# GEOPHYSICAL SURVEYS OF LAND AT MAIN ROAD, HIGH HARRINTON, CUMBRIA

GEOPHYSICAL SURVEY REPORT CP. No: 10267/12 26/07/2012



MARTIN RAILTON BA (HONS), MA, MIFA
WARDELL ARMSTRONG ARCHAEOLOGY LTD
COCKLAKES YARD,
COTEHILL,
CARLISLE,
CUMBRIA,
CA4 0BQ
TEL/FAX: (01228) 564820/560025

WWW.WA-ARCHAEOLOGY.COM

## WARDELL ARMSTRONG ARCHAEOLOGY LTD

**DOCUMENT TITLE:** Land at High Harrington, Cumbria

**DOCUMENT TYPE:** Geophysical Survey Report

CLIENT: Thomas Armstrong (Construction) Ltd

**CP NUMBER:** 10267/12

NHER: -

PLANNING APP. No:

OASIS REFERENCE: wardella2-131047

**PRINT DATE:** 26/07/2012

GRID REFERENCE: NX 998 255

#### Quality Assurance

This report covers works as outlined in the brief for the above-named project as issued by the relevant authority, and as outlined in the agreed programme of works. Any deviation to the programme of works has been agreed by all parties. The works have been carried out according to the guidelines set out in the Institute for Archaeologists (IfA) Standards, Policy Statements and Codes of Conduct. The report has been prepared in keeping with the guidance set out by WA Archaeology Ltd on the preparation of reports.

REVISION SCHEDULE			
	01	02	03
PREPARED BY:	Angus Clark		
Position:	Assistant		
	Supervisor		
DATE:	25/07/12		
EDITED BY:	Martin Railton		
Position:	Project Manager		
DATE:	26/07/12		
APPROVED BY:	Frank Giecco		
Position:	Project Manager		
DATE:	26/07/12		

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## **SUMMARY**

In July 2012, Wardell Armstrong Archaeology Ltd, commissioned by Thomas Armstrong (Construction) Ltd, undertook geophysical surveys of land adjacent to Main Road, High Harrington, Cumbria (centred on Ordnance Survey grid reference NX 998 255), prior to the proposed submission of a planning application for a residential development on the site.

The objective of the geophysical surveys was to determine the presence/absence, nature and extent of potential archaeological features within the study area, and the presence/absence of any known modern features within the survey area, which may affect the results.

Geomagnetic surveys covering *c*.3ha of land have been conducted within two arable fields off Main Road between Harrington and High Harrington. The surveys detected a modern service pipe running along the line of the northern boundary along with two modern test pits/ bore holes that were visible on the surface. The presence of a mature crop within the survey area may have affected the final quality and clarity of the results obtained as the physical production of the survey was hindered due to the heavy resistance caused by the height and density of the crop.

The geomagnetic surveys detected the presence of possible soil filled features within both of the survey areas (Areas 1-2). The Ordnance Survey map of 1975 shows a system of trackways running through Area 1 and it is likely that these results reflect the buried remains of these earlier trackways. An area of possible interest was noted towards the north west corner of Area 1 in which possible subsurface deposits were recorded, although the nature of the anomaly is uncertain.

No obvious archaeological remains, associated with the adjacent Scheduled Ancient Monument, were detected during the survey.

## **ACKNOWLEDGEMENTS**

Wardell Armstrong Archaeology Ltd would like to thank Barry Denham, Director for Thomas Armstrong (Construction) Ltd, for commissioning the project, and for all assistance throughout the project.

The geophysical surveys were undertaken by Angus Clark and Kevin Mounsey. The project was managed by Martin Railton BA (Hons) MA MIfA, Project Manager for WAA Ltd. The report was written and the drawings were produced by Angus Clark.

## 1 INTRODUCTION

## 1.1 CIRCUMSTANCES OF THE PROJECT (FIGURE 1)

- 1.1.1 Between 24<sup>th</sup> and 25<sup>th</sup> July 2012, Wardell Armstrong Archaeology Ltd, undertook geophysical surveys of land at Main Street, High Harrington, Cumbria, at the request of Thomas Armstrong (Construction) Ltd prior to the proposed submission of a planning application for a residential development on the site. The archaeological work was undertaken in consultation with Cumbria County Council Historic Environment Service (CCCHES). This is in line with government advice as set out in Section 12 of the National Planning Policy Framework (NPPF 2012).
- 1.1.2 The study area comprised two fields of arable agricultural land adjacent to Main Road, High Harrington and measuring 3ha in total. It was bounded by a disused railway, now a public foot and cycle path, to the east, Main Road to the south and further field systems to both the north and west (Figure 2). The site is centred on Ordnance Survey grid reference NX 998 255.
- 1.1.3 There was potential that archaeological remains were present associated with the Scheduled Ancient Monument of the 'Defended Enclosure at Salterbeck' which is believed to date to the Iron Age and is located in the adjacent field.
- 1.1.4 The objective of the geophysical surveys was to determine the presence/absence, nature and extent of potential archaeological features within the survey area, and the presence/absence of any known modern features within the survey area, which may affect the results. The results of the project were to be used to inform the need for further archaeological work, or mitigation measures, should potential significant archaeological remains be identified during the project.
- 1.1.5 This report outlines the results of the geophysical surveys undertaken, and includes an interpretation of the geophysical survey results, in light of the archaeological and historical background of the site, with recommendations for further work where necessary.

## 2 METHODOLOGY

#### 2.1 STANDARDS

2.1.1 The geophysical survey was consistent with English Heritage guidelines (English Heritage 2007 and 2008), and in accordance with the standard and guidance of the Institute for Archaeologists (IfA 2011).

#### 2.2 GEOPHYSICAL SURVEYS

- 2.2.1 *Technique Selection:* geomagnetic survey was selected as the most appropriate technique, given the non-igneous environment, and the expected presence of cut archaeological features at depths of no more than 1.5m. This technique involves the use of hand-held gradiometers, which measure variations in the vertical component of the earth's magnetic field. These variations can be due to the presence of sub-surface archaeological features. Data were recorded by the instruments and downloaded into a laptop computer for initial data processing in the field using specialist software.
- 2.2.2 *Field Methods:* the geophysical study area measured *c*.3ha and was divided by a partial hedgerow into two separate fields (Areas 1-2). A 30m grid was established in each area, and tied-in to known Ordnance Survey points using a Trimble 3605DR Geodimeter total station with datalogger.
- 2.2.3 Geomagnetic measurements were determined using a Bartington Grad601-2 dual gradiometer system, with twin sensors set 1m apart. It was expected that significant archaeological features at a depth of up to 1.5m would be detected using this arrangement. The survey was undertaken using a zigzag traverse scheme, with data being logged in 30m grid units. A sample interval of 0.25m was used, with a traverse interval of 1m, providing 3600 sample measurements per grid unit. The data were downloaded on site onto a laptop computer for processing and storage.
- 2.2.4 **Data Processing:** geophysical survey data were processed using ArchaeoSurveyor II software, which was used to produce 'grey-scale' images of the raw data. Positive magnetic anomalies are displayed as dark grey, and negative magnetic anomalies are displayed as light grey. A palette bar shows the relationship between the grey shades and geomagnetic values in nT.
- 2.2.5 Raw data were processed in order to further define and highlight the archaeological features detected. The following basic data processing functions were used:

Despike: to locate and suppress random iron spikes in the gradiometer data.

Clip: to clip data to specified maximum and minimum values, in order to limit large noise spikes in the geophysical data.

*Destagger:* to reduce the effect of staggered gradiometer data, sometimes caused by difficult working conditions, topography, or operator error.

*Interpolate*: to match the traverse and sample intervals in the data.

2.2.6 *Interpretation:* three types of geophysical anomaly were detected in the gradiometer data:

*positive magnetic:* regions of anomalously high or positive magnetic data, which may be associated with the presence of high magnetic susceptibility soil-filled features, such as pits or ditches.

*negative magnetic*: regions of anomalously low or negative magnetic data, which may be associated with features of low magnetic susceptibility, such as stone-built features, geological features, land-drains or sub-surface voids.

dipolar magnetic: regions of paired positive and negative magnetic anomalies, which typically reflect ferrous or fired materials, including fired/ferrous debris in the topsoil, modern services, metallic structures, or fired structures, such as kilns or hearths.

- 2.2.7 *Presentation:* the grey-scale images were combined with site survey data and Ordnance Survey data to produce the geophysical survey plans. Colour-coded geophysical interpretation diagrams are provided, showing the locations and extent of positive, negative, dipolar, geomagnetic anomalies, and areas of anomalously high or low resistance.
- 2.2.8 Archaeological interpretation diagrams are provided, which are based on the interpretation of the geophysical survey results, in light of the archaeological and historical background of the site.
- 2.2.9 Trace plots of the unprocessed geophysical data are available if required.

#### 2.3 ARCHIVE

- 2.3.1 The data archive for the geophysical survey has been created in accordance with the recommendations of the Archaeology Data Service (ADS 2001). This archive is currently held at the company offices at Carlisle, Cumbria.
- 2.3.2 One copy of the final report will be deposited with the County Historic Environment Record, where viewing will be available on request. The project is also registered with the Online AccesS to the Index of archaeological investigationS (OASIS).
- 2.3.3 The OASIS reference for this project is **wardella2-131047**.

## 3 BACKGROUND

#### 3.1 LOCATION AND GEOLOGICAL CONTEXT

- 3.1.1 High Harrington is located approximately three km to the south of Workington, on the West Cumbria Coastal Plain. The settlement is situated approximately 1km inland (Figure 1). The proposed development area is situated on the north side of Main Road, at a height of *c*.48m above sea level (Figure 2).
- 3.1.2 The Countryside Commission places the area in which High Harrington is located in a character area known as the 'West Cumbria Coastal Plain', which is a narrow belt of land between the coast and the high fells of the Lake District. North of St Bees Head, the area coincides with the outcrop of the Coal Measures, Hensingham Group and Chief Limestone Groups, all of Carboniferous age. These rocks are overlain, particularly in the Whitehaven area, by small outliers of Permo-Triassic ('New Red Sandstone') sedimentary rocks. Glaciation by ice, derived both from southern Scotland and the Lake District, has affected the whole area, leaving a widespread mantle of boulder clay (till) with, in places, sand and gravel (Countryside Commission 1998, 27).

#### 3.2 HISTORICAL CONTEXT

- 3.2.1 *Introduction:* this historical background is compiled mostly from secondary sources, and is intended only as a brief summary of historical developments specific to the study area. Reference to the Cumbria Historic Environment Record (HER) are included where known.
- 3.2.2 *Prehistoric (up to c.70AD):* at present, the only possible evidence for settlement or land use in the immediate vicinity of the proposed development area is the Scheduled Ancient Monument of the 'Defended Enclosure at Salterbeck'. This site is believed to date to the Iron Age (*c.*600BD to AD43), however it has not been excavated and this dating is based on typology.
- 3.2.3 *Roman:* A fragment of a Roman altar was found during restoration work at St Mary's Church (HER No. 1015), although it must be noted that its presence does not necessarily indicate that there was activity during this period at Harrington itself, the stone may have been brought in from elsewhere. Three Roman coins are recorded as having been found in the churchyard (HER No. 19828).
- 3.2.4 *Medieval*: The church is recorded as having fabric within its tower foundations which dates to the 12<sup>th</sup> century (HER No. 1015). There is also

- reference to a medieval font which was discovered built into the wall of the south side of the tower during the restoration of the church in c.1884 (Wilson 1891, 349).
- 3.2.5 Post-medieval and Modern: By the early 18th century the principal settlement at Harrington was situated at the top of the valley, which later became known as High Harrington to distinguish it from Harrington Harbour (Newman 2008, 159). It is therefore possible that the earliest settlement was located at what is now High Harrington, presumably around the church, and consequently in close proximity to the proposed development area.
- 3.2.6 It has been suggested that before the 18th century, the economy of Harrington was based on farming, and there is no evidence to suggest any maritime activity in that area. In the 1560s Harrington was omitted from all lists of Cumberland's ports and does not seem to have been regarded as one. Around 1760, Henry Curwen, descendant of Sir Henry, the original Curwen lord of the manor of Harrington, initiated an industrial and commercial revolution in the parish. In order to exploit the lucrative coal trade with Ireland, it was necessary to develop local infrastructure and the means of transporting the coal to market. Curwen constructed a quay and breakwater to the south of the River Wyre outlet, also making the channel to the Wyre from seawards wider and deeper and Harrington Harbour became universal for the little town (Newman 2008, 161).
- 3.2.7 The First Edition Ordnance Survey map of 1867 clearly shows the proposed development area as open fields located near the settlement of High Harrington, with the only notable feature being north to south orientated field boundaries, and a footpath or trackway located to the eastern side. By the 1870s, however, the topography would change dramatically with the construction of the Cleator and Workington Junction Railway to the north and east (constructed 1877 and opened in 1879) (HER No's 11585 and 11503). The Second Edition Ordnance Survey map of 1900 clearly shows these lines immediately to the north and east along with associated infrastructure.
- 3.2.8 A comparison of the Second and Third Edition Ordnance Survey maps of 1900 and 1925 shows the expansion of a 'Sand Pit' in the fields immediately to the west of the proposed development area. It is not clear when the sand quarry ceased to trade although the Church Road Station had closed for passengers on the 31st May 1926, but remained open for workmen until 1st April 1929, which probably provides the closest *terminus ante quem* for the demise of the sand pits (Healey 2008, 14).
- 3.2.9 The Telephone Exchange building, located immediately to the west of the proposed development area, was noted from historical mapping to have been constructed at some point between 1968 and 1975.

#### 3.3 Previous Archaeological Work

- 3.3.1 The HER records two schemes of archaeological work which has been undertaken within a 1km search radius centred on the proposed development area:
- 3.3.2 Ennerdale to Cummock Link Main: Rapid Identification Walkover Survey, OAN (Oxford Archaeology North), 2003: this project includes a section which runs across the south-east of the 1km search area, along Watery Lane to the south side of High Harrington. The survey recorded 31 sites which had not been previously recorded in the HER, most of which were post medieval in date and included features such as quarries, field boundaries and trackways (HER Report Ref: 4/03/1032). For the purposes of the present study on Main Road, High Harrington, this project provides little in the way of additional information on the history and archaeology of the area around the proposed development site.
- 3.3.3 Land adjacent to 14 East Avenue, High Harrington, Cumbria: Archaeological Desk-Based Assessment, Minerva Heritage, 2008: a desk-based assessment was undertaken prior to the construction of a new dwelling. The assessment revealed that the proposed development area had been used for a short period as a sand quarry in the early 1900s. A site walkover identified a possible former mineral railway embankment. It was noted that any earlier archaeological remains would have been removed by sand extraction activity (HER Report Ref: 2/08/1898; Healey 2008).
- 3.3.4 A desk based assessment was undertaken of the site by Wardell Armstrong Archaeology Ltd in June 2012 in which it determined that the proposed development site lies within close proximity to a defended enclosure of possible prehistoric date, which occupies a promontory site at Salterbeck; this site is designated as a Scheduled Ancient Monument (SM No. CU533), and as such is of national importance. The proposed development site is also located just to the east of St Mary's Church, which is believed to have medieval origins. Given the prominent nature of the land on which the proposed development area is sited, similar to that of the Scheduled Ancient Monument it is recommended that a programme of archaeological work in the form of a geophysical survey be undertaken to establish if any potential archaeological features exist sub-surface, prior to any groundworks on site (Wooler 2012).

## 4 THE GEOPHYSICAL SURVEYS

### 4.1 Introduction (Figure 2)

- 4.1.1 The geophysical surveys were undertaken over two days on the 24th and 25th July 2012. Geomagnetic survey was undertaken over two separate areas (Areas 1-2) within the study area (Figure 2). The two fields were subdivided by a partial hedgerow, running north south with a gap at either end allowing access between the two fields. The field's external boundaries incorporated wire fences that were overgrown with dense foliage. These fences produced strong dipolar magnetic anomalies around the periphery of the survey areas, predominantly along the eastern and western boundaries.
- 4.1.2 Small discrete dipolar magnetic anomalies were detected across the whole of the study area. These are almost certainly caused by fired/ferrous litter in the topsoil, which is typical for modern agricultural land. These anomalies are indicated on the geophysical interpretation drawings, but not referred to again in the subsequent interpretations.

#### 4.2 AREA 1 (FIGURES 3-5)

- 4.2.1 An area of strong dipolar anomalies was detected running adjacent to the majority of the eastern boundary which has been attributed to the presence of a wire fence along the boundary.
- 4.2.2 An area of dipolar anomalies was detected in the south western corner of the survey area, also evident in the south east corner of Area 2, which potentially refers to an area of made ground, deposited to enable access to the field from the main road which sits at an elevated position.
- 4.2.3 A strong dipolar linear magnetic anomaly was detected on the northwest corner of Area 1, aligned northeast to southwest. This was almost certainly due to the presence of a modern service pipe.
- 4.2.4 Three weak positive linear magnetic anomalies were detected running along a north west to south east alignment, two towards the centre of the survey area and one towards the north eastern corner. A single weak positive linear magnetic anomaly was detected running north east to south west through the centre of the survey area. These linear anomalies are likely to be soil filled features, which could be attributed to the trackways that are evident on the Ordnance Survey map of 1975 (Figure 2).
- 4.2.5 An area of negative magnetic anomaly was detected towards the north western corner of the survey area. It is possible that this is resultant from buried stonework, at this stage of unknown form and function.

### 4.3 AREA 2 (FIGURES 3-5)

- 4.3.1 An area of strong dipolar magnetic anomalies was detected in the south west corner of the survey area and extended partway along the western field boundary. This is due partly to the wire fence bounding the site and potentially buried waste associated with the construction of the telephone exchange located adjacent to the site in this area.
- 4.3.2 Two areas of very strong dipolar magnetic anomaly were detected, one in the centre and one to the south west of the survey area. These have been attributed to modern test pits/ bore holes that were visible on the surface.
- 4.3.3 An area of strong dipolar magnetic anomalies was detected towards the north west corner of the survey area and extends partway along the western field boundary. This is due to the wire boundary fence.
- 4.3.4 A strong dipolar linear magnetic anomaly was detected running parallel to the northern field boundary which was almost certainly due to the presence of a modern service pipe running along the field's edge.
- 4.3.5 A positive linear magnetic anomaly, following a south west to north east alignment, was noted in the southern extent of the survey area. Possibly associated with this linear feature was a U shaped curvilinear weak positive magnetic anomaly. Both these features have been interpreted as buried soil filled features.

#### 4.4 DISCUSSION (FIGURE 5)

- 4.4.1 The presence of possible soil filled features was detected within both of the survey areas (Areas 1-2). The Ordnance Survey map of 1975 shows a system of trackways running through Area 1 and it is likely that these results reflect the buried remains of these earlier trackways. There is a possibility that the north east to south west aligned linear feature in Area 2 is a continuation of the one noted within Area 1 although this is not supported by the cartographic evidence which could indicate a separate area of interest. An area of possible interest was noted towards the north west corner of Area 1 in which possible structural remains were recorded.
- 4.4.2 The presence of a mature crop within the survey area may have affected the final quality and clarity of the results obtained as the physical production of the survey was hindered due to the heavy resistance caused by the height and density of the crop.

## 5 CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 CONCLUSIONS

- 5.1.1 Geomagnetic surveys covering c.3ha of land have been conducted within two arable fields off Main Road, High Harrington prior to the proposed submission of a planning application for a residential development on the site.
- 5.1.2 The geomagnetic surveys detected a modern service pipe running along the line of the northern boundary along with two modern test pits/ bore holes that were visible on the surface. The presence of a mature crop within the survey area may have affected the final quality and clarity of the results obtained as the physical production of the survey was hindered due to the heavy resistance caused by the height and density of the crop.
- 5.1.3 The geomagnetic surveys detected the presence of possible soil filled features within both of the survey areas (Areas 1-2). The Ordnance Survey map of 1975 shows a system of trackways running through Area 1 and it is likely that these results reflect the buried remains of these earlier trackways. An area of possible interest was noted towards the north west corner of Area 1 in which possible sub-surface deposits were recorded.
- 5.1.4 No obvious archaeological remains, associated with with the adjacent Scheduled Ancient Monument, were detected during the survey.

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## **APPENDIX 1: FIGURES**

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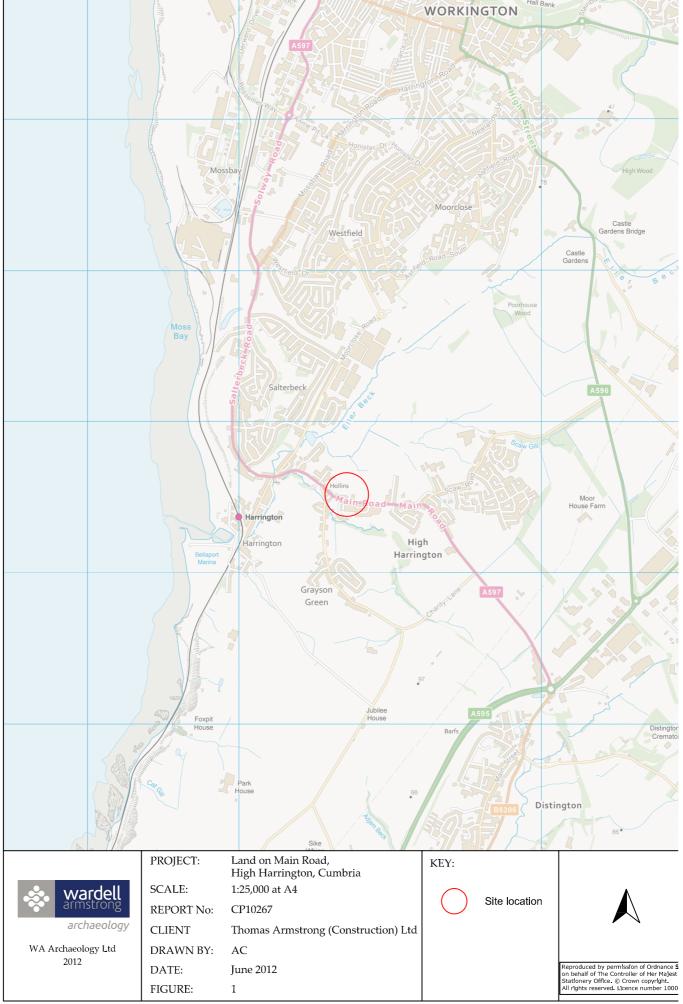


Figure 1: Site location

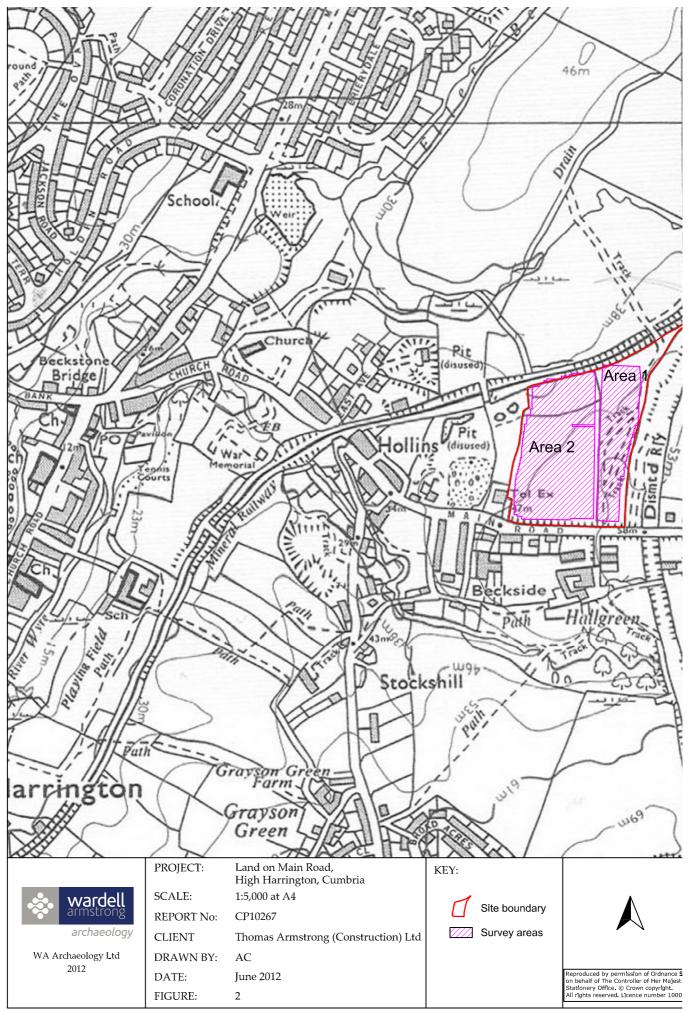


Figure 2: Location of the survey areas (Ordnance Survey Map, 1975)

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Figure 4: Geophysical interpretation