors (Evans 1997: 32-34; Aitchison 2003: 37) and constituted the elite cavalry of the age (Evans 1997: 49-51; Aitchison 2003: 27, 31, 80). The warband was not large with estimates ranging from Pollington's (1996: 28) dozens or 100 to Alcock's (1987: 300-302) several hundred to the approximately 1200 found in the *Senchus Fer nAlban* (Bannerman 1974: 146-148). *The Gododdin* (Skene 2007: VII) records that the warband of Mynyddog Mwynfawr, king of the Manaw Gododdin, numbered 300 at the Battle of Catraeth. The bond between a lord and his *comitatus* was strong and was based upon a reciprocal relationship. The lord was expected to provide gifts of gold rings, arms, armor, and horses; feasts of food and drink, shelter in his hall; and also, protection (legal) should the need arise. In return, the warrior owed his lord loyalty to death, vengeance for the death of his lord, and would accompany his lord into exile (Norman & Pottinger 1966: 13-14; Evans 1997: 51, 53-55, 66-68; Aitchison 2003: 35). Ecgfrith may have only had his warband and the warbands of his nobles with him at Dún Nechtain. It appears that he marched

rapidly to engage Bridei against the advice of his advisors (Bede 2008: 221-222). This rapid movement may have served him well at the Battle of Two Rivers (Colgrave 1985: 43) and his move against Bridei may be what is depicted in the Aberlemno 2 Stone (Figure 6.1). It may have been that raids were conducted by mounted warbands who moved quickly, while invasions were handled by larger armies.

The bulk of the army was made up of infantry comprised of militia levies (Aitchison 2003: 14, 24, 31). Levy quotas were assessed and organized according to units of land holding.[65] Among the Picts military obligation may have been assessed according to the *pet(t)*, a term meaning a piece or share of land, probably part of a dependent estate, where a commoner worked the land as part of a clientage relationship with the lord (Aitchison 2003: 18-21). The *pet(t)* placename survives as *Pit-* in over 300 places in northeast Scotland, such as Pitlochry (Perthshire) and Pittenween (Fife) (Aitchison 2003: 8). Pictish military obligations also may have been assigned according to the *dabhach* or *davach*, which was the normal land unit for assessing taxes or dues in the form of agricultural produce (Aitchison 2003: 19-20). How many men were levied per unit of land is unclear. It is possible that the Pictish *pet (t)* was analogous to the Saxon *hide* and resulted in a single levy joining the army.[66] Estimates as to the size of a Pictish army

[65] The Scots of Dál Riata organized their levies by household or *tech* (Bannerman 1974: 71, 132-141; Aitchison 2003: 15-18).

[66] The Welsh required men 14 years of age and over to fulfill military obligations as part of the *llu,* meaning army or military force (Davies 2014: 52). It would seem that the basic unit of organization was the *commote* but how many men served on average and how it compare to the Pictish and Saxon militia levies is unclear (Davies 2014: 83-84).

vary considerably according to the formula used with numbers ranging as high as 7,000 to 10,000 men (Aitchison 2003: 23). These numbers are improbable for two reasons. First, the number is based on the ratio of men able to bear arms in the Highlands and Isles during the 1700's and applied to an arbitrary population estimate of 100,000 for all of Pictland (Aitchison 2003: 22-23). Second, the number of men actually mustered for military service depended upon circumstances with only a partial number of men being mobilized at a time (Aitchison 2003: 23). The Scots of Dalriada were noted for their ability to muster what was considered a large army for the period. The *Senchus Fer nAlban* estimates that Dalriada could have mustered approximately 2000 to 2100 men (Bannerman 1974: 146-148).

The Saxons assessed military obligations in units known as *hides*. A *hide* was not an exact measure of land, rather it referred to the amount of land necessary for a commoner to support his family. The area of land that comprised a *hide* varied depending on soil quality. The military quota generally equated to one man per *hide* (Pollington 1989: 153; Hollister 1998: 2-3; Halsall 2003: 59).[67] Assessing military obligation based essentially on the productivity of land makes it difficult to estimate the size of a Saxon army. As with the Picts above, there is no satisfactory mechanism to gauge the size of Saxon armies during the seventh century. Again, we must resort to the *Senchus Fer nAlban* for an estimate of approximately 2000 to 2100 men,

[67] Aitchison (2003: 17) says it was one man per five *hides*.

keeping in mind the same caveats mentioned above relative to the Picts (Bannerman 1974: 146-148).

The muster of militia levies was called the *fecht* (army service) or *slógad* (hosting) by the Scots (Aitchison 2003: 21) and the *fyrd* by the Saxons (Pollington 1996: 78-82; Harrison & Embleton 1998: 8-9). What the Picts called the levying of militia quotas is unknown. There were three principal reasons for mustering the militia: a hosting within the kingdom's borders to repel an invader; a hosting on the border to guard against invasion; and a hosting to invade another kingdom (Aitchison 2003: 21, 31-32). Raids conducted against rival kingdoms may have been carried out by mounted warbands (Pollington 1996: 77; Aitchison 2003: 31). It would seem that a hosting was primarily defensive in nature and occurred within home territory. This point becomes important when considering the battle scene depicted on the Aberlemno 2 stone (Figure 6.2).

Armies of the Early Middle Ages were composed of two main elements. The nucleus of the army was comprised of the royal warband and was augmented by the warbands of the nobles. The warbands represented the military elite, the professional warriors, who functioned as cavalry as well as providing leadership (Aitchison 2003: 31). They may have been armored (the Saxons particularly with their distinctive helmets) and would have carried a sword, shield, and javelin (Norman & Pottinger 1966: 14-16; Heath 1980: 77-78, 109-113; Pollington 1996: 95-160; Evans 1997: 38-40; Wagner 2002: 22-28; Aitchison 2003: 45-49). It is possible that a battle began with a cavalry charge before the nobles dismounted to lead their levies in person (Aitchison

2003: 79-84; Nicholson 2004: 56-57). They could also be used to maneuver around the enemy's flanks and take up the pursuit should the enemy break. The majority of the army was made up of the militia levies who acted as infantry. Armed primarily with spear and shield they would have fought in a shield wall, or *scildburh* (shield-fort), a block type formation (Harrison and Embleton 1998: 27, 30). The Aberlemno 2 stone (Figure 6.2) depicts a Pictish formation that appears similar to *scildburh* or, perhaps, an early form of schiltron. They also may have made use of the *cuneus* or flying wedge, a form of charge that could be either close order or a more open formation (Halsall 2003: 194-195).

KOCOA Analysis

In this case study, KOCOA is used to address the debate between the two most commonly proposed locations of the Battle of Dún Nechtain. A KOCOA analysis was conducted on each of the sites at Dunnichen and Dunachton in order to determine which of the two sites is the most likely location of the battle. The landscape at each site was evaluated using KOCOA and compared to the terrain descriptions in surviving historical accounts. A table summarizing the results of the KOCOA analysis is presented below for each site. This is followed by a discussion interpreting the likely influence of the terrain on the conduct of the battle.

There are three historical accounts that are of particular interest to this case study as they contain terrain descriptions. They are herein quoted:

> “Indeed the very next year [685] the king rashly took an army to ravage the kingdom of the Picts, against the urgent advice of his friends and particularly of Cuthbert, of blessed memory, who had recently been made bishop. The enemy feigned flight and lured the king into some narrow passes in the midst of inaccessible mountains; there he was killed with the greater part of the forces he had taken with him, on May 20, in the fortieth year of his age and the fifteenth of his reign” (Bede 2008: 221).

> “Egfrid is he who made war against his cousin Brudei, king of the Picts, and he fell therein with all the strength of his army, and the Picts with their king gained victory; and the Saxons never again reduced the Picts so as to exact tribute from them. Since the time of this war it is called Gueithlin Garan” (Nennius 2008: 40).

> “But in the same year [685] in which Egfrid had caused this venerable father to be ordained bishop, he was killed at Nechtansmere (that is, The lake of Nechtan), along with a large portion of the troops which he had taken with him to plunder the land of the Picts. This happened, as the same father Cuthbert had predicted, upon the thirteenth of the kalends of June [20 May], in the fifteenth year of his reign. His body was buried in Iona, the island of Columba.” - Simeon of Durham (Stevenson: 1855: 637).

From the above excerpts it can be seen that the battle took place in a narrow pass amongst inaccessible mountains alongside, or near a lake that, perhaps, hosted a population of cranes during the month of May.

Objectives

The objectives of the combatants at Dún Nechtain must be inferred from the historical context. As discussed earlier, it would appear that Northumbrian hegemony had seen a series of challenges to its hegemony in northern Britain. In response, King Ecgfrith led or dispatched punitive expeditions against Pictish allies in the years 683 and 684. It appears that Ecgfrith

undertook a punitive expedition into Pictland in 685 (Stevenson 1855: 637; Brede 2008: 221; Nennius 2008: 40). If the Aberlemno 2 stone is an accurate depiction of the Battle of Dún Nechtain, then it appears that Bridei raised at least a partial hosting in order to defend his territory form Ecgfrith's warband at Dún Nechtain.

Dunnichen

Battle of Dún Nechtain KOCOA Analysis of Dunnichen

Terrain Feature	KOCOA Classification	Reason for Classification
Dunnichen Hill (350927, 749661)	Key Terrain	232 m (761 ft) above sea level sandstone and trapstone hill approx. 4.8 km (3 miles) in length trending SW to NE rises approx. 107 m (351 ft) above Dunnichen Village. Southern face open. North face and part of summit is tree covered.
	Observation	Depends where on hill observer is and tree cover. Generally speaking, from south side of summit open viewshed to south and east past parish boundaries, or at least Dumbarrow Hill.
	Concealment	Depends on location of enemy observation point and tree cover. Hill provides concealment on reverse side from observation point. Trees and vegetation would have obscured observation particularly at distance.
Castle Hill (350663, 748679)	Key Terrain	138 m (453 ft) above sea level sandstone hill just west of Dunnichen Village. A south extending spur of Dunnichen Hill. Drystone structure, fort, castle or enclosure stood here, but has been mostly quarried out. Floor deposits consisted of a thick bed of wood ash mixed with animal bones. Flint debitage found outside to south. Possibly Dunnichen derived from Dun-Achan (hill or fort of the valley) not Dun Nechtan.
Lownie Hill (349448, 748946)	Key Terrain	200 m (656 ft) above sea level sandstone with trapstone hill 2.7 km (1.68 miles) west of Dunnichen Hill Summit. Western terminus of Dunnichen Hill ridge. Tree covered with some wetland on summit.

Table 6.1 KOCOA Analysis Dunnichen (Part 1 of 2)

	Observation	Depends on where observer is located at tree cover at that point. Viewshed to north, west and south open. Line of sight east obstructed by higher elevation of Dunnichen Hill.
	Concealment	Like Dunnichen Hill concealment depended on location of enemy observation point. Reverse side of Lownie Hill offered concealment. Summit back from military crest or within tree cover would have as well.
Dumbarrow Hill (355028, 747878)	Key Terrain	163 m (535 ft) above sea level sandstone hill southeast of Dunnichen Parish approx. 4.5 km (2.8 miles) from Dunnichen Hill. Location of another stone enclosure or building. Summit is open. No tree cover. Gentle slopes.
	Observation	Good viewshed in all directions. Unobsructed line of sight.
	Concealment	Some protection from observation on reverse side of hill from observation point.
Dunnichen Moss (351752, 748948)	Obstacle	Natural existing turning or blocking water obstacle in the form of a small loch possibly with marshy shores. Drained c. 1760 for marle and peat. Now meadow with small pond between Dunnichen Village and Letham. Possibly Nechtansmere or Lin Garan. Boundaries reconstructed by Wainwright in 1948. Correlates to Forfarshire Map sheet Drdnance Survey 1st Series 1865 6 inch. A number of burial tumuli found in area of East Mains of Dunnichen (351530, 749330) 115 m (377 ft) (north shore of loch). Cremations and inhumations in stone lined cists with grave goods coarse pottery, knives and bead necklaces. Chalmers equated to a battle but likely early pre battle cemetery. Stone with "warrior head" also found.

Table 6.1 KOCOA Analysis Dunnichen (Part 2 of 2)

Cruickshank (1991: 14-17) has presented a reconstruction of the Battle of Dún Nechtain tailored to the landscape of Dunnichen Hill (Figure 6.3). Cruickshank has attempted to find congruence between the terrain descriptions in the historical sources and the landscape at Dunnichen. He

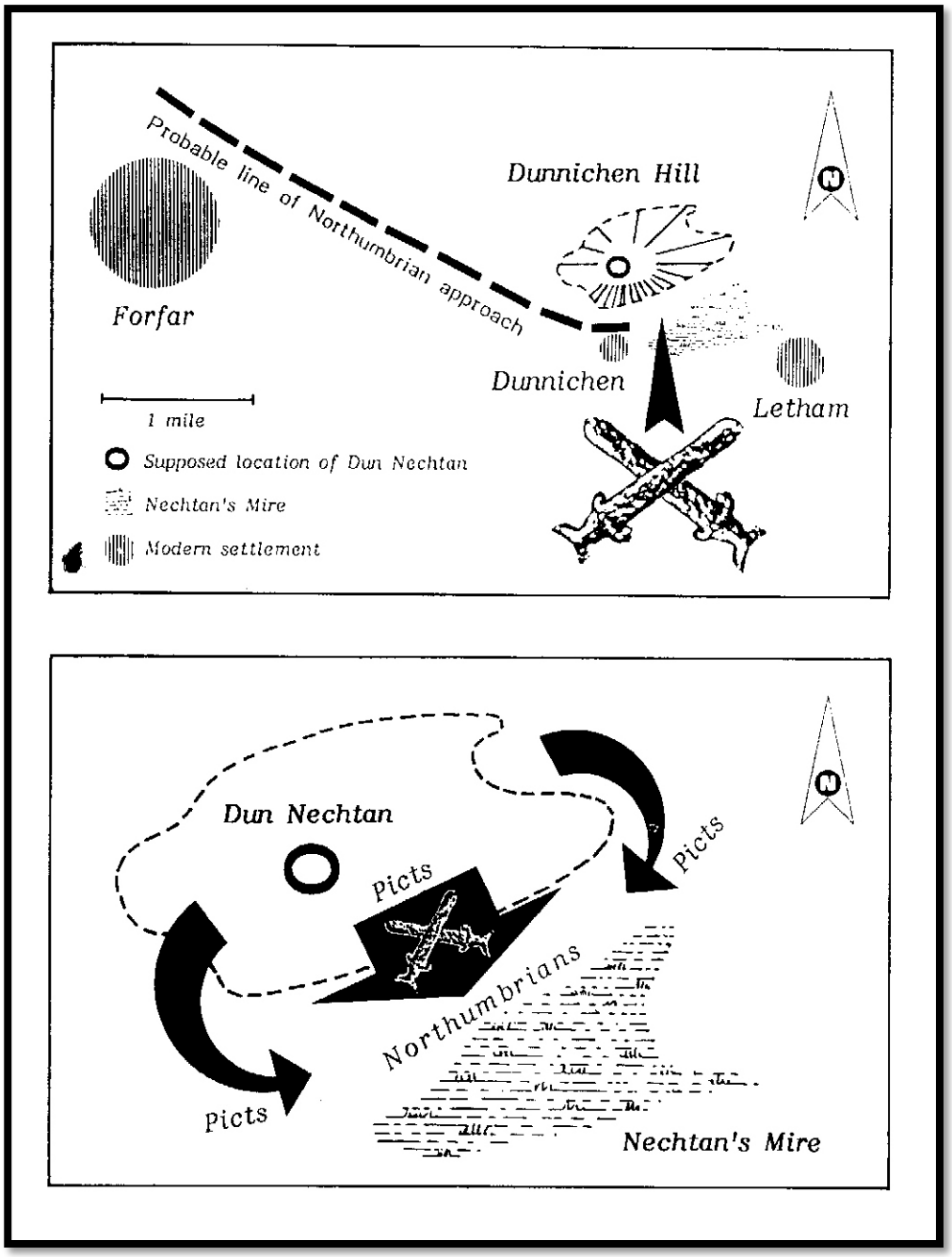


Figure 6.3. Reconstruction of Battle of Dún Nectain at Dunnichen (From Cruickshank 1991: 14-15)

hypothesized that Bridei lured Ecgfrith's Northumbrians into an ambush site situated in a narrow mobility corridor between Dunnichen Hill on the north and a small loch that once occupied the area that is now Dunnichen Moss on

the south. The ambush site, then, is located in a narrow pass between Nechtan's Fort on the summit of the hill to the north and Nechtansmere on the south. Cruickshank's hypothesis is the best reconstruction given the location of the ambush site, but the KOCOA analysis revealed that it is ultimately unsustainable (Table 6.1).

The key terrain of Dunnichen Hill (Table 6.1, Figure 6.4) is a sandstone and trapstone hill, whose summit rises 107 m (351 ft) above Dunnichen Village. The hill is actually an elongated ridge extending 3 km (1.86 m) along a southwest to northeast axis. Cruickshank placed Dún Nechtain on the summit of the hill, just to the northeast of present Dunnichen Village (Figure 6.3). Why Cruickshank placed Nechtan's Fort in this location is unclear. No evidence for a hillfort on the summit of Dunnichen Hill was found during the KOCOA analysis. There are, however, the remains of an enclosure of unknown date on the key terrain of Castle Hill (Table 6.1, Figure 6.4). Headrick (1845: 142) points to this enclosure as being Dun-Achan, meaning "the hill or fort of the valley." Linguistically, Dunnichen may be a derivative of Dun-Achan and not Dún Nechtain casting doubt on Chalmers identification (1887: 210, 255). The enclosure on Castle Hill seems a poor candidate for Dún Nechtain. It appears to have been a small, unimpressive drystone enclosure (Lock & Ralston 2017c) and not a center of Pictish power in the area, although a symbol stone was found nearby (Fraser 2006: 63-64). A better candidate would be Kemp Castle on Turin Hill approximately 5 km to the north. This, in fact, may have been Ecgfrith's intended target before being

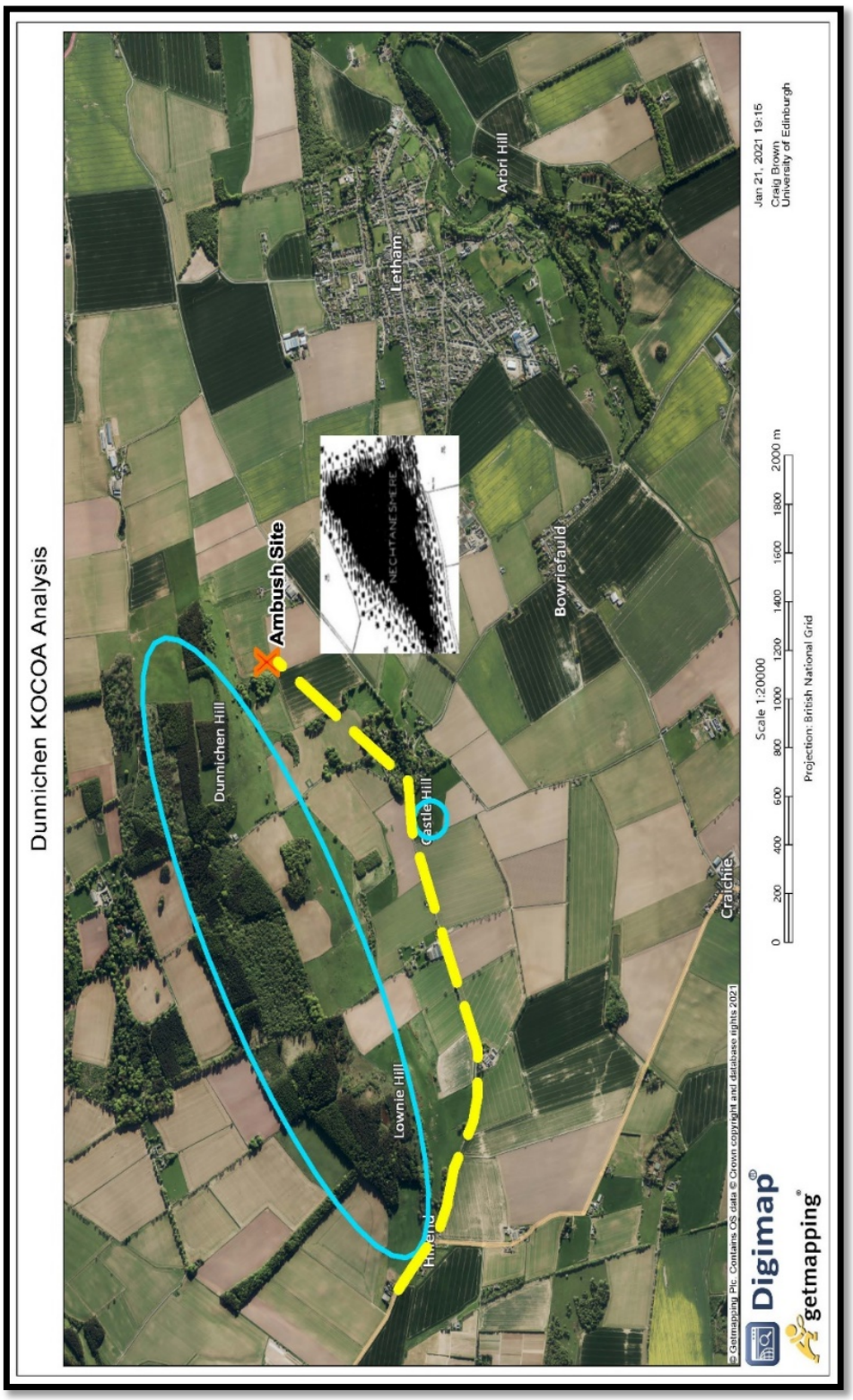


Figure 6.4. KOCOA Analysis Dunnichen. Corresponds to Table 6.1. Key Terrain circled in blue. Dunnichen Moss is to scale from Wainwright (1948). Northumbrian Avenue of Approach shown in green to ambush site shown as red 'X' (Drawn by ©Craig J. Brown ©Edina Digimap)

diverted toward Dunnichen (Alcock 1996: 141; Fraser 2002: 54-59; 2006: 64).

Fraser (2006: 61) lamented that insufficient attention has been paid to the travel routes through early historic Angus. This lack of scholarly attention hampers this case study. If Ecgfrith was indeed marching his army through Strathmore and in the direction of Turin Hill as speculated (Alcock 1996: 141; Fraser 2002: 54-59, 2006: 61, 64-65), it would have required a major diversion to lure him to the ambush site at Dunnichen. The avenue of approach from Forfar likely approximated the course of present Dunnichen Road where it curls around the base of Lownie Hill to arrive at Castle Hill and Dunnichen, a distance of approximately 4 or 5 km (2.5 m to 3.1 m) (Figure 6.4). This is likely part of the same avenue of approach that Wainwright (1948: 88) identified as part of the old road along the south of what was the loch. It is unclear if Cruickshank accounted for Lownie Hill in his reconstruction (Figure 6.3), but it does not appear that he did. Lownie Hill (Figure 6.4) extends approximately 1 km (0.62 m) to the west of Castle Hill and changes the angle of approach to the ambush site near present Dunnichen East Mains. By changing the angle of approach, it alters the observation characteristics of the ambush site. Figure 6.5 to 6.7 shows the area that was visible to Ecgfrith at various points along the Northumbrian avenue approach from Forfar. Figure 6.5 shows that the north face of Dunnichen Hill was visible to Ecgfrith along its entire length, with nearly the entire eastern area in view. This casts doubt on Fraser's (2002: 58-60)

suggestion that the battle took place on the north side of Dunnichen Hill. Figure 6.7 shows that as Ecgfrith passed Castle Hill and reached the area of Dunnichen Village he would have had a good view of the ambush site. If the slope above the ambush site was devoid of vegetative cover as it is today, then Ecgfrith likely would have discovered the ambush in time to avoid it. Ecgfrith was an experienced battlefield commander and he had defeated a Pictish ambush at the Battle of Two Rivers in 671 (Colgrave 1985: 43). It seems unlikely that Ecgfrith would knowingly march his army into the ambush site with the loch at his back limiting his ability to maneuver when there was good ground to the south. Cruickshank (1991: 15-16) realized the problem of observation and concealment relative to an ambush at Dunnichen. He seems to have dealt with it by reasoning that since the ambush was successful, Ecgfrith must have approached from the northwest and not the south due to line of sight to Dunnichen Hill. The KOCOA analysis, however, showed that there was a good chance the Ecgfrith would have discovered the ambush even by using the northwest avenue of approach.

Wainwright (1948: 91-93) reconstructed the boundaries of the loch that once existed at Dunnichen Moss and is proposed that this was Nechtansmere. He found that the loch corresponded to its depiction in Ainslie's map of 1794 (Figure 6.8) (Wainwright 1948: 91). According to Wainwright's map (Figure 6.9) the loch measured approximately 704 m (2,310 ft) east to west and 302 m (991 ft) north to south (Wainwright 1948: 93). Wainwright (1948: 91) estimated its depth at only 10 or 12 feet. It was fed by a spring that still exists and had an outlet on the southeast

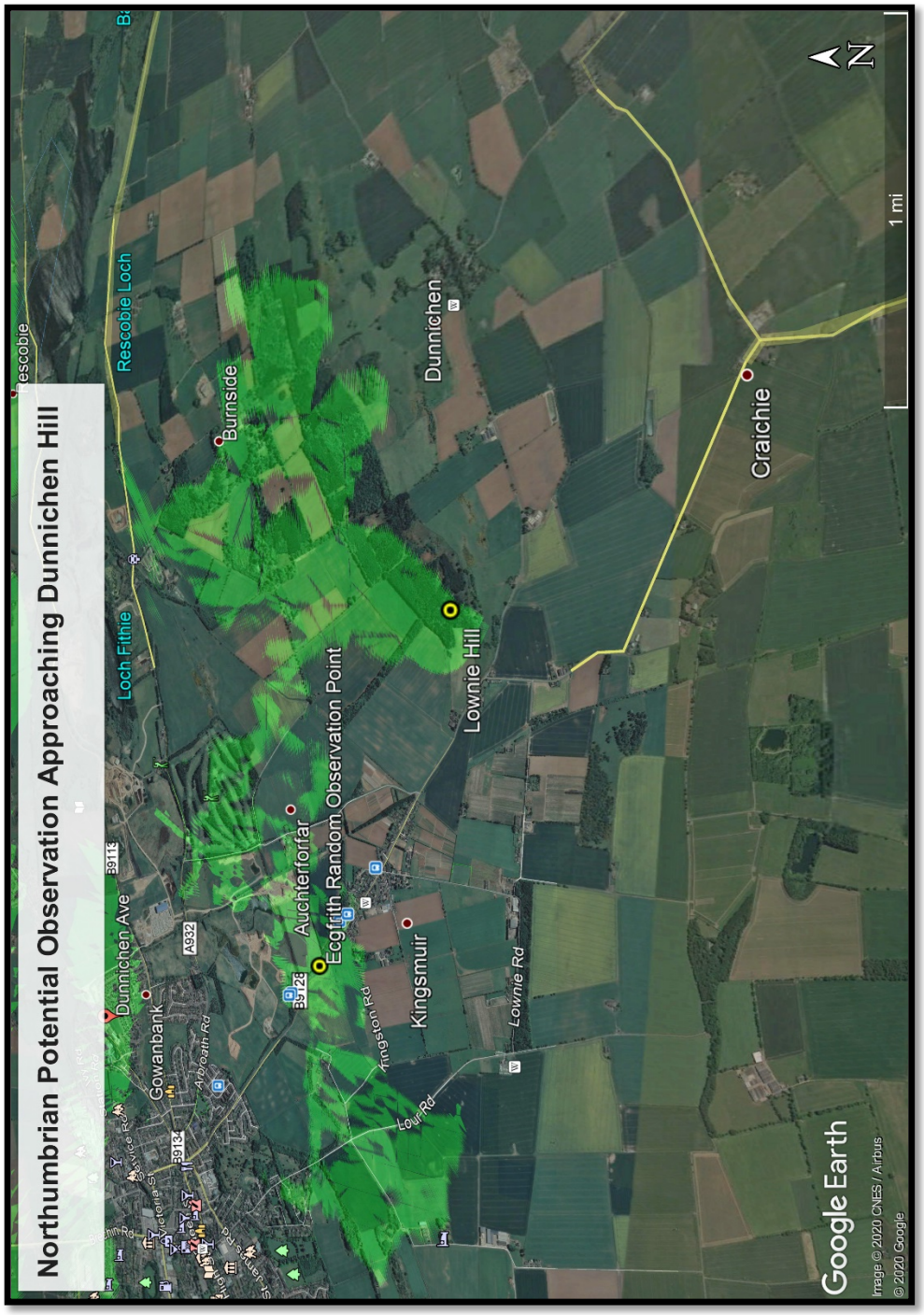


Figure 6.5. Northumbrian observation having left Forfar area and are moving along what is now Dunnichen Road. Entire northern face of Dunnichen Hill is visible, as well as the area above the ambush site (Drawn by ©Craig J. Brown ©Google Earth).

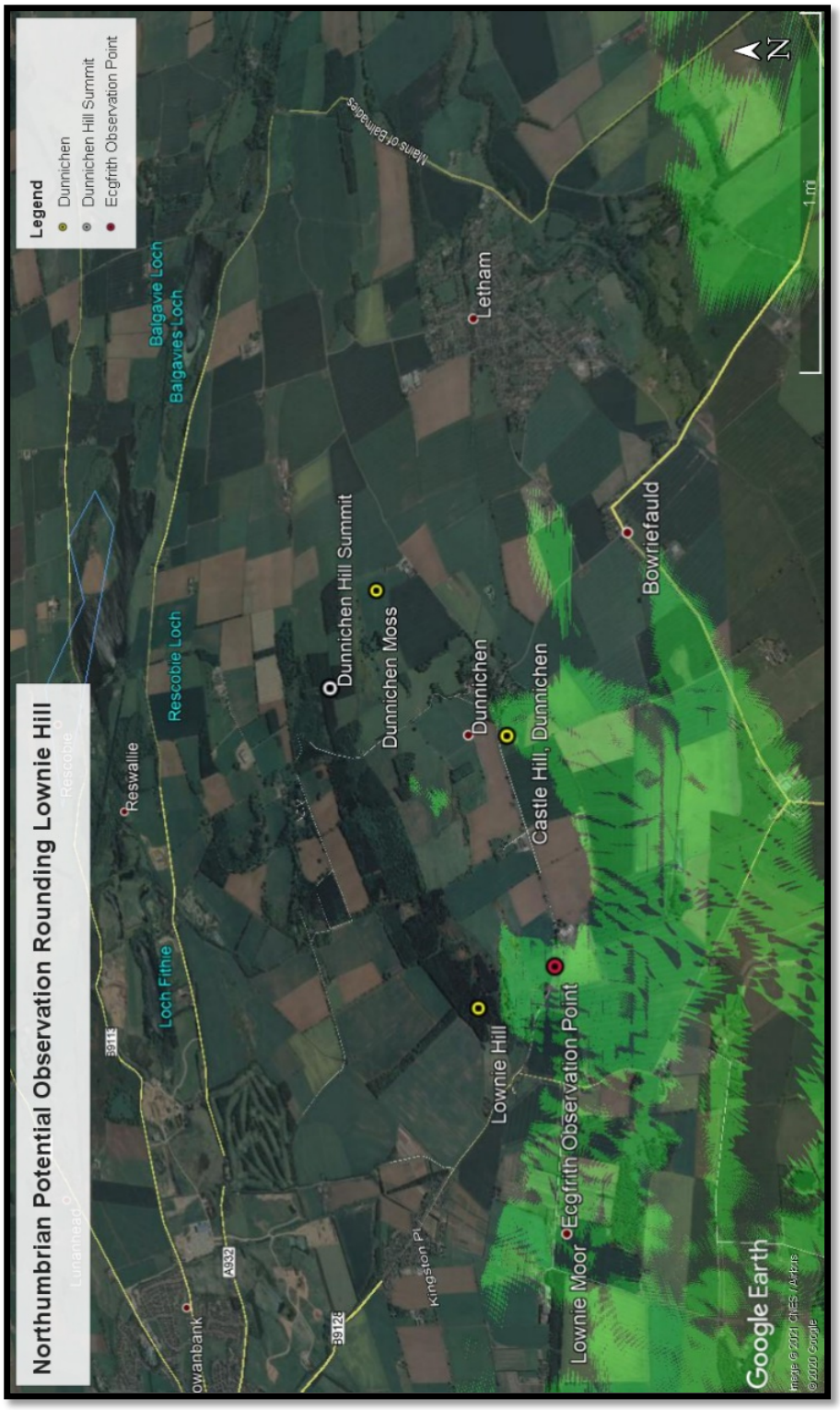


Figure 6.6. Northumbrian observation rounding Lownie Hill continuing on what is now Dunnichen Road. Dunnichen Hill is temporarily concealed from observation (Drawn by ©Craig J. Brown ©Google Earth)

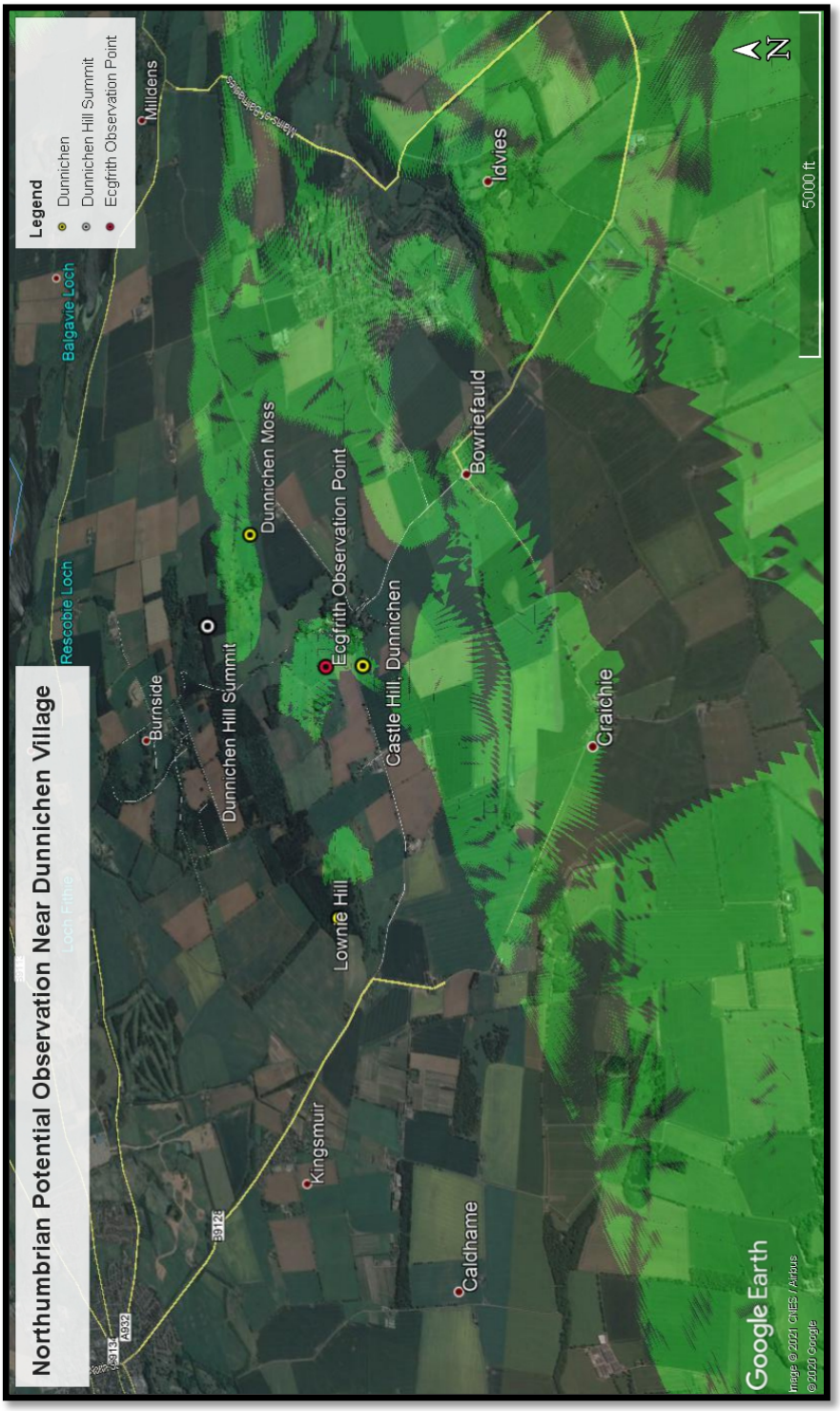


Figure 6.7. Northumbrian observation from what is now Dunnichen Village. Ecgfrith has passed Castle Hill and has the slope above the ambush site under observation. Without forest cover ambush would have been detected (Drawn by ©Craig J. Brown ©Google Earth).

(Wainwright 1948: 91-92). Marshes may have existed along its borders (Figure 6.8). Although small, this loch would have been a formidable existing turning or blocking obstacle for a warband. Under normal circumstances travel would simply divert or turn to move along the north and south banks of the loch. If Ecgfrith had been lured into the ambush site and caught between the Picts attacking from the key terrain of Dunnichen Hill and the loch to the south, he would have found himself in a disadvantageous position. The loch would have blocked movement to the south and may have allowed Ecgfrith's warband to be surrounded as proposed by Cruickshank (Figure 6.3) (Cruickshank 1991: 16). The loch was drained in stages beginning in the 1790's (Sinclair 1791: 426). The process was still ongoing in 1845 (Headrick 1845: 146). If the loch had formed the southern boundary of the battlefield,

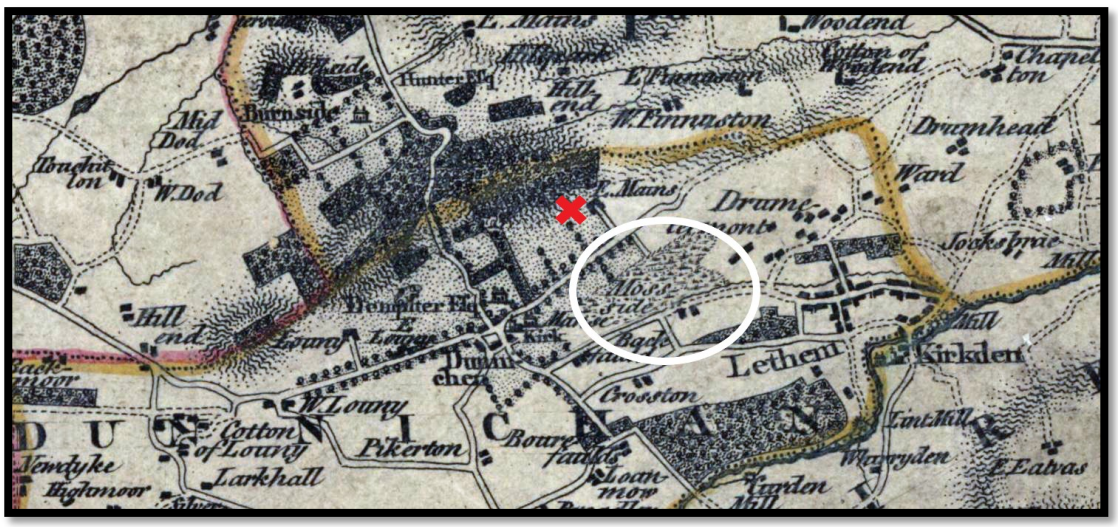


Figure 6.8. Ainsle's 1794 Map depicting Dunnichen Moss (Nechtansmere/ Lin Garan) circled in white. The proposed ambush site is marked by the red 'X' (Ainslie 1794; ©National Library of Scotland EMS.s.356).

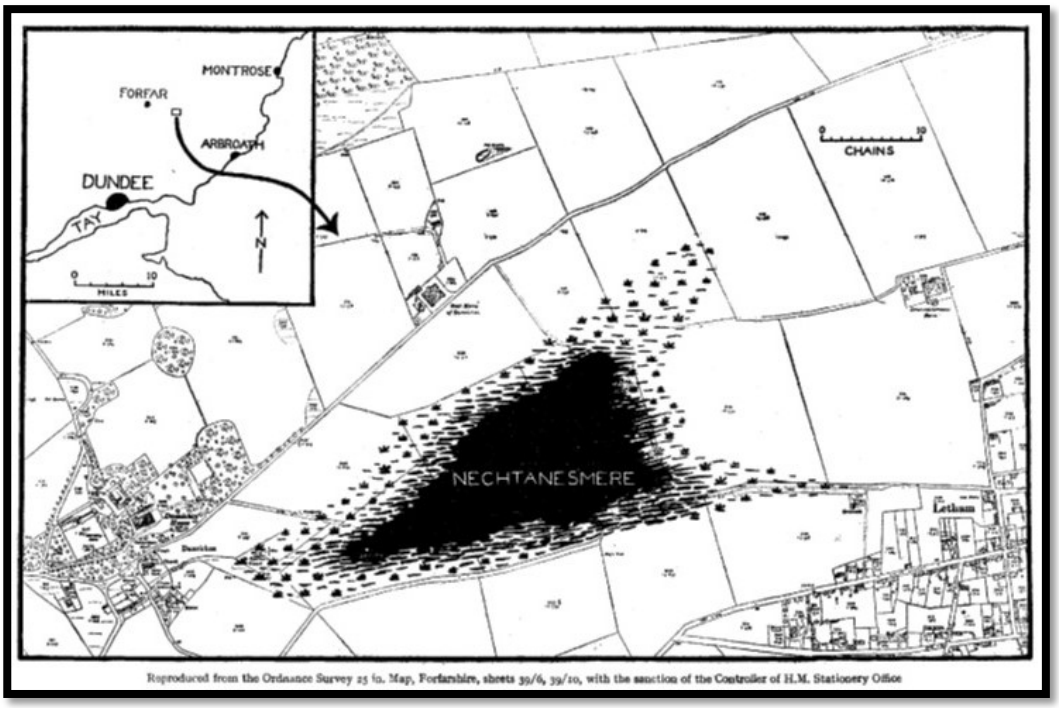


Figure 6.9. Wainwright's (1948: 93) reconstruction of Dunnichen Moss.

then it would be expected that some form of remains from the battle would have been uncovered when the loch was drained and peat extracted. Cremation burials and possible inhumations were indeed found along the northern shore of the loch, but these were similar to other burials found near Letham and pre-dated the battle (Headrick 1845: 146; Wainwright 1948: 92-94). Wainwright (1948: 92) concedes that no association between the battle and the burials is permissible but held to the belief that the battle could have been fought there. It would seem, however, that surviving burials would be indicative of the preservation potential of skeletal remains associated with the battle, particularly the larger elements associated with equines. Headrick (1845: 146) did not report the recovery of bone outside the aforementioned burials.

The proposed ambush site at Dunnichen does not seem sustainable as being in a narrow pass amongst inaccessible mountains as described by Bede (2008: 221). An elevation profile through the ambush site demonstrates the accessibility of the slope (Figure 6.10). The elevation profile also demonstrates the difficulty in maintaining concealment in the event the slope was open ground. As seen below, Dunachton presents a more favorable aspect.

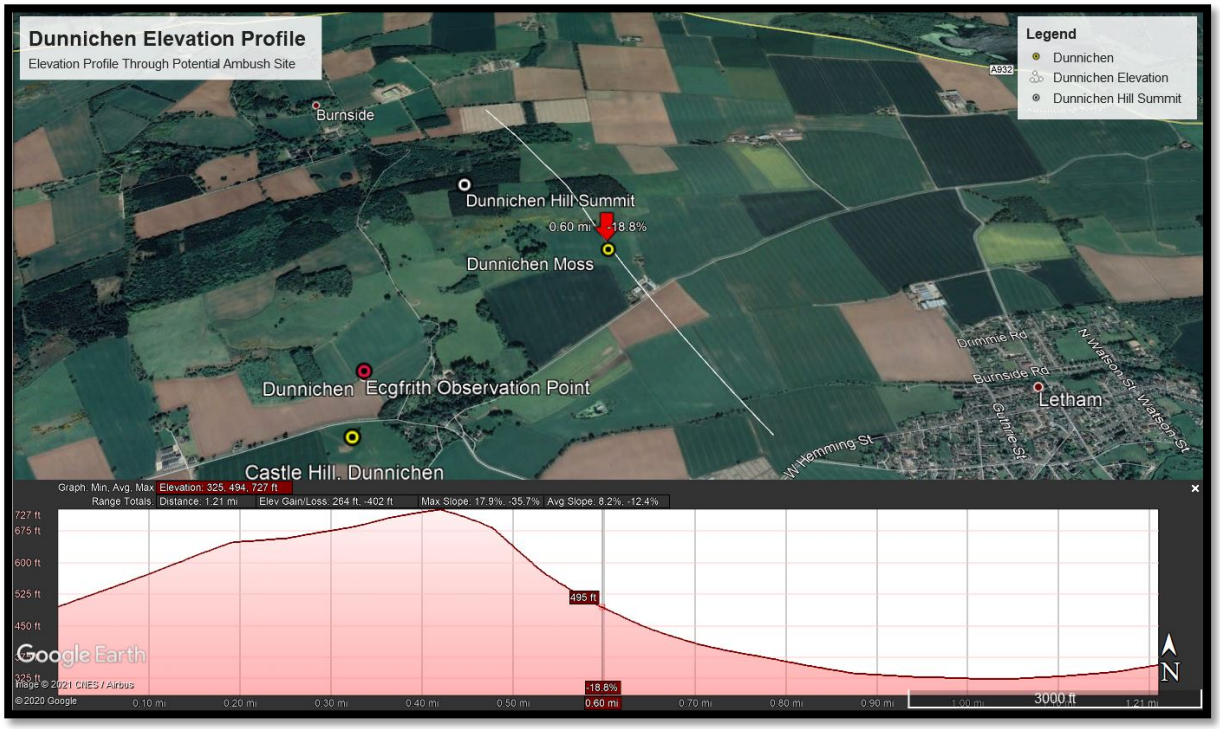


Figure 6.10. Dunnichen Elevation Profile. Profile shows elevation through ambush site demonstrating accessibility of the key terrain. Reinforces observation from Figure 6.6 above. An ambush set here would likely need forest cover to remain concealed until Northumbrians reached the site (Drawn by ©Craig J. Brown ©Google Earth).

Battle of Dún Nechtain KOCOA Analysis of Dunachton		
Terrain Feature	**KOCOA Classification**	**Reason for Classification**
Cairngorm Mountains	Key Terrain	Mountain range in eastern Highlands in Aberdeenshire, Inverness-shire, and Banffshire. Centered on Cairn Gorm 1245 m (4085 ft). Strathspey forms a mobility corridor running from Dalwhinnie north to Granton-on- Spey.
	Concealment	Line of sight broken by micro-topography. Caledonian Forest provided tree cover from enemy observation. Opportunities to set ambushes.
	Obstacles	Existing disrupting, turning, and blocking. Block or divert army movement into mobility corridors. Hilly terrain could have disrupted movement. Peaks near Dunachton on west: An Suidhe (541 m), Creag Bhaig (526 m), Creag Righ Tharailt (470 m), Creag Bheag (374 m); on east: Geal-Charn (920 m) and Creag Mhigeachaidh (742 m). Rugged tree-covered slopes may have been Bede's "inaccessible mountains."
Dunachton Lodge (282131, 804770)	Key Terrain	Built 1869 on ruins of Dunachton Castle (HES n.d.a). Castle was mentioned in 1380 precept (Fraser-Mackintosh 1866: 1). Was burned c. 1689 (Fraser-Mackintosh 1866: 13-14). Castle possibly built on older ruins. Lodge sits at 245 m (804 ft) elev. on a plateau or terrace. 450 m (1476 ft) to 600 m (1968.5 ft) from Loch Insh. Slope rises 25 m (82 ft) at a 5.56% to 4.17% gradient. Strong defensive position, especially from approach upslope from east. Observational characteristics not favorable looking south up Spey Valley due to intervening key terrain.
Unnamed Hill (281821, 804523)	Key Terrain, Observation	Small defensible hill approx. 258 m (846 ft) elev. Approx. 350 m southwest of Lodge. Provides observation of A9, B9152 and Wade's Road avenue of approach up Spey Valley from the south.

Table 6.2 KOCOA Analysis Dunachton (Part 1 of 3)

Loch Insh (283304, 804394)	Obstacle	Existing turning or blocking obstacle. Freshwater loch covering 131 ha surface area. Sits at 214 m (702 ft) elevation. Mean depth is 11.4 m (37 ft). Maximum depth is 30.5 m (100 ft) (Murray & Pullar 1908; UK Centre for Ecology & Hydrology 2020). Normally diverted traffic to roads and trackways to west and east. If road on west was blocked, Loch Insh could have become a blocking obstacle preventing withdrawal to the east.
River Spey (281050, 803294)	Obstacle	Existing obstacle. Sub-type of obstacle depends on river conditions (width, depth, current). Today Spey is approx. 30 m (98 ft) to 32 m (105 ft) in Insh Marshes. Flows north through Loch Insh. Depth at Boat-on-Garten, north of loch, averages .681 m (2.23 ft) since 1988 (SEPA 2020). Average discharge is 64m^3 per second (2,300 ft^3/s). Current through Insh Marshes (unknown) likely slower due to lower gradient of floodplain (1: 1200) (Spey Fisheries Board). Unless Spey was running high at time of battle (spring runoff) it likely could be forded by individual mounted and on foot. Likely functioned as a disrupting or fixing obstacle.
Insh Marshes (280685, 802434)	Obstacle	Existing obstacle, sub-type depended upon water level and soil conditions at time of battle. Likely normally functioned as a disrupting or fixing obstacle for both individuals and horse due to care needed to negotiate. Marshes cove 1,159 ha including Loch Insh from Kingussie to Kincraig. Act as floodplain south of Loch Insh. Spey floods several times a year mainly Autumn to Spring. Wading birds and waterfowl use the marshes as a nesting ground April to June (Taylor, Street & Mayhew n.d.; Ramsar 2020). Good candidate for Lin Garan. If in flood at time of battle, Marshes would have acted as a blocking or turning obstacle.
Dunachton Burn (281860, 804974)	Obstacle	Existing disrupting obstacle. Stream wraps around Lodge on west and north. Archaeological remains near: mills, prehistoric enclosures, roundhouse, and pits (HES n.d.a).
Craigbui Wood (279084, 803499)	Obstacle, Concealment	Non-primary growth wood west of Spey at approx. 260 m (853 ft) to 410 m (1345 ft) elev. This wood was not present in 685 AD but may serve as an analog for Caledonian Forest. Existing disruptive

Table 6.2 KOCOA Analysis Dunachton (Part 2 of 3)

		obstacle that broke up linear formations. Forest cover here would aid in concealing ambush.
Inshriach Forest (283540, 802249)	Obstacle, Concealment	Similar to Craigbui Wood on east side of loch at 300 m (984 ft) elev. Forest here in 685 would have function as existing disruptive obstacle.
A9 (282086, 804457); B1952(282280, 804518); Wade's Military Road Remnants (282079, 804540)	Avenue of Approach	The 3 roads form the primary avenue of approach on the west side of the Spey, Insh Marshes, and Loch Insh. In the area of the Lodge the roads run parallel to each other through a narrow mobility corridor on the slope above Loch Insh. Wade's Road (230 m – 240 m elev.); A9 (230 m elev.); B1952 (222 m – 226 m elev.). Mobility corridor is less than half a company in width (500 m) at only 180 m to 185 m wide. Forms a natural chokepoint that could have acted as a positive force modifier in setting an ambush at this location.

Table 6.2 KOCOA Analysis Dunachton (Part 3 of 3)

Dunachton lies approximately 87 km (54 miles) on a straight-line northwest of Dunnichen Hill above Loch Insh in Badenoch (Figure 6.1). As previously stated, the site was identified by Woolf (2006: 186) by virtue of the placename appearing in a dispute dating to c. 1380 (Innes 1837: 183-187). The place evidently held some importance or connection to the Picts due to the discovery of a class I symbol stone portraying a deer's head (Figure 6.11). The stone had been used as a door lintel and was found during demolition of the previous lodge. It has since been moved to a spot close by. The present Dunachton Lodge was built atop the remains of Dunachton Castle mentioned in the c. 1380 dispute. The castle was burned in c. 1689 by the MacDonalds of Keppoch (Fraser-Mackintosh 1866: 1, 13-14; Historic Environment Scotland n.d.a). It may have been built on still older remains

Figure 6.11. Dunachton Class I Symbol Stone depicting a deer's head. Found as a door lintel in the previous Dunachton Lodge, but demonstrates site's connection to the Picts. Dates from c. 600 to c. 800 (©Historic Environment Scotland n.d.a).

that may imply a connection with the elusive Dún Nechtain, however, this is just conjecture at this point in time.

The landscape at Dunachton is a better fit than Dunnichen based upon the hypothesis of the Battle of Dún Nechtain being an ambush. This

was demonstrated through the KOCOA analysis, the findings of which are summarized in Table 6.2 and represented graphically in Figure 6.12. A discussion of the key points follows below.

The Cairngorm Mountains (Table 6.2, Figure 6.12) are a good candidate for Bede's (2008: 221) "inaccessible mountains." The mountains comprise key terrain through which runs the Strathspey or Valley of the River Spey, the topography of which may be construed as the "narrow passes" of Bede (2008: 221). Since both terrain elements are present at Dunachton, we are not forced to ignore Bede's (2008: 121) "*inaccessorum montium*" as Alcock (1996: 141) instructs us to do. The River Spey meanders through the Insh Marshes, home to migratory wading birds and waterfowl, before opening into Loch Insh below Dunachton Lodge. The main road network likely follows a long established avenue of approach that passes through a narrow mobility corridor between Dunachton and Loch Insh. Above Dunachton to the west are the mountains of Suidhe (541 m), Creag Bhaig (526 m), Creag Rich Tharailt (470 m), and Creag Bheag (374 m). What role these key terrain features played in the battle is unknown, however, they may have formed the western boundary of the battlefield.

Dunachton Lodge occupies a key terrain feature comprised of a terrace or plateau located below the peak of Creag Rich Tharailt at 245 m (804 ft) elevation (Table 6.2, Figure 6.12). There have been a series of historically documented buildings on the site, with the oldest known being Dunachton Castle dating to at least as early as the 14th Century (Innes 1837: 183-187; Fraser-Mackintosh 1866: 13-14; Historic Environment Scotland

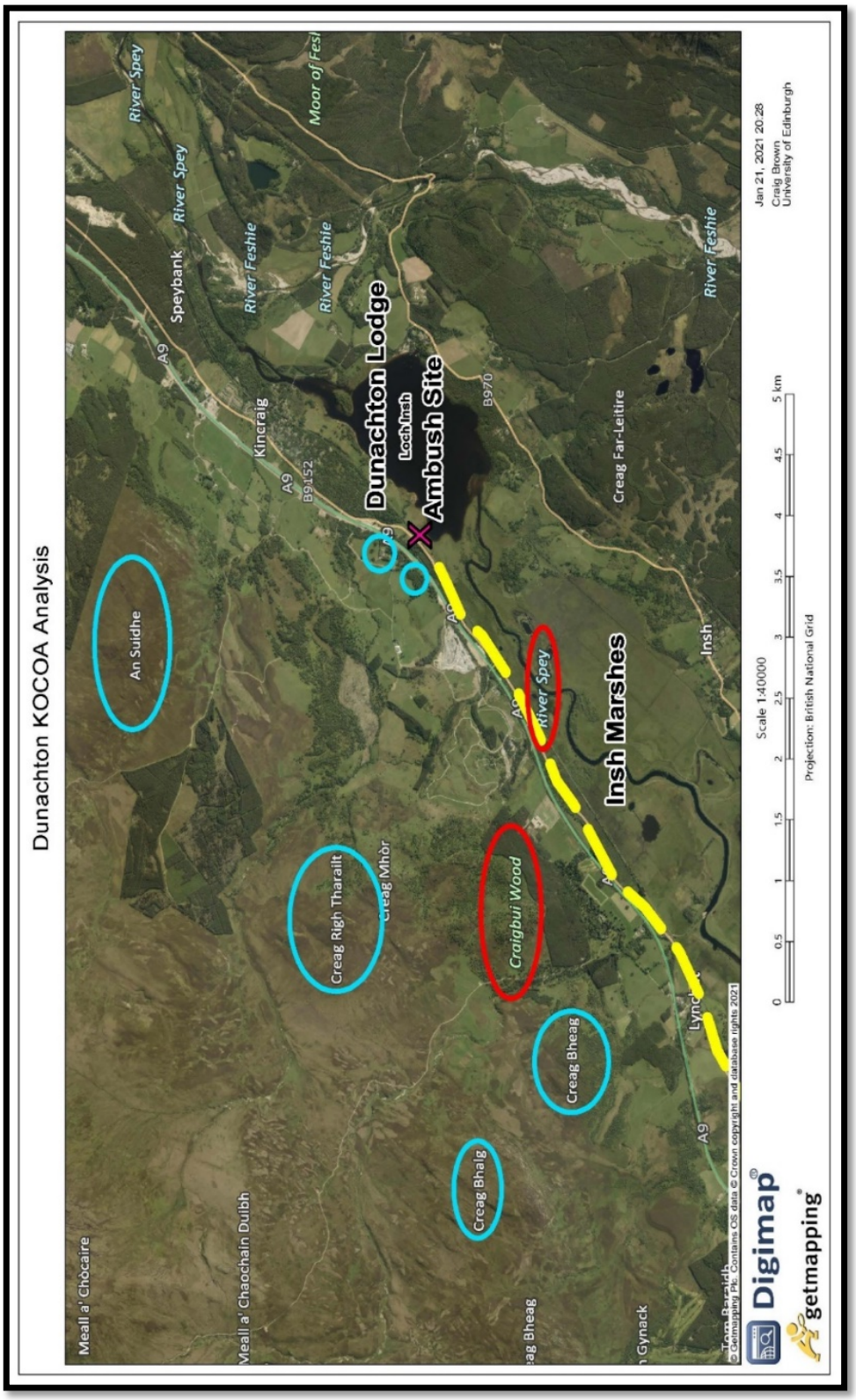


Figure 6.12. KOCOA Analysis Dunachton. Key Terrain is circled in blue. Obstacles are circled in red. Loch Insh and the Insh Marshes also served as obstacles. Northumbrian likely avenue of approach is shown by the yellow line. Potential ambush site is marked by the red 'X' (Drawn by ©Craig J. Brown ©Google Earth).

n.d.a.). The site would have been a formidable defensive position. The castle would have stood approximately 450 m (1476 ft) to 600 m (1968.5 ft) from the shore of Loch Insh. The slope rises 25 m (82 ft) over that span at a 4.17% to 5.56% gradient. St. Drostan's Chapel with its associated burial ground stood between the castle and A9 (Historic Environment Scotland n.d.b).[68]

The castle would have overlooked the avenue of approach comprised by the A9, B9152, and Wade's Military Road (Table 6.2, Figure 6.12). This road network likely follows an ancient travel route through this section of the Highlands. An old drove road of unknown antiquity linking Inverness with Kingussie passed by Dunachton at this spot (Haldane 2019: 110). It would seem that Wade's Military Road linking Inverness and Dunkeld may have been built along the same track as the droving road, or vice versa (Salmond 1934: 146-147; Taylor 1976: 51-53). The micro-topography shows a ridge just above the road network, just below the castle, which could have provided concealment to a force lying in ambush. Covid-19 restrictions prevented a visit to the site to evaluate this ridge, however, its presence can be seen in the Evaluation Profile (Figure 6.13). The profile shows where the roads pass below Dunachton as indicated by the red marker. The ridge is immediately to the left. It is possible that the area was wooded at the time of the battle, which would have enhanced concealment. Nearby Craigbui Wood serves as

[68] The chapel ruins that stand on the site today are mock ruins constructed during the 18th Century (Historic Environment Scotland n.d.b).

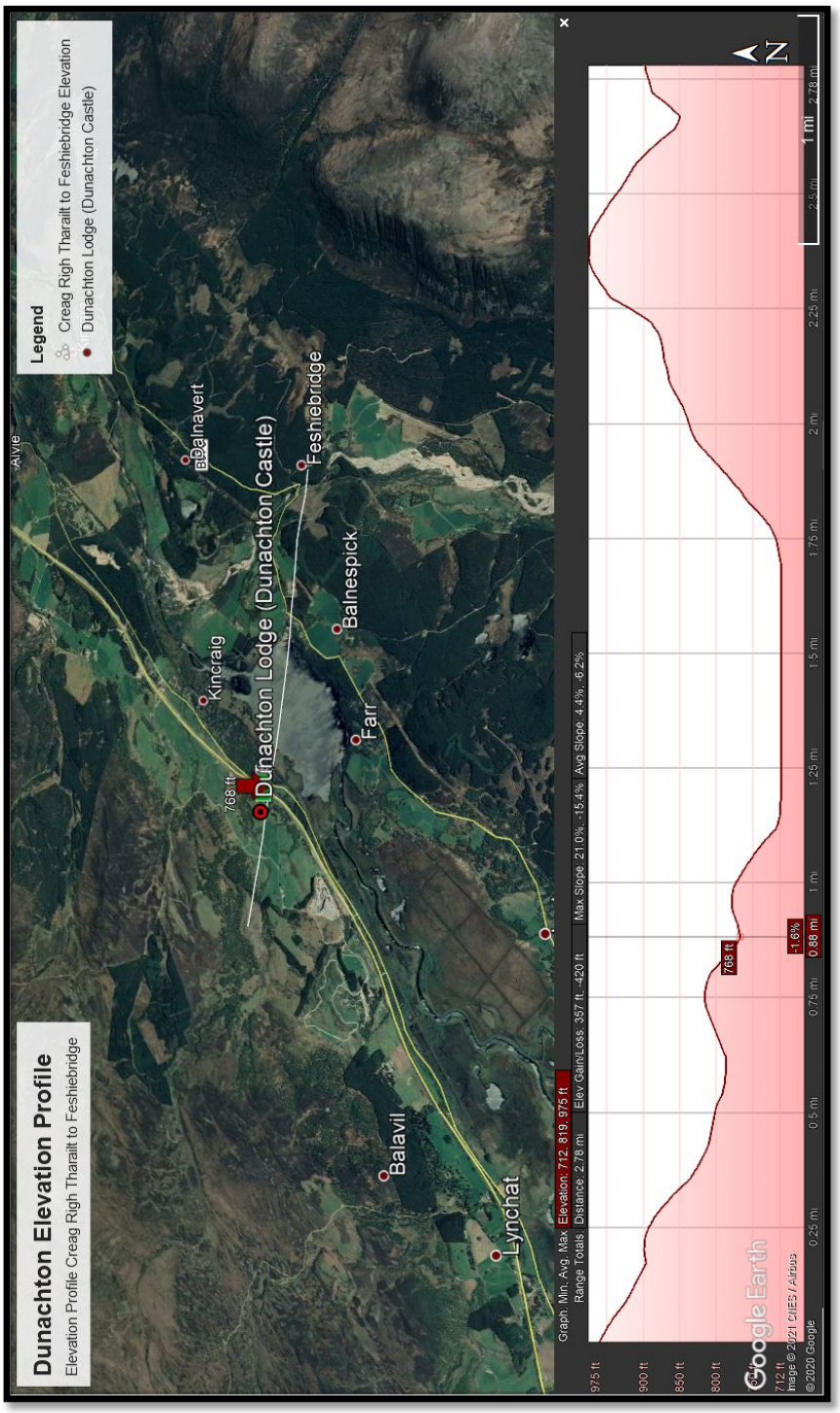


Figure 6.13. Dunachton Elevation Profile drawn through potential ambush site. Notice mountainous terrain in general as compared to Dunnichen (Figure 6.9). The avenue of approach past Dunachton Lodge passes through a narrow mobility corridor indicated by the red marker and line. Forms a natural chokepoint at this spot. The ridge to the west (left) could have concealed an ambush (Drawn by ©Craig J. Brown ©Google Earth).

an analog (Table 6.2, Figure 6.12). This defile is a rather disadvantageous spot for mounted warriors to be ambushed in. The defile was a natural chokepoint, where they could be trapped against Loch Insh and the Insh Marshes. There was little room to maneuver and they would have to fight uphill. Dunachton was a strategically important point near to where as many as five mountain passes converge (Woolf 2006: 187). It does not require the inferential leap to place Ecgfrith along this avenue of approach if he was raiding into Bridei's Fortriu. If Fortriu was north of the Mounth as Woolf (2006: 188-200) proposes, this was a likely approach route for Ecgfrith to use. Bridei would not have to lure Ecgfrith on a diversion of several kilometers off his presumed route of march to get him to the ambush site as at Dunnichen.

Observation looking southwest up the Strathspey from Dunachton was obstructed by intervening terrain (Figure 6.14). This would have made it difficult to track the Northumbrian approach down the valley. There is an unnamed key terrain feature approximately 350 m southwest of Dunachton Lodge. This hill provided an excellent observation point over much of the valley below while still allowing for the ambush force to remain concealed (Figure 6.15). Figure 6.16 through 6.18 demonstrate what Ecgfrith may have seen as moved down the valley. The dialectic between observation and concealment is what makes Dunachton an intriguing possibility for the location of the Battle of Dún Nechtain.

Loch Insh likely represented a natural existing turning or blocking obstacle (Table 6.2, Figure 6.12). It is a freshwater loch with a normal

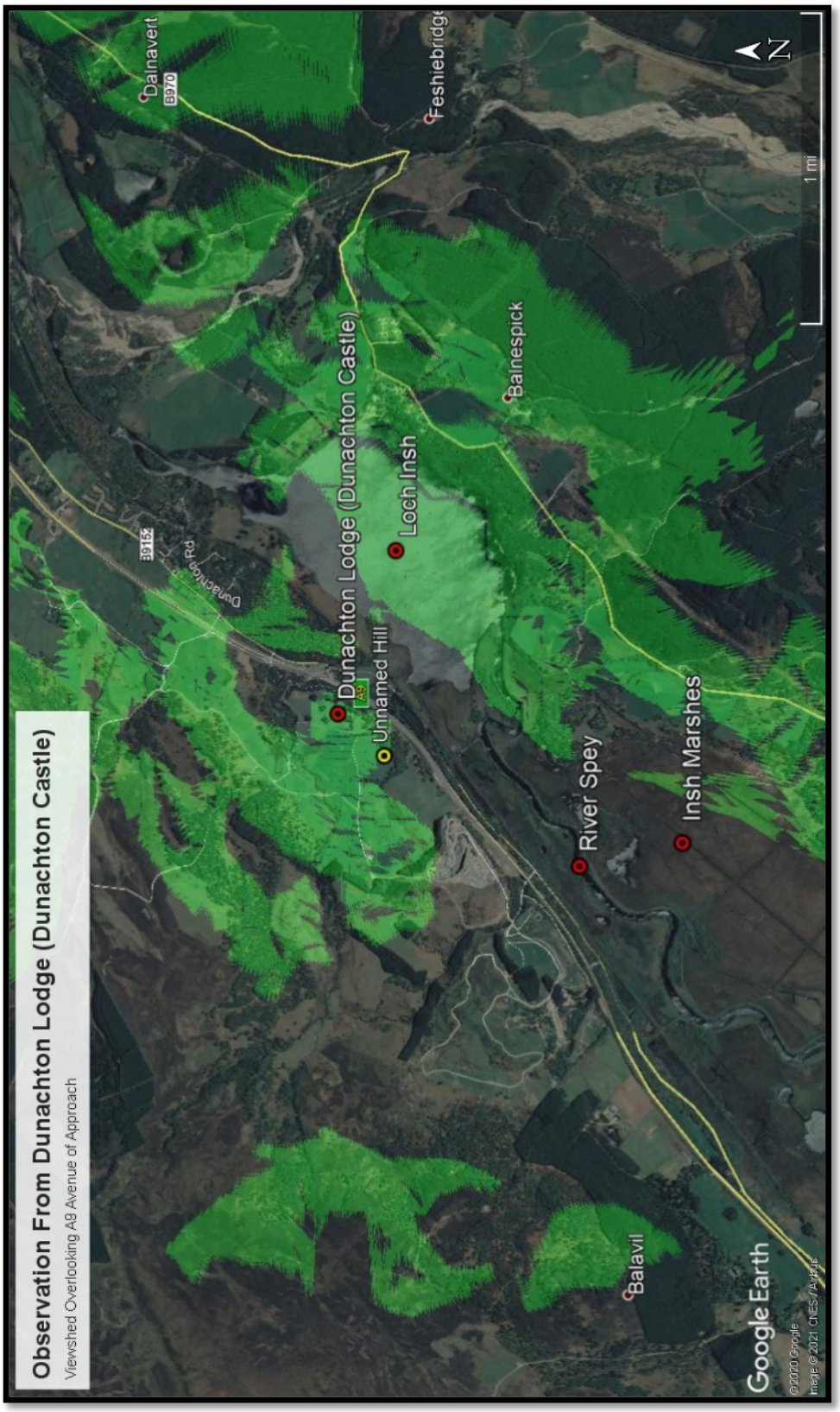


Figure 6.14. Observation from Dunachton Lodge. Line of sight south is blocked by intervening key terrain (Drawn by ©Craig J. Brown ©Google Earth).

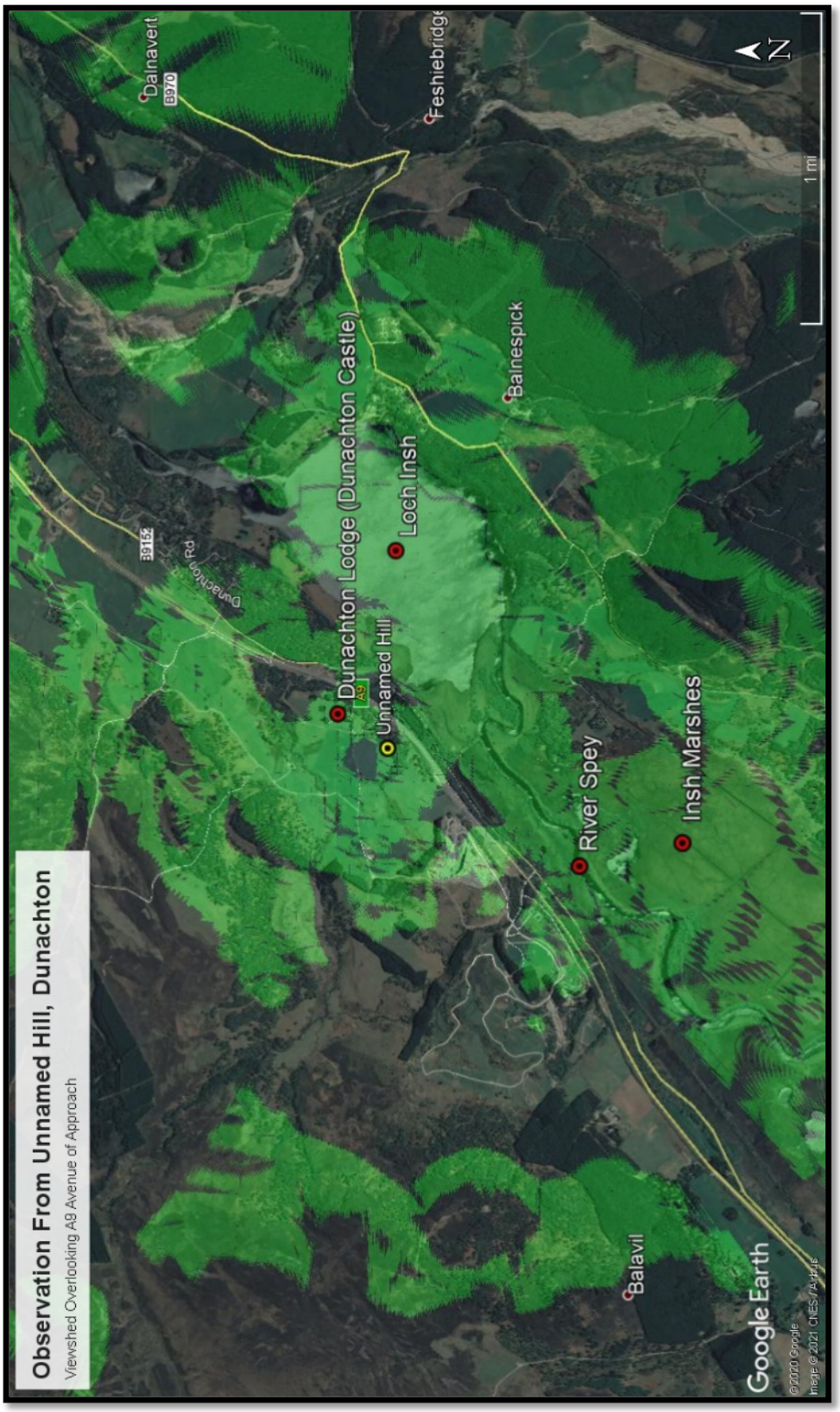


Figure 6.15. Observation from Unnamed Hill. If the observer moved from the Lodge to this hill they could have monitored the A9 avenue of approach leading to the potential ambush site (Drawn by ©Craig J. Brown ©Google Earth).

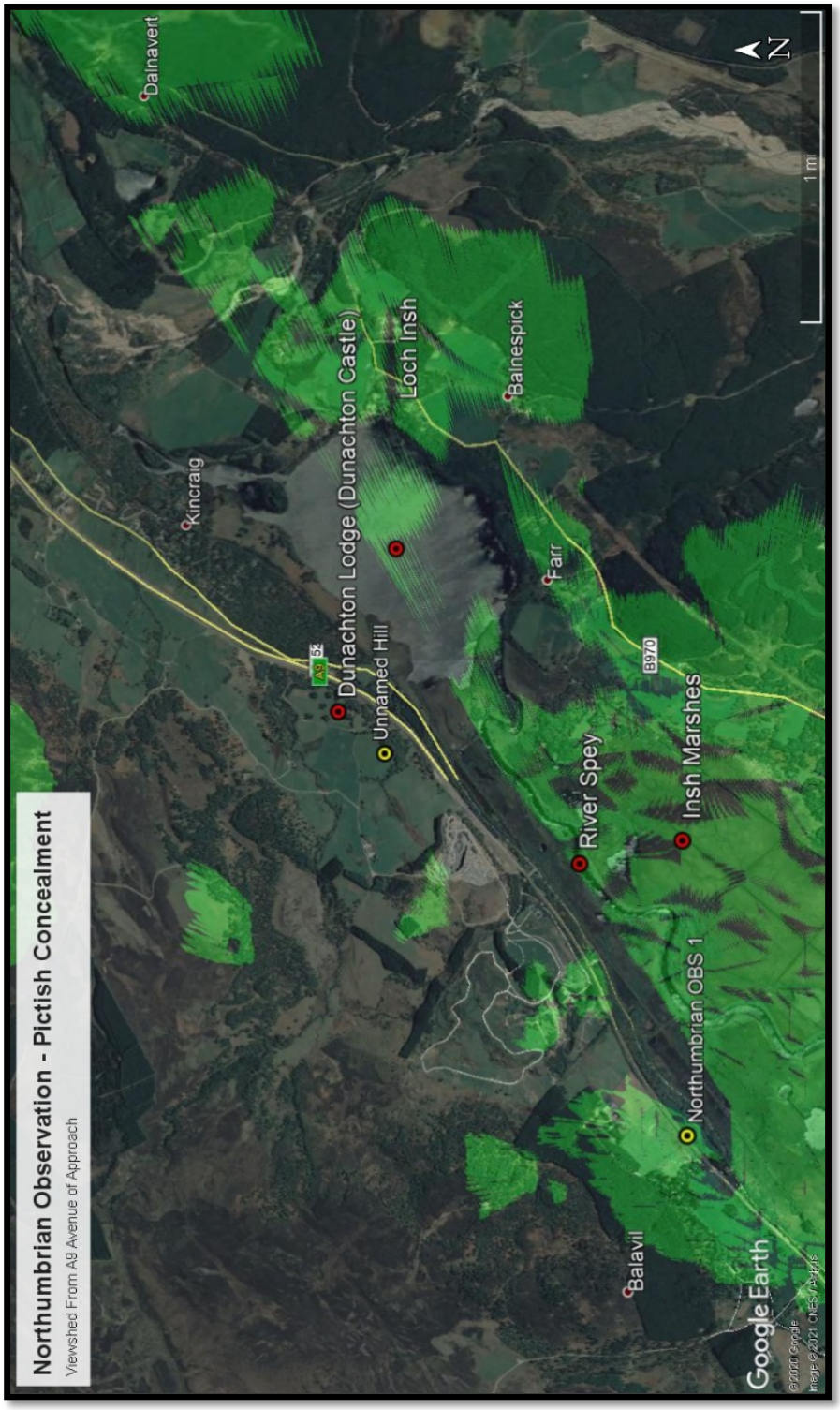


Figure 6.16. Northumbrian observation as they move along A9 avenue of approach. The mobility corridor severely restricts line of sight (Drawn by ©Craig J. Brown ©Google Earth).

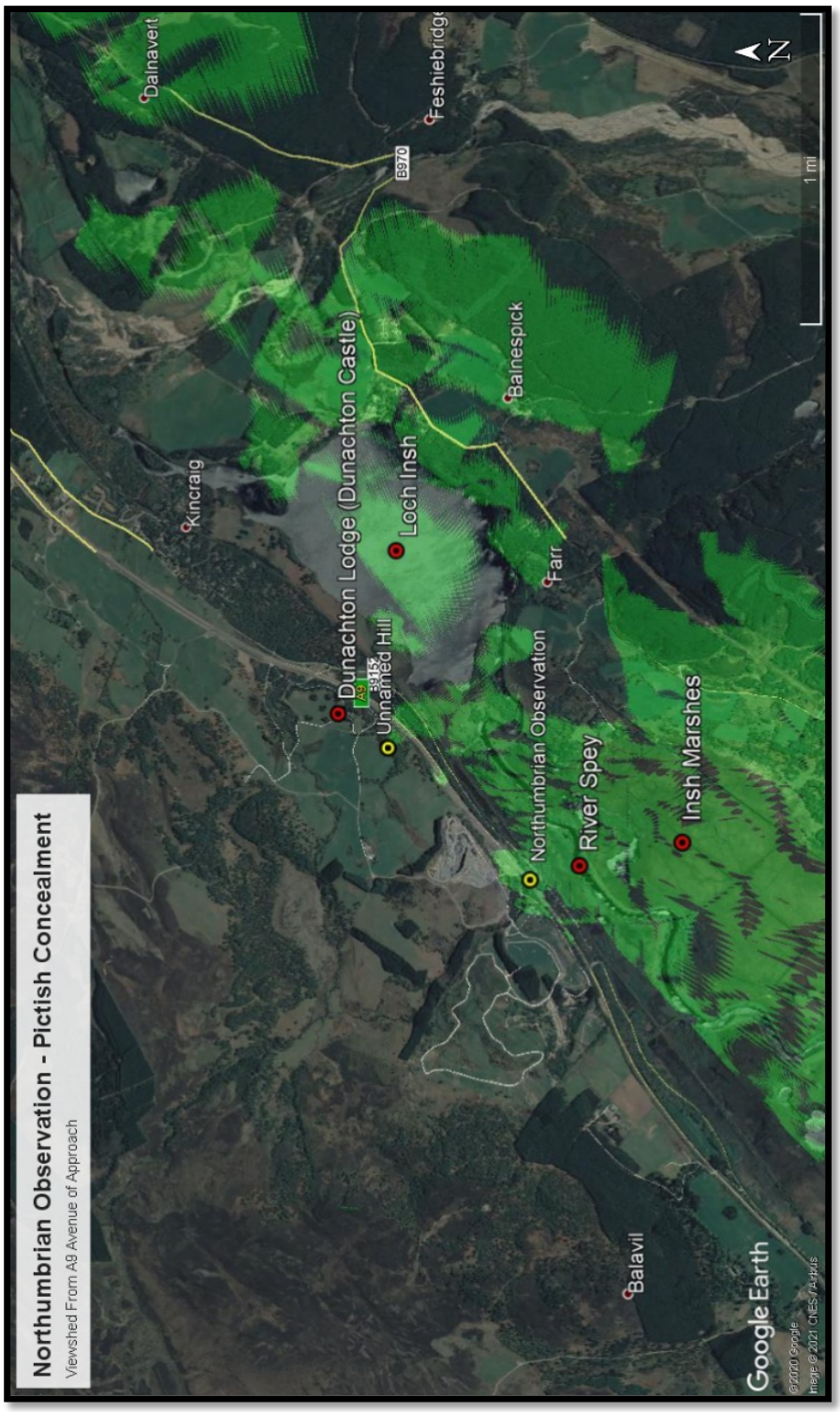


Figure 6.17. Northumbrian observation along A9 avenue of approach. A mile closer and ambush site remains concealed (Drawn by ©Craig J. Brown ©Google Earth).

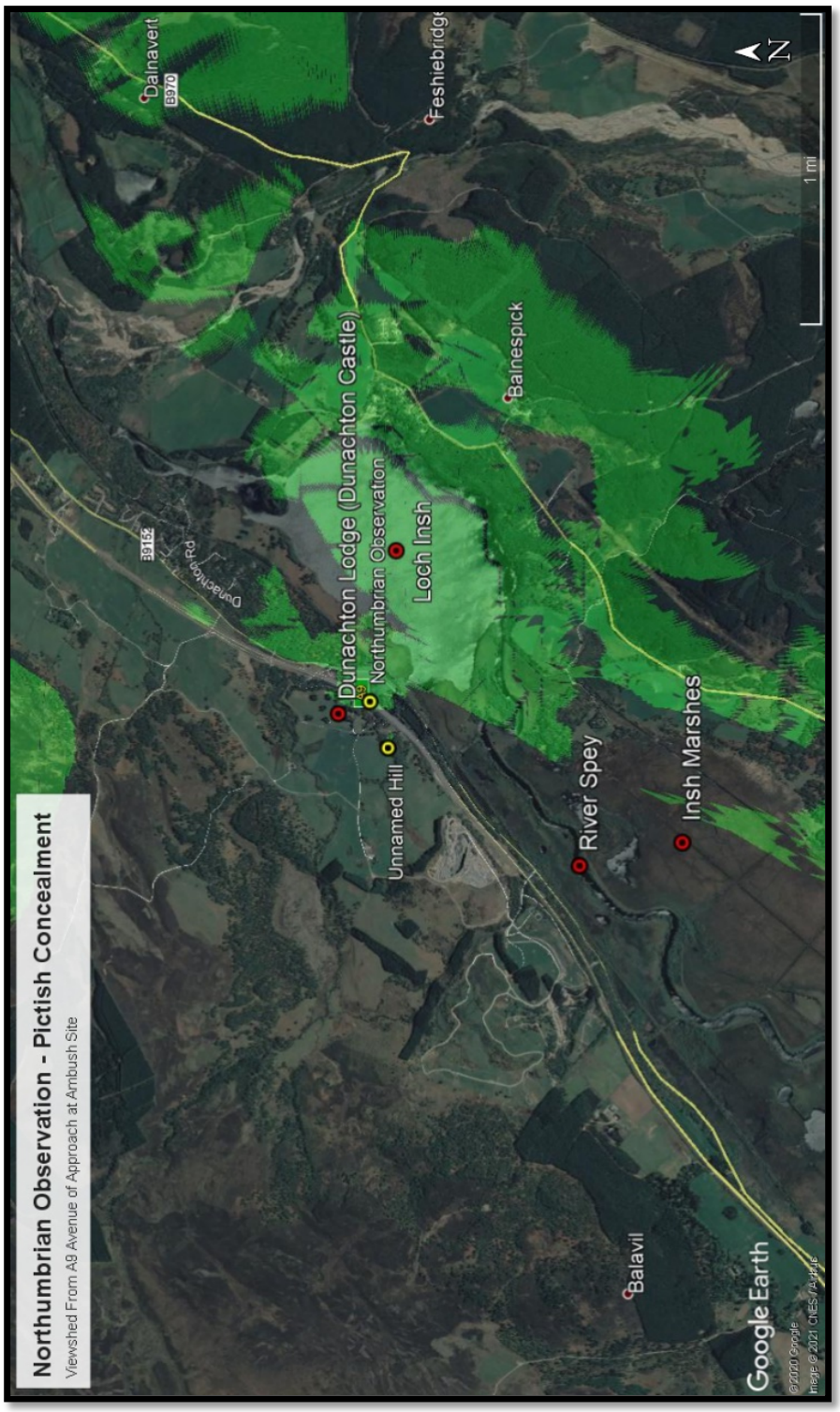


Figure 6.18. Northumbrian observation at potential ambush site. Ecgfrith would have been in a narrow mobility corridor with a blocking obstacle to his east at Loch Insh. Picts may have deployed hosting levies on ridge to the west. If Bridei had lured Ecgfrith to this spot, he may have turned his mounted warband around to fight at this point (Drawn by ©Craig J. Brown ©Google Earth).

surface area of approximately 131 ha, but may have been larger at the time of the battle due to recent snowmelt. The loch sits at 214 m (702 ft) of elevation with a mean depth of 11.4 m (37 ft) and a maximum depth of 30.5 m (100 ft) (UK Centre for Ecology & Hydrology 2020). Normally, traffic likely bypassed, or turned, onto the A9 avenue of approach or smaller trackways on the east. During the battle, the loch likely would have functioned as a blocking obstacle, in a type of hammer and anvil maneuver. A fully equipped warrior could not have retreated through the loch.

The River Spey represented a natural existing obstacle, but the sub-type of obstacle depended on conditions (width, depth, speed of current) present at the time of the battle (Table 6.2, Figure 6.12). The Spey flows north through Loch Insh below Dunachton. Data on average river conditions during the month of May could not be obtained due Covid-19 restrictions and closures. Near Dunachton, the river averages approximately 30 m (98 ft) to 32 m (105 ft) in width. The average depth and discharge rate had to be obtained from a measuring station at Boat of Garten (SEPA 2020), downstream from the outlet of Loch Insh. The average depth for a year, measured since 1988, is .681 m (2.23 ft), but it may have been higher at the time of the battle in May 685. Average discharge rate, or speed of the current, is 64m^3 per second, but again, this is measured on the opposite side of Loch Insh from Dunachton. It is likely that the current is more sluggish where it meanders through the Insh Marshes. Conditions at the time of the battle are not known, meaning that the Spey could have functioned as a

disruptive, fixing, or blocking obstacle to troop movement depending upon conditions at the time of the battle.

The Insh Marshes represented a natural existing obstacle, but the sub-type of obstacle depended upon soil and water conditions in the marshes at the time of the battle (Table 6.2, Figure 6.12). The marshes likely functioned as a disrupting or fixing obstacle for mounted and dismounted individuals due to the care that needed to be exercised in traversing them. Northumbrians fleeing into the marsh in an attempt to escape the Picts may have been hindered or fixed by the mud and killed. The Insh Marshes are extensive, including Loch Insh, covering 1159 ha from Kingussie to Kincraig. The marshes are actually a floodplain south of Loch Insh. The Spey floods several times a year from autumn to spring. Waterfowl and wading birds use the marshes as nesting grounds from April to June (Dún Nechtain was fought on May 20, 685) (Taylor, Street & Mayhew n.d.; Ramsar Sites Information Service 2020). It was not possible to verify if the Insh Marshes were the historical nesting ground of cranes and herons, but if they were it would mean that the marshes, along with Loch Insh, were a good candidate for being Linn Garan or Nechtansmere.

Conclusion

In this case study, KOCOA was applied to the two most commonly proposed sites for the Battle of Dún Nechtain, Dunnichen (Chalmers 1887: 210, 255) and Dunachton (Woolf 2006: 185-187). The intention was to ascertain if a

KOCOA analysis of the terrain at each location could inform the debate between the two and possibly identify the site of the battle. As mentioned above the performance of this case study encountered severe challenges that had a detrimental effect on the outcome. Historical, archaeological, and environmental data presented a fragmentary reconstruction of the three variables of tactics, force composition, and terrain. In spite of the challenges, the KOCOA analysis produced intriguing results regarding the feasibility of an ambush at each site.

Pictish tactics or *praxis* of war relative to the battle was inferred from Bede's comments regarding how the "enemy feigned flight and lured the king into some narrow passes in the midst of inaccessible mountains" (Bede 2008: 221). This would seem to be similar to the Battle of Two Rivers where Stephanus described a concealed Pictish host (Colgrave 1985: 43). It may have been that the Pictish *praxis* of war resembled that of the Cantabrians in Chapter 7. They may have used guerilla type tactics when it was to their advantage to do so, or they may have fought a set-piece battle when the situation called for it. The Northumbrian Saxons seem to have been conducting a punitive raid into Pictish territory, possibly in order to reassert their hegemony over the Picts.

Force composition is inferred based upon the battle scene depicted on the Aberlemno 2 symbol stone. The stone arranges the battle into three panels. These panels clearly depict a mounted Pictish warband reinforced by Pictish infantry arranged in a shield wall or schiltron. This iconography would seem to suggest that Bridei augmented his warband by calling out a hosting

to defend his territory. The Saxons are identified by their distinctive helmets and are depicted mounted. This depiction might be showing the Ecgfrith was engaged in a raid using only his mounted warbands. There are questions that arise when interpreting the stone in this manner. The Aberlemno 2 symbol stone stands some 5 km from Dunnichen Hill and, although not on the battlefield, it is rather closer to Dunnichen than Dunachton (approximately 90 km away) (Fraser 2014: 215-216). If the assumption is made that the stone commemorates Dún Nechtain, then it would seem to discredit Dunachton. However, the stone stands closer to the sites advocated by Alcock (1996) then it does to Dunnichen, bringing discredit to Dunnichen as well. Henderson and Henderson (2011: 134-135, 179), though, caution against relying on the stone relative to any particular battle. Until such day as the battlefield is located, the conduct of the battle as based on the stone, and its location relative to the stone, will remain speculative.

The idea that the Battle of Dún Nechtain took the form of an ambush seems to be accurate based on the available evidence. Ambush is a common tactic practiced by warriors throughout history. Crazy Horse, for example, was part of a small party of horseman that lured Captain William J. Fetterman's company of U. S. Cavalry into an ambush of thousands of Sioux and Cheyenne warriors outside of Fort Phil Kearney, December 21, 1866 (Brown 1971: 171). Fetterman and his company were wiped out in hilly terrain not far from their fort. Dún Nechtain and the Fetterman Massacre possessed two qualities in common: the dialectic between observation and concealment. For an ambush to be successful, the force setting the ambush

must be able to monitor the avenue of approach, looking for the enemy, while remaining concealed from enemy observation themselves. While testing observation points at Dunnichen and Dunachton respectively, as part of KOCOA, it was realized that Dunachton (Figure 6.15) was rather more suited to an ambush than Dunnichen (Figure 6.7). Archaeological survey is required to confirm the findings of the KOCOA analyses.

Chapter 7: *Oppugnatio repentina*: The Roman Conquest of the Cantabrian *Oppidum* of Monte Bernorio, c. 26 BC

"Here two powerful nations, the Cantabrians and the Asturians, lived in freedom from the rule of Rome. The Cantabrians rose first and were more energetic and obstinate in their rebellion; not content with defending their own liberty, they tried also to dominate their neighbours and harassed the Vaccaei, the Turmogi and the Autrigones by frequent raids."

– Florus (*Epitome della storia romana*: 2.33.46-47).

Introduction

The *oppidum* of Monte Bernorio (Villarén, Pomar de Valdiva, Province of Palencia) is one the largest and most significant Iron Age fortified sites in the Iberian Peninsula (Torres-Martínez and Domínguez-Solera 2008: 104; Torres-Martínez, Martínez-Velasco and de Luis Mariño 2012: 139; Torres-Martínez, *et al* 2016: 364; Fernández-Götz, Torres-Martínez and Martínez-Velasco 2018: 131). The settlement occupies the relatively flat summit and lower terraces of Monte Bernorio, an oval-shaped limestone mountain 1,173 meters high. The top of the mountain is fortified by a wall-and-fill rampart, augmented in some areas with a substantial V-shaped ditch that encloses a 28-ha area. The lower terraces are encircled by an impressive discontinuous, multivallate system of earthworks that raises the total fortified area to approximately 90 ha Monte Bernorio is centrally located in the southern foothills of the Cantabrian Mountains, of northern Spain, in an area of transition to the Northern Inner Plateau (*Meseta*) of the

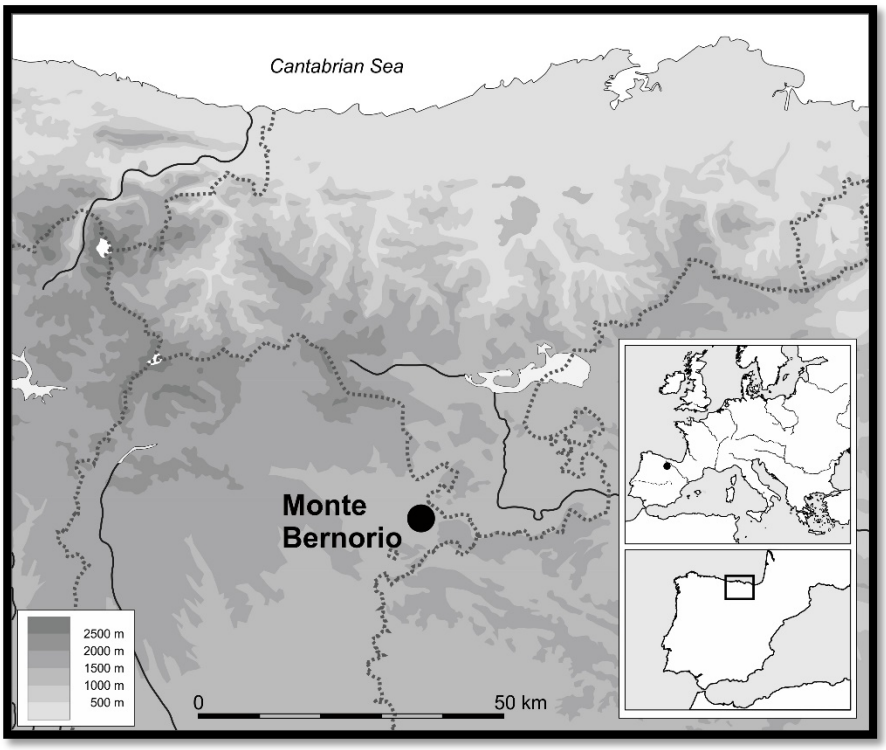


Figure 7.1 The location of Monte Bernorio north of Roman Segisama in the Territory of the Cantabri in Central-Northern Spain (From Brown et al 2017: 116).

Iberian Peninsula (Figure 7.1). The site occupies a strategic position overlooking an important intersection of natural transportation routes. These routes allow north-south communication between the *Meseta* and the Bay of Biscay through the Pisuerga River Valley, along an avenue of approach Syme (1970: 92-98) analyzed in his work on the Cantabrian Wars. The east-west route connects the provinces of Asturias and Galicia in the west to the Pyrenees and Mediterranean in the east, through the Ebro River Valley. Classical sources do not mention Monte Bernorio (see Appendix 7.1), but archaeological excavations carried out over the years have revealed that the indigenous Iron Age occupation of the *oppidum* ended in a battle with a Roman army, which subsequently erected their own fortifications on the summit (see Figure 7.2), at a time dated to the Cantabrian Wars (San Valero

Aparisi 1960: 105; Torres-Martínez 2004: 92; Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 529; Torres-Martínez, *et al* 2016: 7-8).

Figure 7.2 Aerial photograph of Monte Bernorio showing the Outer Earthworks as light shadows in the landscape. The Roman Castellum wall can be seen in the Acropolis. The Springs can also be seen along with the South Wall and Gate (Photo by ©IMBEAC).

Since 2004, the *Instituto Monte Bernorio De Estudios De La Antiguedad Del Cantábrico* (IMBEAC) has conducted a series of excavations and surveys at Monte Bernorio. This fieldwork has provided a wealth of new information regarding the *oppidum* and offers an opportunity to test the application of the KOCOA methodology to the study of ancient conflict. There is no historical documentary record associated with the Roman attack demonstrable by archaeological evidence on Monte Bernorio. As discussed

in Chapters 1 and 2, the lack of historical documentation can be redressed by using KOCOA to examine defining landscape features through the lens of the military doctrines, the tactics and weapon systems, employed by the combatants. The absence of historical documentation of the battle itself does not preclude the application of KOCOA, rather KOCOA may provide insight into a battle where documentation does not exist. A working knowledge of tactics and weapons used by the combatants obtained from classical sources and archaeological reports can be used interpret the archaeological assemblage from Monte Bernorio and reconstruct the Roman attack on the *oppidum*. There is a large body of literature devoted to Roman warfare, the Roman Army, Roman tactics and weapon systems (Levithan 2013: 1). The literature relative to Cantabrian warfare is slightly less robust in terms of quantity. Fernández-Götz, Torres-Martínez and Martínez-Velasco (2018: 127) point to the lack of surviving sources and general isolation in which Spanish researchers worked as part of a possible explanation. Illarregui (2008: 81) noted that as of 2008 the only strictly Cantabrian *oppidum* whose archaeological report had been published was Celada Morlantes, although he included the pre-Cantabrian *oppidum* of Monte Bernorio as well. Illarregui's comment, however, fails to make notice of the work of González-Echegaray (1986, 1995, 1999). There is also an increasing body of recent work by Peralta Labrador (2009, 2015) and Torres-Martínez (2004, 2011, 2015), but these sources are hard to locate outside of Spain. A KOCOA analysis was performed on the landscape at Monte Bernorio, in relation to Roman and Cantabrian military doctrine, to develop battlefield boundaries

and locate defining terrain features. The KOCOA analysis was used to interpret artifact distributions obtained from published archaeological reports to reconstruct the Roman attack on Monte Bernorio.

Historical Context

The *Bellum Cantabricum et Asturicum*, known simply as 'The Cantabrian Wars', were a series of military campaigns conducted by the newly founded Roman Principate against the Cantabrian and Asturian peoples of northern Spain between 29-19 BC.[69] Classical sources state that frequent raids conducted by the Cantabrians against the neighboring Vaccaei, Turmogi and Autrigones, tribes who had previously been brought under the control of Rome, was responsible for the conflict (Florus *Epitome della storia romana*: 2.33.47; Orosius *Hist*.: 6.21.3). Some modern scholars dispute this justification arguing that gaining control over the vast mineral wealth of the region, perhaps as a means for Augustus to finance further conquests and building projects, was the primary inducement for going to war (Curchin 1991:52; Varga 2015: 72). Augustus had recently successfully concluded a costly civil war and the prosecution of a foreign war as a means of unifying and consolidating power within the new Principate must also be considered as a reason for prosecuting the war. Through a political sleight of hand in 27 BC, Augustus had been able to take direct control over the Province of Hispania Citerior but was only able to retain control of the army due to the

[69] The Cantabrians and Asturians occupied the present Autonomous Communities of northern Castille y León, the Provinces of Burgos, Palencia, and León.

presence of people who had not yet submitted to Roman rule (Powell 2018: 36-37).

Previous military operations were conducted in 29 BC as part of a campaign lead by General Statilius Taurus against the *Vaccei*, the *Astures*, and the *Cantabri* (Cassius Dio *Rom. His.* 51.20). At present, not much is known concerning this initial campaign, or of its relationship to later operations, and different historical reconstructions have been proposed (Amela 2014: 72-73). In 26 BC, Augustus moved to *Segisama* (Sasamón)[70], in the modern province of Burgos, to personally supervise war operations (Strabo *Geogr* 6.4.2; Florus *Epitome della storia romana* 1.33.5). The Emperor divided his estimated 50,000 men, comprised of eight legions with auxiliaries, into three columns, in order to approach the central territory of the *Cantabri* on three fronts. Augustus assumed command of one of the three columns as the army marched north from *Segisama* (Florus *Epitome della stori romana*: 2.33.48; Orosius *Hist.*: 6.21.1-11).

Florus (*epitome della storia romana*: 2.33.49) and Orosius (*Hist*.: 6.21.5) recorded that the first great battle of the *Bellum Cantabricum et Asturicum* was fought under the walls of *Bergida* in 26 BC with the defeated survivors fleeing to distant Mount Vindius to find sanctuary. The true location of *Bergida* is not known with certainty, but the site has recently become most commonly associated with the Iron Age *oppidum* of Monte Bernorio (Peralta Labrador 2003: 264-265, 315-319; Torres Martinez 2004: 79; Torres-

[70] On recent archaeological discoveries relating to military camps in the municipality of *Segisama* (Sasamón), see Didierjean, 2015: 293-303.

Martínez, Fernandez-Götz and Sobremazas 2016: 167-170; Brown *et al* 2017: 115-116).

Several important indigenous centres on the route from *Segisama* towards the natural passes through the Cantabrian Mountains are known to have suffered violent destruction (González-Echegaray, 1995, 1999a: 161-165; Peralta, 2003: 261-264, 2009, 2015; Syme 1970: 92-97; Torres-Martínez, 2015: 112-115). The years 26/25 BC proved to be crucial for the prosecution of the war, with major Roman victories at the battles of *Bergida*, in the territory of the *Cantabri*, and *Lancia*, in the lands of the *Astures*. Following these victories, the Roman army advanced through the mountain passes, while a fleet sent from Gaul operated along the coast in the Bay of Biscay. Major operations were completed by 19 BC under the command of general Agrippa (Florus *Epitome della storia romana*: 2.33; Cassius Dio 1990: 53.25, 53.29, 54.5, 54.2-5; Orosius Hist.: 6.21.1-11). However, the situation remained unstable, as evidenced by some minor rebellions that took place until 16 BC and by the presence of two legions (*Legio X Gemina* and *Legio IV Macedonica*) which the Romans stationed in the territory for several decades thereafter.

Roman and Cantabrian Way of War

Roman Warfare

When confronted with having to capture an enemy *oppidum* or fortified city, the Roman Army had a range of tactical options available to them. These

tactical options can be broadly classified into three main types according to how the operation was to be conducted: 1.) Blockade (*Obsidio*); Stealth (*Praetendi taedas*); and 3.) Assault (*Oppugnatio*) (Levithan 2013: 51-52; Goldsworthy 2003: 188; Guillen 1985: 579-590).[71] Assault operations can be furthered classified into two types: 1.) Rapid or Storming Assault (*Oppugnatio repentina*); and 2.) Siege, or Long Assault (*Oppugnatio longinqua obsidio*) (Guillen 1985: 579-590). The distinctions between these categories of operations are based primarily upon the descriptions of individual events found within the classical sources. Although based upon historical descriptions of Roman attacks on *oppida*, these classifications can be used by archaeologists working with KOCOA to interpret assaults on, or events at, similar sites that are not represented in the surviving classical sources. Each of the operations listed above leaves its own archaeological signature. Roman engineering associated with the capture of *oppida* often left remnant features, like those at Alesia and Masada, that can be identified in the landscape today. The presence or absence of these features can be indicative of the type of operation conducted. The density and pattern of artifact deposition can be used to further refine interpretation.

Blockade (*Obsidio*) operations involved the encirclement of the target by a series of fortifications, contravallation and circumvallation, designed to isolate the *oppida* from the countryside and its resource base. Over time, the inhabitants of the *oppida* would use up their supplies of water and food and

[71] The use of the terms of this tripartite classification date back to the Greco-Roman historian Appian of Alexandria when he used them to describe the campaign of Hannibal in Numidia during the Second Punic War (218 BC – 201 BC) (Appian 7.33).

be forced to surrender or risk starvation (Levithan 2013: 77-79; Goldsworthy 2003: 188; Guillen 1985: 580-582). *Obsidio* was an effective means of taking enemy strongholds but was not considered a desirable option for Roman commanders due to the long time spent passively waiting for the enemy to attack or starve, the investment in materials needed to construct the encircling works, and the loss of battle honors that would normally accrue to the soldiers during an assault (Levithan 2013: 77).

Roman blockade (*Obsidio*) operations were characterized by the fortified camps, forts and obstacles associated with the encirclement of the target *oppidum*, the line of contravallation and the line of circumvallation (if there was one). Initial encirclement of the target *oppidum* was accomplished by the building of fortified camps or forts on key terrain surrounding it (Davies 2006: 38-40). Seven forts were constructed by Scipio's army on hills circling the Celtiberian *oppidum* at Numantia (Spain) at the outset of his *Obsidio* in 133 BC. At least five of the forts were located by Schulten during his excavations between 1905 and 1912 (Campbell 2005:8-9; Cheesman 1911: 180-182).[72] Initial forts provided the encircling Roman Army a measure of defensive protection while they had commenced construction of the fortifications associated with contravallation, as well as a proximal position from which they could interdict enemy travel from and into the target

[72] The ramparts and internal buildings of the forts were constructed of stone and loosely based on the Polybian format, but the interior buildings were of irregular dimensions, possibly to accommodate larger unit size (Cheesman 1911: 181-183). The important point to be made here is that, in this case, the archaeological remains of these initial fortified camps and forts associated with *obsidio* can be recovered in the landscape and are indicative of the type of military operation conducted.

oppidum. The Roman camps constructed opposite the gateway approaches at Burnswark (Ecclefechan, Dumfries and Galloway, Scotland) may have served as blockading camps, possibly alleviating the need for formal works of circumvallation (Jobey 1978; Reid 2016; Reid and Nicholson 2019).

When the preliminary encirclement had been affected, the Roman Army commenced construction of the more formidable lines of contravallation and circumvallation. The initial fortified camps or forts may or may not have been physically incorporated into the new defensive fortifications. The lines of contravallation and circumvallation could have been extensive, extending several miles in circumference and constituting a defense in depth. Caesar, during his *Obsidio* of Vercingetorix at Alesia (Gaul) in 52 BC, constructed a line of contravallation that extended for ten miles in circumference (Caesar *BG* VII, 69). The outer line of circumvallation extended for fourteen miles (Caesar *BG* VII, 74). Archaeological excavations revealed that the line of contravallation was not uniform but was constructed to reinforce natural obstacles where present in the landscape (Davies 2006: 72; Reddé 2018: 188-189). On the Plaine des Laumes (west of Alesia), the contravallation consisted of two ditches (the second of which was filled with water diverted from the River Brenne and River Ose), a *glacis*, and a third ditch or trench that fronted a turf-revetted rampart that averaged five meters in width. Crowning the rampart was a wooden wall with towers spaced approximately twenty-five meters (80 feet) apart. The line of circumvallation was constructed in similar fashion, but one hundred meters to the rear of the line of contravallation and fronting in the opposite direction in order to defend

against an attack by a Gaulish relief force from the countryside (Davies 2006: 72-73; Caesar *BG* VII, 69-VII,74).

Roman *Obsidio* operations were designed to contain the target *oppidum* and wait for the enemy surrender due to depletion of resources. An *Obsidio* operation lacked the engineering specifically associated with a siege, or *Oppugnatio linginqua Obsidio*, such as the construction of an *agger* or mining operations. In theory, sorties conducted against the *Obsidio* would result in deposition of artifacts indicative of fighting near the line of contravallation.

Roman stealth (*Praetendi taedas*) operations were a type of small unit surprise or commando style attack aimed at the capture of a key location, the control of which would have allowed the approach of the main body of the army (Goldsworthy 2003: 188). The Roman capture of Capsa in Numidia (106-107 BC) was accomplished by this method (Sallust *Jugur.* 89.1-94.7). A Ligurian auxiliary discovered a previously unknown approach up the cliffs behind the town that when secured allowed Roman light infantry and cavalry to launch a surprise attack on the city gates from that direction (Sallust *Jugur.* 93.2-94.7; Goldsworthy 2003: 188). The stealth category can be expanded, as Guillen (1985: 579) and Levithan (2013: 51-52) do, to include the capture of an *oppidum* through stratagem, such as bribery or some form of trickery. Stealth/ Stratagem operations can be difficult to identify in the archaeological record. Bribery, for example, likely would not have resulted in artifact deposition at all.

The first subcategory of Roman assault (*Oppugnatio*) operations, the rapid or storming assault (*Oppugnatio repentina*) sought to capture an enemy *oppidum* by sending men over, under or through defensive obstacles to overwhelm its defenders (Guillen 1985: 582-583; Goldsworthy 2003: 188; Levithan 2013: 51-52). This type of assault required careful planning or casualties could have been expected to be high, but the attack could be launched on short notice while on the march or from a nearby fortified camp. Prefabricated baskets would likely have been used to fill defensive ditches. The walls or ramparts could have been scaled with ladders constructed during preparations for the assault. A testudo formation could have been employed to protect soldiers attacking a gate or attempting to mine under a wall. Caesar himself employed this type of operation to capture the city of Gomphi, Thessaly during the Civil War with Pompey in 48 BC. Caesar described little of the actual assault on Gomphi, but specifically mentioned that he "ordered ladders and galleries built and brushwood bundles readied for an immediate assault (Caesar *BC* 3.80.5)."

The archaeological signature of a storming assault is distinct from those of the other types of Roman military operations under consideration in this chapter. A Roman storming assault would likely have resulted in the deposition of artifacts related to a battle, parts of weapons, kit and munitions, directed against the defenses of the target oppidum. Engineering associated with *Obsidio* or an active siege (*Oppugnatio longinqua obsidio*) would have been absent. With a storming assault, there was no need for lines of contravallation or circumvallation, or an agger. There may have been a

fortified camp associated with the storming assault, but it may or may not have been located in close physical proximity to the target oppidum. As will be discussed below, a storming assault is likely the type of operation conducted at Monte Bernorio.

The siege, or long assault (*Oppugnatio longinqua obsidio*), may have shared the characteristics of encirclement with blockade (*Obsidio*) operations, but whereas a blockade effected the capture of an *oppidum* through a passive investment, a siege achieved the same goal through assault. When the encirclement had been affected, the assault phase of the siege commenced. The assault could have included a probing and or storming assault but was characterized by what Levithan termed the Heavy Assault (Levithan 2013: 66). The term Heavy Assault refers to an attack with engineered components, used to negate enemy obstacles, siege towers or battering rams where the avenue of approach allowed, mining operations, or quintessentially an *agger*. The *agger* was a hallmark of Roman siege warfare, a man-made earthen, stone, and timber mound built to provide an approach to enemy ramparts that negated their height advantage (Levithan 2013: 66).

Roman sieges which have left an archaeological footprint are best exemplified by the architectural remains associated with the siege of the Jewish stronghold of Masada (72-73 AD). Excavations have identified eight fortified camps that were associated with the siege, the wall of circumvallation (really contravallation) the *agger* and a later camp associated with a post-siege occupation (Richmond 1962: 144-145, 153-154). Walls

(aside from the *agger*) were constructed of drystone rubble with vertical faces. Surviving sections averaged 1.5 meters (five feet) in height and 1.5 meters (five feet) in thickness. The amount of collapsed material indicated a height of approximately 3 meters (ten feet) (Richmond 1962: 145-146). The *agger*, however, is what distinguishes the Siege of Masada from the blockade (*Obsidio*) of Alesia. The *agger* was constructed of earth on top of a natural bedrock outcrop (Gill 2001: 25-26). It was 215 meters long with a width at the base that varied between 50 meters and 200 meters. The ramp rose at a 17° gradient to a height of approximately 74-75 meters (Gill 2001: 30; Davies 2011: 76). This height fell short of the summit by 13 meters, but the difference would have been more than compensated for by the 75 foot (23 meters) wide, 75 foot (23 meters) high stone platform described by Josephus at the top of the *agger* (Richmond 1962: 154; Davies 2011: 76).

Cantabrian Warfare

By the end of the Iron Age, the Cantabrians had developed a practice of warfare that was well suited to the mountainous environment in which they lived and likely differed little from their neighbors, the Asturians and Lusitanians (Illarregui 2008: 85; Varga 2015: 141). The Cantabrians appear to have preferred guerrilla tactics, the setting of ambushes and the conduct of small unit raids. They likely possessed knowledge of Roman tactics and weaponry gained through exposure while serving as mercenaries or auxiliaries, both for and against various Roman factions, dating at least as far

back as the Second Punic War 218-210 BC (Italicus *Punica* 3.325-330, 16.46-65; Torres-Martínez 2011: 439-441; Caesar *BC* 1,38,2-4). Cantabrian armor and weapons recovered from archaeological contexts reveal that their basic armament was similar to their Roman adversaries (Illarregui 2005: 81, 85). Yet, references in classical sources (see Appendix 7.1) describe the Cantabrians deploying guerilla tactics (described below) when confronting the Roman Army. A working knowledge of Cantabrian tactics and force composition, as derived from the archaeological and classical sources, forms the basis for inferring how the Cantabrians may have used the terrain at Monte Bernorio. This inference informs the KOCOA analysis and facilitates the reconstruction of the Roman capture of Monte Bernorio based upon the archaeological record.

The Cantabrians appear to have fought primarily as light infantry and light calvary (Illarregui 2008: 84-85). They could move with speed and agility through mountainous terrain. The geographer, Strabo (*Geogr*. 3.4.18), described how the Cantabrians “ride double on horseback, though in time of battle one of the two fights on foot.” The relief carved on the Down Burial stone from Borobia (Soria) depicts a Cantabrian warrior astride a mount with a second warrior jogging behind holding onto the horse’s tail (Illarregui 2008: 87, 91). In either case, the horse could have aided the warriors in covering ground more quickly than the warriors could have on their own, but this method of travel risked tiring the mount. The ability to march quickly would have been an asset in utilizing the guerilla style tactics the Cantabrians may have preferred to employ. Cassius Dio (1990: 53.25.6) relates that during the

Roman campaign of 26 BC the Cantabrians “caused [Augustus] many difficulties by continually seizing the high ground in advance and setting ambushes in the valleys and woods.” Varga (2015: 137-138) states that during the campaign of 26 BC, the Cantabrians also cut Roman supply lines and raided supply convoys. Although Varga does not cite a source for this assertion, the interdiction of supplies seems likely given the Cantabrian preference for guerilla style tactics documented in the classical sources. It is likely that the guerilla style tactics of ambush and raid were practiced throughout the Iron Age and the Cantabrians continued the practice against the Romans until pressed to defend their *oppida* directly.

Fighting as light infantry and light cavalry does not mean that guerilla style tactics were practiced exclusively. Quesada Sanz (2006: 246) recognized that characterization of troops as ‘light’ or ‘heavy’ in antiquity did not depend on their arms or armor but referred to the way in which they fought, or the tactical formations used. Strabo (*Geogr*. 3.3.7) wrote that the mountain peoples, including the Cantabri, “hold contests, for light-armed and heavy-armed soldiers and cavalry, in boxing, in running, in skirmishing, and in fighting by squads.” Skirmishing was carried out by light-armed troops, often operating as the vanguard of an army, deployed in an open order, dispersed formation. In the Roman Army of the late Republic and early Empire, this function was carried out by *auxilia*, drawn from non-Italian allies (Gilliver 2017: 106). From this open order formation, the Cantabri may have employed a pattern of charge and withdrawal that the Romans termed *cuneus* or *concursare*. The purpose of the *cuneus* (flying wedge) was to

disrupt the opponent's battle line, to break up and isolate units, so that they could be eliminated (Treviño Martinez 1986: 7-8; Quesada Sanz 2011: 51-52; Varga 2015: 127). The previous quote by Strabo also indicates that the Cantabrians may have employed a form of heavy infantry, but it is unclear if heavy infantry constituted a distinct unit type or was a form of close order formation.

Cantabrian cavalry was well respected throughout the Roman world (Bouchier 1914: 81; Torres-Martínez 2011: 40). Caesar made use of Cantabrian cavalry, recruiting them as mercenaries during his civil war with Pompey (Caesar 2016: 1.38.2-4). The Roman *Equites* adopted at least two of the Cantabrian cavalry's tactical maneuvers, the *Cantabricus impetus* and the *Circulus Cantabricus* (Illarregui 2008:86). The *Cantabricus impetus*, or Cantabrian Attack, consisted of a massed charge designed to break an enemy's line (González-Echegaray 1986: 87; Illarregui 2008: 86). Functionally, the *Cantabricus impetus* was different than the infantry's *cuneus*, relying on the strength and momentum of a charging horse to achieve the same disruption of tactical stability of an enemy's line. The *Circulus Cantabricus*, or Cantabrian Circle (also known as the Cantabrian Gallop), consisted of a group of mounted javelin or spear throwers forming a single-file rotating circle. As the javelin throwers approached the enemy line, they tried to drive their spears through the shield of their opponent. The overall effect was a steady stream of javelins impacting a relatively small target area (Arrian 1993: 40.1-12; Hyland 1993: 23, 29, 33, 53, 133; Illarregui 2008: 86).

The arms and armor Cantabrian warriors likely used may have depended upon their personal wealth and what spoils that had previously collected (Illarregui 2008: 85). In either case, Cantabrian infantry and cavalry seemed to have been similarly equipped. They probably carried one or two javelins, spears, or a combination of the two (Treviño Martinez 1986: 36-37; Varga 2015: 114-115, 155). The javelins may have been either a type of *soliferrum* or *falarica*; both were similar to Iberian and Celt-Iberian javelins (Illarregui 2008: 85) and were functionally much the same as a Roman *pilum* (Quesada Sanz 2006: 250; Varga 2015: 157-159). They were likely meant for close-range fighting (out to approximately 30 meters) and sported a pyramidal bodkin type head designed to pierce shields and armor (Goldsworthy 1996: 183; Bishop and Coulston 2006: 50-52). An example of a Cantabrian spear was recovered during excavations at Monte Bernorio. The spearhead was made of iron, was lanceolate in profile and cross-shaped in cross section (González Echegaray 1986: 96; Illarregui 2008: 85, 87). The spear could have been thrown as a javelin but was likely utilized as a thrusting weapon that could have extended the reach of a warrior.

Cantabrian warriors also carried either a straight or curved short sword (Treviño Martinez 1986: 37-38). Denarii minted at Emerita Augusta between 27 BC and 23 BC, about the time Augustus was campaigning in Cantabria, depict a sword that is similar to a *Gladius hispaniensis*, the standard sword used by the Roman Army (Illarregui 2008: 83, 86-87). Swords of this type recovered from burials across Europe would seem to indicate a double-edged blade, averaging approximately 640 millimeters in length and 57

millimeters in breadth, that tapered to a sharp point (Bishop and Coulston 2006: 56; Bishop 2016: 11-12). This type of sword was well suited to close combat having a blade that could be used to effectively stab and hack (Treviño Martinez 1986: 38).

A stone relief recovered from Urso depicts a Hispanic warrior armed with a curve-bladed *falcata* (Curchin 1991: 51). A well preserved *falcata* was recovered from a Cantabrian castro at Celada de Morlantes, north of Monte Bernorio (Illarregui 2008: 85, 87). *Falcatas* appear to have had an average blade length of 60 centimeters (Treviño Martinez 1986: 40). The cutting edge of a *falcata* was on the inside of the curved blade, making it more of a hacking than stabbing weapon. It was better suited to open order combat or as a type of cavalry sword.

Cantabrian aggressiveness in combat and courage in the face of death is remarked upon in the classical historical sources and is integral to their habitus or practice of war. Orosius counted the Cantabri among the "sturdiest Spanish tribes" and wrote of their "long and fierce resistance" at Racilium (26 BC) (Orosius *Hist*. 6.21.1, 6.21.5). Strabo recounted stories of Cantabrian "ferocity and bestial insensibility," which should be taken to mean a "contempt for suffering (Strabo *Geogr.* 3.4.17)." Quotes such as the above by Strabo (*Geogr.* 3.4.17) may be mere hyperbole designed to enhance the magnitude of the Roman victory over the Cantabri, but in this case they possibly reflect a real, if perhaps exaggerated, cultural characteristic. Florus (*Epitome della storia romana* 2.33.50) and Orosius (*Hist*. 6.21.8) wrote that when faced with the prospect of slavery upon surrender or death upon the

Roman capture of Mons Vindius (Mount Medullius) (26 BC), the Cantabrians brought “on their own deaths in the midst of a banquet by fire and the sword and a poison which is there commonly extracted from the yew-tree” (Florus *Epitome della storia romana* 2.33.20). Cassius Dio (1990: 54.5.1-3) wrote of similar instances during a subsequent Cantabrian and Asturian revolt in 22 BC. Cantabrian willingness to set fire to their *oppida* and commit suicide is important to consider when performing the KOCOA analysis and interpreting the archaeological assemblage at Monte Bernorio. It was possible that the conflagration that marked the end of the Cantabrian occupation of the Monte Bernorio *oppidum* was set not by the Romans, but by the Cantabrians themselves.

KOCOA Analysis

The application of KOCOA in this case study differs from those in earlier chapters of this thesis. In the case of the Roman attack on Monte Bernorio, KOCOA is being applied directly to the landscape and archaeological assemblage from the battlefield in order to reconstruct the battle. There is no mention of conflict at Monte Bernorio in the classical sources, therefore, KOCOA cannot be applied using historical sources. KOCOA, however, is able to be utilized in this fashion because KOCOA does not depend upon historical sources directly related a particular battle. KOCOA is based upon the interrelationship of the three variables of landscape, practice of war (habitus) and technology (force composition). For

this KOCOA analysis, aerial photographs of the Monte Bernorio battlefield were utilized to identify defining terrain features. The defining terrain features were located and assessed during fieldwork undertaken in August 2016. The practice of war (habitus) of the Romans and Cantabrians was developed from classical ethnographic and archaeological sources. The technology (force composition) available to the combatants was estimated primarily from artifacts recovered from the battlefield itself, burial excavations in the area and artistic depictions. Ethnographic sources, consulted above, supplemented this information. The resulting KOCOA analysis was applied to artifact distributions obtained from published archaeological reports of excavations at the Monte Bernorio battlefield in order to reconstruct the Roman attack. Due to KOCOA being applied to reconstruct the battle at Monte Bernorio, only those KOCOA features relative to the actual battle were incorporated into the reconstruction. For a fuller review of the KOCOA analysis see Appendix 7.2 (Brown *et al* 2017).

Objectives

Due to the lack of documentation in classical sources regarding Monte Bernorio, the tactical objectives of the Roman and Cantabrian combatants must be inferred from the archaeological evidence indicating the Roman capture and subsequent occupation of the *oppidum* set within the wider context of the Cantabrian Wars. Florus (*Epitome della storia* romana 2.33.47) and Orosius (*Hist*. 6.21.3) alluded specifically to the frequent raids

undertaken by the Cantabri against the neighboring Vaccaei, Turmogi and Autrigone, tribes allied to Rome, as the cause of the war. From the statements, it can be inferred that the overall Roman strategic objective was the conquest and pacification of Cantabria and Asturia through the elimination of their ability and willingness to make war. Achievement of the Roman strategic objective required a series of operations aimed at the defeat of the Cantabrian and Asturian armies in battle and the seizure of their hilltop strongholds. Archaeological excavations have revealed that a number of *oppida* in the vicinity of Monte Bernorio were destroyed by a Roman Army during the time of the Cantabrian Wars (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 526-528). It is likely that the reduction of the Cantabrian *oppidum* at Monte Bernorio and the elimination of its warriors were the tactical objectives that needed to be achieved as part of a series of steps towards the fulfilment of the overall strategic objective. By contrast, the Cantabrian overall strategic objective, judging by their reported preference of death to slavery mention in the classical sources above, was likely to remain a free people by defeating the armies of Rome. At Monte Bernorio, the Cantabrian objective likely was to successfully defend their *oppidum*.

Battlefield of Monte Bernorio

The Key Terrain of Monte Bernorio marks the western boundary of the battlefield (Table 7.1). The mountain dominates the intersection of natural transportation routes providing unobstructed line of sight for several

kilometers allowing observation of these transportation routes. The summit of Monte Bernorio is a relatively flat, 28 ha kidney-shaped plateau that is referred to as the Acropolis in published excavation reports (Torres-Martínez 2004: 80). The Acropolis is encircled by a wall-and-fill rampart measuring 1700 meters in length (Figure 7.3). The wall was constructed using irregular

Figure 7.3. Excavated Remains of the Southern Acropolis Wall. The Acropolis Wall was a wall and fill rampart that served as the primary defensive fortification of the Monte Bernorio oppidum (Photo by ©Craig J. Brown).

medium-sized ashlar blocks of limestone quarried from Monte Bernorio itself. The outer face was set directly on the bedrock at the edge of the slope with the blocks dressed to present a smooth, homogenous appearance. The inner face of the rampart was built on a foundation of large stone blocks set on another level of bedrock back from the edge of the slope so that it stood

slightly higher on the terrace. The intervening space between the two wall faces was filled with an aggregation of rubble, earth, and refuse. The completed rampart averaged 3 meters in thickness (Torres-Martínez and Serna Gancedo 2010: 78-79; Torres-Martínez, Martínez Velasco, and Serna Gancedo 2013: 22-29; Torres-Martínez et al 2016: 365-366). The rampart is estimated to have stood approximately 6 meters in height, based upon the height from the exterior base of the wall to the surviving top of the section, and may have been topped with a wooden palisade, barrier, or roofed platform (Figure 7.4, 7.6) (Torres-Martínez and Serna Gancedo 2010: 79). As part of an urbanized the landscape, the Acropolis Rampart can be classified as an existing obstacle that was constructed to reinforce the natural height of the upper slopes of Monte Bernorio. The Acropolis Rampart was designed to deny access to the inhabited area the *oppidum* and can be further classified as a Blocking Obstacle (Table 7.1). Any point along the rampart's circuit could have provided observation for several kilometers into the distance from any point along the wall's circuit. From the Southern Wall, an observer could have witnessed the entire approach of the Roman Army from El Castillejo, across the Plain of Monte Bernorio, all the way into the Outer Earthworks (Figure 7.5). Line of sight into the core of the Acropolis

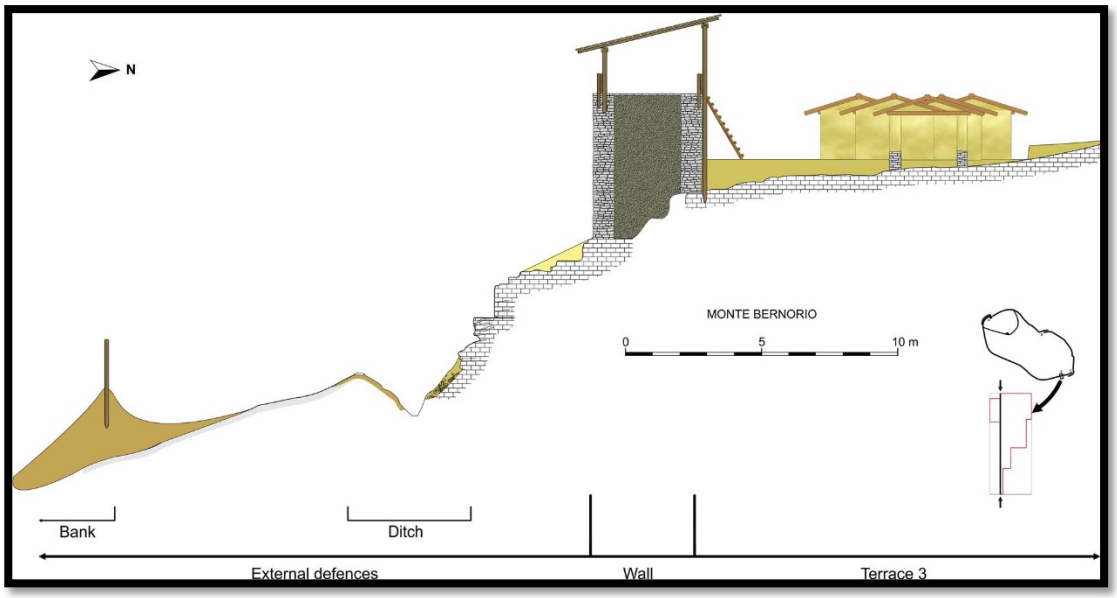


Figure 7.4. Defenses of Monte Bernorio (Torres-Martínez, et al 2016: 6). Depicted are the external defenses, incorporating the dump bank earthworks and ditch. Also depicted is the Rampart Wall with a roofed walkway. Behind the Rampart Wall a cluster of densely packed houses is shown. IMBEAC likely based this reconstruction on their excavations as well as those cited in Fernández Acebo, et al (2010) (Drawn by ©IMBEAC).

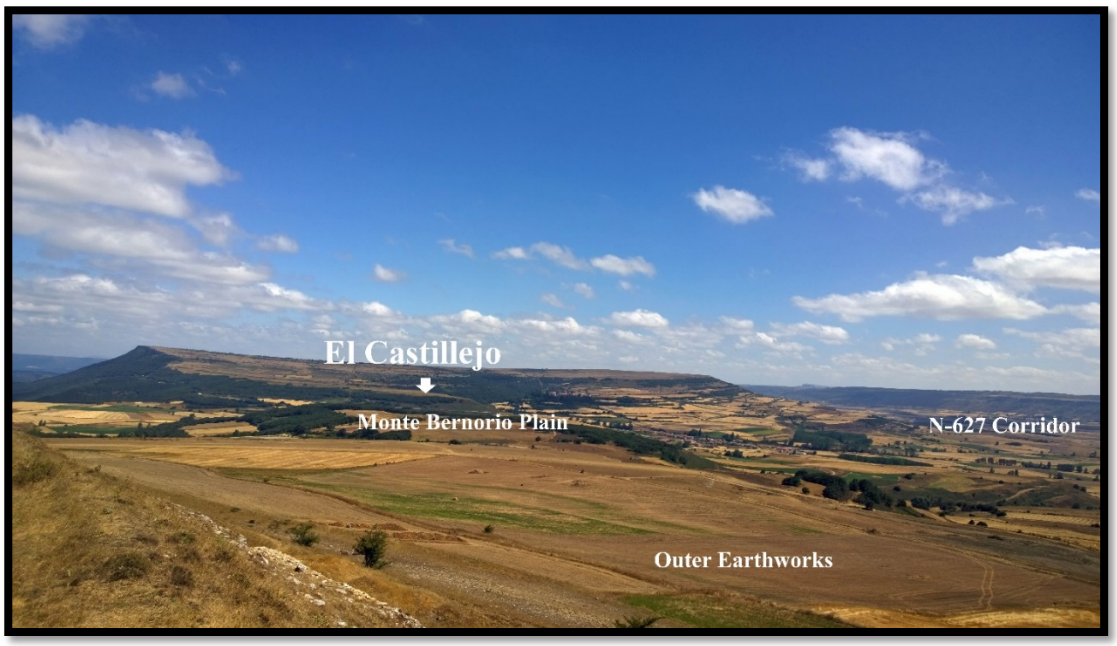
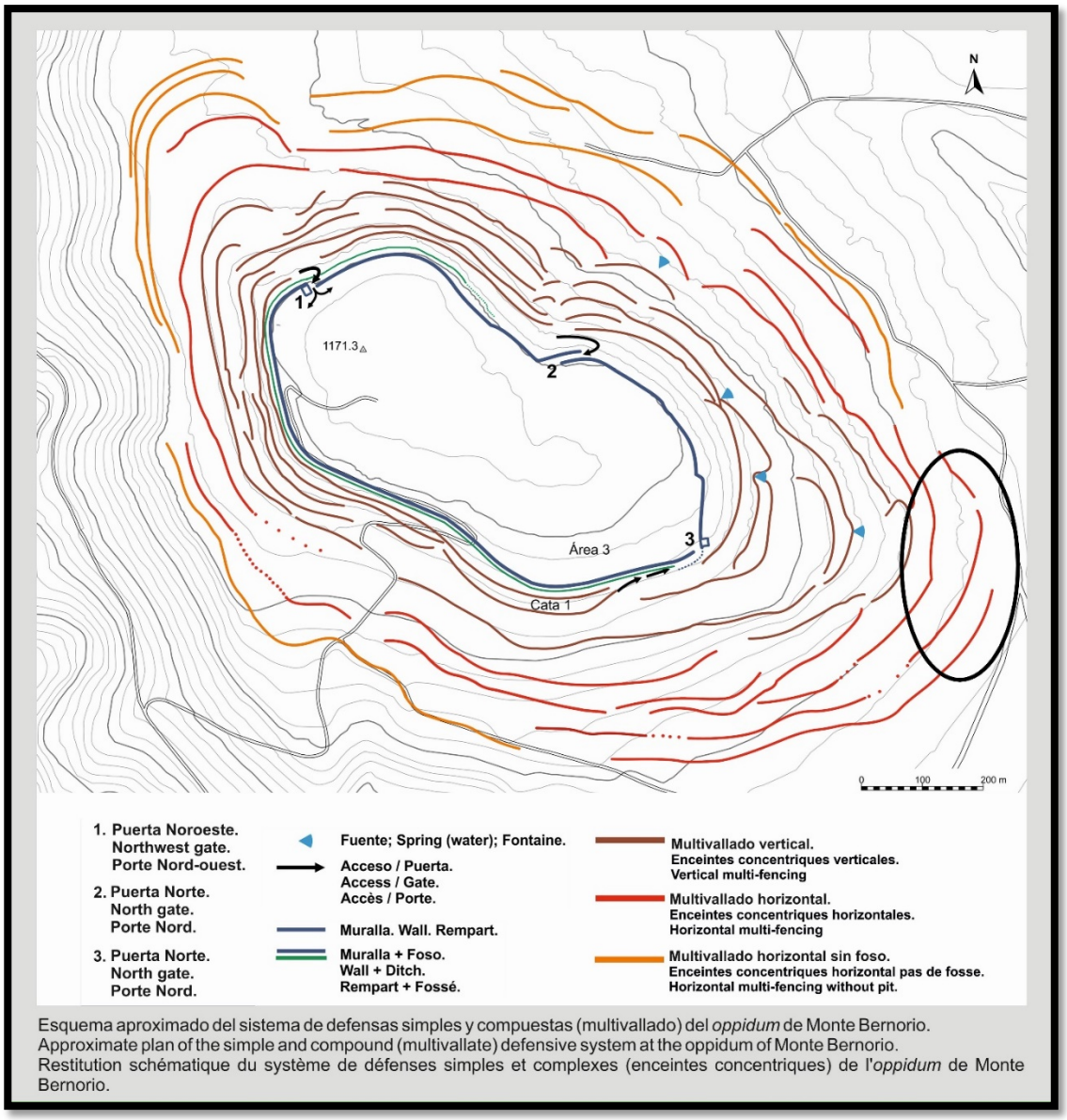


Figure 7.5. South Wall Observation Viewshed. View is toward the east and shows the Outer Earthworks below the South Gate, Monte Bernorio Plain battle site, Roman Camp at El Castillejo and the N-627 Corridor Avenue of Approach (Photo by ©Craig J. Brown).

was blocked by the topography of the summit and its associated structures. This may have made the coordination of the *oppidum's* defenses difficult should an attack have been made at multiple points along the rampart.

The Acropolis Rampart had three gateways that controlled access to the interior of the site (Torres-Martínez 2004: 84; Torres-Martínez, Martínez Velasco and Serna Gancedo 2013: 23; Torres-Martínez et al 2016: 366). Being components of the Acropolis Rampart, the gateways can be classified as existing blocking obstacles in KOCOA (Table 7.1). The Northwest Gate (Figure 7.6 Number 1, Figure 7.7) possessed a defensive tower that dominated a sharply angled access ramp that passed between two parallel wall sections. This approach ramp was estimated[73] to have been approximately 2 meters in width and had been flanked by a substantial ditch feature. The ditch was triangular in cross-section, approximately 4 – 5 meters wide and 2 meters deep. The ditch was lined with stones embedded into a yellowish clayey soil, which may have served as a mount for *cervi* type wooden stakes. The ditch would likely have served as a Fixing Obstacle that reinforced the existing height of the cliff and rampart. The cliff is near vertical in the area of the Northwest Gate and the height from the base of the ditch to the top of the rampart would likely have been approximately 13 – 14 meters. The North Gate (Figure 7.6 Number 2, Figure 7.8) was narrow, estimated to

[73] Estimates of the width of the three gates was made visually by the author in 2016 and should be considered only for general comparison purposes. The gates have not been excavated by IMBEAC.



Esquema aproximado del sistema de defensas simples y compuestas (multivallado) del *oppidum* de Monte Bernorio.
Approximate plan of the simple and compound (multivallate) defensive system at the oppidum of Monte Bernorio.
Restitution schématique du système de défenses simples et complexes (enceintes concentriques) de l'*oppidum* de Monte Bernorio.

Figure 7.6 Defenses of Monte Bernorio: 1. Northwest Gate; 2. North Gate; 3. South Gate; Springs are indicated by blue triangles; Acropolis Wall and Ditch are indicated by blue lines; Outer Earthworks are indicated by green, red and yellow lines. Black circle indicates entrance into Outer Earthworks from Monte Bernorio Plain (Drawn by ©IMBEAC).

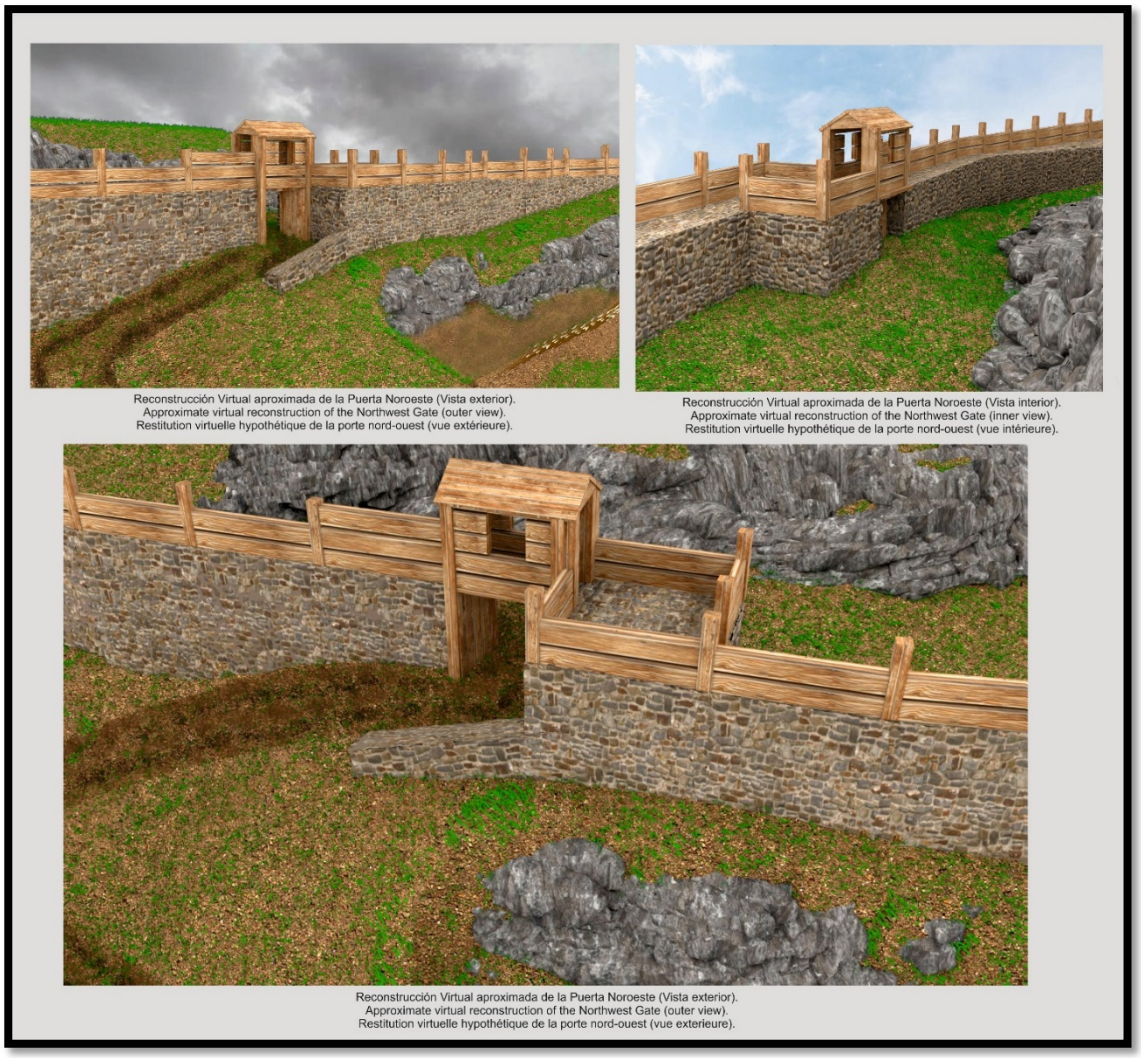


Figure 7.7. Reconstruction of the Northwest Gate of Monte Bernorio. The tower mentioned in published excavations reports refers to the platform flanking the entrance. An attack on this gate had to advance up the ramp facing directly into the defense before turning left to the gate and exposing their right flank. A section of the ditch feature at the base of the cliff can be seen in the bottom right of the first panel. It is likely that the Romans attacked this gate, but aside from its destruction during or just after the attack, this has not been confirmed archaeologically. The reconstruction is based upon archaeological evidence and analogy to similar gate constructions in the region during the Iron Age (Drawn by ©IMBEAC).

have been approximately a meter or so in width and was more of a sally port or postern. The gate does not appear to have possessed a tower; its defensive features consisted of a long narrow approach corridor between two parallel wall faces. The South Gate (Figure 7.6 Number 3, Figure 7.9) was accessed by a long ramp that descended from the gate to the lower southern

terrace. This ramp was constructed on a foundation of dressed limestone blocks and provided a relatively gentle slope for people travelling to and from the agricultural plateau to the south and southeast of the Acropolis. There are no obvious remains on the ground surface indicative of a fortified tower that would have protected the South Gate as there is at the Northwest Gate, however, there may have been a bridge or covered gallery that could have provided cover for defenders and facilitate movement along the wall. The lack of obvious architectural remains made it difficult to estimate the width of the Southern Gate. The ramp approaching the gate is slightly wider than the ramp approaching the Northwest Gate, as a result, this author estimates the Southern Gate to have been 2 to 3 meters in width. Normal travel to and from the Acropolis would have been controlled by the three gates described above, but during times of danger these gates would have been shut and defended.

Cantabrian reliance on javelins as missile weapons would have limited their capability to defend the Acropolis Rampart. The maximum range of the javelin depended on the arm strength of the individual warrior throwing it. The javelin and *pilum* were closely related in form and function, allowing for the

Figure 7.8. Reconstruction of the Northern Gate of Monte Bernorio. This gate led to the freshwater springs and the plain on the north of the Acropolis. The gate and adjacent wall seems to have been the target of the Roman attack originating from the Outer Earthworks on the northern side. A ballista projectile (Figure 6.14, 6.18 Number 21) was recovered from the base of the wall to the right of the gate in the first panel. The reconstruction is based upon archaeological evidence and analogy to similar gate constructions in the region during the Iron Age (Drawn by ©IMBEAC).

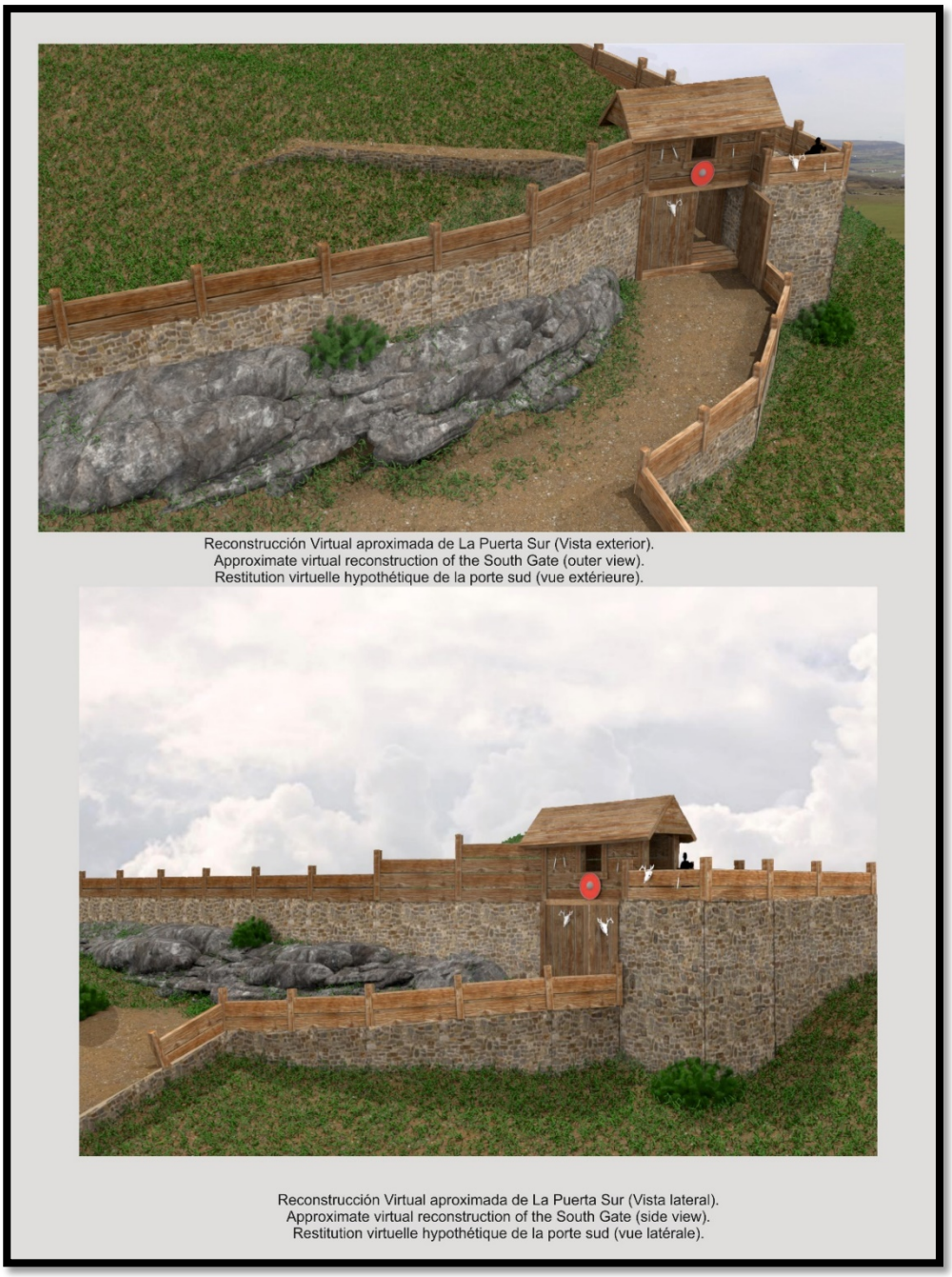


Figure 7.9 Reconstruction of the Southern Gate of Monte Bernorio. This gate led to the freshwater springs and the plain on the southside and southeast of the Acropolis. The gate and adjacent wall seem to have been the target of the Roman attack originating from the Outer Earthworks and following a battle on the Plain of Bernorio. The reconstruction is based upon archaeological evidence and analogy to similar gate constructions in the region during the Iron Age (Drawn by ©IMBEAC).

estimate of the Javelin's to be set at a similar 30-meters (Goldsworthy 1996: 183). With a 30-meter field of fire, Cantabrian defenders manning the

Acropolis Wall could have done little more than attempt to keep attackers from the base of the wall. The Northwestern and Southern Gates were accessed by a ramp that double-backed upon itself and that was within the 30-meter field of fire. Attackers advancing up the ramps would have temporarily been fixed in place, blocked or detained by the gates, where javelins may have been a bit more effective.

The lower terraces and a portion of the southern plateau of Monte Bernorio are enclosed within a complex multivallate system of discontinuous concentric earthworks that increase the *oppidum's* fortified area to 90 ha; the earthworks are clearly distinguished in aerial photographs (Figure 7.2) and LiDAR images (Figure 7.10). On the ground, large segments of the earthworks remain well enough preserved to permit close inspection. Recent excavation of one of the earthworks confirms a Late Iron Age construction, which likely happened in association with the construction of the ditch below the Rampart. The ends of the discontinuous earthworks are slightly curved

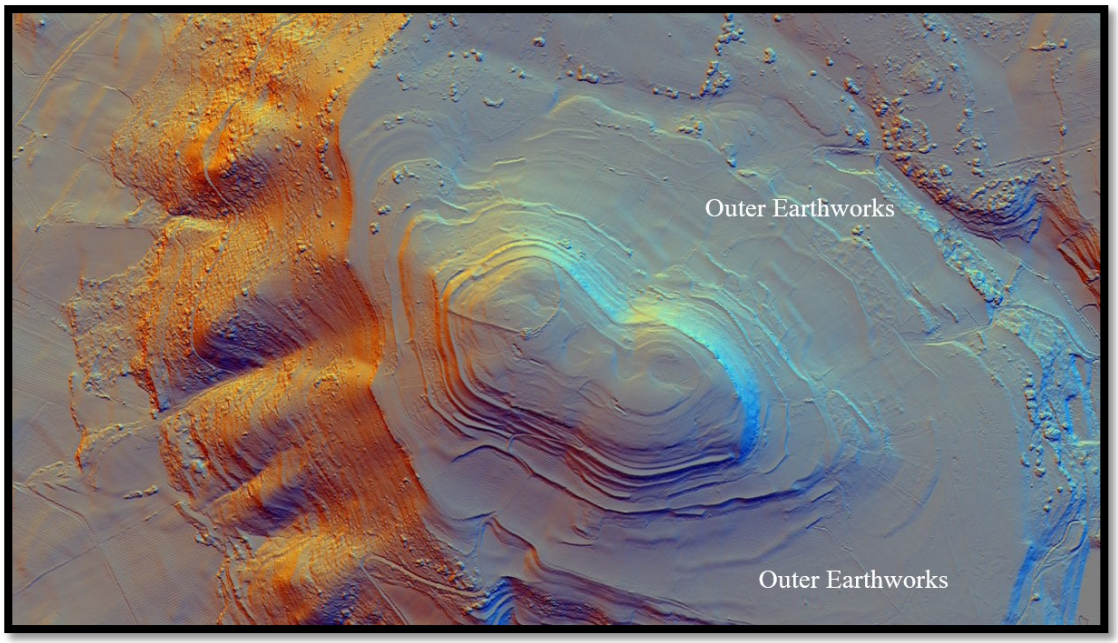


Figure 7.10. LiDAR image of Monte Bernorio showing the Outer Earthworks as rises in the landscape (Photo by ©IMBEAC).

(Torres-Martínez et al 2016: 368). The dimensions of the earthworks vary, but in some places, they measure approximately 2-meters in height and nearly 4-meters in thickness at the base (Figure 7.11).[74] The intervals between rows of earthworks vary, as well as the width of the passages through them (Figure 7.6). There is no visible evidence of there having been barriers across the passages between the rows of earthworks.[75] The size and complexity of this defensive system would have required a great deal of collective labor and materials for its construction.

[74] Estimated measurements were made by the author during site walkovers in August 2016. Generally speaking, these earthworks appear to have been twice as wide at the base as they were tall.

[75] Agricultural and road building activity has damaged most of the earthworks on the southern side of Monte Bernorio, however, their remains appear as cropmarks in aerial photographs and have been mapped (Figure 7.6).

Figure 7.11. Terminal Profile of one of the Outer Earthworks as observed during August 2016 Walkover. View is looking west. Exterior or downslope face is to the left. Interior or upslope face is to the right (Photo by ©Craig J. Brown).

In 2007, IMBEAC excavated a segment of the earthen ramparts that constitute the Outer Earthworks at Monte Bernorio. Their work revealed that at least a portion of the ramparts had been constructed along the edges of the natural terraces that make up the hillside, while others were situated on the slope, where erosion built up the artificial terraces visible in the landscape today (Torres-Martínez *et al* 2017: 251). The earthworks were built using a base of compacted stones, gravel and earth situated on the outer edge of the slope that acted as containment for earthen fill. The interior, or upslope edge was bounded by a series of stones set into a base of yellowish clay (Torres-Martínez *et al* 2017: 251). This gave the earthworks a cross-section with a steep outer face, a rounded top and gradual slope to the exterior that was still observable during a 2016 walkover (Figure 7.11). Allowing for time and the

effects of erosion, it is possible that the earthworks once stood at 2.5 to 3-meters in height and were approximately 4 meters wide at the base. Artifacts (although these are not identified in published reports) recovered from the earthen fill of the earthworks dated their construction to the Late Iron Age (Torres-Martínez *et al* 2017: 251). IMBEAC's excavations did not reveal the presence of a palisade or wooden *chevaux-de-frise* as suggested by their reconstruction (Figure 7.12; Figure 7.13, but it is possible that one or the other may have existed. Ditch features, either interior (upslope) or exterior (downslope) are not visible in the present landscape and are also not mentioned in published excavation reports (Torres-Martínez *et al* 2017: 251). During excavations in 2016, however, a ditch feature was uncovered, within the Outer Earthworks, running along the southern boundary of the Necropolis.[76] This ditch was not found in obvious association with a rampart, but the ramparts in this area have been flattened to make way for the farming of cereal crops. The presence of the above ditch feature suggests the possibility that there are ditches within the Outer Earthworks that may be associated with the earthworks that have been filled in either through erosion or agricultural activity. These ditches would likely have provided the upcast material used to construct the earthworks. This construction technique corresponds with what Avery (1993: 51-61) categorizes as an Unretained Low Dump Rampart[77] and is a common fortification technique that has been

[76] This author personally observed this ditch feature while excavating another section of the trench positioned in the Necropolis but did not take measurements at that time. It was not substantial, perhaps less than a meter wide and less than a meter deep.

[77] This author bases the identification of the Monte Bernorio earthworks as unretained low dump bank earthworks of the fact that the vast majority of the earthwork is not contained or faced with stone. There is a stone base with perhaps a course or two of stones on the downslope side to catch

documented at other sites in northern Spain, albeit on a smaller scale (Camino 1995, 158-165; Torres-Martínez 2011, 289-292). The Outer Earthworks constituted the first line of defense for the *oppidum* and can be characterized as Key Terrain based upon three factors: 1.) the presence of the freshwater springs within them; 2.) their inferred defensive characteristics as an Obstacle; and 3.) it was necessary for the Roman Army to control the Outer Earthworks in preparation for any attack against the core of the *oppidum*, particularly as a placement for their artillery and archers.

Along the northern side of the hill and around to the south of Monte Bernorio, are a series of springs (Figure 7.6 Blue Triangles). With no water source within the Acropolis of the *oppidum*, all water used by the inhabitants likely came from these springs. Construction of the Outer Earthworks brought the springs into the defended perimeter of the *oppidum* and also prevented easy access to the any of the three gates by a large force of infantry or cavalry. By increasing the fortified area of the *oppidum* (90 ha.), the Outer Earthworks presumably increased the range that enemy siege engines would have had to operate at when directed at the Acropolis Rampart.[78] The earthworks likely did not possess prepared fighting platforms and the multiple openings, irregularly spaced along the several circuits of earthworks, meant that defenders attempting to use the earthworks as a form of breastwork could have been easily outflanked. The manpower requirements necessary

upcast material and form a base for the earthwork. The majority of the upcast was dumped on this base to form the low bank rampart (Figure 7.11).

[78] This is also the conclusion reached by IMBEAC as to the general function of the Outer Earthworks (Torres-Martínez, Martínez Velasco and Vacas-Madrid 2015: 118).

to have adequately manned the Outer Earthworks in order to have secured the multiple openings was likely greater than what the *oppidum* could have supported. In terms of KOCOA, the Outer Earthworks likely functioned as a Disruptive Obstacle meant to break up the cohesion of an attacker's linear formations as they approached the Acropolis Wall. Enemy infantry would have been forced to storm each ring of earthworks in turn or change formation to move along the many pathways through them. The pathways themselves could have been defended and this likely would have been effective against raiding parties. Defense of the pathways would require less manpower than defense of the earthworks, however, the defenders would still be subject to a flank attack from an enemy force that had entered the Outer Earthworks at another point. An enemy army possessing siege engines would have had to gain control of the Outer Earthworks in order to have had a platform for deploying them in an attack upon the Acropolis Rampart.

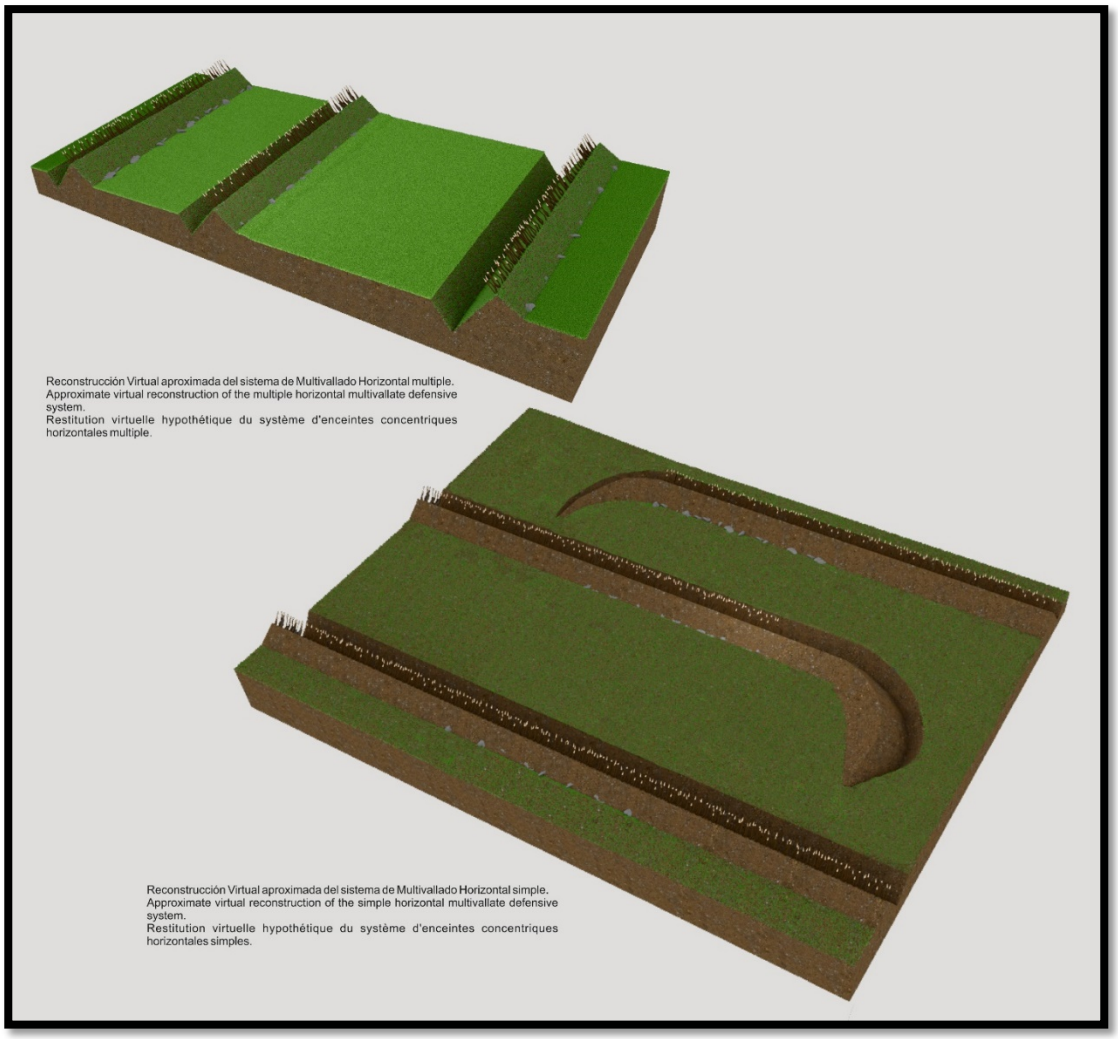


Figure 7.12. Reconstruction in horizontal, or plan, view of how the Outer Earthworks may have looked. Reconstruction shows discontinuous, multivallate earthworks with ditch and type of wooden chevaux-de-frise or cervi stake construction (Drawn by ©IMBEAC).

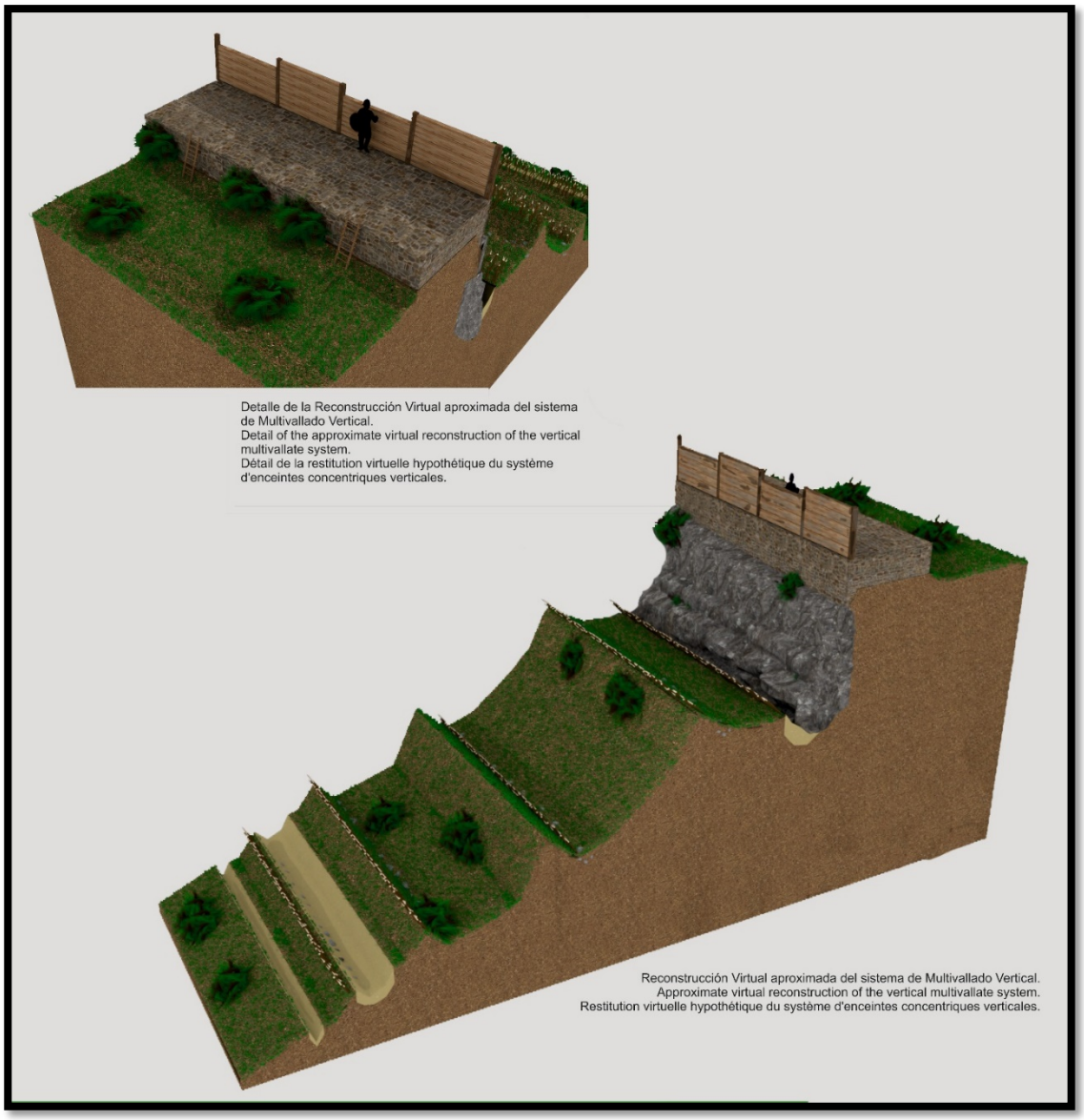


Figure 7.13. Reconstruction in vertical, or profile, view of how the Outer Earthworks may have appeared. Reconstruction shows multivallate earthworks with ditch and type of wooden chevaux-de-frise or cervi stake construction. Earthworks likely served to extend the defensive zone of the Acropolis Wall (Drawn by ©IMBEAC).

Across the plateau, some 3 km to the south, on the plain of La Lastra (Pomar de Valdivia, Province of Palencia), lies the Roman camp (*castra*) of El Castillejo (Figure 7.14 Number 1). La Lastra is a defensible Key Terrain feature approximately 1045 m (3430 ft) in elevation that forms the eastern boundary of the battlefield (Table 7.1). The camp at El Castillejo possessed an unobstructed line of sight, providing excellent observation of the eastern half of the Monte Bernorio *oppidum* (Table 7.1; Figure 7.16). Between 2000 and 2002, surveys and targeted excavation trenches were carried out at El Castillejo by the Instituto de Prerromanos y de la Antiguedad (IEPA) under the direction of Eduardo Peralta Labrador. IEPA identified a large irregularly shaped Roman camp (*castra maiorem*) taking in over 41 ha. The core of the site was occupied by a central seasonal camp (*castra aestiva*), of traditional rectangular plan and 18 ha in size. This camp was surrounded by a *vallum* (palisade) consisting of an *agger* earthwork and stones with *fossa fastigiata*. Other structures were constructed to conform to the shape of the plateau, giving the outer camp its irregular plan. These outer fortifications reinforced the natural steep slopes and cliffs of the plateau. More open areas were obstructed with a stone *agger*, most likely with a *vallum*, a *fossa duplex* (double ditch) and a *contra agger*.

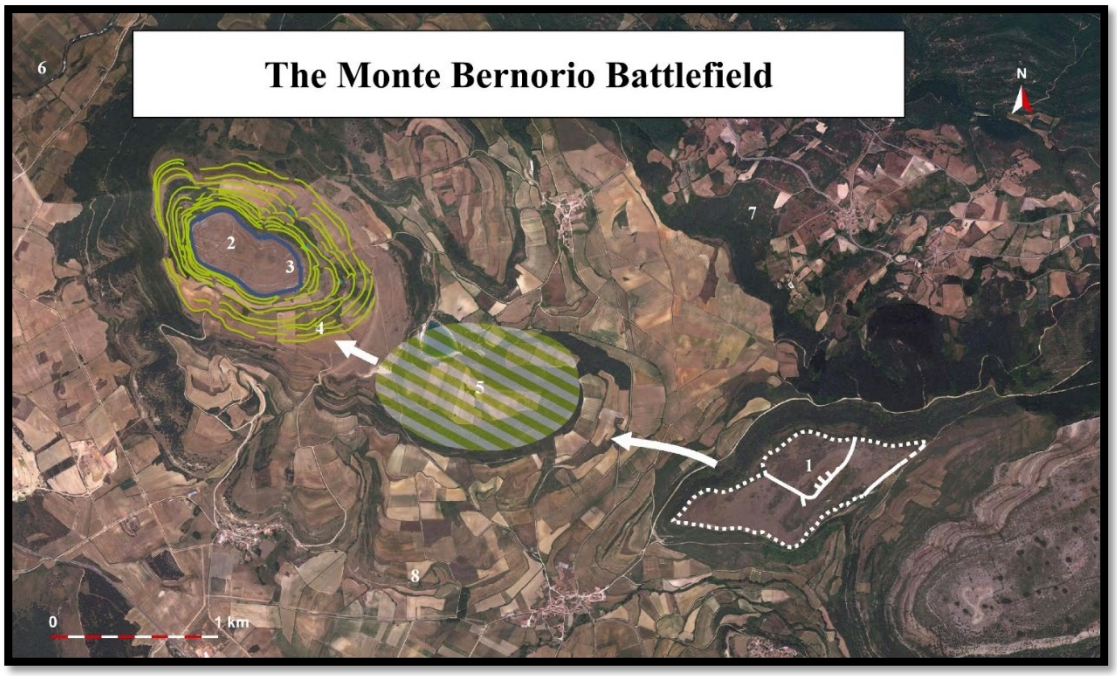


Figure 7.14. The Monte Bernorio Battlefield. 1. The Roman Camp at El Castillejo (White); 2. Monte Bernorio Acropolis; 3. Acropolis Wall (Blue); 4. Outer Earthworks (Green); 5. Plain of Bernorio (Battle Site) (Blue and Green Hatching); 6. Pisuerga River Valley (A67 Route); 7. CA-273 Corridor; 8. N-627 Corridor; White arrows indicate Roman Avenue of Approach (Drawn by ©IMBEAC).

The fortified main entrance to the camp was located on the side of the plateau facing Monte Bernorio. Although of irregular plan, the proportions of the features of the camp are consistent with those cited in Pseudo-Hyginius' (1993: 233-245) *De munitionbus castrorum* and Vegetius' *De Re Militari* (1985: 91-94, 139-142). The camp could probably have accommodated two complete legions with accompanying auxiliaries, the equivalent, perhaps, of three complete legions (between 12,000 and 18,000 men). Finds recovered from El Castillejo include pieces of military equipment (*caligae* nails, triple-bladed arrowheads, a *pilum* fragment), fragments of military dress (an *aucissa*-type brooch), tools, tent pole fragments, and more importantly, coins that date the camp to the Early Principate of Augustus. Just as important is

the realization that these finds are consistent with Roman finds recovered from Monte Bernorio and the intervening plateau. This indicates, quite clearly, that the Roman assault undertaken at Monte Bernorio originated from this camp (Peralta Labrador 2003: 280-282, 301-306; Torres-Martinez Velasco, and Perez Farraces 2012: 529-530).

Table 7.1 Battle of Monte Bernorio KOCOA Analysis

Terrain Feature	KOCOA Classification	Reason for Classification
El Castillejo, Roman Camp (Figure 7.13, No. 1 and 7.14, No. 1)	Key Terrain	Large, easily defended plateau with steep sides approximately 3.5 km (2.25 miles) east - southeast of Monte Bernorio summit. Large enough to accommodate several Roman legions. Excellent Observation point for southern face of Monte Bernorio and the Monte Bernorio Plain.
	Observation	Unobstructed, unaided line of sight across the plain of La Lastra to the southern face of Monte Bernorio. Good view of the Rampart, South Gate and Outer Earthworks.
Monte Bernorio *Oppidum* Acropolis (Figure 7.13, No. 2 and 7.14, No.5)	Key Terrain	Core living area of the *Oppidum* occupied 28 ha summit of Monte Bernorio. Consisted of densely packed rectangular and sub-rectangular houses separated by narrow streets. Encircled by the Acropolis Wall. Excellent Observation. Above intersection of three transportation corridors.
	Observation	Unobstructed direct line of sight throughout 360° for several kilometers. Good Observation of transportation corridors.
	Cover & Concealment	Rudimentary Cover & Concealment provided by buildings. Urban environment.
Monte Bernorio Acropolis Wall (Figure 7.3 and 7.6)	Observation & Fields of Fire (Figure 6.16)	Unobstructed direct line of sight throughout 360° for several kilometers. Good Observation of transportation corridors. Cantabrians possessed javelins and stone cobbles to use as missile weapons. Field of Fire extended out from Rampart only as far as an individual warrior could throw, perhaps a 30-meter arc.

	Cover & Concealment	Provided excellent protection from direct missile fire for those sheltering behind the wall, perhaps less for those manning it. Completely concealed movement and dispositions immediately behind or in lee of wall. View from lower terraces and Outer Earthworks completely blocked. Observation point at El Castillejo had partially concealed view.
	Obstacle	Existing and reinforcing blocking Obstacle. 1700 meters long, wall and fill rampart encircled the Acropolis. Built along cliff edge to take advantage of steep, high cliff face. Faced with ashlar stones. Rampart estimated to be 5 meters high and may have had a wooden palisade or roofed structure. Averaged 3 meters in thickness.
Northwest Gate (Figure 7.6, No.1 and 7.7)	Obstacle	Existing, Blocking Obstacle controlling primary access to Acropolis. Approach ramp doubled back on itself to pass between two parallel wall sections before climbing to entrance. A tower overlooked the point where the approach doubled back.
	Avenue of Approach	Based upon architecture, believed to be main or primary entrance into Acropolis offering restricted mobility into interior.
South Gate (Figure 7.6, No. 3 and 7.9)	Obstacle	Existing, Blocking Obstacle controlling access to the Acropolis on the south side of Monte Bernorio. Gate was reached by a long ramp constructed on a foundation of dressed limestone blocks.
	Avenue of Approach	Restricted mobility between the Acropolis, Springs and agricultural or grazing area along south side of Monte Bernorio and Monte Bernorio Plain.
North Gate (Figure 7.6 No. 2 and 7.8)	Obstacle	Existing, Blocking Obstacle to control northern entry into the Acropolis. Long, narrow and flanked by two parallel walls. Similar to a sally port or postern.

	Avenue of Approach	Restricted mobility between Acropolis and Springs along north side of Monte Bernorio.
Ditch (Figure 7.6)	Obstacle	Reinforcing, Fixing Obstacle running along portions of cliff base below Acropolis Wall and flanking entry approaches. Triangular in cross-section, averaged 4 to 5 meters wide and 2 meters deep.
Freshwater Springs (Figure 7.6)	Decisive Terrain	Only source of potable water for the entire Monte Bernorio *Oppidum*. Located outside Rampart among Outer Earthworks.
Monte Bernorio *Oppidum* Outer Earthworks (Figure 7.6)	Key Terrain	Designated as Key Terrain primarily due to the presence of the Freshwater Springs within the Earthworks. Earthworks also conveyed some defensive advantages. Roman Army needed to seize the Earthworks in order to place their artillery within effective range of the Rampart.
	Observation & Fields of Fire	In some sections, the Earthworks survive to a height of 2 meters or slightly higher. The top of the Earthworks does enhance Observation in the immediate area. Cantabrians likely used javelins here and the corresponding Field of Fire would be limited to how far an individual could throw a javelin effectively, perhaps an arc of 30 meters.
	Cover & Concealment	Offered protection from direct fire and observation while behind the Earthworks. Defenders on top were more exposed. Likely would not have offered Cover or Concealment to the Roman Army when assaulting the Acropolis.
	Obstacle	Existing, Disrupting or Fixing Obstacle. Large portions of Earthworks have survived, reaching 2 meters high by 2 meters thick in some places. Discontinuous with many entrances. Effective at disrupting calvary advance. Less effective against infantry.

	Avenue of Approach	Outer Earthworks are discontinuous with many entrances creating a non-linear path to the Acropolis via the three gates.
Plain of Monte Bernorio (Figure 7.13, No. 5)	Avenue of Approach	Unrestricted mobility across open ground outside of Outer Earthworks. Agricultural and grazing land. Some scrub.
Pisuerga River Valley (Figure 7.13, No. 6)	Avenue of Approach	Primary north - south travel route offering unrestricted mobility along a reliable water source. Allowed communication between the Bay of Biscay, near Santander, and the Meseta. Autovía Cantabria - Meseta A67 follows this route past western base of Monte Bernorio.
CA-273 To Ebro River Valley Corridor (Figure 7.13, No. 7)	Avenue of Approach	East - west unrestricted mobility corridor along north base of Monte Bernorio and El Castillejo that links the Pisuerga River Valley to the Ebro River Valley.
N-627 Corridor (Figure 7.5 and 7.13, No. 8)	Avenue of Approach	West - southeast unrestricted mobility corridor along south base of Monte Bernorio and El Castillejo that links the Pisuerga River Valley to points southeast.

Table 7.1. KOCOA analysis of the Monte Bernorio Battlefield showing Defining Terrain Features, KOCOA classifications and reason for classification (Part 4 of 4).

Attack on Monte Bernorio Reconstruction

Preparatory to launching their attack on the Cantabrian *oppidum* at Monte Bernorio, a Roman Army column established a fortified camp on key terrain at El Castillejo approximately 3 kilometers distant (Figure 7.15 Number 1). This column likely had been operating in the Pisuerga River Valley along the avenue of approach north from Segisama. Numismatic and textual evidence suggest construction of the camp at El Castillejo took place during the Cantabrian Wars, possibly during the year 26 BC, a time when Augustus himself personally commanded operations in the area. The numismatic evidence consists of two coins recovered from the eastern portion of the site

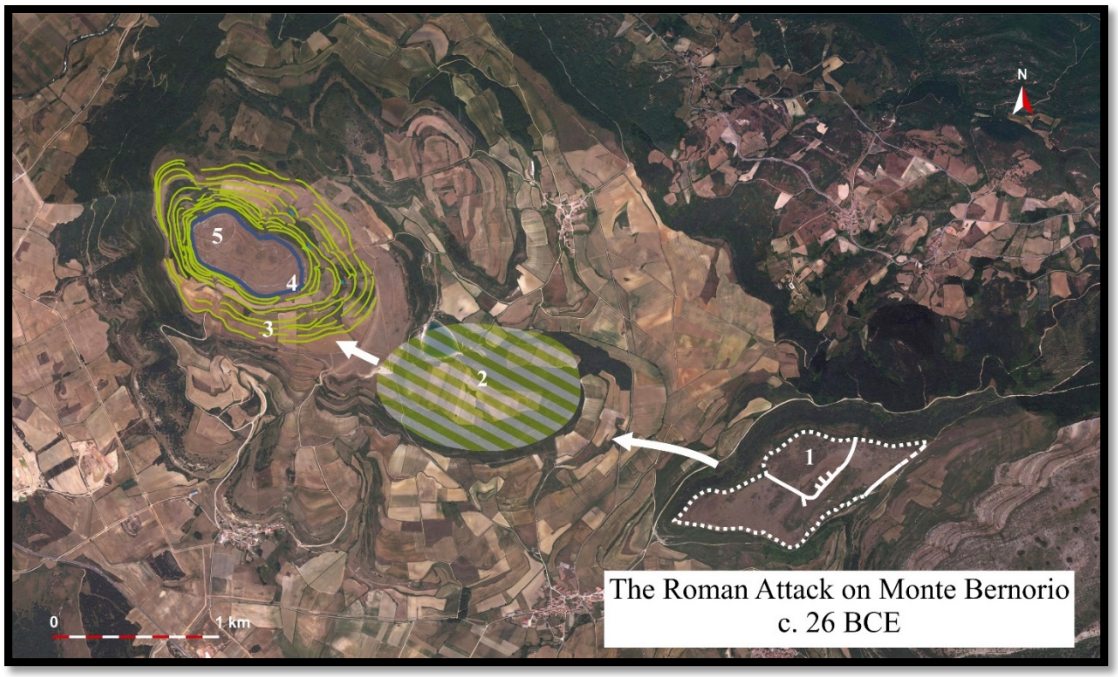


Figure 7.15. The Roman Attack on Monte Bernorio. 1. Roman Army establishes camp at El Castillejo. 2. Roman Army marches along indicate Avenue of Approach to Plain of Bernorio, where archaeology indicates site of battle. Romans defeat Cantabrians. 3. Roman Army secures Outer Earthworks beneath Monte Bernorio Acropolis. 4. Roman Army assaults South Gate and adjacent Acropolis Wall. Archaeology indicates fighting here. Romans likely breached the South Gate and entered Acropolis at this point. 5. Last Cantabrian resistance in Core of Acropolis as indicated by archaeology (Drawn by ©IMBEAC).

during excavations conducted in 2001 (Peralta Labrador, Hierro Gárate and Gutiérrez Cuenca 2011: 163). The first coin is a fragment depicting a male head on the front with possibly a wolf on the reverse that was minted at Iltirta (Ilerda Lleida) at the time of the Sertorian War c. 82-72 BC. The second coin is complete and bears an Eagle Jupiter on its face with the legend LIVNIUS_II_VIR_QUIN_AVG. It was likely minted in Carthago Nova around the year 44 BC, or perhaps a bit later in 37 BC (Peralta Labrador, Hierro Gárate and Gutiérrez Cuenca 2011: 163). Taken together, the coins provide a generalized *terminus pro quem* that is nonetheless suggestive of the

camp's contemporaneity with the Cantabrian Wars. However, caution should be exercised in using the coins to date the Roman camp at El Castillejo and by extension the battle at Monte Bernorio to c. 26 BC. Both coins had been in circulation for decades prior to the battle and could have been deposited before the construction of the camp.[79] In this case, the association of the coins with the camp would possibly be more apparent than real.

Textual evidence is circumstantial as it is based upon the itineraries developed by Blázquez (1920) and Syme (1970: 92-101). The itineraries were constructed from surviving sign inscriptions naming way stations along the Roman road from *Segisama*, through the Pisuerga River Valley and Cantabrian Mountains, to the Bay of Biscay (Blázquez 1920: 99; Magie 1920: 329; Syme 1970: 92). Two of the names, that of *Villecia* (*Villicae*, *Atticae*, *Bergida*) and *Aracillum*, are believed to correspond to Cantabrian *oppida* (Schulten 1943: 1; Syme 1970: 92-93; González-Echegaray 1986: 83, 180) that are mentioned in both Florus (*Epitome della storia romana* 2.33.49-51) and Orosius (*Hist.* 6.21.5-8) as being the sites of battles during the 26 BC campaign led by Augustus (Magie 1920: 330-331; Syme 1970: 92). *Villecia* (*Villicae*, *Atticae*, *Bergida*) has recently been associated with Monte Bernorio (see Appendix 7-2). A Roman army operating along the Pisuerga River avenue of approach would not leave an intact *oppidum* astride its line of communications to Segisama. Supplies to feed the army were likely being convoyed from the base at Segisama along the same line of advance (Syme 1970: 88; Varga 2015: 137-138). The itinerary evidence can be regarded as

[79] One is a fragment 1/3 size of complete coin and the other is fairly worn.

tenuous, however it does also support a 26 BC date, or at least an early date during the Cantabrian War, for the Roman attack on Monte Bernorio.

The Key Terrain of La Lastra was likely chosen by the Romans as the site for their fortified camp (El Castillejo) because of the location's defensive and observational characteristics. The camp occupies a plateau that sits approximately 70-meters (230 feet) above the surrounding valley floor. The cliffs are nearly vertical with the camp's outer earthworks running along portions of the cliff edge, constructed so as to reinforce the existing natural obstacle of the cliff itself. On the southern edge, these works overlooked and could have interdicted travel along the gently sloping defile that acted as the primary avenue of approach to the gates of the camp. The constructed defenses, described previously, and topography of El Castillejo, made for a strong defensive position. The Romans at El Castillejo could have observed the southern and eastern areas of Monte Bernorio (Figure 7.16).[80] El Castillejo stands at approximately 1050-meters above sea level, only 8 meters below the plain upon which the outer earthworks of Monte Bernorio sit. The plain slopes gently down toward El Castillejo, which likely provided an unobstructed view of the Springs, Southern Gate and Outer Earthworks at the south-eastern tip of Monte Bernorio (Figure 7.16).

[80] This author has personally confirmed line of sight from El Castillejo to Monte Bernorio at approximately 3 km as seen in Figure 7.16.

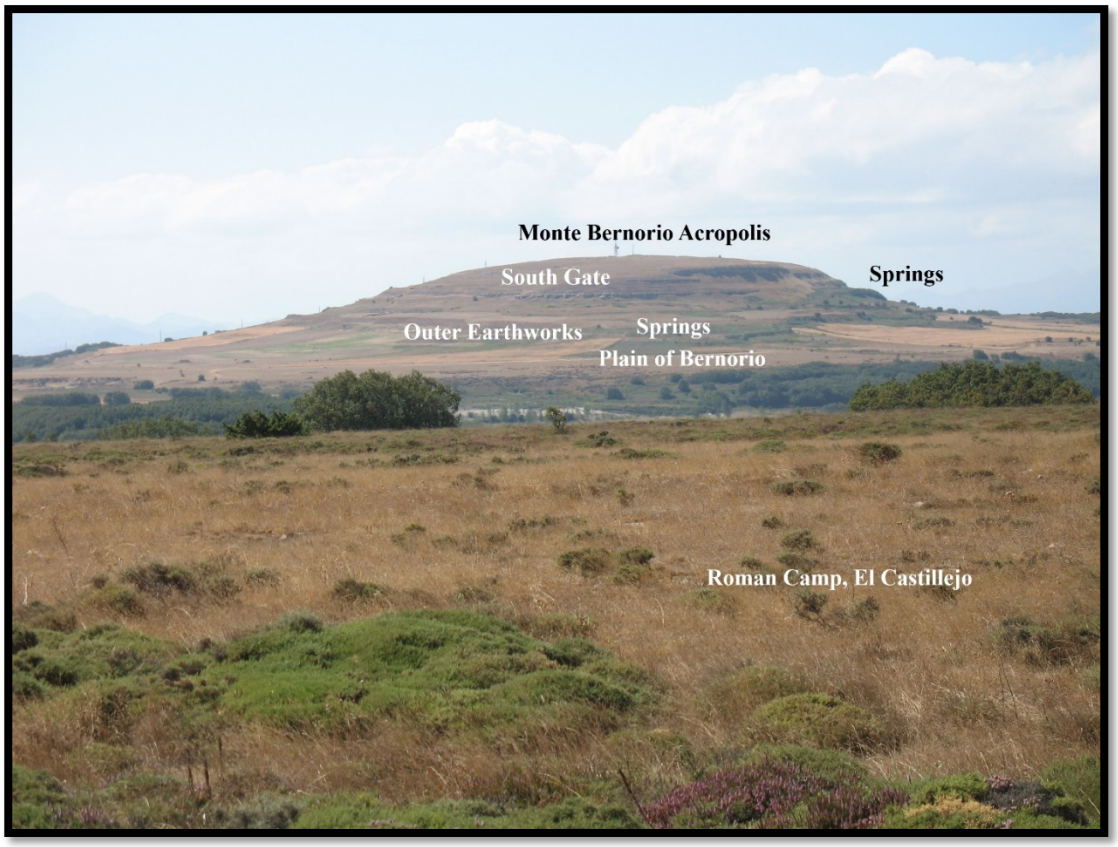


Figure 7.16. Observation viewshed looking west toward Monte Bernorio from the Roman Camp at El Castillejo (Photo by ©Manuel Fernández-Götz).

The topography of Monte Bernorio is unsuited to circumvallation as part of *Oppugnatio longinqua obsidio* or *Obsidio* operations. Monte Bernorio is comprised of several different layers of limestone terraces and plateaus of differing elevation with steep slopes of approximately 29% to 30% gradient. The changing elevations would likely have made construction of lines of circumvallation and contravallation difficult.[81] The differing elevations would have broken line of sight along large sections of the encirclement, which

[81] The Romans did utilize textbook siege tactics during the Cantabrian Wars as evidenced by the siege of Mount Medullus as described by Florus (*Epitome della storia romana* 2.33) and Orosius (*Hist*. 6.21.7-8). The fact that they did not attempt to encircle Monte Bernorio, even using additional camps, may have been, at least partially, a result of the terrain. Line of sight could not have been maintained along the line of encirclement or between camps, likely delaying the arrival of support should the need have arisen.

could have delayed timely reinforcement if a sector came under attack. To have selected a more propitious circuit, an estimated encirclement of approximately 7 to 8 kilometers in circumference may have mitigated the difficulties of abrupt changes in elevation and would likely have maintained a suitable distance from Bernorio's multivallate earthworks, but the investment in time and materiel needed to effect and maintain the encirclement may have made this an unattractive option. Even if travel into and out of the *oppidum* had been denied, the Cantabrian resource base, particularly their access to water at the Springs, would have remained largely intact inside the encirclement. El Castillejo likely did not have a water source of its own, adding to Roman logistical difficulties.[82] Augustus likely knew the value of controlling a water source in a semi-arid environment. During the Actium campaign of 31 BC, Augustus successfully defended his water sources near Epirus, Greece from attack by Marc Anthony, helping to ensure Augustus's eventual success during that campaign (Powell 2018: 9-10). The springs below Monte Bernorio on the east and south lay on a direct line across an unrestricted Avenue of Approach from El Castillejo. Augustus[83] may have chosen to approach Monte Bernorio from the east based upon the presence of the springs in that area.

When the Roman Army marched from El Castillejo to attack Monte Bernorio, it is probable that they descended the defile on the south side of

[82] That El Castillejo does not presently have a water source was confirmed by a site visit in August 2016.

[83] If the attack on Monte Bernorio did take place in 26 BC, there was a good chance that Augustus led the column operating in the Pisuerga River Valley as this column receives the lion's share of attention in Florus and Orosius.

the camp, crossed a small valley and climbed a small incline to reach the Monte Bernorio Plain. This avenue of approach consists of a plateau that measures approximately 1.87 kilometers east from the base of the ramp to the Southern Gate by approximately 1.20 kilometers north to south. Today the plain is flat, open grassland dotted by a few scrub bushes that is used for growing cereals and for grazing sheep. The plain may have served a similar function for the Cantabrians inhabiting the *oppidum* during the Iron Age.[84] As a KOCOA feature, the plain is best classified as an open and unrestricted Avenue of Approach. There is, and likely was, no natural obstacle to interdict travel across the plain itself until reaching the Outer Earthworks below Monte Bernorio's Southern Gate.

In 2007, IMBEAC conducted a metal detector survey on the plain between the southern area of Monte Bernorio and El Castillejo. This survey recovered "varied finds of a military nature, both Roman and indigenous, which could hypothetically belong to the battlefield" (Torres-Martínez, Martínez-Velasco and Pérez Farraces 2012: 531; Fernández-Götz, Torres-Martínez and Martínez-Velasco 2018: 135). The finds themselves are not described or precisely located on the plain, understandable, given that this area has been the subject of heavy looting through illegal metal detecting (Torres-Martínez, Martínez-Velasco and Pérez Farraces 2012: 531; Fernández-Götz, Torres-Martínez and Martínez-Velasco 2018: 135). The threat from looters to the archaeological resources in this part of the

[84] Faunal remains recovered from Monte Bernorio include the bones of cattle (*Bos taurus*), pigs (*Sus scrofa*), sheep (*Ovis aries*), goats (*Capra hircus*) and horse (*Equus*) (Torres-Martínez *et al* 2016: 370-373).

battlefield suggests that this area should be flagged as a priority for further survey.[85]

The lack of specificity in the published reports that mention this area of the battlefield does hamper reconstruction of the battle, however, IMBEAC has provided at least a general location for where these finds were made and thus inferentially where the battle referenced above took place (Figure 7.15 Number 2). The center of the battle location is nearly 1 kilometer east-southeast out away from the Outer Earthworks and on a direct line from El Castillejo. The notion that the Cantabrians would have sought to engage the Roman Army outside of their *oppidum* is not as surprising as it sounds.[86] The Monte Bernorio Plain would likely have been ideally suited to the Cantabrian's preferred tactics previously described. Cavalry, in particular, could have been employed on the plain to good effect, whereas it could not have been utilized at all when fighting within the fortifications. There are examples from the Cantabrian War where the Indigenous defenders did engage the Roman Army outside their *oppida*. Florus (*Epitome della storia romana* 2.33.54-58), Cassius Dio (1990 53.29.1-2) and Orosius (*Hist*. 6.21.9-10) describe how the allied Asturians attempted to attack the Romans within their fortified marching camps during a later phase of the war. It may have been possible that the Cantabrians preferred to fight away from their *oppida* if

[85] Inquiry made by the author with regards to the location, type and viewing of these artifacts was unsuccessful. Metal detecting is currently prohibited in the area in question. It appears that many of the artifacts ended up in private collections and were not available for viewing. This appears to be a politically sensitive issue and the author did not pursue the issue further.

[86] Actually, the Romans preferred to fight in the open field as well as it apparently conformed to their notion of a "fair fight" (Levithan 2013: 6-20).

they believed that they possessed sufficient strength in numbers and an opportunity for success. The need to protect their only source of water in the form of the springs present within the Outer Earthworks may have also been a factor in the Cantabrians meeting the Romans on the plain. If the Cantabrians had chosen to defend the outermost earthwork of the multivallate system facing the Roman Avenue of Approach, it would have fixed their position within range of Roman archery and artillery with no effective means to respond. It is no surprise, then, that the Cantabrians would have chosen to close with the Roman Army and engage them directly on the plain.

The battle on the plain appears to have constituted the first of two phases in the Roman conquest of Monte Bernorio, but without recourse to the distribution of artifacts recovered during the 2007 IMBEAC metal detector survey there is little more that can be said. It may be inferred that the Romans won the engagement based upon the fact that they retained possession of the field and were able to proceed to successfully attack the *oppidum* itself. Whether the Cantabrians retreated in good order or had lost tactical stability and were routed by the Roman Army is not presently known. LiDAR (Figure 7.10) and IMBEAC's map of the Outer Earthworks (Figure 7.6) do not show an entrance passage into the earthworks on the eastern side directly opposite where the battle of the plain took place. IMBEAC's map does seem to show a set of entrance passages to the north (Figure 7.6, Circle) that would have been approximately 1 kilometer northwest of the

battle.[87] It would seem plausible that the Cantabrian Avenue of Withdrawal from the battlefield would have proceeded northwest toward the entrance in the Outer Earthworks. At present, however, there is no archaeological evidence to support a retreat into or through the Outer Earthworks. It is possible that the Cantabrians withdrew north past the Outer Earthworks and away from the *oppidum*. Additional archaeological survey in this area is needed to resolve this question.

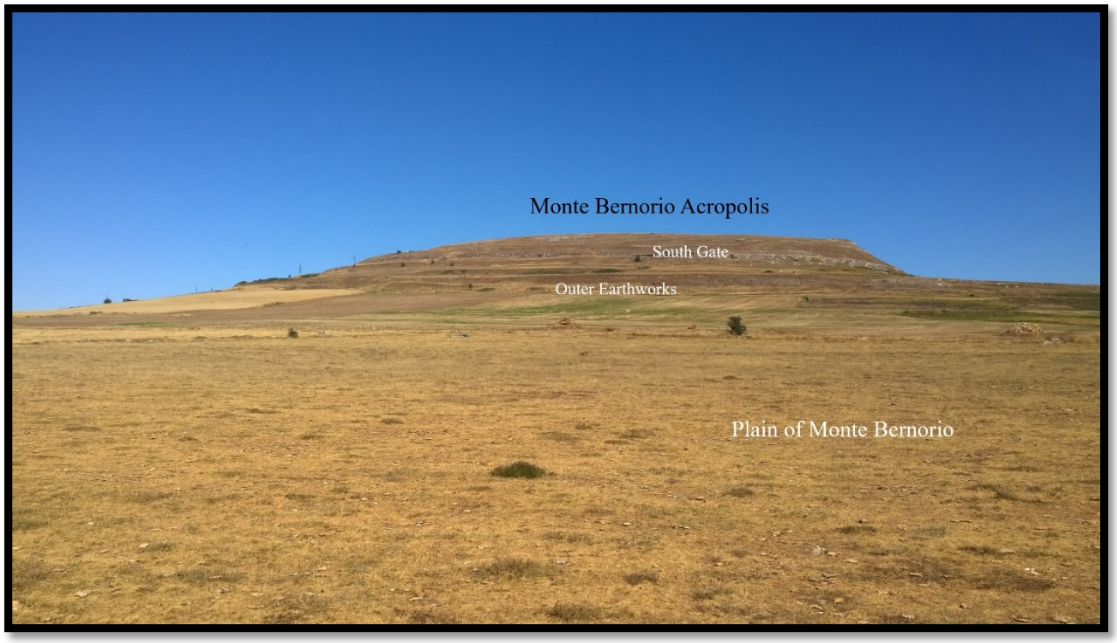


Figure 7.17. Roman Army Avenue of Approach to the Outer Earthworks from the Monte Bernorio Plain. View is looking Northwest (Photo by ©Craig J. Brown).

[87] The IMBEAC map (Figure 7.6) does show a potential entrance into the Outer Earthworks on the south, approximately 1 kilometer, possibly a bit more, west of the battle on the plain. During a site walkover in 2016, this author found this potential entrance passage had been obliterated by a farm road and agricultural field. It is possible that there was no entrance at this location and that the earthwork continued through this area.

After the battle, the Roman Army would have had to cross the Monte Bernorio Plain and negotiate the Outer Earthworks Key Terrain feature in order to encircle and approach the Acropolis Rampart with its 3 gates (Figure 7.6 Number 1-3; Figure 7.15; Figure 7.17). The interval of time between the end of the battle and the Roman approach to the Outer Earthworks is unknown. At the present time, there is no archaeological evidence, particularly in the form of Roman projectile points, found within the Outer Earthworks that would be indicative of a Cantabrian defense of the position, although this may be reflective of excavation strategy (Brown *et al* 2017: 131). Further archaeological survey within the Outer Earthworks, particularly the area opposite the Roman avenue of approach across the plain, may determine if the Cantabrians attempted a systematic defense of the earthworks or if they retreated through them in an attempt to reach the Acropolis. Based upon current evidence, it may be inferred that the Roman Army occupied the Outer Earthworks and encircled the Acropolis with little or no opposition following shortly after the battle on the plain.

Control of the Outer Earthworks Key Terrain feature conveyed two advantages to the Roman Army. First, by securing the oft mentioned Springs, the Romans not only denied the Cantabrians their only source of water for the *oppidum*, but also alleviated any difficulties the Romans may have had in obtaining water for their own use. Second, possession of the Outer Earthworks provided the Roman Army with a position where they could have formally deployed their infantry, archers, and artillery in order to assault the Acropolis Wall and its three gates. IMBEAC posits that the assault was

directed against the southern segment of the Acropolis Wall and Southern Gate and came from the Outer Earthworks below as indicated by an assemblage of Roman projectile points recovered *in situ* embedded in this Wall and in association along its base (Figure 7.18; Figure 7.19) (Torres-Martínez, Serna Gancedo and Dominguez-Solera 2011: 131; Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 531-537; Brown *et al* 2017: 130-131; Fernández-Götz, Torres-Martínez and Martínez-Velasco 2018: 137-139). However, in examining Figure 7.18 a spherical stone *ballista* projectile (Number 21) was recovered in association with the North Gate.[88] The recovery of this projectile permits the inference that the North Gate also came under attack during the storming of Monte Bernorio. If both the North Gate and South Gate were attacked, it is likely that the Northwest Gate was attacked at the same time. It would seem to be likely that all three gates were targeted during the attack with Roman artillery providing cover fire for infantry advancing on the gates possibly in a testudo formation.

Published accounts of the excavations of the Acropolis Rampart on the south side of Monte Bernorio record the recovery of 13 Roman arrowheads (*sagittae*) and 4 fragments of *pila catapultari* (Figure 7.19) (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). Twelve of the arrowheads are of a pyramidal cross section, marking them as

[88] A *ballista* bolt was also recovered from the interior of the Acropolis (Figure 7.18, Number 20) meaning that the artillery was also used inside the *oppidum*. *Ballista* bolt No. 21 is unlikely to have been an overshot from the interior due to range, intervening structures, and angle of fire.

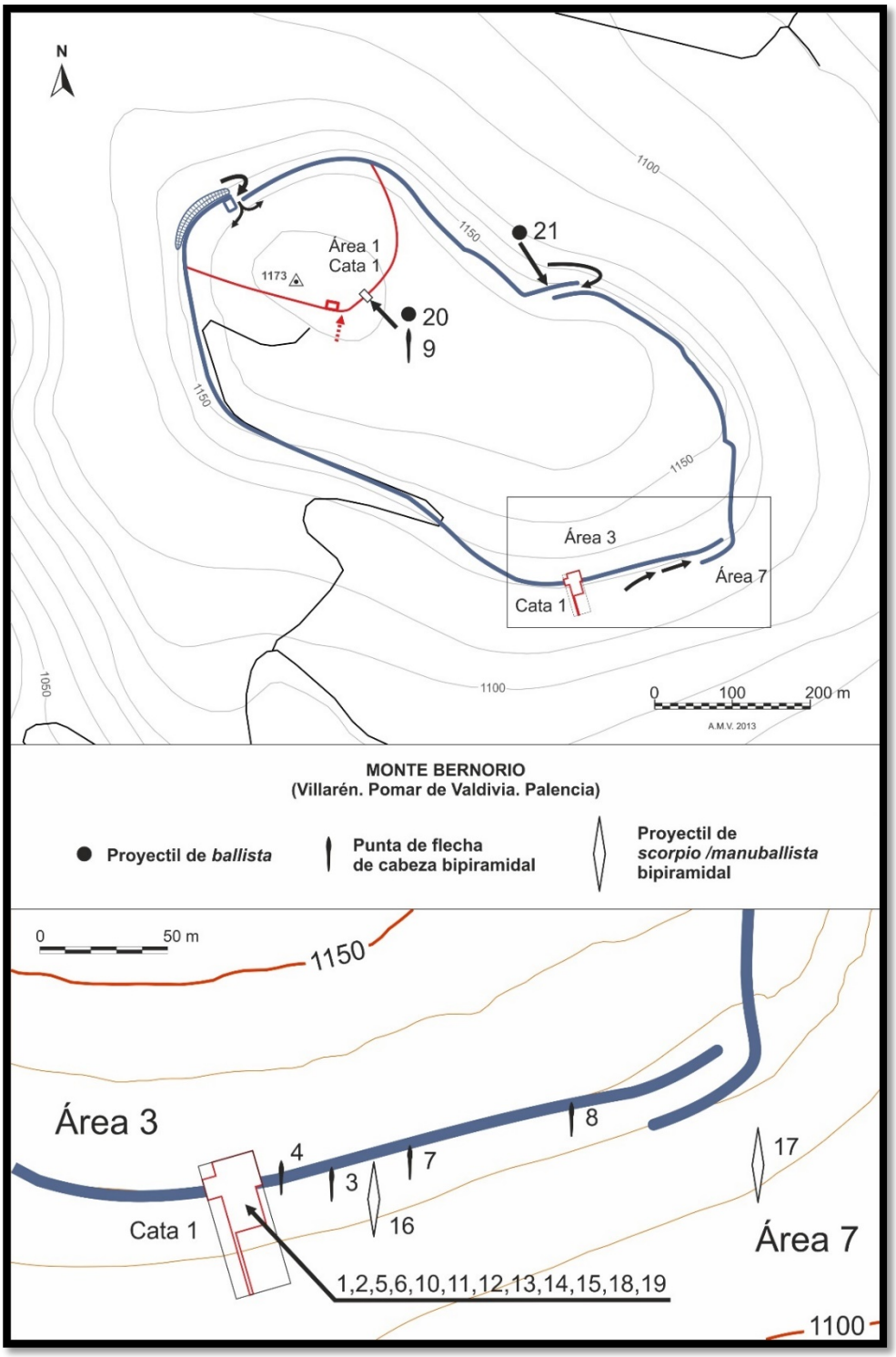


Figure 7.18. Roman projectile distribution along Southern Acropolis Wall, South Gate, and North Gate. Projectiles recovered through metal detector survey (Drawn by ©IMBEAC).

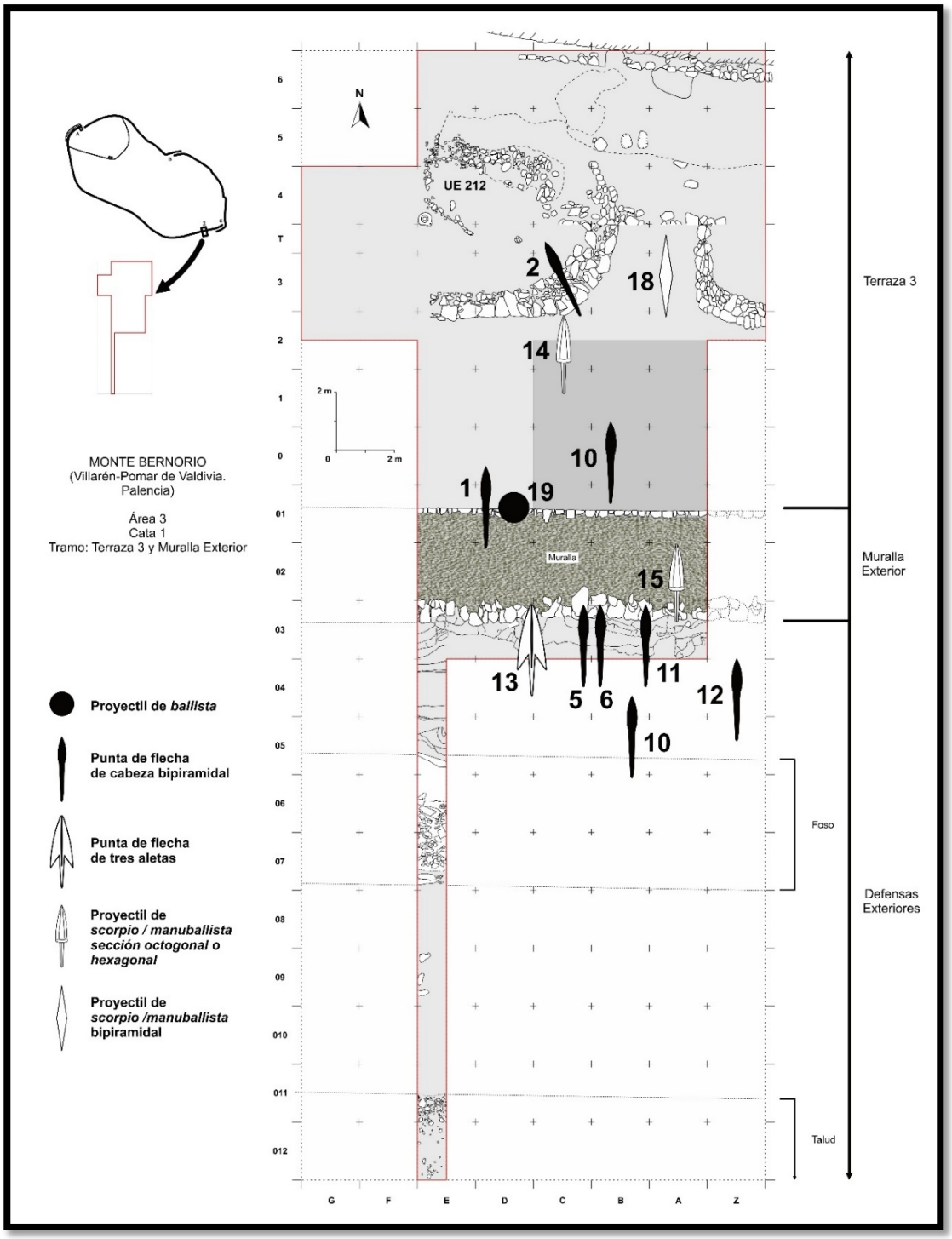


Figure 7.19. Roman projectile distribution as recovered during excavation of Southern Acropolis Wall (Drawn by ©IMBEAC).

belonging to the Syrian Type, however, there is a single triple-bladed arrowhead as well. This arrowhead is similar in form to the Trilobate Tanged

points described by Coulston (1985: 264, 348) as being of Scythian origin. Several of the arrowheads were found embedded in the rampart wall itself, with more recovered at its foot (Figure 7.18 and Figure 7.19). These arrowheads link Monte Bernorio with the Roman camp at El Castillejo as well as another *oppidum* site at La Loma that was attacked by the Romans during the Cantabrian Wars (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533; Torres-Martínez *et al* 2016: 14).[89] Roman bows had an estimated maximum range of 230 m, but a much shorter effective range at 90 m (Goldsworthy 1996: 184). An arc of 90 m from the excavated rampart section would put the archers on the terrace below the rampart in an area known as the Necropolis after burials were discovered there in early excavations (Torres-Martínez 2004: 80; Moro 1891: 432-437).

Two iron projectile heads, likely from bolts fired by a *scorpio* were also recovered during excavations, as were two additional smaller iron projectile heads. The larger heads are square in cross section, tapering to a sharp point, and with a long tang for attachment to the shaft. They measured 8.8 cm in length by 0.7 cm in width and 7.1 cm by 0.8 cm respectively (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). Marsden (1969: 89) mentions that different sized *scorpio* had different ranges, but only lists a 700 yards range for a three-span machine. This would put the shooter beyond the outer earthworks in this area. The smaller projectiles are interpreted as coming from a *cheirobalistra* or *manubalista*. The heads are

[89] The same type of arrowhead being found at Monte Bernorio, El Castillejo and La Loma would seem to indicate the contemporaneity of the sites and possibly that the same Roman units took part in both the assault on Monte Bernorio and La Loma.

multi-sided and hexagonal in cross section, measuring 5.3 cm and 5.2 cm long respectively. Both tips were blunted by impact (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). The maximum ranges achieved depended upon the degree of aim with a maximum range of 421m at 15º elevation (Rossi *et al* 2015: 85). Effective range is not given, but presumably is one half (192.5 m) to one third (128.33 m) that distance. This is similar to the maximum effective range of 185 to 200 m estimated by Wilkins (1995: 54). Marsden (1971: 233) claims only a maximum range of only 150 yards (137.06 m). If these effective estimates are accurate, that would likely place the shooters within the Necropolis or on the next terrace further down.

Three small caliber stone projectiles were recovered from the base of the walls at the North Gate (7.18, 7.20, Number 21), from the interior base of the southern Acropolis Rampart (Figure 7.18, 7.19, 7.20 Number 19), and from near the center of the Acropolis itself (Figure 7.18, 7.20, Number 20) (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533; Torres-Martínez *et al* 2016:14). These stones were coarsely worked into a spherical shape, with diameters between 4.4 cm and 5.3 cm, and range in weight between 102 g and 134 g, which is roughly equivalent to one quarter of a Roman *mina* (Figure 7.20, Numbers 19-21) (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). Although of lesser size, these spherical stones closely resemble 13 small caliber *ballistae* projectiles, weighing between 1 and 2 *minas*, that were recovered from Numantia (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533;

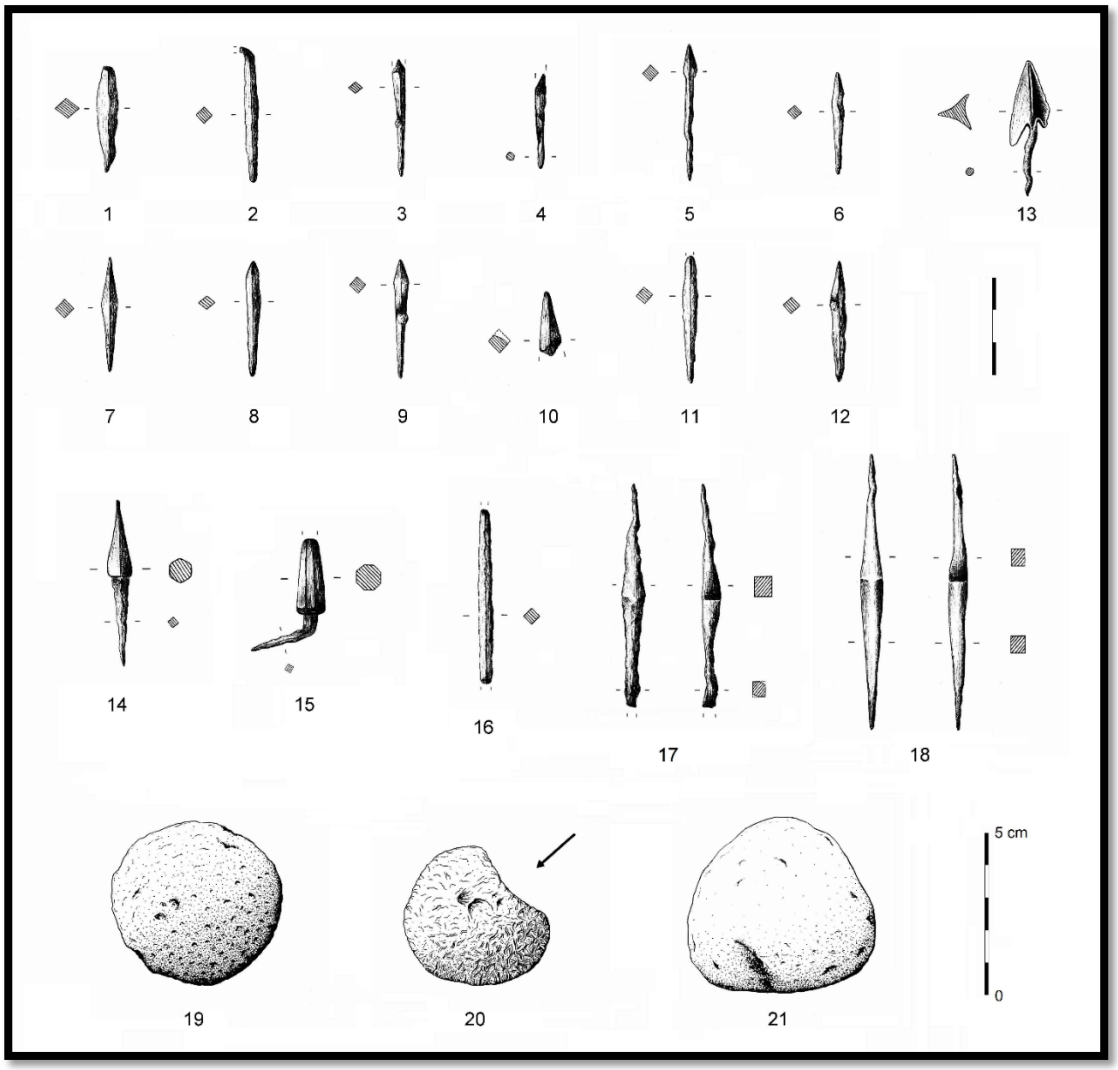


Figure 7.20. Monte Bernorio projectiles found at South Wall: 1-13 sagittae; 14-18 pila catapultaria; 19-21 stone projectiles (ballistae)(From Brown et al 2017: 131).

Menéndez 1962: 174-176, Figure 130).[90] It is currently inferred that these projectiles came from a small portable *ballista*, perhaps a weapon similar to the *cheirobalistra* or *manubalista* that fired the iron bolts described above.

Interestingly, a large number of rounded river cobbles were recovered from the interior and exterior of the Acropolis. Cantabrian use

[90] E. Peralta Labrador (2015: 95) also identifies spherical stone projectiles from *ballistae* but does describe the specimens.

of rounded stone cobbles for defense has also been documented in the siege of La Loma and, more clearly, in the siege of Puerta de Quintanilla, where there are hundreds of them just in front of the indigenous defense (Brown *et al* 2017: 121). E. Peralta Labrador (2015: 94) described these river cobbles as being 6-7 cm in diameter and suggested that they were Indigenous slingshot. There is, however, currently no evidence for the use of slings, or bows for that matter, among the Cantabrians (Brown *et* al 2017: 121; Illarregui 2005: 85). At present, it is believed that these river cobbles were thrown by hand and were used to offset the expenditure of iron used in javelin and spear points (Brown *et al* 2017: 121). In terms of assessing fields of fire for such a weapon, the range would extend only as far as a Cantabrian warrior could throw such a projectile. This range would be variable based upon the weight of the individual stones and certainly could not have been effective over an extended distance from the rampart. The effectiveness of these stones against armored Romans assaulting the gates using a testudo formation or even as a defense against scaling ladders is debatable.

The archaeological evidence described above demonstrates that the Roman Army deployed a varied set of light field artillery to bear against the Acropolis Rampart from a position within the Outer Earthworks. Their intent could not have been to breach the wall with these weapons, as they lacked the size and power. Rather, these machines likely functioned like smaller field artillery used by later armies, primarily as anti-personnel weapons. Their use here was most likely as cover fire for an assault upon the gates, perhaps

in tandem with an assault upon the rampart itself with scaling ladders. Unfortunately, the question of the use of scaling ladders as part of the Roman assault on Monte Bernorio cannot be answered definitively with the evidence at hand and remains speculative at present. From the relatively small amount of projectiles recovered, however, it can be inferred that the Roman cover fire was not of long duration, implying that the assault quickly breached the defenses of the Acropolis.[91] In examining the distribution of Roman projectiles (Figure 7.18, Number 9 and 20), this author infers that the breach occurred at the Southern Gate based upon the recovery of both an arrowhead fired by a *sagittarius* (Number 9) and a spherical stone fired from a *ballista* (Number 20) from near the summit of the mountain in the northwest of the Acropolis. At present, both unit types are represented among the projectiles recovered from the area of the Southern Gate, while only a single *ballista* stone (Number 21) has been recovered from the area of the Northern Gate. The range at which the above weapons would have been used is also a factor. Roman infantry that had breached the Northern Gate would have been much closer to where the projectiles were recovered, close enough where they may have foregone the use of archery and artillery.

Once the Southern Gate and/or adjacent wall had been breached, Cantabrian resistance would likely have been rapidly overcome. There can be no way of knowing how many Cantabrian warriors were still present within the *oppidum*, but it was likely not many given the evidence of a battle on

[91] Compare the number of Roman projectiles recovered from Monte Bernorio (21) with that of La Loma (hundreds), where it is apparent that the Romans conducted a siege (Peralta Labrador 2015).

Monte Bernorio Plain and subsequent defense of the Acropolis Rampart. The Romans would have likely swept northwest through the Acropolis eliminating pockets of defenders as they were encountered. Excavations undertaken within the Acropolis revealed a dense settlement of rectangular and sub-rectangular homes with interweaving spaces or streets (Torres-Martinez 2004: 80, 89-92). The structures in this area would have functioned as Obstacles providing Cover and Concealment to both Cantabrians and Romans as the fighting likely would have devolved into a sort of urban warfare. The Roman projectiles (Figure 7.18, Number 9 and 20) that were recovered during excavations in the northwest of the Acropolis seem to suggest that fighting did take place here and may represent the end of Cantabrian resistance (Torres-Martinez 2004: 88). The topography of the summit and distance from the Acropolis Rampart make it unlikely that these finds are an overshot from the fighting there.

The excavations in the Acropolis further revealed that the end of the indigenous occupation of the *oppidum* is marked by a massive fire that destroyed the settlement. The remains of this fire are characterized by a pronounced ash colored horizon containing burned wood, charcoal, and destruction debris (Torres-Martinez 2004: 91; Torres-Martinez *et al*. 2016: 370). Although this fire was likely of Roman origin, either set during the attack or after as the *oppidum* was razed prior to their own occupation, consideration should be given to the idea that the fire was set by the Cantabrians themselves. As previously discussed, the Cantabrians setting fire to their own *oppidum* in an act of defiance as a sort of “last stand” was

within their character to do so. After the capture of Monte Bernorio, the Romans constructed a *castellum* on the summit in the northwestern section of the former Cantabrian Acropolis, a site they occupied for a number of years (Torres-Martinez *et al*. 2016: 379; San Valero Aparisi 1944: 34-36).

Conclusion

The above reconstruction of the Roman attack on the Cantabrian *oppidum* of Monte Bernorio is based upon artifact distributions interpreted through KOCOA analysis. The battle reconstruction presented above is generally similar to the reconstruction proposed by IMBEAC, with the main issue of variance being that all three gates, as well as the possibility that the Acropolis Rampart itself, likely came under attack and that the attack was not simply directed against the Southern Gate. This similarity is due to the KOCOA reconstruction relying, in part, on the same data set as the IMBEAC reconstruction, although the KOCOA analysis was prepared separately from IMBEAC. Although it utilized published artifact descriptions and distributions, the KOCOA analysis also incorporated ethnographic information, as described in the discussion of the Roman and Cantabrian Ways of War above, along with observations of terrain and architectural features obtained during fieldwork undertaken in August 2016. The KOCOA based reconstruction presented above and IMBEAC's reconstruction should be seen as separate, but mutually supporting interpretations of how the battle for Monte Bernorio may have unfolded.

Despite their similarity, the KOCOA based reconstruction makes significant contributions to the understanding of how the Roman attack on Monte Bernorio was likely conducted that IMBEAC has not discussed. Arguably the most important contribution was the recognition of the Springs as a Decisive Terrain Feature. As the only source of water for the *oppidum*, Roman control of the Springs would have rendered the defense of the *oppidum* untenable, likely in a matter of days. The Romans knew the importance of securing water sources from past experience like the Siege of Uxellodunum (Puy d'Issolu, France) 51 BC (Ralston 2006: 112-115) and Augustus' Actian Campaign 31 BC (Powell 2018: 10). The importance of the Springs likely factored into the Cantabrian decision to meet the Romans in the open on the Monte Bernorio Plain out away from the *oppidum*, although cultural or tactical preference may have played a part as well.

The Springs were enclosed within the Outer Earthworks and the evaluation of the Outer Earthworks as a defensive obstacle in terms of KOCOA is another significant contribution. The Outer Earthworks are visually impressive and represent a major expenditure of labor and material in their construction. How they functioned as a defensive obstacle is not clear (Appendix 6.2) (Brown *et al* 2017: 133-134). Excavations showed a low-dump rampart similar to that described by Avery (1993: 54-64), but did not locate associated palisades, as inferred, chevaux-de-fries or ditch features (Torres-Martínez *et al* 2017: 251). The presence of these features would have dictated certain behaviors to an attacker that would have been advantageous to the defenders. The Outer Earthworks do not appear to have

been fighting platforms like those seen at Hod Hill for example (Avery 1993: 59; Harding 2012: 73). Their irregular construction and wide intervals between earthworks differ markedly from the more familiar regular and close set multivallation seen in Great Britain making comparison and analogy difficult (Lock and Ralston 2019; Ralston 2006; Cunliffe 2005). Their size and multiple openings likely could not have been adequately defended by the number of warriors available to the *oppidum*. This seems to suggest that the Outer Earthworks likely functioned as a Disrupting Obstacle designed to increase the defensive zone, providing a defense in depth for the primary fortification of the Acropolis Rampart. The defensibility, or lack thereof, of the Outer Earthworks may have also factored in the Cantabrian's decision to fight the Romans on the Plain of Monte Bernorio.

That the Roman attack on Monte Bernorio likely took the form of an *Oppugnatio repentina* or storming assault became apparent as the KOCOA analysis was performed. The Acropolis Rampart and its associated gates served as the primary fortification of the *oppidum* acting as a Blocking Obstacle that controlled traffic into the core of the *oppidum*. The rampart, and associated ditch, was constructed along the edge of a natural terrace in order to reinforce the natural advantage of height. The Cantabrian reliance on javelins and rounded cobbles, with their limited range, however, meant that the Romans could have almost reached the wall before coming within the Cantabrian field of fire. Excavations also show that the Romans deployed their archers and artillery within the Outer Earthworks and directed their Field of Fire against the Acropolis Rampart. This was likely done to further facilitate

the Roman approach to the three gates and, possibly, the rampart itself. That the Romans may have utilized pre-constructed scaling ladders against the rampart, as they did at Gomphi in 48 BC, and/or the approach of a testudo, as part of a *Oppugnatio repentina* style attack is further supported by the lack of evidence of Roman engineering associated with the attack. The archaeology also shows that, although rapidly overcome, Cantabrian resistance did not end when the Southern Wall or Gate was breached. A Roman arrowhead and *ballista* stone found on the summit may indicate a last stand of sorts in this area and the possibility that the Cantabrians themselves set the fire that razed the *oppidum* should not be discounted out of hand. A final act of defiance, however futile, would have been well within the Cantabrian character.

The application of KOCOA as a post-excavation interpretive analysis using terrain features and artifact distributions to reconstruct the conduct of a battlefield marks a significant departure from the way in which KOCOA is used in the United States. The reconstruction of the Roman conquest of Monte Bernorio developed through the application of KOCOA in this case study can be replicated on other undocumented battles, including those involving the armies of Rome. The complex archaeology at Burnswark Hillfort (Ecclefechan, Dumfries and Galloway, Scotland) has been variously interpreted as a full Roman siege (Reid 2016; Reid and Nicholson 2019) or a Roman practice field (Breeze 2011; Campbell 2011). KOCOA, as utilized in this case, could be performed at Burnswark in order to address this debate.

Chapter 8: Conclusion – The End is Nigh…

"Yea, though I walk through the valley of the shadow of death, I will fear no evil."

– *Psalms 23:4* (King James Version 2021).

Conclusion

Conflict Archaeology has experienced rapid growth over the thirty years since its inception. In order to define a theoretical and methodological framework for the growing discipline, conflict archaeologists adopted standard military terminology and analytical procedures. The terminology and analytical procedures provided a ready-made lexicon and conceptual framework, akin to middle-range explanatory theories (Scott & McFeaters 2010: 113). One of these methods, the KOCOA (OKOCA) system of terrain analysis, shows promise as a ready-made, replicable analytical and locational tool for the study of conflict landscapes and the influence of those landscapes on the conduct of military operations. KOCOA has seen widespread use within the United States through its adoption by the National Park Service's American Battlefield Protection Program as a mandatory analysis for identifying defining terrain feature and delineating battlefield boundaries for cultural heritage management purposes.

Thesis Aims, Purposes, and Scope

Despite its widespread use in cultural heritage management, KOCOA was adopted without appreciating its full potential or limitations (Babits 2011a; 2014: 263). At present, KOCOA has been applied primarily to a narrow context composed of terrestrial battlefields that have been preserved in some fashion or have been historically documented. If KOCOA, however, is to continue to develop as part of the methodological and conceptual framework of Conflict Archaeology, then it needs to be applicable in a wider, geographical, temporal, and categorically different set of contexts.

This thesis set as its primary objective the development of a KOCOA methodology that is applicable in these wider contexts and could be applied in a series of case studies that assessed its potential and limitations. Secondarily, this thesis employed the full KOCOA analysis methodology gleaned from United States Army training manuals in assessing how the terrain influenced the conduct of the battle under consideration. The full KOCOA system has not been used in previous academic treatments of the method (McNutt 2014; Sivilich 2014). Through this process, the KOCOA methodology used in this thesis was confirmed to be applicable to wider geographical, temporal, and categorically different contexts than it has been applied previously. The KOCOA method has been proven to be a powerful analytical and locational tool to the study of past conflict landscapes.

Critical Evaluation of Thesis Methodology and Review of Case Studies

The methodology employed in this thesis begins with the three interdependent variables of tactics (*habitus*), force composition (*technology*), and terrain. This concept has an ancient pedigree. It was first recognized in writing by Sun Tzu in the opening quotation of this thesis (Giles 2009: 39). Clausewitz, whose writings have had such a profound effect on military theory, wrote of, “the influence that terrain brings to bear upon a general, and particularly the political composition of the fighting forces, is closely followed in importance by its influence on the ratio between arms of service” (Clausewitz 1989: 350). McNutt (2014) recognized the tripartite relationship between these variables in developing a thesis methodology using historical terrain reconstruction and elements of KOCOA to refine the location of battlefields. The importance of this concept is established here because it is the mechanism by which KOCOA can be applied to battlefields that are devoid of direct historical documentation, as well as the way in which KOCOA becomes applicable to a wider range of academic questions.

This tripartite concept was incorporated into the methodology through its implicit relationship with METT-T(c), the suite of military planning analyses of which KOCOA forms a component. A summary of the tactics (*habitus*) and weapon systems (*technology*) employed by the combatants informed the KOCOA analysis in each case study. These summaries were developed from historical (where available), ethnographic, archaeological, and artistic sources. This research, along with the discussion of objectives as part of KOCOA, actually comprises components of METT-T(c).

As mentioned in Chapter 1, METT-T(c) is a military anagram that stands for **M**ission, **E**nemy, **T**errain, **T**roops, **T**ime, and **C**ivilian Concerns (U.S. Army 2001: 5-3-5-6; Babits 2014: 264-265). Mission equates to objectives, or what the combatants intend to achieve. Objectives can be explicitly stated from historical sources, may be inferred from historical context, or hypothesized from archaeological and artistic evidence. Knowing the objectives, or suspecting what the objectives were, allows a researcher to infer how the combatants may have approached the landscape, thus informing the KOCOA analysis. Enemy refers to an analysis of the tactics and force composition of one of the combatants (unfriendly). Terrain is a KOCOA analysis. Troops refers to an analysis of one of the combatants (friendly). Time usually refers to the time available or the time allotted to complete a mission, but it can refer to other time attributes. An element of time was touched on in Chapter 3 in the discussion of Lord Drummore's setting of the time of the engagement at Prestonpans at 5:15 AM and how that related to troop movements to contact. Time in its proper consideration was demonstrated in Chapter 4, where according to the chivalric agreement for the Battle of Halidon Hill, the Scottish Army had to relieve the English siege of Berwick by vespers on July 19, 1333. Douglas arrived on the field early that morning, but waited until high tide in the River Tweed, just after midday, to begin his attack. Both sides were conscious of time and were attempting to manipulate it to their advantage.

As the above shows, the methodology adopted for this thesis contains all the elements of the METT-T(c) suite of analyses. It would be a just

criticism, or a fair question to ask, if this thesis should not be a critical evaluation of METT-T(c)? The answer is no. In practice, the component analyses of METT-T(c) are used to inform each other, with the results being collated to use in planning military operations. Each component analysis could be the focus of a study with the remaining components informing it. In this thesis, the focus is on terrain, using KOCOA to analyze the landscape of battle with the other components of METT-T(c) being consulted in summary form in support. A KOCOA analysis devoid of this support would result in a simple list of defining terrain features (see Chapter 2) with no context that would likely be too limited to be of value in an academic, cultural heritage management, or military setting. Even though informed by the other components of METT-T(c), the methodology used in this thesis is still KOCOA.

The second component in the methodology used in this thesis is the conduct of a full KOCOA analysis according to the full instructions and terminology codified in U.S. Army training manuals (U.S. Army 1994: 2-10-2-26; ROTC 2002a: 245-261, 2002b: 187-203; U.S. Army 2007: 5-9-5-15). This is a more complete application of KOCOA and represents a departure from previous dissertations. McNutt (2014), for example, reconstructs the terrain of historically documented battlefields, using key terrain to properly situate the engagement within the landscape. This thesis also uses terrain reconstructions derived from map regression, but the method of terrain reconstruction is not the primary focus of this thesis. Rather, the primary focus is applicability of the KOCOA methodology employed by the United

States Military to a wide range of geographically, temporally, and categorically different conflict archaeological contexts. Sivilich (2014) used a fuller form of KOCOA but applied it in a slightly different way. Sivilich used KOCOA to posit the location of a set of U.S. Army forts constructed during the Second Seminole War (1835-1842). By virtue of their training undertaken at the U.S. Military Academy at West Point, the forts should have been constructed on key terrain, but Sivilich found that they were constructed in close proximity to roads (Sivilich 2014). This revealed a cultural adaptation based on local environmental conditions and hostile activity. Sivilich used a single case study throughout the thesis process including archaeological survey and excavation, in contrast to both this thesis and McNutt (2014). The performance of complete KOCOA analyses is best demonstrated by examining the five case studies employed in this thesis which will demonstrate the applicability of the method in a wide range of contexts.

The Five Case Studies

This thesis demonstrated the applicability of this KOCOA methodology to wider geographical, temporal, and categorically different contexts through its implementation in five case studies. The salient point was the evaluation of the KOCOA method in these wider contexts, with regards to its usefulness and applicability for archaeological research, not necessarily to find anything new regarding the battles themselves. This approach was adopted in order to

advance the discipline of Conflict Archaeology with regards to the adoption of military analytical procedures and terminology.

Chapter 3: "Hey, Johnie Cope, are ye waking yet?" The Battle of Prestonpans, September 21, 1745

The engagement at Prestonpans between Lieutenant General Sir John Cope and Prince Charles Edward Stuart was chosen as the inaugural case study based upon several criteria. Geographically the battle took place in open fields between Prestonpans and Seton on land that descends slightly toward the Firth of Forth north of Tranent. Prestonpans was an early modern engagement using familiar muzzle-loading gunpowder weapons with linear tactics and armies composed of the (then) three arms of service: infantry, artillery, and cavalry or dragoons. Cope appears to have needed the open ground in order to maneuver his dragoons and infantry offensively (Cope 1749: 37). The battle was covered in a large number of accounts written by participants, mostly within a few years of the engagement. Prestonpans has been intensively researched by historians and archaeologists.

For many years, historians located the site of the 21 September engagement at the 1722 Waggonway, where Cope's Army had occupied a position during the previous night (Home 1802: 108-109; Tomasson and Buist 1978: 62; Margulies 2013: 136). Metal detector surveys conducted during archaeological investigations in 2009 located the engagement site hundreds of yards to the east in the fields near Seton West Mains Farm

(Pollard and Ferguson 2010). The primary objective of this case study was the application of KOCOA to the engagement to examine how the terrain may have influenced Cope's decision to redeploy his army to the field east of the wagonway to confront the Jacobite advance.

A KOCOA analysis (Table 3.3) was performed using Roy's Military Survey for Prestonpans and Tranent as a terrain reconstruction. Through the KOCOA analysis the movements of the British and Jacobite armies were reconstructed leading to the engagement in the pre-dawn of 21 September. In summation, the 1722 Waggonway, with its associated cart path and drainage ditch, the presence and scale of which was not known until 2019, likely was a determining factor in Cope's decision to redeploy his army to the east. The Waggonway was initially classified as an existing disrupting obstacle based upon it being a permanent urban feature (urban features being classified in KOCOA as existing features due to their permanence even when manmade) that may have interfered with movement, particularly horse and artillery. Excavation in 2019, the findings of which were incorporated into the ground-truthing phase of the analysis, revealed the presence of the drainage ditch that made the Waggonway a more substantial obstacle than first thought. Therefore, it was also classified as a turning obstacle, as it was likely that horse and particularly artillery would be forced to use the road from Seton to Preston to negotiate the Waggonway. It must be kept in mind that Cope's redeployment was undertaken in response to movement by the Jacobites toward his left flank, the fields east of the Waggonway, and these movements were concealed by darkness and mist.

Assessing the KOCOA methodology to develop a terrain-based explanation for the engagement taking place east of the Waggonway is challenging. Although archaeology plays a role, by virtue of the engagement site being located through metal detector survey and the construction of the Waggonway at the time of the battle being recovered through excavation, the question being asked is largely a historical question. Normally, KOCOA is used to resolve ambiguities in participant accounts, assess the accuracy of those accounts, and help establish those locations within the landscape. In this case, the participant accounts are rather clear and corroborate each other. The placenames that appear in the accounts are still known today. The 1722 Waggonway, for example, is still an obvious and accessible feature in the landscape where it crosses the battlefield (Figure 3.1 No. 7). The only thing new that KOCOA revealed, in this regard, was the relocation of the Riggonhead Defile Crossing (Figure 3.1 No. 6) in the present landscape. With those two terrain features evaluated, it became a matter of historically reconstructing the movements of the two armies using KOCOA terminology. The case study became a discussion of obstacles (Table 3.3, Figure 3.6) and avenues of approach (Table 3.3, Figure 3.7). Cover was not present in the open field. Concealment by the mist and darkness was a major factor influencing the engagement, but mist and darkness cannot be mapped. The evaluation of the Waggonway as an obstacle through KOCOA led to the interpretation that Cope redeployed his army east in order to put the Waggonway behind him, so that he could maneuver his army offensively.

Chapter 4: "We Dout Not Bot Your Lordship Is Sore Offended With Us": The Siege of Edinburgh Castle, April 25 – May 29, 1573

The city center of Edinburgh is a rather different geographical setting than the open fields outside of Prestonpans ten miles to the east. The landscape in the vicinity of Edinburgh Castle is now heavily urbanized with key terrain features at differing elevations. Temporally, this case study takes place 172 years before the Battle of Prestonpans during the military period known as "Pike and Shot." This was a period when pike armed infantry shared the battlefield with early gunpowder weapons. The 1573 Siege of Edinburgh Castle is a categorically different type of battle conducted using formal siege tactics of the period. The siege was recorded in a number of participant accounts; however, most are written by English participants and this introduces a somewhat one-sided point of view. Historical images associated with the siege proved to be problematic in reconstructing the terrain of April-May 1573 (see Appendix 4.1). The intent of this case study was to apply KOCOA to posit locations for the English artillery fortifications that have been subsumed within the urbanization of Edinburgh's city center (Figure 4.1). The secondary objective was to assess how the terrain influenced the conduct of the siege.

KOCOA posited the location of six artillery positions located on four key terrain features surrounding Edinburgh Castle (Figure 4.33). The differing elevations and the need to have a direct field of fire on David's Tower dictated where on the key terrain the artillery was placed. Artillery of the 16th Century was aimed by direct sight looking along the barrel, with the breech,

cannon mouth, and target forming three points in a line. The angle of fire necessitated by the differing elevations and the ordnance's capabilities also dictated the distance from the castle that the artillery needed to be placed. This resulted in the hypothesized location of the English artillery batteries as shown in Figure 4.33). Using KOCOA to recover or infer battle locations is a standard application of KOCOA in the United States. This same approach was used at the Battle of Chelsea Creek (May 27-28, 1775), where battle locations were recovered in the urban landscape of East Boston, Massachusetts (Mastone, Brown and Maio 2011). Archaeological survey or excavation could not be conducted to verify suspected battery locations (Figure 4.33) within the urban landscape around the castle.

The differing elevations between the key terrain features around the castle, as well as the engineering properties of the key terrain of Castle Rock itself, caused the English to deviate from the formal siege tactics described in the case study. English mining operations on Castle Hill were stopped after encountering the basalt bedrock of Castle Rock. The differing elevations between key terrain features caused the English to abandon the idea of sapping in favor of a heavy artillery bombardment followed by a storming assault. The storming assault could only be launched against the castle from two avenues of approach: east and west. The KOCOA analysis provided a new terrain-informed re-examination of the conduct of the siege that posited a likely location of the English artillery fortifications within the urbanized landscape of Edinburgh' s city center. Through the KOCOA analysis, it was realized that the artillery fortifications were likely deliberately placed due to

the need to maintain direct line of sight and proper angle of fire. These requirements determined the field of fire in KOCOA. The case study also demonstrated that the differing elevations between key terrain features caused an alteration in the siege progression, where a bombardment was followed by a storming assault to reduce the castle.

Chapter 5: Between The River Tweed And The Sea: The Battle Of Halidon Hill, July 19, 1333

The Battle of Halidon Hill was a classic set-piece battle conducted in the open field according to the chivalric conventions of the Late Medieval Period. The Scots and English used different tactics and weapons systems that likely caused them to approach the terrain differently. The Scots used compact schiltrons of pikemen, while the English dismounted their knights and men-at-arms and combined them with their pikemen in divisions. They then flanked each division with a strong contingent of archers. The English deployment at Halidon Hill represented the adoption of tactics first used by Balliol at the Battle of Dupplin Moor (August 10-11, 1332). The Halidon Hill battlefield is generally known. The battle was covered in a number of chronicles, some written as much as 150 years after the engagement. The primary purpose of this case study was to apply KOCOA to verify the accuracy of the chronicle sources. Secondarily, it was hoped that the KOCOA analysis would develop a hypothesis of the actual conduct of the battle that could be tested by archaeological survey.

The chronicle sources were evaluated as part of the KOCOA analysis and the findings were summarized in Table 5.1. Only three of the ten chronicles consulted during the KOCOA analysis were found to contain terrain descriptions of the battlefield. These three chronicle sources were found to be accurate to some degree in their description of the terrain. Interestingly, the majority of the placenames encountered still are in use, save for one. “Boothulle” (“Bothul or Bothulle”) is a name that has fallen out of use but was inferred as Witches’ Knowe based upon topography and chronicle accounts as had others earlier. There were, however, two issues identified that should be taken into consideration when consulting the chronicles used in this case study. There was a discrepancy identified regarding the inclusion of the phrase “with some precipices” in *The Book of Pluscarden* (1880: 202). No precipices or cliffs were located through the KOCOA analysis although maps, aerial photographs, and field walking were conducted. The battlefield is comprised of hilly terrain, but it is unknown what the author meant by the inclusion of the phrase. It was also realized that many of the chronicles borrowed material from one another.

KOCOA validated the chronicle sources with regards to terrain and generated a hypothesis for the conduct of the battle (Figure 5.11-5.15) that can be tested now archaeologically. KOCOA suggested that the morass below Witches’ Knowe disrupted the continuity of the Scottish line of battle by fixing at least two schiltrons in place for an unknown length of time. This allowed English archers on the left side of their battle line to concentrate their fire on Moray’s Schiltron as it pulled ahead. Moray’s men had to cover

approximately 250 yards under intense archery fire to reach the English on Halidon Hill. They ultimately broke and attempted to retreat the way they had come. The Scottish army was routed and driven north back across Witches' Knowe toward the present route of the A1. Unfortunately, this hypothesis of the battle cannot be verified by the author. Aside from field walking, archaeological survey was outside the bounds of this thesis. Metal detector survey, soil coring, geophysical survey, and test excavations could be employed in future research on the battlefield using the results of the KOCOA analysis as a testable interpretation. The lack of follow-on survey is not a weakness of KOCOA, but rather KOCOA should be seen as a beginning hypothesis in a program of research when applied in this way.

Chapter 6: Scotland's Lost Battlefield: The Battle of Dún Nechtain, May 20, 685

This case study presented significant challenges to the interrelationship of the three variables of tactics, force composition, and terrain. There is very little historical or archaeological information available and none of it can be definitively tied to a location. The tactics and force composition presented in the case study are assumed based on heroic literature, artistic depiction, and archaeology in the form of Anglo-Saxon warrior burials. The practice of warfare in Early Historic Northern Britain was based on the military institution of the warband or *comitatus*. Sword, spear, and shield were the primary weapons. Most fighting was done on foot, but there were some mounted

troops. The battle is inferred to have been an ambush with Ecgfrith being drawn onto the killing ground. This inference is based in part upon the writings of Bede (2008: 221), where he speaks of “feigned retreat” and of Ecgfrith being lured into “narrow passes” amidst “inaccessible mountains.” That the Picts used ambush tactics was demonstrated by the Battle of Two Rivers (c. 671) (Colgrave 1985: 41).

There are few terrain clues within the scant historical documentation and the actual location of the battle remains unknown and debated in academic discourse. Two sites have become most commonly associated with the battle based on placename evidence: Dunnichen, near Forfar, Angus (Chalmers 1880: 210, 255) and Dunachton, Badenoch, near Loch Insh (Woolf 2006: 185). A KOCOA analysis was performed for each location and compared in order to ascertain which site may have been the location of the Battle of Dún Nechtain, if either. Essentially, the KOCOA analysis proved to be a terrain-centric re-evaluation of the available evidence.

The results of the KOCOA analysis did not support the identification of Dunnichen being the location of the Battle of Dún Nechtain. Bede’s description of the battle mentioned above supports the interpretation that the battle was an ambush, where Ecgfrith was lured onto ground advantageous to Bridei. If an ambush is to be successfully executed, then the force setting the ambush must have clear observation of the avenues of approach leading to the ambush site, while being concealed from observation by the enemy target. These conditions were not met by the terrain at Dunnichen. The KOCOA analysis demonstrated that a Pictish army could not have remained

concealed from Ecgfrith as the Northumbrian army passed the key terrain elevation of Castle Hill.

Dunachton showed slightly more promise based on a small range of factors. Loch Insh was classified as an existing blocking obstacle barring movement by mounted and dismounted individuals. The Insh Marshes were classified as an existing obstacle, but the sub-type of obstacle would have been determined by the conditions within the marshes on the day of the battle. The River Spey, which flows through Loch Insh, was classified as an existing obstacle that may have been further classified as disrupting based upon the width of river, depth, and the speed of current that existed at the time of the battle. The hypothesis that was developed posits that Bridei concealed Pictish infantry, the majority of his army, in the hills above the avenue of approach approximated by what is now Wade's Military Road. The hills and Loch Insh form a constricted mobility corridor (companywide), or a choke point, that could be defended by a small detachment. The pursuit of this detachment likely would have drawn Ecgfrith's Northumbrians into this chokepoint, where the Pictish infantry attacked their flank and pinned them against the loch and marsh. The spot where Bridei may have concealed his army was able to maintain observation of the avenue of approach to the potential ambush site, while remaining concealed themselves.

Through the application of KOCOA in this case study, it was determined that KOCOA is not particularly well suited to an open-ended search for Dún Nechtain. KOCOA is not a checklist, where the site that has the most KOCOA elements present is selected as the most likely. The

analysis simply adds supporting evidence to the site posited by Woolf (2006: 185-187). KOCOA is best at providing a hypothesis that can be tested archaeologically as seen in Chapter 5. KOCOA is also useful in interpreting battlefield assemblages recovered from undocumented conflict sites as in Chapter 7. KOCOA is also helpful in clarifying ambiguities in participant accounts and in generally verifying the accuracy of participant accounts relative to the terrain. Although curtailed, this case study raised questions as to its utility in finding forgotten fields as implied by the title of McNutt (2014). KOCOA needs more evidence relative to the three variables. This author believes that KOCOA could still prove useful in the search for Dún Nechtain, but on a potential site by site basis as a means of positing battle locations within a bounded geographic area. Such a search would be better conducted as a long-term project beyond the constraints of this case study.

Chapter 7: Oppugnatio repentina: The Roman Conquest of the Cantabrian Oppidum of Monte Bernorio, c. 26 BC

This final case study completes the evaluation of KOCOA, moving back in time from the early modern era, through varying geographical, temporal, and categorical contexts. The attack on Monte Bernorio likely took the form of a storming assault (*Oppugnatio repentina*) that took place during the Cantabrian Wars (27 BC – 19 BC). The Roman capture of Monte Bernorio was not documented in classical sources written about the Cantabrian Wars.

This case study presented the opportunity to apply KOCOA to ancient warfare, itself a novelty, in an undocumented context.

In this case study, KOCOA was applied in the interpretation of the battlefield assemblage from Monte Bernorio. The assemblage took the form of fortifications and artifact distributions attributable to the attack on the *oppidum*. As part of the analysis, KOCOA assessed the defensive characteristics of fortification obstacles associated with the *oppidum*. The KOCOA analysis also provided an interpretation of the conduct of the final assault on Monte Bernorio. The battle which took place on the plain below the summit of Monte Bernorio could not be reconstructed due to the absence of data detailing artifact distributions. Its location, however, could be plotted.

Through the KOCOA analysis, the springs located below the summit and enclosed within a series of discontinuous earthworks were classified as decisive terrain. There was not a source of potable water on the summit of Monte Bernorio and it is herein inferred that their protection constituted a primary purpose for the construction of the earthworks. The earthworks were classified as existing and disrupting or turning obstacles for the Romans. They were likely not a particularly strong position for the Cantabrians as they would have required a large army to defend and any position defended within them could be outflanked through one of the numerous openings in the discontinuous system. Once the Romans had defeated the Cantabrians on the plain, they were able to occupy the earthworks and encircle the *oppidum*. They likely went on to attack the three gates simultaneously, possibly using testudo formations and scaling ladders. Roman archery and artillery

projectiles recovered near the Southern Gate testify to it coming under attack, but an overlooked ballista projectile found near the North Gate may indicate that it came under attack as well. More excavation in the area of the gates would likely bring more information to light regarding the attack. Based upon the recovery of Roman projectiles inside the *oppidum* near the summit, the South Gate was likely breached, and the Cantabrians quickly overwhelmed.

KOCOA was well suited to this type of application. Tactics and weaponry employed by the Romans have been intensively documented and studied. Cantabrian tactics and weaponry have also been documented. Battle locations were demarcated by assemblages of artifacts and fortification architecture that permitted a reconstruction of the Roman capture of Monte Bernorio through the lens of KOCOA. This case study demonstrated that KOCOA does not necessarily require battle-specific historical records to work if sufficient archaeological evidence and historical context exists.

The primary objective of this thesis was to evaluate the KOCOA methodology in response to Babits (2014: 263) call for caution in the use of concepts adopted from United States military manuals. Babits was correct in pointing out that these concepts, particularly KOCOA given its widespread use as part of ABPP survey methodology, have not had their strengths, deficiencies, and parameters evaluated. To this author, it seemed that if KOCOA, specifically, was adopted as a sort of middle-range conceptual framework for Conflict Archaeology as suggested by Scott & McFeaters

(2010:113) and Bleed & Scott (2011: 48), then it would be a prudent step in moving the discipline forward if Babits' concerns were addressed.

In order to accomplish this, the thesis applied the KOCOA methodology to a diverse set of battles ranging from the well-known, well-documented early modern battle of Prestonpans 1745 AD through to the unknown (until archaeologically discovered) classical battle at Monte Bernorio c. 26 BC. In all case studies, the application of the KOCOA methodology remained unchanged. KOCOA was brought into this thesis directly from United States Army training manuals without modification just as Scott & McFeaters (2010: 113) and Bleed & Scott (2011: 48) advocated. In doing so, its replicability from one researcher to another was demonstrated. It should be mentioned here that the full KOCOA methodology was utilized in this thesis. Previous academic consideration of KOCOA explored facets of KOCOA (See McNutt 2014; Sivilich 2014).

McNutt (2014) in particular was concerned with developing KOCOA as a locational tool in a desk-based study of known historic battlefields using the tripartite variables of Tactics, Force Composition, and Terrain. This thesis followed suit, however, as discussed in Chapter 1 and here in this conclusion, this acknowledgement of the three interrelated variables is not a new innovation. It is, however, a recognition of how the other components of METT-T(c) are used to inform and are a part of a KOCOA analysis. The way in which the other components of METT-T(c) inform KOCOA is what allows KOCOA to be applied in a wider range of geographically, temporally, and categorically different types of conflict sites than it has traditionally been

employed. Although KOCOA performed well and revealed new information about the battles in all case studies, for this author the potential and limitations of KOCOA are best exemplified in Chapter 6 (Dún Nechtain) and Chapter 7 (Monte Bernorio). As mentioned above, with regards to Dún Nechtain there is not enough extant information available to fully construct the three variables and this limits the applicability of KOCOA in locating the site of the battle. The case study did demonstrate how KOCOA could be used in a support role in the debate between Dunnichen and Dunachton, but KOCOA is likely not able to find a “lost or forgotten” battlefield without the three variables. Monte Bernorio, however, shows the potential for the application of KOCOA to Classical or undocumented sites when the variables can be reconstructed.

From the case studies undertaken in this thesis, KOCOA demonstrated its utility in resolving ambiguities in participant accounts of a battle (Prestonpans), relocating battle related features in an altered landscape (Edinburgh Castle), verifying accuracy of period chronicles and producing a hypothesis of the conduct of a battle that could aid in further research (Halidon Hill), providing terrain based insights in academic discourse (Dún Nechtain), and the interpretation of battlefield assemblages used in the reconstruction of battles (Monte Bernorio). The application of KOCOA to undocumented battles opens an exciting new avenue of research into past conflict using the method. Throughout the thesis, the full KOCOA methodology, as adopted from military manuals, was applied without modification demonstrating its replicability in a wide range of circumstances.

Future Work

This thesis was successful in expanding the range of applications for KOCOA in response to Babits' concerns that the method's parameters had not been tested (2011a; 2014: 263). There is, however, work that needs to be done. There are three primary areas where the range and limitations of KOCOA could be further evaluated.

The first area where further work may provide further application for KOCOA is this notion of finding forgotten or lost battlefields as implied by the title of McNutt (2014). KOCOA based upon the tripartite relationship between tactics, force composition, and terrain could now be applied to the search for these lost battlefields like Dún Nechtain or Mons Graupius. This thesis began the search for Dún Nechtain but was not able to take the next step by moving beyond the proposed sites of Dunnichen and Dunachton to locate other potential sites for the battle.

A second area of further work that shows great promise is the application of this KOCOA methodology to the investigation of undocumented historical, classical, and prehistoric sites of conflict. The application of this methodology to the battlefield assemblage from the Roman conquest of Monte Bernorio in Chapter 7 demonstrates its applicability for interpreting artifact distributions and architectural remains from classical conflict sites that have no direct form of historical documentation. The summarized practice of warfare that was developed as part of the KOCOA methodology used in this thesis allows for hypotheses to be generated as to how each combatant may

have approached the terrain. This summary can be based upon archaeological data, artistic depiction, or ethnographic historical data where it exists. This was demonstrated in Chapter 6, The Battle of Dún Nechtain, 685 AD, as well as the chapter regarding Monte Bernorio. This summary practice of warfare, or *praxis*, is the mechanism that allows KOCOA to be applied to battles where direct documentation does not exist. The application of KOCOA to undocumented historical, classical, and prehistoric sites of conflict provides a new and interesting avenue of further research utilizing the method. The question of whether the undocumented attack on the Burnswark hillfort was a true Roman siege or simply practice (see Breeze 2011; Campbell 2011; Reid 2016; Reid and Nicholson 2019) would be a good candidate for KOCOA.

The third and final area of further work under consideration here is the role archaeological fieldwork should play in any KOCOA analysis. As mentioned in the opening chapters, KOCOA is often applied in the United States as part of cultural heritage management planning where no follow up archaeological fieldwork is performed. KOCOA is an excellent tool for generating a hypothesis regarding the conduct of a battle that can then be tested archaeologically. This was demonstrated in Chapter 5 The Battle of Halidon Hill, July 19, 1333. KOCOA was applied in order to verify the accounts of the battle recorded in chronicle sources written years after the battle, but the analysis also produced a hypothesis of how the battle was conducted. Ultimately, this hypothesis could not be tested as survey fieldwork was outside the constraints of this thesis project. The small-scale excavation

of the 1722 Waggoway at Prestonpans (Chapter 3) that the author took part in had a profound influence on the KOCOA analysis and the resulting interpretation of the battle. This author is of the opinion that archaeological fieldwork should constitute a larger portion of projects where KOCOA is applied. Otherwise, researchers run the risk, as Espenshade (2014: 254) wrote, of simply substituting one myth for another.

Final Thoughts

This author is left with conflicting thoughts. Clearly, the KOCOA methodology used throughout this thesis, particularly the emphasis of viewing KOCOA through the lens of the interrelationship of tactics, force composition, and terrain, allows KOCOA to be applied in wider geographical, temporal, and categorically different contexts than it has hitherto been used. This was the primary objective that the thesis set out to accomplish. Since KOCOA needs the other elements of METT-T(c) to inform the analysis, especially when applying the method to questions within an academic setting, is it still KOCOA? Is it not METT-T(c)?

Academic conservatives, sceptics, and those working outside the United States where KOCOA simply has not been as unquestionably adopted, may be inclined to answer the above question in the negative by pointing to the several METT-T(c) components that inform KOCOA. After deliberation on this question, this author answers in the affirmative. This is because in practice the constituent analyses that comprise METT-T(c) inform

one another, with the results being collated and used in the planning of military operations. Performing a KOCOA analysis in isolation would likely result in a bland categorization of existing terrain features and be of little use academically. This author accepts the METT-T(c) informed KOCOA methodology and advocates for its further application and evaluation within Conflict Archaeology. This thesis demonstrates that the KOCOA methodology provides a standardized and replicable qualitative analysis that is applicable in wide range of geographical, temporal, and categorically different settings. KOCOA is a valuable analytical and locational tool that should be a part of the conflict archaeologist's tool kit.

APPENDICES

Appendix 4.1: A Discussion of the Historical Documents and Images

Documents

The KOCOA analysis relative to the 1573 Siege of Edinburgh Castle was performed in consultation with the primary historical record of the siege.[92] The results of the source analysis has been summarized in Table 4.1. This appendix adds more detail.The two most important primary documents relative to the English intervention that brought the 'Lang Siege' to its end are "A Survey Taken Of The Castle And Towne Of Edinburgh In Scotland, By Us Rowland Johnson And John Fleminge" (Johnson and Fleminge 1573: 69-71), dated 27 January 1572-3 and "Journal Of The Siege Of The Castle Of Edinburgh, April And May, 1573" (Anon 1573: 72-80), written by an unknown author. Both documents are reprinted in the 1836 edition of *The Bannatyne Miscellany*, Volume 2 (Anon 1836).

Rowland Johnson served as Deputy Surveyor and John Fleminge as Master Gunner under Sir William Drury at Berwick-Upon-Tweed. The pair was sent to reconnoiter the area around Edinburgh Castle in January 1573, prior to the English intervention beginning in April 1573. "A Survey" is their report describing the battlefield and giving their recommendations of how Edinburgh Castle could be approached. The "Journal Of The Siege Of The Castle Of Edinburgh, April And May, 1573" is an anonymous work most often

[92] Modern historians prefer to concentrate on events relating directly to Mary Queen of Scots leaving the military operations of the Marian Civil War unrecognized. This study located only one modern treatment of the 'Lang Siege': Harry Potter's *Edinburgh Under Siege 1571-1573* (2003). Potter's account provided a solid introduction to the people, place names, events and context of the 'Lang Siege'.

attributed to the English poet Thomas Churchyard, who apparently was present at the siege, based upon his name being written in the margin on the document's first page (Anon 1836: 68). The document can best be described as a diurnal narrative. Regardless of whom the author may have been, they were obviously present with the English army based upon the author's point of view and lack of knowledge concerning the activities of King James VI's Scottish soldiers under the command of James Douglas, 4th Earl of Morton. The "Journal" establishes a detailed timeline of the two months of the siege.

Several other primary and close secondary documents provide details in support of the situation and timeline of the siege derived from the sources listed above. An important collection of letters was written during the siege by Sir Henry Killigrew, Queen Elizabeth I's ambassador to Scotland, and Sir William Drury, Marshall of Berwick and General in command of the English army during the siege. These letters supply important insight into the objectives of the siege and timing of events occurring during the siege but are written by English participants and consequently embody that point of view. The collection of letters can be found in two separate volumes, *Calendar of State Papers, Scotland* Volume 4 (Boyd 1905) and *Calendar of State Papers, Elizabeth* Volume 10 (Crosby 1876).

There are fewer Scottish primary and near secondary sources related to the final two months of the 'Lang Siege'. An important Scottish primary source to this case study is *The Diarey Of Robert Birrel* (Birrel 1605). Birrel was a burgess of the burgh of Edinburgh and witnessed the siege firsthand. Birrel was not a dedicated recorder of events as his diary has large gaps in

time, however, he did record the position of the English and Scottish artillery mounts using contemporary Scottish place names. Birrel provides an essential service as the changing place names can be traced forward in time and the position of the artillery mounts more accurately located on the modern cityscape of Edinburgh. Further assistance in locating the position of the artillery batteries comes from the anonymous author of *A Diurnal Of Remarkable Occurrents That Have Passed Within The Country Of Scotland* (Thompson 1833). Like Birrel, the author of '*A Diurnal'* locates the battery mounts using contemporary landmarks but adds detail in the number and type of cannon in each battery. There are a handful of letters written by Regent Morton and Sir William Kirkaldy included within the *Calendar of State* Papers (Boyd 1905; Crosby 1876) that add detail. Holinshed's *Chronicles Of England, Scotland, And Ireland* (1808) is a close secondary source that originally appeared in print in 1577, a mere four years after the conclusion of the Marian Civil War. Holinshed provides a comprehensive narrative of the final two months of the 'Lang Siege' as well as what is perhaps the best-known depiction of the siege (see below). There are myriad other primary and secondary sources that touch on the 'Lang Siege', but these add little to the sources discussed here.

The archaeological record relative to the 'Lang Siege' is less robust. Edinburgh Castle itself has been the subject of several archaeological excavations (Ewart and Gallagher 2014; Driscol and Yeoman 1997; Oldrieve 1913, 1914; Skene 1822). These excavations focused on the architectural history and occupational chronology of Edinburgh Castle, touching only

incidentally on the 1571-1573 Lang Siege. This should not be a criticism as it appears that the English army took the time to recover and recycle expended munitions leaving little for archaeologists interested in reconstructing the battle to find (Grant 1849: 347). Ewart and Gallagher's (2014) *Fortress Of The Kingdom Archaeology and Research at Edinburgh Castle* contains detailed accounts of the work undertaken on the remains of David's Tower, building upon the earlier work of W. T. Oldrieve (1913, 1914;), and excavations that revealed remains of the Spur under the current Esplanade. Driscoll and Yeoman's (1997) *Excavations Within Edinburgh Castle in 1988-91* established the long occupational chronology of Castle Rock, but it is the work on the defenses of the north side of the castle and their discussion of the water supply that is of primary interest. The English/ Scottish trench system and battery mounts have seemingly been lost to archaeologists amidst the urban development surrounding the castle, although Pollard's excavation of Somerset's Mount at Pilrig Park in Leith offers some hope that remains have survived (Pollard 2008: 170, 178-179). These structures were important in their own right, with the battery location in the vicinity of Saint Cuthbert's Kirk being reused in subsequent sieges (Corsar 1949: 45). In the course of this research, no archaeological reports relative to these remains have been located.[93] This then is the most important contribution of this case

[93] In checking the Historic Environment Record for archaeological remains identified as belong to the English fortification system of 1573, I accessed the Canmore database and canvassed *Discovery and Excavation In Scotland*. Canmore possesses over 16,800 records for Edinburgh indexed by site number or site name. I narrowed the pool by filtering the results by road name (Lothian Road, Castle Terrace, Princes Street, etc.). This reduced the pool to a few hundred records, which were then scanned. No archaeological remains directly identified as belonging to the English fortification system was located.

study: locating the likely location of these remains within the present day landscape of Edinburgh using KOCOA.

Images

A large body of cartographic and image sources exists depicting old Edinburgh and Edinburgh Castle. The results of the analysis of the historical images consulted for this case study are summarized in Table 4.2. The images were used with the intention of providing a visual bridge between the Edinburgh of c.1573 and the Edinburgh we see today. It was hoped that by doing this it would be possible to locate place names mentioned in the primary historical sources relative to the siege in the landscape of modern Edinburgh. Unfortunately, many of the early images are not useful in reconstructing the terrain in detail that existed at the time of the 1573 siege. Scales and place names are often omitted. Many are artistically rendered depictions of Edinburgh Castle and Edinburgh viewed side on obscuring terrain features that would be useful in terrain reconstruction. This focus on Edinburgh Castle and Edinburgh is transferred to early maps leaving the surrounding area filled with map furniture (see below). The surrounding area is important for locating the trenches and battery mounts constructed by the Scottish and English forces besieging Edinburgh Castle.

The earliest depictions of Edinburgh and Edinburgh Castle date from the 16th century. Drawn during the Earl of Hertford's attack in 1544, the 'English Spy's Drawing' illustrates David's Tower and Constable's Tower with

the high thin curtain wall linking them (Figure 4.23) (Lee 1544). Edinburgh is shown as being confined to the ridge running east from the castle and encircled by a town wall. A ‘Drawing of the Siege of Leith, May 1560’ (Petworth 1560) focuses on the fortifications surrounding Leith during that conflict, but also includes a view of Edinburgh Castle in the background. This view is similar to that of the ‘English Spy Drawing of 1544’ in that both are viewed side on looking south; however, the latter appears to include the addition of an outer defensive fortification at the castle entrance that is likely the Spur (Figure 4.24) (Petworth 1560). This is the first graphic depiction of the Spur, which was constructed in 1548 during the ‘Wars of the Rough Wooing’ (Ewart and Gallagher 2014: 99).

MacGibbon and Ross’s 1887 *The Castellated And Domestic Architecture Of Scotland From The Twelfth To The Eighteenth Century* contains an image of Edinburgh Castle “as it existed before the siege of 1573” (MacGibbon and Ross 1887: 449). This image was copied from Daniel Wilson’s *Memorials Of Edinburgh In The Olden Time*, where he identifies it as an engraving made in 1575 from an already existing map (Figure 4.25) (Wilson 1875: 8). If this provenance is true, then this image of Edinburgh Castle was drawn rather close to the time of the 1571-1573 siege. This image clearly depicts David’s Tower and the Royal Lodgings on the south side of the castle, as opposed to the north side in the previous images. It is another side on view, which obscures structures behind David’s Tower, but the Portcullis and entrance to the castle can be seen. The Spur is depicted as a triangular fortification on the eastern side (right) of the Castle. This

depiction of the Spur correlates well with Petworth's 'Drawing' (Figure 4.24) (Petworth 1560), lending support for the authenticity of the Wilson image (Wilson 1875: 8).

The above image of Edinburgh Castle also appears in the 1582 Braun and Hogenberg map, 'Edenburgum, Scotiae Metropolis' (Figure 4.26) (Braun and Hogenberg 1582).[94] Braun and Hogenberg drafted 'Edenburgum' for inclusion in the third volume of their *Civitates Orbis Terrarum* series (Braun and Hogenberg 1581: 4). The entire map is a compilation of images from at least two sources: the 1575 image of Edinburgh Castle copied by Wilson (1875: 8); and Edinburgh as depicted in a 'Facsimile of a Plan of the Siege of the Castle of Edinburgh, May 1573' (Anon 1836: 75) first published in the 1577 edition of the *Holinshed's Chronicles Of England, Scotland, And Ireland* (Anon 1836: 68). This depiction of Edinburgh and Edinburgh Castle in 'Edenburgum' should be used with caution in reconstructing the terrain and cityscape at the time of the 1573 siege. 'Edenburgum' is arranged in accord with how European readers of *Civitates* thought a city should look, with neatly ordered streets and surrounded by bordered fields (Fleet and MacCannell 2014: 22). Important landmarks are not in their proper location or are absent altogether. St. Cuthbert's Kirk is improperly located due west of Edinburgh Castle, in the area of present-day Usher Hall on Lothian Road. The distinctive 'Z' shaped West Bow linking Grassmarket and High Street that existed until the construction of Victoria Street between 1829-1834 is absent.

[94] Although the National Library of Scotland's copy of 'Edenburgum Scotiae Metropolis' is dated c. 1582, the map appears in Braun and Hogenberg (1581) *Urbium Praecipuarum Totius Mundi*, the third volume of their *Civitates Orbis Terrarum*.

Holyrood Palace at the foot of High Street is missing entirely. The 1575 image of Edinburgh Castle, with its proliferation of towers along the outer curtain wall (Figure 4.25, 4.26), differs in this detail from the depiction of the Castle in a ‘Facsimile’ (Figure 4.28; See Below).

A ‘Facsimile of a Plan of the Siege of the Castle of Edinburgh, May 1573’ (Figure 4.27) is an engraving based on a plan of the siege of 1573, which accompanied a report prepared at the time by the command of Sir William Drury (MacGibbon and Ross (1887: 449-450; Anon 1836: 68). The plan was likely drawn on the spot and may be the “makinge of a Platte” referred to by Johnson and Fleminge in ‘A Survey’ (Johnson and Fleminge 1573: 71; Anon 1836: 68). This raises two important points. If a ‘Facsimile’ is based on a sketch made by Johnson and Fleminge in January 1573, then the siege of April – May had not yet taken place. The illustration is likely showing where Johnson and Fleminge thought the English artillery batteries should be placed as referred to in their ‘Survey’ and not necessarily where they were placed during the siege. This possibility resolves a conflict between a ‘Facsimile’ and the primary historical record, where the illustration shows six English/ Scottish battery mounts instead of the five listed in the primary historical sources (Anon 1836: 74-75; Birrel 1605: 20-21). Second, if a ‘Facsimile’ is based on a sketch made by Johnson and Fleminge in January 1573, then it is likely an accurate representation of Edinburgh Castle (Figure 4.28) as they saw it. The image of the Spur in a ‘Facsimile’ correlates well with Petworth (1560) (Figure 4.24). There are archaeological remains associated with the tower outside of the Royal Lodgings (Figure 4.2) (Ewart

and Gallagher 2014: 94). Ascertaining the configuration of Edinburgh Castle and the location of its artillery batteries in 1573 is important to reconstructing accurate Fields of Fire. Based upon the evidence above, this author infers that the depiction of Edinburgh Castle in a 'Facsimile' is more accurate than that of Wilson (1875: 8) and Braun and Hogenberg (1582). The depiction of Edinburgh in a 'Facsimile' is essentially the same as that in 'Edenburgum' and embodies the same issues described above. It also lacks both a scale and landmarks to the north and west of the castle, limiting its value in locating the battery mounts and trench system.

The 17th century produced the first true maps of Edinburgh. The most important to this study is James Gordon's 'Edinodunensis Tabulam' (Figure 4.29) (Gordon 1647). Houses, gardens and prominent buildings are rendered with an incredible level of detail. While lesser structures are idealized, important buildings, such as the Castle, St. Giles Kirk and the Tolbooth appear to be realistic representations. An accurate north arrow and scale are included. For the first time, the spatial relationship between important landmarks can be seen. The Nor' Loch is clearly depicted, along with Saint Cuthbert's Kirk. The increasing urbanization to the south of Edinburgh Castle can be seen. Sadly, the areas north of the Nor' Loch and west of Edinburgh Castle are not represented.

The problem of a lack of accurate representation of the topography to the north and west of Edinburgh Castle is partly addressed by two additional 17th century maps. The first, 'A New Description of the Shyres Lothian and Linlitquo' (Figure 4.30) was drawn around the year 1610 by noted

cartographer Timothy Pont (c.1610) and published in Jodocus Hondius 1630 *Gerardi Mercatoris – Atlas sive Cosmographicae Meditationes de Fabrica Mundi et Fabricati Figura*. This map is large in scale showing major hills, water courses and village locations that correlate well with the same features depicted in modern maps. The resolution is not fine enough to accurately illustrate the built environment or include the micro-topography surrounding Edinburgh, but Pont provides a critical contribution by depicting the road network of the area (Pont c.1610). Drawn relatively close in time to the 1573 siege, this depiction of the road network is valuable in assessing avenues of approach that may have been utilized during the siege. The second map is John Adair's 'Map of Midlothian' drawn circa 1682 (Figure 4.31) (Adair c.1682). Adair's map is visually rather similar to Pont in the way in which he chose to depict the built environment, water courses and road networks. Upon close inspection, however, Adair depicted Edinburgh and its hinterland in greater detail in terms of topography, important buildings and road layout than Pont (Fleet and MacCannell 2014 :37). Like Pont, the features depicted by Adair correlate well with the same features depicted in modern maps. Due to this correlation, this author infers that Pont and Adair provide a reasonably accurate depiction of the terrain and built environment surrounding Edinburgh Castle, particularly of those areas to the north and west that are obscured or absent from other maps. Pont and Adair provide a baseline with which changes or stability in terrain features relative to the 1573 siege that can be assessed when compared with later maps useful for terrain reconstruction,

such as Roy's 1747-55 'Military Survey of Scotland' and the later work of Andrew Bell.

Several detailed maps were produced during the 18th century, including some of the first maps to clearly survey and depict to scale the terrain surrounding Edinburgh Castle on the north, west and south. These maps lack elevation data, but the inclusion of a scale allows for the reconstruction of fields of fire and plotting the probable location of English artillery based upon the ranges of the guns used in the siege. When compared to the earlier maps of Pont (c. 1610; Figure 4.20) and Adair (c. 1682; Figure 4.31) these maps show that the terrain to the north and west of the castle remained little changed from the time of the battle. Most of the urban development that occurred remained to the south of Edinburgh Castle outside the old town walls along the line of present-day West Port, Lauriston Place, and Teviot Place.

An important map for assessing the terrain surrounding Edinburgh Castle is the 1747-55 'Roy Military Survey of Scotland', specifically the 'Area Around Edinburgh, in Edinburghshire (or Midlothian)' and 'Area Around Corstorphine and Southward to Pentlands in Edinburghshire (or Midlothian)' map sheets (Figure 4.32) (Roy 1747-55a, 1747-55b). As mentioned in the previous chapter regarding terrain at the Battle of Prestonpans, Roy did not intend for his map to be accurate down to the minutest detail (Roy 1785: 386-387), however he does a superb job of locating features of military significance (Fleet and MacCannell 2014 :61). Roy depicts several terrain elements of interest in the KOCOA analysis of the 1573 siege. He shows the

proper configuration of the Nor' Loch's western shore at the foot of St. Cuthbert's Kirk, confirming Adair's (c.1682) (Figure 4.31) illustration of the same feature. Confirming the proper configuration of the Nor' Loch is important to understanding how the loch functioned as an obstacle to movement against the north side of Edinburgh Castle. Unfortunately, Roy does not include terrain elevations in his survey, but he does use a form of hill shading to indicate raised ground surrounding Edinburgh Castle. This hill shading is an improvement over the maps discussed above in that Roy conveys an impression of the uneven topography surrounding Edinburgh Castle. Roy also does not include local place names hindering attempts to locate landmarks mentioned in historical texts. The road network surrounding Edinburgh Castle is mapped in detail, providing an important component in reconstructing avenues of approach for KOCOA. The omission of local place names in Roy's 'Military Survey of Scotland' is mediated by consulting later maps drawn by Andrew Bell (1759, 1773) (Figure 4.33, 4.34), John Ainslie (1780a, 1780b) (Figure 4.35, 4.36) and Alexander Kincaid (1784) (Figure 4.37).

Andrew Bell's 1773 'A Plan of the City of Edinburgh, with all the New Streets, Avenues, Buildings, Squares, Courts &c Within & Round the City, since 1741 till this Present Year 1773...' (Bell 1773) (Figure 4.34) is unique in depicting changes in the built environment occurring during the period from 1741 until 1773. The early stages of the construction of Edinburgh's New Town are shown in relation to the older landmarks and terrain features present in previous maps. This proved critical in locating siege positions in

the modern landscape. The ‘Lang Dykes’, for example, the major east-west road on the north side of the Nor’ Loch is depicted as mostly conforming to present day Rose Street in New Town. ‘Bare Foots Parks’, a corruption of ‘Bearford’s Parks’ is clearly shown as being the terrain on the south side of the ‘Lang Dykes’ down to the north bank of the Nor’ Loch (on proposed canal). ‘Bearford’s Parks’ and ‘Lang Gait (Dykes)’ were mentioned in the historical record as the location of one of the English/ Scottish artillery mounts (Thompson 1833 :331; Grant 1849 :335). The transitional nature of Bell’s maps proved to invaluable in locating siege positions, particularly north of Edinburgh Castle.

Figure 4.23. 'English Spy's Drawing' 1544 Showing the Earl of Hertford's attack on Edinburgh. Notice David's Tower, Constable's Tower and the Curtain Wall. The Spur is not yet present (Lee 1544).

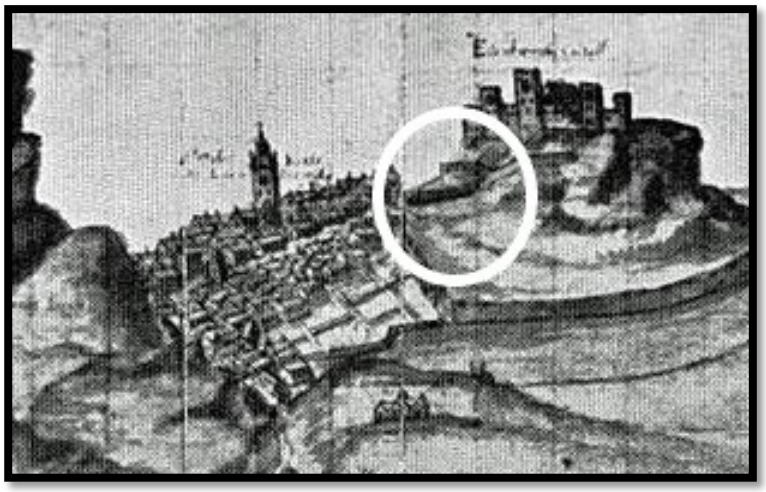


Figure 4.24. Detail From 'Drawing of the Siege of Leith, May 1560' Showing Spur at Edinburgh Castle (Pentworth 1560).

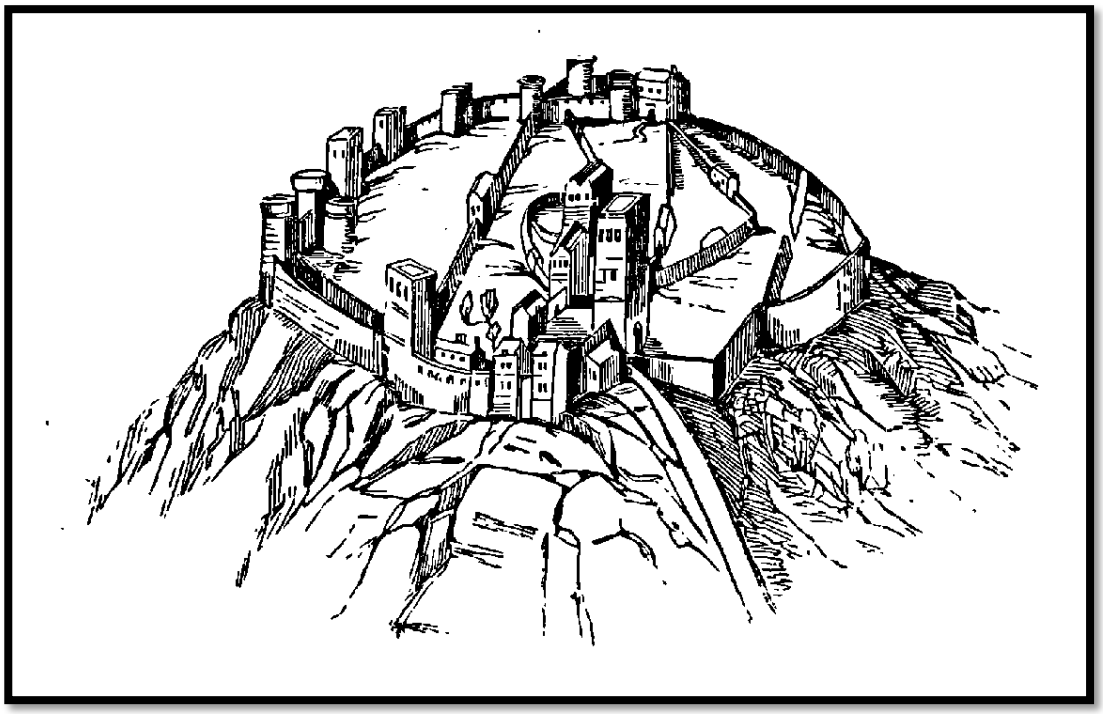


Figure 4.25. Reconstruction of 1573 Edinburgh Castle (From MacGibbon and Ross 1887: 449; Wilson 1875: 8).

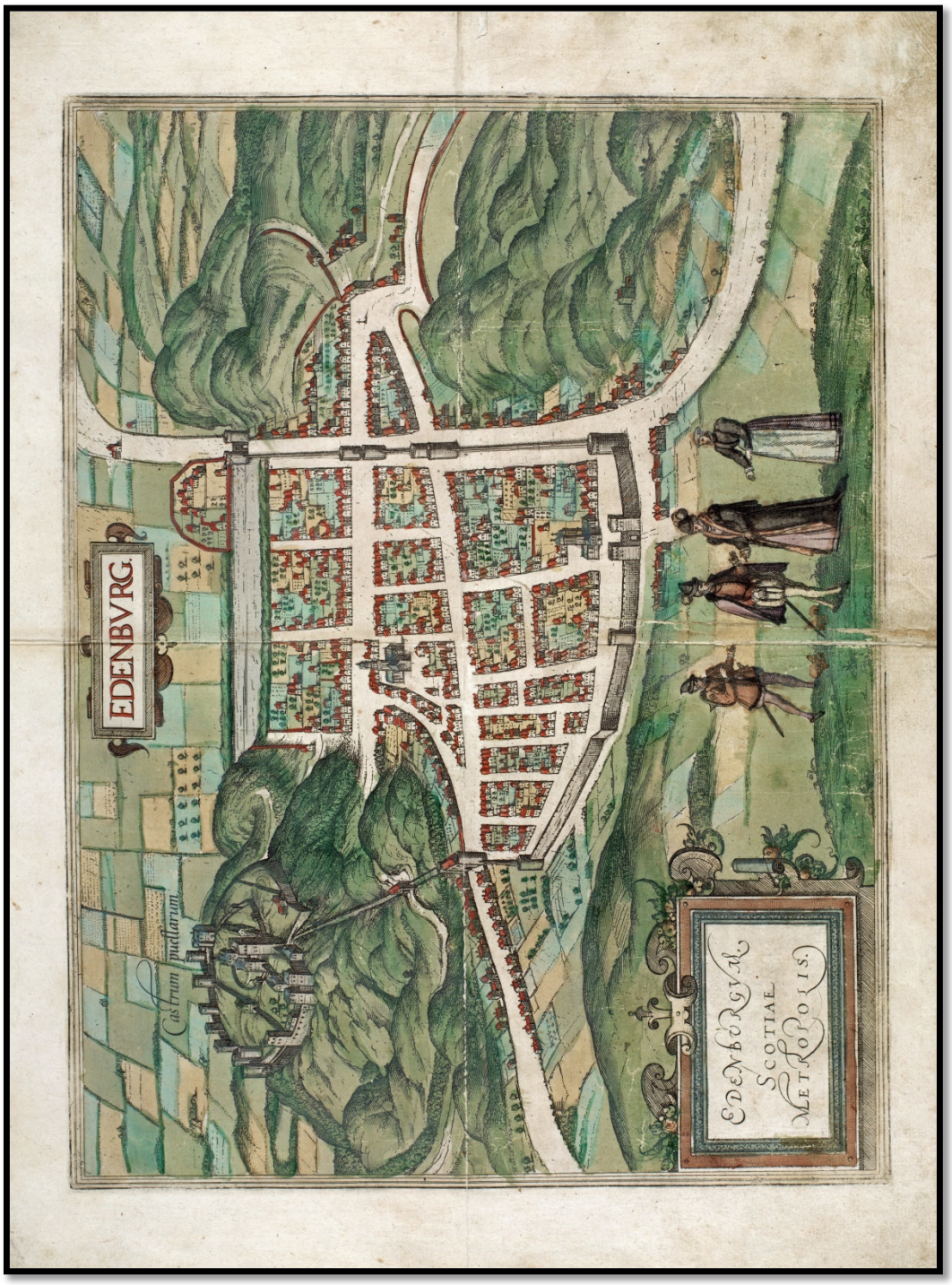


Figure 4.26. 1582 Braun and Hogenberg (1582) 'Edenburgum, Scotiae Metropolis' (also ©National Library of Scotland EMS.s.653).

Figure 4.27. 'Facsimile of a Plan of the Siege of the Castle of Edinburgh' (Anon 1836: 75). This image is more helpful in reconstructing the terrain and built environment of the battlefield. Notice the difference in the depiction of Edinburgh Castle from Figure 4.26.

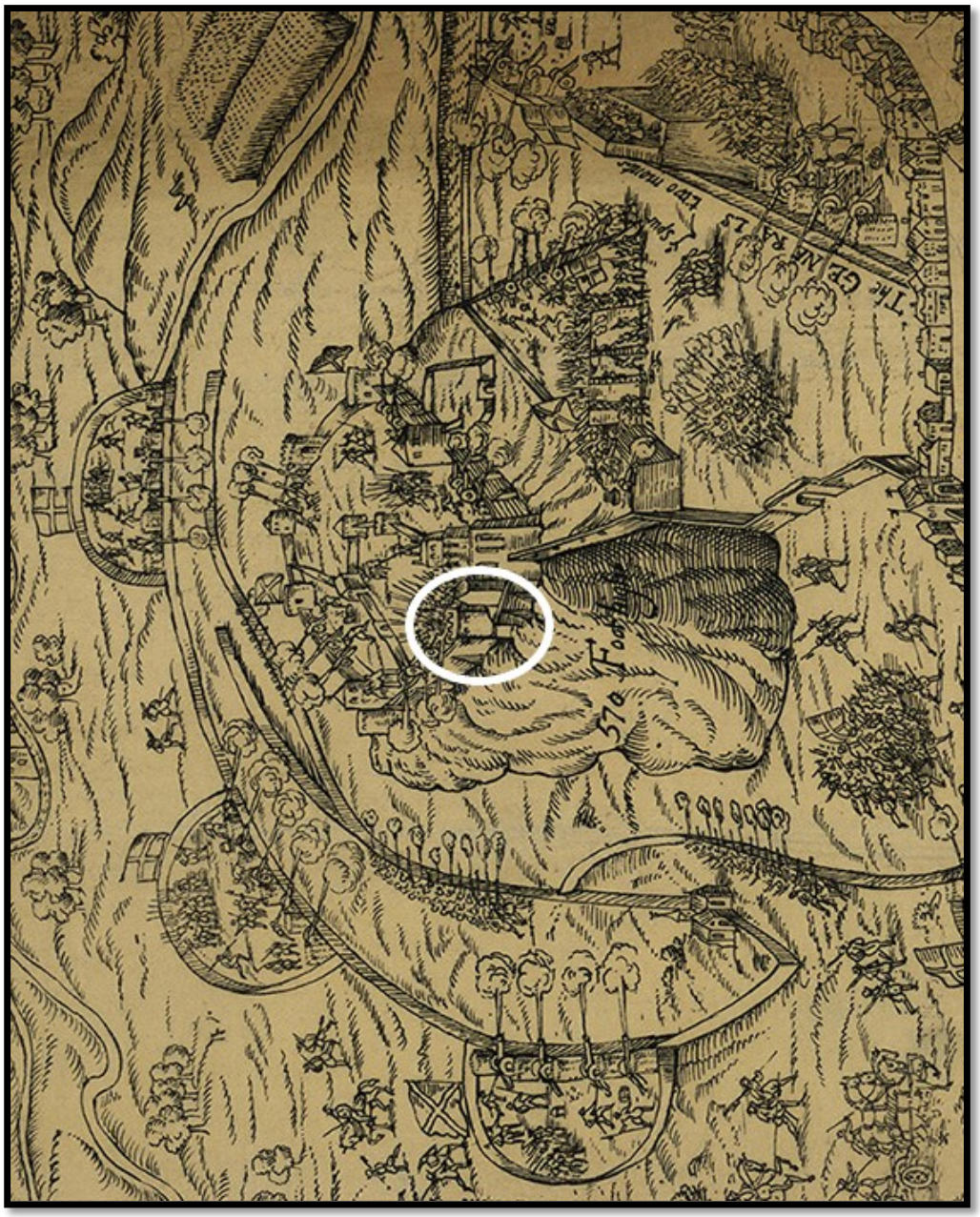


Figure 4.28. Detail of Edinburgh Castle from Holinshed's 'A Facsimile of a Plan of the Siege of the Castle of Edinburgh, May 1573' (Anon 1836: 75). There are archaeological remains associated with the tower circled.

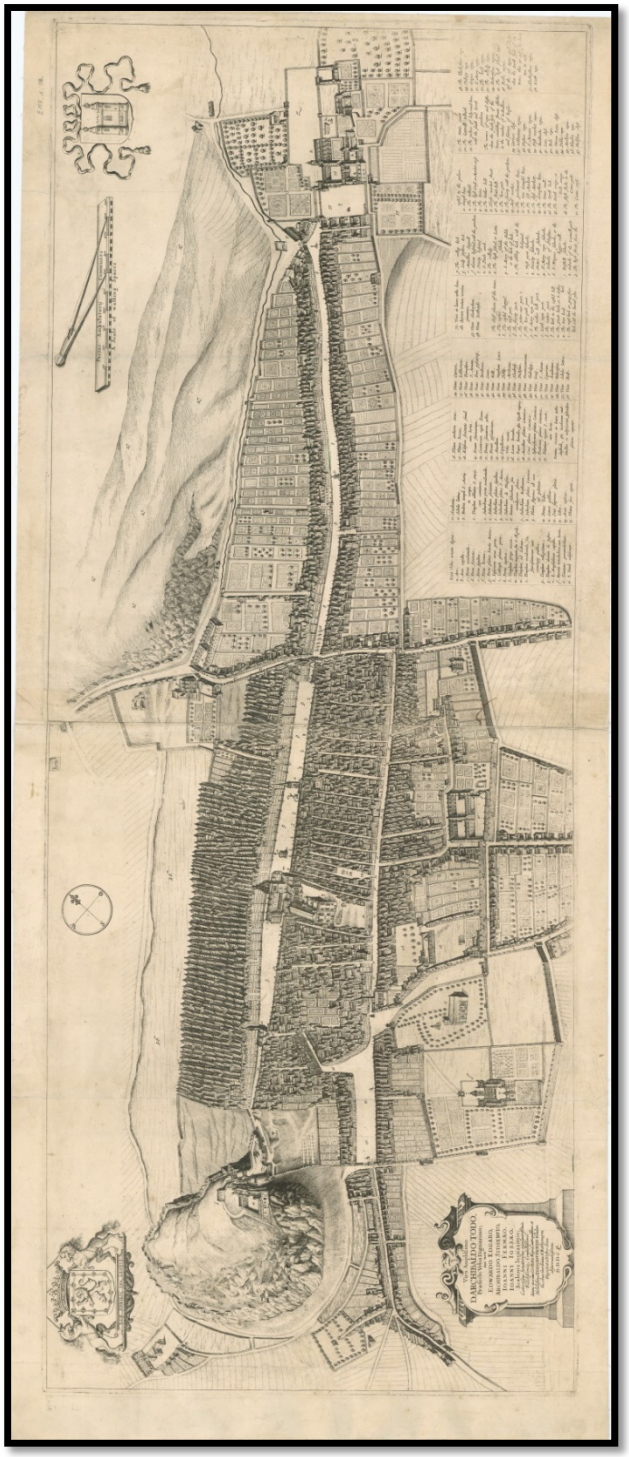


Figure 4.29. 'Edinodunensis Tabulam' by James Gordon (1647) (Gordon 1647; ©National Library of Scotland EMS.s.52).

Figure 4.30. Detail 'A New Description of the Shyres Lothian and Linlitquo' (Pont c. 1610) showing Edinburgh and Environs (Pont c.1610; ©National Library of Scotland EMS.s.676).

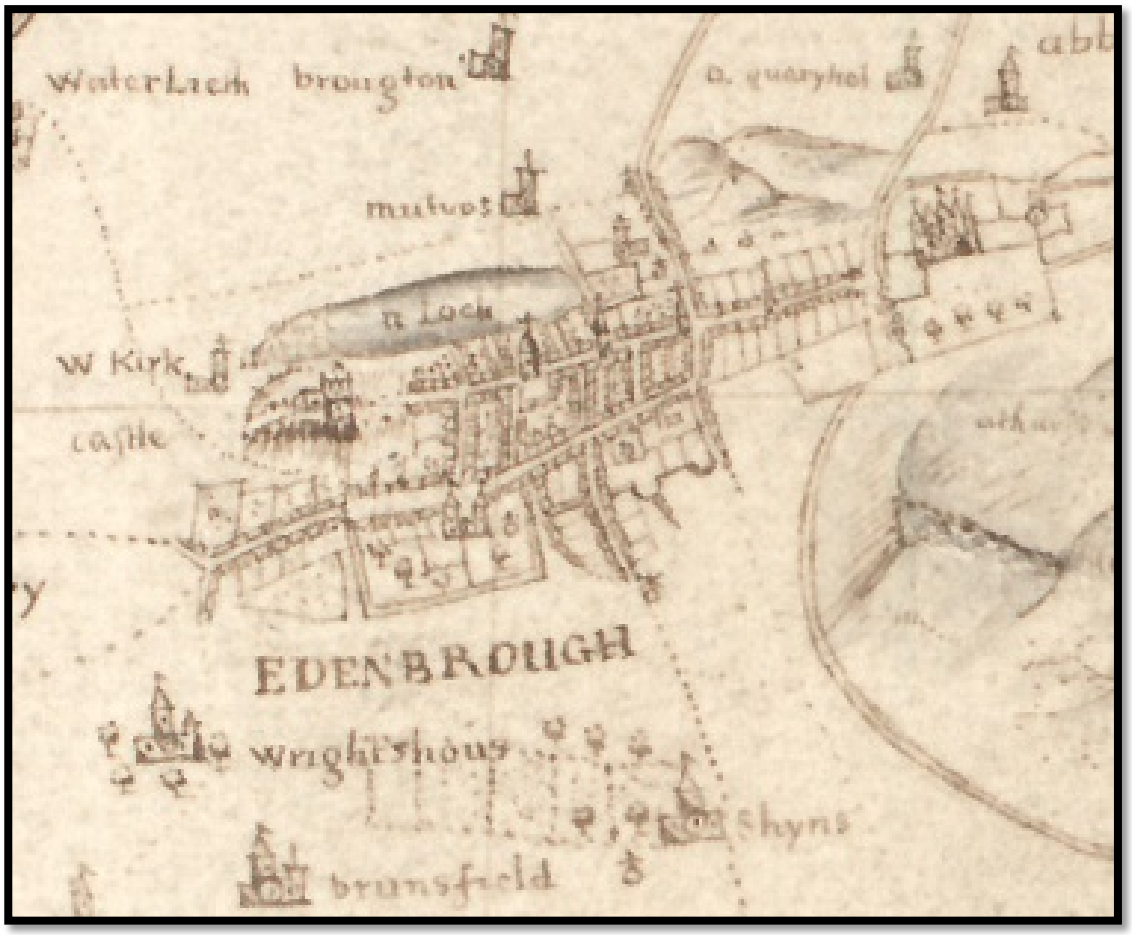


Figure 4.31. Detail of John Adair's c. 1682 'Map of Midlothian'. Showing terrain features and prominent buildings surrounding Edinburgh Castle (Adair c.1682; ©National Library of Scotland Adv.MS.70.2.11 (Adair 9)).

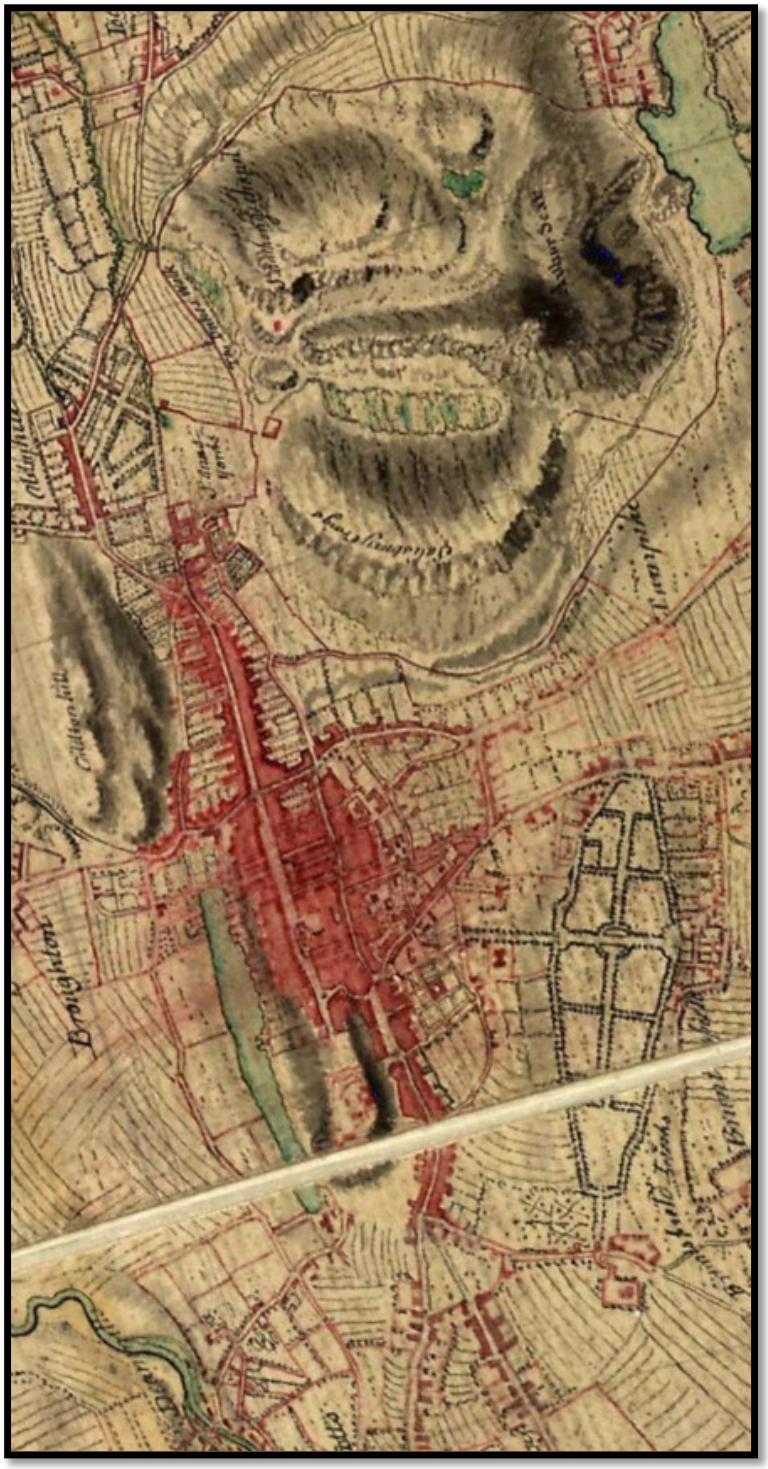


Figure 4.32. Detail of Edinburgh from 'Roy Military Survey of Scotland' (Roy 1747-55a,1747-1755b; ©National Library of Scotland https://maps.nls.uk/geo/roy/).

Figure 4.33. Andrew Bell's 1759 'A Plan of the City of Edinburgh with the Adjacent Grounds' (Bell 1759; ©Ancestry.com http://freepages.rootsweb.com/~genmaps/genealogy/genfiles/COU_files/Sco/MLN/bell_edin_1759.html).

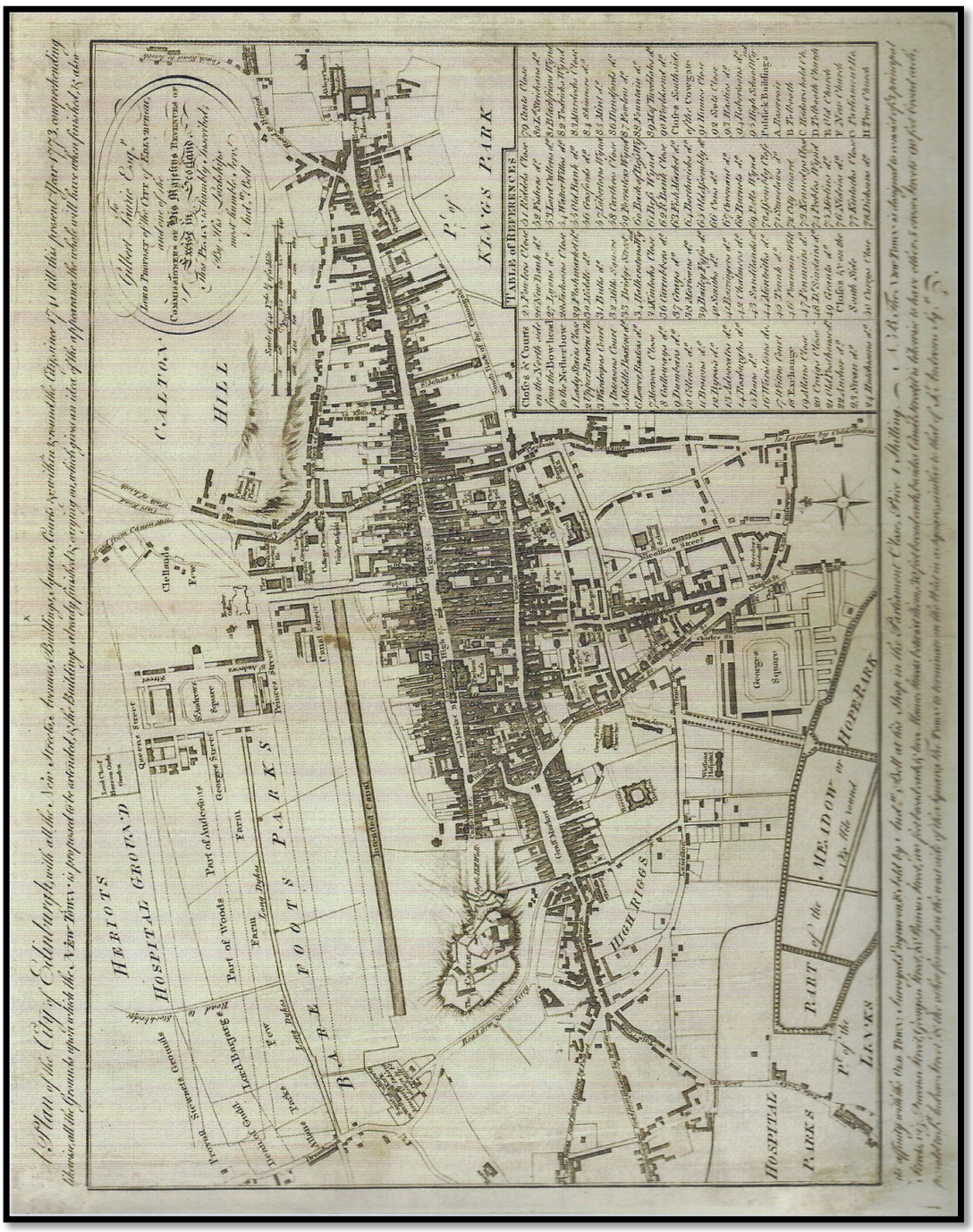


Figure 4.34. Andrew Bell's 1773 'A Plan of the City of Edinburgh...' Showing the old landmarks being converted into New Town (From Fleet and MacCannell 2014: 79).

Figure 4.35. Detail from John Ainslie's 1780 'City of Edinburgh - Earlier State' (Ainslie 1780a; ©National Library of Scotland EMS.s.59).

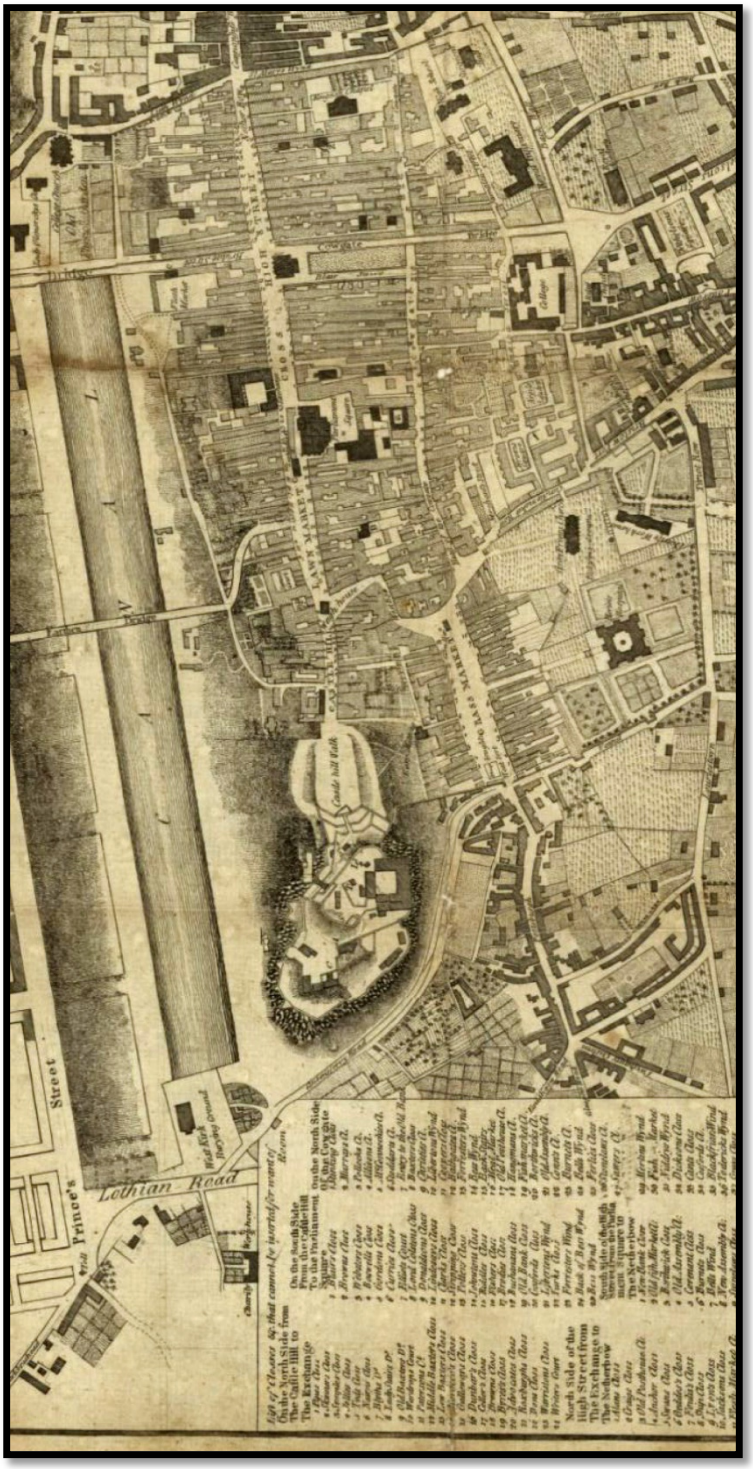


Figure 4.36. Detail from John Ainslie's 1780 'City of Edinburgh - Later State' (Ainslie 1780b; ©National Library of Scotland EMS.s.296).

Figure 4.37. Detail from Alexander Kincaid's 1784 'A Plan of the City and Suburbs of Edinburgh' (Kincaid 1784; ©National Library of Scotland EMS.s.632).

Appendix 4.2 A More Detailed Evaluation of KOCOA Features 1573 Siege of Edinburgh Castle

The following is a more detailed discussion of the KOCOA features associated with the 1573 Siege of Edinburgh Castle. This appendix is intended to augment the summary KOCOA Analysis presented in Tables 4.6 – 4.10. It is hoped that this appendix will provide a deeper understanding of the terrain in what is now the City Centre of Edinburgh and its influence on the siege in 1573. The organization of the appendix follows along with that of the summary tables with each piece of key terrain being present along with its associated features.

Key Terrain - Castle Rock (Edinburgh Castle)

Edinburgh Castle owed its strategic value to the geological setting of Castle Rock. Castle Rock is the eroded remnant of a basaltic plug from the central vent of a Palaeozoic volcano. The intrinsic strength of the basalt made mining operations at Castle Rock impractical (Price and Knill 1967: 414, 416)."[95] This is precisely what Johnson and Fleminge determined during their examination of the terrain during their survey of Edinburgh Castle in January 1573 (Johnson and Fleminge 1573: 70). The plug

[95] Price and Knill determined (among other things) that the basalt of Castle Rock possesses a tensile strength of 8500 lb/ sq. in., compressive strength of 26,500 lb/sq. in., Shore hardness of 96, and a Schmidt impact number of 55 (Price and Knill 1967: 417). Presented in isolation, the data does not mean much other than the basalt is hard, resistant to the weather, and resistant to being worked. A reasonable search did not locate comparable data for the sandstone bedrock of Castle Hill.

intrudes almost vertically through a sequence of well-bedded Cementstone Group sedimentary rocks of Lower Carboniferous (Dinantian) age (345 Ma) (Donnelly *et al* 2005: 120; Ruckley 1997: 15, 1991: 18; MacLaren 1984: 10-19). Steep cliff faces border Castle Rock on the north, west and south, restricting access to the summit. While there is a secondary avenue of approach on the west side, the summit can only be accessed by a large party from the eastern approach. In plan view, Castle Rock resembles an elongated oval measuring 984 feet (300 m) by 656 feet (200 m) oriented along a northwest to southeast axis following the tilt of the intrusion (Krabbendam and Callaghan 2013: 1; Donnelly *et al* 2005: 120; Ruckley 1991: 18; MacLaren 1984: 10; Price and Knill 1967: 411). Elevations above the surrounding valley system vary across Castle Rock from an estimated 131 feet (40 m) to 197 feet (60 m) around the perimeter to a maximum height of 275 feet (84 m) at the summit (364 feet (111 m) above sea level) (Krabbendam and Callaghan 2013: 1; Donnelly *et al* 2005: 120; Price and Knill 1967: 412). Its domination of the lower elevations around it provide the Rock with excellent visibility, making it an important observation point with good fields of fire. Edinburgh Castle was constructed to take advantage of the natural characteristics outlined above. Castle Rock and Edinburgh Castle are classified as Key Terrain on the basis of advantage these characteristics conveyed to the defender in possession of them.

In spite of its defensive strength, Castle Rock has a major liability: there is no naturally occurring source of potable water existing at or near

the ground surface. Price and Knill rated the water absorption of the basalt at 0.03%, meaning that the rock itself is a rather poor aquifer (Ruckley 1991: 24; Price and Knill 1967: 417). Wells sunk into the summit of Castle Rock depend upon the number, size, and orientation of naturally occurring joints within the basalt bedrock to carry water into the well shaft from the surrounding catchment area (Ruckley 1991: 24). These naturally occurring fissures come in various shapes and sizes, some being mapped as extending 50 feet or more in length (Price and Knill 1967: 414).[96] The jointing of the basalt of Castle Rock, historically speaking, did not render an attacker's mining operations any more practicable, however, they could also divert water away from wells putting the Castle's water supply at risk during dry weather and times of increased consumption. At the time of the 1573 siege, only one well, the Fore Well (Figure 4.9, Feature 6) (see below) existed within the inner ward of Edinburgh Castle. This well was located adjacent to a contact interface of the basalt plug and surrounding sandstone at the eastern edge of the summit. There is a level of permanent water saturation that exists at approximately fifteen meters above the current footpath leading west from the Well House Tower (Wallace Tower), but the Fore Well did not reach that depth (Ruckley 1991: 24).

[96] Price and Knill defined three main classifications of joints (although many joints fell outside these types): "R (radial) joints – steeply inclined smooth-faced joints trending normal to the boundary of the plug; C 9circumferential) joints – steeply inclined smooth-faced joints trending parallel to the boundary of the plug and generally inwardly dipping; D (dome) joints – typically gently dipping smooth-faced joints, outwardly inclined relative to the basalt mass" (Price and Knill 1967: 414).

Several springs are known to have existed in antiquity in the valley system along the base of Castle Rock (Ruckley 1991: 24). Two of the springs located at the base of Castle Rock were improved with wells to provide an additional source of water for the Castle's garrison: Saint Margaret's Well (Figure 4.4) and the Well House Tower (Wallace's Tower) (Figure 4.4). These exterior wells were in use and their control was contested throughout the earlier phases of the Lang Siege (1571-1573). The value of St. Margaret's Well and the Well House Tower to the Castle's garrison characterize them as key terrain, even though they occupied inferior defensive terrain. By the time the English army under Drury arrived on 20 April 1573, both wells were already under the control of Regent Morton creating a water shortage for Grange's garrison inside Edinburgh Castle (Potter 2003: 121-122).

Observation and Fields of Fire - Castle Rock (Edinburgh Castle)

Observation

Castle Rock (140 meters/ 460 feet) possesses a comprehensive natural 360º viewshed that is comparable to that obtained from the nearby elevations of Calton Hill (100 meters/ 328 feet) and Arthur's Seat (251 meters/ 823 feet) to the northeast and southeast respectively (Figure 4.8) (Ordnance Survey 2016). This vista, in combination with other defensive characteristics of the site, is likely what first drew people to Castle Rock during the Late Bronze Age or Early Iron Age (Driscoll and Yeoman 1997:

220). What can be observed within this viewshed, however, is dependent upon where the observer is within Edinburgh Castle. This is as true today as it was in 1573. Generally speaking, the buildings and fortifications of the Castle would increase elevation and improve observation. These same structures could, however, also completely obscure observation depending on the individual's position. For purposes of discussing the observable viewshed of 1573, it will be assumed that the observer would occupy the best point within the Castle to see the surrounding landscape.

The visible landscape of 1573 in the immediate vicinity of Edinburgh Castle was rather different than the landscape of today owing to the intense urbanization of the nineteenth and twentieth centuries. To the north an observer in the Castle had a nearly unobstructed line of sight to the Firth of Forth. There would have been a bit of a shadow effect in the middle ground created by the George Street Rise and Moutrie's Hill (Moultree's Hill) that would conceal what was immediately behind the rise. The Port of Leith could be seen to the northeast, connected to Edinburgh at the New Port by Leith Walk or the Road To Leith. Near Moutrie's Hill the Road To Leith intersected with the Lang Dykes or Lang Gait (present day Rose Street), the principal east to west road along the Lochbank and Nor' Loch. At its western end the Lang Dykes intersected with the Road To Saint Cuthbert's (present day King Stables Road), which ran south along the west edge of Castle Rock to enter the Grassmarket at the West Port. Mary Queen of Scots used this route to enter Edinburgh Castle via the Western Postern (St. Margaret's Gate) upon her arrival in August 1561

(MacIvor 1993: 59). Another road (present day Queensferry Street/ Road) branched to the north, leading to the mills along the Water of Leith in what is now Stockbridge. The land along these thoroughfares was largely open, belonging to farmsteads that were part of the Barony of Broughton and went by the names Lochbank, Broughton Parks, Wood's Farm and later Bearford's Parks (Mackay 1867: 56). In the valley between Castle Rock and Lochbank was the Nor' Loch.

The terrain to the west of Edinburgh Castle was likewise sparsely populated, a large swathe of this land once belonged to the ancient Castle gardens and orchards. On the northwest, beyond the bounds of St. Cuthbert's Kirk, the forest of Drumselch (Drumsheugh) served as the royal hunting grounds. The portion of the ancient Castle Gardens to the west of the Castle occupied a large plot of land from Drumselch and St. Cuthbert's, on the north and northeast respectively, south to the Burgh Muir (Boroughmuir) and as far west as Dalry (Malcolm 1925: 101-102). This area corresponds to present day Lothian Road, from Princes Street south to Bruntsfield and west to Dalry. By 1573, the royal residence had moved to Holyrood Palace, at the base of High Street in Canongate, and the ancient Castle Gardens were given over to farmsteads. The main road to the west left Grassmarket at the West Port and proceeded along the line of present day Bread Street and Morrison Street. This road could be observed from the Castle as it crossed the Water of Leith at the Colt Bridge and continued past Corstorphine Hill. The small burgh of Portsburgh had sprung up along the road outside of the West Port. Much

of Portsburgh had been burned to the ground by Kirkcaldy of Grange on the night of 12 February 1573 (Potter 2003: 125; Grant 1850: 110, 1849: 327-328). The condition of these structures at the time of the siege is unknown. As mentioned above, the Road to St. Cuthbert's ran through the valley along the west base of Castle Rock. At its northern terminus was the Kirk and associated buildings. Outside the West Port, wrapping around the southern base of Castle Rock were the King's Stables, Barras and St. Margaret's Well.

An observer looking south from the Castle in 1573 could look down on the whole of Grassmarket from the West Bow and the head of Cowgate on the east to the West Port on the west. The 1573 configuration of Grassmarket was likely similar to that of today with buildings ringing the outer edges and the open market in the center. The exact condition of Grassmarket in April 1573 is unknown. The entire neighborhood had been razed by Kirkcaldy and his men on the night of 12 February 1573 in the same sortie that burned Portsburgh (Potter 2003: 125; Grant 1850: 110, 1849: 327-328). On the heights above Grassmarket, the farming estates along the north bank of the Borough Loch, or South Loch, occupied the ridge of land known as the High Riggs (Easton 1988: 7-11). These farmsteads lay outside the Flodden Wall, along what is now Lauriston Place, making them technically part of Portsburgh (Lewis 1846: 388-396). To the east along this ridge, but within the Flodden Wall, was the burial ground of Greyfriars. The kirk would not be built until 1620 using material recycled from the convent of St. Catherine at Sciennes (Gray 1940: 33).

Beyond Greyfriars stood Arthur's Seat and winding its way south was the Road to Dalkeith. Just discernable some four miles distant was the tower of Craigmillar Castle. Far to the south, the Pentland Hills mark the end of unassisted observation.

To the east of the Castle, Edinburgh itself occupied the mile long 'tail' sloping down to Holyrood Palace. The architectural characteristics of each individual structure in 1573 is unknown, making it more difficult to assess the viewshed in that direction (Figure 4.38). The height of these buildings is key and there are only two extant today in something like original form that were present in 1573: St. Giles Cathedral and

Figure 4.38. Photo From Half Moon Battery Looking East Down High Street Approximating Interdicted Observation From Castle To The East In 1573 (Photo by ©Craig J. Brown).

John Knox House. If the John Knox House is a suitable analogy, then most of the buildings were constructed of a timber and stone composite, with

overlapping gables, four or five stories high. Some of the nicer buildings may have been constructed entirely of stone. The homes and shops that fronted on High Street and the narrow closes that descended both the north and south slopes of the ‘tail’ provided cover and concealment from observation from the Castle. The height of the buildings obstructed line of sight to the east, limiting observation to an area extending to the top of the West Bow, or perhaps as far as the Lawnmarket or St. Giles Cathedral. On the north side of Edinburgh, the eastern end of the Nor’ Loch was in view.

Fields of Fire

Small arms, specifically the ‘hackbut’ in 1573, possessed a 360º field of fire around Edinburgh Castle. In theory, this field of fire extended out to a maximum range of between 360 to 400 yards (329 m to 366 m) (The Alderney Maritime Trust 2017), but realistically these weapons could maintain an effective field of fire out to approximately 100 yards (91 m) (Krenn, Kalaus and Hall 1995: 105). Although cumbersome for the individual by the standards of today, hackbuts were portable and could have been employed throughout Edinburgh Castle in 1573.

Reconstructing the fields of fire for the artillery of Edinburgh Castle in 1573 presents more of a challenge. In order to accurately reconstruct fields of fire, it is necessary to determine the type, number and placement of artillery pieces within the Castle, as well as ascertaining construction details relative to towers and curtain walls. Artillery pieces were mounted in

embrasures, static holes made through walls and parapets to enable the cannon to fire. Embrasures provided cover for artillery and crews, but reduced the field of fire both laterally and in elevation. The tall, straight walls of medieval castles, like Edinburgh Castle possessed natural dead zones where artillery fire could not reach and these dead zones could be exploited during an assault on the castle.

Historical documents allow us to infer the number, type and ranges of the artillery likely present in Edinburgh Castle in 1573 (see Table 4.4) (Douglas *et al* 1578: 248-261; Balfour *et al* 1566: 165-177). MacIvor estimates that by 1566 at least 25 artillery pieces had been mounted within the Castle's walls (MacIvor 1993: 60). Contemporary historical sources describe the eastern defenses of the 1573 Castle in some detail while leaving out other parts of the Castle (Johnson and Fleminge 1573; Errington 1573). This makes sense given that the eastern approach was the main and only viable approach for a large body of armed men and likely was the major factor in military planning for both attacker and defender.

David's Tower anchored the eastern defenses on the south, standing on rock outcrop above and behind the Spur on Castle Hill. The body of David's Tower may not have contained artillery, but a 3 inch (75mm) calibre 'moyane' was mounted on its top in 1562 (MacIvor 1993: 60; Balfour *et al* 1566: 166). This was a French 'couleuvrine moyenne', which had a 2.9 inch (74 mm) calibre and fired a 2 pound shot out to approximately 1300 yards (1189 m) (Guérout and Liou 2001: 231; Caldwell

1981: 60).[97] Being positioned atop David's Tower, this piece could theoretically be made to fire in any direction, giving it a 360º field of fire (Figure 4.9 Feature 1).

Extending from David's Tower toward the northwest, along the same line as the Forewall Battery of today, and terminating at the Constable's Tower was the Curtain Wall (Figure 4.9 Feature 3). In 1573, the Curtain Wall housed 6 "cannons, or such lyke peaces in loopes of stone, lookinge in the streatwarde" (Johnson and Fleminge 1573: 69). This battery was comprised of four French 6 ½ inch (165 mm) 'canon' capable of firing a 33 pound iron ball approximately 1700 yards (1554 m) (Balfour *et al* 1566: 166). Oldrieve (1914: 249) recovered 6 inch iron cannon balls (the difference being the windage) from water tanks behind the remains of the Curtain Wall that likely were intended for use by this battery. Included in this battery were two 'gross culverinnis' (MacIvor 1993:60; Balfour *et al* 1566: 166). These likely were either French 'grande couleuvrines' of 4 $^{11}/_{12}$ inch (132 mm) calibre that fired a 15 to 15 ½ pound iron ball approximately 1800 to 2000 yards (1646 m to 1829 m); or they were possible Scottish 'grose culverins' of similar size. The Scottish 'grose culverin' was a 4 ⅔ inch (118 mm) calibre cannon that fired an iron ball weighing around 16 pounds out to a maximum range of approximately 2000 yards (1829 m)

[97] A Scottish 'culverin moyen' was a 2 ¾ inch (70 mm) calibre artillery piece that fired a 3 pound iron ball 1300 yards. The next closest Scottish cannon in terms of size was 'double falcon', 3 $^{1}/_{10}$ inch (79 mm) caliber that fired a 4 pound iron ball out to approximately 1300 yards maximum range (Caldwell 1981: 60). There was great variability in Sixteenth Century artillery in terms of size and ballistic capability from one nation to the next. The Scots appear to have emulated the French nomenclature (Caldwell 1981: 32), but the artillery pieces themselves may not have matched size and capability.

(Guérout and Liou 2001: 231; Caldwell 1981: 60). This battery was mounted within embrasures set, presumably at regular intervals, inside the Curtain Wall. The construction of the embrasures limited the battery's field of fire, both on a horizontal plane and in elevation, to a sub-rectangular block extending to the east and northeast out approximately 1800 to 2000 yards (1646 m to 1829 m). The right sections of this battery fronted onto High Street and the left out over the eastern Nor' Loch. The embrasure adjacent to David's Tower survives and was excavated by Oldrieve (1913: 5-6, 1914: 243-247) in 1912-1913. Oldrieve described a "massive masonry wall" into which a "stone-built gun platform" (Oldrieve 1914: 243). The Curtain Wall angled 110° trending toward the northwest from its junction with the tower. The external face was comprised of ashlar and the gun port was aligned to fire directly down High Street (Oldrieve 1914: 243).The Curtain Wall terminated at the Constables Tower adjacent to the Laing Stairs, the primary point of entry into the Castle's Inner Ward (Figure 4.9 Feature 2). It is unknown if any ordnance was mounted within the Constables Tower at the time of the siege in 1573.

A 'second tier' of ordnance was placed in an open space on the summit of Castle Rock above and behind the Curtain Wall (Figure 4.9 Feature 5). Johnson and Fleminge (1573: 69) noted the presence of this artillery battery in their January 1573 survey and estimated that it stood 26 feet (8 m) above the Curtain Wall. This would place the battery on a line facing east between the Munition House (St. Margaret's Chapel) and St. Mary's Church. This battery consisted of 4 artillery pieces, 2 'cannon' and

2 ‘bastard culverins’ (MacIvor 1993: 60; Balfour *et al* 1566: 166). The Scottish or French ‘bastard culverin’ was quite a bit smaller than the ‘cannon’ (see above), but had a similar range. It was a 3 5/6 inch (97 mm) calibre artillery piece that fired a 7.2 pound (French) or 8 pound (Scottish) iron shot approximately 1600 yards (1464 m) (Guérout and Liou 2001: 231; Caldwell 1981: 60). It is unknown if this battery was protected by an enclosure of any type.

In the outer curtain wall on the north side of the Castle with their field of fire to the north were arrayed two additional cannons and two ‘couleuvrine moyennes’ (Figure 4.9 Below Feature 14). At the postern gate, in or near St. Margaret’s Tower at the northwest corner, were a saker and a falcon (Figure 4.9 Feature 15). These cannon had a maximum range of approximately 1400 yards (1280 m) and likely fronted to the northwest in the direction of the present intersection of Lothian Road and Princes Street. Along the western curtain wall, with a field of fire fronting west, the double cannon and an English culverine were mounted between the archery targets. From the archery targets on the west around to the south, back to the Royal Lodgings, were mounted an English saker, two moyans, a double falcon, and two additional moyans (Figure 4.9 Between Features 10 And 15) (Balfour *et al* 1566: 166-167). Several of these pieces were facing south to fire toward Grassmarket and Portsburgh, covering the road through the West Port.

Another artillery position was constructed inside Edinburgh Castle near the smithy building (Figure 4.9 Feature 14). This position was

observed by Nicholas Errington during a visit on 27 March 1573 (Errington 1573). The position consisted of a rampart fronted by a ditch that was constructed across the main avenue of approach from the Spur. It is unknown what how many and what type of artillery were placed here, but they were ideally placed to provide enfilade fire down the main entrance into the Castle.

Cover and Concealment - Castle Rock (Edinburgh Castle)

Cover

Edinburgh Castle in 1573 provided excellent protection from small arms fire. An enemy shooter would have to be dangerously close, within 100 yards (91 m) or so, of the Castle walls to have a realistic chance of hitting a target with an aimed shot. Volley fire could be more effective by virtue of increasing the volume of fire. The Castle's walls, however, were thick enough to withstand the shot from both harquebus and caliver and, if crenellated and loop-holed, would have greatly reduced the exposure of an individual on the parapet.

Protection from artillery fire was another matter. The Edinburgh Castle of 1573 was in many respects still a medieval castle, construction beginning in 1336, an earlier structure having been razed by forces loyal to Robert the Bruce in 1314 (MacIvor 1993: 35-37). The curtain walls and towers were tall, thin, and rose perpendicular to the ground surface, providing inadequate cover from artillery of the sixteenth century. This

weakness was recognized and steps were taken to ameliorate it. Following the Earl of Hertford's siege of Edinburgh in 1544, a program was undertaken to improve the Castle's artillery defenses (MacIvor 1993: 56-58). In 1548, The Spur, a modern Trace Italienne style artillery fortification was constructed on the Castle Hill-Esplanade as part of a major strengthening of the Castle's eastern defenses (see below) (Tabraham, Suddaby & Neighbour 2014: 99; MacIvor 1993: 58). Also during the middle Sixteenth Century, the Curtain Wall connecting David's Tower and Constable's Tower was reconstructed with embrasures for gun emplacements (Tabraham, Suddaby & Neighbour 2014: 99; MacIvor 1993: 58). The base of David's Tower was substantially thickened by the addition of 2.5 meters of new interior walling particularly on the eastern side (Ewart & Gallagher 2014: 45). This survives almost intact in the northern chamber but was removed by Oldrieve in the south-east chamber during excavations in 1912-193 (Ewart & Gallagher 2014: 45). Johnson and Fleminge estimated that it would require 20 days after the first battery was placed for Edinburgh Castle to be subdued (Johnson and Fleminge 1573: 71). It ultimately took less than two weeks with all batteries in action (Anon 1573: 75). 1573 Edinburgh Castle has been reconstructed to give an idea of the Cover and Concealment available to Grange in Figure 4.9.

Concealment

In terms of protection from enemy observation, the Edinburgh Castle of 1573 would have differed little from what we see today. The Castle's Inner Ward upon the summit of Castle Rock is completely concealed from view

by the outer walls and buildings of the Castle. In 1573, however, the battery above the Curtain Wall between David's Tower and Constable's Tower would have been visible. Even with the aid of a spy glass, an observer on the summit of Arthur's Seat could not have improved the view. The Outer Ward, located below the summit on the west and north sides of Castle Rock, was likewise concealed behind a curtain wall. Although, this area was lower in elevation than the summit the height of the curtain wall blocked line of sight into the area from the north. The slope outside the curtain wall, however, was open down to Wallace's Cradle (Crane Bastion). This entire section could be observed from the heights across the Nor' Loch from Lochbank to the George Street Rise.

Obstacles - Castle Rock (Edinburgh Castle)

The obstacles of Castle Rock can be separated into natural and man-made, as regards the slopes of Castle Rock and Edinburgh Castle itself, but in both cases are classified as existing obstacles. The Nor' Loch is discussed below as it served as more of an obstacle interrupting movement toward the Castle Hill Esplanade and burgh of Edinburgh. The marshes bordering the Nor' Loch along its western border did interrupt movement toward Castle Rock and are considered as an obstacle here.

Castle Rock Slopes: The nearly vertical cliff faces on the north, west, and south (Figure 4.39; 4.40; 4.41) and the intrinsic strength of the basalt of

Castle Rock are discussed above. In 1573, the nearly vertical rise of these cliffs restricted approach to Edinburgh Castle to one of three avenues of approach discussed below. Of the three approaches, only the eastern approach could accommodate a large body of armed men attacking in formation. An attack could have been mounted along the secondary approach on the west, but it would have been a difficult climb, requiring the assault to be made in column. An obstacle that redirects movement into a particular avenue of approach is a turning obstacle.

Figure 4.39. Northern Cliff Face of Castle Rock Showing It as a Turning Obstacle (Photo by ©Craig J. Brown).

Figure 4.40. Western Cliff Face of Castle Rock (Photo by ©Craig J. Brown).

Figure 4.41. South Cliff Face Castle Rock from The Vennel (Photo by ©Craig J. Brown).

Edinburgh Castle: As a whole, the Edinburgh Castle of 1573 (Figure 4.9) possesses characteristics of both existing and reinforcing obstacles. The outer curtain wall was built to conform to the military crest on all but the

north side of Castle Rock. This was done in order to reinforce the defensive advantages conveyed by the height and nearly vertical cliff faces of the Rock. Conforming to the military crest, however, gave the Castle an asymmetrical ground plan that reduced interlocking fields of fire. The lack of interlocking fields of fire would have been a problem only if an attacker managed to gain the open ground, outside the curtain wall, on the north side of the Rock. Edinburgh Castle was constructed to protect Edinburgh as a permanent feature of the urban landscape. Indeed, the Castle is still there today. Being part of the cityscape is a characteristic of existing obstacles and this is how I have categorized the Castle in this case study. Edinburgh Castle further qualifies as a blocking obstacle. The intent of the Castle was to provide a secure refuge for the defense of Edinburgh.

Nor' Loch Marsh (North Marsh, West Marsh): The extent of the marsh land at the western end of the Nor' Loch in 1573 is unknown. It is certain, however, that it was there (Figure 4.4 East Of Feature 6). The marsh was part of the 1603 conveyance of ownership of the Nor' Loch from King James VI to the Town of Edinburgh (Fife 2004: 1). Maitland (1753: 171) writing in 1753, essentially describes the marsh as extending from the ruins of the Well House Tower west to St. Cuthbert's (West Kirk). It is possible that since the water level in the loch could be artificially controlled, the area encompassing the marsh changed size with a alteration in water level. With the springs and Craig Burn present, it is likely that the ground in this location was marsh prior to the formation of the Nor' Loch in 1450.

This circumstance means that the marsh was a natural feature and can be classified as an existing obstacle. The marsh would delay men moving through it, but there were roads along the banks. Mobility was likely diverted to the roads, which would categorize the marsh as a turning obstacle.

Avenues of Approach - Castle Rock (Edinburgh Castle)

Most people visiting Edinburgh Castle today can easily pick out the two approaches into the Castle: the Main Entrance on the east and a secondary entrance through a postern gate on the west side (Figure 4.10). In 1573, however, there were actually three approaches into the Castle. The third approach originated within the Well House Tower on the shore of the Nor' Loch and made its way into the Castle via a ladder attached to the northern cliff face. All three avenues of approach are classified as highly restricted for purposes of KOCOA based upon the nature of the obstacles associated with them (see above).

Eastern Approach: The principal avenue of approach into Edinburgh Castle is through the main entrance on the eastern side from the Castle Hill – Esplanade (Figure 4.9 Feature 13). In 1573, this avenue of approach was the only viable approach for a large body of armed men and consequently this is where the principal defenses of the Castle were concentrated. The main entrance to the Castle was through a gate in the

south wall of The Spur on Castle Hill. From this gate the approach made its way through The Spur and bent toward the northwest. It may have crossed a drawbridge at this point, but it continued until reaching the Humes-Porter Blockhouse. Once through the Humes-Porter Blockhouse the path led to the Portcullis Gate at The Constable's Tower (Driscoll and Yeoman 1997: 84-93).

Western Approach: A secondary avenue of approach exists via a postern gate on the west side of the Castle above what is now King's Stables Road (Figure 4.9 Feature 15). This postern gate is sited above a steep, but navigable slope in the northwest corner of the Castle. In the 16th century, St. Margaret's Gate stood in approximately the same spot as the present postern gate. This gate was where Mary Queen of Scots entered Edinburgh Castle upon her visit in 1561 (MacIvor 1993: 59). Until St. Margaret's Well was poisoned by Regent Morton in January 1573, Grange's garrison used this avenue of approach to procure water (Potter 2003: 121-122). Once inside St. Margaret's Gate, a cobblestone pathway led to the principal entrance through the Portcullis Gate in the Constable's Tower. This was likely the causeway excavated by Driscoll and Yeoman (1997: 43-49). The causeway was likely constructed and refurbished in two phases that appeared as a combination of flag stones (perhaps robbed from earlier structures) and tightly packed cobbles with kerb stones along the north and south edges (Driscoll and Yeoman 1997: 43-49).

Northern Approach: The third approach originated within the Well House Tower and provided a means of communication with the Castle via Wallace's Cradle (Crane Bastion) perched on the edge of the cliff above (Figure 4.9 Feature 16). This avenue of approach was uncovered and described during an archaeological excavation conducted by James Skene in 1822. What Skene observed can still be seen today (Figure 4.42). A set of stairs made its way from the Well House Tower to a nearby natural fissure in the basalt of Castle Rock. A ladder was fastened to the western face of this fissure that provided a precarious means of accessing Wallace's Cradle (Crane Bastion) above (Skene 1822: 471-472). Wallace's Cradle (Crane Bastion) stood outside the northern curtain wall of the Castle. Access to the Castle's outer ward may have been through a postern gate here, or through St. Margaret's Gate on the western side of the Castle. Skene was able to access this approach by excavating a bank of debris at the base of the fissure. During his excavation, Skene recovered human remains from a person that he interpreted as dying in a fall from the heights on this approach (Skene 1822: 472). It is possible that this bank is associated with the collapse of the eastern defenses and that the individual buried within was associated with the 1573 siege.

Figure 4.42. Photo of Wallace's Cradle Location Of The Third Or Northern Approach Into Edinburgh Castle. The Approach Led From The Wellhouse Or Wallace's Tower (Bottom Center), To A Ladder On The Cliff Face And Ultimately To The Crane Bastion Above (Photo by ©Craig J. Brown).

Key Terrain - Castle Hill-Esplanade[98]

The underlying geology of the Castle Hill-Esplanade (Figure 4.4 Feature 2; Figure 4.7 Feature 2) is different from that of Castle Rock. The bedrock is comprised of alternating sequences of sandstones, averaging between 0.30 and 0.60 meters thick, interbedded with calcareous mudstones and shales characteristic of the Ballagan Formation, a part of the Inverclyde Group, and Tournaisian in age (Carboniferous, c. 350 mya) (Krabbendam and Callaghan 2013: 1, 5-6; Donnelly et al 2005: 120). At the western edge

[98] The Esplanade of today did not exist in 1573. It was created during the middle Eighteenth Century in order to construct a parade ground for Edinburgh Castle. I use the term 'Castle Hill Esplanade' to refer to the space between the top of High Street on the east to Castle Rock on the west. I do this in order to differentiate it from that part of Castle Hill from the top of High Street on the west to the Lawnmarket on the east.

of the Castle Hill-Esplanade the sedimentary strata are displaced by a sub-vertical fault (Castle Hill Fault) caused by the intrusion of the basalt plug of Castle Rock. Contact with the molten basalt created a metamorphosed zone consisting of hornfels and marly shales (Krabbendam and Callaghan 2013: 7-8; Donnelly et al 2005: 120; Ruckley 1997: 17-18; Tait 1945: 31). Engineering properties vary across the individual sandstones strata (Donnelly et al 2005: 120), leaving the Castle Hill bedrock intrinsically weaker than the basalt of Castle Rock. Mining operations targeting Edinburgh Castle could be successfully undertaken from Castle Hill until those operations crossed the Castle Hill Fault and encountered the metamorphosed zone and basalt of Castle Rock.[99] Borehole tests conducted during 1975 and 2008 revealed that the sandstone bedrock is overlain in some areas with glacial drift deposits composed of sandy clay and gravel (Tabraham, Suddaby & Neighbour 2014: 99; Donnelly et al 2005: 123; Sissons 1971: 188). The thickness of these deposits vary from 0.5 meters on the eastern end of the Esplanade to 13.6 meters in the northwest corner, with an average of between 2 meters to 5 meters across most of the site (Tabraham, Suddaby & Neighbour 2014: 99). These glacial deposits mark the natural ground surface at the time of the 1573 siege. The boreholes also revealed that the size and height of the Esplanade today is the product of an extensive layer of fill brought in

[99] This is precisely what happened to Oliver Cromwell during his siege of Edinburgh Castle in 1650 (Corsar 1949: 44). "Cromwell had recruited Scottish miners from Prestonpans and Glasgow to begin a mine to enable him to take the Castle. By the time he returned from the western excursion to Glasgow, the mine had been going for three weeks and was said to be only fifteen yards from completion, but from then on the rock was impossible to penetrate" (Grainger 1997: 68).

during the 1750's to bury the remains of the Spur and construct a parade ground for the Castle (Tabraham, Suddaby & Neighbour 2014: 107-108). The thickness of the fill layer varies from 9 meters to 10 meters along the north and south edge of the Esplanade to roughly 3 meters near the remains of the Spur (Tabraham, Suddaby & Neighbour 2014: 106; Donnelly et al 2005: 123). The Spur protected the main entrance to the Castle (Figure 4.9 Feature 4 and 13).

Observation and Fields of Fire - Castle Hill-Esplanade

Observation

Observation from the Castle Hill Esplanade is interdicted to the west by Edinburgh Castle perched atop the higher elevation of Castle Rock, as well as to the east by the buildings of Old Town Edinburgh running along the Royal Mile (High Street). The viewshed to the north or south depends upon where the observer is positioned on Castle Hill-Esplanade. An observer positioned at either the north or south edge of the Esplanade is greeted with a 180º panoramic viewshed from sky to valley floor. An observer positioned at the center of the Esplanade has a restricted line of sight, both laterally and in declination. This was true in 1573 as it is today.

In 1573, the ground surface of the Castle Hill-Esplanade was several meters lower than it is today. The difference in elevation may have been negated by the height of the Spur, which Johnson and Fleminge (1573: 69) estimated at nearly twenty feet high (6 m). If Johnson and

Fleminge's estimate is accurate, an observer standing on the parapet of the Spur would have had a viewshed approximating that of the Esplanade surface today. The view to the north would have taken in the northern portion of the Nor' Loch, all of Lochbank (Princes Street), most of the length of the Lang Dykes (Rose Street), all the way up the George Sreet Rise and beyond to the Firth of Forth (Figure 4.43). In 1573, this land was open farmland and sparsely populated. There would have been a slight shadow effect created in the lee of the George Street Rise, as well as along the base of the Castle Hill-Esplanade itself. Individuals immediately behind these rises in elevation would have been concealed from observation. There would be some obstruction of the viewshed to the east and west (as described above), but the view would have been nearly 180º. The viewshed to the south in 1573 would have suffered from similar

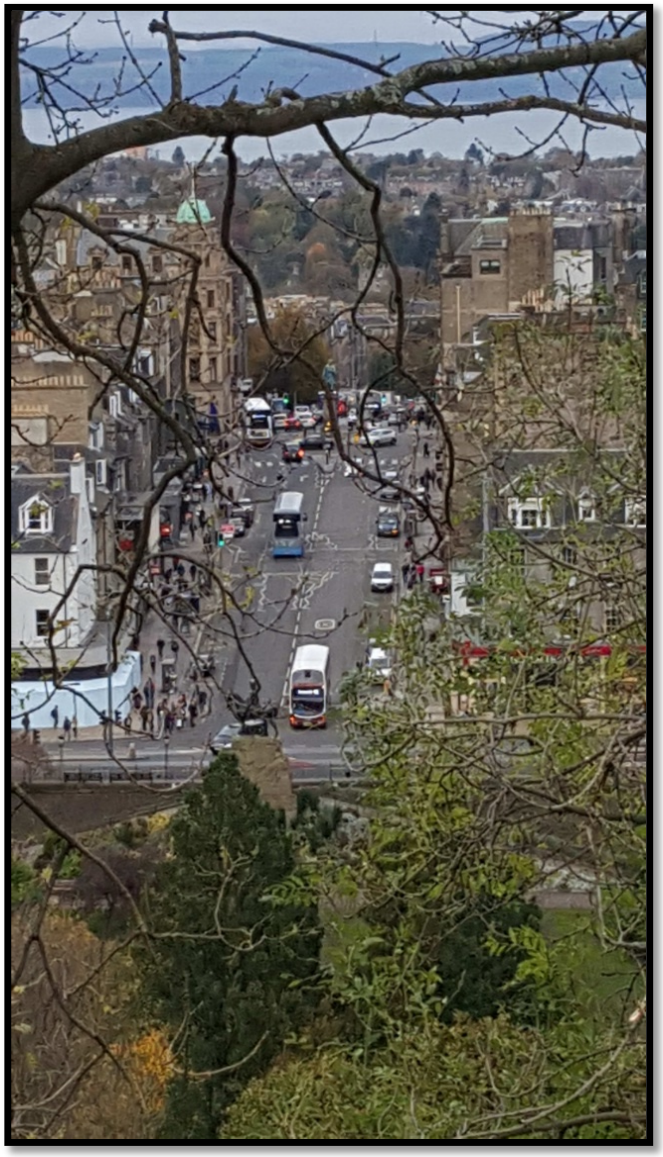


Figure 4.43. Photo From Castle Hill-Esplanade Looking North Up Frederick Street From Princes Street (Lochbank) To George Street (George Street Rise) Depicting Beneficial Change In Elevation For Sutton's Mount (Photo by ©Craig J. Brown).

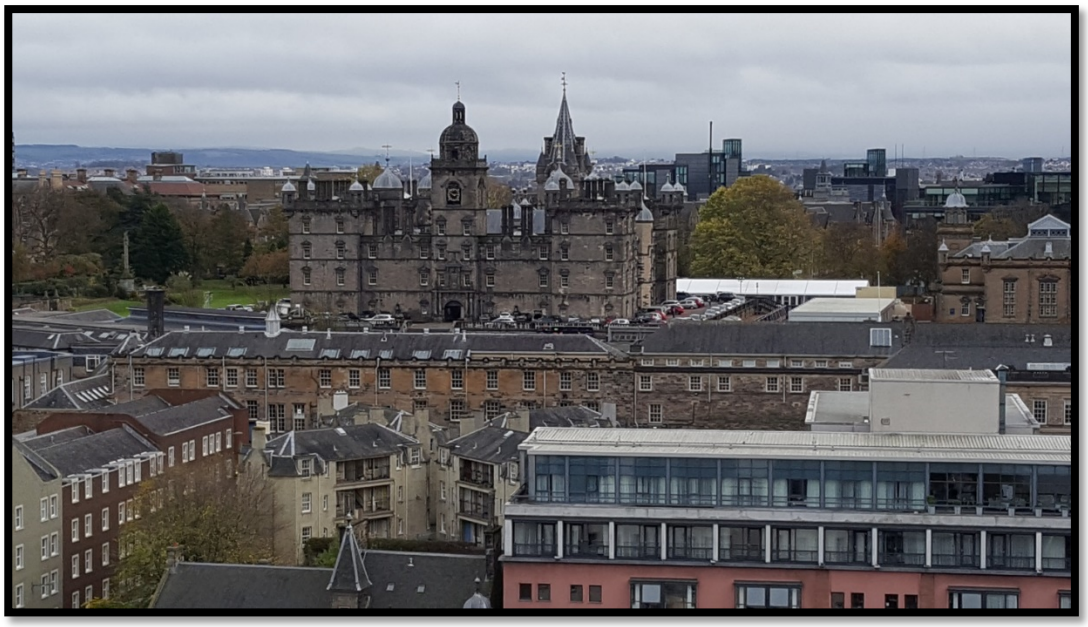


Figure 4.44. Photo From Castle Hill-Esplanade Looking South Over Heriot's School (Lauriston-High Riggs Rise) Where The Regent's Mount Was Likely Located (Photo by ©Craig J. Brown).

constraints, however the shadow effect in the near foreground would have been somewhat lessened by the more gentle slope on that side. At the base of Castle Hill-Esplanade, all of Grassmarket would have been visible. On the heights beyond, the farming estates of High Riggs (Lauriston Place) with Greyfriars Kirkyard plainly visible (Figure 4.44).

Fields of Fire

Artillery and small arms firing from the Spur had their fields of fire limited by the range and declination of the weapons themselves. The number, type and placement of the artillery within the Spur at the time of the 1573 siege is unknown. The height and ground plan of the Spur ultimately determined its artillery's field of fire. If the Spur resembled Thomas Carlisle's 1548

drawing, artillery positioned in battery along the northeast and southeast walls would have been effective at sweeping the corresponding corners of the Esplanade, where Ramsay Gardens and the Cannonball House are today. There would have been an area of dead space in front of the apex of the Spur which its artillery could not reach. This dead space may have extended as far as the opening of High Street or until it intersected the field of fire of the artillery from David's Tower and the Curtain Wall of the Castle proper. There would also be an area of ground in front of the walls of the Spur where the artillery would not be able to cover due to being unable to depress the muzzles of the cannon. This space would have been covered by either hackbut or artillery placed in the demi-bastions depicted in Carlisle's 1548 drawing.

If, contrastingly, the Spur resembled the depiction in '*The Facsimile*' (Anon 1573: 75) or the '*Plan of the repaired Spur*' (Ewart and Gallagher 2014: 102) the artillery's field of fire would have been directed more toward the north (Figure 4.43) and south faces (Figure 4.44) of the Castle Hill-Esplanade. In this configuration it would have been possible to direct fire onto the heights above the Nor' Loch along Lochbank (Princes Street) and the High Riggs above Grassmarket. The Spur would still have the same dead space at its apex, this is a characteristic of the Trace Italienne style. This dead space would actually be larger in this configuration due to the angle of the Spur but could have been covered to a degree by David's Tower and the Curtain Wall. The tip of the Spur uncovered during excavations in 2009-2011 does not solve this debate. The Spur appears to

have been constructed predominantly of yellow sandstone with ashlar facing (on the south the facing appeared to be black basalt). The southern exposure was 8 meters long east to west with another 2 meters estimated to lie outside the trench to the east. The section measured 2 meters in width. This point was rather sharper than the rounded point expected for the 1573 Spur (Tabraham, Suddaby & Neighbour 2014: 106). It must be remembered, however, that the Spur that was uncovered represent its final configuration. The Spur had seen conflict and subsequent repairs on multiple occasions following the 1573 siege.

Infantry stationed within the Spur, in either configuration, would lend fire support to the artillery in a similar field of fire, but could also eliminate much of the artillery's dead space because the 'hackbut' was portable. Their primary purpose, however, was to keep the walls clear of assailants. The 'hackbut', whether arquebus or caliver, was not an accurate weapon above 30 meters, but could deal horrific damage out to 100 meters (or more) when fired in volley. These weapons could bring fire to bear upon the entire Esplanade and the upper reaches of the southern slope occupied by the Castle's kitchen gardens. Flankers on either side of The Spur could fire along the walls to keep them clear of attackers (Johnson and Fleminge 1573: 69).

For the allied forces of Regent Morton and Marshal Drury, the Castle Hill-Esplanade provided a dangerously exposed, yet ideal position for directing fire upon Edinburgh Castle's main entrance and eastern defenses. Attacking artillery positioned on Castle Hill could only be placed

at the Esplanade's eastern end. This placement was well within point blank range of cannon in The Spur (approximately 50 meters) and Castle (approximately 100 meters), however, the reverse was also true. Infantry occupying trenches here would effectively cut the Castle off from Edinburgh via the High Street. Small arms fire could sweep the Esplanade to the west save for those areas marked by the walls of the Spur.

Cover and Concealment – Castle Hill-Esplanade

In 1573, the Esplanade area of Castle Hill offered little in the way of cover or concealment. The summit was open with clear lines of sight and fields of fire around the Spur. An observer within David's Tower, or atop the adjacent Curtain Wall, would have been able to see and direct small arms fire into the entire Esplanade, save for that small strip of ground in the lee of the walls of the Spur. The small ravine shown on Gordon's 1647 '*Edinodvnesis Tablum*' (Figure 4.29, Appendix 4.1), if it existed in 1573, would not have offered respite due to the proximity and height of the Spur and David's Tower. The northern side of the Castle Hill-Esplanade may have offered minimal cover and concealment to soldiers moving along its base so long as the military crest on that side remained unoccupied. Silence and the cover of night would increase the odds of remaining undetected. The southern slope likewise offered only minimal cover or concealment. A portion of the slope was occupied by the Castle's kitchen gardens, which may have offered some hope of concealment to

individuals, however, the entire slope was within view of the Castle's Royal Lodgings and David's Tower, if not of the Spur as well. There may have been some light structures associated with the gardens, but these would not have offered any real cover from artillery and only minimal to small arms of the period.

Man-made fortifications provided the only bona fide cover and concealment on the Castle Hill-Esplanade. The Spur (Figure 4.9 Feature 4) provided cover from enemy artillery (direct fire at least, mortars, which the attackers had, could lob shells over the walls). Johnson and Fleminge during their January scout observed that the Spur's walls had been strengthened with turf and gabions (Johnson and Fleminge 1573: 69). Nicolas Errington, on a visit in March 1573, reported "they have cut off the fore part of the Spur, which was before made of timber and boards, and now have made one high wall of lime and stone to cover them withal" (Errington 1573: 534). This supports the height of the Spur's walls, reported by Johnson and Fleminge (1573: 69) as being "lyke xx foote h[ye]," which would have concealed the interior from observation.

Prior to the expiration of the truce on 1 January 1573, Morton's Scottish Kingsmen had constructed a trench line and bulwark across the eastern end of the Esplanade in front of the arch to the opening of High Street (Figure 4.11 Feature 1). This trench was likely a meter or so deep and fronted with gabions. The construction of these defenses would provide sufficient cover from small arms fire, if one was careful, but artillery fire, particularly from the Spur a mere 50 yards away (and if the Spur was

configured like Carlisle's 1548 drawing) could have been another matter. This trench was vulnerable to sorties from the Spur until the arrival of Drury's reinforcements brought additional men and artillery.[100] A large bulwark of earth, turf and dung had been constructed across the head of High Street to provide cover from the Castle's artillery (Potter 2003: 120). This bulwark was large enough to provide the added benefit of concealing whatever was behind it. Similar bulwarks were constructed at Lawnmarket and at St. Giles Cathedral in order to protect townsfolk moving on the High Street ('*News out of Scotland*' 29 January 1573; Grant 1849: 326).

Obstacles – Castle Hill-Esplanade

Although compact and less imposing than the adjacent heavily fortified Castle Rock, the Castle Hill-Esplanade nevertheless possessed formidable obstacles. The northern slope may have been steeper in 1573 than it is today due to fill being deposited during construction of the parade ground in 1750. Together with the Nor' Loch at its base, this slope redirected the majority of traffic east into Edinburgh proper or west around the base of Castle Rock and into Grassmarket via the West Port. The summit (Esplanade) was open on the east, but the ground was a bit uneven. The western half was occupied by the Spur, a formidable artillery fortification constructed in the 'Trace Italienne' style. The presence of the Spur highly

[100] Grange overran these trenches on multiple occasions prior to 20 April 1753. The latest was the sortie was on 15 March, when Grange was successful in destroying the Kingsmen defenses on the east side of the Castle Hill Esplanade (Potter 2003: 127).

restricted movement across the otherwise open summit into Edinburgh Castle. What follows is a discussion of the obstacles present in 1573 on the Castle Hill-Esplande beginning with those on the summit.

The Summit

The Spur: The Spur (Figure 4.9 Feature 4) was originally constructed in 1548 during the 'War of the Rough Wooing' as designed by the Italian military engineer Migliorino Ubaldini (Tabraham, Suddaby & Neighbour 2014: 99; MacIvor 1993: 58). Ubaldini had been sent to Scotland by King Henri II of France, prospective father-in-law to Mary Queen of Scots at the time, to upgrade the Castle's defenses using the latest style of artillery resistant angle bastion (Trace Italienne) architecture. Ubaldini's fortification became the centerpiece of Mary Queen of Scots formal entry procession into Edinburgh in 1561 (MacIvor 1993: 58-60).

Ubaldini constructed the Spur to serve as an obstacle whose primary purpose was, as Hume of Godscroft wrote in 1644, "to defend the entrance and gates of the Castle" (Hume 1644: 327). In this capacity, the Spur is properly classified as an existing and blocking obstacle at the time of the 1573 campaign. Existing obstacles can be man-made obstacles that are considered permanent and interdict movement, such as buildings, towns or castles. The Spur was intended to serve as a permanent artillery fortification integrated into Edinburgh Castle's eastern defenses. It served in that capacity for over 100 years until its demolition in 1649-1650

(Tabraham, Suddaby & Neighbour 2014: 104). Although an argument can be made for classifying the Spur as a fixing obstacle, the intent of the fortification was not to delay or hold an attacker in position, but to deny or block an attacker from gaining access to the interior of Edinburgh Castle. The outermost gate of the main avenue of approach into the Castle was located in the southern wall of the Spur (Figure 4.9 Feature 13) (Johnson and Fleminge 1573: 69). The intent of the Spur was to control who entered and who left the Castle at that point.

The Ravine: The small north-south ravine shown on Gordon de Rothiemay's (1647) 'Edinedvnesis Tablum' (Figure 4.29, Appendix 4.1) near the tip of the Spur is something of an enigma. The same borehole tests that revealed the underlying geology of the Castle Hill-Esplanade (Tabraham, Suddaby & Neighbour 2014: 99; Donnelly *et al* 2005: 120-125) revealed that the ravine had originally possessed a "shallow convex profile" sloping down toward the west. The inference was made that this ravine occupied a low spot naturally eroded into the soft bedrock at that location (Tabraham, Suddaby & Neighbour 2014: 99). As a natural terrain feature the ravine can be classified as an existing obstacle. The difficulty arises in assessing the potential impact, if any, the ravine would have had on an attacker approaching the Spur. Johnson and Fleminge made no mention of this ravine in their examination of the Spur in January 1573 (Johnson and Fleminge 1573: 69). Nicolas Errington likewise omitted any mention of the ravine in his description of the spur during his visit in March

(Errington 1573: 533-534). It is possible that it was either regarded as being insignificant or had been filled in leveling the ground for the construction of the Spur in 1548. If the ravine still existed in 1573 as shown in Gordon de Roth Rothiemay's (1647) 'Edinedvnesis Tablum', it should be classified as a disrupting obstacle as it would most likely have served to interrupt the pace of advance and break up formations. The ravine would not have offered cover due the height of the walls of the Spur and David's Tower.

The Northern Slope

The Northern Slope: The northern slope of the Castle Hill-Esplanade (Figure 4.4 Feature 2) may have been steeper in 1573 and did not appear to have had a path giving direct access to the summit, although Maitland is of the opinion there was one (Maitland 1753: 172). A plan of the area dating to 1725 indicates the presence of a quarry, but the date of the quarry is unknown (Rothiemay's (1647) 'Edinedvnesis Tablum'). Borehole tests reveal that much of the present appearance of the Esplanade is due to the construction of the parade ground in 1750 using fill excavated from the City Chambers (Tabraham, Suddaby & Neighbour 2014: 107-108; Donnelly *et al* 2005: 126). As a natural terrain feature the northern slope of the Castle Hill-Esplanade is classified as an existing obstacle. The steepness of the slope did not deny access to the summit in and of itself, however, easier avenues of approach existed to the east and south. In that

sense, the northern slope acted as a turning obstacle diverting movement to the more accessible avenues of approach.

The Nor' Loch: The Nor' Loch (Figure 4.4) was an artificial loch that occupied the valley to the north of Edinburgh in what is now Princes Street Gardens. This artificial loch existed for approximately three hundred years, from around 1450 to 1816 (Tait 1945: 29).[101] The Nor' Loch was created by damming Craig Burn, a tributary of the Tummel (or Tumble) River, near to where North Bridge is today. Craig Burn originated in what is now Atholl Crescent and flowed east into the marsh in the valley near St. Cuthbert's Kirk. There the burn was joined by waters arising from the springs at the base of Castle Rock before continuing eastward to join the Tummel (Fife 2004: 7).

The purpose in creating the Nor' Loch was defensive, to act as a pseudo-town wall on the northern side of Edinburgh (Maitland 1753: 171-172). To that end, the Nor' Loch is more properly considered as an obstacle protecting the burgh of Edinburgh, but is included here because it also covered the Castle Hill-Esplanade area. The true extent of the Nor' Loch in 1573 is unknown. It is not believed to have been particularly deep; its depth and extent was controlled by a sluice gate in the dam (Fife 2004: 7-9). It is likely, however, that the Nor' Loch extended from the area of the

[101] There is evidence of a natural loch existing in the same location following the last Ice Age (Fife 2004: 6-7; Sissons 1971: 194; Tait 1945: 28-29). There is some evidence to suggest that the artificial Nor' Loch was older than 1450 (Fife 2004: 2-4).

North Bridge to the area around the Well House Tower, perhaps extending a short distance around the western face of Castle Rock. The waters of the loch were bordered by marsh and bogs in this area.

The Nor' Loch was intended to be a permanent defensive feature of Edinburgh, classifying it as an existing obstacle for purposes of KOCOA. An argument can be made for classifying it as a reinforcing obstacle based upon the fact that it was man-made and functioned as an augmentation to the steep slopes on the northern side of Castle Rock and Castle Hill. As Maitland wrote, however, "the said *Nord Loch*, as aforesaid, was made at the fortifying of *Edinburgh*, about the Middle of the fifteenth century, to save the Expence of a Wall on that Side" (Maitland 1753: 172). It should be remembered that the area that became the Nor' Loch was marshy and difficult to traverse before the loch was made. Since the intention was to have the Nor' Loch function as a permanent town wall fortification for the burgh of Edinburgh, it is properly classified as an existing obstacle.

The intention of having the Nor' Loch function as a pseudo-town wall means that it should be further classified as a blocking obstacle. Town walls are constructed as a fortification to control access to a town. They are meant to protect the population of the town within by keeping an attacker out. In the case of the Nor' Loch, however, the intent could not be fully realized. Anyone who possessed a boat could have made their way across with minimal hazard from the Castle's artillery as portions of the water surface were beyond the Castle's field of fire. Movement into and out of Edinburgh became easier during the winter months when the Nor' Loch

was frozen. Kirkcaldy's Queensmen used the frozen loch to escape pursuers on at least one occasion (Potter 2003: 48). Morton (before he became Regent) conceived a plan to march across the ice and assault the Castle directly from the north, but never put the plan into action ('Morton's Demands', 25 November 1571).

The Southern Slope

Kitchen Gardens: The gardens present on the lower half of the southern slope of the Castle Hill-Esplanade are difficult to assess for purposes of KOCOA. Contemporary sources do not mention them and the 'Facsimile of a Plan of the Siege of the Castle of Edinburgh, May 1573' (Anon 1573: 74) shows only a bare slope. The gardens, however, were present in 1573 and, in fact, there were likely two sets. Gordon's 1647 'Edinodvnensis Tabulam' (Figure 4.29) does depict the Castle's kitchen gardens on a possibly terraced section of the southern slope above the gardens or yards belonging to the buildings fronting onto Grassmarket. The lower gardens and yards likely were demarcated by boundary walls. Both sets of gardens extended from the interior of the Flodden Wall on the west to Castle Wynd on the east (Malcolm 1925: 101).

In each case the gardens were a part of the permanent urban landscape and are classified as existing obstacles. They would not have proved to be a deterent to a large body of armed men seeking to gain the summit of the Castle Hill-Esplanade from the southern slope. Stonewalls,

boundary fences, or other structures, if they existed in 1573, could disrupt timing of a march and break up linear formations. In this case, the gardens are properly classified as disrupting obstacles for purposes of KOCOA.

The same is true for buildings fronting on Grassmarket to which the lower gardens belonged. As a permanent part of the urban landscape, they can be classified as existing obstacles. They would likewise disrupt the timing of a march and break up a line of battle. This is assuming that the buildings were still standing. The area of Grassmarket at the base of the southern slope of the Castle Hill-Esplanade was put to the torch by Kirkcaldy during his sortie on the night of 12 February 1573. Grange overran Morton's trench on the eastern end of the Castle Hill-Esplanade and moved down Castle Wynd toward the West Port, setting fire to the buildings as he went. Wind caused the fire to spread engulfing all of Grassmarket (Potter 2003: 125; Grant 1850: 110, 1849: 327-328; Anon 1825: 128). The condition of the buildings along the base of the southern slope on 20 April 1573 is unknown.

Avenues of Approach– Castle Hill-Esplanade

The designation of the Castle Hill-Esplanade area as key terrain is due to the fact that this diminutive high ground is the Main Avenue of Approach to Edinburgh Castle and the only approach that could accommodate a large body of armed men moving in line of battle to assault the Castle. The majority of the Castle's defenses in 1573 were oriented toward the Castle

Hill-Esplanade approach and had to be neutralized in order for an assault on the Castle proper to proceed.

Eastern Approach: In 1573, as it is today, the principal Avenue of Approach to the Castle Hill-Esplanade was from the east via High Street (Royal Mile) (Figure 4.10). The buildings on either side would have constituted a mobility corridor less than a company wide that severely constricted the approach march of a large group soldiers to a column in the street itself. At the time of the siege of 1573, the traverse bulwark erected at the head of High Street by Regent Morton provided cover and concealment for this approach (Figure 4.11 Feature 1). Without this protection, artillery fire from the Castle's Curtain Wall could potentially enfilade an approaching column, in effect making this highly restricted terrain. Wooden buildings near the Esplanade offered concealment, but little in the way of cover from the Castle's artillery. At any rate, the homes along Castle Wynd at the eastern end of the Castle Hill-Esplanade had been razed by Kirkcaldy during his sortie on the night of 12 February 1573 (Grant 1850: 110, 1849: 327-328).

Southern Approach: A second Avenue of Approach existed through the kitchen gardens on the southern slope of the Castle Hill-Esplanade (Figure 4.10). This terrain would be restricted by the gardens themselves but would have been wider and in many ways more suitable for an

approaching line of battle.[102] These gardens extended approximately 100 meters from Castle Wynd on the east to the Flodden Wall on the west. This space would allow an attacking column to change formation to a line of battle before ascending the hill to make its assault. Depending upon the success of a preliminary bombardment, or the alternative configurations of the Spur (see Fields of Fire above), artillery fire may not have been a major factor here. A 'Facsimile of a Plan of the Siege of the Castle of Edinburgh, May 1573' (Anon 1573: 74) implies that this scenario is what occurred.

Key Terrain – George Street Rise (Newtown, Edinburgh)

The ridge of high ground currently occupied by George Street in Newtown, Edinburgh can be designated as Key Terrain for the Kingsmen based upon line of site and field of fire toward Edinburgh Castle from the summit of this ridge (Figure 4.7). The George Street Rise herein refers to the slope of land from George Street south to Princes Street Gardens. It is of the same sedimentary structure as the Castle Hill Esplanade (see above) (Sissons 1971: 190). In 1573, this area was open farm and park land encompassing the northern shore of the Nor' Loch (Lochbank) (Figure 4.7). The summit of this ridge stands at 246 feet (75 meters) above sea level. Occupation of the summit possessed a good line of sight and firing elevation for artillery being employed against the north side of the Castle.

[102] This approach still constituted a less than company wide mobility corridor.

Observation and Fields of Fire – George Street Rise (Newtown, Edinburgh)

Observation

The line of sight from the George Street Rise was impaired by the northern curtain wall of Edinburgh Castle and military crest of the Rise itself. An observer on the summit of the Rise would essentially see the curtain wall and tops of larger buildings, such as David's Tower. The top half of the northern cliff would have been in view, but the military crest of the Rise would have blocked the remainder of the view to the valley floor.

Field of Fire

The summit of the George Street Rise would have provided a good field of fire for an artillery battery employed against the north side of the Castle. The elevation of 246 feet (75 m) provided a flatter trajectory for artillery fire and exposed more of the Castle as a target by decreasing the angle of fire. The military crest of the George Street Rise in 1573 was roughly analogous to the course of Princes Street today. The elevation at this point is approximately 213 feet (65 m) above sea level, 150 feet (46 m) lower than Edinburgh Castle. The military crest was approximately 200 to 220 yards (183 m to 201 m) across the Nor' Loch Valley from the Castle creating a steeper angle of observation and ballistic trajectory. Moving to the true summit of the Rise decreases that angle by increasing the elevation of the observer or artillery battery. The distance from the Castle

increases to approximately 360 yards (329 m), but this distance is still well within maximum artillery range of all cannon available to the Kingsmen. 360 yards (329 m) is still within the effective range of the great carthoun, culverines and demi-culverins within the Kingsmen artillery train (Figure 4.11 Feature 5).

Cover and Concealment – George Street Rise (Newtown, Edinburgh)

In 1573, the southern slope of the George Street Rise was open land offering little in the way of natural cover and concealment from artillery fire and observation from Edinburgh Castle. The military crest portion of the Rise was low enough in elevation that artillery from the Castle could fire directly into a trench line or battery mount making each untenable. This can be seen in Figure 4.43. The summit of the Rise could have been fortified and maintained. A trench line or battery mount would have provided cover through the flattening of the ballistic trajectory from the Castle and construction of the fortifications themselves. A limited area on the reverse (northern) slope of the Rise would offer complete protection from artillery fire and observation from the Castle (see above).

Obstacles – George Street Rise (Newtown, Edinburgh)

The George Street Rise possessed no appreciable obstacles to possession by a besieger of Edinburgh Castle in 1573. The Rise, however, did possess obstacles impeding attack by defenders sortieing from the

Castle. The northern slopes and the Nor' Loch would interdict movement against the George Street Rise in much the same way as they obstructed movement against the Castle (see above). The 1573 gradient of the George Street Rise is unknown. Levelling of the ground surface of Lochbank, the area of the Rise south from the Lang Dykes (Rose Street) to the shore of the Nor' Loch, may have increased the vertical aspect of the slope in this area. Regardless, this slope would have been a difficult, but not impossible climb for infantry. The principal obstacle on the summit would have been the trench and battery mounts constructed by the Kingsmen. These can be classified as reinforcing obstacles, having been constructed to take advantage the natural slope. They can be further classified as blocking obstacles, having been constructed to cut off the escape of Grange's garrison in the Castle.

Avenues of Approach – George Street Rise (Newtown, Edinburgh)

The George Street Rise is easily accessible via road and across country from Leith. The 'Lang Dykes' (Rose Street) bisected the area from east to west approximately 60 to 70 yards (55 m to 64 m) south of the summit (Figure 4.4) but was within the field of fire from the north facing artillery in the Castle. Movement from Leith could have been made across country, stone boundary walls and fences would not have prevented an army marching to the summit. The 'Lang Dykes' was part of the road network that circled Edinburgh connecting points north, south, east and west.

Key Terrain – High Riggs (Lauriston Rise)

The High Riggs – Lauriston Rise is the southern counterpart to the George Street Rise (Figure 4.7). This area of high ground occupied an isthmus of sorts between Grassmarket on the north and the Borough Loch (The Meadows) on the south. The axis of this ridge was analogous to the line of present Teviot Place and Lauriston Place. It was of the same sedimentary structure as the Castle Hill Esplanade and George Street Rise (Sissons 1971: 190). At approximately 312 feet (95 meters) above sea level, High Riggs possessed a better line of sight and field of fire toward the Castle than the George Street Rise. The summit was approximately 240 yards (219 m) from the south wall and buildings of the Castle, within the effective range of all artillery types available to Morton and Drury. The High Riggs – Lauriston Rise can be classified as Key Terrain for the Kingsmen based upon the line of sight and field of fire toward the Castle.

Observation and Fields of Fire - High Riggs (Lauriston Rise)

The High Riggs could have provided nearly 180° observation of the southern exterior of Edinburgh Castle (Figure 4.45). The Castle Hill Esplanade summit, to the east of the Spur, could have been seen, as well as the slopes containing the Kitchen Gardens. The view into Grassmarket and Portsburgh would likely have been obstructed by the built environment, however, that movement in the streets and open markets

would likely have been visible. The field of fire would have been similar. The entire southern face of Edinburgh Castle, from the eastward tip of the Spur to the western curtain wall, would have been exposed to batteries placed on the High Riggs. David's Tower and the Royal Lodgings would have been dangerously exposed to artillery fire from these positions.

Figure 4.45. Photo From Heriot's School Looking Northwest Toward Castle Depicting Observation And Field Of Fire For The Regent's Mount Likely Located Here (Photo by ©Craig J. Brown).

Cover and Concealment - High Riggs (Lauriston Rise)

The cover and concealment available on the High Riggs in 1573 was likely similar in nature to that offered by the George Street Rise. The northern slope of High Riggs would have been open offering little natural cover or

concealment. Artillery fortifications and trench lines would have been necessary to provide cover from the Castle's artillery. Greyfriars' burial ground occupied the eastern end of the ridge (Figure 4.4 Feature 8). Behind Greyfriars were the neighborhoods of Candlemaker Row and Potters Row. Movement through or behind those neighborhoods would have been protected from observation or artillery fire from the Castle. Like the George Street Rise, the reverse slope near the summit would offer protection from observation and artillery fire from the Castle.

Obstacles - High Riggs (Lauriston Rise)

The Flodden Wall occupied a portion of the base of the northern slope, enclosing that part of the High Riggs slope within Grassmarket. The height and thickness of the wall at this location is not known for certain. The purpose of the Wall was to act as a permanent defensive feature that controlled access to the city of Edinburgh. The Flodden Wall can be classified as an existing obstacle, being a part of the cityscape, and as a blocking obstacle, due the intent to control access. The Wall functioned as an obstacle for both combatants. The West Port, the principal western avenue of approach to the city of Edinburgh, was constructed at the base of the High Riggs slope. This gate could have been controlled by troops and artillery positioned on the western end of the High Riggs Rise. Trench lines and artillery battery mounts constructed along the summit of the Rise

would function as a reinforcing blocking obstacle intended to prevent the escape of those besieged within the Castle.

Avenues of Approach - High Riggs (Lauriston Rise)

The High Riggs Rise was accessible or circumvented by road. The Bristo Port gate in the Flodden Wall at the top of Candlemaker Row (near Bedlam Theater) allowed easy access to the Rise from the city. Thieves' Raw (Drummond Street and West College Street), a road running along the exterior of the Flodden Wall from east to west, connected with Old Dalkeith Road in the Pleasance. Old Dalkeith Road served as the main road connecting the principal Kingsmen bases at Leith, Holyrood Palace and Dalkeith. On the west, the Vennel ran along the outside of the Flodden Wall, between the West Port and High Riggs.

Key Terrain – Lothian Road (Ancient Castle Gardens)

In 1573, as it does today, the land to the west of the Edinburgh Castle forms a connection between the High Riggs and George Street Rise ridges. This area west of the Castle once served as the Gardens of the Castle (see above) (Malcolm 1925). The gradient of the slope in 1573 is unknown. Today, the slope along King's Stables Road is truncated by a short steep bank, into which is built a carpark. From the top of this embankment, the ground gently slopes upward to the west (Lothian Road and beyond). The elevation at the West Port, where it connects with the

High Riggs, is 262 feet (80 m) above sea level. The ridge descends to 236 feet (72 m) directly west of the Castle and to 233 feet (71 m) near the intersection of Lothian Road with Princes Street. The embankment runs quite close to the base of Castle Rock, 120 yards (110 m) on average, but near the carpark the distance is less. This ridge can be classified as key terrain for the Kingsmen because it completed their encirclement of the Castle and blocked the use of the western avenue of approach (Figure 4.7).

Observation - Lothian Road (Ancient Castle Gardens)

The area of Lothian Road provided a good point for observation of the western side of the Castle and its western avenue of approach. The best vantage point would have been along the top of the embankment, but this would have been dangerously exposed to both artillery and hackbut fire from the Castle. This position, however, would have allowed for close monitoring of King's Stables Road (Figure 4.46). The road may not have been in view from further west. The field of fire along the edge of the embankment is harder to assess. The ridge runs on a northwest to southeast diagonal. The northwest part of the ridge is where Lothian Road intersects with Princes Street near St. Cuthbert's Kirk. A battery placed in this position would have an excellent field of fire toward the western approach of the Castle. The area directly west of the Castle is

questionable for an artillery position due the elevation needed to bring fire on the Castle. There is a small area of higher elevation, 256 feet (78 m)

Figure 4.46. Photo Of King's Stables Road Looking South. Castle Is On The Left. The Lothian Road Elevation Is On The Right (Photo by ©Craig J. Brown).

above sea level, 240 yards (219 m) west of the Castle near present Usher Hall that would have been an excellent artillery position. An artillery battery here would have an excellent field of fire toward the Castle but would lose observation of King's Stable Road and greatly increase the distance covered by the trenches.

Cover and Concealment - Lothian Road (Ancient Castle Gardens)

The Lothian Road area in 1573 offered no real cover and concealment from artillery fire and observation from the Castle (see above).

Fortifications would have been necessary to protect against fire from the Castle.

Obstacles - Lothian Road (Ancient Castle Gardens)

In 1573, the Lothian Road area would not have offered appreciable natural obstacles to movement. This area once belonged to the orchards and gardens of the Castle (Malcom 1925) and likely retained that character. The Orchardfield placename once denoted this same tract of land and survived into the nineteenth century (Easton 1988: 5, 13). Trenches could have been constructed here to reinforce the natural embankment or slope. These tranches would have served to complete the encirclement of Grange's garrison in the Castle and block their escape to the west.

Avenue of Approach - Lothian Road (Ancient Castle Gardens)

In 1573, there were three avenues of approach to the Lothian Road area from the east. The 'Lang Dykes' intersected the Road to St. Cuthbert's (Kings' Stables Road) near to St. Cuthbert's Kirk before continuing west toward Colt Bridge. The 'Lang Dykes' allowed for east and west travel to gain access to the Lothian Road area on the north. On the south, the western approach (Bread Street) into the West Port gave access to the area on that side. The third approach was to move directly up the embankment from the Road to St. Cuthbert's (Kings' Stable Road).

Appendix 7.1 Cantabrian Wars Mentioned In Classical Sources and Their Relevance to the KOCOA Analysis of Monte Bernorio

The Cantabrian Wars are scarcely mentioned in classical historical sources. This is somewhat surprising, perhaps, given that the Cantabrian War of 26-25 BCE is the only known foreign conflict in which Augustus personally led Roman Legions in the field. The Cantabrian Wars may have received extensive narration beginning in Book 135 of Livy's *Ab Urbe Condita*. Livy was a contemporary historian of Augustus. His proximity to this important event during the reign of Augustus may have enabled Livy to record the Cantabrian War of 26-25 BCE in detail, which allowed for his work to become a reference for succeeding historians. Unfortunately, the portion of *Ab Urbe Condita* that likely contained Livy's writings of the Cantabrian Wars has been lost, leaving historians dependent upon classical sources derived, in part, from Livy. There are only three main classical sources of Greco-Roman origin containing accounts that can facilitate a historical reconstruction of the Cantabrian Wars: 1.) Lucius Annaeus Florus, *Epitome of Roman History*, Book II (Florus 1984; 2.33.49); 2.) Cassius Dio, *Roman* History, Book LIII and Book LIV (Cassius Dio 1990: 53.25.1-8, 54.11.1-7); 3.) P. Orosius, *History Against The Pagans*, Book VI (Orosius 2010: 6.21.5).

1.) Florus, L. A. 1984. *Epitome of Roman History.* Forester, S. E. (Trans.). Cambridge: Harvard University Press, 2.33.46-60 (343-349):

“In the west almost all Spain had been subjugated, except that part which adjoins the cliffs where the Pyrenees end and is washed by the nearer waters of the Ocean. Here two powerful nations, the Cantabrians and the Asturians, lived in freedom from the rule of Rome. The Cantabrians rose first and were more energetic and obstinate in their rebellion; not content with defending their liberty, they tried also to dominate their neighbours and harassed the Vaccaei, the Turmogi and the Autrigones by frequent raids. The news of their unusual activity induced Caesar himself to undertake an expedition instead of entrusting it to another. He came personally to Segisama, where he pitched his camp, and then, dividing his army into three parts, enveloped the whole of Cantabria and enclosed its fierce people like wild beasts in a net. Nor did he give them any peace on the side of the Ocean; for they were also assailed in the rear by attacks of his fleet. The first battle against the Cantabrians was fought under the walls of Bergida. From here they fled to the lofty peak of Mount Vindius, to which they though the Roman army was less likely to ascend than the waters of the Ocean. Next the town of Aracelium offered a stout resistance, but was eventually taken. The last incident was the siege of Mount Medullus. When it had been surrounded by a continuous earthwork extending over eighteen miles and the Romans were closing in on every side, the barbarians, seeing that their last hour had come, vied with one another in hastening their own deaths in the midst of a banquet by fire and the sword and a poison which is

there commonly extracted from the yew-tree. Thus most of them saved themselves from a captivity which was deemed more grievous than death itself by men who had hitherto never been conquered. Caesar received the news of these operations, which were carried out by Antistius and Furnius, his lieutenant-generals, and Agrippa, while he was wintering on the coast at Tarraco. Himself arriving quickly on the scene, he brought some of the inhabitants down from the mountains, secured the fidelity of others by taking hostages, and sold others, by right of conquest, into slavery. His success was considered by the senate to be worthy of a laurel crown and a triumphal chariot; but Caesar was now so mighty that he despised any glory that a triumph could bestow. The Asturians meanwhile had come down from the snow-clad mountains in a vast host. This attack seems not to have been undertaken without consideration by the barbarians; but they pitched their camp at the river Astura and, dividing their forces into three parts, prepared a simultaneous attack on the three camps of the Romans. With such brave enemies attacking suddenly and with so well-conceived a plan the struggle would have been doubtful and bloody-and I would I could think that the losses on both sides would have been equal-had not the Brigaecini acted as traitors and had not Carisius arrived with his army as a result of their warnings. To have frustrated the enemy’s designs meant victory, though, even so, the struggle was a bloody one. The well-fortified city of Lancea opened its gates to the remains of the defeated army; here such efforts were

needed to counteract the natural advantage of the place, that when fire-brands were demanded to burn the captured city, it was only with difficulty that the general won mercy for it from the soldiers, on the plea that it would form a better monument of the Roman victory if it were left standing than if it were burnt. This was the end of Augustus' campaigns as well as of the rebellion in Spain. After this we were able to rely on the loyalty of the Spaniards, and uninterrupted peace ensued as a result both of their natural disposition for the arts of peace and also of the wise measures taken by Caesar, who, dreading the confidence inspired by the mountains into which they were wont to retire, ordered them to occupy and cultivate the district in the plain where his camp had been; he urged that the council of the nation should be held there and the place regarded as the capital. The natural advantages of the place favoured his plan; for the whole district bears gold and is rich in chrysocolla, vermilion and other pigments; he, therefore, ordered that the soil should be tilled. Thus the Astures, digging deep into the ground in search of riches for others, gained their first knowledge of their own resources and wealth."

2.) Cassius Dio. 1990. *The Augustan Settlement (Roman History 53-55.9)*. Rich, J. W. (Ed. and Trans.). Wilts: Aris & Phillips Ltd., 53.25.1-8, 54.11.1-7 (55-83).

“[5] …Augustus himself campaigned against the Cantabri and the Astures at one and the same time. They would not surrender to him because of their confidence in their strongholds [6] and would not fight at close quarters because they were inferior in numbers and mainly javelineers. Whenever he made a move, they caused him many difficulties by continually seizing the high ground in advance and setting ambushes in the valleys and woods. As a result he was completely at a loss. [7] Falling ill from the physical exertion and axiety, he withdrew to Tarraco and convalesced there. Meanwhile Gaius Antisius continued the war with much success, not because he was a better general than Augustus, [8] but because the barbarians, despising him, closed with Romans and were defeated. He thus captured severl places, and later Titus Carisius took Lancia, the Asturians’ largest town, after it had been abandoned, and won many other places over (53.25.5-8).”

“[1] …As soon as Augustus left Spain, leaving Lucius Aemilius behind as governor, the Cantabri and Astures revolted. They sent to Aemilius and, without giving him any hint of their real purpose, said that they wished to present grain and other commodities to the army. [2] Taking a large number of troops ostensibly to transport the gifts, they brought them to places suitable for their purpose and massacred them. Their enjoyment of this success was, however, shortlived. The suppression of the revolt was quickly brought about by the ravaging of their land,

the burning of some of their forts and above all the cutting off of the hands of all those who were captured (53.29.1-2)."

"[1] At about the same time as these events took place in Rome, the Cantabri and Astures went to war again, the Astures because Carisius devoted himself to luxurious living and was cruel, the Cantabri because they saw that the Astures were in revolt and despised their governor Gaius Furnius, because he had recently arrived and they thought that he lacked knowledge of the local situation. [2] In the event he did not turn out like this, and both peoples were defeated by him (for he gave help to Carisius) and enslaved. Not many of the Cantabri were taken alive, for, when they despaired of freedom, they no longer wished to live. [3] Some set fire to their forts and then killed themselves, others chose to be burnt to death with the forts, and others took poison communally, so that the majority of them perished including the fiercest. The Astures, once they had been driven back when besieging a stronghold and then defeated in battle, abandoned resistance and were immediately subdued (54.5.1-3)."

"[2] …Having dealt with these problems, he went to Spain. The Cantabri who had been taken alive in the war and sold into slavery had each by themselves killed their masters; they had then returned home and induced many to join their revolt. With their help they had

seized and fortified places, from which they were threatening the Roman garrisons. [3] Agrippa marched against these rebels, but encountered trouble with his own troops as well. Many of the soldiers were ageing, worn out by the continuous warfare, and afraid of the Cantabri, regarding them as formidable enemies, and so they became mutinous. [4] Agrippa quickly restored them to obedience by a combination of threats, exhortations and promises. However, he suffered many reverses in his campaign against the Cantabri, for they had gained practical experience through being enslaved to the Romans and had given up hope of being spared again if they were captured. [5] Agrippa lost many of his soldiers and disgraced many others for being defeated (for example, he gave orders that a whole legion, which had borne the title Augusta, should no longer carry that name), but finally he killed almost all of the enemy who were of military age, disarmed the rest and obliged them to move down from their strongholds and live in the plains (54.11.2-5)."

3.) Orosius, P. 2010. *Orosius' Seven Books of History against the Pagans*. Fear, A. T. (Trans.). Liverpool: Liverpool University Press, 6.21.1-11 (311-312):

"[1] 726 years after the foundation of the City, when the Emperor Caesar Augusts was consul for the sixth, and Agrippa for the second, time, Caesar, realizing that little would have been achieved in Spain

over the last 200 years, if the Asture and Cantabrians, the two sturdiest Spanish tribes, were left to live by their own devices, opened the gates of the temple of Janus and marched to the Spains himself at the head af an army. [2] The Cantabrians and Astures live in the northern part of the province of Gallaecia by the end of the Pyrenees, not far from the second Ocean. [3] These tribes were not only ready to defend their own freedom, but even dared to take away that of their neighbours, frequently raiding the Vaccaei, Turmogi, and Autrigonae.

Caesar pitched camp at Segisama and by using three columns surrounded almost all of Cantabria. [4] A long period elapsed when the army was worn out for no purpose and often found itself in danger. Finally, Caesar ordered a fleet to cross the Ocean from the Aquitanian Gulf and land troops before the enemy realized what was happening, [5] The Cantabrians then fought a great battle under the walls of Attica, were defeated, and fled to Mount Vinnius, a natural stronghold. Here they were besieged and almost starved to death. Then the town of Racilium was finally captured and sacked after long and fierce resistance. [6] At the same time, Caesar's lieutenants, Antistius and Firmus, subdued by heavy and serious fighting the further-flung parts of Gallaecia whose mountains and woods run down to the Ocean. [7] Digging a ditch 15 miles long, they besieged mount Medullius which towers over the Minius river, and where a great host of men had taken refuge. [8] Then, when this naturally savage and indomitable race discovered that they had neither sufficient means to survive the siege

nor were equal to fighting a battle, their fear of slavery led them willingly to commit suicide, and so almost all of them killed themselves with fire, sword, or poison. [9] Now the Astures, who had pitched their camp by the river Astura, would have overwhelmed the Romans with their great numbers and cunning plans, had they not been betrayed and forestalled. They made a sudden attack intending to overwhelm Caesar's three lieutenants, who were separated with their legions into three camps, with three equally-matched columns of their own, but they were betrayed by their own people and discovered. [10] Afterwards, Carisius brought them to battle and, after heavy Roman losses, defeated them. Some of them escaped from the battle and fled to Lancia. When the troops had surrounded the town and were preparing to fire it, their commander, Carisius, persuaded his men not to do this and got the barbarians to surrender voluntarily. He made great efforts to leave the town safe and undamaged, so it could bear witness to his victory. [11] Caesar accorded this honour to his victory in Cantabria: he ordered that the gates of war be closed once more. And so, the gates of Janus were then closed for a second time by Caesar, this being the fourth time they had been closed since the foundation of the City (6.21.1-11)."

The three sources transcribed above likely contain the most complete information available in the classical historical sources that can be used to reconstruct the history of the Cantabrian Wars, but

they must be used with caution. These sources are rather problematic in terms of consulting them with the intention of performing a KOCOA analysis on Monte Bernorio. Significantly, as Syme (1970: 84-85) discovered during his reconstruction, the sources lack detail. The battles are not recounted and there are no real terrain cues that can be used to locate them on the modern landscape. Several place names are given, however, there is no real connection between those place names and their modern counterparts. In terms of KOCOA, this lack of detail renders the classical historical sources useful only in providing contextual background for the Roman attack on Monte Bernorio as an unrecognized component of the Cantabrian Wars.

The accounts of Florus and Orosius exhibit close similarity in their structure and presentation of events. It would seem that they were likely based upon the same source material. It is possible that their primary source was the now lost portion of Livy, or perhaps, the lost Autobiography of Augustus. Both Florus and Orosius appear to be conflating a series of events that took place over a period of years and are narrating only that segment of the campaign of 26 BCE that Augustus personally took part in. The activities of the other columns that Augustus divided his army into are not reported. The loss of the original source material utilized by Florus and Orosius makes it impossible to clarify their accounts and ascertain if there were terrain cues or battle accounts that would have been useful in performing the KOCOA analysis. Cassius Dio seems to have based his history of the

Cantabrian Wars on different source material, for he relates actions that occurred subsequent to the 26 BCE campaign of Augustus. That said, Cassius Dio did not provide any additional detail that would have been useful to the KOCOA analysis of Monte Bernorio. The three principle accounts of the Cantabrian Wars transcribed above provided context and were used to infer a possible date for when the Roman attack on Monte Bernorio occurred within the wider history of the Cantabrian Wars.

APPENDIX 6.2 Fought Under The Walls Of Bergida

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Fought under the walls of *Bergida*: KOCOA analysis of the Roman attack on the Cantabrian *oppidum* of Monte Bernorio (Spain)

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ABSTRACT

As conflict archaeology has matured as a discipline, there have been calls for more unified analytical techniques. Several researchers advocate the adoption of codified analytical and planning concepts used by the United States Army. One of these concepts, KOCOA Terrain Analysis, shows promise as a locational and analytical aid in archaeological contexts. Defining terrain features are identified and categorized according to well-defined terminology, allowing for a detailed analysis of the effects of terrain on military operations. KOCOA's structure and codification render the concept transferable between researchers and diachronically across different site types. KOCOA has only rarely been utilized outside the United States and only on historical battlefields. The ongoing archaeological research at the Monte Bernorio *oppidum* (Palencia, Spain) provides an opportunity to utilize KOCOA in a classical, proto-historical archaeological context.

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> Primum adversus Cantabros sub moenibus Bergidae proeliatum. Hine statim fuga in eminentissimum Vindium montem, quo maria prius Oceani quam arma Romana ascansura esse erediderant. – Florus (1984: 2.33.49)[1]

Introduction

Classical sources tell us that the first great battle of the *Bellum Cantabricum et Asturicum*, known colloquially as the 'Cantabrian Wars', was fought under the walls of *Bergida* in 26 BC, with the defeated survivors fleeing to distant Mount Vindius to find sanctuary (Florus 1984, 2.33.49; Orosius 2010, 6.21.5). The 'Cantabrian Wars' were a series of military campaigns waged by the nascent Roman Principate against the Cantabrian and Asturian peoples of northern Spain between 29 and 19 BC. Military operations, with the campaign of 26–25 BC under the personal command of the Emperor Octavian Augustus, were conducted primarily within the present Autonomous Communities of northern Castille y León (provinces of

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Burgos, Palencia, and León), Cantabria and Asturias (Figure 1). The Cantabrians and Asturians represented the last free peoples of the Iberian Peninsula. Classical sources state that it was the Cantabrians' frequent raiding against the neighbouring Vaccaei, Turmogi and Autrigones, tribes previously brought under the control of Rome, that was responsible for the conflict (Florus 1984, 2.33.47; Orosius 2010, 6.21.3). Some modern scholars dispute this justification, arguing that gaining control over the vast mineral wealth of the region, perhaps as a means for Augustus to finance further conquests and building projects, was the primary inducement for going to war (Curchin 1991, 52; Varga 2015, 72). Augustus had recently successfully concluded a costly civil war and the prosecution of a foreign war as a means of unifying and consolidating power within the new Principate must also be considered. The location of *Bergida* is not known with certainty, but the site has become most commonly associated with the Iron Age *oppidum* of Monte Bernorio (Peralta Labrador 2003, 264–265, 315–319; Torres-Martínez 2004, 79; Torres-Martínez, Fernández-Götz, and Sobremazas 2016, 167–170). In fact, in the last two decades archaeology has uncovered an increasing amount of archaeological data related to the Roman conquest of northern Spain (see overview in Camino, Peralta Labrador, and Torres-Martínez 2015).

The *oppidum* of Monte Bernorio (Villarén, Pomar de Valdiva, Province of Palencia) is one the largest and most significant Iron Age fortified sites in the Iberian Peninsula (see summary in Torres-Martínez et al. 2016). The settlement occupied the relatively flat summit and lower terraces of Bernorio Mountain, an oval-shaped limestone mound 1173 m high. At the end of the Iron Age, the top of the mountain was fortified by a wall-and-fill rampart, augmented in some areas with a substantial V-shaped ditch that encloses a 28 ha area. Moreover, the lower terraces were encircled by an impressive multi-vallate, discontinuous system of earthworks that raises the total fortified area to approximately 90 ha. Monte Bernorio is centrally located in the southern foothills of the Cantabrian Mountains, of northern Spain, in an area of transition to the Northern Inner Plateau (*Meseta*) of the Iberian Peninsula. The site occupies a strategic position overlooking an important intersection of natural transportation routes.

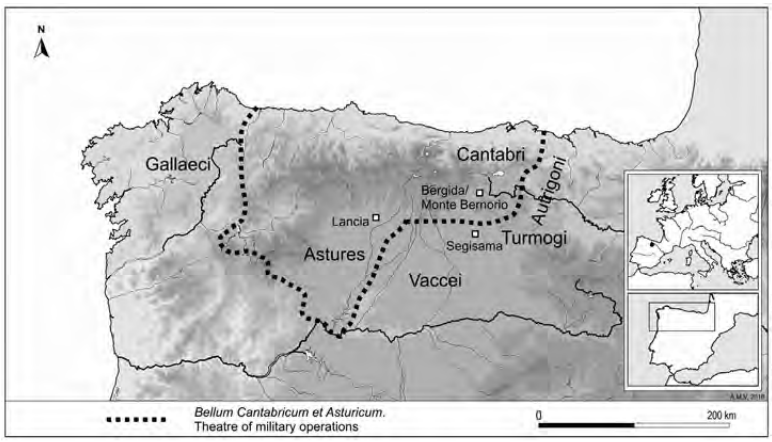

Figure 1. Theatre of military operations during the *Bellum Cantabricum et Asturicum* (Map drawn by IMBEAC Bernorio Project Team & A. Martínez-Velasco).

These routes allow north–south communication between the *Meseta* and the Bay of Biscay along an axis of advance Syme (1970) analysed in his work on the Cantabrian Wars. The east–west route connects the provinces of Asturias and Galicia in the west to the Pyrenees and Mediterranean, through the Ebro Valley, to the east. Archaeological excavations carried out over the years have revealed that the indigenous Iron Age occupation of Monte Bernorio ended in a clash with a Roman army, which subsequently erected their own fortifications on the summit, at a time dated to the Cantabrian Wars (Torres-Martínez 2004, 92; Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 529; Torres-Martínez et al. 2016, 376–379).

Since 2004, the *Instituto Monte Bernorio de Estudios de la Antiguedad del Cantábrico* (IMBEAC) has conducted a series of excavations and surveys at Monte Bernorio. This fieldwork has provided a wealth of new information regarding the *oppidum* and offers an opportunity to test new analytical techniques that can be used to study ancient conflict. As Conflict Archaeology has grown as a discipline, there have been calls for the adoption of analytical concepts from the United States military to aid in the understanding of the vast quantities of data that are being accumulated (Bleed and Scott 2011; Scott and McFeaters 2011; Babits 2014). One of these, KOCOA terrain analysis, shows promise as a locational and analytical tool for assessing how terrain features influenced battle. KOCOA can provide a predictive model of what was likely to have happened given the military doctrine of the combatants. This model can then be tested against the archaeological and historical record. As a codified analytical concept, KOCOA is transferable among researchers and site categories making it an excellent tool for conflict archaeology. KOCOA has been used for a number of years in the United States on historical battlefields and has recently been applied in the United Kingdom (McNutt 2014), but it is applicable to prehistoric battles as well (Brown, forthcoming).

KOCOA terrain analysis: history and methodology

KOCOA is an acronym that originated within the United States Army as a mnemonic device used to describe a military terrain analysis system that classifies terrain characteristics relative to mission objective (Babits 2011; 2014, 263). The letters constituting the KOCOA acronym denote: **K**ey or Decisive Terrain; **O**bservation and Fields of Fire; **C**over and Concealment; **O**bstacles; and **A**venues of Approach (U. S. Army 1994, 2–10; 2007, 5–10; 2008, 5–6). Also contained within the terrain analysis, though not implicitly stated as part of the acronym, are climate variables, such as weather, light and tides. The definitions of these terms are summarized in Table 1 and are discussed in detail below (U. S. Army 1994, 2–9, 2–23; 2007, 5–13; 2008, 5–6).

KOCOA analysis is one module within a suite of analyses used to plan tactical operations making it an essential component within the Intelligence Preparation of the Battlefield (IPB) process (U. S. Army 1994, 2–8; ROTC 2002a, 248). In order to accomplish this analysis, the Army has adopted another acronym: METT-TC, where the constituent letters denote: **M**ission; **E**nemy; **T**errain and Weather; **T**roops and Support Available; **T**ime; and **C**ivil Considerations (U. S. Army 2007, 5-8 – 5-15). KOCOA comprises the Terrain and Weather analysis, the first 'T' of METT-TC. A proper estimation of the effects of terrain and weather relative to the objective, not only for friendly troops but those of the enemy, in anticipating possible courses of action, is critical for mission success. KOCOA analysis 'can be very important even after a battle is

Table 1. KOCOA terrain analysis summary definitions (C. J. Brown).

Key or decisive terrain	Any locality or area the seizure, retention, or control of which affords a marked advantage to either combatant	High Ground, Bridge Over Unfordable River, Mountain Pass
Observation and fields of fire	Observation is the ability to see the threat either visually or through the use of surveillance devices. A field of fire is the area that a weapon or group of weapons may effectively cover with fire from a given position	High Ground with good Line-of-Sight, Open Fields
Cover and concealment	Cover is protection from the effects of direct and indirect fires. Concealment is protection from observation	Ditches, Buildings, Fortifications, Woods, Underbrush, Snowdrifts, Tall Grass, Cultivated Vegetation
Obstacles	Any natural or manmade terrain features that stop, impede, or divert military movement	Buildings, Steep Slopes, Rivers, Lakes, Cities, Minefields, Trenches
Avenues of advance	An air or ground route of an attacking force of a given size leading to its objective or to key terrain in its path	Roads, Railroads, Paths, Dry River Beds
Weather	Military aspects of weather: Visibility, Wind, Precipitation, Cloud Cover, Temperature and Humidity	Ambient Light, Temperature Inversions, High Heat, Extreme Cold, Fog

over because combat action can significantly alter the terrain, requiring an update of the previous terrain analysis' (ROTC 2002a, 248). Post-battle terrain analysis will also aid in the evaluation of unit performance.

As part of the United States Army's troop-leading procedures, KOCOA is taught at the most basic unit levels, that of platoon and squad leader (U. S. Army 1986, 2-1; ROTC 2002a, 248; Babits 2014, 263). At these levels, personal ground reconnaissance is preferred but often unobtainable, leaving the platoon and squad leaders to rely upon maps. When the operational order is received from battalion and company command, the unit objective and unit area of operations will be given. It is then incumbent upon the platoon or squad leader to conduct a KOCOA analysis in order to familiarize themselves with the terrain and weather variables within their area of operations. This will not only allow the platoon or squad leader to make the best use of the terrain and anticipate enemy courses of action, but will also allow for enhanced understanding of the overall commander's intent and the activity of other units operating within the larger area of operations. KOCOA is covered in several Army field manuals and Reserve Officer Training Corps (ROTC) courses (U. S. Army 1986; 1994; 2001; 2007; 2008; ROTC 2002a; 2002b). This ensures a standard codification of KOCOA that is easily replicated from one generation of officers to the next. Although periodically updated, the texts are readily available in libraries and on the internet. This ease of access, standardization and replicability make KOCOA attractive as a conceptual framework for conflict archaeologists (Bleed and Scott 2011; Scott and McFeaters 2011).

The use of KOCOA in the historical sciences emerged following the Second World War as an instructional aide for US Army War College staff rides at historic battlefields (McMasters 2011). In 1991, the Secretary of the Interior gave the initial impetus to the creation of the American Battlefield Protection Program (ABPP). It was not until 1996, however, when Congress signed into law the American Battlefield Protection Act that the ABPP received funding and official sanction (ABPP 2016). The year 1996 also saw the first use of KOCOA analysis as a cultural resource tool at Gettysburg National Military Park (McMasters 2011). In 2000, David W. Lowe compiled the ABPP's *Battlefield Survey*, a manual marking the first real attempt at establishing a replicable survey process utilizing KOCOA in an archaeological context (Lowe 2000). In 2004, KOCOA became a formal requirement of battlefield surveys funded by the ABPP (McMasters 2011; Sivilich 2014). Since its creation in 1996, the ABPP has funded the survey of over 650 battlefields spanning 16 wars (ABPP 2016). The requirement to adhere to the survey methodology outlined by Lowe means that the vast majority of these surveys utilize KOCOA in varying degrees. In this capacity, KOCOA is used to delineate battlefield boundaries and identify defining battlefield features for preservation planning purposes (McMasters 2011).

The way in which the ABPP utilizes KOCOA has drawn some criticism from conflict archaeologists as reducing KOCOA to a mere locational and categorization aide (Sivilich 2014, 2). This study proposes to use KOCOA in a way similar to the US Army, from which it is derived, by examining landscape features through the lens of the military doctrines employed by the combatants. Monte Bernorio is a large site and the archaeological investigations have revealed a relatively small percentage of the *oppidum*, rendering a reconstruction of the entire settlement unfeasible. However, the landscape likely retains enough of its appearance to make a general KOCOA analysis worthwhile. The results will then be checked against the archaeological record to arrive at a plausible general battle reconstruction.

Roman and Cantabrian way of war

Roman

The Roman legions emerged from the Civil War as an effective and seasoned army. The legionary troops were armed with *pila* and spears, swords (*gladius*) and daggers, and protected with coat of mail, helmet and *scutum* (shield). Another characteristic element of their personal equipment, among the most numerous finds in the archaeology of the Cantabrian Wars, are the *caligae* (sandal nails). They were professional soldiers trained to fight in many kinds of legionary formations and manoeuvres. The art of warfare in the Roman world, and particularly siege operations, is a topic widely discussed in numerous works and exceeds the scope of this article. As a reference for Roman siege warfare, the works of Campbell (2006) and Campbell and Tritle (2013) are recommended. In the present analysis of the Roman assault on the *oppidum* of Monte Bernorio, there are two questions that need to be addressed. On the one hand, what are the different ways in which a city or town could be taken, and on the other, what can the archaeology of the Cantabrian Wars tell us about the tactics employed to this aim?

Three basic ways to take a city are distinguished in Roman times (Guillén 1994, 579–589):

(1) *Obsidio*. Consists of blocking and defeating the city by depletion of resources.
(2) *Oppugnatio repentina*. Consists of attack or conquest of the city by arms.
(3) *Oppugnatio longinqua*. Consists of a long attack or siege.

The Roman army undertook several sieges and assaults on indigenous settlements during the Cantabrian Wars. In those, different techniques of siege and assault have been documented. Relative to the study of Monte Bernorio, the siege of La Loma (Santibáñez de la Peña, Palencia: Peralta 2015), the siege of La Espina del Gallego (Corvera de Toranzo, Anievas y Arenas de Iguña, Cantabria: Peralta Labrador 2002), the siege to Peña Dulla (Merindad de Sotoscueva, Burgos) and the assault on Ornedo-Santa Marina (Fernández et al. 2015) are especially interesting. Different excavations and surveys carried out in these places have documented the use of *opugnatio* and *obsidio* by the Roman army, although for this campaign, as shown in La Loma, the most common way to assault an *oppidum* was de *oppugnatio longinqua*. These surveys have also documented the majority use of the light artillery, mainly the *scorpio*, for shooting large arrows (*tella*), and archery (Fernández Ibáñez 2015). They have also found three round stone projectiles (*globus obsidionalis*) of small calibre in Monte Bernorio (Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 531–533) and another three of larger calibre, one in the siege of La Loma (Peralta 2015, 95) and two on the battlefield of La Puerta de Quintanilla (Bohigas, Peralta, and Ruiz Vélez 2015, 194). As a result, round stone projectiles may have been less used than the archery. Only a single Roman lead slingshot has been found in all of Cantabria, outside the Roman camp at Campo de Las Cercas (Puente Viesgo-San Felices de Buelna, Cantabria: Peralta Labrador 2007, 497). It can be hypothesized that the Roman Army preferred archery for tactical use over slingers.

Cantabrian

At the end of the Iron Age, the Cantabri were using similar weapons to that of other peoples in the so-called 'Celtic' world, and not so different from the weapons in use in the

Mediterranean area. They carried spears, javelins, swords and daggers for attack, and helmets, coat of mail and leather breastplates (*cotas de malla*), shields and *scutum* for their personal protection. The archaeological record at Monte Bernorio, La Loma, and other indigenous settlements shows us that the most common weaponry used by de Cantabrians was spears and javelins (Torres-Martínez 2011, 385–442).

When fighting on the defensive, the Cantabrians' most useful weapons to repulse the attacker were spears and javelins thrown from behind the protection offered by their shields. However, the using of spears and javelins in the defence of a position implies an enormous loss of material that they could not afford. For this reason, Cantabrians tried to solve the problem of ammunition shortage for defence using cobbles (river stones). At Monte Bernorio, hundreds of cobbles were recovered inside of the wall as well as outside. The use of rounded stone cobbles for the defence can also be seen in La Loma and, more clearly, in the siege of Puerta de Quintanilla, where there are hundreds of them just in front of the indigenous defence. Simple but effective, this cheap resource allowed defenders a high number of shot and improved the defence. There is no archaeological evidence to confirm that the Cantabrians, in contrast to other indigenous populations in Iberia, used the sling during this period.

By the Late Iron Age, Cantabrian soldiers, both as *auxiliaries* and mercenary troops, had taken part in the Roman Civil Wars and had fought against the Romans in other conflicts, such as the Vaccei or Aquitanian Wars (Torres-Martínez 2011, 439–441). The Cantabri were familiar with the tactics, weapons and ways of Roman siege warfare, and with effective ways of defending fortified positions like the Monte Bernorio *oppidum*. In addition, the Cantabri had become skilled at designing the defences around their fortified cities and in the careful management of vital resources during siege combat. The preferred strategy of the indigenous communities was to take refuge in these fortified places, from where they were able to engage in a war of attrition, exerting pressure, both from within and outside. However, Cassius Dio (1927, 53.55.6) also records that the Cantabri often occupied high ground and set ambushes in woodlands along the Roman advance. Clearly, then, the Cantabri were not averse to engaging the Roman Army outside of their hillforts when they believed it was to their advantage to do so.

Cantabrian Wars – historical background

The *Bellum Cantabricum et Asturicum* was launched by the Roman emperor Octavian Augustus in 29 BC against the Asturian and Cantabrian communities of the northern fringe of Iberia (González-Echegaray 1999). Initial military operations began with a campaign lead by General *Statilius Taurus* against the *Vaccei*, the *Astures* and the *Cantabri* (Cassius Dio 1927, 51.20). Sustained military operations commenced in 26 BC, when Augustus himself moved to *Segisama* (Sasamón), in the modern province of Burgos, to supervise the war operations (Strabo 1923, 6.4.2; Florus 1984, 1.33.5). This campaign is better detailed in classical literature and, by combining literary and archaeological sources, it is possible to recreate the beginning of the military offensive against the southern territories of the *Cantabri*. Florus (1984, 2.33.48) and Orosius (2010, 6.21.1-11) record that the offensive advanced northwards from the Roman base camp at *Segisama* under the personal command of Augustus. The Emperor divided his estimated 50,000 men, comprised of eight legions and auxiliaries, into three columns, to approach the central territory of the *Cantabri* on three fronts.

The Romans probably preferred to force a direct confrontation on the field, which would quickly decide the outcome of the war and allow the army to attack and destroy the enemy's hillforts, one by one. Several important indigenous centres on the route from *Segisama* towards the natural passes through the Cantabrian Mountains are known to have suffered violent destruction (Syme 1970, 92–97; González-Echegaray 1999, 161–165; Peralta Labrador 2003, 261–264; 2009; 2015; Torres-Martínez 2015, 112–115). The years 26/25 BC proved to be crucial for the prosecution of the war, with major Roman victories at the battles of *Bergida* (in the territory of the *Cantabri*) and *Lancia* (in the lands of the *Astures*). Following these victories, the Roman army advanced through the mountain passes, while a fleet sent from Gaul operated along the coast in the Bay of Biscay. Major operations were completed by 19 BC under the command of General Agrippa (Florus 1984, 2.33; Cassius Dio 1927, 53.25, 53.29, 54.5, 54.2-5; Orosius 2010, 6.21.1-11). However, the situation remained unstable, as evidenced by some minor rebellions that took place until 16 BC and by the presence of two legions (*Legio X Gemina* and *Legio IV Macedonica*) which the Romans stationed in the territory for several decades thereafter.

The battlefield of Monte Bernorio

Monte Bernorio controlled the southern approach to the central pass crossing through the Cantabrian Mountains. The *oppidum* acted as a gateway to the northern territory of the Cantabri and was likely to have been one of the Cantabri's more powerful strongholds. The attack and conquest of the Monte Bernorio *oppidum* was crucial to the development of Roman offensive operations (Fernández-Götz et al. 2018; Torres-Martínez 2015).

The summit of Monte Bernorio is a relatively flat, 28 ha kidney-shaped plateau referred to as the 'Acropolis' in excavation reports (Torres-Martínez 2004, 80). The 'Acropolis' is ringed by a wall-and-fill rampart measuring 1700 m in length. The wall was constructed using irregular medium-sized blocks of limestone quarried from the mountain itself. The outer face was laid directly on the bedrock at the edge of the slope with the blocks dressed to present a smooth, homogenous appearance. The inner face was constructed on a foundation of large blocks set on another level of bedrock, so that it stood slightly higher on the terrace. The space between these two wall faces was then filled with an aggregation of earth, rubble and refuse. The completed rampart averaged 3 m in thickness (Torres-Martínez and Serna Gancedo 2010, 78–79; Torres-Martínez, Martínez Velasco, and Serna Gancedo 2013, 22–29; Torres-Martínez et al. 2016, 365–366). This wall is estimated to have stood 5 m in height and may have been topped with a wooden palisade or roofed platform (Torres-Martínez and Serna Gancedo 2010, 79) (Figure 2).

The Acropolis wall had three gateways that provided access to the interior of the site (Torres-Martínez 2004, 84; Torres-Martínez, Martínez Velasco, and Serna Gancedo 2013, 23; Torres-Martínez et al. 2016, 366). The north-western gate possessed a defensive tower that dominated a sharply angled ramp that passed between two parallel wall sections. Flanking this access route are the remains of a substantial ditch, most probably constructed during the Late Iron Age. The ditch is triangular in cross-section, some 4–5 m wide and 2 m deep. The interior of the ditch is lined with stones embedded into a yellowish clayey soil, which may have served as a mount for *cervi* type wooden stakes. The northern gate was narrow, more of a sally port or postern. Apparently, it did not possess a tower; its defensive features were marked by a long narrow corridor between two parallel wall faces. The southern gate

Figure 2. Upper wall and ditch of the *oppidum* of Monte Bernorio (Photo: IMBEAC; 3D reconstruction & design D. Vacas).

is accessed by a long ramp that ascends from the lower southern terraces. This ramp was constructed on a foundation of dressed limestone blocks and provides a relatively gentle slope for anyone wishing to gain access from the agricultural plateau to the south and south-east of the hilltop. At present, there are no obvious remains of a fortified tower protecting the southern gateway, but it may have in fact possessed one.

The southern plateau and lower terraces of Monte Bernorio are enclosed within a complex multi-vallate system of discontinuous large concentric earthworks that increase the *oppidum*'s occupied area to 90 ha; earthwork defences are clearly distinguished in aerial photographs and LiDAR images (Figure 3). On the ground, large sections remain well enough preserved to permit close inspection. Recent excavation of one of the earthworks confirms the Late Iron Age construction, which likely happened in association with the construction of the ditch on the summit. The ends of the discontinuous earthworks are slightly curved (Torres-Martínez et al. 2016, 368). In some sections, these earthworks measure just over 2 m in thickness at the base and nearly 2 m in height. The size and complexity of this defensive system would have required a great investment in collective labour and materials for its construction. This type of earthwork defence has been documented at other locations in northern Spain, although on a smaller scale (Camino 1995, 158–165; Torres-Martínez 2011, 289–292). Inside the outer earthworks, all along the northern side of the hill and around to the south of Monte Bernorio, are a series of springs. There is no water source within the Acropolis of the *oppidum*. All water used by the inhabitants came from these springs.

Across the plateau, some 3 km to the south, on the plain of La Lastra (Pomar de Valdivia, Province of Palencia), lies the Roman camp (*castra*) of El Castillejo (Figure 4). Between 2000 and 2002, surveys and targeted excavation trenches were carried out at El Castillejo by the Instituto de Estudios Prerromanos y de la Antigüedad (IEPA) under the direction of Eduardo

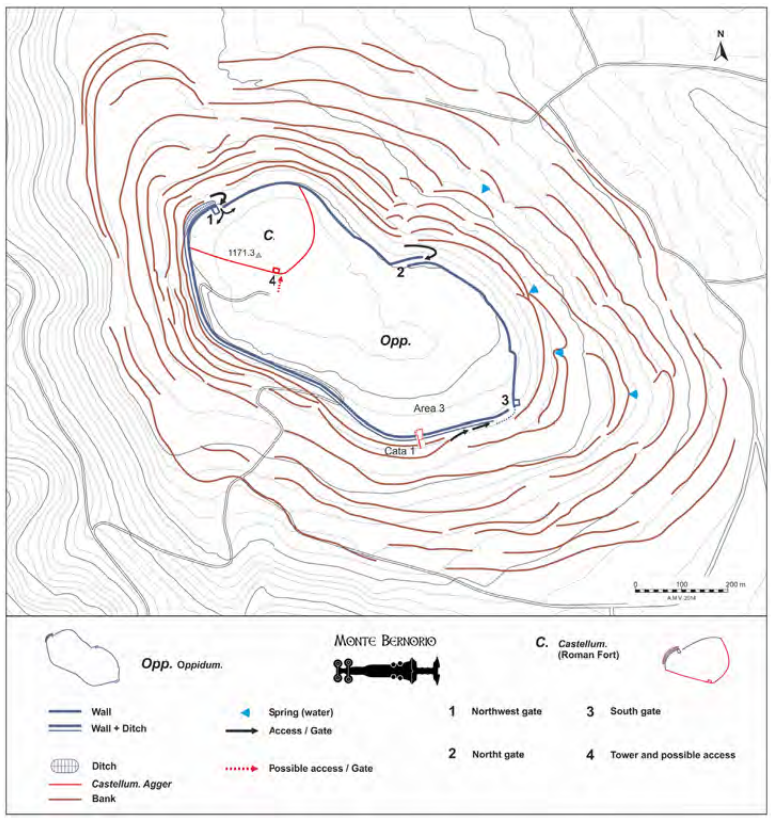

Figure 3. Multivallate earthworks enclosing an area of 90 hectares with location of springs (IMBEAC, design A. Martínez-Velasco).

Peralta Labrador. IEPA identified a large irregularly shaped Roman camp (*castra maiorem*) taking in over 41 ha. The core of the site was occupied by a central seasonal camp (*castra aestiva*), of traditional rectangular plan 18 ha in size. This camp was surrounded by a *vallum* (palisade) consisting of *agger* earthworks and stones with *fossa fastigiata*. Other structures were constructed to conform to the shape of the plateau, giving the outer camp its irregular plan. These outer fortifications took advantage of the natural steep slopes and cliffs of the plateau. More open areas were reinforced with a stone *agger*, most likely with a *vallum*, a *fossa duplex* (double ditch) and a *contra agger*. The fortified main entrance to the camp was located on the side of the plateau facing Monte Bernorio. Although of irregular plan, the proportions of the features of the camp are consistent with those cited in Pseudo-Hyginius (*De munitionbus castrorum* XLIX) and Vegetius (mil. I, 24). The camp could probably have accommodated two complete legions with accompanying auxilliaries. Finds recovered from El Castillejo include pieces of military equipment (*caligae* nails, triple-bladed arrowheads, a *pilum* fragment), fragments of military dress (an *aucissa*-type brooch), tools, tent pole

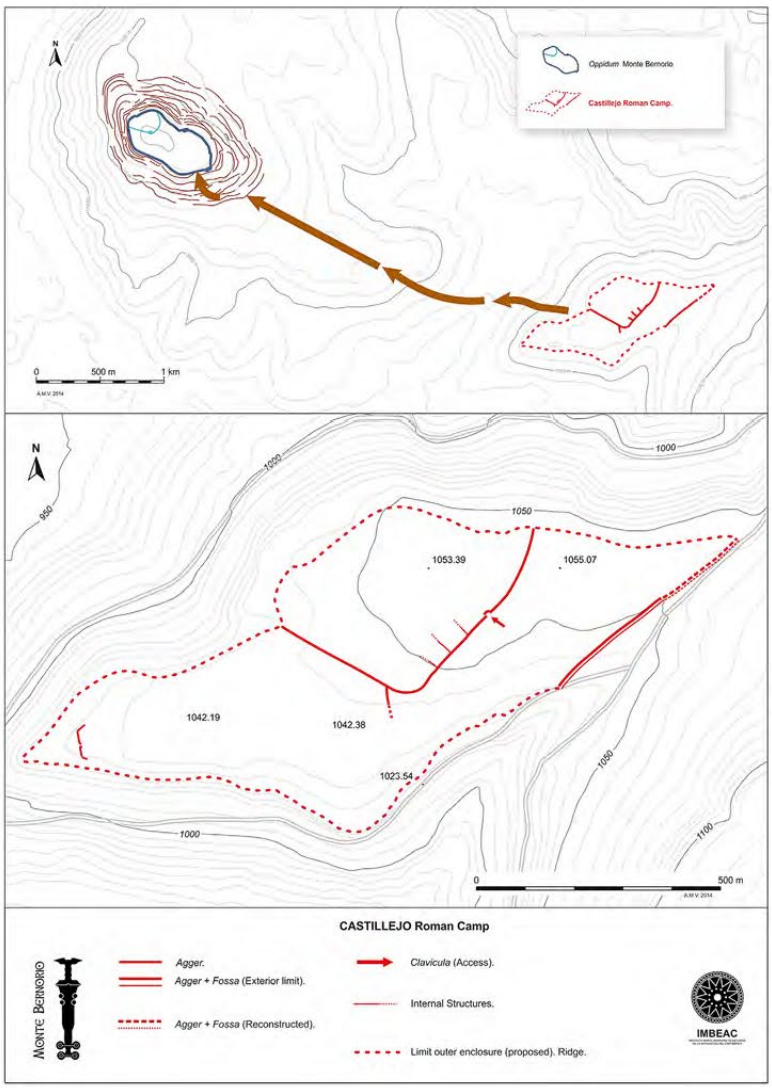

Figure 4. Location and plan of the Roman military camp of 'El Castillejo' (IMBEAC, design A. Martínez-Velasco & M. Galeano Prados).

fragments, and more importantly coins that date the camp to the Early Principate of Augustus. Just as important is the realization that these finds are consistent with Roman finds recovered from Monte Bernorio and the plateau in between. This indicates, quite clearly, that the Roman

assault undertaken at Monte Bernorio originated from this camp (Peralta Labrador 2003, 280–282, 301–306; Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 529–530).

KOCOA analysis at Monte Bernorio (Figure 5)

Objectives

In the absence of explicit documentation, the objectives of the two combatants must be inferred; however, in this case it should be safe to do so. The overall Roman strategic objective was the conquest and pacification of the provinces of *Cantabria* and *Asturia* through the elimination of their ability and willingness to make war (Florus 1984, 2.33.47; Orosius 2010, 6.21.3). Achievement of this objective required a series of operations aimed at the reduction of their strongholds and defeat of their armies in battle. The reduction of the Cantabrian *oppidum* at Monte Bernorio and the elimination of its warriors were the tactical objectives that needed to be achieved as a step towards the fulfilment of the overall strategic objective. By contrast, the Cantabrian overall strategic objective was to remain a free people by defeating the armies of Rome. At Monte Bernorio, the Cantabrian tactical objective was simply to defend successfully their main settlement.

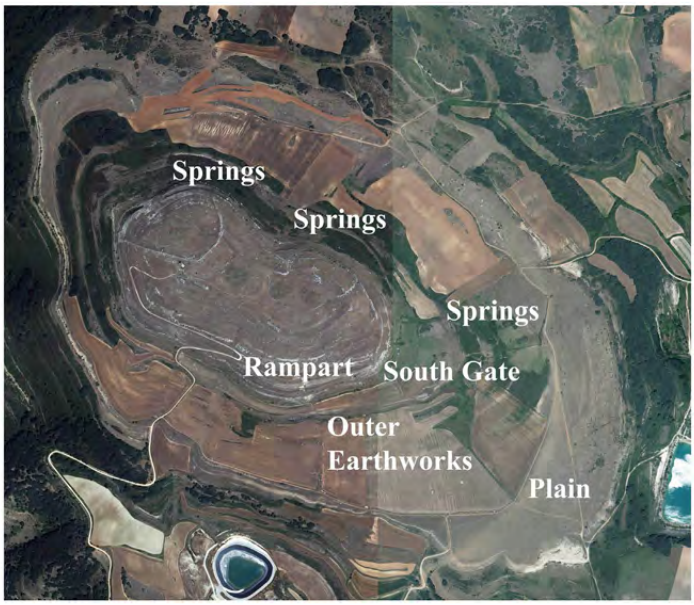

Figure 5. Aerial photograph of Monte Bernorio with KOCOA features (Photo: Visor SigPac V3.3 modified by IMBEAC).

Key terrain

Key Terrain is 'any locality or area the seizure, retention, or control of which affords a marked advantage to either combatant (U. S. Army 1994, 2–17)'. Key Terrain is often selected for use as battle positions or objectives and 'may be enemy oriented', meaning that if the enemy controls the terrain it could prevent the accomplishment of mission objectives (ROTC 2002b, 197; U. S. Army 2007, 5–12). 'You identify key terrain starting at the objective or main battle area and working backward to your current position (ROTC 2002b, 197; U. S. Army 2007, 5–12)'.

Acropolis

The Acropolis was the ultimate objective for both the Romans and the Cantabrians. As the Roman objective was the reduction of the Monte Bernorio *oppidum* as a Cantabrian stronghold, along with the elimination of the military capabilities of its inhabitants, securing and occupation of the Acropolis represented the successful achievement of the objective. To the Romans would accrue all the strategic benefits possessed by the Monte Benorio *oppidum*. The Romans did in fact occupy the site immediately following the destruction of the *oppidum* by building a *castellum* within the northern area of the Acropolis. For the Cantabrians, the opposite was true. As long as they controlled the Acropolis, they maintained a hope of retaining Monte Benorio. The rampart and gates will be discussed under 'Obstacles' below. Excavations within the Acropolis revealed a relatively dense settlement of rectangular and sub-rectangular houses with intervening spaces or streets (Torres-Martínez 2004, 80, 89–92). The structures in this area would have functioned as rudimentary obstacles, as fighting in this area would devolve into a sort of urban warfare. The excavations in this area did recover Roman arrowheads, suggesting that fighting did in fact take place in the Acropolis, and may represent the end of Cantabrian defence at Monte Benorio (Torres-Martínez 2004, 88). Excavations further revealed that the end of the indigenous occupation of the *oppidum* is marked by a massive fire that destroyed the settlement. The fire is characterized by a pronounced ash-coloured horizon containing burned wood, charcoal and destruction debris (Torres-Martínez 2004, 91; Torres-Martínez et al. 2016, 370).

Springs

The freshwater springs located along Monte Bernorio's northern perimeter and southern tip were, in effect, the *oppidum*'s Achilles' heel. There was no natural source of potable water within the Acropolis; all water consumed by the inhabitants was obtained from these springs. It is not known whether the Romans were aware of the location of these springs or of their importance to the *oppidum*. For the Cantabrians, however, access to these springs was critical. If the Romans occupied, or otherwise denied the use of these springs, the Cantabrians would be forced to rely upon whatever water they had managed to store within the Acropolis of the *oppidum*. Monte Bernorio would quickly become untenable, perhaps in a matter of days. It was therefore essential that the Cantabrians defend them. It is likely that they chose to meet the Roman army in the open field between the *oppidum* and the Roman camp at El Castillejo, or chose to fight among the multivallate earthworks on that side.

Outer earthworks

The outer earthwork fortifications will be discussed under 'Obstacles' below. They are included here as Key Terrain due to the defensive advantages they conveyed to both combatants. For the Cantabrians, either falling back from the open field or in initial deployment, the outer earthworks provided cover from Roman missile fire. More importantly, these defences forced Roman attackers to conform to a certain range of behaviours and approaches to the Acropolis of the *oppidum*. In the case of the Romans, the outer earthworks were an objective that needed to be secured to permit approach to, or siege of, the Acropolis. Once secured, the earthworks likely provided some concealment from Cantabrians deployed along the rampart encircling the Acropolis.

Observation-fields of fire

Areas around Key Terrain, Objectives, Avenues of Approach, and Obstacles are analysed to determine if they provide clear Observation and Fields of Fire for both friend and enemy forces (ROTC 2002b, 189; U. S. Army 2007, 5–12). Observation is the ability to see the threat visually or through the aide of surveillance devices, including scouts or forward observers (U. S. Army 1994, 2–10). A field of fire is the area that a weapon or group of weapons may effectively cover with fire from a given position (U. S. Army 1994, 2–10). Fire may be either direct or indirect. In ancient warfare, a soldier could generally see farther than a projectile could be fired. The exception would be archers or artillery firing blind over a wall or other obstacle.

Observation

Acropolis

The summit of Monte Bernorio offers unobstructed direct line of sight for several kilometres throughout a full 360º viewshed. This viewshed is one of the critical elements comprising the strategic importance of Monte Bernorio. The Roman camp at El Castillejo is fully within view (Figure 6). Except for a small area of slightly lower elevation near to El Castillejo, the entire approach of the Roman army would be visible to watchers on the rampart. The Cantabrians would have seen the preparations and march of the Roman army as it left El Castillejo for its approach to Monte Bernorio. They would have ample warning and time in which to deploy their forces in the outer earthworks or outside on the plateau. The final dispositions of the Roman army would be clearly visible as they moved to contact. Closer at hand, the height and vertical face of the rampart wall created something of an artificial military crest that offered excellent visibility over the immediate area outside of the Acropolis. From this vantage point, Roman attackers would be fully visible moving through the outer earthworks to Cantabrian defenders manning the rampart.

Roman camp El Castillejo

The Roman camp at El Castillejo is well situated for surveillance of Monte Benorio. Roman commanders had an unobstructed, unaided direct line of site across the plateau that was to be their avenue of approach to the southern side of Monte Bernorio (Figure 7). They could plainly see the rampart, with the southern gateway, and outer earthwork fortifications that

Figure 6. View of the Roman camp at El Castillejo from observation point in Monte Benorio Acrópolis. (Photo: C. J. Brown).

Figure 7. View of Monte Bernorio from observation point in Roman camp at El Castillejo (Photo: M. Fernández-Götz).

they would have to contend with. The northern side of Monte Bernorio was masked by the mountain itself. Views to the south and west of the camp were blocked by higher terrain.

Fields of fire

Acropolis rampart

The maximum range of the Cantabrian javelin depended on the arm strength of the warrior throwing it. The javelin and *pilum* were closely related in form and function, allowing for the estimate of the maximum effective range of the javelin to be similar at 30 m (Goldsworthy 1996, 183). This means that the defenders manning the rampart wall could do little but attempt to keep attackers from the base of the wall. The gateways, however, were well within this 30 m arc. Both the north-western and southern gateway were accessed by a ramp that double-backed upon itself with a tower covering its approach. Each section of the ramp was in range of the tower and there would be crowding at the gateway.

Published accounts of the excavations of the Acropolis Rampart on the south side of Monte Bernorio record the recovery of Roman arrowheads (*sagittae*), stone projectiles and two fragments of *pila catapultari* (Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 533). The arrowheads are of particular interest. Most of them are of a pyramidal cross-section, marking them as belonging to the 'Syrian type', however, there a several triple-bladed arrowheads as well. Several of the arrowheads were found embedded in the rampart wall itself, with many more recovered at its foot (Figure 8). These arrowheads link Monte Bernorio with the Roman camp at El Castillejo as well as the hillfort of La Loma (Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 533; Torres-Martínez et al. 2016, 376–378). Roman bows had an estimated maximum range of 230 m, but a much shorter effective range at 90 m (Goldsworthy 1996, 184). An arc of 90 m from the excavated rampart section would put the archers on the terrace below the rampart in an area known as the 'necropolis' after burials were discovered there in early excavations (Torres-Martínez 2004, 80).

Several small calibre stone projectiles were recovered from the destruction levels around the rampart and southern gate. These stones were coarsely worked into a spherical shape with diameters between 4 and 5 cm. They range in weight between 102 and 134 g, which is roughly equivalent to one quarter of a Roman *mina* (Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 533). The discovery of rounded river stones used in the defence of the rampart is interesting. In terms of assessing fields of fire for such a weapon, the range would extend only as far as a Cantabrian warrior could throw such a projectile. This range would be variable based upon the weight of the individual stones, however, this could not have been effective over an extended distance from the rampart. Up close, however, large stones would be an effective means of clearing attackers from scaling the rampart wall on ladders.

Two iron projectile heads, likely from bolts fired by a *scorpio* were also recovered, as were two additional smaller iron projectile heads. The larger heads are square in cross-section, tapering to a sharp point, and with a long tang for attachment to the shaft. They measured 8.8 cm in length by 0.7 cm in width and 7.1 cm by 0.8 cm respectively (Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 533). Marsden (1969, 89) mentions that different sized *scorpio* had different ranges, but only lists a 700 yards range for a three span machine. This would put the shooter beyond the outer earthworks in this area. The smaller projectiles are interpreted as coming from a *cheirobalistra* or *manubalista*. The heads are multi-sided and hexagonal in cross section, measuring 5 cm long. Both tips were blunted by impact (Torres-Martínez, Martínez Velasco, and Pérez Farraces 2012, 533). The maximum ranges achieved depended upon the degree of aim with a maximum range of 421 m at 15º elevation (Rossi et al. 2015, 85). Effective range is not given, but presumably is one half (192.5 m) to one third (128.33 m) that distance. This is similar to the maximum effective range of

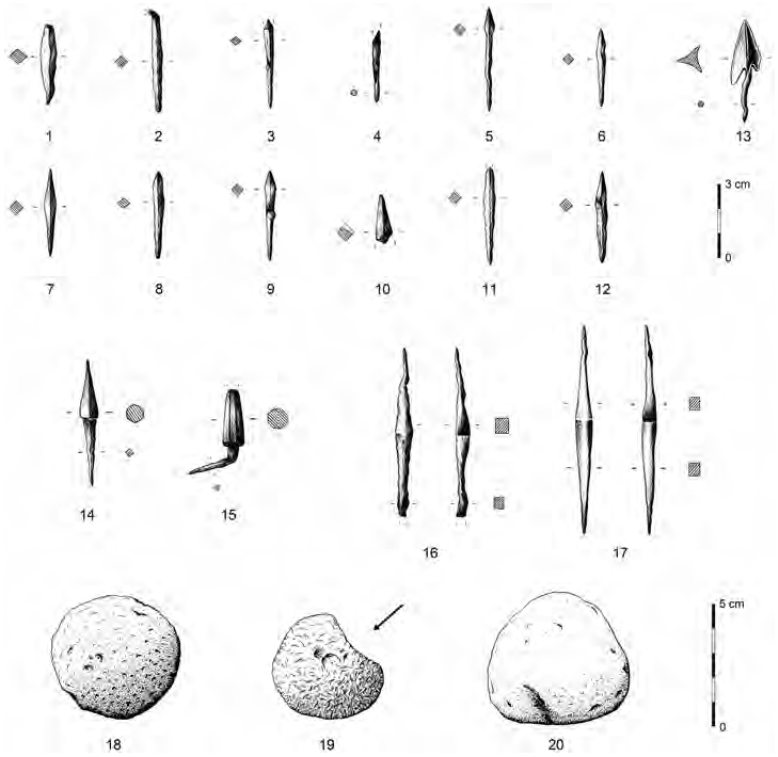

Figure 8. Selection of Roman projectiles found at Monte Bernorio: 1–13 arrowheads (*sagittae*); 14–17 *pila catapultaria*; 18–20 stone projectiles (*ballistae*) (Drawings by IMBEAC Bernorio Project Team & design A. Martínez-Velasco).

185–200 m estimated by Wilkins (1995, 54). Marsden (1971, 233) claims only a maximum range of only 150 yards (137.06 m). If these effective estimates are accurate, that would likely place the shooters within the necropolis or on the next terrace further down.

The Roman army deployed a varied set of light field artillery to bear against the rampart wall on the south side of the acropolis. Their intent could not have been to breach the wall with these weapons, as they lacked the size and power. Rather, these machines likely functioned like smaller field artillery used by later armies, primarily as anti-personnel weapons. Their use here was most likely as cover fire for an assault upon the rampart with scaling ladders in tandem with an attack upon the southern gate. We infer from the lack of evidence for formal siege operations that the assault was successful.

Outer earthworks

There are, as yet, no finds of projectile points from the outer earthworks, which could be largely due to the lack of research in this area. Much of the intervening area between the rows of earthworks could be covered by Cantabrians with javelins positioned on top the walls. Romans could have used *pila* with good effect, as well as archers. The Cantabrians could reach

30 m effectively out into the open plateau from the outermost earthwork. The Romans could have used covering fire from the plateau during an approach to the earthworks.

Cover and concealment

Cover is defined as 'protection from the effects of direct and indirect fires (U. S. Army 1994, 2–11)'. Concealment is 'protection from observation (U. S. Army 1994, 2–11)'. Concealment does not provide protection from direct or indirect fire, it only masks visibility (ROTC 2002a, 255). There was no cover or concealment on the open plateau between Monte Bernorio and El Castillejo. The plateau is open grasslands with no tree or shrubbery cover and likely resembles its appearance at the time of the Cantabrian Wars.

Acropolis rampart/acropolis structures

The Acropolis Rampart offered excellent cover from direct missile fire for those taking shelter directly behind it. Those manning the top of the wall had slightly less protection. The Acropolis Rampart likewise concealed the disposition and movements of troops directly behind it. The wall completely obstructs the line of sight of any attacker approaching from the lower terraces. Observation points further back on the lower terraces and plateaus, or even kilometres back at El Castillejo may have been able to see some dispositions and movements taking place higher on the slope behind the rampart, but the view would have been at least partially obstructed by houses or other structures. However, there was a shadow effect caused by the height of the rampart wall that would block the line of sight to the sector directly behind it. The structures within the Acropolis offered similar cover and concealment if on a smaller scale. Once the rampart was breached, these structures would break up line of sight, reducing the effectiveness of missile weapons, but presumably fighting that took place within the Acropolis would be primarily hand-to-hand combat.

Earthworks

In terms of cover and concealment, the outer earthworks functioned in the same fashion as the Acropolis Rampart. Cantabrian warriors behind the earthworks were protected from direct missile fire coming from attackers on the plateau. Indirect missile fire arcing over the earthworks would inflict some casualties, however. The open ends of the discontinuous lines of earthworks would make any defenders sheltering behind them vulnerable to direct missile fire from attackers who managed to take up position astride the openings. Defenders on top of the earthworks would be more exposed, but may have had the benefit of a palisade or *cervi* stakes to provide additional cover. As long as the earthworks remained in the control of the defenders, movements behind them would be completely screened from observation from an attacker on the plateau except when moving through or behind the openings.

Obstacles

Obstacles are any natural or man-made terrain features that stop, impede, or divert military movement (U. S. Army 1994, 2–14). There are two kinds of obstacles: 'existing' and 'reinforcing'. 'Existing' obstacles are natural obstacles or obstacles that are considered permanent. Buildings, rivers, creeks, stonewalls, hedgerows, depressions, and the like are considered 'existing obstacles'. 'Reinforcing' obstacles are generally man-made obstacles that are typically

used to augment 'existing' obstacles. These include minefields, booby traps, *abatis*, barbed-wire, downed trees and so on (ROTC 2002a, 253; 2002b, 192; U. S. Army 2007, 5–10).

Obstacles are further classified into four categories (Figure 9), based upon their tactical purposes, or the behaviour they are intended to force upon an attacker: 'disrupt,' 'turn,' 'fix' or 'block.' 'Disrupting' obstacles are used to break up enemy fortifications and tempo, throw off their timetable, make them commit breaching assets prematurely, and cause them to launch their attack piecemeal (ROTC 2002b, 194). A 'Turning' Obstacle is one which forces an attacker to deviate from their current avenue of approach onto an avenue of approach of the defender's choosing (ROTC 2002b, 194). 'Turning' Obstacles expose the attacker's flank to defensive fire or attack and funnel the attackers into an engagement area or kill zone. 'Fixing' Obstacles prevent an enemy from moving any part of his force from a particular location for a particular period. 'Blocking' Obstacles act to deny the enemy access to an area or prevent advance along a particular direction or avenue of approach.

Earthworks

The outer earthworks encircling the lower terraces of Monte Bernorio share the characteristics of several types of obstacles, but are most correctly identified as an existing disruptive obstacle for purposes of KOCOA. The multiple openings, irregularly spaced along the several circuits of earthworks, meant that without substantial gate fortifications, they could not have acted as blocking obstacles. Although the flanks of attackers moving between the earthworks were

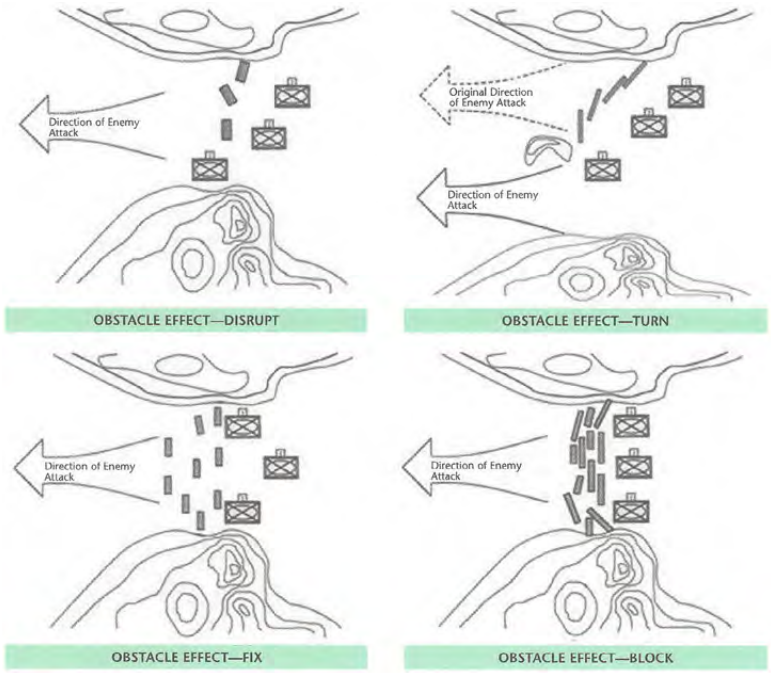

Figure 9. Obstacle effects (Drawing from ROTC 2002a).

vulnerable to missile fire from the tops, the irregularly spaced openings were seemingly not designed to lead attackers into a prearranged kill zone or fix them in place for a certain length of time. The function of these earthworks then was to disrupt or break up an attacker's linear formations. An attacker would be forced to storm each ring of earthworks in turn, change formation in order to fight along the pathways through them, or a combination of the two.

Acropolis rampart

The Acropolis Rampart and associated ditch was clearly intended to function as a blocking obstacle by keeping potential assailants out. Normal travel to and from the Acropolis was controlled through the three gateways described above. In the event of attack, these gates would have been shut, barred and defended. In the absence of large siege engines, the only methods available to breach the rampart was an assault on the wall using scaling ladders and/or an assault on a gate using a small covered ram or *testudo* formation.

Avenues of approach

An Avenue of Approach is 'an air or ground route of an attacking force of a given size leading to its objective or to key terrain in its path (U. S. Army 1994, 2–18)'. The identification of Avenues of Approach is critical because all manoeuvre is dependent upon them.

From Roman camp El Castillejo

The Roman line of march from their camp at El Castillejo across the plain to Monte Benorio was unrestricted across open ground until encountering Cantabrian warriors on the plain or manning the outer ring of earthwork fortifications (Figure 10). From that point, their avenue of approach into the acropolis at the summit of Monte Benorio would have been severely restricted by the earthworks and the Acropolis Rampart fortification. The earthwork fortifications were discontinuous, their open ends allowing passage to the southern gate and Acropolis Rampart.

Figure 10. Photo of the terrain encountered by Roman soldiers in their advance on Monte Bernorio (Photo: C. J. Brown).

The Acropolis Rampart would have blocked approach to the interior of the site, and would have necessitated either scaling of the rampart with ladders or breaching the gateway, possibly using a *Testudo* formation or fire. Once inside the rampart, attackers would have had to negotiate the homes and structures of the settlement. Any surviving Cantabrians that managed to escape would likely have fled north, away from the Roman avenue of approach.

Conclusion

The KOCOA analysis of Monte Bernorio was carried out over a three-week period in August 2016, utilizing aerial photographs and field walking. The analysis did not reveal evidence of a formal or protracted siege of Monte Bernorio. The classic elements of a complex Roman siege, as chronicled at sites such as *Alesia* in Gaul (52 BC; Reddé et al. 1995) and the Spanish hillfort at La Loma (a site interpreted as belonging to the same campaign as Monte Bernorio, see Peralta Labrador 2015), are absent. There are, as yet, no obvious traces of fortifications indicative of Roman circumvallation of Monte Bernorio. The outer earthworks remain in a relatively good state of preservation, aside from natural erosion and relatively recent destruction in one section to facilitate agriculture. The ditch feature was not filled in antiquity to permit the approach of large siege engines. El Castillejo remains the only Roman encampment to be identified in association with Monte Bernorio to date. It appears that Monte Bernorio bears more of a resemblance to Caesar's '*repentina oppugnatio*' (violent assault) on Gomphi (48 BC) in Greece (*Civil War* 2016, 3.80), than it does to the more well-known Roman sieges.

The KOCOA analysis suggests that an attack on the Cantabrian *oppidum* of Monte Bernorio originated from the Roman encampment at El Castillejo, an attack that likely consisted of the equivalent of two full legions with associated auxiliaries, an estimated 15,000 men. The objective of the attack was the reduction of Monte Bernorio as a stronghold along with the elimination of its warriors as a military force. The Romans likely marched across the intervening plain to within a kilometre or so of the outer earthworks, where they were met by a Cantabrian army of unknown size. The Cantabrians were probably forced to meet the Romans outside their main defensive fortification at the Acropolis due to the need to protect the only available water source on the northern edge of the plateau. A battle took place in which the Romans prevailed. Cantabrian survivors may have attempted to withdraw through the outer earthworks and into the Acropolis or may have attempted to leave the battlefield by withdrawing to the north. The Romans may have regrouped and prepared for an assault upon the Acropolis, preparatory to opening formal siege operations. The assault was aimed at the southern gateway and rampart, using cover fire from field artillery in support of an attempt with scaling ladders and possibly a *testudo*-type assault upon the southern gate. This assault, or a similar follow up assault, succeeded and fighting continued within the Acropolis itself. The Roman army succeeded in obtaining their objective, as any Cantabrians who managed to escape most probably fled north away from the Roman line of advance. This proposed hypothesis is supported by ongoing archaeological excavations.

When used as the military does, with knowledge of the military doctrines of the combatants and representations of the terrain as close to the time of battle as possible, KOCOA terrain analysis shows promise as a locational and analytical tool for assessing how terrain features influenced battle. KOCOA can provide a predictive model of what likely happened that can then be tested against the archaeological and historical record. As a codified analytical concept, KOCOA is transferable among researchers and site categories making it an excellent tool for conflict archaeology. KOCOA has been used for a number of years in the

United States on historical battlefields, but as is demonstrated by the Roman attack on Monte Bernorio it is applicable to prehistoric and early historic battles as well.

Note

1. 'The first battle against the Cantabrians was fought under the walls of *Bergida*. From here they fled to the lofty peak of Mount Vindius, to which they had thought the Roman army was less likely to ascend than the waters of the Ocean'. Florus (1984, 2.33.49)

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Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

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