

LAND OFF HALLMOOR COURT, WETHERAL, CUMBRIA

Archaeological Desk-Based Assessment and Geophysical Survey



Client: Simtor Ltd

NGR: NY 4642 5472 (centre)

© Greenlane Archaeology Ltd
September 2012



Greenlane Archaeology Ltd,
2 Albrights Yard, Theatre Street,
Ulverston, Cumbria, LA12 7AQ

Tel: 01229 588 500
Email: info@greenlancearchaeology.co.uk
Web: www.greenlancearchaeology.co.uk

Contents

Illustrations and Tables	2
List of Figures	2
List of Plates	2
List of Tables	2
Non-Technical Summary	3
Acknowledgements.....	3
1. Introduction	4
1.1 Circumstances of the Project	4
1.2 Location, Geology, and Topography	4
2. Methodology	6
2.1 Desk-Based Assessment	6
2.2 Site Visit.....	6
2.3 Geophysical Survey	6
2.4 Archive.....	6
3. Results	7
3.1 Introduction.....	7
3.2 Desk-Based Assessment	7
3.3 Map Regression	9
3.4 Site Visit.....	10
3.5 Geophysical Survey	11
3.6 Conclusion.....	12
4. Site History.....	13
4.1 Introduction.....	13
4.2 Prehistoric Period (c11,000BC – 1 st century AD)	13
4.3 Romano-British to Early Medieval Period (1 st century AD – 11 th century AD)	13
4.4 Medieval Period (11 th century AD – 16 th century AD)	14
4.5 Post-Medieval (16 th century AD – present)	15
4.6 Previous Archaeological Work	15
5. Discussion.....	16
5.1 Introduction.....	16
5.2 Significance	16
5.3 Potential for Unknown Archaeological Remains	16
5.4 Disturbance	17
5.5 Impact.....	17
5.6 Recommendations	17
6. Bibliography	18
6.1 Primary and Cartographic Sources	18
6.2 Secondary Sources	18

6.3 Aerial Photographs	20
Appendix 1: Site Gazetteer	21
Appendix 2: Significance Criteria.....	26
Appendix 3: Geophysical Survey.....	27

Illustrations and Tables

List of Figures

Figure 1: Site location	5
Figure 2: Site gazetteer and extent of Scheduled Monuments and archaeological work within the study area	8

List of Plates

Plate 1: Extract from the tithe map for Wetheral parish (CAC(C) DRC/8/196 1842).....	9
Plate 2: Ordnance Survey 1863.....	10
Plate 3: Ordnance Survey 1868.....	10
Plate 4: Ordnance Survey 1901.....	10
Plate 6 (left): General view of the site from the south corner	11
Plate 7 (right): View of the earthwork continuing the line of the field boundary and the large tree	11
Plate 8 (left): Sheet of plywood covering a possible void	11
Plate 9 (right): Water trough in an old bath tub.....	11

List of Tables

Table 1: Summary of sites of archaeological interest within the study area	7
Table 2: Details of the plots within the site as given in the tithe apportionment (CAC(C) DRC/8/196 1842).....	9
Table 3: Significance by site	16
Table 4: Degree of potential for unknown archaeological remains by period	17

Non-Technical Summary

As part of pre-planning consultation for a proposed residential development on land off Hallmoor Court, Wetheral, Cumbria Greenlane Archaeology was commissioned to carry out a desk-based assessment and geophysical survey of the site. This is intended to identify whether there are any known archaeological remains within the site, and what the potential is for as yet unknown archaeological remains to be present. The project was carried out in September 2012; the desk-based assessment, including site visit, was undertaken by Greenlane Archaeology and the geophysical survey by Phase Site Investigations, working as sub-contractors on behalf of Greenlane Archaeology.

The site is situated on the south side of the village of Wetheral, which is historically dominated by the medieval Priory, but is in an area of known prehistoric and Roman remains and also potentially early medieval. The Historic Environment Record for the area has records of sites of most periods within the study area. The priory of Wetheral is known to have been established c1100, but Wetheral is seemingly recorded at an earlier date as being on the boundary of the diocese of Hexham, which did not exist after the 9th century, and there are apparently early references to a group of artificial caves known as Constantine's Cells and a holy well dedicated to St Cuthbert, which might also indicate an important early medieval presence in the area. A group of Roman inscriptions near these caves indicate a Roman, probably military presence in the area, which is in the hinterland of Hadrian's Wall and the important Roman city of Carlisle. The village of Wetheral is at least medieval in origin, although a fragment of Anglian cross was found in the churchyard. It is likely that the village saw relatively little development until the post-medieval period, following the Dissolution and after the coming of the Newcastle-Carlisle railway.

The site visit identified few constraints to further archaeological work and no obvious areas of disturbance within the site area, although a small part of it was covered with spoil from the adjoining development site. It was also apparent that a former field boundary, shown to cross the site on the early maps, was preserved as an earthwork across part of the site. The geophysical survey revealed areas of magnetic disturbance, probably resulting from modern activity around the edges of the site and a negative linear anomaly corresponding to the former field boundary shown evident as an earthwork. A smaller north/south orientated linear feature ran from this, to the south, and a further larger north/south anomaly was present in the east part of the site. This, and a scatter of smaller anomalies across the site, did not relate to any known feature within the site and could therefore be of archaeological significance – it is apparent that it continues the alignment of field boundaries to the north and south, but it may also represent a modern features.

In view of the archaeological evidence from the wider area, there is some potential for similar remains to be present within the site area. The geophysical survey identified two main areas of potential archaeological interest, although only the two north/south linear features were particularly apparent and their nature and origin is not certain. In light of these discoveries it is therefore recommended that further investigation of the anomalies revealed by the geophysical survey be carried out through the excavation of archaeological evaluation trenches. This would also allow an investigation of the extant earthwork.

Acknowledgements

Greenlane Archaeology would like to thank Simtor Ltd for commissioning the project, and their agent, Taylor and Hardy, in particular Margaret Hardy, for their information about the site. Additional thanks are due to Jeremy Parsons, Historic Environment Officer at Cumbria County Council, for issuing the brief, the staff of Cumbria Archive Centre in Carlisle (CAC(C)) for help with accessing their archives and Jo Mackintosh, Historic Environment Records Officer at Cumbria County Council, for help with accessing the HER.

The project was managed by Dan Elsworth, who also carried out the desk-based assessment and site visit, and wrote the report with Tom Mace, who also produced the illustrations. The geophysical survey was carried out and the associated report produced by Phase Site Investigations, and the final report was edited by Jo Dawson.

1. Introduction

1.1 Circumstances of the Project

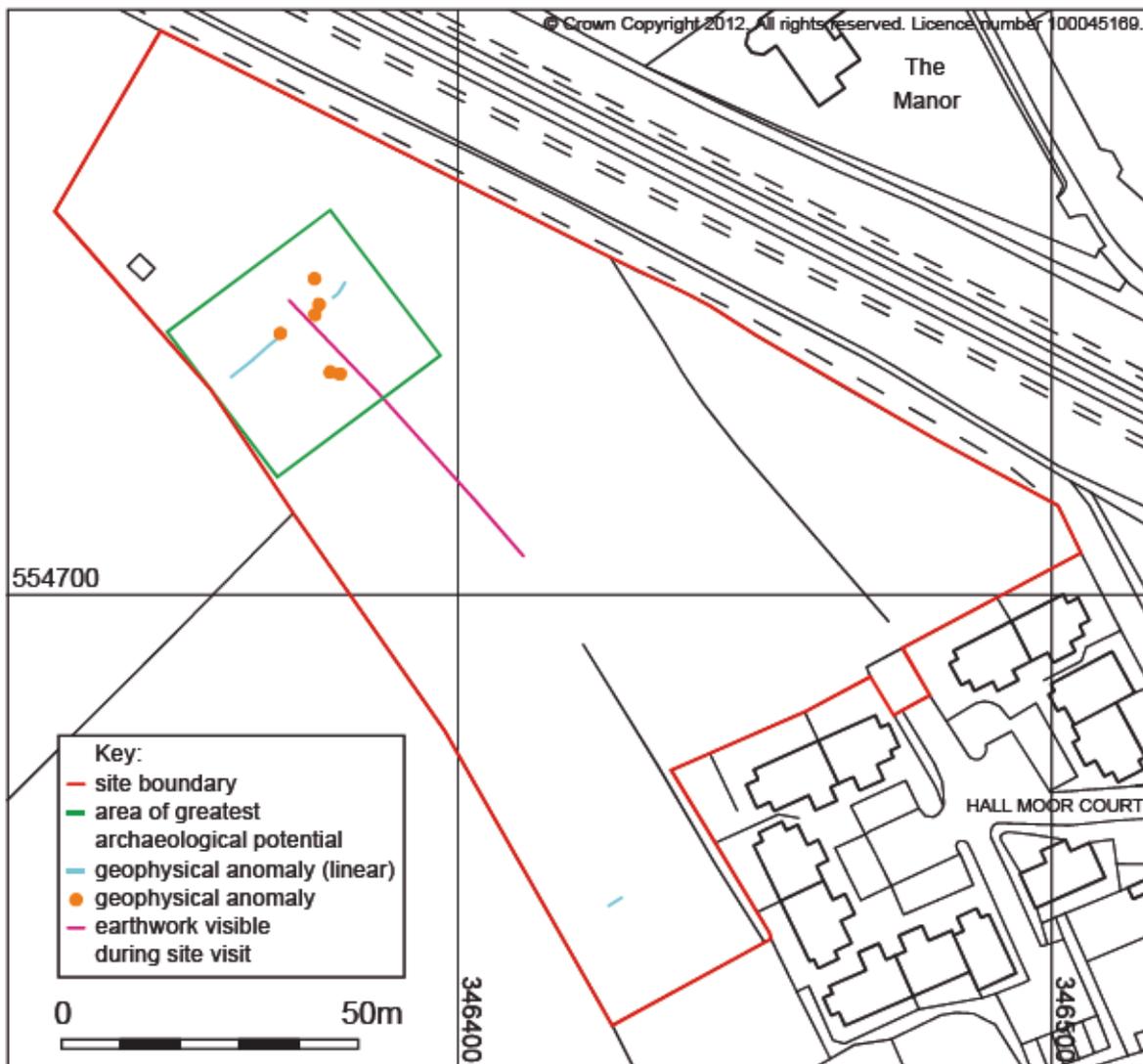
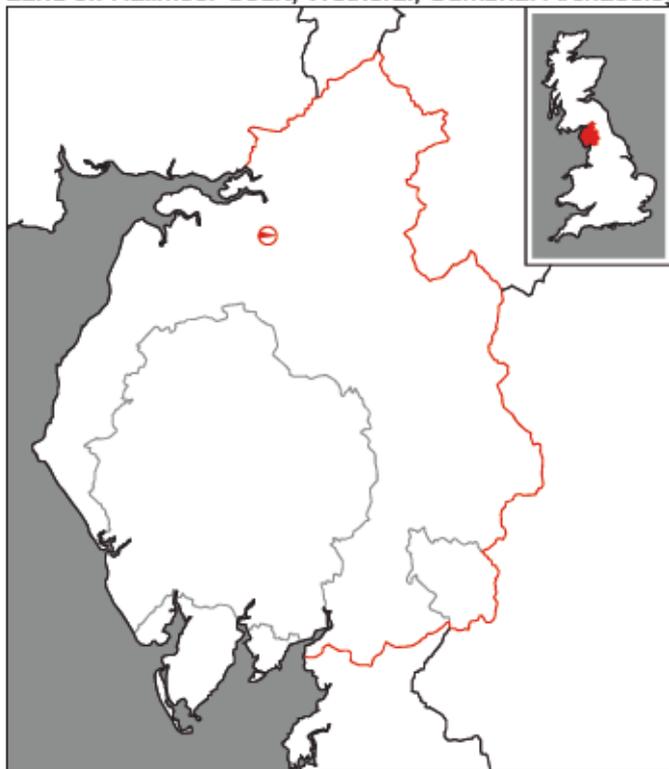
1.1.1 As part of pre-planning consultation for a proposed residential development on land off Hallmoor Court, Wetheral, Cumbria (NGR NY 4642 5472 (centre)), Jeremy Parsons, Historic Environment Officer at Cumbria County Council, recommended that a programme of archaeological desk-based assessment and geophysical survey be carried out. This was intended to establish at an early stage whether the area was likely to have any known sites of archaeological interest within it or whether there was any potential for as yet unknown sites to be present. A brief was prepared by Jeremy Parsons (Parsons 2012) in response to which Greenlane Archaeology produced a project design. Following its acceptance by Simtor Ltd (hereafter 'the client') and approval by Jeremy Parsons, the work was carried out in September 2012.

1.1.2 The proposed development site comprises an area of 1.17 hectares and is on the northern edge of the medieval village of Wetheral in an area thought to comprise early strip fields (Parsons 2012).

1.2 Location, Geology, and Topography

1.2.1 The site occupies an area of relatively level ground, sloping down slightly to the north-east, at between c55m and 60m above sea level (Ordnance Survey 2007) (Figure 1). The main road through Wetheral is located less than 50m to the east and the steep valley of the River Eden is less than 200m to the east of this. The solid geology comprises red Permian sandstone of the Penrith group (Moseley 1978, plate 1), with overlying glacial deposits concealing much of the bedrock (Countryside Commission 1998, 40), although it is revealed along the length of the deep gorge containing the River Eden.

1.2.2 The site is on the north side of the core of the village of Wetheral, adjacent to the Carlisle-Newcastle Railway to the north, although with a rough track between it and the actual railway cutting. Hallmoor Court comprises a relatively recent housing development to the south-east, and there are open fields to the south-west and west.



Client: Simtor Ltd

© Greenlane Archaeology Ltd, September 2012

Figure 1: Site location

2. Methodology

2.1 Desk-Based Assessment

2.1.1 A desk-based assessment was carried out in accordance with the guidelines of the Institute for Archaeologists (IfA 2008). This principally comprised an examination of early maps of the site and published secondary sources. A number of sources of information were used during the desk-based assessment:

- **Cumbria Historic Environment Record (HER):** this is a list of all the known sites of archaeological interest within the county, which is maintained by Cumbria County Council and is the primary source of information for an investigation of this kind. All of the known sites of archaeological interest within 1km of the centre of the proposed development area were examined; each identified site comes with a grid reference, description and source and any additional information which was referenced was also examined as necessary. In addition, unpublished reports of archaeological investigations in the vicinity of the site were examined;
- **Cumbria Archive Centre, Carlisle (CAC(C)):** this was visited principally in order to examine early maps and plans of the site, but other documentary sources and published records were also consulted in order to gather information about the historical development of the site and its environs, and also information about the archaeology of its immediate environs;
- **Kendal Local Studies Library:** secondary sources relating to specific aspects of the local history and archaeology were examined here;
- **Greenlane Archaeology library:** additional secondary sources were examined to provide information for the site background.

2.2 Site Visit

2.2.1 A brief site visit was carried out, primarily with the intension of identifying any areas that might prove constraining to any subsequent archaeological work and whether the site had been affected by any modern activity that might have impacted upon archaeological remains. In addition, the presence of any features, finds, or deposits of possible archaeological interest was noted. Brief written notes were made during the site visit and areas of interest noted on a plan of the site. Colour digital photographs showing the general arrangement of the site and any features of interest were also taken.

2.3 Geophysical Survey

2.3.1 Full details of the methodology used during the geophysical survey are presented in *Appendix 3*. A detailed magnetic survey was carried out using a Bartington Grad601-2 magnetic gradiometer with data logger. The data was recorded over 30m by 30m grids with readings taken on the 100nT range (0.1nT sensitivity) at 0.25m intervals on profiles spaced 1m apart.

2.4 Archive

2.4.1 A comprehensive archive of the project has been produced in accordance with the project design, and current IfA and English Heritage guidelines (Brown 2007; English Heritage 1991). The paper and digital archive and a copy of this report will be deposited in the Cumbria Archive Centre in Carlisle following the completion of the project. A copy of this report will be provided for the client, a digital copy for the client's agent, and a copy will be retained by Greenlane Archaeology. In addition, at a suitable time a digital copy will be provided to the Historic Environment Record Officer at Cumbria County Council, and a record of the project will be made on the OASIS scheme.

3. Results

3.1 Introduction

3.1.1 A total of 19 sites of archaeological interest were identified within the study area during the desk-based assessment and walk-over survey (*Appendix 1*; summarised in Table 1 below) ranging from prehistoric to post-medieval in date. All of these sites, apart from one (**Site 4**), were previously recorded in the HER and none are situated within the proposed development area. However, at least three sites (**Site 7, 15, and 17**) are not accurately located, and so their significance to the study area is uncertain. Sites included in the gazetteer that relate to periods of the study area's history are individually mentioned in the site history (see *Section 4* below). The cropmarks (**Site 6**) and other possible earthworks (**Site 18**) are of unknown date and some or all of these are unlikely to be of any specific archaeological interest. Some of the other sites are also of uncertain date, although these are perhaps medieval in origin, including **Site 07, 10, 11, 13, and 17**.

Site No.	Type	Period	Site No.	Type	Period
1	Findspot	Prehistoric	11	Ridge and furrow	Medieval?
2	Railway	Post-medieval	12	Priory	Medieval
3	Well	Medieval	13	Drinking trough	Medieval – post-medieval?
4	'Gallow Acre' field name	Medieval – post-medieval?	14	Tower house	Medieval – post-medieval
5	Mill	Medieval – post-medieval?	15	Findspot	Roman
6	Cropmarks	Uncertain	16	Findspot	Early medieval
7	Possible chapel site	Medieval?	17	Possible chapel site	Medieval?
8	Cross	Post-medieval	18	Earthwork	Uncertain
9	Church	Early-medieval – post-medieval	19	Salmon coops	Medieval – post-medieval
10	Church cross	Medieval – post-medieval			

Table 1: Summary of sites of archaeological interest within the study area

3.2 Desk-Based Assessment

3.2.1 The results of the desk-based assessment have been used to produce two separate elements. Firstly all sites of archaeological interest recorded within the study area were compiled into a gazetteer (*Appendix 1*). The gazetteer is used to assess the general type of historic landscape that makes up the study area, contribute to the compilation of the general history of the site (see *Section 4*) and, more importantly, identify sites that are likely to be affected by the proposed development. The significance of each of these sites and the degree to which they are likely to be affected is considered in *Section 5* and from this recommendations for further work are produced.

3.2.2 The second purpose of the desk-based assessment is to produce a background history of the site. This is intended to cover all periods, in part to provide information that can be used to assess the potential of the site (particularly for the presence of remains that are otherwise not recorded in the study area), but more importantly to present the documented details of any sites that are known (see *Section 4*).

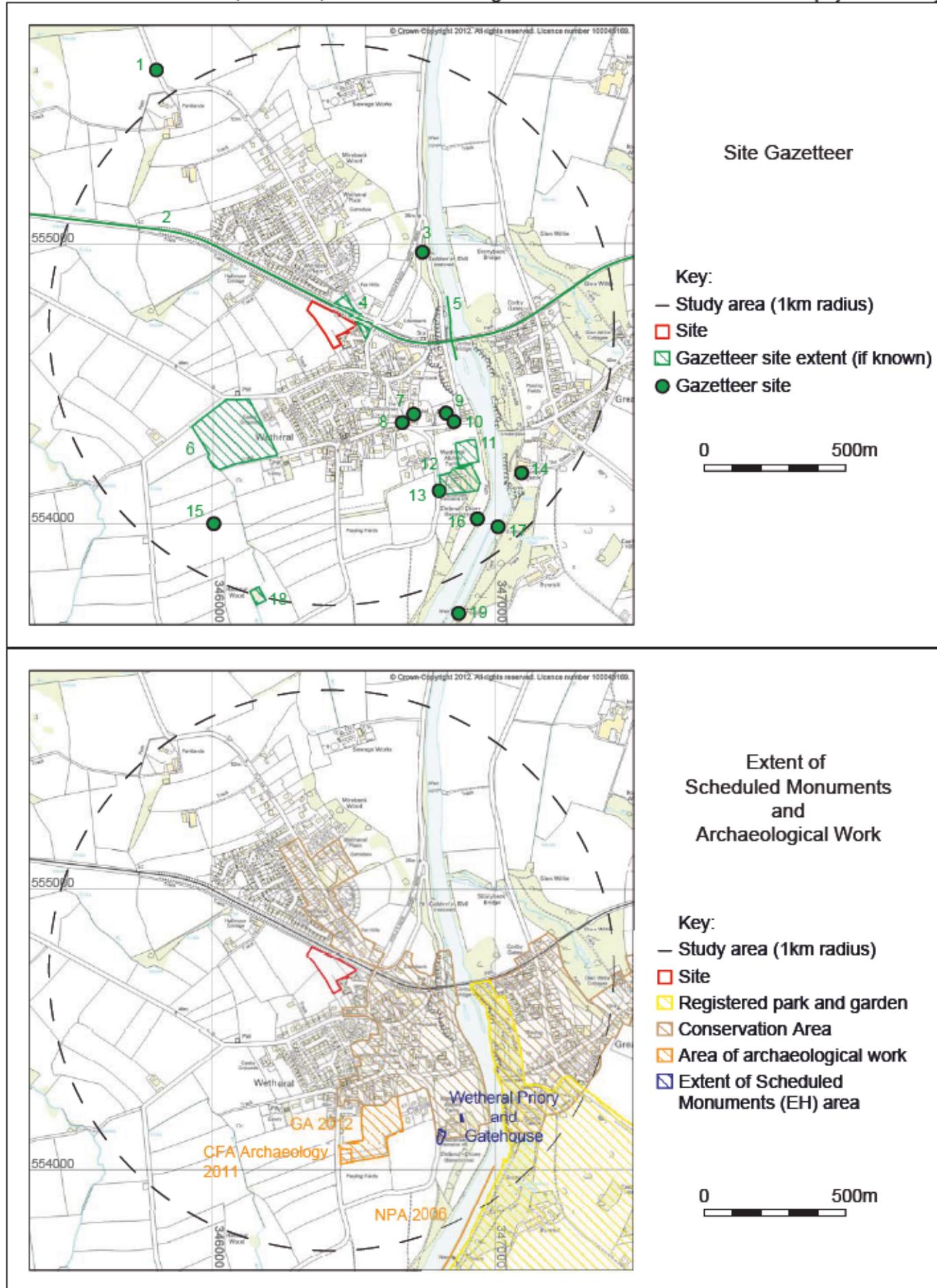


Figure 2: Site gazetteer and extent of Scheduled Monuments and archaeological work within the study area © Greenlane Archaeology Ltd, September 2012

Client: Simtor Ltd

3.3 Map Regression

3.3.1 **Tithe map for Wetheral township (CAC(C) DRC/8/196 1842)**: this is the earliest detailed map of the area. The site comprises elements of open fields to the south of the Newcastle and Carlisle railway, numbered 215, 216 and 217 from west to east (Plate 1). In addition, plot 215 is subdivided into two parts by a dashed line with plot 215a to the north. The plot numbers provide a considerable amount of information relating to the site, as summarised in Table 2 below. It is noteworthy that the plot to the north of plot 218 ('Gallow Acre/South'), plot 129, is named 'Gallow Acre/North', indicating that these were once a single field, which was split in half by the railway. Whether this name indicates the presence of an actual gallows in the area is uncertain; the name could also derive from the Norse *Gallgoidil* meaning foreigners and used to distinguish between different groups of Vikings and which gave its name to Galloway in Scotland (Griffith 2010, 40), but this is perhaps unlikely.

Plot No.	Owner	Occupier	Name	Description
215	John Hodstead	Thomas Bulman	Croft	Arable
215a	John Hodstead	Thomas Bulman	Croft	Arable
216	Rev John Graham	Thomas Mandle	Croft	Arable
217	John Graham (Mellguards)	John Parhouse	Garth Foot	Arable
218	Railway Company	William Tiffin	Gallow Acre/South	Arable

Table 2: Details of the plots within the site as given in the tithe apportionment (CAC(C) DRC/8/196 1842)



Plate 1: Extract from the tithe map for Wetheral parish (CAC(C) DRC/8/196 1842)

3.3.2 **Ordnance Survey 1863**: the site is unchanged (Plate 2).

3.3.3 **Ordnance Survey 1868**: the site is still undeveloped (Plate 3).

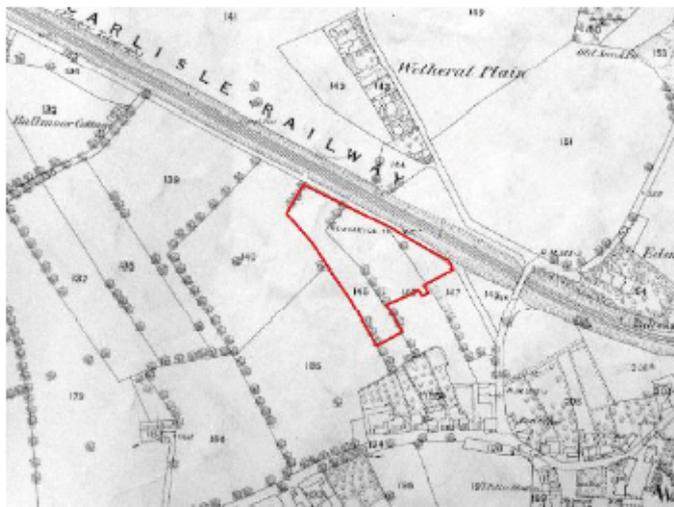


Plate 2: Ordnance Survey 1863



Plate 3: Ordnance Survey 1868

3.3.4 **Ordnance Survey 1901:** a boundary is marked along the south-east end at the south-west end of the site and a small building has been added in the field to the south-east of this, but the area occupied by the site remains unchanged (Plate 4).



Plate 4: Ordnance Survey 1901

3.4 Site Visit

3.4.1 **Site Arrangement and Character:** the site comprises an area of rough grazing mostly formed by hummocky grass (Plate 5), with the remains of two former field boundaries, comprising hedge banks orientated north-west/south-east, evident across the site, with the south-westernmost of these continuing as an apparent earthwork and including a large tree (Plate 6). The whole area slopes slightly towards the north-west, where it is bounded by a track running along the side of the cutting for railway. The south-west and most of the south-east edges of the site are bounded by hedge banks, although the southern corner comprises a post and wire fence. Much of the site is boggy and spoil from recently excavated and backfilled test pits is present along the south-west side of the site. This seems to mostly comprise a reddish-orange boulder clay, with only very occasional finds of post-medieval date evident.



Plate 5 (left): General view of the site from the south corner

Plate 6 (right): View of the earthwork continuing the line of the field boundary and the large tree

3.4.2 Constraints: in general terms there are few major constraints to any further archaeological work across the site. The generally boggy conditions would make investigation difficult in some areas and test pits are likely to have caused some damage to any below-ground features. In addition, in the centre of the south-east side of the site a large piece of plywood had been laid on the ground, perhaps covering a void of some form, an area of surface burning was evident in the southern end of the site, and a ruined metal structure was situated against the south-west boundary in the north corner of the site with a derelict horse box stood next to it, both of which might have affected below-ground remains. A water trough, in the form of an old bath tub, was also positioned at the south-east end of the central field boundary, which would suggest that some form of water pipe is likely to be connecting to it, something which will also have affected below ground remains.



Plate 7 (left): Sheet of plywood covering a possible void

Plate 8 (right): Water trough in an old bath tub

3.5 Geophysical Survey

3.5.1 The full geophysical report is presented in *Appendix 3*. In summary, the whole site had considerable areas of magnetic disturbance across it, particularly in the south-east end and the north-west corner. A possible linear feature orientated south-west/north-east was evident on the north-west side apparently associated with an area of positive responses (see Figure 1). This linear feature possibly corresponds to a turn in the central field boundary shown on the early maps of the site, although if so it would appear to also include an extension of this to the south-west. The origin of the other responses is

uncertain, although they could relate to archaeological features. It is notable that the linear earthwork evident on the ground and apparently continuing the line of the partial field boundary across the middle of the site was not revealed during the geophysical survey.

3.6 Conclusion

3.6.1 The map regression shows that the area has been open fields since at least 1842. The name 'Gallow Acre' in the adjoining field to the north-east might suggest the position of a gallows, but it is not clear whether this would leave any archaeological evidence.

3.6.2 The site visit revealed that there has been some disturbance to the site, but this is generally restricted to small areas so it is likely that across most of the site any archaeological features that are present are likely to have survived.

3.6.3 The geophysical survey showed few features of interest and considerable areas of what is likely to be relatively modern disturbance. A single notable linear feature probably relates to a former field boundary.

4. Site History

4.1 Introduction

4.1.1 The history of the local landscape is arguably dominated by two significant elements: the medieval priory of Wetheral and the village of Wetheral, although Corby Castle, which has at least medieval origins, is a short distance to the east on the other side of the River Eden, and there are numerous other sites of archaeological interest recorded in the general area dating from the prehistoric period onwards. Information relating to specific sites recorded during the desk-based assessment (see *Section 3* above) is included where relevant.

4.2 Prehistoric Period (c11,000BC – 1st century AD)

4.2.1 While there is limited evidence for human activity in the county in the period immediately following the last Ice Age, this is typically found in the southernmost part on the north side of Morecambe Bay. Excavations of a small number of cave sites have found the remains of animal species common at the time but now extinct in this country and artefacts of Late Upper Palaeolithic type (Young 2002). No remains of this date are known from the immediate area of the site, although a pair of barbed spear heads made from antler were found at Crosby-on-Eden (Hodgson 1895), which, although undated, may belong to the end of the Palaeolithic or early Mesolithic. The county was clearly more densely inhabited during the following period, the Mesolithic (c8,000 – 4,000 BC), as large numbers of artefacts of this date have been discovered during field walking and eroding from sand dunes along the coast, but these are typically concentrated in the west coast area and on the uplands around the Eden Valley (Cherry and Cherry 2002). More recently a particularly large assemblage has been recovered during excavations, directly on the edge of the River Eden, outside Carlisle (Clark 2010) and field walking has found additional scatters of some significance also in the Eden valley near Penrith (Clarke *et al* 2008). Coastal areas and river valleys are notably places where such material is frequently found in the wider region (Middleton *et al* 1995, 202; Hodgkinson *et al* 2000, 151-152; Hodgson and Brennan 2006, 26).

4.2.2 In the following period, the Neolithic (c4,000 – 2,500 BC), large scale monuments such as burial mounds and stone circles begin to appear in the region and one of the most recognisable tool types of this period, the polished stone axe, is found in large numbers across the county, having been manufactured at Langdale in the central Lake District (Hodgson and Brennan 2006, 45). During the Bronze Age (c2,500 – 600 BC) monuments, particularly those thought to be ceremonial in nature, become more common still, and it is likely that settlement sites thought to belong to the Iron Age have their origins in this period. Sites of this type, while not present in the study area, are recorded, typically as crop marks revealed in aerial photographs, in the wider area although they are typically undated and little understood. In addition, there is likely to have been a considerable overlap between the end of the Iron Age and the beginning of the Romano-British period; it is evident that in this part of the country, initially at least, the Roman invasion had a minimal impact on the native population in rural areas (Philpott 2006, 73-74).

4.2.3 The only confirmed prehistoric site from within the study area is a polished stone axe, found during ploughing on the bank of the River Eden (**Site 1**).

4.3 Romano-British to Early Medieval Period (1st century AD – 11th century AD)

4.3.1 While the local area around Wetheral has relatively little evidence for activity of this date, the environs of the site are within a few kilometres of Hadrian's Wall, to the north, and the Roman city of Carlisle, to the west. The fort at Carlisle was first established in the autumn or winter of AD 72-73 (Zant 2011, 35) but was soon altered, in AD 83-84 (*op cit*, 36-37). It was abandoned for a time, before being rebuilt in the early 2nd century, cAD 105, but its character changed by the AD 120s, probably on account of the construction of Hadrian's Wall, which began in AD 122-123 (*op cit*, 42-43). This in turn led to the construction of a new fort at Stanwix, but the fort at Carlisle continued and in the early 3rd century AD it was rebuilt in stone (*op cit*, 48). Both Carlisle and Stanwix continued to be occupied into the 4th century and beyond, along with an extensive civilian settlement at the former. Evidence for post-Roman

habitation is limited and inconclusive (*op cit*, 50-51) but it is apparent that Carlisle remained an important place into the 7th century, with an historical account of that period famously describing the extant walls of the Roman town and a working fountain (Zant 2009, 15). In more rural areas such as that around Wetheral the impact of the Romans, in what would have been a heavily militarised zone, is less clear. The size of the 'military market' to the local area must have been of great importance, but it is clear that many 'natives' initially continued to live in much the way they had before the arrival of the Romans, perhaps supplying them with goods and, as a result at first benefiting from their arrival (Higham 1986, 216-225). The extensively military nature of the area is represented by a crop mark to the west of the study area, which has been interpreted as a Roman temporary camp (Small 2008, 29 and 33). In addition, a pair of Roman inscriptions formerly situated in the cliff face south of Wetheral but now loose and stored in Tullie House Museum (Perriam and Ramshaw 2008, 4), have been taken as evidence for the military quarrying the local stone (Collingwood and Wright 1965, 335-336).

4.3.2 Physical and archaeological evidence from the post-Roman early medieval period is considerably less common in rural areas. Place-name evidence shows that Wetheral derives from the Anglian Old English *h(e)alh* meaning either low pasture, typically flat alluvial land on the side of a river (Armstrong *et al* 1950, 160), or a corner of land (Phythian-Adams 1996, 67) of the wethers (a castrated male sheep). Its existence at an early date is also seemingly confirmed by later sources describing it as on the boundary of Hexham diocese, which ceased to exist by the early 9th century (Rollason 2003, 45). Evidence for the presence of an early settlement at Wetheral is also found in a fragment of cross with a fragmentary runic inscription found at the church (**Site 9**) in c1965, thought to be of 8th to 9th century date (Bailey and Cramp 1988, 153-154; Perriam and Ramshaw 2008, 5). The presence of this cross and the significance of Wetheral's mention in relation to the boundary of Hexham Diocese has led to the suggestion that it was home to a '*literate religious community*' (Phythian-Adams 1996, 67), perhaps monastic. In addition, the rock-cut chambers known as Constantine's Cells, to the south of the study area on the edge of the River Eden, may have early medieval origins, being apparently mentioned in early documents relating to Wetheral priory as already in existence and relating to St Constantine (Armstrong *et al* 1950, 163). They have been little studied, however (Milborne 1749; Anon 1899), and may be entirely medieval in origin. Similarly, a holy well dedicated to St Cuthbert (**Site 3**) is described in a charter of AD 1200 (McIntire 1944, 15), but could have much earlier origins.

4.3.3 Sites of Roman date from within the study area include a second century Roman coin found by a metal detectorist (**Site 15**) and may include the earthwork enclosure at Harbour Wood, which has been identified as a possible Roman fortlet (**Site 18**). Sites of early medieval date from the study area are also infrequent, but include a metal strap-end probably dating to the 9th century, also found by a metal detectorist (**Site 16**) and should perhaps also include the site of the church at Wetheral (**Site 9**).

4.4 Medieval Period (11th century AD – 16th century AD)

4.4.1 Wetheral is first recorded in c1100 but in connection with Wetheral Priory (now only represented by the surviving gatehouse; **Site 12**) (Armstrong *et al* 1950, 160), which was the approximate date of its foundation (Martindale 1922b). It was founded as a Benedictine house and cell of the Abbey of St Mary in York by Ranulph Meschin (*op cit*, 239) and subsequently received gifts from Henry I, Henry II, Henry III and Richard I, and also the future David I of Scotland (*op cit*, 240). The monastic church had at least two altars, one dedicated to the Blessed Virgin Mary the other to the Holy Trinity, but early references are also made to dedications to St Mary and St Constantine, and two chapels are also mentioned, one dedicated to St Anthony (**Site 7**) the other to St Servanus or St Severinus (**Site 17**), although the exact whereabouts of these is not known (*op cit*, 251). The priory also had fishing rights in the River Eden, and the salmon coops (**Site 19**) still remaining there are thought to originate in the medieval period (Railton and Davies 2007, 97). Few remains of the priory now survive, with the exception of the gatehouse, which is early 16th century (Hyde and Pevsner 2010, 669). The priory was surrendered on 20th October 1538 during the Dissolution (Martindale 1922b, 241). The origins of the village of Wetheral are less clear, although it is likely to be at least medieval given that the church there (**Site 9**) contains mostly medieval and later fabric (Martindale 1922a) and the cross situated in the churchyard is also medieval in origin (**Site 10**).

4.4.2 Apart from those sites already mentioned above there are a few others of likely medieval date within the study area. The field named 'Gallow Acre' (**Site 4**) perhaps indicates the position of a gallows serving the village, parish or manor, which could therefore be medieval in origin. The stone horse drinking trough near to Wetheral Priory gatehouse (**Site 13**) and an area of ridge and furrow (**Site 11**) adjacent to the site of the priory may also be medieval, as may an area of crop mark field boundaries (**Site 6**). The square earthwork at Harbour Wood (**Site 18**) has been described as a moated enclosure of medieval date, but this is uncertain. Of particular importance to the local area, although of less importance to the site, is Corby Castle, which had its origins as a 14th century fortified tower, encased in later additions (Perriam and Robinson 1998, 142-143; Hyde and Pevsner 2010, 300).

4.5 Post-Medieval (16th century AD – present)

4.5.1 The map evidence (see *Section 3.3*) demonstrates that the site had reached approximately its present state by the beginning of the 19th century, with all the fields enclosed, and it is likely that relatively little changed in the area following the end of the medieval period. Following the Dissolution the lands and properties formerly held by Wetheral Priory passed into the hands of local families, the Tullie family acquiring the lease of Wetheral Manor from the Dean and Chapter of Carlisle (Perriam and Ramshaw 2008, 16) and the Howard family of Corby Castle ultimately acquiring the salmon coops thought to have originally belonged to the priory (Railton and Davies 2007, 97). The former site of the priory became home to a farm, known as Wetheral Abbey Farm (Perriam and Ramshaw 2008, 21). The area in general remained very rural in character and probably saw little substantial change until the coming of the Newcastle-Carlisle railway (**Site 2**), which opened in 1838 (Robinson 2011, 175-176). This heralded a new period of industrialisation seen at a national and local level, with nearby Carlisle developing a substantial range of industries, particularly those relating to textiles (Newman 2011). There is considerably less evidence for industrialisation in rural areas such as Wetheral, although the mill (**Site 5**) at least dates to the post-medieval period.

4.5.2 Apart from those sites already mentioned, the current village cross (**Site 8**), which is socketed in a squared base and was previously used for the maypole before being moved to its current location, dates to the 19th century. Other sites, such as Corby Castle (**Site 14**) and elements of the former Wetheral Priory (**Site 12 and Site 19**) continued in use, albeit typically following modification, into the post-medieval period.

4.6 Previous Archaeological Work

4.6.1 Two pieces of previous archaeological work have been carried out within the study area, an evaluation and recording of the salmon coops situated in the River Eden (NPA 2006; subsequently published as Railton and Davies 2007), and an evaluation on land adjacent to the B6263 (CFA Archaeology 2011). A desk-based assessment and geophysical survey is also concurrently being undertaken on land adjacent to the playing fields on the south side of Wetheral (Greenlane Archaeology 2012).

4.6.2 The investigation of the salmon coops recorded several phases of development of the structures, probably dating from the 17th, 18th and 19th centuries (NPA 2006; Railton and Davies 2007, 103). The evaluation off the B6263 revealed only a single undated linear feature, thought to represent the line of a former field boundary (CFA Archaeology 2011). The desk-based assessment and geophysical survey adjoining this revealed former field boundaries, with areas of ridge and furrow respecting these, as well as another linear feature, which may continue the line of extant field boundaries, and a scatter of other anomalies (Greenlane Archaeology 2012).

5. Discussion

5.1 Introduction

5.1.1 The discussion of the results of the desk-based assessment, site visit and geophysical survey are intended to determine the archaeological significance and potential of any known remains (above or below ground) and the potential for any as yet unidentified remains being present. The system used to judge the significance of the remains identified within the development area, or those thought to have the potential to be present within the development area, is based on the criteria used to define Scheduled Monuments (DoE 1990, Annex 4; *Appendix 2*). Of the 19 sites identified within the study area, none are situated within the proposed development area and they are therefore unlikely to be affected by any subsequent groundworks.

5.2 Significance

5.2.1 No previously recorded sites of archaeological interest are recorded within the proposed development area. However, a group of features comprising a linear anomaly and a group of positive responses on the north-west part of the site and an isolated and shorter linear anomaly to the south were revealed during the geophysical survey (see Figure 1 and *Appendix 3*). While the north-west linear feature is likely to relate to a former field boundary shown on the early mapping the other responses are of less certain origin but could relate to archaeological features. Dating all of these elements is difficult, however; the field boundary is perhaps unlikely to be earlier in date than the medieval period while the other features cannot be dated.

5.2.2 The level of significance of the features within the proposed development area is categorised, according to each criterion, as high, medium, or low, and an average of this has been used to produce an overall level of significance for each site (see Table 3 below: H=high, M=medium, L=low). As can be seen in Table 3 all of these features are considered to be of low significance.

Site	North-west linear	Grouped responses	South linear
<i>Period</i>	L	-	L?
<i>Rarity</i>	L	-	L
<i>Documentation</i>	L	L	L
<i>Group value</i>	M	M	L
<i>Survival/condition</i>	M	L	L
<i>Fragility/Vulnerability</i>	L	M	M
<i>Diversity</i>	L	L	L
<i>Potential</i>	L	M	L
Significance	L	L-M	L

Table 3: Significance by site

5.3 Potential for Unknown Archaeological Remains

5.3.1 The details of those archaeological remains present within the proposed development area is presented in the results of the desk-based assessment (*Section 3*; Figure 2; *Appendix 1*) and the significance of these sites is discussed above (*Section 5.2*). The potential for as yet unidentified archaeological remains to be present, however, is based on the known occurrence of such remains elsewhere in the study area and local environs (see *Section 4*). Where there are no remains known within the study area the potential is based on the known occurrence within the wider local area. The degree of potential is examined by period and the results are presented in Table 4 below; in each case the level of potential is expressed as low, medium, or high.

Period	Present in study area?	Potential
Late Upper Palaeolithic	N	L
Mesolithic	N	M
Neolithic	Y	L
Bronze Age	N	L
Iron Age	N	L
Roman	Y	M
Early Medieval	Y	M
Medieval	Y	H
Post-medieval	Y	H

Table 4: Degree of potential for unknown archaeological remains by period

5.3.2 In consideration of Table 4 it is worth noting that the possibility of finding Mesolithic or Neolithic remains could perhaps be assessed as medium because they are often associated with sites adjacent to watercourses (Middleton *et al* 1995, 202; Hodgkinson *et al* 2000, 151-152). Areas along the River Eden in particular have also recently been the site of significant and large-scale discoveries of finds and sites of Mesolithic date (Clark 2010; Clarke *et al* 2008). Sites of Bronze Age and Iron Age date are extremely rare from the general area, and none are present within the study area.

5.3.3 Sites of Roman, early-medieval, medieval, and post-medieval date all have examples from within the study area. In the case of the medieval and post-medieval finds this is largely due to the presence of the nearby Wetheral Priory and village of Wetheral, while the Roman and early medieval finds seem indicative of some activity in the local area, although the extent and form of this is not necessarily certain.

5.4 Disturbance

5.4.1 The site appears to have seen relatively little disturbance, although the presence of areas of high magnetic disturbance are suggestive of some modern disturbance across parts of the site. The site visit also revealed small areas of potential disturbance but these are quite isolated.

5.5 Impact

5.5.1 Although no detailed plans were available regarding proposed developments, the nature of the ground cover and topography, which would presumably require considerable landscaping, would suggest that any building on site would substantially impact on any archaeological remains that might be present.

5.6 Recommendations

5.6.1 It is clear from the preceding sections that there is some potential for archaeological remains to be present within the site, while the surviving earthwork on the site represents a field boundary of at least post-medieval date. However, the geophysical survey only identified three areas of archaeological interest and the potential of these is likely to be limited.

5.6.2 As a minimum it is recommended that the area containing the larger linear anomaly and group of positive responses revealed by the geophysical survey be examined through evaluation trenching (see Figure 1). This could also be utilised to examine the extant earthwork, which appears to correspond to a former field boundary (Figure 1).

6. Bibliography

6.1 Primary and Cartographic Sources

CAC(C) DRC/8/196, 1842 *Map of Wetheral in Two Parts, Part 1 Part of the Township of Wetheral in the Parish of Wetheral and County of Cumberland*

Ordnance Survey, 1863 *Cumberland Sheet 24.6*, 1:2,500, surveyed 1861

Ordnance Survey, 1868 *Cumberland Sheet 24*, 1:10,560, surveyed 1861

Ordnance Survey, 1901 *Cumberland Sheet 24.6*, 1:2,500, revised 1899

Ordnance Survey, 2007 *Carlisle: Brampton, Longtown and Gretna Green*, **315**, 1: 25,000

6.2 Secondary Sources

Anon, 1899 Excursions and Proceedings, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 1st ser, **15**, 321-336

Bailey, RN, and Cramp, R, 1988 *Corpus of Anglo-Saxon Stone Sculpture Volume II: Cumberland, Westmorland and Lancashire North-of-the-Sands*, Oxford

Brown, DH, 2007 *Archaeological Archives: A Guide to Best Practice in Creation, Compilation, Transfer, and Curation*, IfA, Reading

CFA Archaeology, 2011 *Land Adjacent to the B6263, Wetheral, Nr Carlisle, Cumbria: Archaeological Evaluation*, unpubl rep

Clack, PAG, and Gosling, PF, 1975 *Archaeology in the North*, London

Clark, P, 2010 Excavations at Stainton, Carlisle, Ahead of the Carlisle Northern Development Route, *CWAAS Newsletter*, **64**, 4-5

Clarke, J, Watson, A, Dickson, A, and Hamilton-Gibney, A, 2008 *Fieldwalking in the Vale of Eden*, interim report **01**, Penrith

Collingwood, RG, and Wright, RP, 1965 *Roman Inscriptions of Britain*, Oxford

Countryside Commission, 1998 *Countryside Character, Volume 2: North West*, Cheltenham

Department of the Environment (DoE), 1990 *Planning Policy Guidance: Archaeology and Planning*, **PPG16**

English Heritage, 1991 *The Management of Archaeological Projects*, 2nd edn, London

Greenlane Archaeology, 2012 *Land Adjacent to Wetheral Playing Fields, Wetheral, Cumbria: Archaeological Desk-Based Assessment and Geophysical Survey*, unpubl rep

Griffith, D, 2010 *Vikings of the Irish Sea*, Stroud

Higham, NJ, 1986 *The Northern Counties to AD 1000*, London

Hodgson, TH, 1895 Bone Spear or Harpoon Heads from Terra del Fuego, Found on Peat Near Crosby-on-Eden, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 1st ser, **13**, 402

Hodgson, J, and Brennand, M, 2006 Prehistoric Period Resource Assessment, in M Brennand (ed), *The Archaeology of North West England – An Archaeological Resource Framework for North West England Volume 1: Resource Assessment*, Archaeology North West, **8**, 23-58

Hodgkinson, D, Huckerby, E, Middleton, RH, and Wells, CE, 2000 *The Lowland Wetlands of Cumbria*, North West Wetlands Survey, Lancaster Imprints **8**, Lancaster

Hogg, R, 1958 Recent Additions to Carlisle Museum, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **58**, 106-109

- Hyde, M, and Pevsner, N, 2010 *The Buildings of England – Cumbria: Cumberland, Westmorland and Furness*, London
- Institute for Archaeologists (IfA), 2008 *Standard and Guidance for Archaeological Desk-Based Assessment*, revised edn, Reading
- Martindale, JH, 1922a The Church of the Holy Trinity, Wetheral, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **22**, 234-238
- Martindale, JH, 1922b The Priory of Wetheral, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **22**, 239-251
- McIntire, WT, 1944 The Holy Wells of Cumberland, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **44**, 1-15
- Middleton, R, Wells, CE, and Huckerby, E, 1995 *The Wetlands of North Lancashire*, North West Wetlands Survey **3**, Lancaster Imprints **4**, Lancaster
- Milborne, W, 1749 On the Cells at Wetheral in Cumberland, *Archaeologia*, **1**, 84-86
- Moseley, F (ed), 1978 *The Geology of the Lake District*, Yorkshire Geological Society, occ publ **3**, Leeds
- Newman, C, 2011 The Industrial and Manufacturing City, in M Brennan and K Stringer (ed), *The Making of Carlisle: From Romans to Railways*, CWAAS extra ser, **35**, Kendal, 153-172
- North Pennine Archaeology (NPA), 2006 *Report on an Archaeological Evaluation of the Salmon Coops, Corby Castle, Carlisle, Cumbria*, unpubl rep
- Parsons, J, 2012 *Brief for a Desk-Based Assessment & Geophysical Survey on Land off Hallmoor Court, Wetheral, Cumbria*, unpubl
- Perriam, DR, and Ramshaw, D, 2008 *Wetheral and Great Corby: An Illustrated History*, Carlisle
- Perriam, DR, and Robinson, J, 1998 *The Medieval Fortified Buildings of Cumbria: An Illustrated Gazetteer and Research Guide*, CWAAS extra ser **29**, Kendal
- Philpott, R, 2006 The Romano-British Period Resource Assessment, in M Brennan (ed), *The Archaeology of North West England – An Archaeological Resource Framework for North West England Volume 1: Resource Assessment*, Archaeology North West, **8**, 59-90
- Phythian-Adams, C, 1996 *Land of the Cumbrians: A Study in British Provincial Origins A.D. 400-1120*, Aldershot
- Railton, M, and Davies, G, 2007 Archaeological Evaluation of the Salmon Coops at Corby Castle, Cumbria, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 3rd ser, **7**, 95-106
- Richardson, C, 1990 A Catalogue of Recent Acquisitions to Carlisle Museum and Reported Finds from the Cumbrian Area, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **90**, 1-98
- Rollason, D, 2003 *Northumbria, 500-1100: Creation and Destruction of a Kingdom*, Cambridge
- Shotter, DCA, 1989 Roman Coin-finds in Cumbria, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **89**, 41-50
- Small, F, 2008 *Hadrian's Wall National Mapping Programme: Brampton to Birdoswald*, English Heritage, unpubl rep
- Young, R, 2002 The Palaeolithic and Mesolithic Periods in Northern England: An Overview, in Brooks, C, Daniels, R, and Harding, A, (ed), *Past, Present and Future: The Archaeology of Northern England*, Architect Archaeol Soc Durham Northumberland, res rep **5**, 19-36
- Zant, J, 2009 *The Carlisle Millennium Project Excavations in Carlisle, 1998-2001 Volume 1: the Stratigraphy*, Lancaster Imprints **14**, Lancaster
- Zant, J, 2011 The Roman Army in Carlisle, in M Brennan and KJ Stringer (ed), *The Making of Carlisle: From Romans to Railways*, CWAAS extra ser, **35**, Kendal

6.3 Aerial Photographs

CCC (Cumbria County Council), n.d. **NY4654/B-E** (formerly 2400/1-2 and 4-5)

Appendix 1: Site Gazetteer

Site Number: 1

NGR: 346500 555500

HER No: 4540

Sources: Hogg 1958, 107-8

Designation: None

Description: Polished stone axe of square-butted type found c1899 during ploughing of old pasture at Old House Farm on the west bank of the River Eden north of Wetheral.

Period: Prehistoric

Site Number: 2

NGR: -

HER No: 41002

Sources: HER; Robinson 2011, 175-176

Designation: None

Description: The Newcastle-Carlisle railway opened at the Carlisle end in 1836. The whole line opened in 1838. It became part of the North Eastern Railway (NER) in 1865.

Period: Post-medieval

Site Number: 3

NGR: 346733 554958

HER No: 3815

Sources: McIntire 1944, 15

Designation: None

Description: St Cuthbert's holy well described in charter 1200 as rising above Muchwat (Monks Ford) and below that part of Eden called the Camera Constantini. The spring lies in the wood below the mill and weir. It is covered by a small, stone well-house inscribed 'The Holy Well, Called in the 12th Century, Fons Sancti Cuthberti'. Repaired in 1897.

Period: Medieval

Site Number: 4

NGR: 346490 554740 (centre)

HER No: -

Sources: CAC(C) DRC/8/196 1842

Designation:

Description: The schedule accompanying the tithe map of 1842 lists two fields as 'Gallow Acre/South' (plot 218) and 'Gallow Acre/North' (plot 129). These are now split by the cutting for the railway but were presumably a single field. The place-name suggests it was the site of a gallows, although it is possible that it derives from the Norse word *Gallgoidil* meaning 'foreigners' (Griffith 2010, 40).

Period: Medieval – post-medieval?

Site Number: 5

NGR: 346850 554580

Client: Simtor Ltd

© Greenlane Archaeology Ltd, September 2012

HER No: 10194

Sources: Ordnance Survey 1863

Designation: None

Description: Mill complex consisting of mill and mill race. The mill appears to have been converted to housing now. The mill race is still evident.

Period: Medieval to post-medieval?

Site Number: 6

NGR: 346100 554300

HER No: 6925

Sources: CCC n.d. NY4654/B-E

Designation: None

Description: Crop marks, some of which appear to relate to earlier field boundaries, others appear to be natural.

Period: Medieval to post-medieval?

Site Number: 7

NGR: 346700 554400

HER No: 512, 3816 [repeated entry]

Sources: Martindale 1922b, 251; Clack and Gosling 1975

Designation: None

Description: Possible site of a chapel dedicated to St Anthony. The chapel is supposedly situated on the road between Wetheral and Cumwhinton but there is no evidence to support this.

Period: Medieval?

Site Number: 8

NGR: 346660 554368

HER No: 4535

Sources: HER

Designation: Listed Grade II

Description: Squared red sandstone column c3.5 to 4m high, with chamfered corners and head carved to give a quatraform cross c1844 on a chamfered plinth hollowed to form a shaft socket and set on two squared step slab supports. The octagonal socket is over 1m wide and c0.8m high on a squared base and was formerly used for the wooden maypole in the centre of the green; the cross was added when it was moved to its present location.

Period: Post-medieval

Site Number: 9

NGR: 346810 554400

HER No: 4536

Sources: Martindale 1922a; Hyde and Pevsner 2010, 668

Designation: Listed Grade II*

Description: Church of the Holy Trinity and St Constantine with 13th century fabric and alterations made in the 16th century, between 1790-91, in 1872, and between 1881-2. The church is dressed red sandstone with graduated slate roofs and a coped east gable. It has a west tower nave with vestry and south porch, chancel, chapel, and bellcote at the east end. The hexagonal tower is on the site of the

medieval porch. Medieval features include a 13th century hexagonal font, tomb chest with effigies c1500, and fragments of stained glass. The arcades although much renewed are essentially 13th century.

Period: Medieval to post-medieval

Site Number: 10

NGR: 346840 554370

HER No: 4534

Sources: HER

Designation: None

Description: Wetheral churchyard cross and sundial; a rough red sandstone polygonal pillar, bearing a brass sundial with Roman numerals dated 1751, fitted into a carved socket stone which may be the remains of a churchyard cross surrounded by two low steps.

Period: Medieval to post-medieval

Site Number: 11

NGR: 346880 554250

HER No: 18919

Sources: HER

Designation: None

Description: An area of faint broad ridge and furrow in poor condition immediately north of the remains of Wetheral Priory.

Period: Medieval?

Site Number: 12

NGR: 346800 554100

HER No: 2910

Sources: Martindale 1922b; Hyde and Pevsner 2010, 668-669

Designation: Scheduled Monument; Listed Grade I

Description: Benedictine Priory founded in 1106, surrendered in 1538 and largely demolished, with the exception of the well-preserved 14th or 15th century gatehouse. The three-storey gatehouse has dressed red sandstone walls with moulded dressing and a stone-slab replacement roof. It has two bays, a chamfered plinth course, moulded string course to each storey, one and two-light mullioned windows, and battlement parapet. The entrance arch has a barrel-vaulted passage. Label moulds to the sides show the single storey roofline of the original adjoining buildings. Internally it has a spiral staircase. Part of a one storey, but probably originally two storey wall remains, c25m long; possibly the east wall of Chapter House. Windows in the stonework match those in the gatehouse. The Scheduled area includes the upstanding and buried remains of the Priory. Below ground features include the remains of two buildings known, from visible fragments of rooflines, to have been attached to the north and south external faces of the gatehouse.

Period: Medieval

Site Number: 13

NGR: 346790 554123

HER No: 18918

Sources: HER

Designation: None

Client: Simtor Ltd

Description: A stone horse drinking trough is built into a stone wall just opposite the entrance to Wetheral Priory Gatehouse. It appears of considerable age.

Period: Medieval – post-medieval?

Site Number: 14

NGR: 347080 554190

HER No: 3817

Sources: Perriam and Robinson 1998, 142-143; Hyde and Pevsner 2010, 300-301

Designation: Listed Building, Grade I; National Parks and Gardens Register, Grade I

Description: 14th century tower house encased in later buildings. Additions were made in 1630 and 1690 and the present façade was built between April 1812 and September 1817 by Peter Nicholson for Henry Howard in Grecian Doric style. It is red sandstone ashlar, with slate roofs. It is three-storeys with five bays to the south and three-storeys with seven bays to the west. The main staircase dates to the 1720s and there is a medieval spiral staircase in the original tower. The early 18th century landscape garden with principal landscaping by Thomas Howard is included in the National Parks and Gardens Register, Grade I.

Period: Medieval – post-medieval

Site Number: 15

NGR: 346000 554000

HER No: 19107

Sources: Shotter 1989, 42

Designation: None

Description: A second century Roman coin was found in Wetheral in 1980, but the exact findspot is unknown. It is a Sesterius of Antoninus Pius

Period: Roman

Site Number: 16

NGR: 346930 554030

HER No: 17972

Sources: Richardson 1990, 40-41

Designation: None

Description: Zoomorphic metal strap-end recovered from the River Eden by a metal detectorist in 1985. This example is covered by two intertwining creatures and has a stylised 'animal-head' terminal with a broad snout, eyes and swept back ears. The inlay is niello rather than silver and it has three iron rivets in situ where the object was attached to a leather belt or strap; probably dating to the 9th century.

Period: Early medieval

Site Number: 17

NGR: 347000 554000

HER No: 513

Sources: Martindale 1922b, 251

Designation:

Description: Wetheral chapel, a chapel dedicated to St Servanus or St Severinus and belonging to Wetheral Priory, has not been located, but there is a tradition it was on the River Eden bank east of the Priory.

Period: Medieval?

Site Number: 18

NGR: 346150 553760

HER No: 12793

Sources: Ordnance Survey 1868

Designation: None

Description: Ditched enclosure; rectangular enclosure c26m by 26m, ditched on the east and south sides, with evidence of former ditches on the other two. The ditches have been incorporated into the field drainage system. More than half of the enclosure forms a raised platform about six feet above the field, but on the east side there is a bank some 3.4m wide, with very straight faces and a curved southern corner. Local tradition suggests the enclosure was a monastic burial ground, but it has also been suggested that it was a Roman fortlet or moated medieval site. It is labelled 'Harbour Wood' on the Ordnance Survey map of 1868.

Period: Roman or medieval?

Site Number: 19

NGR: 346855 553685

HER No: 42132

Sources: NPA 2006; Railton and Davies 2007

Designation: Listed Building, Grade I

Description: 12th century salmon coops for Wetheral Priory, with later repairs. After the Dissolution the coops passed to the Howard family of Corby Castle, who still own them and use them occasionally. An evaluation was undertaken in 2005 prior to floor damage repairs to the intricate system of sluice gates, weirs and artificial eyots. Structural deposits were identified in all five of the test pits excavated, and evidence of successive phases of rebuilding and repairs were found which most likely date to the 17th, 18th and 19th centuries.

Period: Medieval – post-medieval

Appendix 2: Significance Criteria

After DoE 1990, Annex 4: '*Secretary of State's Criteria for Scheduling Ancient Monuments*'

- i) *Period*: all types of monuments that characterise a category or period should be considered for preservation;
- ii) *Rarity*: there are some monument categories which in certain periods are so scarce that all surviving examples which retain some archaeological potential should be preserved. In general, however, a selection must be made which portrays the typical and commonplace as well as the rare. This process should take account of all aspects of the distribution of a particular class of monument, both in a national and regional context;
- iii) *Documentation*: the significance of a monument may be enhanced by the existence of record of previous investigation or, in the case of more recent monuments, by the supporting evidence of contemporary written records;
- iv) *Group Value*: the value of a single monument (such as a field system) may be greatly enhanced by its association with related contemporary monuments (such as a settlement and cemetery) or with monuments of different periods. In some cases, it is preferable to protect the complete group of monuments, including associated and adjacent land, rather than to protect isolated monuments within the group;
- v) *Survival/Condition*: the survival of a monument's archaeological potential both above and below ground is a particularly important consideration and should be assessed in relation to its present condition and surviving features;
- vi) *Fragility/Vulnerability*: highly important archaeological evidence from some field monuments can be destroyed by a single ploughing or unsympathetic treatment; vulnerable monuments of this nature would particularly benefit from the statutory protection which scheduling confers. There are also existing standing structures of particular form or complexity whose value can again be severely reduced by neglect or careless treatment and which are similarly well suited by scheduled monument protection, even if these structures are already listed historic buildings;
- vii) *Diversity*: some monuments may be selected for scheduling because they possess a combination of high quality features, others because of a single important attribute;
- viii) *Potential*: on occasion, the nature of the evidence cannot be specified precisely but it may still be possible to document reasons anticipating its existence and importance and so to demonstrate the justification for scheduling. This is usually confined to sites rather than upstanding monuments.

Appendix 3: Geophysical Survey



PHASE
SITE INVESTIGATIONS

**Land off Hallmoor Court, Wetheral
Cumbria**

Archaeological Geophysical Survey

Project No. ARC/829/327

September 2012



Land off Hallmoor Court, Wetheral Cumbria

Archaeological Geophysical Survey

Project No. ARC/829/327

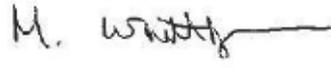
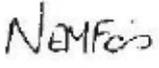
Report prepared by		Report checked by	
Name	Mark Whittingham BSc MA	Name	Nicola Fairs BSc MSc DIC CGeol FGS
Signature		Signature	
Date	12/09/12	Date	12/09/12



Table of Contents

1. SUMMARY	1
2. INTRODUCTION	2
2.1 OVERVIEW	2
2.2 SITE DESCRIPTION	2
2.3 ARCHAEOLOGICAL BACKGROUND	2
2.4 SCOPE OF WORK	2
3. SURVEY METHODOLOGY	4
3.1 MAGNETIC SURVEY	4
3.2 DATA PROCESSING AND PRESENTATION	4
4. RESULTS	6
4.1 GENERAL	6
4.2 DIPOLAR RESPONSES	6
4.3 LINEAR TRENDS	7
4.4 POSITIVE / ENHANCED RESPONSES (ISOLATED)	7
5. DISCUSSION AND CONCLUSIONS	8
DRAWINGS	
ARC_829_327_HCW_01	Site location map
ARC_829_327_HCW_02	Greyscale plot of magnetic gradient data
ARC_829_327_HCW_03	Interpretation of magnetic gradient data
BIBLIOGRAPHY	9
APPENDIX 1	Magnetic survey; technical information
	10

DIGITAL COPY OF REPORT CAN BE FOUND ON CD ATTACHED TO BACK COVER

1. SUMMARY

Phase Site Investigations Ltd was commissioned to carry out a magnetic gradient survey at land off Hallmoor Court, Wetheral, Cumbria utilising magnetic gradiometers. The aim of the survey was to help establish the presence / absence, extent, character, relationships and date (as far as circumstances and the inherent limitations of the technique permit) of archaeological features within the survey area.

A Bartington Grad 601-2 gradiometer was utilised with data collected at 1 m by 0.25 m intervals over a series of 30 m grids.

The majority of the anomalies identified by this survey are thought to relate to modern material / objects or geological / pedological variations.

There are several areas where very strong responses or magnetic disturbance from modern features dominate the surrounding data. It should be recognised that the strength of the strong responses could mask anomalies from other sub-surface features in the area.

The area that could be surveyed in the small eastern field is completely dominated by magnetic disturbance, as is the south-eastern part of the larger field. These responses indicate the presence of significant amounts of made ground / tipped material. There is no obvious indication of structures within these disturbed areas but the strength of the magnetic disturbance in these areas is such that any sub-surface features located in their vicinity may not be detected. There are several smaller areas of magnetic disturbance adjacent to these where the strength of response is not as strong. The amount of modern magnetic material in these areas is probably less than the areas to the south and south-east.

There are a several linear and curvi-linear responses that are weak, irregular or discontinuous. Generally these trends have a positive response but there is a suggestion of linearity to them compared to the other isolated positive or enhanced responses within the survey area. It is possible that the trends are associated with geological / pedological variations that coincidentally appear to be linear but the cause of these anomalies cannot be confirmed and so an archaeological origin cannot be completely ruled out.

The lack of an obvious pattern to the distribution of the isolated positive / enhanced responses and the fact that no other anomalies indicative of archaeological features have been identified suggests that the most probable cause for these responses are geological / pedological variations. However, it should be recognised that isolated archaeological features, such as infilled pits, will produce responses of this type and so an archaeological origin for some of these anomalies cannot be completely ruled out.

2. INTRODUCTION

2.1 Overview

Phase Site Investigations Ltd was commissioned by Mr Dan Elsworth of Greenlane Archaeology Ltd to carry out an archaeological geophysical survey at land off Hallmoor Court, Wetheral utilising magnetic gradiometers.

The aim of the survey was to help establish the presence / absence, extent, character, relationships and date (as far as circumstances and the inherent limitations of the technique permit) of archaeological features within the survey area.

The location of the site is shown in drawing ARC_829_327_HWC_01.

2.2 Site description

The site is situated at Wetheral, approximately 6 km to the east of Carlisle (centred at NGR NY 401 564) and covers an area of approximately 1.1 ha. The survey area covered two adjacent fields to the north of the village.

At the time of survey the land was in use as pasture. Ground covering was mainly short grass, however areas close to the field boundaries had become overgrown with thistles and nettles. The ground was boggy for the most part and fairly level across the site. The field boundary separating the two fields and a section of hedge from an old field boundary were very overgrown; with dense vegetation in places covering a width of up to 15 m. The areas of dense or high vegetation cover could not be surveyed.

The site was bounded on all sides by metallic fencing and hedging. In the northern end of the field a derelict metallic structure and horsebox were present. To the south of the site were modern dwellings and to the east a farm track and railway cutting.

The underlying geology of the site is St Bees sandstone formation overlain by glaciofluvial deposits of Devensian sand and gravel.

2.3 Archaeological background

The brief provided by Cumbria County Council (County Historic Environment Service 2012) states that the site lies on the northern edge of the medieval village of Wetheral in an area where the field boundaries appear to be the remains of medieval strip fields.

Aerial photographic evidence shows crop marks of probable prehistoric agricultural practices and track ways to the north and south of the site.

A desk-based assessment is currently being undertaken by Greenlane Archaeology Ltd and this geophysical survey is intended to assist in the assessment of archaeological potential of the site.

2.4 Scope of work

The survey area was specified by the client based on a proposed development boundary shown in the brief.



Due to the presence of dense vegetation the area accessible for survey was reduced to approximately 0.8 ha, the extent of which is shown in drawing ARC_829_327_HCW_02.

No other problems were encountered during the survey which was carried out on 05 September 2012.

3. SURVEY METHODOLOGY

3.1 Magnetic survey

A Bartington Grad601-02 magnetic gradiometer was used for the magnetic survey. The instrument was balanced and 'zeroed' on site in a magnetically uniform area at the start of each days survey. The instruments was regularly checked for instrument drift during the course of each day and rebalanced as required.

The data was collected over a series of 30 m by 30 m survey grids. All data was collected at 0.25 m intervals over profiles spaced 1 m apart and stored in the instrument for download at the end of the day.

Major grid points were established using a Sokkia GRX-1 RTK GPS Leica and were set-out relative to field boundaries, to an accuracy better than 0.03 m. Bamboo canes or tent pegs were used to mark the grid points. Intermediate grid points were established using tape measures and the position of each profile were established by stringing either a pre-marked rope or a 100 m tape measure between grid points. Bamboo canes were then used to mark profiles and the operator walked between these at a constant pace.

The location of the survey grid(s) was recorded directly to Ordnance Survey national grid co-ordinates using the UKO OSTN2 projection to an accuracy better than 0.03 m. Temporary survey stations (wooden stakes) were also set out and tied in to Ordnance Survey national grid co-ordinates to allow the relocation of the survey grids using a total station.

3.2 Data processing and presentation

The gradiometer data was downloaded and gridded in Archaeosurveyor 2.5.13 (DW Consulting). Where required, the data were minimally processed or improved to remove errors caused by instrument drift and/or collection errors (See Appendix 1.4).

The data was exported from Archaeosurveyor as raster images (PNG files) and is presented in greyscale format at 1:1000 in drawings ARC_829_327_HCW_02 with an accompanying interpretation in drawing ARC_829_327_HCW_03. All greyscale plots were clipped at -3 nT to 3 nT. The data shown in the greyscale plots has been 'smoothed' using the Grad. Shade option for presentation purposes.

The data has been displayed relative to a digital Ordnance Survey base plan provided by the client as drawing '*Hallmoor OS mapping.dwg*'. The base plan was in the National Grid co-ordinate system and as the survey grids were set-out directly to national grid co-ordinates the data could be simply superimposed onto the base plan in the correct position.

X-Y trace plots were examined for all of the data and overlain onto the greyscale plot to assist in the interpretation, primarily to help identify dipolar responses that will probably be associated with surface / near-surface iron objects. However, X-Y trace plots have not been presented here as they do not show any additional anomalies anomies that are not visible in the greyscale data. A digital drawing showing the X-Y trace plot overlain on the greyscale plot is provided in the digital archive.

All isolated responses have been assessed using a combination of greyscale and X-Y trace plots. Only the stronger isolated responses, or those that could have archaeological potential have been shown on the interpretation.



The data was examined over several different ranges during the interpretation to ensure that the maximum information possible was obtained from the data.

The anomalies have been categorised based on the type of response that they exhibit and an interpretation as to the cause(s) or possible cause(s) of each anomaly type is also provided.

A general discussion of the anomalies is provided for the entire site.

The geophysical interpretation drawing must be used in conjunction with the relevant results section and appendices of this report.

4. RESULTS

4.1 General

The data quality across the majority of the survey area is generally very good allowing the data to be viewed at a narrow range of readings to better identify weak anomalies.

There are two areas of very strong magnetic disturbance in south-east of the survey area but increasing the range of readings does not highlight any anomalies suggestive of discrete features.

The categories of anomaly, and their possible causes, which have been identified by the survey are discussed in detail below.

Where an anomaly type can have a number of causes then it is assumed that a non-archaeological origin is the most likely cause unless otherwise stated or unless there is other supporting evidence.

4.2 Dipolar responses

Dipolar responses are those that have a sharp variation between strongly positive and negative components. In the majority of cases dipolar responses are usually caused by modern ferrous features / objects, although fired material (such as brick), some ferrous or industrial archaeological features and strongly magnetic gravel could also produce dipolar responses.

There are numerous isolated dipolar responses (iron spikes) across the survey area that are indicative of ferrous or fired material on or near to the surface. The isolated responses are often caused by small objects, such as spent shotgun cartridges, iron nails and horseshoes or pieces of modern brick or pot. Archaeological artefacts can also produce this type of response but unless there is strong supporting evidence to the contrary they are assumed not to be of archaeological significance. As such this type of anomaly has not been shown on the interpretation.

There are several areas containing dipolar responses (magnetic disturbance). This type of anomaly is usually caused by concentrations of ferrous or fired material and are often found adjacent to field boundaries where such material tends to accumulate. If an area of magnetic disturbance is located away from existing field boundaries then it could indicate a former field boundary, several large isolated objects in close proximity, an area where modern material has been tipped or an infilled cut feature, such as a quarry pit. Areas of dipolar response can occasionally be caused by features / material associated with archaeological industrial activity but they are usually caused by modern activity. Responses in areas of magnetic disturbance can sometimes be so strong that archaeological features located beneath them may not be detected.

Above ground metallic or strongly magnetic features, such as fences, gates, pylons and buildings can produce very strong dipolar responses. The strength of magnetic response from these features is such that any sub-surface features located in their vicinity may not be detected.

The area that could be surveyed in the small eastern field is completely dominated by magnetic disturbance, as is the south-eastern part of the larger field. These responses indicate the presence of significant amounts of made ground / tipped material. There is no obvious

indication of structures within these disturbed areas but the strength of the magnetic disturbance in these areas is such that any sub-surface features located in their vicinity may not be detected.

There are several smaller areas of magnetic disturbance adjacent to these where the strength of response is not as strong. The amount of modern magnetic material in these areas is probably less than the areas to the south and south-east.

4.3 Linear trends

There are a several linear and curvi-linear responses that are weak, irregular or discontinuous. These anomalies have been categorised as trends as it is not certain what their cause is or even if they are associated with definite features. Generally these trends have a positive response (see Section 4.4 below) but there is a suggestion of linearity to them compared to the other isolated positive or enhanced responses within the survey area.

It is possible that the trends are associated with geological / pedological variations that coincidentally appear to be linear but the cause of these anomalies cannot be confirmed and so an archaeological origin cannot be completely ruled out.

4.4 Positive / enhanced responses (isolated)

Isolated positive or enhanced responses can occur if the magnetism of a feature, area or material has been enhanced or if a feature is naturally more magnetic than the surrounding material. It is often difficult to determine which of these factors causes any given responses and so the origin of this type of anomaly can be difficult to determine. They can have a variety of causes including geological variations, infilled archaeological features, areas of burning (including hearths), industrial archaeological features such as kilns or deeper buried ferrous material and modern fired material.

The large number of isolated responses and lack of an obvious pattern to their distribution suggests that these anomalies are probably associated with geological / pedological variations however an archaeological origin cannot be completely ruled out. Only the stronger isolated responses have been shown on the interpretation.

5. DISCUSSION AND CONCLUSIONS

The majority of the anomalies identified by this survey are thought to relate to modern material / objects or geological / pedological variations.

There are several areas where very strong responses or magnetic disturbance from modern features dominate the surrounding data. It should be recognised that the strength of the strong responses could mask anomalies from other sub-surface features in the area.

The area that could be surveyed in the small eastern field is completely dominated by magnetic disturbance, as is the south-eastern part of the larger field. These responses indicate the presence of significant amounts of made ground / tipped material. There is no obvious indication structures within these disturbed areas but the strength of the magnetic disturbance in these areas is such that any sub-surface features located in their vicinity may not be detected.

There are several smaller areas of magnetic disturbance adjacent to these where the strength of response is not as strong. The amount of modern magnetic material in these areas is probably less than the areas to the south and south-east.

There are a several linear and curvi-linear responses that are weak, irregular or discontinuous. Generally these trends have a positive response but there is a suggestion of linearity to them compared to the other isolated positive or enhanced responses within the survey area. It is possible that the trends are associated with geological / pedological variations that coincidentally appear to be linear but the cause of these anomalies cannot be confirmed and so an archaeological origin cannot be completely ruled out.

The lack of an obvious pattern to the distribution of the isolated positive / enhanced responses and the fact that no other anomalies indicative of archaeological features have been identified suggests that the most probable cause for these responses are geological / pedological variations. However, it should be recognised that isolated archaeological features, such as infilled pits, will produce responses of this type and so an archaeological origin for some of these anomalies cannot be completely ruled out.

It should be noted that a geophysical survey does not directly locate sub-surface features - it identifies variations or anomalies in the background response caused by features. The interpretation of geophysical anomalies is often subjective and it is rarely possible to identify the cause of all such anomalies. Not all features will produce a measurable anomaly and the effectiveness of a geophysical survey is also dependant on the site-specific conditions. The main factors that may limit whether a feature can be detected are the composition of a feature, its depth and size and the surrounding material. It is not possible to guarantee that a geophysical survey will identify all sub-surface features. Confirmation on the identification of anomalies and the presence or absence of sub-surface features can only be achieved by intrusive investigation.

BIBLIOGRAPHY

Cumbria County Council County Historic Environment Service, 2012, Brief for a desk-based assessment & geophysical survey on land off Hallmoor Court, Wetheral, Cumbria,

Greenlane Archaeology Ltd, 2012, Land off Hallmoor Court, Wetheral, Cumbria, Archaeological desk-based assessment and geophysical survey project design

APPENDIX 1

Magnetic survey: technical information

1.1 Theoretical background

- 1.1.1 Magnetic instruments measure the value of the Earth's magnetic field; the units of which are nanoTeslas (nT). The presence of surface and sub-surface features can cause variations or anomalies in this magnetic field. The strength of the anomaly is dependent on the magnetic properties of a feature and the material that surrounds it. The two magnetic properties that are of most interest are magnetic susceptibility and thermoremanent magnetism.
- 1.1.2 Magnetic susceptibility indicates the amount of ferrous (iron) minerals that are present. These can be redistributed or changed (enhanced) by human activity. If enhanced material subsequently fills in features such as pits or ditches then these can produce localised increases in magnetic responses (anomalies) which can be detected by a magnetic gradiometer even when the features are buried under additional soil cover.
- 1.1.3 In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. Less magnetic material such as masonry or plastic service pipes which intrude into the topsoil may give a negative magnetic response relative to the background level. The strength of magnetic responses that a feature will produce will depend on the background magnetic susceptibility, how rapidly the feature has been infilled, the level and type of human activity in the area and the size and depth of a feature. Not all infilled features can be detected and natural variations can also produce localised positive and negative anomalies.
- 1.1.4 Thermoremanent magnetism indicates the amount of magnetism inherent in an object as a result of heating. Material that has been heated to a high temperature (fired), such as brick, can acquire strong magnetic properties and so although they may not appear to have a high iron content they can produce strong magnetic anomalies
- 1.1.5 The magnetic survey method is highly sensitive to interference from surface and near-surface magnetic 'contaminants'. Surface features such as metallic fencing, reinforced concrete, buildings or walls all have very strong magnetic signatures that can dominate readings collected adjacent to them. Identification of anomalies caused by sub-surface features is therefore more difficult, or even impossible, in the vicinity of surface magnetic features. The presence of made ground also has a detrimental effect on the magnetic data quality as this usually contains magnetic material in the form of metallic scrap and brick. Identification of features beneath made ground is still possible if the target feature is reasonably large and has a strong magnetic response but smaller features or magnetically weak features are unlikely to be identified.
- 1.1.6 The interpretation of magnetic anomalies is often subjective and it is rarely possible to identify the cause of all magnetic anomalies. Not all features will produce a measurable magnetic response and the effectiveness of a magnetic survey is also dependant on the site-specific conditions. The main factors that may limit whether a feature can be detected are the

composition of a feature, its depth and size and the surrounding material. It is not possible to guarantee that a magnetic survey will identify all sub-surface features.

- 1.1.7 Most high resolution, near surface magnetic surveys utilise a magnetic gradiometer. A gradiometer is a hand-held instrument that consists of two magnetic sensors, one positioned directly above the other, which allows measurement of the magnetic gradient component of the magnetic field. A gradiometer configuration eliminates the need for applying corrections due to natural variations in the overall field strength that occur during the course of a day but it only measures relative variations in the local magnetic field and so comparison of absolute values between sites is not possible.
- 1.1.8 Features that are commonly located using magnetic surveys include archaeological ditches and pits, buried structures or foundations, mineshafts, unexploded ordnance, metallic pipes and cables, buried piles and pile caps. The technique can also be used for geological mapping; particularly the location of igneous intrusions.

1.2 Instrumentation

A Bartington Grad601-2 magnetic gradiometer was used for the magnetic survey. The Bartington Grad601-2 is a dual sensor instrument, incorporating two Grad-01-1000 gradiometers set at a distance of 1 m apart.

1.3 Survey methodology

- 1.3.1 The magnetic survey was carried out on a series of regular 30 m grids. Data was collected on zig-zag profiles (walking along a profile and then returning up the adjacent profile in the opposite direction) that were 2 m apart within a grid (the dual sensor array means that this equates to 1 m profile intervals. All data was collected at 0.25 m and stored in the instrument for download at the end of the survey.
- 1.3.2 Readings were taken on 100 nT range (0.1 nT sensitivity). The instrument was balanced and 'zeroed' at a base station that was established on site in a magnetically quiet and uniform location. The instrument was checked for electronic and mechanical drift at this base station at regular intervals during the course of the survey.
- 1.3.3 The survey grids were established using a Sokkia GRX-1 RTK GPS system. Grid points were set-out to an accuracy better than 0.03 m using bamboo canes.
- 1.3.4 The location of the survey grid(s) was tied-in using the GPS system and related to existing survey stations and to temporary survey stations (wooden stakes) established by Phase Site Investigations Ltd.

1.4 Data processing, presentation and interpretation

- 1.4.1 The data was downloaded from the instrument at the end of the each days survey using bespoke software specific to the instrument. The gradiometer data was downloaded and gridded in Archaeosurveyor 2.5.13 (DW Consulting).
- 1.4.2 Where required the data was destriped and destaggered to remove errors caused by instrument drift and heading errors. This data has been classed as minimally processed data as no other processing steps were used.
- 1.4.3 The following processing schedule was applied to all data presented within the report.

- Zero median sensor
- The data presented in the greyscale plots has been 'smoothed' using the Grad. Shade option clipped at -3 nT to 3 nT.

- 1.4.4 The data has been displayed relative to a digital Ordnance Survey base plan provided by the client as drawing '*Hallmoor OS mapping.dwg*'. The base plan was in the National Grid co-ordinate system and as the survey grids were set-out directly to national grid co-ordinates the data could be simply superimposed onto the base plan in the correct position.
- 1.4.5 The anomalies have been categorised based on the type of response that they have and an interpretation as to the cause(s) or possible cause(s) of each anomaly type is also provided.
- 1.4.6 Several different ranges of data were used in the interpretation to ensure that the maximum information possible is obtained from the data.
- 1.4.7 X-Y trace plots were examined for all of the data and overlain onto the greyscale plot to assist in the interpretation, primarily to help identify dipolar responses that will probably be associated with surface / near-surface iron objects. X-Y trace plots have not been used in the report as they do not show any additional anomalies that are not visible in the greyscale data. A digital drawing showing the X-Y trace plot overlain on the greyscale plot has been provided in the digital archive.
- 1.4.8 All isolated responses have been assessed using a combination of greyscale and X-Y trace plots. If a response is not thought to have significant archaeological potential then it has not be shown on the final interpretation
- 1.4.9 The greyscale plots and the accompanying interpretations of the anomalies identified in the magnetic data are presented as 2D AutoCAD drawings. The interpretation is made based on the type, size, strength and morphology of the anomalies, coupled with the available information on the site conditions. Each type of anomaly is displayed in separate, easily identifiable layers annotated as appropriate.

1.5 Limitations of magnetic surveys

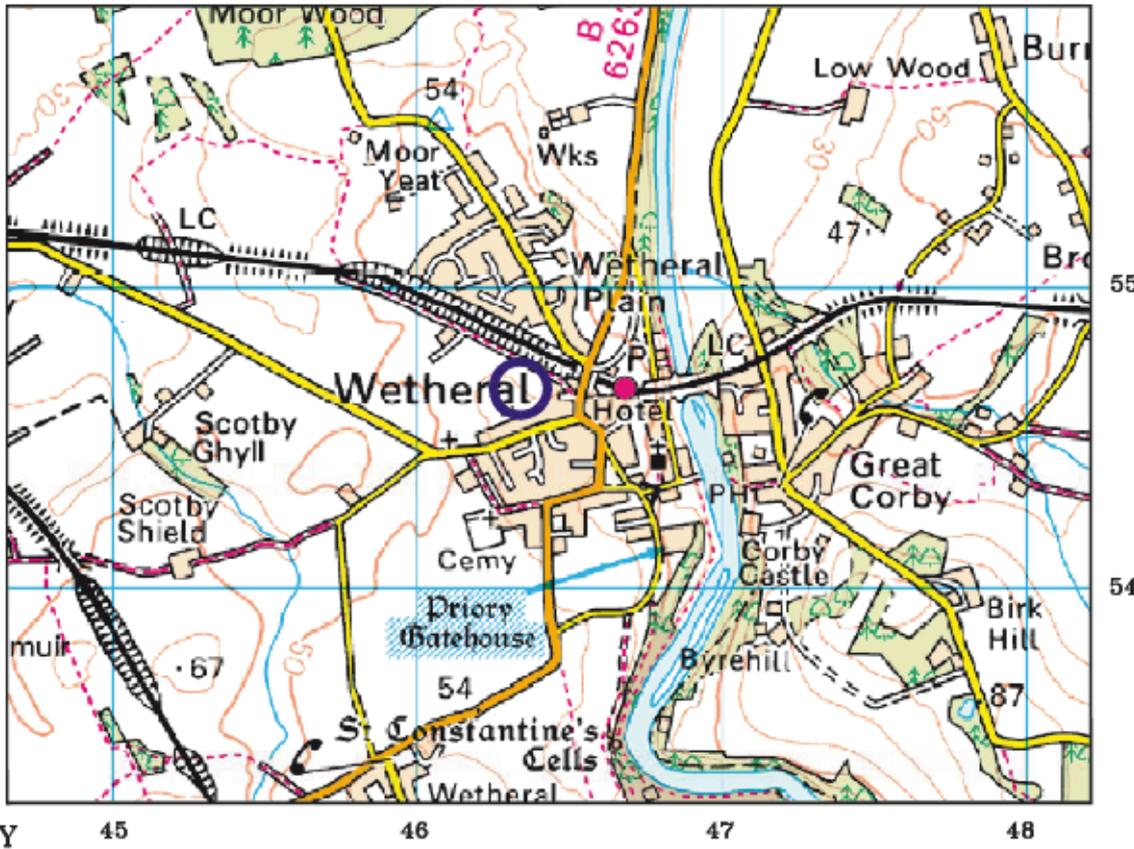
- 1.5.1 The magnetic survey method requires the operator to walk over the site at a constant walking pace whilst holding the instrument. The presence of an uneven ground surface, dense, high or mature vegetation or surface obstructions may mean that some areas cannot be surveyed.
- 1.5.2 The depth at which features can be detected will vary depending on their composition, size, the surrounding material and the type of magnetometer used for the survey. In good conditions large, magnetic targets, such as buried drums or tanks can be located at depths of more than 4 m. Smaller targets, such as buried foundations or archaeological features can be located at depths of between 1 m and 2 m.
- 1.5.3 A magnetic survey is highly sensitive to interference from surface and near-surface magnetic 'contaminants'. Surface features such as metallic fencing, reinforced concrete, buildings or walls all have very strong magnetic signatures that can dominate readings collected adjacent to them. Identification of anomalies caused by sub-surface features is therefore more difficult or even not possible in the vicinity of surface and near-surface magnetic features.
- 1.5.4 The presence of made ground also has a detrimental effect on the magnetic data quality as this usually contains magnetic material in the form of metallic scrap and brick. Identification of features beneath made ground is still possible if the target feature is reasonably large and

has a strong magnetic response but smaller features or magnetically weak features are unlikely to be identified.

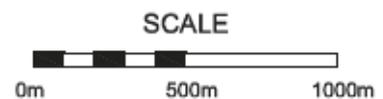
- 1.5.5 It should be noted that anomalies that are interpreted as modern in origin may be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.
- 1.5.6 A magnetic survey does not directly locate sub-surface features - it identifies variations or anomalies in the local magnetic field caused by features. It can be possible to interpret the cause of anomalies based on the size, shape and strength of response but it should be recognised that a magnetic survey produces a plan of magnetic variations and not a plan of all sub-surface features. Interpretation of the anomalies is often subjective and it is rarely possible to identify the cause of all magnetic anomalies. Geological or pedological (soil) variations or features can produce responses similar to those caused by man-made (anthropogenic) features.
- 1.5.7 Anomalies identified by a magnetic survey are located in plan. It is not usually possible to obtain reliable depth information on the features that cause the anomalies.
- 1.5.8 Not all features will produce a measurable magnetic response and the effectiveness of a magnetic survey is also dependant on the site-specific conditions. It is not possible to guarantee that a magnetic survey will identify all sub-surface features. A magnetic survey is often most-effective at identifying sub-surface features when used in conjunction with other complementary geophysical techniques.



REPRODUCED BY PERMISSION OF THE ORDNANCE SURVEY ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. ©CROWN COPYRIGHT. ALL RIGHTS RESERVED. LICENCE NUMBER 100047783.



 SITE LOCATION



NOTE

THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.



Phase Site Investigations, Unit F9, Morton Park Way, Morton Park, Darlington, County Durham, DL1 4PQ

T: +44 [0] 01325 487 766
 F: +44 [0] 01325 354 203
 E: enquiries@PhaseSI.com
 W: www.PhaseSI.com

Scale	[A4 Sheet]	Drawing	Status
AS SHOWN		ARC_829_327_HCW_01	FINAL
Client			
GREENLANE ARCHAEOLOGY LTD CUMBRIA			
Site			
LAND OFF HALLMOOR COURT, WETHERAL CUMBRIA			
Title			
SITE LOCATION MAP			
Job No			
ARC_829_327			
Chk.	MW	Drawn	CW
		Date	10/09/2012



NOTES

1. THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_829_327_HCW_RPT.DOC) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
 2. THIS DRAWING IS BASED UPON DRAWING 'Hall Moor OS mapping', PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY COORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKO OSTINDZ PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
 3. PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
 4. THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.
- ALWAYS EXERCISE CAUTION WHEN EXCAVATING**

KEY

-  SITE BOUNDARY
-  EXTENT OF MAGNETIC GRADIENT SURVEY
-  TEMPORARY SURVEY STATION (WOODEN STAKE)



PHASE
SITE INVESTIGATIONS

Phase Site Investigations, Unit F9, Morton Park Way,
Morton Park, Darlington, County Durham, DL1 4PQ
T: +44 (0) 01325 487 786
F: +44 (0) 01325 354 203
E: enquiries@phasesi.com
W: www.phasesi.com

Scale: JAS:swf Drawing Status
1:1000 ARC_829_327_HCW_02 FINAL
Client: GREENLANE ARCHAEOLOGY LTD
CUMBRIA

Site: LAND OFF HALLMOOR COURT, WETHERAL
CUMBRIA

Title: GREYSKALE PLOT OF MAGNETIC
GRADIENT DATA

Job No	ARC_829_327		
Surveyed	DP, JMD	Drawn	MW
Chk.	NF	Date	05/09/2012



ANOMALY TYPE	INTERPRETATION
● ISOLATED DIPOLAR RESPONSE (IRON SPIRE)	SURFACE / NEAR-SURFACE FERROUS OR FUSED MATERIAL
● AREA OF STRONG DIPOLAR RESPONSES (MAGNETIC DISTURBANCE)	SURFACE / NEAR-SURFACE FERROUS OR FUSED MATERIAL
— LINEAR / CURVILINEAR TREND	POSSIBLE SUB-SURFACE FEATURE
● POSITIVE / ENHANCED RESPONSE	POSSIBLE GEOLOGICAL / PEDOLOGICAL VARIATION BUT COULD ALSO BE DEEPER BURIED FERROUS / FUSED MATERIAL OR ARCHAEOLOGICAL FEATURE

- ### NOTES
- THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_829_327_HCW_JPT.DOC) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
 - THIS DRAWING IS BASED UPON DRAWING 'Hall Moor OS mapping', PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY COORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKO OSTING PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
 - PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
 - THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.
- ALWAYS EXERCISE CAUTION WHEN EXCAVATING**

KEY

—	SITE BOUNDARY
—	EXTENT OF MAGNETIC GRADIENT SURVEY
△	TEMPORARY SURVEY STATION (WOODEN STAKE)



PHASE
SITE INVESTIGATIONS

Phase Site Investigations, Unit F9, Morton Park Way,
Morton Park, Darlington, County Durham, DL1 4PQ

T: +44 (0) 1325 487 788
F: +44 (0) 1325 354 203
E: enquiries@phasesi.com
W: www.phasesi.com

Scale	1:1000	Status	FINAL
Client	GREENLANE ARCHAEOLOGY LTD CUMBRIA		
Site	LAND OFF HALLMOOR COURT, WETHERAL CUMBRIA		
Title	INTERPRETATION OF MAGNETIC GRADIENT DATA		
Job No	ARC_829_327		
Surveyed	DP, JMD	Drawn	MW
Chk.	NF	Date	05/09/2012