



Long Preston Geophysical Survey July and August 2016



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1. Introduction

At the request of the Long Preston Heritage Group, Swaledale and Arkengarthdale Archaeology Group (SWAAG) has carried out geophysical surveys - magnetic and earth resistance - of two sites in Long Preston, near Settle as part of that group's Heritage Lottery Fund supported "Big Dig." The sites were also GNSS surveyed.

The surveys were carried out on July 18th 2016 for site 1 and 10th August 2016 for site 2.

This report describes the equipment and methodology used for the surveys and for the data analysis. The results of the surveys are presented together with an interpretative commentary. Each site is considered separately.

This report including the survey results may be used freely with appropriate accreditation;

Copyright and Archive

1. All reports produced by SWAAG (swaag.org) are ©swaag.org but can be freely used with accreditation.
All reports will be made available on swaag.org and through the OASIS project on the Archaeology Data Service.
2. The Google Earth image can be used but the 'Google Earth and the secondary text' must remain as part of the image.
3. The LIDAR image is Published by the Environment Agency and licensed under Open Government Licence.

2. Equipment and Methodology

Geophysical surveys were undertaken with a Bartington Grad601-2 Gradiometer and a Geoscan Research RM85 Resistivity Meter with a PA20 Probe Array. Grids of 30m square were set out using geometry and their precise locations were established with a Spectra Precision Promark120 Professional Grade GPS/GLONASS GNSS Receiver. The following is a summary of the techniques and instruments used in the survey together with a summary of the data processing methodologies.

Magnetometry

| | |
|------------------------------|--|
| Instrument | Bartington Grad601-2 Gradiometer |
| Grid Size | 30m by 30m |
| Sampling along the traverses | 0.25m |
| Traverse intervals | 1m |
| Collection mode | Zig-Zag |
| Settings | Range 100nT; resolution 0.03nT |
| Direction of traverse | East - west for site 1 Northwest – southeast for site 2 |

At site 2, the northeast/southwest axis of the grid was restricted by a wall and wire fence. To allow for that the data collection was truncated and dummy readings entered from the 20m marker.

The raw data was downloaded into Terrasurveyor version 3.0.29.3. It was de-striped, and de-staggered where necessary, and then clipped and interpolated.

The data plots were imported into QGIS, a free, Open Source Geographic Information System programme where it was superimposed on the grids located with the ProMark 120 GNSS (see below). The processed survey data was superimposed on Google Satellite View images using the GNSS data to fix its position. LIDAR (at 50% transparency) was also superimposed on Google Satellite View images to show topographical features for comparison.

Resistivity

| | |
|-----------------------------|---|
| Instrument | Geoscan Research RM85 Resistivity Meter & PA20 Probe Array |
| Array | Twin Parallel Probe, 4 probe |
| Probe Spacing | 0.5m |
| Grid Size | 30m by 30m (site 1) 30m (northwest - southeast axis) by 20m (northeast - southwest axis) for site 2 |
| Sampling along the traverse | 0.5m |
| Traverse intervals | 1m |
| Collection mode | Zig-Zag |
| Settings | Gain x10; Frequency 122.5Hz; Output 45V |
| Direction of traverse | East - west for site 1 Northwest - southeast for site 2 |

The raw data was downloaded into Terrasurveyor version 3.0.29.3, clipped and interpolated.

The data plots were imported into QGIS and manipulated as described above for the magnetometry.

3. Location

Long Preston is located south of Settle in North Yorkshire and sits astride the A65 highway.

Site 1 is located approximately north east of Long Preston and centred on grid reference SD 83695 58632

Site 2 is located centrally in Long Preston and to the west of the A65. It was centred on grid reference SD 83410 58039

Figure 1 is a Google Earth image showing Long Preston with the two survey sites highlighted in red.

4. Description of Sites

Site 1 is a grassed field which at the time of the survey was being used to graze sheep. The field's long axis runs approximately north - south and the field slopes gently down from the north. Inspection of the field showed evidence of old, now largely ploughed-out ridge and furrows, and possible lynchets running north - south. In the approximate centre of the site is a mound, the focus of the survey. The mound's long axis runs approximately north - south and measures some 20metres by 10metres east - west.

Figure 2 is a LIDAR image of the site superimposed on a Google Earth image of the site. The survey grids are also shown. The ridge and furrows are clearly visible as is the mound on the junction between the western and centre grids. The area of the survey site was 2700 square meters.

On the day of the survey the weather was dry and sunny and ground conditions were very dry.

Site 2 is grassed pasture land. At the time of the survey the grass was long (6 to 9 inches) and the field was not being grazed. The site is immediately adjacent to the houses which form the western edge of Long Preston. The long axis of the field runs approximately northwest - southeast. There was little visible evidence of any features in the field, possibly due to the long grass obscuring the ground.

Figure 3 is a Lidar image of the site superimposed on a Google Earth image of the site. The survey grids are also shown. Ridge and furrow plough marks are visible running northwest - southeast on the site and in the surrounding fields; the points marked A, B, and C show the areas of three possible platforms, the foci of this survey. The OS Grid references for these points are:

A: SD 83371 58057
B: SD 83399 58028
C: SD 83414 58009

The area of the survey site was 1800 square metres.

On the day of the survey the weather was fine and sunny and ground conditions were dry.

5. Results and Discussion - Site 1

Magnetic Survey: Figure 4 shows the raw data trace from the magnetic survey alongside the processed data which was de-striped and clipped at -3nT to +3nT. In Figure 5 the processed magnetic survey data has been superimposed on a Google Satellite view of the site. In Figure 6 the processed data has been superimposed on a LIDAR image at 50% transparency over a Google Satellite image of the site.

The raw and processed data plots, Figure 4, show a scatter of isolated small bipolar responses, possibly stray ferrous or iron objects which are commonly found scattered over fields.

The plots also clearly show a series of responses running approximately north - south across the width of the survey area. These are typical of the remains of largely ploughed out ridge and furrows and possibly lynchets. There are also two stronger responses running north - south in the eastern-most grid. These are typical of ditches or furrows which have become infilled with topsoil. In figure 6 it can be seen that these features line up with long depressions shown up by the LIDAR.

Resistance Survey: Figure 7 shows the raw data trace from the earth resistance survey. In Figure 8, the processed resistance survey data has been superimposed on a Google Satellite view of the site, and in Figure 9 the processed data plot has been superimposed on a LIDAR image at 50% transparency over a Google Satellite image of the site.

Ground resistance surveys detect areas of ground which retain moisture to a greater or lesser extent than their surroundings. The data shows several possible features:

- in the western-most grid at the north end is a small high resistance anomaly, possibly rocks;
- almost aligned along the border of the western and centre grids it is possible to see in Figure 8 the mound with anomalies at either end together with a small scatter of anomalies over the top part of the mound;
- adjacent to the mound in the centre grid, Figure 8 shows what appears to be a weak circular anomaly; possibly a clearance cairn;
- in the centre of the middle grid and running north - south from the top of the grid to just over half way down there is a stronger anomaly. Comparison with Figure 9 suggests that the anomaly lines up well with one of the the north - south ridge and furrows/lynchets clearly shown on the LIDAR image of the site; it may be a stone-faced bank.
- In the eastern grid there would appear to be an anomaly which starts toward the top and western side of the grid, runs east and at about the centre of the grid curves down the approximate centre of the grid. The anomaly is a mixture of weak and stronger responses. Figure 9 show that the anomaly lines up well with one of the ridge and furrows/lynchets.
- Also in Figure 8, it is possible to see across all of the grids parallel lines of anomalies running approximately east - west.

Discussion: The earth magnetic survey and the resistance survey both strongly indicate that the site was at one time ploughed on a north - south alignment and cultivated using ridge and furrow and that there may have been stone revetted lynchets. This is supported by comparison of the surveys with Figure 2 (LIDAR superimposed on Google Satellite view) which clearly shows ridge and furrows and possible lynchets throughout the whole site.

Additionally, the ground resistance survey, in Figure 7, shows weaker anomalies running in almost parallel lines approximately east - west across the site; the lines would appear to be slighted by the north - south anomalies. Similar lines are not apparent on the LIDAR plots of the area, Figure 2. Is it possible that in an earlier time period the site was

cultivated using east - west running ridge and furrows/lynchets and these anomalies are the residual stone facings.

There are two stronger magnetic anomalies towards the eastern end of the survey site in Figure 5. The one running through the centre of the grid appears to line up with the weak resistance anomaly in the eastern-most grid shown in Figure 7; could it perhaps be a rock-filled ditch or old stream bed. The magnetic anomaly at the eastern-most edge of the eastern grid in Figure 5 does not appear in the resistance survey data and may reflect a stone faced lynchets or a dry stream bed. Note that in the weeks leading up to the survey there had been little rain and the ground was very dry.

The magnetic survey, Figure 4, does not give any indications as to the make-up of the mound. However, the resistance survey, Figure 7, has revealed a number of anomalies in the area of the mound. The resistance survey shows the mound with an area of low resistance towards the centre and higher resistance at each end. Perhaps the higher resistance at the ends is indicative of stones, perhaps from field clearances. Adjacent to the mound and at its eastern edge there is a circular anomaly, it may be a cairn, clearance or otherwise. Archaeological excavation will be required to provide an explanation of what these might be.

6. Results - Site 2

Magnetic Survey: Figure 10 shows the raw data trace from the magnetic survey alongside the processed data. In Figure 11 the processed data has been superimposed on a Google Satellite image of the site, and in Figure 12 on a LIDAR image at 50% transparency over a Google Satellite image of the site.

The raw and processed data plots, Figure 10, show a scatter of isolated small bipolar responses, possibly stray ferrous or iron objects which are commonly found scattered over fields. The strong response running along the northeastern edge of the grids is due to the wire in the eastern wall boundary to the site. There is also a strong bipolar response at the junction of the southern and centre grids.

There are weak magnetic responses in the vicinity of B and C, the possible platform sites, and there is a negative anomaly running northeast - southwest across the northernmost grid, and south of it a line of three distinct anomalies. The survey does not indicate any ridge and furrows/lynchets which are seen in the LIDAR image of the site, Figure 3

Resistance Survey: Figure 13 shows the raw data trace from the earth resistance survey. In Figure 14 the processed resistance survey data has been superimposed on a Google Satellite view of the site, and in Figure 15 the processed data plot has been superimposed on a LIDAR image at 50% transparency over a Google Satellite image of the site.

The resistance survey shows a weak linear anomaly crossing the northernmost grid and centred in that anomaly are three distinct stronger anomalies. At the junction of the southern and centre grids is a possible trapezoidal-shaped anomaly which extends halfway into the centre grid and in the vicinity of site B. There is also a weak anomaly at approximately site C.

There are weak anomalies running northwest – southeast through the whole site, possibly as a result of ridge and furrows/lynchets.

Discussion: The foci of the survey were the three points A, B, and C where it was thought there may be medieval platforms.

Both the magnetic and resistance surveys show low level anomalies near to point C.

The magnetic survey also suggests a bipolar anomaly on the boundary between the southern and central grids, which could possibly be ferrous/iron (wire?) in the boundary wall but perhaps it should be noted that it is located in the same area as the trapezoid shaped resistance anomaly.

In the centre of the central grid, near to B there is also a magnetic bipolar anomaly. There is no corresponding resistance anomaly. Could it be wire in the boundary wall?

In the northern grid there is a magnetic anomaly running across the width of the grid together with three small distinct anomalies south of it. The resistance survey shows an anomaly running across the northern grid in the similar area to that seen in the magnetic survey and within that anomaly three distinct responses which appear to be in a similar positions as those in the magnetic survey. Perhaps this might be the remains of a wall, or a field drain.

The magnetic and resistance surveys of site 2 have indicated several anomalies a few of which occur in the same areas. However, archaeological excavation will be required to provide an explanation of what these might be.

Acknowledgements

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David Brooks, Andrea Dixon, Shirley Gale, Perry Gardener, Mike Keenan, John Russell and Mike Walton. The data processing was carried out by Mike Walton and this report was written by David Brooks and Mike Walton.

Our thanks are due to: the members of the Long Preston Heritage Group for giving SWAAG an opportunity to undertake these surveys and for their hospitality and help throughout; to David Johnson for his help and support and to the Heritage Lottery Fund for their support to SWAAG which allowed us to buy most of the equipment used in these surveys.

8. Illustrations.

Figure 1: Long Preston village, showing survey sites (in red)

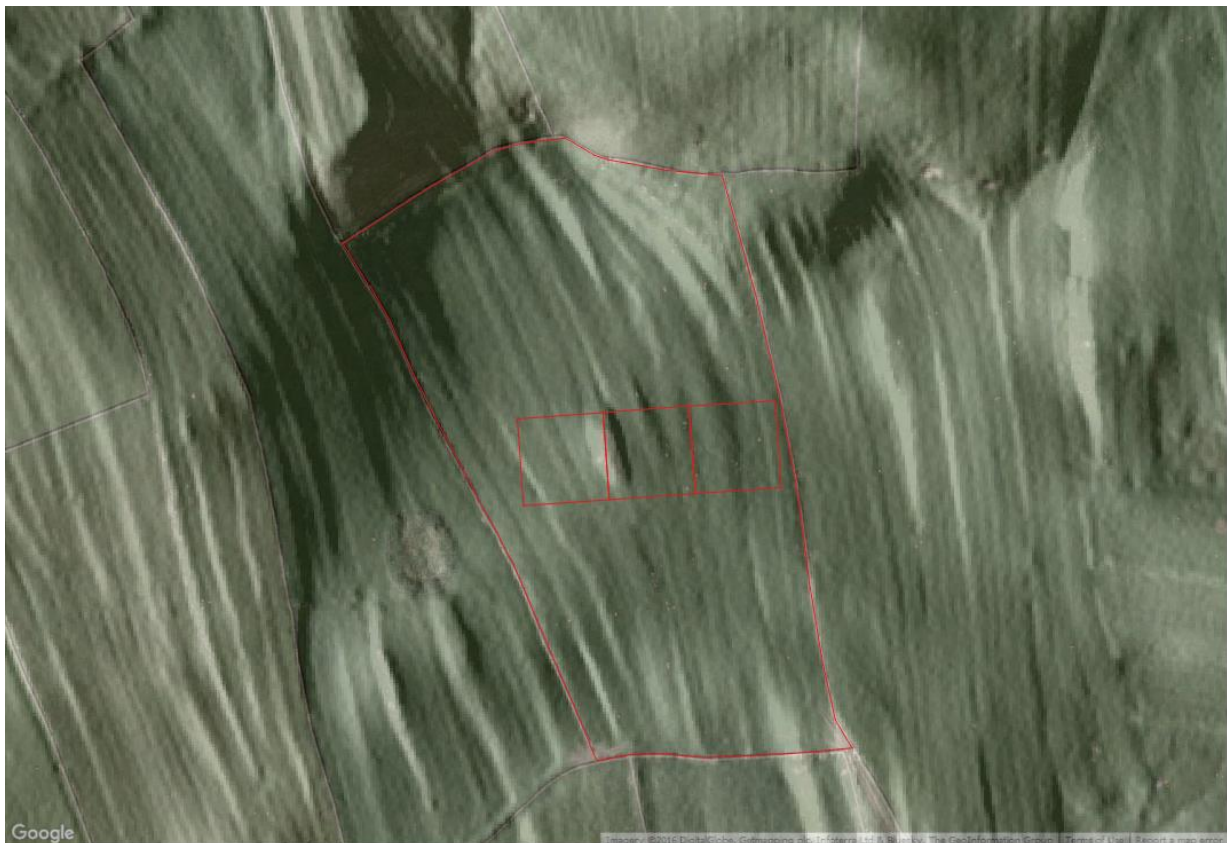


Figure 2: Site 1, LIDAR at 50% transparency over Google Satellite image



Figure 3: Site 2, LIDAR at 50% transparency over Google Satellite image

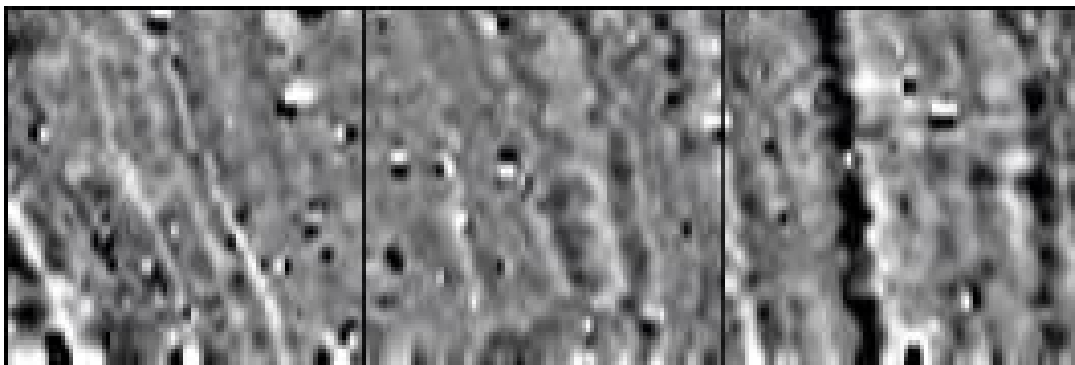
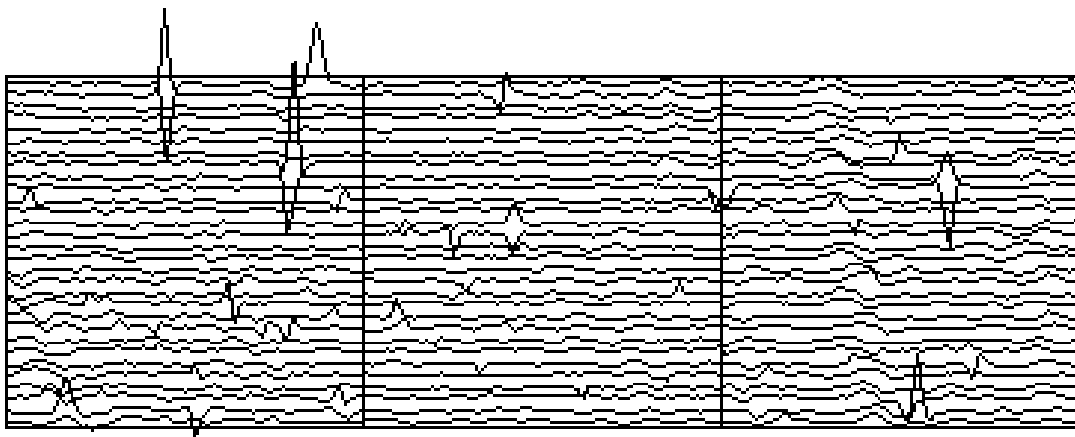


Figure 4: Site 1, Magnetic Survey, Raw Data trace (top) and Processed Data (Range -3nT to +3nT) (bottom)



Figure 5: Site 1, Magnetic Survey over Google Satellite image (Range -3nT to +3nT)



Figure 6: Site 1, Magnetic Survey superimposed over LIDAR at 50% transparency over Google Satellite image (Range -3nT to +3nT)

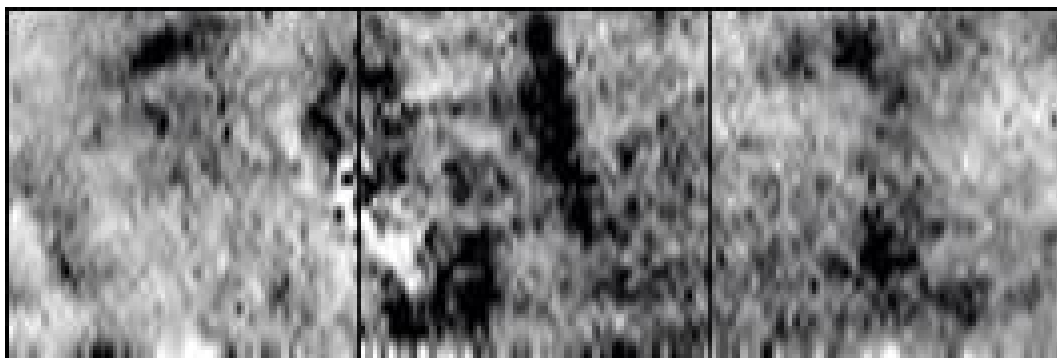


Figure 7: Site 1, Processed Resistance Data , clipped at $\pm 2SD$



Figure 8: Site 1, Processed Resistance Survey data clipped at $\pm 2SD$ over Google Satellite image

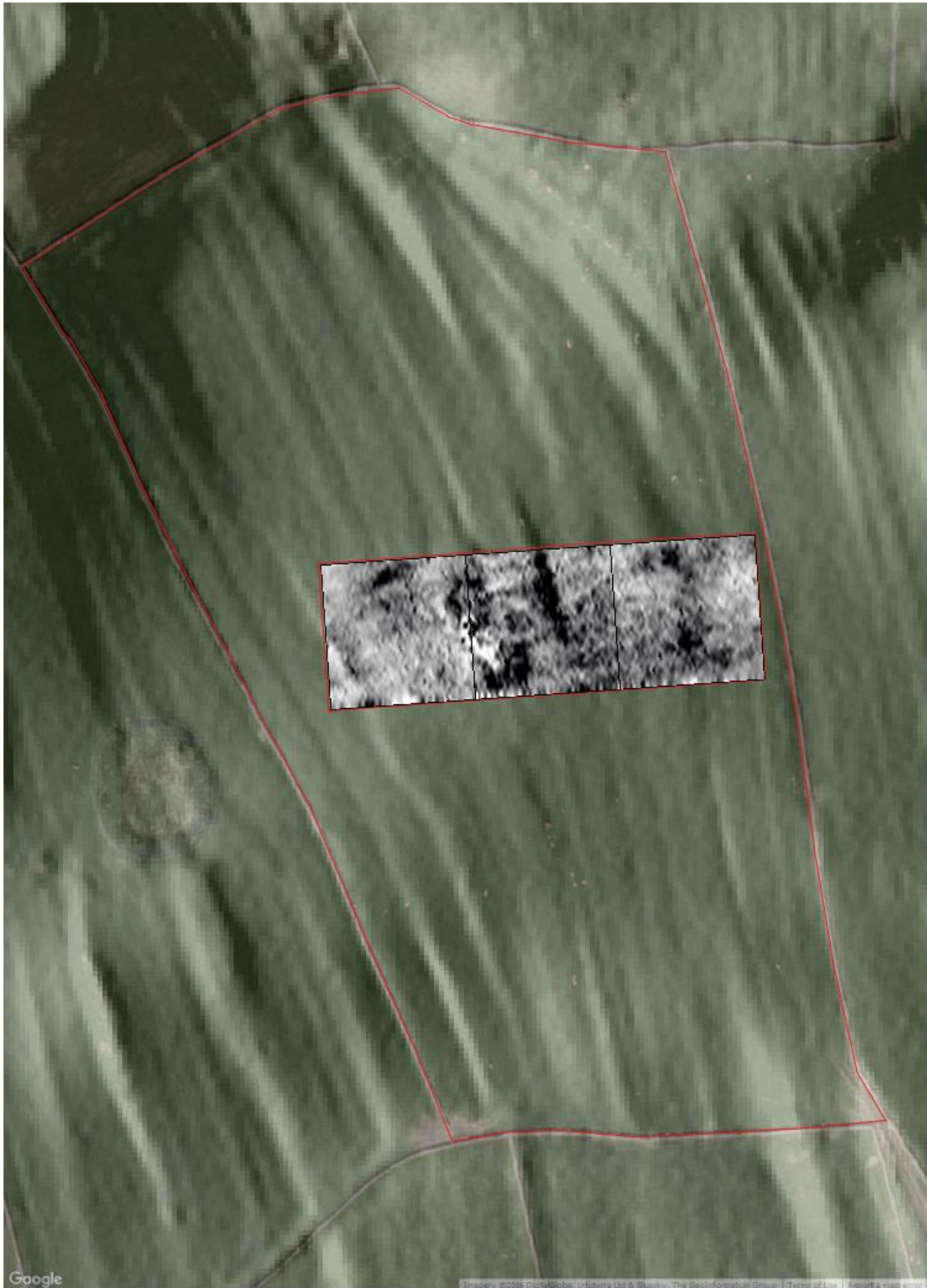


Figure 9: Site 1, Processed Resistance Survey data clipped at $\pm 2SD$ superimposed over LIDAR at 50% transparency over Google Satellite image

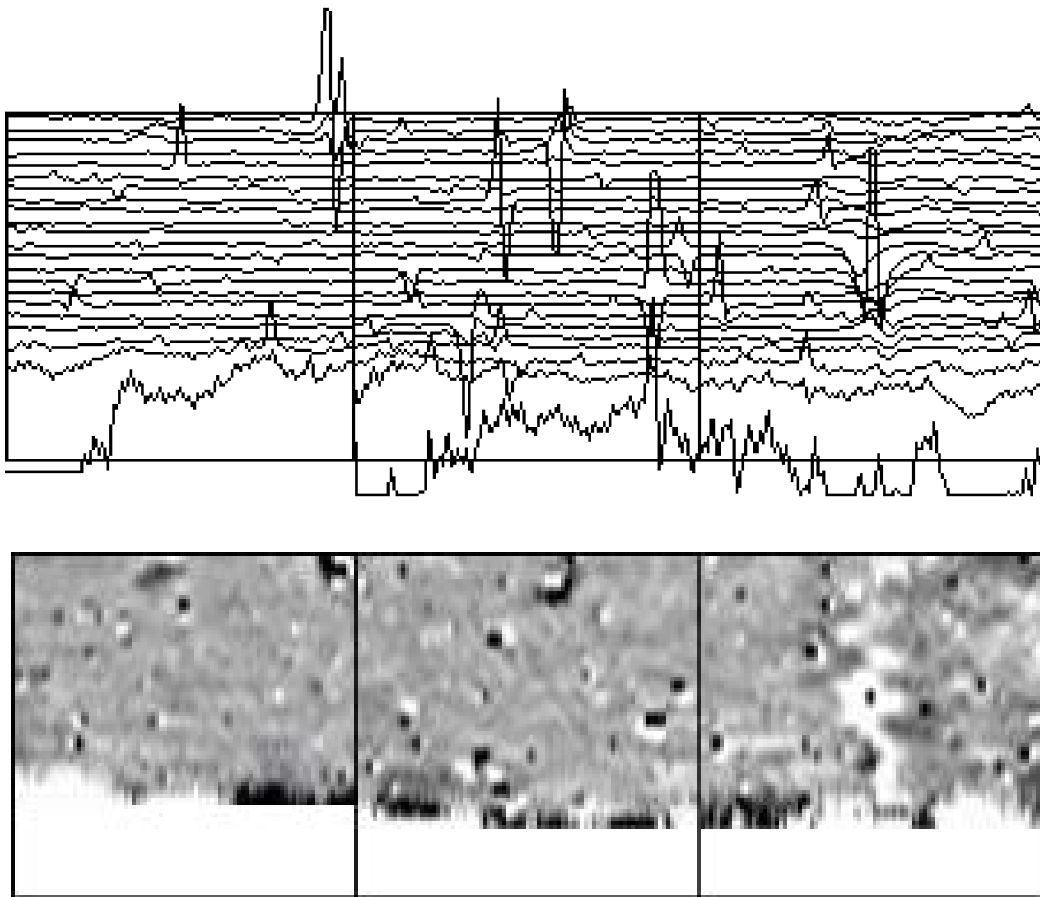


Figure 10: Site 2, Magnetic Survey, Raw Data Trace (top)
Processed Data (bottom) (Range -5nT to -10nT)



Figure 11: Site 2, Magnetic Survey data superimposed over Google Satellite image
(Range -5nT to +10nT)



Figure 12: Site 2, Magnetic Survey data superimposed over LIDAR at 50% transparency over Google Earth image. (Range -5nT to +10nT)



Figure 13: Site 2, Processed Resistance Survey data (Clipped at ± 2 SD)



Figure 14: Site 2, Processed Resistance Survey data superimposed over Google Satellite image. (Clipped at $\pm 2SD$)



Figure 15: Site 2, Processed Resistance Survey data superimposed over LIDAR at 50% transparency over Google Satellite image. (Clipped at $\pm 2SD$)

Site 1



Site 2

