SEGELOCUM ROMAN TOWN, LITTLEBOROUGH NOTTINGHAMSHIRE

Report on geophysical survey conducted in December 2015

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SUMMARY

- Trent & Peak Archaeology was commissioned by Nottinghamshire County Council and Sturton Parish Council, to conduct geophysical surveys and engage in community-based volunteer training on land within the Scheduled Ancient Monument of Segelocum Roman Town, and land adjacent to it, at Littleborough (nr. Sturton le Steeple), Nottinghamshire, centred on NGR SK 82192 82852 at a height of c. 2m OD (Fig. 1).

- The work was carried out between the 7th and 22nd December 2015 in accordance with standard, accepted practices for archaeological geophysical surveys (EH 2008).

- The site is situated on deposits of Mercia Mudstone, with Holme Pierrepont sand and gravel superficial deposits.

- The site was composed of 7 discrete areas immediately adjacent to Littleborough Road, Littleborough, Nottinghamshire.

- Ground conditions for the survey were generally satisfactory. The land was largely under arable cultivation during the survey, some areas to the south of the modern road were used as paddocks for horses.

- Geophysical survey demonstrated the presence of potential buried archaeological features, these comprised:

    - Probable archaeological features relating to settlement activity along the line of the Roman road (Areas B, C, D, & F).
    - Probable archaeological features relating to settlement activity within the core of the Roman town of Segelocum (Area E).
    - The line of the Roman road from Lincoln to Doncaster (Area D).
    - Possible remains of ditched field-boundaries or drainage systems (Areas A, & G).

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The Project Manager for the work undertaken was Paul Johnson. The Project advisor was Lee Elliott. The Project Team comprised Tom Hooley, and Povilas Cepauskas.

1. INTRODUCTION

1.1. Trent & Peak Archaeology was commissioned by Nottinghamshire County Council and Sturton Parish Council to conduct geophysical surveys and engage in community-based volunteer training on land within, and adjacent to, the Scheduled Ancient Monument of Segelocum Roman Town (324920) at Littleborough (nr. Sturton le Steeple), Nottinghamshire, NGR SK 82192 82852 at a height of c. 2m OD (Fig. 1).

1.2. The fieldwork was conducted in December 2015 on approximately 4 hectares of land within the area of the Scheduled Ancient Monument (SAM), to the north of Littleborough Road. Further survey was carried out on c. 11 hectares of land to the west of the SAM. along the western bank of Mother Drain, on both the northern and southern sides of Littleborough Road.

1.3. The site is located on deposits of Mercia Mudstone; Sedimentary Bedrock formed approximately 200–251 million years ago in the Triassic period. Superficial deposits of the Holme Pierrepont Sand and Gravel Member are recorded overlying the bedrock (British Geological Survey).

1.4. Topographically the site lays immediately adjacent to Littleborough Road (approximately running on the line of the Roman road from Lincoln to Doncaster), and to the west of the River Trent. The Mother Drain (water channel) running north–south, bisects the site, which is currently in agricultural use. The site is bounded by agricultural fencing and comprised of land currently used for largely arable cultivation, with some small paddocks along the southern side of the modern road. The site displays little topographical variation.

1.5. The presence of remains of a Roman settlement are indicated within the survey area and are in part a designated Scheduled Ancient Monument (324920).

2. PROJECT BACKGROUND

2.1. Potential Remains

2.1.1. The archaeological potential of the site is considered to be extremely high as a result of its proximity to known heritage assets.

- *Prehistoric*
  No prehistoric features are known within the survey area.

- *Roman*
  The site of the Roman Small Town of Segelocum was first identified in the early 18th century, when foundations and pavements were seen in the river bank. Investigations have found it impossible to define the limits of the settlement or to say whether it had defences or military occupation, but parts of timber buildings dating from the 1st century A.D. have been found. Two kilns, possibly for corn drying, were also excavated, and a small domed oven was also found together with building debris, coins and pottery of the late 1st to later 4th centuries (Wade & Ford 1973).

  Aerial photography suggested that the site extended northwestwards from the present-day settlement of Littleborough over an area of approximately 400m by 300m, between the River Trent and the Mother Drain however, the limits of the settlement were not clear and no remains are visible from ground level. A short stretch of probable Roman road is recorded immediately to the south of the settlement, but no direct relationship was visible.

  The Roman town of Segelocum is a Scheduled Ancient Monument (324920).

  Evidence of Romano-British field systems, or ditched enclosure complexes, had been discovered in the fields to the north of the Scheduled Ancient Monument (Elliott 2004). Of these, the closest to the SAM exhibited excavated evidence suggesting occupation and activity from the late-2nd until the 4th century A.D. (Elliott 2004: 25–29).

- *Mediaeval*
  Littleborough is recorded within Domesday, and the 11th century Church of St. Nicholas (Grade I listed, LB 1216860) is located within the village.

- *Post-Mediaeval*
  No known post-mediaeval remains are located within the survey area, although a number of buildings within Littleborough date to this period

2.2. Proposed Fieldwork

2.2.1. In order to evaluate the potential archaeological remains in this area, the following geophysical fieldwork investigation was proposed:

- Geomagnetic survey inside the Scheduled area at standard (0.5m x 0.25m) sampling density for archaeological characterisation across an area totalling c. 4 ha.
- Geomagnetic survey outside the Scheduled area at standard (1m x 0.25m) sampling density for archaeological evaluation across an area totalling c. 11 ha.
- Earth-resistance survey outside the Scheduled area at standard (1m x 1m) sampling density for archaeological evaluation across an area totalling c. 1ha.

3. OBJECTIVES

3.1 The principal objective of this phase of geophysical investigation at Segelocum is to assess the extent and nature of surviving archaeological remains both within and beyond the area of the Scheduled Ancient Monument, which will inform subsequent stages of this project in addition to further research and heritage management strategies for the site.

3.2 The archaeological work undertaken through this project aims to provide information that will enable the remains to be placed within their local, regional, and national context, and for their significance to be assessed.

4. METHODOLOGY

4.1. Geophysical Survey: Geomagnetic

4.1.1. The decision to use magnetic gradiometry to survey the site was based on its efficiency as a survey technique suitable for detecting the buried remains of a range of materials resulting from differences in their magnetic characteristics as compared to the geological background of the area (Gaffney et al. 1991, 6; 2003).

4.1.2. The results of this method are, however, severely restricted in areas of modern disturbance and by the presence of ferrous material (Scollar et al. 1990, 362ff). Because of the presence of metal fencing within the field boundaries, these features were given a wide-berth with an average distance of 3m being allowed to limit their effect on the archaeological data. Although a number of alternative geophysical survey techniques could be applied to the site (Appendix B), magnetometry represented the best compromise between speed and quality of data retrieval for an initial investigation.

4.1.3. The magnetometer survey was undertaken, within the guidelines advocated by English Heritage (David et al. 2008), by a two-person team using a Bartington Instruments Grad 601-2 fluxgate gradiometer. This equipment allowed the survey to be conducted rapidly as the area was relatively free of obstructions. Within the area of the Scheduled Ancient Monument, readings were taken at 0.25m intervals along traverses of 0.5m spacing, walking east. Beyond the SAM, readings were taken at 0.25m intervals along traverses of 1m spacing walking east. This enabled a sufficiently high density of data for the purposes of archaeological characterisation to be collected in the Scheduled area, and for archaeological evaluation to be collected across the remainder of the site in the relatively short time allotted for the survey to be completed.

4.1.4. The geophysical survey grids of 30m by 30m were set out using a Leica GS15 GPS with SmartNet, in the Ordnance Survey National Grid coordinate system. The use of a north-south orientation for the survey grids was employed in the expectation that any surviving remains would be intersected by the survey traverses at an angle of approximately 30°.

4.1.5. The geophysical survey data were processed in Geoplot 3.0 software to remove any environmental disturbances or variations produced in the course of the survey. Firstly, data were manipulated to remove any distorting 'spikes' from the survey results. A high-pass filter was then also used to reduce the effect of geological anomalies in the data-set. Low-pass filtering was then used to improve the resolution of larger archaeologically derived anomalies. Finally, the data were interpolated to produce uniform data-densities equivalent to 0.25m x 0.25m.

4.1.6. The results were exported as greyscale, raster images and inserted into the AutoCAD plan of the site, generated from Ordnance Survey data, for georeferencing and production of a descriptive, vector overlay. The anomalies presented here were identified visually and manually digitised to produce the vectorised plans which are discussed in the results section of this report. The final print-versions of these plans were elaborated and prepared for printing in Adobe Illustrator CS6.

4.2. Geophysical Survey: Earth-resistance

4.2.1. The decision to use earth-resistance survey on the site was based on its ability to provide relatively precise detail about buried structures and to indicate the presence of both stratigraphically positive and negative sub-soil features without the interference often present in magnetic data as a result of modern disturbance and the presence of ferrous material close to the ground surface (Geoscan Research 1996; Scollar et al. 1990, 362ff).

4.2.2. The results of this method are, however, severely restricted by environmental conditions such as the retention of moisture within the soil (Clark 1990, 27). Details of this survey technique are provided (Appendix B), although other techniques such as magnetometry or GPR could have been applied to the site. Earth-resistance survey represented the best compromise between speed and quality of data retrieval for an investigation of possible structures extending beyond the excavated areas. These had not been recognised in previous geomagnetic survey and so it was desirable to apply a technique measuring different physical properties in order to recover these features.

4.2.3. The earth-resistance survey was undertaken, within the guidelines advocated by English Heritage (David et al. 2008), by a two-person team using a Geoscan Research RM15 Resistance meter and MPX15 multiplexer module in parallel twin-probe configuration. This equipment allowed the survey to be conducted relatively rapidly as the area was free of obstructions. Readings were taken at 1 m intervals along traverses of 1m spacing walking west. This enabled a sufficiently high density of data for the purposes of archaeological evaluation to be collected across the site in the relatively short time allotted for the survey to be completed.

4.2.4. The geophysical survey grids of 30m by 30m were set out using a Leica GS15 RTK GPS system with SmartNet, in the Ordnance Survey National Grid coordinate system. Since the predominant alignments of the expected archaeological remains were known, a north–south orientation for the survey grids was employed as this was able to ensure that any surviving remains would be intersected by the survey traverses at an angle of approximately 30°.

4.2.5. The geophysical survey data were processed in Geoplot 3.0 software to remove any environmental disturbances or variations produced in the course of the survey. Firstly, data were manipulated to remove any distorting 'spikes' from the survey results and to normalise data from the two parallel arrays. A high-pass filter was then also used to reduce the effect of geological anomalies in the data-set. Low-pass filtering was then used to improve the resolution of larger archaeologically derived anomalies.

4.2.6. The results were exported as greyscale, raster images and inserted into the AutoCAD plan of the site, generated from Ordnance Survey data, for georeferencing and production of a descriptive, vector overlay. The anomalies presented here were identified visually and manually digitised to produce the vectorised plans which are discussed in the results section of this report. The final print-versions of these plans were elaborated and prepared for printing in Adobe Illustrator CS6.

Ground Conditions

4.3.1. Ground conditions for the survey were satisfactory. The site is used as a mixture of arable land and pasture.

5. RESULTS
(Figures 2-5)

5.1. Geomagnetic Survey
5.1.1. Within the area surveyed, the site exhibited a generally good response to the geomagnetic survey. Geophysical anomalies can be observed across the whole area surveyed, and buried features can be clearly discerned against the geological background. There is relatively little noise in the dataset, with the main concentration in Area A, where fewest archaeologically derived anomalies are observed. The overall magnetic response is good, although spikes within the dataset extend the range of unfiltered values to $^{+}/_{-}$ 100nT the standard deviation of the raw-data typically remained within c. 10 nT of the mean. Any cut features are likely to show against this background as areas of positive magnetism. Positively magnetic anomalies are likely to result from the presence of settlement activity and deposition of thermo-remanent, or depositionally-remanent magnetised material within stratigraphically-negative features.

5.1.2. The results are presented below as greyscale images of the processed data (Fig's. 2 & 3), and complementary numbered interpretative plans to which the following description relates (Fig's. 4 & 5). This description is organised broadly from northwest to southeast. Unprocessed survey data are also presented below (Fig's. 10 & 11). These data are unfiltered and hence show striping resulting from slight but consistent imbalances between the two sensors used for the survey.

Area A:
5.1.3. The survey exhibited a degree of magnetic disturbance from modern services, this was largely constrained to a band of dipolar responses [1], [2], and [3], extending for approximately 22m from the southern edge of this survey area, and probably resulting from buried services running broadly southeast–northwest across the southern part of the site. The c. 713m^2 dipolar macula [4], situated to the north of [4], also represents some form of modern disturbance. The southern part of Area A appears to be defined by a c. 157m by 24m, "L-shaped", rectilinear, positively-magnetic anomaly [5], orientated east-northeast–west-southwest. Approximately 9m to the south of this feature, located approximately centrally along its longest extent, is a 3.5m-diameter, positively-magnetic macula [6].

5.1.4. Approximately 28m to the north of the large, rectilinear anomaly [5], is a c. 42m-long, linear, positively-magnetic anomaly [7], aligned broadly east–west. The alignment of this feature is continued c. 4.5m to the east by a 35m-long, linear, positively-magnetic anomaly [8]. The alignment of the two previously discussed anomalies is paralleled c. 28m to the north by a 165m-long, positively-magnetic, linear anomaly [9]. The eastern edge of Area A is characterised by the presence of an approximately cruciform group of five, positively-magnetic maculae [10]. Approximately 15m to the north of this group is a single positively-magnetic, 4.5m-diameter macula [11]. Approximately 6m to the north of this feature is a c. 14.5m-long, positively-magnetic anomaly [12], running northeast–southwest.

Area B:
5.1.5. A single significant dipolar maculae [13], resulting from modern disturbance, appears within Area B. The southern part of this area is characterised by two parallel, linear, positively-magnetic anomalies [14], and [15], running north–south for at least 53m from the northern to southern edges of the survey area. A 22m^2 positively-magnetic macula [16], is located adjacent to the northern end of [14], to the west of the point where it meets the northern edge of the survey area. Approximately mid-way along [15], and immediately to its western side, is a c. 9m by 4m, "d-shaped", positively-magnetic anomaly [17], aligned broadly northwest–southeast. A linear, c. 30m-long, positively-magnetic anomaly [18], runs northeast–southwest from the northern end of [15] to the southern edge of the survey area. The southern end of this previous feature appears to intersect with a positively-magnetic, linear anomaly [19], running west-northwest–east-southeast for

approximately 15m between the western and southern edges of the survey area. Approximately 12m to the northeast of this feature is a parallel, positively-magnetic anomaly [20], running for approximately 24m between an apparent intersection with [18] and the western edge of the survey area. Approximately 16m to the northeast of this feature is another parallel, positively-magnetic anomaly [21], running for approximately 39m between an apparent intersection with the northern end of [18] and the western edge of the survey area. The area defined by [20], [18], and [21] contains a number of large anomalies. A c. 9m by 10m "n-shaped", positively-magnetic anomaly [22], located adjacent to [18] appears to be constrained by all three of the previously discussed linear anomalies. Approximately 2.5m to the northwest of this feature is an amorphous positively-magnetic anomaly [23], covering approximately 66.5m^2. Immediately to the northwest of this feature is a 5m by 4m, "T-shaped", negatively-magnetic anomaly [24]. Immediately to the north of the dipolar macula [13], is a c. 30m-long, linear, positively-magnetic anomaly [25], broadly parallel to [21], displaying a diffusion of signal to its southern end.

Area C:

5.1.6. Area C is located immediately adjacent to the western edge of Area B and the predominant alignments of the anomalies within this area are broadly consistent with those of the previously discussed area, though the geophysical responses are less clear. The eastern edge of the survey area is defined by a series of three amorphous positively-magnetic maculae [26], [27], and [28] which define a c. 10m-wide band of positively-magnetic response running for 22.5m, broadly parallel to anomaly [18] in Area B, from the northeastern corner of the survey. Approximately 13m to the southeast of [28] is a broadly linear, 11.5m-long, positively-magnetic anomaly [29], orientated parallel to the previously discussed features. Approximately 1.5m to the southwest of this feature, is a 9.5m by 5.5m, distorted "T-shaped", positively-magnetic anomaly [30], aligned to both [29] and [20] in Area B. Approximately 11m to the southwest of [30], is a positively-magnetic macula [31], which appears to continue the alignment suggested by [29], and [30]. Approximately 16m further to the southwest is a c. 17m-long, positively-magnetic, linear anomaly [32], orientated north-northeast–south-southwest, intersecting the southern edge of the survey area. Approximately 3m to the west of this feature is an irregular, c. 16m-long, positively-magnetic anomaly [33] on a broadly parallel alignment to the previously discussed anomaly. Approximately 3m to the northeast of this feature is a c. 9.5m-long, linear, positively-magnetic anomaly [34], which appears to be aligned to [32]. Approximately 3.5m to the northeast of this feature is an irregular, "L-shaped", positively-magnetic anomaly [35], consistent with the predominant orientation within this area of survey, and measuring 7.5m by 9.5m. The central part of Area C is characterised by a group of three parallel, irregular, linear, c. 16m-long, positively-magnetic anomalies [36], [37], and [38]. Of these, [36] appears to continue an alignment established by [20], [30], and [35]. Anomaly [38] appears to continue the alignment of [21], and [28], with [37] located between [36] and [38], consistent with [22], [23], and [24]. Approximately 3m to the northwest of anomalies [36]–[38] is a c. 72m-long, linear alignment, orientated northeast–southwest, described by a series of four positively-magnetic anomalies [39], [40], [41], and [42]. Approximately 12m to the northwest of [42], and aligned parallel to it, is a c. 9.5m-long, linear, positively-magnetic anomaly [43]. Approximately 5m to the north of this feature is a c. 6m-long, positively-magnetic, linear anomaly [44], orientated northwest–southeast and aligned with [41], [36], [35, and [30]. Approximately 23.5m to the northeast of [43] is a c. 27m-long, linear, positively-magnetic anomaly [45], on the same alignment. Approximately 22m to the west of this feature is a c. 78m^2 area of positively-magnetic response [46], broadly consistent with [40], and [37], appearing to respect the same alignment as those anomalies. Approximately 8m to the northeast of this feature is a 24.5m-long, linear, positively-magnetic anomaly [47], running northwest–southeast and appearing to respect the alignment of [38], and [21].

Area D:

5.1.7. The westernmost area surveyed exhibits a dense concentration of geomagnetic anomalies. These are described broadly from west to east in a sequence in order to maximise the legibility of the anomalies. Adjacent to the western edge of the survey area

is a c. 20m-long, linear, positively-magnetic anomaly [48], running broadly northwest–southeast. This feature defines the predominant orientation of anomalies within this area and is continued intermittently to the southeast for a total of c. 221m by a series of positively-magnetic anomalies. The first of these, [49], 9m from [48], is a 25.5m-long, linear anomaly. Approximately 3m beyond this is a 6m-long, linear anomaly [50]. At a distance of 11.5m from this feature is the 41m-long, linear anomaly [51]. The 5.5m-long, linear anomaly [52], is located c. 6m beyond this feature. Approximately 32.5m further to the southeast is the 7m by 2.5m, "L-shaped" anomaly [53]. Approximately 11.5m to the southeast of this feature is the c. 73m-long linear anomaly [54], which represents the last visible sign of the alignment thus described. Approximately 5.5m to the northeast of [50], and running parallel to the previously described alignment is a c. 18.5m-long, linear, positively-magnetic anomaly [55]. The alignment defined by this feature is clearly continued c. 4m to the southeast by the 13.5m-long, linear, positively-magnetic anomaly [56]. A further 7m beyond that feature is a 16m-long, linear, positively-magnetic anomaly [57], and 21m beyond that, the final anomaly in the sequence is a c. 30.5m-long, linear, positively-magnetic anomaly [58]. Approximately 24m to the southeast, parallel to [58] but offset approximately 4m to the northeast from its alignment, is a c. 34m-long, linear, positively-magnetic anomaly [59]. This anomaly also parallels [54], being offset c. 8m to the northeast of that feature. Approximately 3.5m from the southeastern end of [59], and continuing its alignment, is a c. 7m-long, linear, positively-magnetic anomaly [60]. Approximately 34m beyond this feature is a 26m-long, linear, positively-magnetic anomaly [61].

5.1.8. Adjacent to the western edge of the survey area, to the south of the alignment discussed in Section 5.1.7, is an 18.6m-long, linear, pair of positively magnetic anomalies [62], parallel to [48]. Approximately 1.5m to the southeast of this feature, and on the same alignment, is a c. 30.5m by 7m rectilinear, positively magnetic anomaly [63], intersecting the southern edge of the survey area, and exhibiting a "hooked" re-entrant to its southeast extent. The alignment of the southern re-entrant of the previously discussed feature is picked up by a cluster of c. 11.5m-long, quasi-linear, positively-magnetic anomalies [64], orientated northeast–southwest. Approximately 3m to the southeast of this feature is a 33m by 24m, "L-shaped", positively-magnetic anomaly [65] orientated parallel to the predominant alignment in this survey area. Within the northern corner of the previously discussed feature is a cluster of positively-magnetic, negatively-magnetic, and dipolar maculae [66]. Immediately to the southeast of these anomalies is a c. 6m-long, positively-magnetic anomaly [67], running perpendicular to the predominant alignment. Approximately 7m to the southwest of the eastern extent of [65], is a 29.5m by 11m "T-shaped" group of linear, positively-magnetic anomalies [68]. Approximately 2.5m to the southeast of [65], and aligned to that feature, is a 6m-long, linear, positively-magnetic anomaly [69], parallel to the predominant alignment of anomalies in the survey area. Approximately 1m to the south of this feature is a 11.5m by 13.5m, "L-shaped", positively-magnetic anomaly [70], also following the orientation of the predominant alignment within the survey area. The c. 95m^2 area defined by this feature is occupied by a cluster of strongly dipolar maculae [71]. Approximately 7.5m to the southwest of the southern end of [70], is a squat, 6.5m-long, linear, positively-magnetic anomaly [72], orientated southwest–northeast. Approximately 6m to the south of this feature is a "distorted-T-shaped", 29m by 11m, positively-magnetic anomaly [73], orientated parallel to [72]/perpendicular to the predominant alignment in the survey area. Approximately 3.5m to the south of the previously discussed feature is a 6m by 5.5m, "U-shaped", positively-magnetic anomaly [74]. Approximately 6.5m to the north of this feature is a 9m by 5m, "L-shaped", alignment, defined by positively-magnetic anomalies [75]. The alignment of [70] appears to be continued c. 7m to the southeast by a 15m-long, linear, positively-magnetic anomaly [76]. Approximately 6m to the northeast of this feature is a 6m by 5.5m, "L-shaped", positively-magnetic anomaly [77]. This feature is paralleled c. 5.5m to its east by a pair of positively-magnetic maculae [78].

5.1.9. At the approximate mid-point of the southern side of the survey is a c. 23m by 40m rectilinear, "L-shaped", positively-magnetic feature, orientated parallel and perpendicular

to the predominant alignment in Area D, defined by four anomalies [79], [80], [81], and [82]. Within the area defined by these anomalies, parallel to, and approximately 12m to the southeast of [79] and [80], is a 14m-long, linear, positively-magnetic anomaly [83]. Approximately 10m to the northeast of this feature, is a c. 6m-long, linear, positively-magnetic anomaly [84], aligned with [83] and orientated northwest–southeast. This alignment is continued to the northwest, after a 2m gap, by a 2.5m-long, linear, positively-magnetic anomaly [85]. Within the area defined by the northern terminus of [83], and the pair of anomalies [84 and [85], is a cluster of small (c. 1.5m–2m-diameter) positively-magnetic maculae [86]. Approximately 9m to the southeast of [84] is a c. 50m by 15m, broadly "L-shaped", positively-magnetic anomaly [87], 4m to the southwest of, and parallel to, the alignment defined by [54]. This feature exhibits a complexity at the point where it turns through 90°, seeming to define an interior space of c. 4m by 4m, open to the northeast. This feature also seems to be paralleled c. 4m to its southwest, over a distance of c. 27m, by a series of linear, positively-magnetic anomalies [88], [89], and [90]. Approximately 4.5m to the southwest of the western end of [90], is a c. 9m-long, linear, positively-magnetic anomaly [91], running perpendicular to that feature and the predominant alignment within the survey area. This feature is paralleled approximately 10m to the southeast by a c. 8m-long, linear, positively-magnetic anomaly [92]. Approximately 3.5m to the southeast of [87], on the same alignment, is a c. 41m-long, broadly linear, positively-magnetic anomaly [94]. This alignment is continued a further 3.5m to the southeast by a c. 17m-long, linear, positively-magnetic anomaly [95]. Approximately 5m to the southeast of this feature, is a c. 8m-long, curvilinear, positively-magnetic anomaly [96], orientated northeast–southwest. Approximately 2.5m to the southwest of this feature is a 9m by 11m, "T-shaped", positively-magnetic anomaly [97]. Approximately 3m to the northeast of this feature is a c. 15m-long, curvilinear, positively-magnetic anomaly [98]. Approximately 10m to the southeast of the "tail" of [97], and appearing to pick up its alignment, is an irregular positively-magnetic macula [99], which is situated adjacent to the edge of the survey area.

5.1.10. To the north of the predominant alignment discussed in Section 5.1.7 is an equally dense distribution of geomagnetic anomalies. The northwestern corner of the survey area is characterised by a substantial, 15m by 8m, "L-shaped", positively-magnetic anomaly [100], perpendicular to the predominant alignment of features within the survey area. Approximately 1m to the southwest of this feature, is an "L-shaped", 12.5m by 18m, positively-magnetic anomaly [101], on the same alignment as the previously discussed feature. The alignment of this feature, parallel to the predominant alignment in the survey area, is picked up approximately 6m to the southeast by a c. 26m-long, linear, positively-magnetic anomaly [102]. Parallel to this feature, and approximately 1.5m to the east of [100], is a broadly-linear, c. 21m-long, positively-magnetic anomaly [103]. Approximately 4.5m to the southeast of the southern end of this feature is a c. 18m-long, curvilinear, positively-magnetic anomaly [104], running parallel to the predominant alignment of the area surveyed. Within the area defined by [101], [102], [103], and [104], is a c. 19m^2, positively-magnetic macula [105]. Approximately 8m to the northeast of [104] is a c. 10m-long, linear, positively-magnetic anomaly [106], running parallel to [103] and offset c. 3.5m to its northeast. Within the area defined by [104] and [106], is a group of five, positively-magnetic, 2m–5m-diameter, maculae [107]. Approximately 1.5m to the southeast of [102] and on the same alignment as that feature, is a c. 8m-long, linear, positively-magnetic anomaly [108]. Immediately to the east of this feature is a c. 50m-long, rectilinear, positively-magnetic anomaly [109], orientated northeast–southwest, which demonstrates two projections, of 6.5m and 11.5m, to the northwest. At the southern end of this feature, is a c. 30.5m-long, positively-magnetic, linear anomaly (with a short interruption approximately 5.5m from its southern end) [110], running parallel to the predominant alignment within the survey area. Adjacent to the southern end of this feature is a "T-shaped", positively-magnetic anomaly [111], orientated perpendicular to the predominant alignment in the area, and measuring 38.5m by 6m. Approximately 6m to the north of the projecting leg of [111], and to the northeast of the feature, is a 24.5m-long, linear, positively-magnetic anomaly [112], running parallel to the predominant alignment in the survey area. Approximately 1.5m to the north of this feature is a c. 16m by 24m, "T-

shaped", positively-magnetic anomaly [113], orientated perpendicular to the predominant alignment within the survey area. Adjacent to the southern end of this feature, and seemingly associated with it, is a 10.5m by 5m, "L-shaped", positively-magnetic anomaly [114]. Within the area defined by [109], [110], [111], and [112], is a penannular, positively-magnetic anomaly [115], with a diameter of approximately 13m. Also within this area is a c. 20m^2 positively-magnetic macula [116]. Approximately 2.5m to the east of [111], and appearing to be aligned with that anomaly, is a c. 29m by 17m, "irregular T-shaped", rectilinear, positively-magnetic anomaly [117]. Within the area defined by [111] and [117], is an elongated 34m^2 positively-magnetic macula [118]. In the southern part of the area defined by [111] and [117] is a "hook-shaped", c. 7m by 9m, curvilinear, positively-magnetic anomaly [119]. To the north of the near-junction of [111] and [117] is a pair of c. 3m-diameter, positively-magnetic maculae [120]. Approximately 5.5m to the southeast of [57], and 8m to the south of [117], is a c. 40m-long, linear, positively-magnetic anomaly [121], running parallel to the predominant alignment in the survey area. Approximately 9m to the northeast of the midpoint of this feature is a c. 22.5m-long, linear, positively-magnetic anomaly [122], running perpendicular to the predominant alignment. Approximately 9.5m to the northwest of this feature, and running parallel to it, is a c. 8.5m-long, positively-magnetic, linear anomaly [123]. Consistent with the alignment of this feature, and approximately 5m to the south of it, is a c. 9m by 4m, "L-shaped", positively-magnetic anomaly [124]. Approximately 2m to the south of this feature, is a 9.5m by 3.5m, "L-shaped", positively-magnetic anomaly [125], orientated parallel to the predominant alignment in the survey area. Approximately 5m to the north of the eastern end of [125], is a c. 7m-long, positively-magnetic, linear anomaly [126], running north–south. Within the area defined by the three previously discussed anomalies is a pair of c. 1.5m-diameter, negatively-magnetic maculae [127].

5.1.11. East of the previously discussed anomalies are a series of anomalies, also to the north of the central axial alignment predominant in Area D, which appear to deviate slightly from that alignment to something closer to and east–west orientation. Approximately 13m to the east of [122], and almost parallel to it, is a c. 34.5m-long, linear, positively-magnetic anomaly [128] which appears to define the western edge of the group of anomalies deviating from the alignment/orientation respected by the rest of those within this area of the survey. Approximately 6.5m to the south of [128] is a c. 18m-long, linear, positively-magnetic anomaly [129], running almost on the predominant alignment within this area of the survey. Approximately 13m to the east of [128], is a c. 25m-long, slightly curving, linear, positively-magnetic anomaly [130], orientated north–south. Immediately to the east of this feature is a 25.5m^2, positively-magnetic macula, [131]. Immediately to the east of [128], and approximately 6.5m from its southern end, is a c. 6m-long, linear, positively-magnetic anomaly [132], running east-southeast–west-northwest. Approximately 3m to the east of [129], is a "T-shaped", 30.5m by 14m, positively-magnetic anomaly [133], orientated east-southeast–west-southwest, the western end of which appears to be aligned with [130]. Approximately 6m to the east of this feature is a complex rectilinear, positively-magnetic anomaly [134], measuring 14m by 30m and intersecting the northern edge of the survey area. Approximately 3m to the east of the northern end of this feature is a c.21m-long alignment orientated east-southeast–west-northwest, evidenced by two linear, positively magnetic anomalies [135], and [136], measuring 7.5m and 8.5m respectively. Approximately 3m east of the central extension of [134], and aligned with it, is an "L-shaped", 5m by 21.5m, positively-magnetic anomaly [137]. Immediately to the east of [137] is a 114m^2 area of dipolar maculae. Adjacent to the southern end of this zone of dipolar maculae is a pair of positively-magnetic anomalies [139], describing an east–west alignment of c. 10m. Approximately 3m to the east of this alignment is a c. 5.5m-long, linear, positively-magnetic anomaly [140], aligned to the southern edge of [134]. Immediately to the east of this feature is a c. 16m-long, linear, north-northeast–south-southwest orientated, positively-magnetic anomaly [141], intersecting the northern edge of the survey area. Approximately 3m to the east of this feature is a c. 8.5m-diameter, penannular, positively-magnetic anomaly [142], open to the south.

5.1.12. The final area surveyed geomagnetically lies within the Scheduled Ancient Monument of Segelocum Roman Town. Area E, shows evidence of a probable pipeline, in the form of a c. 18m-wide dipolar anomaly [143], running for 120m, broadly east–west across the southern part of the site, 34.5m from the southern edge of the survey area. Two further dipolar maculae, probably representing modern features or materials [144], and [145], are located towards the western extent of the area surveyed. Immediately to the east of [145] is an approximately 322m^2 area characterised by the presence of 1.5m- to 2.5m-diameter, positively-magnetic maculae [146]. Approximately 30m to the south of the northwest corner of the area surveyed is a 17m by 8.5m, "T-shaped", positively-magnetic anomaly [147], orientated roughly east-northeast–west-southwest in compliance with the predominant orientation of anomalies within this survey area. The alignment defined by the southward spur of [147] is continued c. 2.5m from its southern extent by a c. 16.5m-long, linear, positively-magnetic anomaly [148]. Approximately 16m to the east of this feature, and parallel to it, is a c. 3m by 11m, "L-shaped", positively-magnetic anomaly [149]. The area between the two previously discussed anomalies is occupied by three c. 2.5m-diameter, positive maculae [150]. Approximately 14m to the northeast of [147] is a 16m-long, linear, positively-magnetic anomaly [151] orientated parallel to [148]. Approximately 3m to the south of this feature is a c. 36m by 37m, "E-shaped", positively-magnetic, rectilinear anomaly [152]. Approximately 2.5m to the south of this feature is a 19.5m by 26m, "L-shaped", positively-magnetic anomaly [153]. Approximately 13m to the east of this feature, and 2m south of the easternmost extent of [152], is an "L-shaped", positively-magnetic anomaly [154], measuring 56m by 14.5m. Immediately adjacent to the southern extent of this feature is an 11m-long, linear, positively-magnetic anomaly [155], orientated west-southwest–east-northeast. Approximately 5m to the north of this feature are a number of positively-magnetic maculae [156]. Approximately 8m to the north of these features is a group of positively-magnetic, 1m-diameter, maculae [157]. Approximately 2m to the east of [152], is a complex, 69m by 43.5m, rectilinear, positively-magnetic anomaly [158]. The southern extent of the area defined by this feature, appears to be demarcated by a c. 13.5m-long, linear, positively-magnetic anomaly [159], running west-southwest–east-northeast. This feature is paralleled c. 3.5m to its south by a c. 21m-long, linear, positively-magnetic anomaly [160]. Approximately 33.5m to the north of [159] is another positively-magnetic, linear anomaly [161], also parallel to it. Approximately mid-way between these two linear anomalies is a cluster of positively-magnetic maculae [162], which appear to define a roughly square area of 8m by 8m. Approximately 5m northwest of this feature is a 6.5m by 5m, "L-shaped", positively-magnetic anomaly [163]. Approximately 2.5m to the north of [158] is a 38m-long, "hook-shaped", positively-magnetic anomaly [164], on an orientation consistent with the others previously discussed within Area E. Approximately 6m to the east of this feature is an "L-shaped", 17m by 6m, positively-magnetic anomaly [165]. Approximately 1.5m to the south of this feature is a c. 12m-long, linear, positively-magnetic anomaly [166], orientated east-northeast–west-southwest. Approximately 1.5m to the east of this feature is a 21m-long, linear, positively-magnetic anomaly [167], running perpendicular to the previously discussed feature and intersecting the northern edge of the area surveyed. Approximately 4m to the west of this feature, running parallel to it, and also intersecting the northern edge of the survey area is a c. 6.5m-long, linear, positively-magnetic anomaly [168]. Approximately 5.5m to the south of [160], is a 27m by 23m, "L-shaped", positively-magnetic anomaly [169]. Approximately 11m to the south of this feature its alignment is continued by a 7.5m-long, linear, positively-magnetic anomaly [170]. Immediately to the west of the southern end of this feature is a c. 8m-long, linear, positively-magnetic anomaly [171], running perpendicular to the previously discussed anomaly.

5.1.13. The southern part of Area E appears to subdivide into two parts, a northern area which conforms to the orientation and alignments of features elsewhere in the survey area, and a periphery where such alignments are more difficult to discern, and which will be discussed first. Approximately 11m to the south of [170], is a group of three parallel, c. 22m-long, negatively-magnetic, linear anomalies [172], running broadly northeast–southwest. Immediately to the east of these features is a c. 35m-long, linear, positively-magnetic anomaly [173], running broadly on the alignment of [158]. To the south of the

large band of dipolar response [143], is a "blocky, L-shaped", 6m by 5.5m, positively-magnetic anomaly [174]. Approximately 10m to the south of this feature is a c. 15m-long alignment defined by two positively-magnetic anomalies [175]. Within this area, an arc of approximately 10m-diameter is defined by five positively-magnetic maculae [176]. Immediately to the east of [174] is a c. 10.5m-long, linear, positively-magnetic anomaly [177], aligned to [173]. Immediately to the south of this feature, and continuing its alignment, is a c. 10.5m-long, linear, positively-magnetic anomaly [178]. Approximately 4m from the southern end of [178] is a pair of positively-magnetic anomalies [179], defining a "U-shaped" feature 9m by 4.5m and open to the north. Immediately to the north of the eastern arm of the previously discussed feature is a 10.5m by 6m, "T-shaped" cluster of four, positively-magnetic maculae [180]. Immediately to the east of this feature is a c. 10m-long, linear, positively-magnetic anomaly [181], running east-northeast–west-southwest. Approximately 2m to the east of this feature is a c. 8m-long, linear, positively-magnetic anomaly [182], running north–south. Approximately 1.5m to the south of this feature is a c. 22.5m-long, curvilinear, positively-magnetic anomaly [183], which appears to form a part of an arc, open to the south, with a diameter of approximately 13m. The alignment of the western extent of this arcing feature appears to be picked up by a series of three c.1m-diameter, positively-magnetic maculae [184]. Within the area defined by the arc of [183] is a cluster of three, c. 2m–3.5m-diameter, positively-magnetic maculae [185]. Immediately to the east of [183] is a 23m-long, "club-shaped", positively-magnetic anomaly [186], orientated northeast–southwest. Immediately to the east of the northeastern end of this feature is a pair of 2.5m-diameter, positively-magnetic maculae [187].

5.1.14. Approximately 2m to the east of [173], running parallel to that feature, is a 23m-long, linear, positively-magnetic anomaly [188]. Immediately adjacent to the southern end of the previously discussed feature is a 6.5m-diameter, dipolar macula [189]. Approximately 5m to the south of this feature is a 5m by 3m, "L-shaped", positively-magnetic anomaly [190], which appears to continue the alignment of [188]. Approximately 15m to the east of the mid-point of [188] is an 8.5m by 8m, "L-shaped", positively-magnetic anomaly [191]. Approximately 15m to the south of this feature is a 5m by 4.5m, "L-shaped", positively-magnetic anomaly [192]. Approximately 3.5m to the south of this feature is a 12.5m by 5.5m, "inverted F-shaped", positively-magnetic anomaly [193], which appears to be associated with the previously discussed anomaly. Approximately 7.5m to the north of this feature is a 9m-diameter, "sickle-shaped", positively-magnetic anomaly [194], open to the north. Immediately to the north of this feature, and appearing to continue the alignment of its eastern end, is a 10m by 5.5m, irregular "F-shaped", positively-magnetic anomaly [195]. Immediately to the east of this feature is a 12.5m-long, linear, positively-magnetic anomaly [196]. Immediately to the east of the southern end of this feature is a squat, 7.5m by 5m, "L-shaped", positively-magnetic anomaly [197], orientated north–south. Approximately 9m to the south of this feature is a 19m^2, positively-magnetic macula [198]. The most extensive single feature in the southern part of Area E is represented by a complex rectilinear, positively-magnetic anomaly [199], measuring 63m by 60m at its greatest extents. The southernmost area defined by [199] appears to also be constrained by a series of positively-magnetic maculae [200], describing a roughly rectangular area of 13m by 15.5m. The region to the east of this contains two positively-magnetic maculae [201], of 3m and 2m-diameter, located axially with the centre of the short side defined by [199]. Approximately 9m to the southeast of [199] is a pair of 3m-diameter, positively-magnetic maculae [202], parallel to the previously discussed anomalies [201]. A further c. 3m-diameter, positively-magnetic macula [203] is located centrally within the roughly rectangular area defined by [199] to the north of that containing [201]. The northernmost rectangular area defined by [199], contains a c. 7.5m-diameter dipolar macula [204], surrounded by a series of possible positively-magnetic maculae. Approximately 4m to the east of [199], is a c. 14m-long, linear, positively-magnetic anomaly [205]. Approximately 10m to the north of [199] is a c. 73m-long, linear, positively-magnetic anomaly [206], running east-northeast–west-southwest.

5.1.15. The central part of Area E, is transected by a c. 180m-long, negatively-magnetic, curvilinear anomaly [207], running northwest–southeast. This region within the survey

area is largely defined by a 210m-long, rectilinear, positively-magnetic anomaly [208]. The western end of this anomaly appears to have its alignment picked up, after a 2.5m interruption, by a 10.5m-long, linear, positively-magnetic anomaly [209]. This is in turn continued after a 3m interruption by a c. 11m by 80m, "L-shaped", positively-magnetic anomaly [210]. The area defined by the previously discussed anomalies ([208]–[210]), appears to be bisected along its long-axis by the 26m-long, linear, positively-magnetic anomaly [211], and 31m-long positively-magnetic anomaly [212]. These last two anomalies are separated by a 76m^2 area of dipolar maculae [213]. Approximately 4m to the north of the western end of [211], is an arc of approximately 12m length, defined by three, 2m-diameter, positively-magnetic maculae [214]. Approximately 3.5m to the south of the western end of [211] is a similar, 17m-long, arc of positively-magnetic maculae [215]. Approximately 20m to the east of this feature is a group of three, 2m–3.5m-diameter, positively-magnetic maculae [216], describing a shallow, 12m-long arc. Approximately 16m to the east of this feature is a pair of 2m- and 4m-diameter, positively-magnetic maculae [217]. Approximately 14.5m to the north of [211], and orientated parallel to it, is an elongated "L-shaped", positively-magnetic anomaly [218], measuring 58m by 7m. approximately 22m to the north of this feature is a 50m by 25m, inverted "F-shaped", positively-magnetic anomaly [219]. Approximately 3m to the south of the northeastern extent of this feature, and perpendicular to its long-axis, is a 17m-long, linear, positively-magnetic anomaly [220]. Within the "F" of [219], is a c. 11m-long, linear, positively-magnetic anomaly [221], running parallel to [220]. Approximately 5.5m to the north of [219] is a 51m by 14m, "L-shaped", positively-magnetic anomaly [222]. The alignment of the northern leg of this feature is continued after a 2m interruption by a 9m-long, linear, positively-magnetic anomaly [223]. Approximately 4m to the northeast of this feature, and respecting its northern extent, is a 58m by 19m, "F-shaped", positively-magnetic anomaly [224]. Approximately 24.5m to the north of this feature is a 26m-long, linear, positively-magnetic anomaly [225], running parallel to the long axis of [224], which intersects the northern edge of the survey area. Approximately 18m to the east of the northern end of [225] is an 8m-long, positively-magnetic, linear anomaly [226], running perpendicular to the previously discussed feature. Approximately 1m to the east of this feature, and running parallel to it, is a 12m-long, linear alignment defined by a pair of positively-magnetic, linear anomalies [227]. Within the area defined by [224], [225], and [227], is a 9m-long, east–west, linear alignment [228], defined by three c. 1.5m-diameter positively-magnetic maculae. Approximately 2.5m to the southwest of this feature is a c. 11m-long, penannular alignment [229] comprising a curvilinear anomaly and macula, surrounding the northern side of a 3m-diameter dipolar macula. Approximately 9.5m to the west of this feature is an approximately rectangular area 7.5m by 8m, defined by c. 2.5m-diameter, positively-magnetic maculae [230]. Approximately 10m to the north of the eastern end of [208] is a 11.5m-long, positively-magnetic, linear anomaly [231], which continues the alignment of [208].

5.1.16. The eastern part of Area E is similarly characterised by features which conform to the predominant orientation and alignments within this area of survey. Approximately 3.5m to the east of [231] and running parallel to it, is a c. 33.5m-long, linear, positively-magnetic anomaly [232]. The alignment of this feature is picked up c. 4.5m to the south by a 78m by 27.5m, "T-shaped", positively magnetic anomaly [233]. The short extension of [233] is continued by a 16.5m-long, linear, positively-magnetic anomaly [234]. The southern end of [233] appears to be continued by a complex rectilinear, positively-magnetic anomaly [235], c. 79m by 47m at its greatest extents. The westernmost area defined by [233] and [235] is bisected by a c. 11.5m-long, linear, positively-magnetic anomaly [236]. The southern corner of this area is occupied by a lone c. 3m-diameter, positively-magnetic anomaly [237]. The area defined by [234] and [235] contains a pair of c. 2m-diameter, positively-magnetic maculae [238]. The alignment of [235] is picked up c. 2.5m to its north and immediately to the east of [234], by a c. 71m by 25.5m, "T-shaped", positively-magnetic anomaly [239], the western extent of which appears to align with the southern end of [232]. Approximately 13.5m to the north of the eastern part of [235], is a 29.5m-long, linear, positively-magnetic anomaly [241], running parallel to [234]. Approximately 13.5m to the north of this feature, running parallel to it, is a c. 33.5m-long,

linear, positively-magnetic anomaly [242]. Approximately 18.5m to the north of this feature is a c. 21.5m-long, linear, positively-magnetic anomaly [243], which appears to be axially aligned with the westward extension of [239]. Approximately 9m to the east of [243], running perpendicular to it, is a c. 17.5m-long, positively-magnetic anomaly [244]. The alignment of this feature is continued c. 4m to the southeast by a c. 8m-long, linear, positively-magnetic anomaly [245] which intersects the eastern edge of the survey area. Approximately 3m to the east of [244] and running parallel to it, is a c. 13.5m-long, linear, positively-magnetic anomaly [246], which intersects both the northern and eastern edges of the survey area. Approximately 9m to the east of [235], and possibly picking up the alignment of [244]/[245] and [246] is a 16m by 19.5m, inverted "F-shaped", positively-magnetic anomaly [247]. Approximately 16m to the south and aligned with the eastern of the southern extensions of [247], is a c. 6m-long, linear, positively-magnetic anomaly [248]. Approximately 4m to the south of [235], and running parallel to it, is a c. 67.5m-long, linear, positively-magnetic anomaly [249], which intersects the eastern edge of the survey area. The line of this feature appears to be picked up c. 19.5m further to the east by a 13.5m-long, linear, positively-magnetic anomaly [250]. Approximately 19m to the south of [249], at the southeastern extremity of the survey area, is a 5m by 10.5m, "L-shaped", positively-magnetic anomaly [251], intersecting the southern edge of the survey area. Approximately 5m to the north of this feature, and consistent with its alignment, is a pair of c. 2m-diameter, positively-magnetic maculae [252]. Approximately 17.5m to the southwest of these maculae is a pair of c. 2m-diameter, positively-magnetic maculae [253].

5.2. Earth-resistance Survey

5.2.1. Within the area surveyed, the site exhibited a generally poor response to the earth-resistance survey, although a reasonably high density of geophysical anomalies is observed across the area surveyed, and buried features can be discerned against the geological background. Any cut features are likely to show against the background as areas of relatively low resistance. In contrast, structural remains and voids are likely to present high-resistance signals.

5.2.2. The results are presented below as a greyscale image of the processed data (Fig. 6), and a complementary numbered interpretative plan to which the following description relates (Fig. 7), this description is organised from west to east. Minimally processed survey data is also presented below (Fig. 11), these data are unfiltered but have been corrected to remove striping resulting from a slight but consistent imbalance between the two parallel twin arrays used for the survey.

5.2.3. The earth-resistance survey consisted of two, small, discrete areas to the south of the modern road, labelled Areas F, and G. Within the northwestern area, Area F, a number of anomalies were defined as a result of the survey. Adjacent to the northern edge of the survey is a curvilinear, high-resistance anomaly [r1], measuring approximately 12.5m in length and open to the north. Approximately 13.5m to the south of this feature is a 3m-diameter, high-resistance macula [r2]. A further 13.5m to the south of this feature is a short, 7m-long, linear, high-resistance anomaly [r3], orientated east-southeast–west-northwest. Approximately 2m to the south of this feature is an east–west aligned, 7.5m-long, high-resistance, linear anomaly [r4]. Immediately to the west of this feature is an east–west orientated, "L-shaped" low-resistance anomaly [r5], measuring 8m by 4.5m. Immediately to the south of this feature is a "fish-hook" shaped, low-resistance anomaly [r6], measuring 17m by 7m. The eastern extension of this part of the resistance survey demonstrated the presence of a large, c. 32m by 11m, high-resistance anomaly [r7], orientated broadly east–west. To the south of this feature is a group of low-resistance anomalies [r8], [r9], & [r10], defining a region of approximately 220m^2 which is bounded to the south by an irregular, but broadly linear, 25m-long, high-resistance anomaly [r11].

5.2.4. The eastern area of earth-resistance survey (Area G) is characterised by a number of readily discernable anomalies. Approximately 4m from the western edge of the survey area is a 30m by 7m, north–south aligned, "Y-shaped" high-resistance anomaly [r12], which intersects the edges of the survey area at both its northern and southern extents. Approximately 8m to the east of this feature, and parallel to its eastern bifurcation, is a c. 30m-long, linear, high-resistance anomaly [r13]. Approximately 2.5m to the east of the northern end of [r13], is a high-resistance macula [r14] covering c. 33m^2. Immediately to the south of this feature is a c. 9.5m-long, east–west orientated, linear, low-resistance anomaly [r15]. Approximately 8m to the south of this feature is an irregular, "teardrop-shaped", high-resistance anomaly [r16], measuring c. 18.5m by 11m. Approximately 10.5m to the east of [r14], is a north–south orientated, linear, high-resistance anomaly [r17], which intersects the northern edge of the area surveyed. Approximately 27m to the south of this feature is an irregular, "E-shaped" high-resistance anomaly [r18], measuring c. 49m by 30m, orientated northwest–southeast. Approximately 4m to the northeast of this feature is a high-resistance macula [r19], covering an area of approximately 54m^2. Approximately 15m to the east of this feature is a 22.5m-long, linear alignment of five, c. 2m-diameter, high-resistance maculae [r20]. This alignment is paralleled at its northern end by a curvilinear alignment of similar maculae [r21], deviating from the alignment parallel to [r20] to run to the south, at its southern end. The southern part of the survey area contains an "L-shaped" group, aligned northwest–southeast, of three high-resistance maculae [r22], measuring 9m by 6.5m. A single, 3m-diameter, high-resistance macula [r23], is located approximately 8.5m to the east of the previously discussed group.

6. DISCUSSION

6.1. Geomagnetic Survey

6.1.1. The geomagnetic response to the survey revealed a high density of anomalies across the majority of the survey area. Numerous features with archaeological potential could be clearly recognised within the dataset (Figs, 8–9). The scale of these features is varied, with some probable evidence for field-boundaries or land-management features to the north of the area. Likely archaeological features were generally represented by positive magnetic anomalies. The overall character of the geophysical anomalies revealed by the survey suggests a high probability for the presence of archaeological remains within the area surveyed.

Area A:

6.1.2. The features [5], [7] – [9] appear to suggest the possible presence of buried evidence for land-management systems or large enclosures.

6.1.3. The features [10] – [12], possibly represent the remains of smaller-scale boundary features.

Area B:

6.1.4. The group of features [22] – [25] appear to suggest the possibility for evidence of buried structures, possibly relating to the line of the Roman road.

Area C:

6.1.5. The features [30], [35], [39] – [43], & [45] – [47] appear to suggest the probable presence of evidence for ditches and enclosures or structures associated with the line of the Roman road.

6.1.6. Features [26] – [28], & [31] – [34] may represent small boundary features, or parts of structures.

Area D:

6.1.7. With the exclusion of [138], the features within this area appear to clearly represent a complex of enclosures and structures lining both sides of the Roman road. The road itself is demonstrated by [48] – [61], and as a clear linear area running through the middle of the other features indicative of enclosures, structures, and activities within them.

Area E:

6.1.8. Features [207], [172], & [143] – [145] represent modern disturbance within this area. Feature [172] may represent the effect of modern or post-mediaeval ploughing.

6.1.9. All other numbered features in this area of the survey should be classed as representing probable archaeological features. The overall pattern demonstrates a high degree of quasi-orthogonal planning and the presence of clear axes of movement, or streets, though the response to the geomagnetic survey would suggest that these probably would not have been paved.

6.2. Earth-resistance Survey

6.2.1. The earth-resistance response to the survey revealed a moderate density of anomalies across the majority of the survey area, with an increased density, though with less clarity, to the north, several features with archaeological potential could be clearly recognised within the dataset (Figs, 8–9). Likely archaeological features were generally represented by high-resistance anomalies. The overall character of the geophysical anomalies revealed by the survey suggests a possibility for the presence of archaeological remains within the area surveyed.

6.2.2. The group of features [r18], [r19], [r20], & [r21] appear to suggest the possible presence of enclosures akin to those seen elsewhere in the geomagnetic survey.

6.2.3. The group of features [r12] – [r17] appear to suggest the possible presence of some form of land divisions, or possible water management system.

6.2.4. The group of features [r1] – [r11] appear to suggest the possible presence of features associated with the line of the Roman road.

6.3. General

6.3.1. The overall impression given by the combined techniques employed at Segelocum is one of a densely occupied landscape, presumably in the Roman period, which conforms to a reasonably widespread pattern for Romano-British nucleated settlements (so-called "Small-Towns") of a nucleated core, with settlement activity along the roads leading to, or through, the core of the settlement. The combined surveys indicated significant levels of settlement activity and possible field systems, or enclosures, beyond the previously understood limits of the settlement, and therefore beyond the area of the Scheduled Ancient Monument.

7. CONCLUSION

7.1. Geophysical survey strongly suggested the presence of potential buried archaeological features.

These comprised:

- Probable archaeological features relating to settlement activity along the line of the Roman road (Areas B, C, D, & F).
- Probable archaeological features relating to settlement activity within the core of the Roman town of Segelocum (Area E).
- The line of the Roman road from Lincoln to Doncaster (Area D).
- Possible remains of ditched field-boundaries or drainage systems (Areas A, & G).

7.2. As the settlement at Segelocum is located adjacent to the Roman road from Lincoln to Doncaster, and at a bridging point on the Trent, the settlement is clearly in a key location to benefit from trade and movement along both the road, and the river. The geophysical survey carried out at Segelocum has confirmed the presence of extensive archaeological remains within the area of the Scheduled Ancient Monument, as well as their extension beyond this zone to the west, along the line of the Roman road, the precise location of which was also confirmed by the survey.

7.3. The distribution of geophysical anomalies across the areas surveyed should probably be seen as representative of the presence of archaeological features within the survey area and no significant biases in survival/detection of these remains appear to be present within the dataset.

8. BIBLIOGRAPHY

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Cartographic references

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OS Ordnance Survey 1: 50,000 Landranger Map

Ordnance Survey Maps: All editions 1859-1992

Appendix A: Details of Survey Strategy

Date of Survey: 7th–22nd December 2015
Site: SGC – Segelocum Roman Town, Littleborough (Nottinghamshire)
Region: Nottinghamshire
Grid Reference: NGR SK 82192 82852
Surveyor: Trent and Peak Archaeology
Personnel: Tom Hooley, Povilas Cepauskas
Geology: Mercia Mudstone/Holme Pierrepont Sand and Gravels

Survey Type 1: Geomagnetic, fluxgate gradiometry
Approximate area: 4 hectares
Grid size: 30m
Traverse Interval: 0.5m
Reading Interval: 0.25m
Instrument: Bartington Instruments Grad 601-2
Resolution: 0.1nT
Traverse mode: Zig-zag

Survey Type 2: Geomagnetic, fluxgate gradiometry
Approximate area: 11 hectares
Grid size: 30m
Traverse Interval: 1m
Reading Interval: 0.25m
Instrument: Bartington Instruments Grad 601-2
Resolution: 0.1nT
Traverse mode: Zig-zag

Survey Type 3: Earth-resistance, twin-probe array
Approximate area: 1 hectares
Grid size: 30m
Traverse Interval: 1m
Reading Interval: 1m
Instrument: Geoscan Research RM15D, with MPX15 Multiplexer for parallel-twin operation
Resolution: 0.1Ω
Traverse mode: Zig-zag

Appendix B: Geophysical Prospection Methods

Magnetic Survey

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area. The iron content of a soil provides the principal basis for its magnetic properties. Presence of magnetite, maghaematite and haematite iron oxides all affect the magnetic properties of soils.

Although variations in the earth's magnetic field which are associated with archaeological features are weak, especially considering the overall strength of the magnetic field of around 48,000 nano-Tesla (nT), they can be detected using specific instruments (Gaffney et al. 1991).

Three basic types of magnetometer are available to the archaeologist; proton magnetometers, fluxgate gradiometers, and alkali vapour magnetometers (also known as caesium magnetometers, or optically pumped magnetometers).

Fluxgate Gradiometer

Fluxgate instruments are based around a highly permeable nickel iron alloy core (Scollar et al. 1990, 456), which is magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding. Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it cannot be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings.

Fluxgate gradiometers are sensitive to 0.5nT or below depending on the instrument. However, they can rarely detect features which are located deeper than 1m below the surface of the ground.

Archaeological features such as brick walls, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing location of foundation trenches, pits and ditches. The results are however extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials.

Earth-resistance Survey

Resistivity survey is based on the ability of sub-surface materials to conduct an electrical current passed through them. Differences in the structural and chemical make-up of soils affect the degree of resistance to an electrical current (Clark 1990, 27). The technique involves the passing of an electrical current through a pair of probes into the earth in order to measure variations in resistance over the survey area. Resistance is measured in ohms (Ω), whereas resistivity, the resistance in a given volume of earth, is measured in ohm-metres (Ωm).

Four probes are generally utilised for electrical profiling (Gaffney et al. 1991, 2), two mobile and two remote probes. Earth-resistance survey can be undertaken using a number of different probe arrays; twin probe, Wenner, Double-Dipole, Schlumberger and Square arrays.

Twin Electrode Configuration:

This array represents the most popular configuration used in British archaeology (Clark 1990; Gaffney et al. 1991, 2), usually undertaken with a 0.5m separation between mobile probes. Details of survey methodology are dealt with elsewhere (Geoscan Research 1996) and so will not be discussed here. The twin probe array configuration utilises two probes on a mobile frame, with two remote probes located at a distance from the mobile frame of least 30 times the separation between the mobile probes.

Alterations can be made to suit different conditions. For extremely dry soils, a range of 0.1mA can be used. If the background resistance is lower than 100Ω, then a gain of x10 should be used. If the background resistance is lower than 10Ω, then a gain of x100 can be used. In urban situations, it may be necessary to alter the range and gain of the instrument to 10mA and x1 respectively.

A number of factors may affect the interpretation of twin probe survey results, including the nature and depth of structures, soil type, terrain and localised climatic conditions. The response to non-archaeological features may lead to a misinterpretation of the results, or the masking of archaeological anomalies. A twin probe array of 0.5m will rarely recognise

features below a depth of 0.75m (Gaffney et al 1991). More substantial features may register up to a depth of 1m.

Although changes in the moisture content of the soil, as well as variations in temperature, can affect the form of anomalies present in resistivity survey results, in general, higher resistance features are interpreted as structures which have a limited moisture content, for example walls, mounds, voids, rubble filled pits, and paved or cobbled areas. Lower resistance anomalies usually represent buried ditches, foundation trenches, pits and gullies.

FIGURES