

KIRKBY THORE ROMAN FORT, CUMBRIA

GEOPHYSICAL SURVEY REPORT
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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.

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SUMMARY

In April 2013, Wardell Armstrong Archaeology, commissioned by North Pennines AONB Partnership, undertook geophysical surveys on two areas of pastoral land within and adjacent to Kirkby Thore Roman Fort (*Bravoniacum*), near Penrith, Cumbria (centred on Ordnance Survey grid reference NY 637 257). Kirkby Thore Fort and associated vicus is a Scheduled Ancient Monument (SM 13450). The survey work formed part of a community archaeology project to investigate the Maiden Way Roman Road, between Kirkby Thore and Carvoran (*Magis*), as part of the Altogether Archaeology Project (Project Theme 2), a three year project funded by a grant from the Heritage Lottery Fund (HLF). Kirkby Thore Roman Fort forms the south-west terminus of the Maiden Way and it was felt that geophysical surveys of the Roman Fort would help to determine the route of the road in its immediate vicinity.

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. The results would form part of a community archaeology project aimed at surveying the Maiden Way along its 50 kilometre length along with detailed investigation of particular sites along the route.

In 1983 geophysical surveys using both magnetic and earth resistance techniques were carried out in a field to the north of the fort site. Both survey techniques provided little evidence for the presence of archaeological features. Following exploratory excavations suggested an agrarian use of the land (Gibbons 1989). A geophysical survey of the fort interior was carried out in 2003 using an earth resistance meter, as part of a post-graduate degree (Railton 2003). The survey succeeded in locating the north-west perimeter wall of the fort along with an entrance midway along its length. It also revealed something of the layout of the fort in the form of internal roads and possible buildings. However the survey did not detect evidence for settlement beyond the fort perimeter.

It was felt that further geophysical survey work in the form of a more detailed earth resistance survey and using an alternative technique in the form of a geomagnetic survey would provide further, more detailed information about the site.

The geomagnetic survey detected in the fort field (Area 1) the foundations of the fort's north-west defensive ditch and wall along with gateway, the remains of walls forming the foundations of buildings within the fort including a possible headquarters building (*principia*), internal fort roads and to the immediate north-west of the fort evidence of civilian settlement (*vicus*) strip buildings either side

of a roadway defined by ditches. The survey detected in the narrow field to the north-west of the fort (Area 2) ridge and furrow running along its length.

The earth resistance survey (only carried out in Area 1) revealed evidence for the north-west defensive wall containing a twin towered gateway. Internal roadways between buildings were revealed including the *intervallum* street and the road leading from the north-western gateway to the site of a possible headquarters building (*principia*).

The geophysical surveys in the fort field (Area 1) succeeded in defining the outline of the Roman Fort external north-west defensive wall and entrance mid way along it. Evidence of an external defensive ditch along this side of the fort was absent. Within the fort both surveys recorded evidence of a grid pattern dividing the fort into a series of ordered buildings and streets typically found in the layout of Roman forts. The geomagnetic survey revealed the location of the fort's headquarters building (*principia*) on the south-eastern edge of the field.

The geomagnetic survey was successful in revealing the existence of a possible civilian settlement beyond the north-west defensive wall of the fort. Through this ran a street which lined up with the fort's north-western entrance. It was inconclusive as to whether this was the commencement point of the Maiden Way.

The geomagnetic survey in the narrow field (Area 2) to the north-west of the fort field revealed ridge and furrow running along nearly its entire length but revealed no conclusive evidence for a road crossing it.

In order to establish conclusive evidence of the route the Maiden Way took from Kirkby Thore fort it is necessary to have a bigger picture of the Roman road network immediately surrounding it. More information also needs to be gathered on the approach route of the Maiden Way to the fort all of which could be obtained by future topographical and geophysical surveys.

ACKNOWLEDGEMENTS

Wardell Armstrong Archaeology would like to thank Paul Frodsham, Historic Environment Officer, North Pennines AONB Partnership, for commissioning the project, and for supervising the project throughout. Wardell Armstrong Archaeology would also like to thank all the volunteers who took part in the project.

Wardell Armstrong Archaeology would also like to extend their thanks to Messrs Slee of Streethouse Farm, Kirkby Thore who gave permission for access to the fort site and for their assistance during the fieldwork.

The geophysical surveys were undertaken by Altogether Archaeology Project volunteers, supervised by Kevin Mounsey and Karen Duignan. The project was managed by Martin Railton BA (Hons) MA MifA, Project Manager for WAA. The report was written by Kevin Mounsey and the drawings were produced by Martin Railton.

1 INTRODUCTION

1.1 CIRCUMSTANCES OF THE PROJECT (FIGURE 1)

- 1.1.1 During April 2013, Wardell Armstrong Archaeology, supervised the geophysical surveys of land at Kirkby Thore Roman Fort, Kirkby Thore, near Penrith, Cumbria, at the request of North Pennines AONB Partnership. This followed a proposal by the North Pennines AONB Partnership to carry out the surveys as part of the Altogether Archaeology Project (Project Theme 2) to investigate the Roman Road between Kirkby Thore and Carvoran forts. This is a three year project funded by a grant from the Heritage Lottery Fund (HLF). The archaeological work was undertaken in accordance with a Wardell Armstrong Archaeology Written Scheme of Investigation, (Railton 2012), which was submitted to, and approved by English Heritage, North-West Region.
- 1.1.2 The study area comprised two fields of pastureland within the immediate environs of Kirkby Thore village, measuring 6.1ha in total. The field containing the Roman Fort (Area 1) was bounded by Main Street to the south-east, pastureland to the north-west and residential plots to the south-west and north-east (Figure 1). The narrow field (Area 2) lay to the north-west of the fort field. It was bounded by Piper Lane to the north-west and north-east and pastureland to the south-west and south-east (Figure 1). The two areas are centred on Ordnance Survey grid reference NY 637 257.
- 1.1.3 It was known from a previous geophysical survey that sub-surface archaeological remains of a Roman Fort were likely to survive in Area 1. Previous excavations prior to development in some of the areas surrounding the fort field had indicated the existence of Roman/Romano British extra mural settlement outside the fort. The site of the fort is marked on old and current Ordnance Survey maps.
- 1.1.4 The objective of the geophysical surveys was to determine the presence/absence, nature and extent of archaeological features within the survey areas, and the presence/absence of any known modern features within the survey area, which may affect the results. In particular it was hoped that the surveys might lead to a further understanding of the relationship of the fort with the Maiden Way Roman Road which is presumed to have run from the fort, over the Pennines to the fort of Carvoran on Hadrian's Wall
- 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 PROJECT DESIGN

- 2.1.1 A Written Scheme of Investigation (WSI) was submitted by Wardell Armstrong Archaeology (Railton 2012) in response to a request by North Pennines AONB, for a geophysical survey of the study area. Following acceptance of the project design by English Heritage North West, Wardell Armstrong Archaeology was commissioned by the client to supervise the work. The WSI was adhered to in full, and the work 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:* Both geomagnetic and earth resistance survey techniques were used. The fort field (Area 1) was surveyed using a geomagnetic technique over the whole area and a resistance survey technique over a selected area (over the actual fort site itself). The narrow field to the north-west (Area 2) was surveyed using a geomagnetic technique only.
- 2.2.2 Geomagnetic survey is suitable in non-igneous environments and is capable of revealing the 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 was recorded by the instruments and downloaded into a laptop computer for initial data processing in the field using specialist software.
- 2.2.3 Earth resistance survey was used over the site of the fort itself in order to augment the results of the geomagnetic survey and is particularly responsive to buried masonry. The survey equipment injects a small electric current into the ground and measures any sub-surface resistance. This resistance relates to the ability of the soil to retain moisture and can correspond to the location of cut archaeological features or buried stonewalls etc.
- 2.2.4 *Field Methods:* the geophysical study area measured 6.1ha divided into two separate fields (Areas 1-2). A 20m grid was established in each area, and tied-in to known Ordnance Survey points using a Trimble 3605DR Geodimeter total station with datalogger.

- 2.2.5 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 zig-zag traverse scheme, with data being logged in 20m grid units. A sample interval of 0.25m was used, with a traverse interval of 1m, providing 1600 sample measurements per grid unit, with measurements being recorded at the centre of each grid cell. The data was downloaded on site into a laptop computer for processing and storage.
- 2.2.6 Measurements of earth resistance were determined using a Geoscan RM15 Resistance Meter, with parallel twin probes set 0.50m apart. The survey was undertaken using a zig-zag traverse scheme, with data being logged in 20m grid units. A sample interval of 0.50m was used, with a traverse interval of 1m, providing 800 sample measurements per grid unit. This data was also downloaded on site into a laptop computer for processing and storage.
- 2.2.7 **Data Processing:** geophysical survey data was processed using ArchaeoSurveyor II software, which was used to produce 'grey-scale' images of the raw data. On the geomagnetic survey 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 (Figure 4). On the earth resistance survey regions of anomalously high resistance are displayed as dark grey, and regions of anomalously low resistance are displayed as light grey. A palette bar shows the relationship between the grey shades and earth resistance values in ohms (Figure 2).
- 2.2.8 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 resistance data.

- 2.2.9 **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.

- 2.2.10 **Presentation:** the grey-scale images were combined with site survey data and Ordnance Survey data to produce the geophysical survey figures. 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 (Figures 3 and 5).
- 2.2.11 Archaeological interpretation diagrams are also provided, which are based on the interpretation of the geophysical survey results, in light of the archaeological and historical background of the site.

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 2013). This archive is currently held at the company offices at Carlisle, Cumbria. A copy of the data will also be deposited with the County Historic Environment Record.
- 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), where a digital copy of the report will be made available.
- 2.3.3 The OASIS reference for this project is **wardella2-164201**.

3 BACKGROUND

3.1 LOCATION AND GEOLOGICAL CONTEXT

3.1.1 The site of *Bravoniacvm* Roman Fort is located within the village of Kirkby Thore in the Eden Valley, Cumbria (NY637265) close to the meeting point of the Roman road over Stainmoor to Carlisle, and the Maiden Way. The land around the village is gently undulating, comprising of a rich agricultural area with the Pennine Hills rising steeply to the east. Little remains to be seen of the fort above ground as it has been subject to stone robbing and ploughing and now lies under pasture. It is dissected by the modern road through the village with approximately one third of the area under the road and housing to the south-east. The remainder of the fort lies within a field to the north-west (Figure 1). The outer defences of the fort are visible as banks under the present day field boundaries to the north-east and south-west. A short section of bank is preserved in the eastern corner of the field and appears in cross section where it has been cut through by the road. The fort lies adjacent to residential developments on the north-east side with, as mentioned above, the main road through the village passing immediately to the south-east of it. Open fields containing pastureland lie to the north-west and south-west.

3.1.2 The solid geology of the area comprises Penrith Sandstone Formation, a sedimentary bedrock formed approximately 256 to 290 million years ago in the Permian Period (BGS 2001). The overlying soils comprise, seasonally waterlogged loamy soils known as Clifton soils (SSEW 1890).

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.

3.2.2 *Place Name Evidence:* the name Kirkby Thore indicates influence by Scandinavian migration and probably signifies the renaming of an already significant settlement (Gibbons 1989). It has also been suggested that Kirkby Thore was also named after a temple that was once dedicated to Thor, the Pagan god of thunder (Nicholson and Burn 1777, Parson and White 1829).

3.2.3 *Prehistoric (up to 43 AD):* there was one site of prehistoric date within the nearby vicinity of the site. This was of a standing stone that was

documented as being broken by 1874. An urn was found at the foot of the standing stone.

- 3.2.4 *Roman (43 AD-400 AD)*: early finds from Kirkby Thore date to the Roman period and are contemporary with *Bravoniacum*. The name of this fort is recorded within the Antonine Itinerary as *Brovonacis*, where it is said to be located 14 Roman miles from Voreda, the Roman fort at Old Penrith, and 13 miles from Verteris, Brough Castle. The 4th-5th century Notitia Dignitatum and the Ravenna Cosmology give the name as *Braboniacum* (Birley 1934).
- 3.2.5 Based on 13 Roman inscriptions, seven of which were altar stones and three tombstones, at Kirkby Thore it is thought that the fort housed the auxiliary cavalry or Ala Quingeriaria, a 500 strong unit (Martin 2007). An inscription from Africa on a funeral monument described a commander of a cavalry regiment serving at Brauniacum. An additional inscription dedicated by Aurelius Marcus also described a cavalry garrison, thus confirming the presence of a cavalry garrison at Kirkby Thore (Birley 1934, Jarrett 1960).
- 3.2.6 Limited excavations at Kirkby Thore place a greater emphasis on antiquarian reports for a basic understanding of the nature and extent of Roman activity in the area. One of the better descriptions was recorded by Machell in the late 17th century. Machell noted that remains of the Roman fort could be seen between the Trout Beck on the southeast, on the southwest by Waterman Croft, Keld or Kelk-bottom on the northwest and the Church of Kirkby Thore on the northeast. He also noted that within these areas, but not outside of these areas foundations of walls, both brick and stone, channels of stone and lead pipes, urns, altars and tiles have all been noted. The problem with Machell's description is that the areas of Waterman Croft and Kelk-bottom are not known. The First Edition Ordnance Survey map shows the presently named Street House as Kelk House and it is probable that Machell was referring to the area around this dwelling. There is also a reference to 'Kelkes' and to 'the land of Keldes' in the grants of land made to Holm Cultram in the late 12th century (Gibbons 1989).
- 3.2.7 By 1777 Nicholson and Burn recorded the only other description of the extent of the site. Here they stated that the main area of the fort was located within a place known as Burwens, on high ground, at the bank of the Troutbeck. They stated that the area known as High Burwens was the location of the Roman fort that contained 'eight score yards in diameter, now ploughed and cultivated; and the outer buildings,

mantle and gardens, to have run down along the said rivulet at least as far as the fulling mill, and possibly further, beyond the high street or Roman way; thence up the west side of the said street about eight score yards, and thence up again in a straight line to the west angle of the said area.' The remains they recorded as underground vaults, flags, tiles and slates with iron nails, and the foundations of walls constructed of both brick and stone as well as coins, altars, and urns (Nicholson and Burn 1777, Gibbons 1989).

- 3.2.8 In 1811 the Roman fort was described by John Hodgson who stated that the foundations of the fort's *vallum* were perceptible at the southeast corner and its 'whole area is circumscribed with strong lines...The high road between the lower and upper part of the village runs a little within its southern wall, on the outside of which the ground is still uneven with foundations of buildings, as it also is on the west side' (Gibbons 1989).
- 3.2.9 In 1936 the Royal Commission of Historic Monuments included the main part of the description by Nicholson and Burn in their assessment of the Roman fort. At this time they also drew attention to an area of earthworks. They suggested these earthworks were not part of the same line of works as the area would have been around 36 acres (14.6 hectares) which they thought would have exceeded the area of a roadside fort. They then suggested that the site was originally that of a larger 'labour camp' and that the permanent fort would have occupied the more dominant part of the original enclosure bank with a rounded corner that they described as a rampart.
- 3.2.10 In 1948 a description of the fort was made by Birley for the CWAAS. Here two fundamental leaps were made: the area that produced artifacts and remains filled the 36 acre area postulated by the Royal Commission, and the possible labour camp was transformed into a small town (*ibid*). At this point Gibbons states that the antiquarian descriptions of the Roman fort were pushed to the background and it has been within the shadow cast by theorizing, rather than by any concrete evidence that further archaeological works have been undertaken (*ibid*).
- 3.2.11 The present day A66 has existed as a road since at least since Roman times. This Roman road coexisted with a line of Roman forts over Stainmore, one of which was located at Kirkby Thore along with an associated *vicus*.
- 3.2.12 Within the 500 metre search radius around the proposed development site, eight sites/findspots are of Roman date. These include three

roman coins found within the vicinity of the fort, a trumpet brooch found by a metal detector in a field near Kirkby Thore fort, an additional Roman coin found in the garden of Burwain Terrace, and three vessels.

- 3.2.13 *Medieval (400AD-1485)*: during the reign of King Stephen (1135-1141) the manor of Kirkby Thore was held by the Whelp family. The descendants of Whelp eventually took the name de Kirkby Thore and held the manor until the reign of Henry VI, when it passed to the Wharton family (Parson and White 1829). Associated with Whelp family was Whelp Castle, described as a square enclosure and traditionally said to have been built from the remains of the Roman fort. In registers from Holm Cultram (1179) Whelp Castle is recorded as Castellum Whelp and as Wheallep-castle by Camden. By 1777 Nicholson and Burn reported that 'scarce remains' were to be seen, with the ruins of Whelp Castle said to have been used to construct Kirkby Thore Hall (Ragg 1917).
- 3.2.14 Not much is known about the origin and development of the medieval village. The most clearly recognizable medieval feature at Kirkby Thore is the Parish Church of St. Michael, a 12th century structure with 13th-14th century alterations as well as Kirkby Thore Hall, the core structure of which is a 14th century manor house (Gibbons 1989).
- 3.2.15 The village retains only vestigial evidence of croft boundaries. Excavations undertaken by Gibbons revealed that none of the excavated medieval features bore any relation to the present day plan of the village suggesting that there must have been a considerable evolution of land division (*ibid*).
- 3.2.16 *Post-medieval and Modern (1485 to present)*: the existing bridge at Kirkby Thore was built in 1838 to replace an older stone bridge that was in danger of collapse. The demolition of the earlier bridge revealed a concentrated area of Roman finds that included copper alloy objects, coins, brooches, and small statuettes. It is unclear if the early bridge was completely destroyed in 1838 as well as how the new bridge was positioned. When the bridge was widened in the 1980s no trace of the earlier bridge was present (Gibbons 1989).
- 3.2.17 Three photographs located at Kendal Record Office show the area around Prospect Terrace around the late 1800s. Two of these photographs were undated; one showed the Crosby Terrace area that consisted of three terraced brick houses that fronted onto Cross Street (Ref. No.: WDX 1251/6P). Another of the undated photographs was described as Honeysuckle Cottage, Prospect Terrace (Ref. No.: WDX

1251/38P). In the front of the house was a fence and a cobbled walkway that led to the unpaved road. The remaining photo of the Prospect Terrace area dated to c.1885 and was of a semi-detached lime-washed building also with a thatched roof. This also had a small cobbled walkway that led to a road (Ref. No.: WDX 1251/11P).

3.3 PREVIOUS ARCHAEOLOGICAL WORK

3.3.1 Numerous excavations and investigations have occurred in the immediate area around Kirkby Thore Roman Fort.

3.3.2 In 1961 excavations were undertaken at two sites in the known area of the Roman fort. It was thought that excavations on the south side of the main street, near the junction of Main Street with Chapel Lane, would have found the eastern aspect of the fort as well as part of the defences on the northeast and southeast. All that was found of the defences was a ditch section with two pieces of late 2nd century pottery. Excavations have suggested that this was not the first fort on this site as a turf rampart and ditch were revealed within the area of the stone fort. These finds were similar to the defences of the Flavian temporary camp at Oakwood. Pottery found on the site from earlier levels were dated within the period of 80-120 AD and did not suggest a brief occupation. Pottery from the overlying areas suggests that the early fort ended around c. 120-125 AD, although Charlesworth stated that this was tentative (Charlesworth 1964).

3.3.3 On the south side of Piper Lane, a single trench revealed the foundation of a substantial wall that was thought by Charlesworth to have surrounded the civilian settlement (*ibid*). Charlesworth's hypothesis that a defensive wall surrounded the civil settlement at Kirkby Thore had been questioned by Gibbons who thought that it was possibly the rear boundary wall of a medieval toft (Gibbons 1989).

3.3.4 In 1965 excavations by Charlesworth on the south side of Piper Lane, near the junction of the A66 revealed no traces of disturbance in Roman or later times. The absence of finds suggested that the *vicus* did not extend so far north and west as this (Charlesworth 1965).

3.3.5 In 1983 geomagnetic and earth resistance surveys were undertaken in a field to the north of the northern angle of the fort immediately to the west of Prospect Terrace, centred at NGR NY 6378 2574. These produced little evidence for the presence of archaeological features. The surveys were followed by the excavation of evaluation trenches. Trench 1 was positioned in the upper field and revealed a linear depression interpreted to be a hollow trackway with an uneven

drainage channel aligned along the centre. This contained both Roman and medieval pottery with post-medieval material in the upper fill. A trench in the lower field revealed a deep bank of medieval ploughsoil that had been denuded from the upper field and put against a field wall of which the footing survived. The wall consisted of cobbles in a matrix of ploughsoil. In front of and parallel to the wall was a ditch, the upper fills of which contained pottery dated to the later medieval period. The ditch was thought to have functioned as a drainage channel. From the outer edge of the ditch was a cobbled surface. The wall, ditch and cobbled surface were thought to be contemporary. Trench 3/6 revealed Samian ware dated to the first half of the 2nd century. A medieval field wall that had been robbed was also found. From the wall foundation a single sherd of Roman courseware was found. This excavation established that the area of the field was outside any foci of civilian occupation associated with the fort. This excavation revealed ditches, field boundaries, pits, possible structures and a probable well, of which only two ditches could be interpreted as part of the defences of the later stone fort. The probable well and pit demonstrate the presence of vicus activity on the northeast side of the fort. The main area of the field was interpreted as being used as both arable and pasture land (Gibbons 1989).

- 3.3.6 An archaeological evaluation was undertaken in 1999 on land adjacent to the A66 Trunk Road at Kirkby Thore, to the south of the proposed site boundary. Four of the trenches yielded archaeological deposits and finds including a possible Roman road surface and areas of cobbling interpreted as yards and wall foundations. Sherds of Roman, medieval and post-medieval pottery was also revealed within the area (Giecco 1999, Giecco 2000).
- 3.3.7 In 1999 Lancaster University Archaeological Unit (LUAU) undertook a desk-based assessment and inspection of the Kirkby Thore Road Improvement scheme. It was determined that the scheme would have a slight adverse impact on archaeological remains and recommended recording of these remains prior to road improvement works (LUAU 1999).
- 3.3.8 LUAU conducted an archaeological watching brief in 2000 as part of the road improvements on the A66 at Kirkby Thore, to the south of the proposed site boundary. No archaeological features or artifacts were recovered at this time (LUAU 2000).
- 3.3.9 In 2001 the aforementioned archaeology unit undertook an archaeological assessment of proposed sewerage works, to the south,

southeast of the proposed site boundary. It was deemed that medieval and post-medieval activity may be recovered in the area; however, archaeological remains most likely to be uncovered were considered to be those of the Roman civilian extramural settlement (LUAU 2001a).

- 3.3.10 In 2001 Oxford Archaeology North undertook an archaeological watching brief during the laying of two new waste water pipes to the east of the proposed site boundary, within the immediate vicinity of *Bravoniacum* Roman fort and its associated extramural settlement. The pipelines were excavated in fields to the southeast of the village leading to the Trout Beck. Close to the Trout Beck a series of fluvial deposits were found associated with previous courses of the river. On higher ground, within Trench 1, little Roman archaeology or features were found. A fence alignment was revealed that had been replaced by a shallow ditch in which a 4th century potsherd was found. The lack of building evidence, a single potsherd and in general a small amount of finds would suggest that this was an area used for agricultural purposes rather than the extramural settlement associated with the Roman fort. A post-medieval mill race associated with a corn and saw mill was located across Trenches 1 and 2 as well as a culvert of medieval or post-medieval date (OAN 2002).
- 3.3.11 A building recording was undertaken at Kirkby Thore Hall Farm, to the east of the proposed development site, prior to the conversion of redundant farm buildings that consisted of three ranges of byres, barns and pigsties. The survey found that the majority of buildings were built in a single phase of construction that dated between 1861 and 1869. Evidence of earlier farm buildings was also noted thought to date from the mid 17th century (Brigantia Archaeological Practice 2009).
- 3.3.12 Within the immediate vicinity of the proposed site boundary was an archaeological evaluation conducted in 2000 by Carlisle Archaeology Ltd immediately north of the northern angle of the Roman fort, and to the west of the proposed site boundary in what was known as Field 8866. Roman pottery and features were mostly concentrated in the western part of the field on higher ground. Ploughsoil in two of the trenches was medieval in date. Apart from the ploughsoil, medieval and post-medieval remains were concentrated in the eastern part of the field on lower ground. In one trench a large postpit indicated the presence of a substantial structure thought to be medieval in date that post-dated a shallow gully that was interpreted as a Roman field boundary. The best preserved features were thought to be Roman in date and were associated with the extramural *vicus* and included

buildings, yards, ancillary working areas and field boundaries (Graham 2000).

- 3.3.13 An archaeological excavation undertaken by LUAU the same year followed the aforementioned evaluation conducted in Field 8866. Evidence for the Roman period consisted of a stratigraphic sequence through several phases of Roman occupation. The earliest dated to the 1st century with the majority of finds dating to the 2nd through 3rd centuries as well as a hint of occupation during the 4th century. The medieval period was characterised by shallow linear features and postholes thought to pertain to agricultural activity. A finely metallated cobbled surface and other features represented land boundaries (LUAU 2001b).
- 3.3.14 In 2003 a geophysical survey was undertaken at Kirkby Thore Roman Fort. The electrical resistance survey located the perimeter of the fort and provided an indication of the interior layout. Evidence for buildings within the fort was poor, possibly due to plough damage and stone robbing. The presence of a town to the northwest of the fort was investigated but not substantiated (Railton 2003).
- 3.3.15 In August 2006, an archaeological watching brief was undertaken by Tynescares Archaeology during the construction of a new path north-east of the A66, directly south of the Roman Fort. No features or finds of an archaeological nature were encountered during this watching brief (Liddell 2006).
- 3.3.16 In 2009, North Pennines Archaeology Ltd undertook a rapid desk-based assessment (Strickland 2009) and subsequent evaluation (McElligot 2010) of land at Prospect Terrace, Kirkby Thore (NGR NY 6383 2574) ahead of development work. The research showed that a long antiquarian history of Kirkby Thore extends back to the 16th century during which time it was recognized that a Roman fort with an extensive civil settlement was in existence. The visible remains of the *Bravoniacum* Roman fort are few and the extent of the fort and surrounding *vicus* remains a subject of much debate. Excavation evidence from 1983 (see above) revealed the presence of some settlement activity on the north-eastern side of the fort. The Archaeological Evaluation involved the excavation of six trenches, totalling 2% of the development area. Archaeological remains were identified in all trenches in the form of a series of ditches, foundations and cobbled surfaces along with Roman pottery. All appeared to relate to the nearby Roman Fort and its associated *vicus* (McElligot 2010).

4 THE GEOPHYSICAL SURVEY

4.1 INTRODUCTION (FIGURE 1)

- 4.1.1 The geophysical surveys were undertaken between 22nd and 26th April 2013.
- 4.1.2 Geomagnetic survey was undertaken over two separate areas (Areas 1-2) within the study area (Figures 1, 4 and 7)). Each area consisted of a single field in its own right with boundaries consisting of stone walls and hedges, some of which incorporated post and wire fences. These fences produced strong dipolar magnetic anomalies around the periphery of the survey areas.
- 4.1.3 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.
- 4.1.4 Earth resistance survey was carried out in the south-eastern two thirds of Area 1 only, over the known site of the Roman Fort (Figures 1 and 2).
- 4.1.3 Numbers in the text refer to interpreted features (or groups of similar features) detected during both geophysical surveys. These features are labelled on the geophysical and archaeological interpretation figures.

4.2 EARTH RESISTANCE SURVEY

- 4.2.1 *Area 1 (Figures 2, 3 and 6)* Earth Resistance survey was undertaken over the south-eastern two thirds of Area 1, an area measuring 1.1ha. The area represented the majority of the known site of the Roman fort, clarified by an earlier earth resistance survey carried out in 2003 (Railton 2003).
- 4.2.2 The survey produced a distinct linear area of anomalously high resistance along the north-western edge of the survey area. This was interpreted as the north-western defensive wall of the fort (**A**). The south-western corner of this linear feature curved in the classical shape of a playing card corner indicating the south-western extent of the fort. Midway along the linear feature were two distinct anomalously high resistance areas which clearly represent the two guard towers of the north-western gateway (**B**). The north-eastern tower appears to be better preserved with its full rectangular ground plan still evident.
- 4.2.3 Linear areas of anomalously high resistance were detected within the confines of the fort (**C** and **D**). These features can be interpreted as streets

that ran perpendicular to one another, interspersed on a grid system, between the fort buildings as part of the Roman street network. Giving a particular high resistance reading is the street running south-east from the north-west entrance to the fort (**D**). This street may represent the principle street, the *via praetoria* leading to the headquarters building (*principia*) of the fort.

- 4.2.4 Distinct areas of mottled low resistance are evident between the streets (**C** and **D**). These areas possibly represent the sites of possible Roman barrack blocks. These may have been constructed of stone only on the lower foundation courses, the rest of the building being constructed of wood, wattle and daub. The buildings were probably subjected to systematic robbing of any useful construction stone in later centuries.

4.3 GEOMAGNETIC SURVEYS

- 4.3.1 *Area 1 (Figures 4-6)* The geomagnetic survey was undertaken over an area of 4.9ha which consisted of a whole field and included the north-western two thirds of the known location of Kirkby Thore Roman Fort.
- 4.3.2 A chain of small dipolar magnetic anomalies were detected along the north-eastern boundary and the southern corner boundary lines. These were due to wire fences included in the hedge lines around the periphery of the field. In the eastern corner of the field a strong dipolar magnetic anomaly was detected and was likely due to the area being subjected to some household waste deposition.
- 4.3.3 In the north-western quarter of the field four parallel, positive linear magnetic anomalies were detected. Of these the northern two (**1**) were strong, positive magnetic linear anomalies, the south-western pair (**2**) being much weaker linear magnetic anomalies. The northern positive magnetic anomalies (**1**) are likely to represent the ditches on either side of a Roman street heading north-west. The southern two positive magnetic linear anomalies (**2**) may represent a similar feature but this is less conclusive.
- 4.3.4 Running perpendicular to the northern street a series of both strong and weak positive magnetic linear anomalies (**3**) were detected along with some strong irregular shaped positive anomalies (**4**). The linear anomalies (**3**) can be interpreted as boundary features, possibly foundation trenches or beam slots for Roman strip buildings fronting either side of the street in what would have been part of the civilian settlement (*vicus*). The irregular shaped positive anomalies (**4**) may represent pits and ditches within the confines of the civilian settlement.

- 4.3.5 In the western corner of the field was a curving positive linear magnetic anomaly **(5)** of mixed strength. Shaped like a playing card corner it may possibly represent the corner of another camp, fort or an annex to the known fort.
- 4.3.6 Running diagonally from north-east to south-west, across the north western half of the field a weak, positive, linear magnetic anomaly **(6)** was detected which may represent a modern land drain.
- 4.3.7 The geomagnetic survey was dominated by a dense cluster of positive, negative and dipolar magnetic anomalies, within the south-eastern half of the field, all consistent with subsurface remains relating to a Roman fort.
- 4.3.8 Strong dipolar magnetic anomalies **(7)** were located at the site of the gateway and associated towers of the fort along the north-western edge of the fort. These may be a result of ovens constructed within the tower bases.
- 4.3.9 Along the northern part of the north-western edge of the fort was a strong positive linear magnetic anomaly which most likely represents the fort's outer defensive wall **(8)**. Evidence for a defensive ditch north-west and adjacent to the wall was tentatively observed in the form of a narrow linear negative magnetic anomaly
- 4.3.10 Within the interior of the fort itself were four distinct areas of strong positive magnetic anomaly all running north-east to south-west **(9)**. These were separated from each other by areas of weaker positive magnetic anomaly and strong negative narrow linear anomalies **(10)**. These areas are likely to represent Roman barrack blocks divided apart by cobbled streets. The strong positive anomalies within the barrack blocks are probably due to stone robbing having taken place once the buildings went out of use.
- 4.3.11 The south-eastern area of the field and fort was dominated by a series of mixed strong negative and positive and dipolar magnetic anomalies. Creating a somewhat chequerboard effect it was indicative of a built layout constructed on a grid system. Roman forts were constructed to a precise planned layout and the geomagnetic results are highly indicative of this.
- 4.3.12 Situated centrally on the south-eastern edge of the geomagnetic survey was a series of strong positive magnetic anomalies arranged in a rectangular shape with a strong dipolar magnetic anomaly situated centrally on the north-eastern edge **(11)**. Located in a position directly opposite the north-eastern gateway of the fort it is highly likely that this series of anomalies represent the headquarters building (*principia*) of the fort whose large worked stone blocks were robbed out.

- 4.3.13 A series of weak narrow positive magnetic linear anomalies crossing the field north-east to south-west can best be attributed to post-medieval ploughing.
- 4.3.14 *Area 2 (Figures 7-9)* The geomagnetic survey was undertaken over an area measuring 1.2ha which consisted of a whole narrow field lying to the north-west of Area 1 (Figure 1).
- 4.3.15 A chain of small dipolar magnetic anomalies was detected along the north-western and south-eastern boundary lines. These were due to wire fences included in the hedge lines around the periphery of the field. Situated centrally along the south-eastern edge of the field a strong dipolar magnetic anomaly was detected and was due to a large metal field gate.
- 4.3.16 Strong dipolar magnetic anomalies at the north-eastern end of the field can be attributed to a field entrance and the deposition of stone rubble in it for better access.
- 4.3.17 The vast majority of the surveyed area was covered by a series of parallel, narrow, positive and negative linear anomalies **(12)**. These can be attributed to medieval ridge and furrow ploughing, the land probably being part of the village medieval field system.

4.4 DISCUSSION (FIGURE 6)

- 4.4.1 Both geophysical surveys were effective in detecting a substantial amount of archaeological features although the two survey types, earth resistance and geomagnetic, had differing degrees of success over a variety of feature types. The combined interpreted results of the geophysical surveys are illustrated in Figure 6.
- 4.4.2 The surveys in both areas revealed very little in the way of modern features. This may be partly due to the fact that both areas of land are within a defined Scheduled Ancient Monument (SM 13450). In Area 1 only one possible drain and very ephemeral evidence of ploughing were detected.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

- 5.1.1 Geomagnetic and earth resistance surveys covering c.6.1ha of land have been conducted within two pastoral fields situated within the village of Kirkby Thore, near Penrith, Cumbria as part of a community archaeology project to investigate the Maiden Way Roman Road between Kirkby Thore and Carvoran.
- 5.1.2 The geomagnetic survey in Area 1 was highly successful in locating earth filled ditches relating to a hitherto unknown civilian settlement, with a street running through it, immediately north-west of the fort. In addition to this the survey managed to detect some other earth filled linear features between the fort and the north-west civilian settlement, one of which may represent the curved corner of another camp, fort or annex.
- 5.1.3 Over the fort area itself the geomagnetic survey was useful in giving an overview of the fort layout. Strong positive magnetic anomalies indicated areas of buildings probably robbed of stone whereas weaker magnetic areas were indicative of streets between the buildings. The outline of the headquarters building was recognised as a series of strong positive magnetic anomalies set in a rectangular group. The north-west defensive wall was not very clear on the geomagnetic survey and neither was the existence of any defensive ditch.
- 5.1.4 In Area 2 the geomagnetic survey success fully detected evidence of medieval ridge and furrow ploughing.
- 5.1.5 The earth resistance survey was extremely adept, more so than the geomagnetic survey, at detecting the defensive walls and gate towers of the fort. It was effective in detecting the street layout within the fort but poor at defining actual building outlines, possibly due to rubble spreads. This survey again failed to supply any strong evidence for a defensive ditch outside the fort walls.

5.2 RECOMMENDATIONS

- 5.2.1 In order to establish conclusive evidence of the route the Maiden Way took from Kirkby Thore fort it is necessary to have a bigger picture of the Roman road network immediately surrounding it. More information also needs to be gathered on the immediate approach route of the Maiden Way to the fort itself. All of this could be obtained

by future topographical and geophysical surveys in the surrounding landscape.

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6.2 PHOTOGRAPHS

Photograph (undated) *Crosby Terrace Street Scene*. KRO Ref. No.: WDX 1251/6P.

Photograph (undated) *Honeysuckle Cottage: Prospect Terrace*. KRO Ref. No.: WDX 1251/38P.

Photograph (1885) *Prospect Terrace and S. McGuiness Grocer*. KRO Ref. No.: WDX 1251/11P.

APPENDIX 1 FIGURES

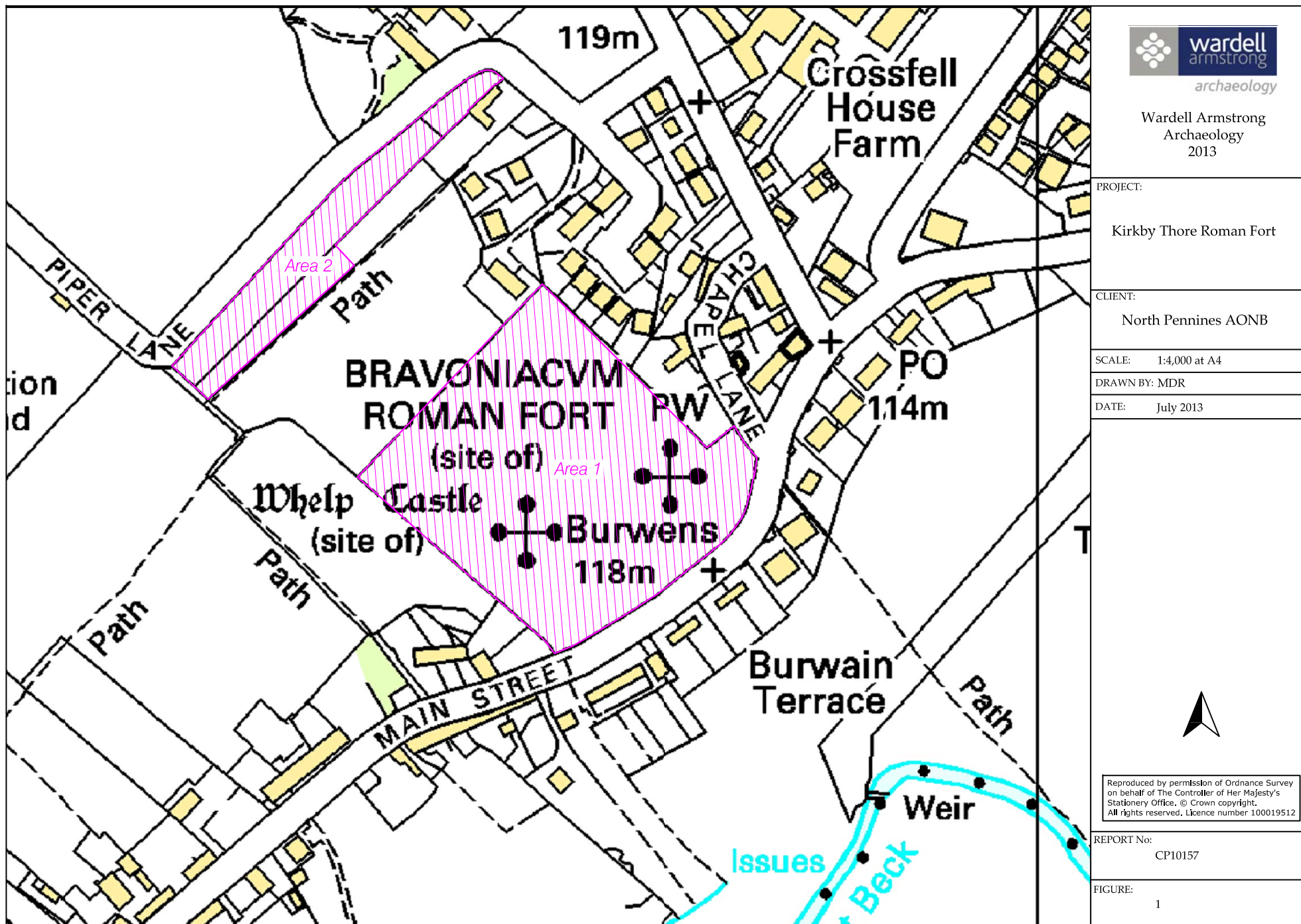


Figure 1: Location of Kirkby Thore Roman Fort



Figure 2 : Earth resistance survey (Area 1)

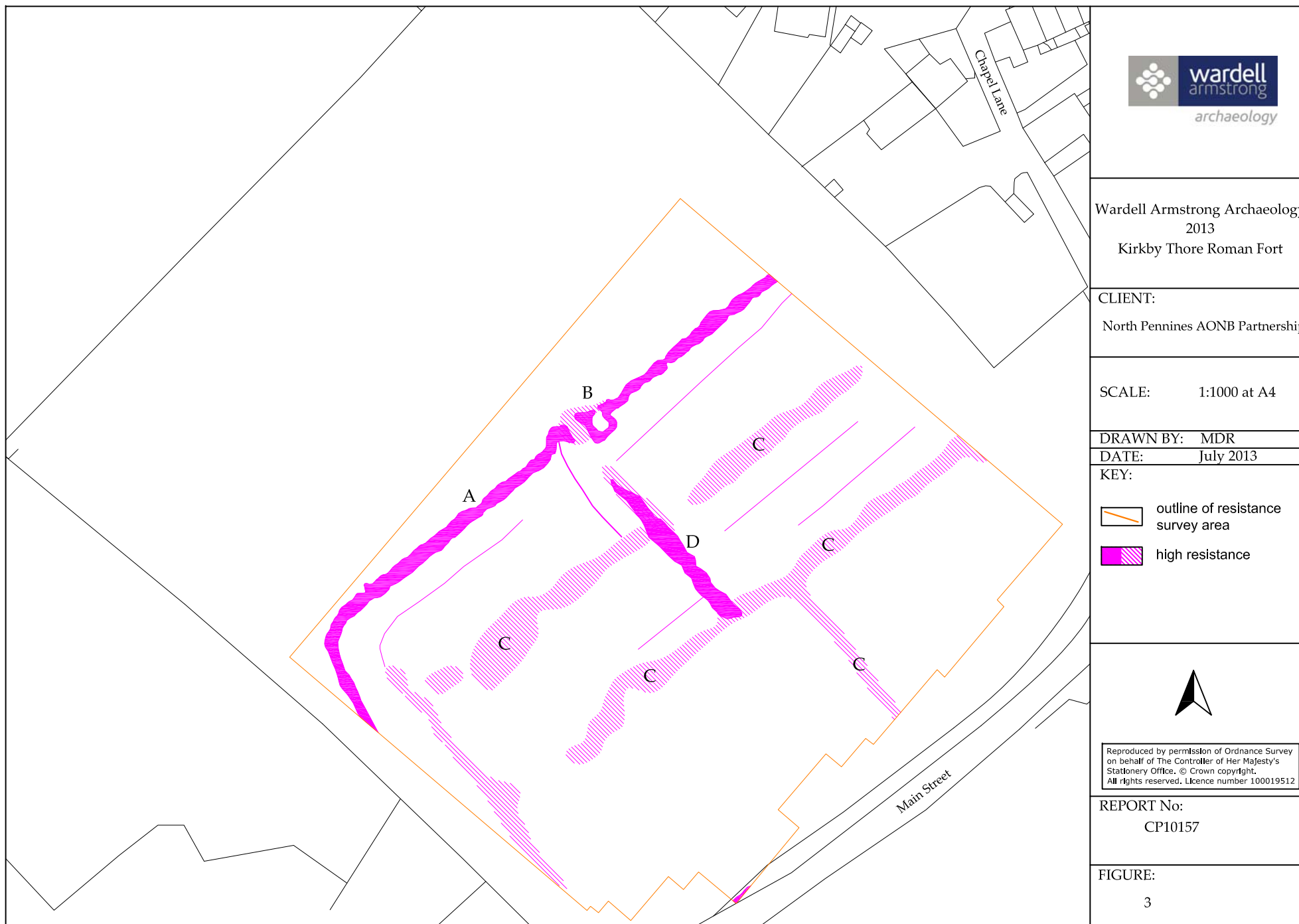


Figure 3 : Geophysical interpretation of the earth resistance survey (Area 1)

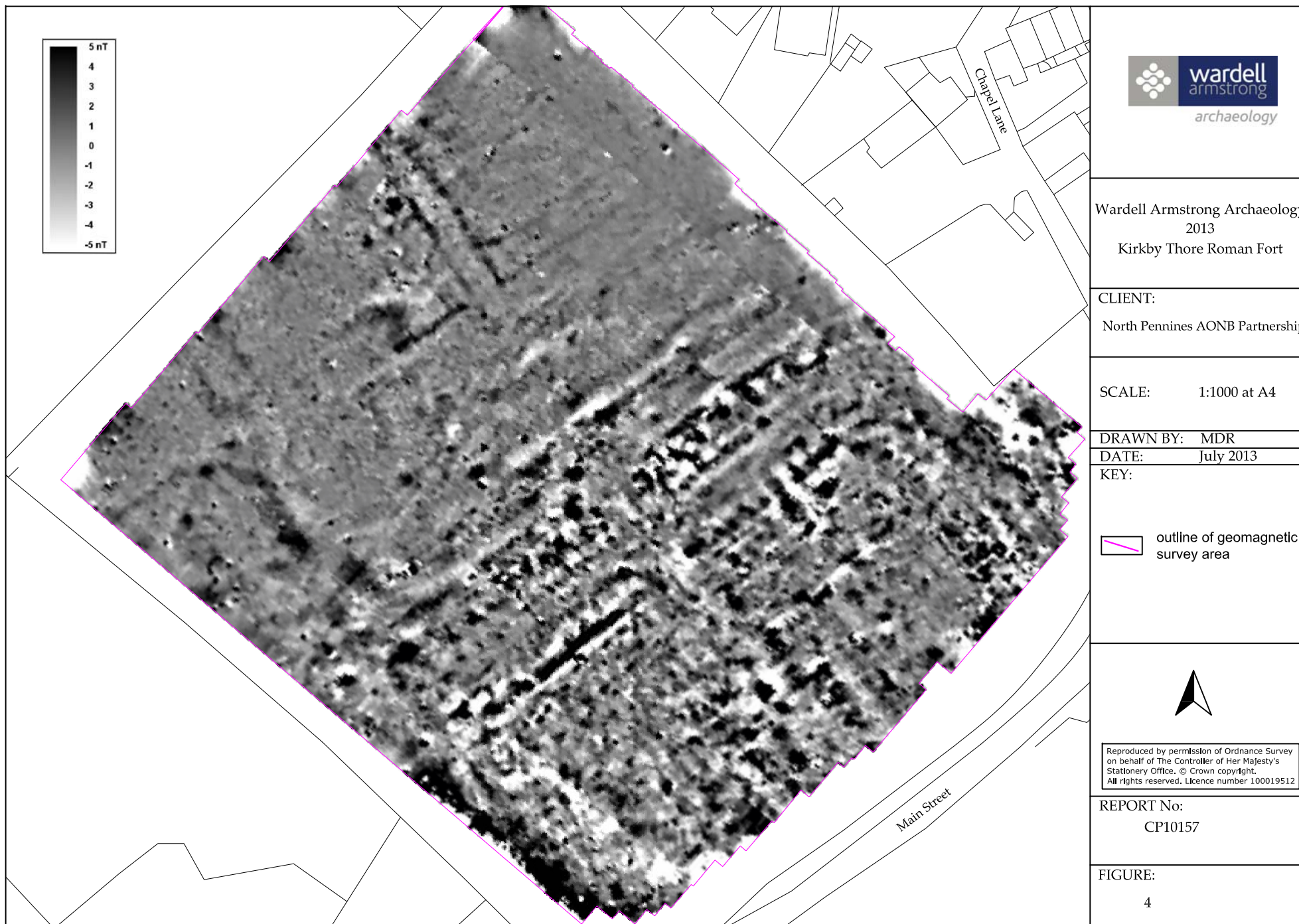


Figure 4 : Gradiometer survey (Area 1)

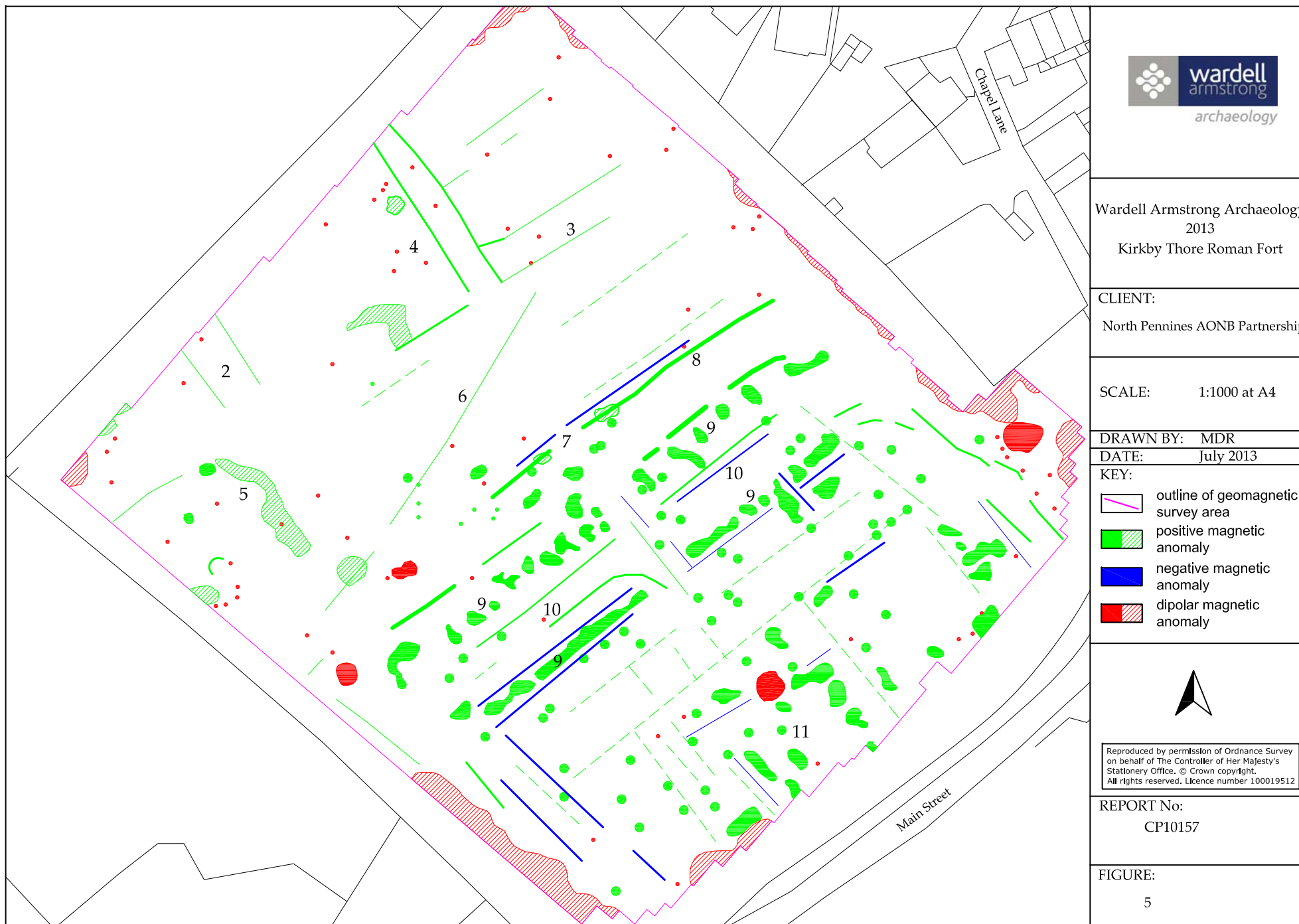


Figure 5 : Geophysical interpretation of the gradiometer survey (Area 1)

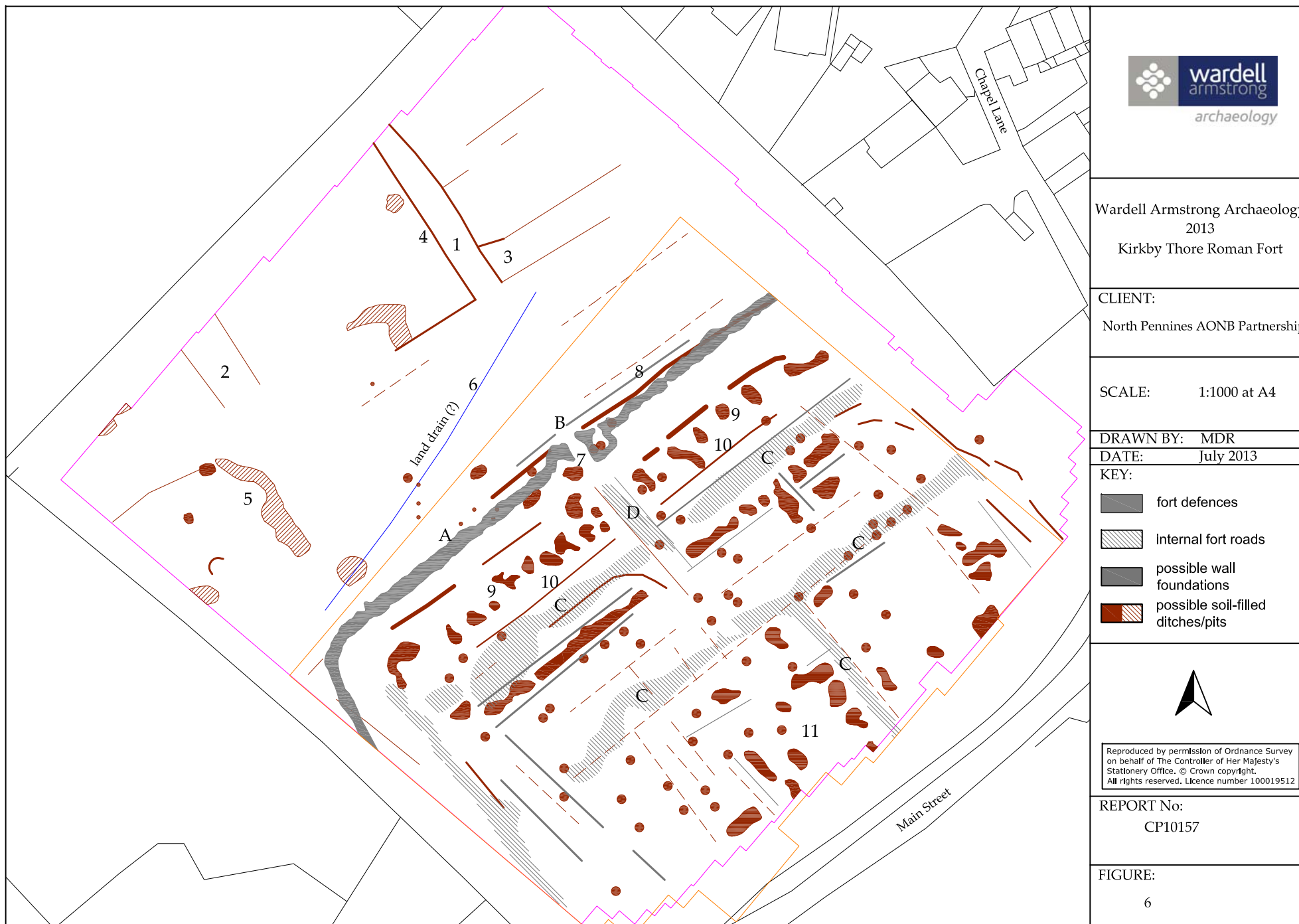


Figure 6 : Archaeological interpretation (Area 1)

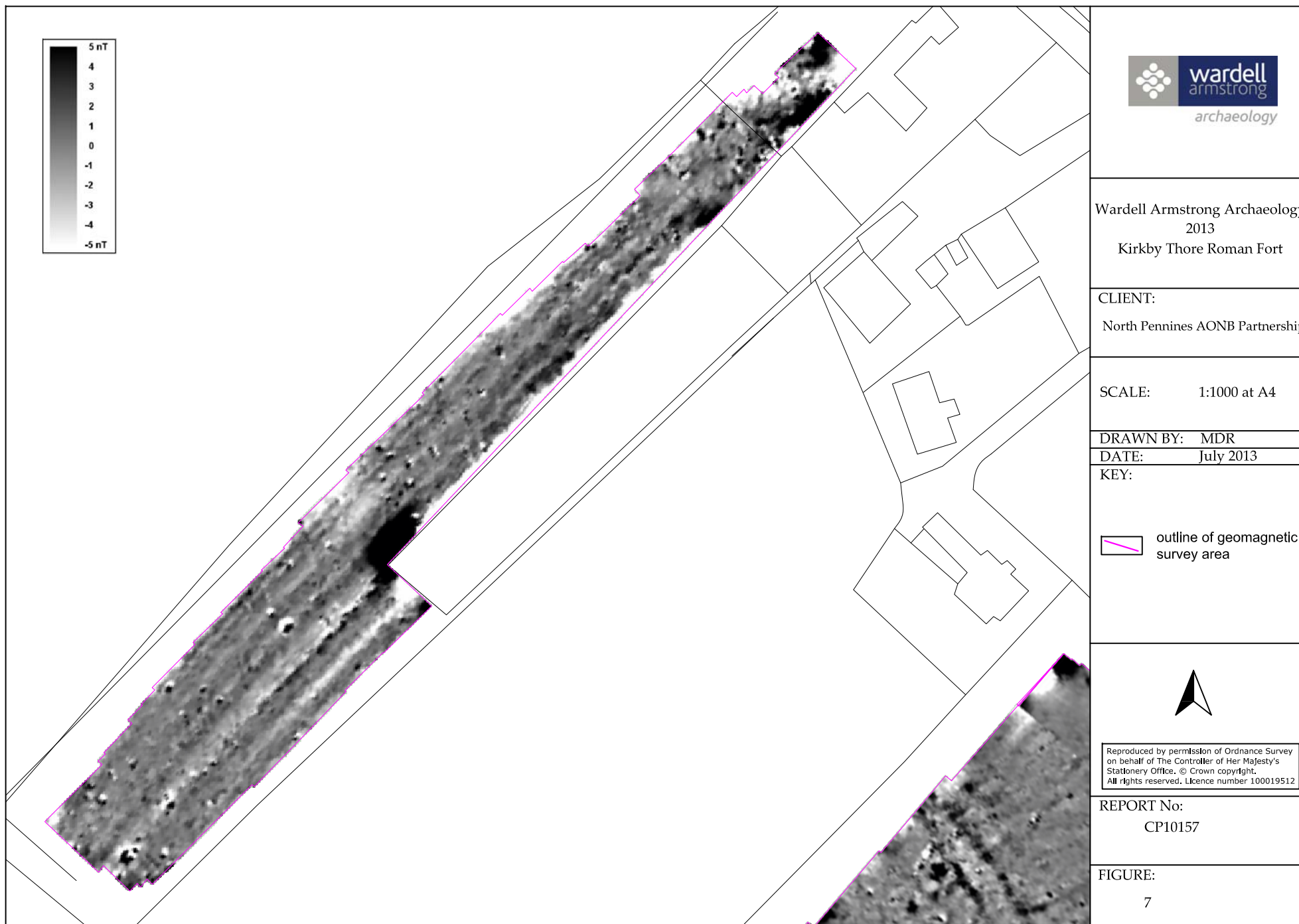


Figure 7 : Gradiometer survey (Area 2)

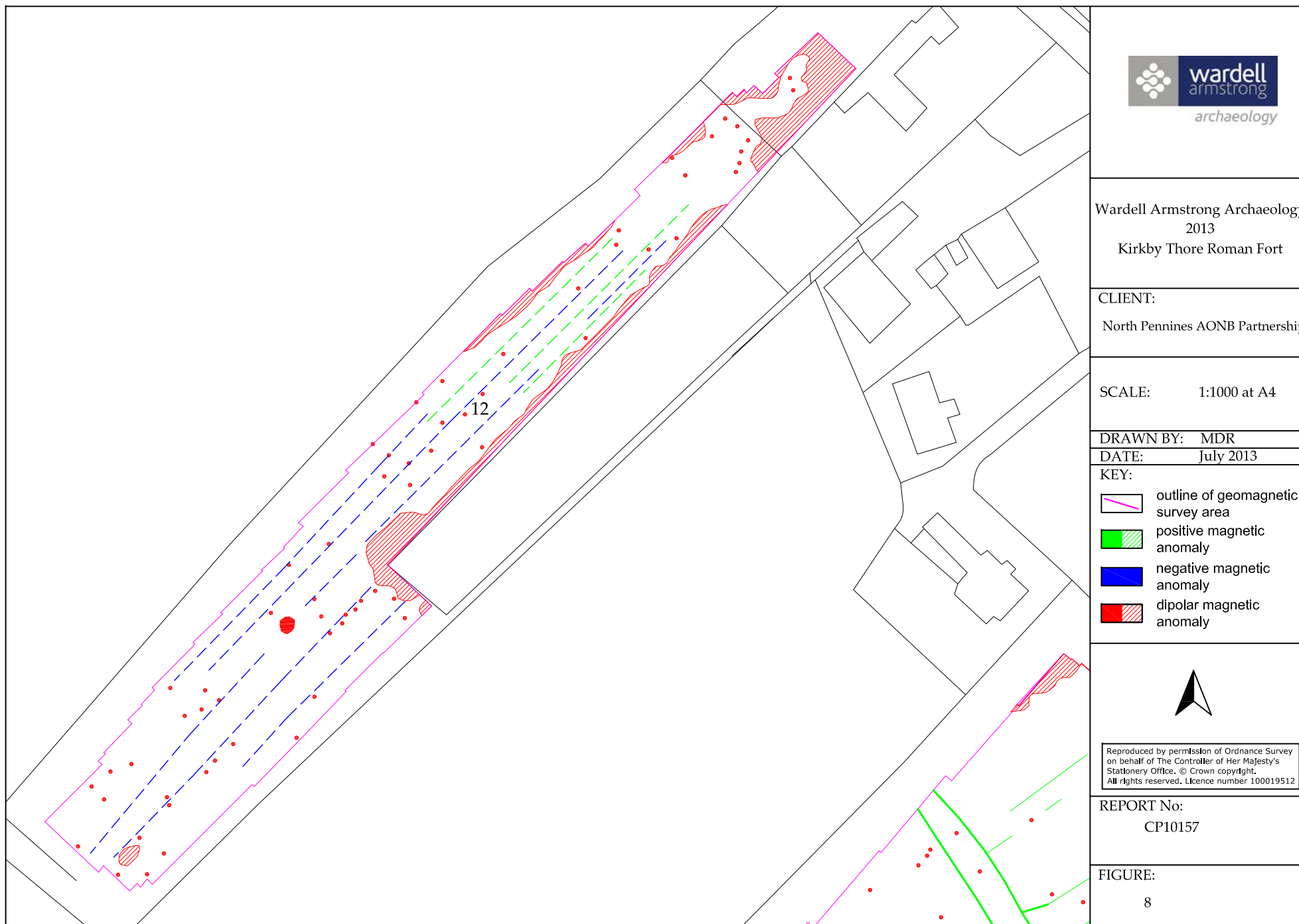


Figure 8 : Geophysical interpretation of the gradiometer survey (Area 2)

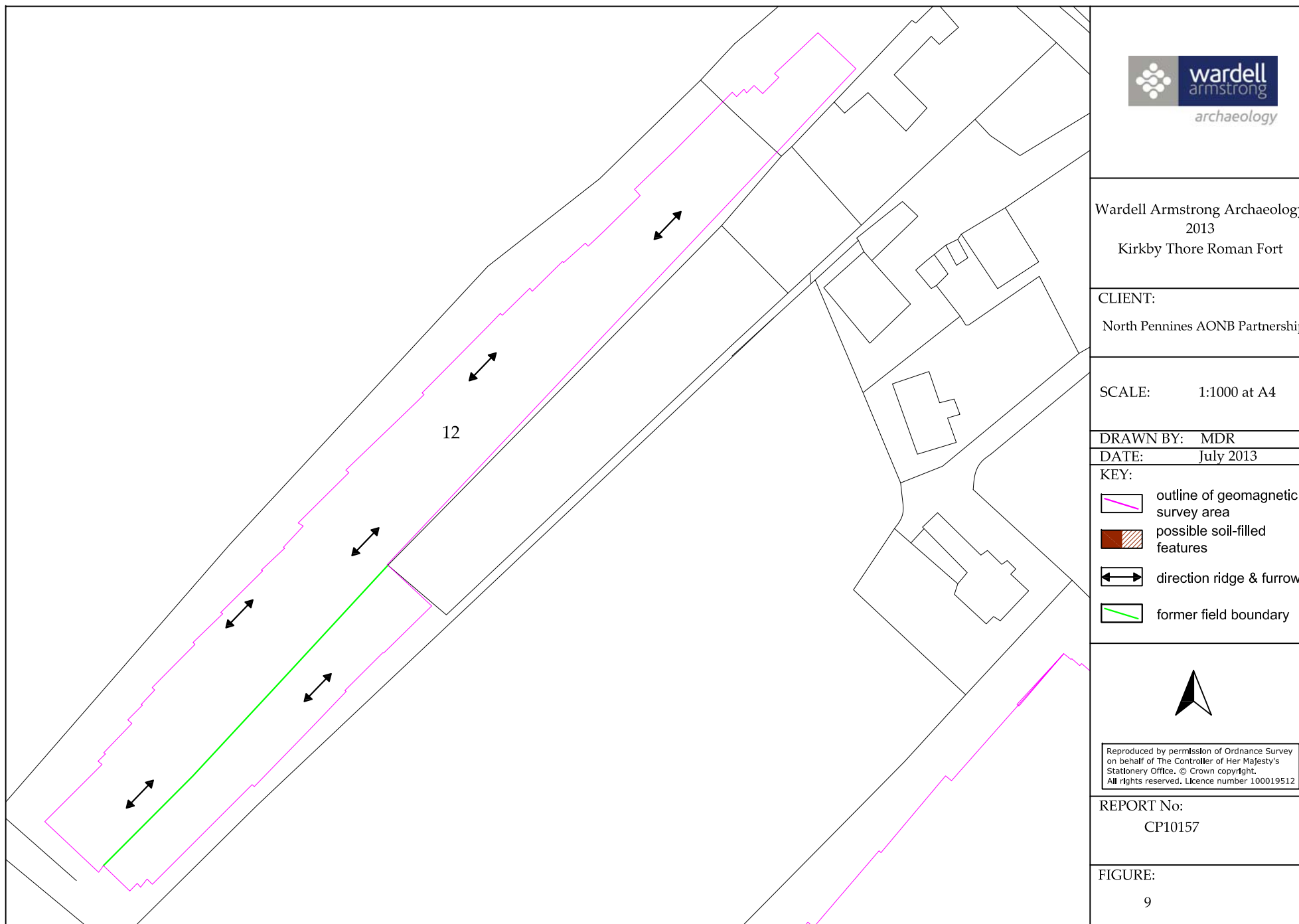


Figure 9 : Archaeological interpretation (Area 2)