

Appendix A15.2: Geophysical Survey Results

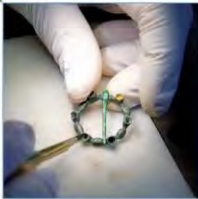
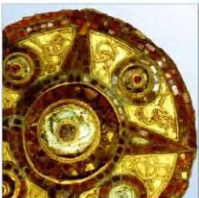
A9 Dualling Programme Pass of Birnam to Glen Garry – Stage 3 Scotland

Archaeological Geophysical Survey

National Grid Reference Number: NO 00252 47094 – NN 94600 56785

AOC Project No: 51736

Date: May 2017



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A9 Dualling Programme
Pass of Birnam to Glen Garry – Stage 3
Scotland

Archaeological Geophysical Survey

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National Grid Reference (NGR): NO 00252 47094 – NN 94600 56785

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Non-Technical Summary

AOC Archaeology Group was commissioned by Jacobs UK Limited (hereafter Jacobs), on behalf of Transport Scotland with Perth and Kinross Council as the Curator, to undertake an archaeological geophysical (gradiometer) survey to investigate the potential for buried archaeological remains along the proposed A9 Dualling Southern Section (from NO 00252 47094 to NN 94600 56785).

A total of thirteen parcels of land were outlined for geophysical survey, covering an area of approximately 16.05 hectares. Three parcels were located in arable fields, with another in scrub land and the rest on grazed pasture, some containing livestock.

The results of the survey located a number of discrete trends and anomalies that are likely to be archaeological in origin. These include some rectilinear and curvilinear trends that could represent enclosures, as well as some pit like features.

A number of uncertain trends and areas of magnetic disturbance were identified across many of the survey areas, which although could have an archaeological origin, may derive from geological or natural processes.

Old field boundaries were identified in three survey areas, which were all confirmed through historical mapping. Agricultural trends were also identified across some of the parcels.

Geological trends are visible in the data from most of the survey parcels, which has in some areas caused difficulty in identifying the nature of the more uncertain linear trends.

Magnetic disturbance was identified in every parcel along field boundaries, as well as a number of areas of magnetic disturbance most likely to be the result of modern activity.

1 Introduction

- 1.1 AOC Archaeology Group was commissioned by Jacobs on behalf of Transport Scotland to undertake an archaeological geophysical survey in thirteen specified parcels of land along the route of the A9 Dualling Southern Section, running from the Pass of Birnam to Glen Garry.
- 1.2 The survey was carried out to provide information on the extent and significance of potential buried archaeological remains within the proposed development site.

2 Site Location and Description

- 2.1 Thirteen parcels of land were selected for survey, located on either side of the A9 between Dowally (centred at NO 00252 47094) and Pitlochry (centred at NN 94600 56785) Scotland (see Figure 1).
- 2.2 The parcels of land collectively covered an area of approximately 16.05 hectares (ha). Parcels 1, 1a, 3, 5, 6, 6a, 8, 9 and 10 consisted of pasture, Parcels 4, 4a and 7 consisted of recently planted crop, and Parcel 2 consisted of scrub.
- 2.3 The parcels for the most part were located on relatively level land varying from 60m aOD to 100m aOD (above Ordnance Datum). Parcels 1, 1a, 5, 6 and 6a were all located on land with steep slopes, varying from 110m aOD to 100m aOD, to 100m aOD to 80m aOD.
- 2.4 The recorded geology for this section of the scheme is taken from the P3 Specification for Archaeological Geophysical Survey (Jacobs, 2017).
- 2.5 From the Tay Crossing to Ballinluig; based on published BGS information, the underlying bedrock geology is metamorphic bedrock of Dalradian age, belonging to the Southern Highland Group. This is recorded by the BGS GeoIndex as psammites and semipelites, with an area of micaceous psammite at the southern end of the section.
- 2.6 Based on published BGS information, superficial deposits within the study area are primarily composed of alluvium (consisting of clay, silt, sand and gravel) and glaciofluvial deposits (consisting of gravel, sand and silt). There are also isolated areas of river terrace deposits along the existing A9 (consisting of gravel, sand, silt and clay). Glacial till is indicated to lie over the lower hillsides. Typically, the existing A9 lies to the eastern edge of the floodplain, at the limit between the alluvium/river terrace deposits and the glaciofluvial deposits.
- 2.7 From Pitlochry to Killiecrankie, the underlying bedrock geology comprises predominantly metasedimentary and metavolcanic rocks. The southern extent of the section, to the south of Pitlochry, is primarily underlain by psammites and semipelites belonging to the Southern Highland Group. A small section of metalava and metatuff, also belonging to the Southern Highland Group, underlies the route at ch3250 - ch3550. The northern extent of the route is underlain by metamorphic rocks of the Argyll Group, successively the Loch Tay Limestone Formation (meta-limestone), Ben Lui Schist Formation (semi pelite), Farragon Volcanic Formation (meta-limestone and metatuff), Ben Lawers Schist Formation (calcareous pelite), Ben Eagagh Schist Formation (graphitic pelite) and Carn Mairg Quartzite Formation (gritty psammite).
- 2.8 Superficial deposits within the study area are primarily composed of alluvium (consisting of clay, silt, sand and gravel), with the northern section of the route at Faskally underlain by river terrace deposits (consisting of gravel, sand, silt and clay). There is also an isolated area of river terrace deposits from ch2200 to ch2900, located to the south-west of Pitlochry.

3 Archaeological Background

- 3.1 The archaeological background below is drawn from the results of data searches using the CANMORE website and is meant only as a parcel specific overview of the survey areas (Canmore 2017). A more detailed archaeological background has been provided as a Gazetteer as part of the P3 Specification for Archaeological Geophysical Survey (Jacobs, 2017).

Parcel 1 and 1a

- 3.2 There are no known recorded heritage monuments within the survey boundaries, and three cultural heritage assets within 500m of the survey boundaries. The parcels are also close to a farmstead which visually would appear to be of some antiquity. This may or may not suggest at historic farming activity within the surrounding area.
- 3.3 The potential for unrecorded monuments is high due to the vista of the survey area itself. The parcels are set high up, looking out over the River Tay and surrounding landscape, which would be an ideal setting for monuments of various periods.

Parcel 2

- 3.4 Parcel 2 is located on relatively flat ground and again close to the River Tay, and is also situated south west of the township of Dowally (CANMORE ID 131962). There are no recorded historic monuments within the survey parcel. The township of Dowally however contains several historical cottages and farmhouses (CANMORE ID 163930, 163969, 163966 and 163964), St Anne's Well (CANMORE ID 27113) and St Anne's Church (CANMORE ID 27111) which are recorded on Canmore.
- 3.5 Further to these recorded buildings, a number of prehistoric monuments have been recorded within 500m of the survey parcel. These include an undated enclosure (CANMORE ID 26229), a ring ditch (CANMORE ID 68184), a cairn (CANMORE ID 27110) and a pair of Neolithic / Bronze Age standing stones (CANMORE ID 27109), of which the later two are within 10m of the parcel boundary.

Parcel 3

- 3.6 This parcel falls within the central part of the settlement of Dowally and just to the north of the recorded St Anne's Church and well (CANMORE ID 27111 and 27113). No known recorded monuments are located within the parcel itself.
- 3.7 As with Parcel 2 a number of older, possibly prehistoric monuments are recorded within 500m of the parcel boundary.

Parcel 4 and 4a

- 3.8 Recorded within Parcel 4a is a possible enclosure (CANMORE ID 26229). The record has very little detail other than being an unassigned enclosure.
- 3.9 Other than this recorded monument, no other items of interest are located within either survey parcel. However as with Parcels 2 and 3; the settlement of Dowally is located within 500m to the south which contains a number of historically important records.

Parcel 5

- 3.10 The parcel contains no recorded monuments within its boundary, however the settlement of Guay is located less than 50m to the north.
- 3.11 The recorded assets of the area surrounding the survey parcel are mainly related to the village of Guay, including a School, Smithy and Township (CANMORE ID 140573), the railway station

(CANMORE ID 167032) and a farmhouse (CANMORE ID 225875) recorded on the Canmore website as being of historic importance.

- 3.12 General Wade's Military Road is also located immediately west of the survey parcel (CANMORE ID 138417).

Parcel 6 and 6a

- 3.13 These parcels fall just north of the historic township known as Haugh of Kilmorich (CANMORE ID 131823) which is recorded as being of historic importance on the Canmore website.
- 3.14 The parcels would appear to have some potential for prehistoric activity as a number of undated pits have been recorded to the south and west of the parcels (CANMORE ID 287033). Within Parcel 6a, and possibly running in to Parcel 6, cropmarks of an unknown date have also been recorded (CANMORE ID 82113).

Parcel 7, 8 and 9

- 3.15 Parcels 7, 8 and 9 are all located in close proximity to one another and are adjacent to a number of historic townships. The historic farmstead of Westhaugh of Tulliemet (CANMORE ID 242604) is located less than 10m north of Parcel 9, with the township Haugh of Kilmorich (CANMORE ID 131823) located to the south of Parcel 7.
- 3.16 The following records have been associated with the Westhaugh of Tulliemet; Rig and Furrow ploughing and a sunken floored building (CANMORE ID 347076), a farmhouse (CANMORE ID 87620) and four Cist burials (CANMORE ID 26318) have been recorded. A cup marked standing stone has also been recorded to the west of the settlement (CANMORE ID 26346).
- 3.17 Located close to the Haugh of Kilmorich; an early medieval cross slab, located in between Parcels 8 and 9 (CANMORE ID 26347), a speculative location of a prehistoric standing stone located within / adjacent to Parcel 7 (CANMORE ID 26319), pits of an unknown date (CANMORE ID 287033) and cropmarks of an unknown date (CANMORE ID 82113) have been recorded.

Parcel 10

- 3.18 There are a number of recorded monuments within 500m of the parcel boundary. These would appear to fall within the main nucleus of the Mains of Dunfallandy - a recorded farmstead (CANMORE ID 131760), a farm and stables (CANMORE ID 227384) and a burial enclosure (CANMORE ID 26309).
- 3.19 The Canmore site also records a Pictish cross slab / symbol stone (CANMORE ID 26295), an undated cairn (CANMORE ID 26297) and a knocking stone known as The Bloody Stone of Drumfallandy (CANMORE ID 26294) which indicate the township of Dunfallandy, of which Parcel 10 is immediately adjacent to, of being of some antiquity.
- 3.20 There are no recorded monuments from the Canmore website located within the boundary of Parcel 10. The parcel is relatively flat and is located on the flood plain of the River Tummel. The Dunfallandy settlement itself is located on a scarp above the floodplain immediately next to the parcel, suggesting the area could contain some unknown finds of an archaeological origin associated with the settlement.

4 Aims

- 4.1 The aim of the geophysical survey is taken from the Specification for Archaeological Survey (Jacobs 2017) and is to inform and support the cultural heritage chapters of the Environmental Statements for Project 03 – Tay Crossing to Ballinluig and Project 04 – Pitlochry to Killiecrankie. It

will identify any potential unknown archaeological remains within the survey parcels, and the potential magnitude of the impact of the scheme on them.

4.2 Specifically the aims of the gradiometer survey were;

- To determine (so far as possible) the presence or absence of buried archaeological remains in the survey parcels;
- To clarify the extent and layout of known sites of archaeological interest within the survey parcels;
- To clarify the extent and layout of previously unknown buried remains within the survey parcels;
- To interpret any geophysical anomalies identified by the survey; and
- Disseminate the results of the archaeological geophysical survey through the deposition of an ordered archive and detailed report at the National Record of the Historic Environment (NRHE).

5 Methodology

- 5.1 All geophysical survey work was carried out in accordance with recommended good practice specified in guideline documents published by English Heritage – now Historic England (David *et al.* 2008) and the Chartered Institute for Archaeologists *Standard and Guidance for archaeological geophysical survey* (2014).
- 5.2 Parameters were selected that were suitable for the prospective aims of the survey and in accordance with recommended professional good practice (David *et al.* 2008, 8).
- 5.3 The gradiometer survey was carried out using Bartington Grad601-2 fluxgate gradiometers (see Appendices 2 and 3). Data was collected on an east-west alignment using zig-zag traverses, with a sample interval of 0.25m and a traverse interval of 1m. A total of 242 full or partial 30m by 30m grids were surveyed within the specified area, totalling an area of approximately 16.05ha.
- 5.4 Attention was taken to avoid metal obstacles present within the survey area during data collection using gradiometers. Gradiometer survey is affected by ‘above-ground noise’ such as metal objects, and avoiding these improves the overall data quality and results obtained.
- 5.5 The gradiometer data were downloaded using Bartington Grad601 PC Software v313 and processed using Geoscan Geoplot v3.0 / v4.0. The details of these processes can be found in Appendices 4 and 5. Data processing, storage and documentation were carried out in accordance with the good practice specifications detailed in the guidelines issued by the Archaeology Data Service (Schmidt and Ernenwein, 2009).
- 5.6 Interpretations of the data were created as layers in AutoCAD LT 2009 / GIS and the technical terminology used to describe the identified features can be found in Appendix 6.

6 Results and Interpretation

- 6.1 The gradiometer survey results have been visualised as greyscale plots, with the minimally processed data plotted at -1nT to 2nT in Figures 3, 6, 9, 12, 15, 18, 21, 24 and 27. The processed data is also plotted at -1nT to 2nT and can be seen in Figures 4, 7, 10, 13, 16, 19, 22, 25 and 28. An interpretation of the data can be seen in Figures 5, 8, 11, 14, 17, 20, 23, 26 and 29. An individual characterisation of the identified anomalies follows in Appendix 1. The results will be discussed per survey parcel.

Parcel 1 and 1a (0.34ha and 0.50ha) – Figures 3 - 5

Archaeology

- 6.2 No responses indicating definitive archaeological remains have been located in the survey area.

Linear trend - Unclear origin

- 6.3 Some tentative curvilinear and linear trends have been identified in the data for both areas. A positive linear trend runs in a north-west to south-east direction across Parcel 1 (**A1**). Three sub circular positive anomalies are observed in the east of Parcel 1 adjacent to a further curvilinear trend running roughly east-west (**A2**). In Parcel 1a a sub-circular trend adjacent to an amorphous strong positive anomaly is observed in the north-west of the dataset (**A3**), as well as a linear trend running north-east to south-west in the south of the dataset (**A4**). Given the steep topography of the land across the two parcels, it is unlikely that these anomalies are archaeological in origin, however it cannot be ruled out given the vista of the survey parcels.

Non-Archaeology

- 6.4 A number of geological trends are observed across both parcels 1 and 1a (**A5**). Geological variations consist of an area of disturbance that is composed of irregular significant increases or decreases in magnetic values compared with background readings and is likely to indicate natural variations in soil composition or geology.
- 6.5 In Parcel 1 they consist of positive and negative linear trends running both north-east to south west and west to east (**A5**). These follow the steep topography of the area and follow a ravine / old river channel running down the northern boundary of the parcel.
- 6.6 In Parcel 1a the geological trends are much broader and again follow the topography of the area (**A5**).
- 6.7 Magnetic disturbance along the southern boundary of Parcel 1 is attributed to metal fencing along the field boundary, as well as an electricity substation to the south-east of the parcel. Areas of modern disturbance are characterised by significant increases or decreases in values compared with background readings.
- 6.8 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes). These are commonly caused by ferrous or high magnetically susceptible material on the surface or within the topsoil of the site, and it is likely that modern agricultural activity has changed the magnetic properties of the top soil and created a high level of background 'noise' within the data set.

Parcel 2 (0.91ha) – Figures 6 - 8

Archaeology

- 6.9 No responses indicating definitive archaeological remains have been located in the survey area.
- 6.10 The data for this parcel contains a high amount of magnetic disturbance, which may have been from the construction of the A9 to the east. A bank of material forms the western boundary of the survey area which may also be related to this magnetic disturbance. The disturbance could also be due to the geology of the area, causing a very strong magnetic response.

Linear trend - Unclear origin

- 6.11 A number of linear trends are observed in the north of the parcel, criss-crossing in various orientations (**A6**). As the area is very magnetically noisy it is difficult to ascertain if these have an archaeological nature.

- 6.12 A further trend runs north-south down the eastern half of the dataset which again falls in a magnetically noisy area and therefore its origin is difficult to interpret (**A7**).

Linear trend – Old field boundary

- 6.13 A former field boundary runs north-east to south-west through the southern half of the dataset (**A8**). These isolated long linear anomalies, most often represented as a negative magnetic trend, are likely to relate to former field boundaries. The magnetic signal may appear inconsistent but the positioning is confirmed when cross-referenced with historic mapping from 1900 (OS County Series: Perthshire 1900-1901, Old-maps, 2017).

Non-Archaeology

- 6.14 Magnetic disturbance is observed in patches across the whole dataset, in particular in a band across the south (**A9**) and along the western boundary adjacent to the spoil heap. These anomalies are most likely modern in origin.
- 6.15 The modern disturbance in the south-west of the dataset correlates with the location of the historic General Wade's Military Road (**A10**).
- 6.16 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes).

Parcel 3 (0.21ha) – Figures 9 - 11

Archaeology

- 6.17 No responses indicating definitive archaeological remains have been located in the survey area.
- 6.18 Similarly to Parcel 2, the data for this area contains a high amount of magnetic noise which could either relate to the construction of the A9 to the west, or could relate to the geology of the area.

Linear trend - Unclear origin

- 6.19 A number of trends which could have an archaeological origin have been observed in the dataset for this parcel, however given the strong geological response in the data, they could have a natural origin.
- 6.20 Two curvilinear trends are evident in the south of the data, one of which runs towards the graveyard in the south of the parcel and therefore could have an archaeological origin (**A11**). A further sub-circular trend is observed in the north of the dataset which could also have an archaeological origin (**A12**).

Linear trend – Old field boundary

- 6.21 A former field boundary is seen in the south-west of the data (**A13**) which is confirmed by historic mapping (OS County Series: Perthshire 1900, Old-maps, 2017).

Non-Archaeology

- 6.22 Two bands of geology are visible in the dataset (**A14**) which correlate with the topography of the parcel, where an incline to the north was observed at the time of survey.
- 6.23 On the eastern boundary there is a small isolated dipolar anomaly (iron spike).

Parcel 4 and 4a (0.77ha and 0.64ha) – Figures 12 - 14

Archaeology

- 6.24 No responses indicating definitive archaeological remains have been located in the survey area.

Discrete trend – Archaeology?

- 6.25 Rectilinear and curvilinear trends which are likely to be of an archaeological nature are visible in the south of the data for Parcel 4 (**A15**). These appear to form an enclosure and further investigation would be required to ascertain their origin.
- 6.26 Curvilinear trends are observed in the east of Parcel 4a, adjacent to a linear trend running north-west to south-east through the parcel which could all be archaeological in origin (**A16**). These may correlate with cropmarks identified through historic oblique aerial photography, which have identified a possible ring-ditch and a possible adjacent enclosure – CANMORE ID 26229 (Canmore 2017).

Pit – Archaeology?

- 6.27 Four anomalies typical of the responses given by pits are visible in the centre of the dataset for Parcel 4 (**A17**). These are situated next to and within the rectilinear anomalies **A15** and may be related. Pits are an anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit. These could be natural responses, but further investigation would be required to ascertain their origin.

Linear trend – Unclear origin

- 6.28 A curvilinear trend is visible in the north-west of the data for Parcel 4, which may have a natural rather than archaeological origin, relating to a former palaeochannel or geology (**A18**).

Non-Archaeology

- 6.29 Ploughing trends running north-south are visible in the dataset for both Parcel 4 and 4a (**A19**). Ploughing trends are represented by a series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values.
- 6.30 An agricultural headland is also visible running along the southern boundary of Parcel 4 (**A20**).
- 6.31 A strong geological response is visible in the north of Parcel 4a, which has caused some distortion and striping in the dataset (**A21**).
- 6.32 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes).
- 6.33 Magnetic disturbance is observed along the eastern field boundaries which relates to metal fencing and a drain.

Parcel 5 (0.92ha) – Figures 15 - 17**Archaeology**

- 6.34 No responses indicating definitive archaeological remains have been located in the survey area.

Discrete trend / disturbance – Unclear origin

- 6.35 A number of trends are visible in the dataset for Parcel 5 (**A22**), however they are located in an area of magnetic noise (**A23**) and therefore an interpretation is very difficult. Curvilinear and sub-circular trends can be picked out from the data, but it is not possible to ascertain if these have an archaeological origin.
- 6.36 The area of magnetic noise that is visible across the dataset similarly is difficult to interpret (**A23**). The survey area is located on a relatively level plateau, with a sharp decline towards the north-west in the north-west of the area. The plateau would be an ideal location for archaeological remains, and thus the magnetic disturbance could be archaeological in nature and could represent destruction of former remains. However the response is also likely to have a natural origin and could represent geology.

Non-Archaeology

- 6.37 Ploughing trends are visible in the south-east of the dataset running north-south, running up to to an anomaly that is suggestive of a former field boundary (**A24**). However, this cannot be confirmed through historic mapping and therefore has an unclear origin.
- 6.38 Magnetic disturbance is seen in patches in the west of the dataset and is related to animal feeders and farm debris observed at the time of survey (**A25**). Further disturbance along the western field boundary relates to metal fencing.
- 6.39 There is an isolated dipolar anomaly within the dataset for this parcel (iron spikes).

Parcel 6 and 6a (1.10ha and 0.87ha) – Figures 18 - 20**Archaeology**

- 6.40 No responses indicating definitive archaeological remains have been located in the survey area.

Discrete trend – Archaeology?

- 6.41 Both parcels contain anomalies that could be archaeological in origin. In Parcel 6, a long curvilinear trend runs from the north-west to the south-east (**A26**), which is intersected / intersects two parallel linear anomalies running from the north-east to the south-west.
- 6.42 In Parcel 6a a group of sub-circular positive anomalies have a strong response compared to background readings (**A27**). These are adjacent to a curvilinear trend running north-south, all of which could be archaeological in their origin given their location on a small plateau within the survey area.

Discrete trend – Unclear origin

- 6.43 A large number of positive trends and anomalies are visible across both parcels which have been classed as having an unclear origin.
- 6.44 A rectilinear anomaly that seems to form an enclosure is visible in the south-west of Parcel 6 (**A28**) however the signal is not typical of buried remains, and therefore further investigation is required to ascertain its origin. It is also located on a slope and is more likely to be geological in origin.
- 6.45 Positive sub-circular anomalies are seen scattered across the entire dataset for Parcel 6 which are very unusual in their response and positioning (**A29**). These could be archaeological in their origin and represent post holes for some kind of structure, however they could also represent tree bowls if the area was once forested heavily. Further investigation is required to ascertain their origin.
- 6.46 A negative curvilinear trend runs through the south of Parcel 6a from the south-west to the east which has an uncertain origin and could be geological (**A30**).

Non-Archaeology

- 6.47 A large area of geology is visible in the dataset for Parcel 6a (**A31**) which correlates with the very steep and undulating topography of the area.
- 6.48 Magnetic disturbance is seen in two areas in the centre of Parcel 6 which relate to boreholes in the parcel, observed at the time of survey (**A32**).
- 6.49 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes).

Parcel 7 (1.19ha) – Figures 21 - 23**Archaeology**

- 6.50 No responses indicating definitive archaeological remains have been located in the survey area.

Discrete trend – Archaeology?

- 6.51 A sub-circular trend is located in the north-east of the dataset which is likely to be archaeological in origin (**A33**). This is located to the north of several other sub-circular and linear positive trends which could also be archaeological in nature (**A34**) though they form no discernible patterning or shaping to help understand their origins.
- 6.52 A rectilinear positive anomaly is visible in the south of the dataset (**A35**) which although does not form a complete enclosure, is likely to be of that category and therefore be archaeological in nature. As the edge of the survey area stops in this feature, interpretation is difficult and further investigation is required to ascertain the nature of the remains.
- 6.53 A further rectilinear feature is observed in the north-east of the dataset (**A36**) which could be archaeological in nature and related to the adjacent anomalies discussed above.

Pit – Archaeology?

- 6.54 Three pit like anomalies (**A37**) are visible within the collection of anomalies labelled as **A34** that could be archaeological in their origin given their proximity. They could however be natural infilled depressions.

Discrete trend / area of disturbance – Unclear origin

- 6.55 Two long linear trends are visible running north-west to south-east following the eastern field boundary, and running north-east to south-west through the centre of the dataset (**A38**). The linear trend running across the centre of the data could be an old field boundary not denoted on available historic mapping, and the sub-circular anomalies to the north and south of it could be related.
- 6.56 A strong response is visible in the south-east of the dataset which does not relate to anything visible in the field at the time of survey (**A39**). This would normally be attributed to modern disturbance, however given that a reputed standing stone is supposed to be in the vicinity (CANMORE ID 26319), it could relate to this (Canmore, 2017).

Non-Archaeology

- 6.57 Ploughing trends are visible across the dataset running in a north-west to south-east direction (**A40**).
- 6.58 An area of geology is visible in the north-west of the dataset (**A41**) which continues on into Parcel 8 to the north.
- 6.59 Magnetic disturbance is observed in the south of the dataset and along the eastern boundary and relates to an access trackway running along the southern boundary and metal boundary fencing.
- 6.60 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes).

Parcel 8 (1.08ha) – Figures 21 - 23**Archaeology**

- 6.61 No responses indicating definitive archaeological remains have been located in the survey area.

Discrete trend – Unclear origin

- 6.62 Some tentative linear and rectilinear trends are visible in the dataset running in a north-east to south-west direction (**A42**), which although could be archaeological in nature, could also relate to former ploughing trends running in a different direction to those discussed below.
- 6.63 Two parallel curvilinear trends are observed in the south west of the dataset which also have a very weak tentative response, however an archaeological origin cannot be ruled out (**A43**).

Non-Archaeology

- 6.64 Ploughing trends are visible across the entire dataset running in a north-west to south-east direction (**A44**) as well as a ploughing headland following the southern boundary. These are likely to be modern conventional ploughing trends.
- 6.65 Bands of geology are visible across the dataset as negative trends running from the north to the south (**A45**). These may be related to the river to the west and could be palaeochannels on the floodplain.
- 6.66 Magnetic disturbance is observed along the eastern and southern boundary and relates to metal fencing and debris.
- 6.67 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes).

Parcel 9 (1ha) – Figures 24 - 26**Archaeology**

- 6.68 No responses indicating definitive archaeological remains have been located in the survey area.

Discrete trend – Archaeology?

- 6.69 A number of curvilinear positive anomalies are visible in the north of the dataset which could be archaeological in origin (**A46**), given their proximity to a standing stone with cup marks, four cists and a cross slab (CANMORE IDs 26346, 26318 and 26347, Canmore 2017). Further investigation is required to ascertain their origins.

Discrete trend – Unclear origin

- 6.70 Two strong negative anomalies are visible in the southern half of the dataset crossing over each other (**A47**). These could relate to old field boundaries though their responses are not typical, and so these may be geological trends.
- 6.71 Further linear trends of an unclear origin are visible further south of these anomalies running in various directions, which could be archaeological or natural variations (**A48**).

Non-Archaeology

- 6.72 Ploughing trends are visible as negative anomalies running north-west to south-east through the dataset (**A49**).
- 6.73 A band of geology, similar to those observed in Parcel 8, curves round from the south to the north through the dataset as a wide positive trend (**A50**).
- 6.74 Magnetic disturbance is observed along the eastern boundary adjacent to the A9, the southern boundary adjacent to housing, and the northern and western boundary relating to farm buildings, fencing and a trackway.
- 6.75 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes).

Parcel 10 (6.52ha) – Figures 27 - 29**Archaeology**

- 6.76 No responses indicating definitive archaeological remains have been located in the survey area.

Discrete trend – Unclear origin

- 6.77 A number of trends have been identified across the dataset for this parcel, which although weak and tentative, cannot be ruled out due to their proximity to the Mains of Dunfallady, cross slab, burial ground and cairn (CANMORE IDs 131760, 26295, 26309 and 26297, Canmore 2017).

- 6.78 Sub-circular and sub-rectangular positive anomalies have been observed in the centre-west of the dataset which could be archaeological in origin (**A51**).
- 6.79 These are adjacent to a long linear trend running from the south-west to the north-east which is bisected at regular intervals by field drains, which it most likely pre-dates (**A52**). The trend is negative and wide and is likely to be geological in origin.
- 6.80 A similar negative trend runs from the north-east to the south-west in the east of the data and similarly may be geological in origin, though again, an archaeological origin cannot be ruled out (**A53**).
- 6.81 Rectilinear trends are visible in the south-east of the dataset which appear to form very tentative enclosures (**A54**), though as the anomalies are very weak, these could be from a combination of natural variations and field drains.
- 6.82 A stronger negative trend in the east of the data runs from the south to the north-east and though whilst it could be geological in origin, given the proximity to the farmstead, could be archaeological in origin (**A55**).

Linear trend - Old field boundary

- 6.83 Three former field boundaries are visible within the dataset for Parcel 10, all of which have been confirmed when compared with historic mapping (OS Plan 1976, Old-maps, 2017).
- 6.84 One runs from the north-east to the south-west through the centre of the dataset (**A56**) and is surrounded by a band of magnetic noise (**A64**) which may relate to the destruction of the former boundary.
- 6.85 The second runs through the western half of the dataset following the same north-east south-west orientation (**A57**) and coincides with a band of geology along the same orientation (**A60**). It may be that this is a coincidence, or perhaps the boundary followed an old river channel or natural ravine that is not visible in the field now.
- 6.86 The third former field boundary to the west of this has a strong signal similar to that of a service (**A58**), however historic mapping confirms a former boundary was in this location (OS Plan 1976, Old-maps, 2017).

Non-Archaeology

- 6.87 Linear trends run through the centre-east of the dataset from the north to the south, which are most likely to be geological in origin (**A59**). A broader band of geology runs in a similar / more north-east south-west direction in the west of the dataset (**A60**) and coincides with the alignment of former field boundary **A57**, and as discussed may represent an old river bed or broad natural field boundary that is now removed.
- 6.88 A number of parallel positive linear trends are visible in the data in a herringbone pattern, consistent with the response given by field drains (**A61**). These seem to all run towards / run up to anomaly **A59** – the geological trend – which may be related in some way, perhaps an underground stream or trend of well-draining geology.
- 6.89 Two strongly magnetic linear trends are visible in the western half of the data, with dipolar responses that are typical of services or pipes (**A62**). One runs north to south and appears to interject / run underneath the larger possible service, which runs from the north-west of the dataset in a south-east direction.

- 6.90 The north-western extents of the dataset consist of magnetic disturbance, which is likely to be modern in origin (**A63**). The ground in this section was heavily rutted and uneven underfoot suggesting it had been heavily waterlogged at some point, however it is unclear if the magnetic disturbance relates to this.
- 6.91 Magnetic disturbance is observed along the northern boundary adjacent to the A9 and the south-western boundary relating to metal boundary fencing.
- 6.92 Across the data set there is a small quantity of isolated dipolar anomalies (iron spikes).

7 Conclusion

- 7.1 The gradiometer survey has not identified any anomalies or features of a definitive archaeological nature.
- 7.2 Across Parcels 4, 4a, 6, 6a, 7, 8 and 9 a number of linear, curvilinear, sub circular and rectilinear anomalies have been identified as having a possible archaeological origin. These include possible enclosures and ditches, as well as a number of pits of archaeological interest that all require further intrusive investigation to ascertain if they have an archaeological origin.
- 7.3 A larger number of anomalies that have an unclear origin have been identified across every survey parcel. The strength of the anomaly, coupled with their unusual patterning makes interpretation tentative, however given their proximity to a number of recorded heritage assets, they cannot be ruled out as not having an archaeological origin.
- 7.4 Five former field boundaries were identified in the data and were confirmed using historic mapping.
- 7.5 Agricultural trends were observed in parcels 4, 4a, 5, 7, 8 and 9 which are most likely related to former ploughing regimes and ploughing headlands.
- 7.6 Geological variations were seen in most of the datasets for this survey, which given the location was to be expected.
- 7.7 Field drains were identified in Parcel 10 in a herringbone drainage pattern.
- 7.8 Possible services were also identified in Parcel 10 which gave a strong magnetic signal.
- 7.9 Further modern magnetic disturbance was observed in most of the parcels, relating to metal fencing along field boundaries, farm debris within the survey area, boreholes from geotechnical investigation or buildings close to the survey area itself.

8 Statement of Indemnity

- 8.1 Although the results and interpretation detailed in this report have been produced as accurately as possible, it should be noted that the conclusions offered are a subjective assessment of collected data sets.
- 8.2 The success of a geophysical survey in identifying archaeological remains can be heavily influenced by several factors, including geology, seasonality, field conditions and the properties of the features being detected. Therefore the geophysical interpretation may only reveal certain archaeological features and not produce a complete plan of all of the archaeological remains within a survey area.

9 Bibliography

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Plate 1. Parcel 1 looking south-west



Plate 2. Parcel 1a looking north



Plate 3. Parcel 2 looking south-east



Plate 4. Parcel 3 looking south-east



Plate 5. Parcel 4 looking north



Plate 6. Parcel 4a looking north



Plate 7. Parcel 5 looking west



Plate 8. Parcel 6 looking south



Plate 9. Parcel 6a looking north-west



Plate 10. Parcel 7 looking north-east



Plate 11. Parcel 8 looking east



Plate 12. Parcel 9 looking south



Plate 13. Parcel 10 looking north

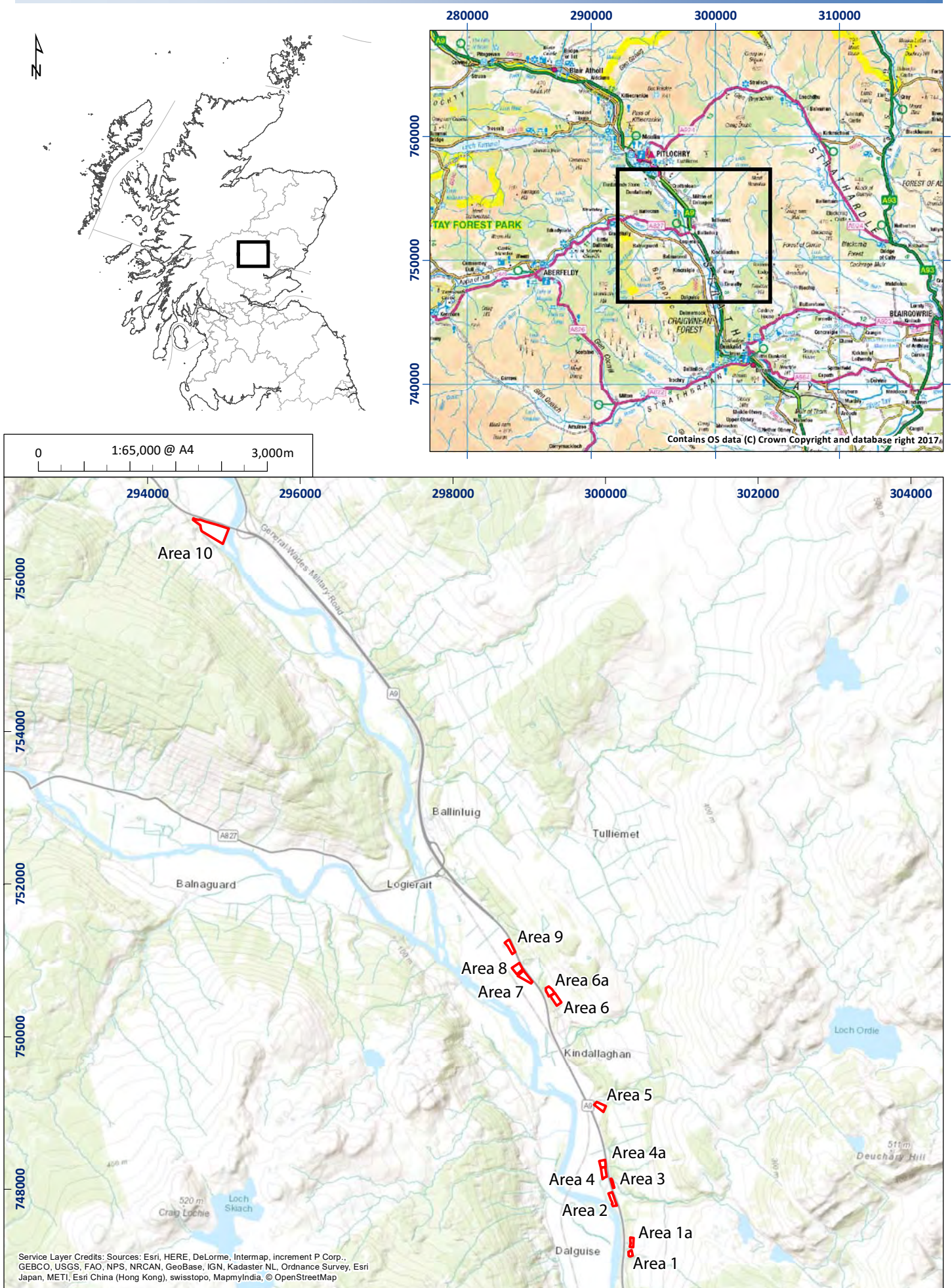
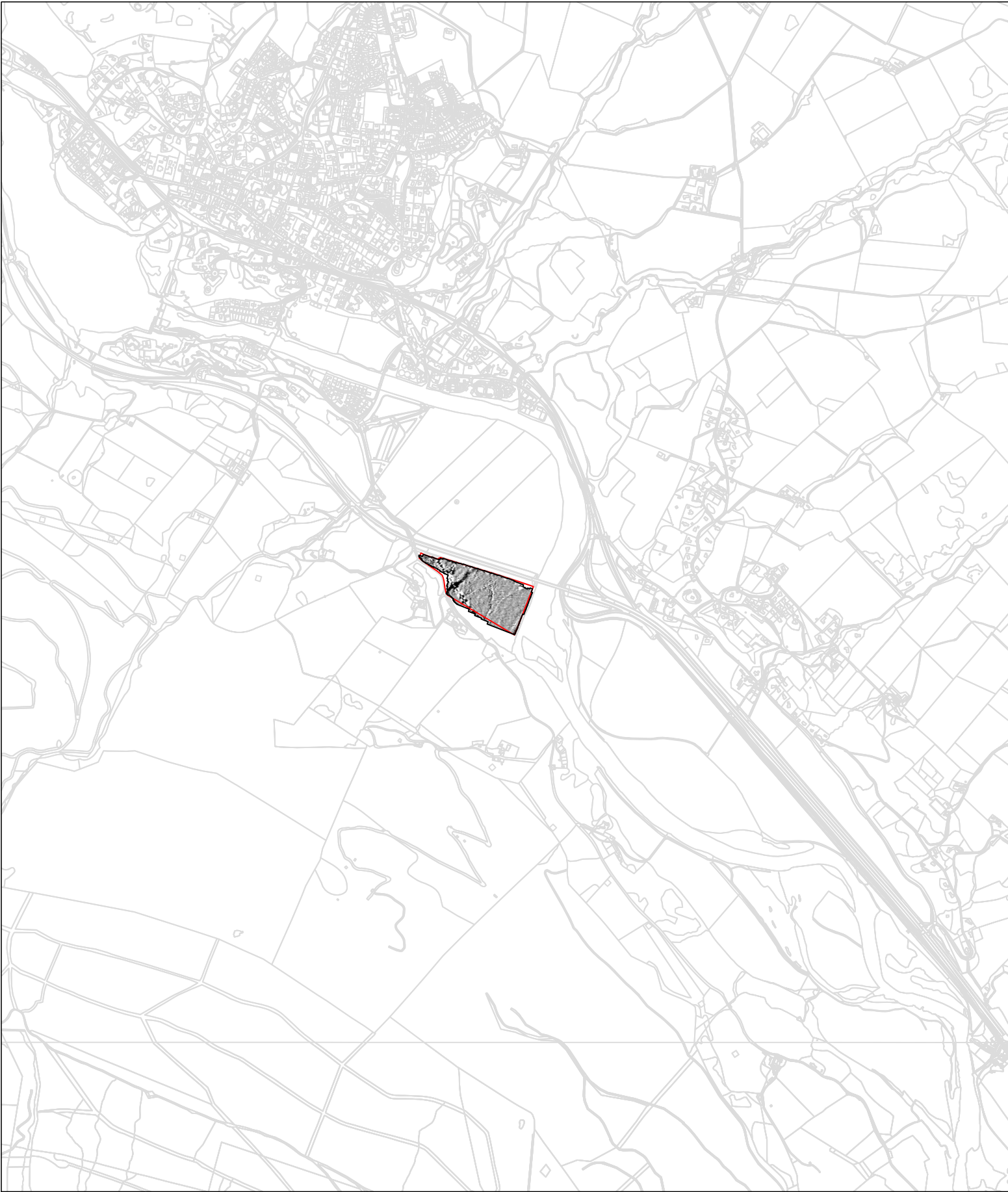


Figure 1: Site location plan




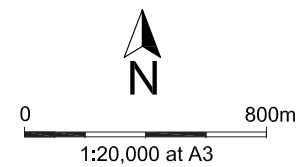
Location of survey areas - Parcel 10



Location of survey areas - Parcels 1 - 9

Figure
2

 Red line boundary

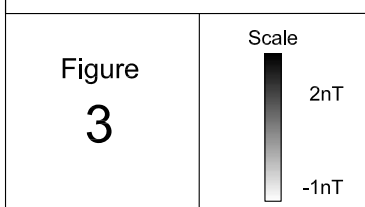
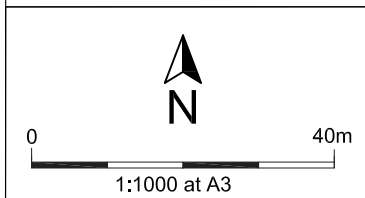


Project Title: A9 Dualling: Pass of Birnam to Glen Garry - Stage 3 Project No: 51736		
Drawing Title: Figure 2 Location of Survey Areas - Parcel 10 / Parcels 1-9		
V1/51736/GEO/F2/25.05.17		
Drawn by: KT 25/05/2017	Checked by: JL 25/05/2017	Approved by: JL 25/05/2017





Figure 3: Minimally processed gradiometer survey results - greyscale plot - Parcels 1 and 1a



Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

Drawing Title: Figure 3
Minimally processed gradiometer survey results - Parcels 1 and 1a

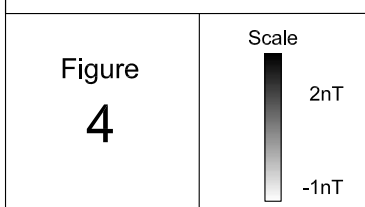
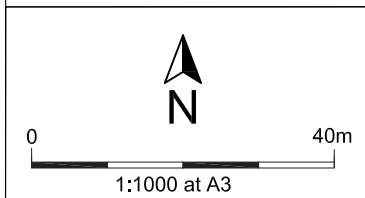
V1/51736/GEO/F3/25.05.17

Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Figure 4: Processed gradiometer survey results - greyscale plot - Parcels 1 and 1a



Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

Drawing Title: Figure 4
Processed gradiometer survey results - Parcels 1 and 1a

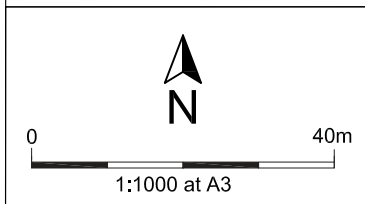
V1/51736/GEO/F4/25.05.17

Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Figure 5: Interpretation of gradiometer survey results - Parcels 1 and 1a



- Trend (Unclear Origin)
- Geology / Natural
- Area of Disturbance (Modern)
- Ferrous / Iron Spikes
- Red line boundary

Figure
5

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

Drawing Title: Figure 5
Interpretation of gradiometer survey results - Parcels 1 and 1a

V1/51736/GEO/F5/25.05.17

Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



Parcel 2

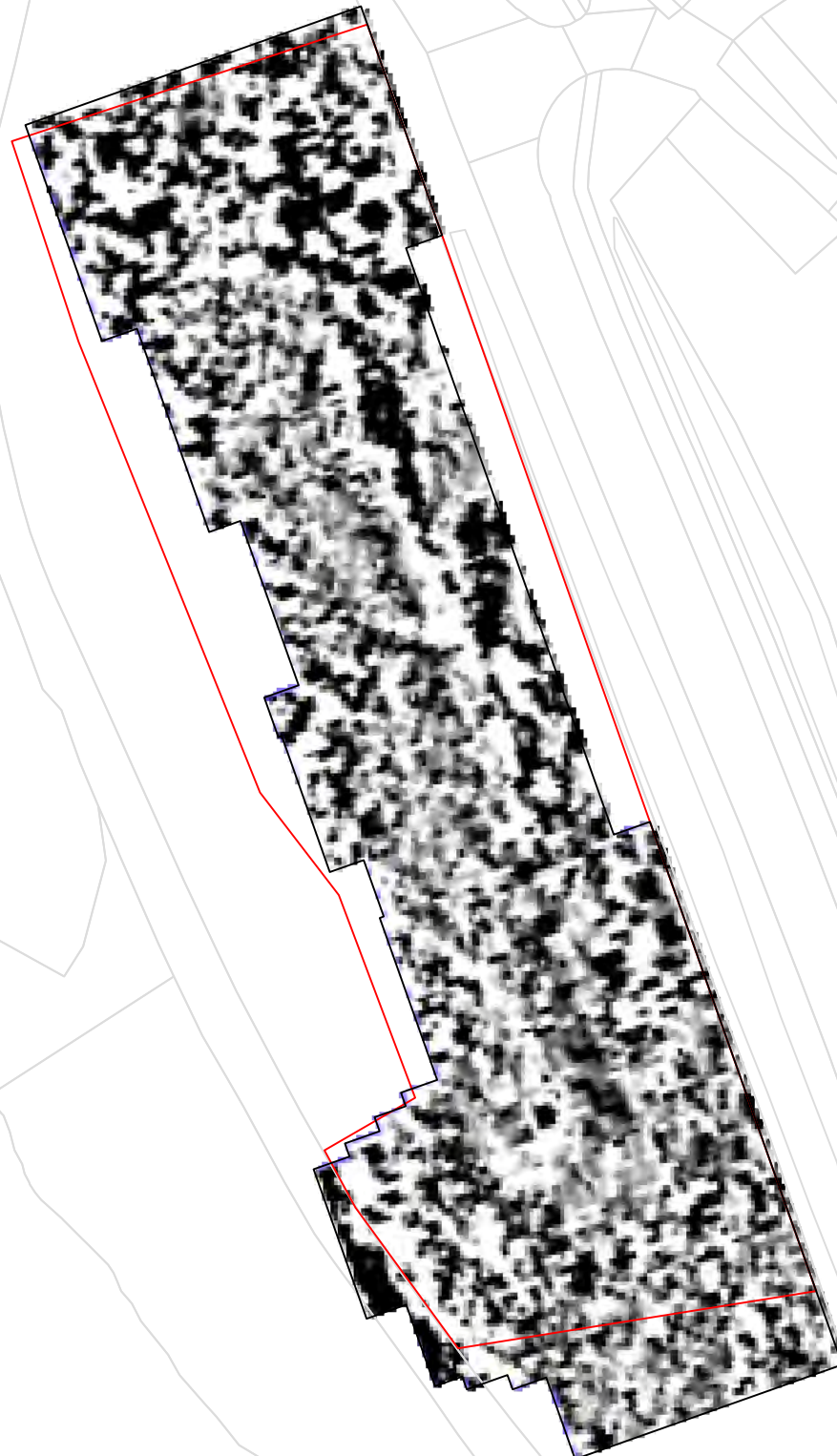
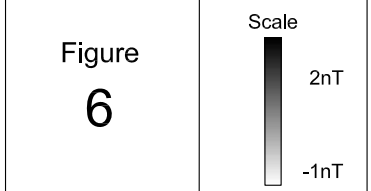
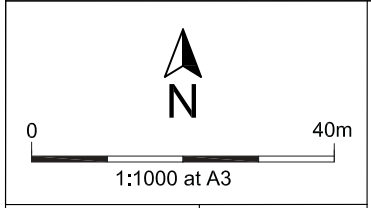


Figure 6: Minimally processed gradiometer survey results - greyscale plot - Parcel 2



Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 6		
Minimally processed gradiometer survey results - Parcel 2		
V1/51736/GEO/F6/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



Parcel 2

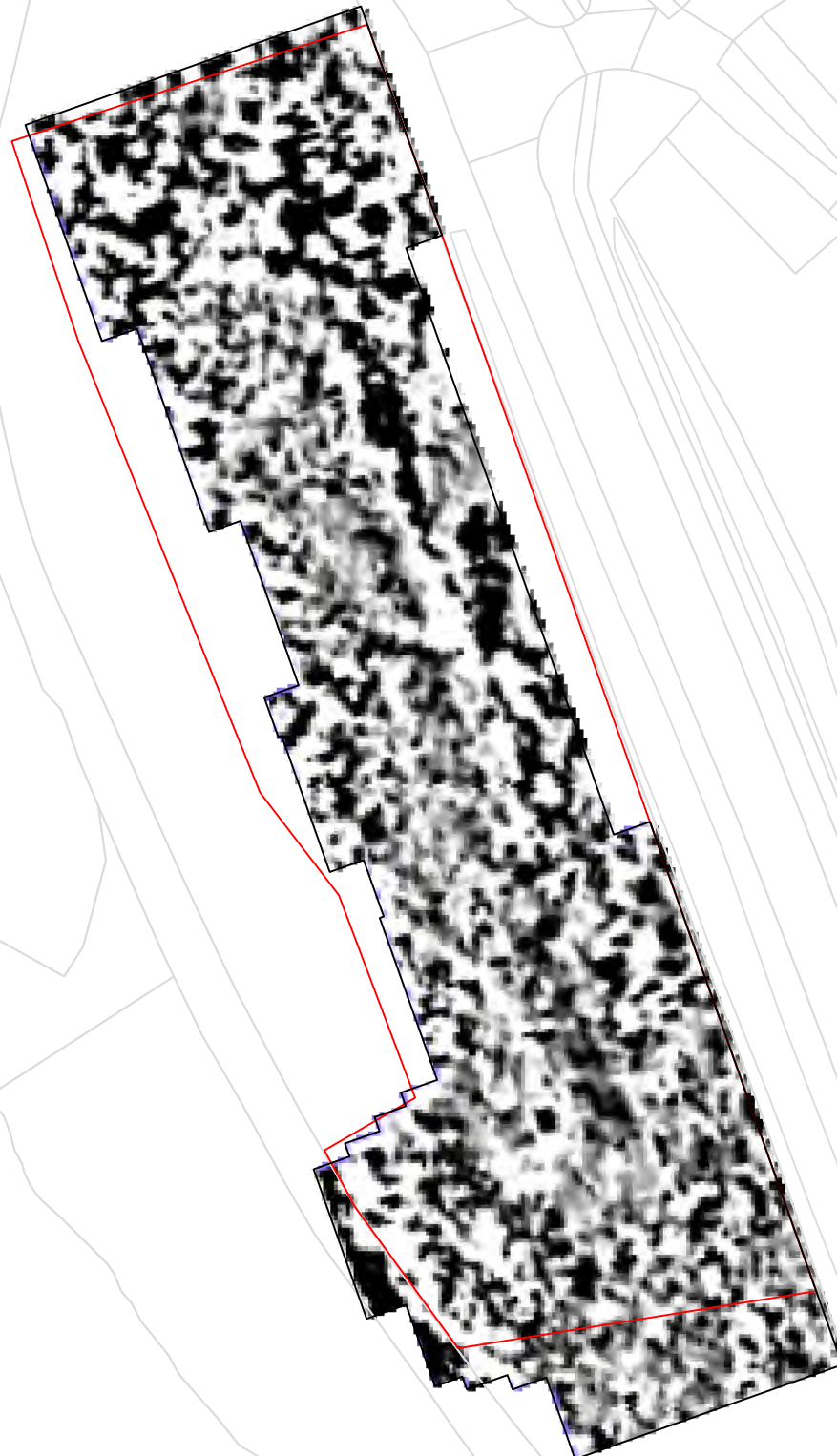
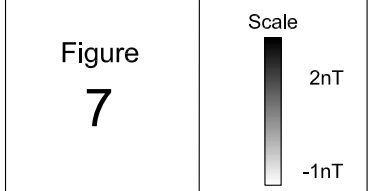
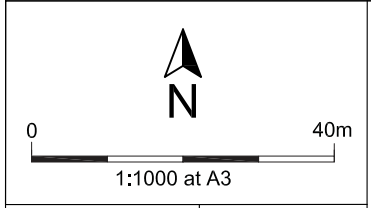
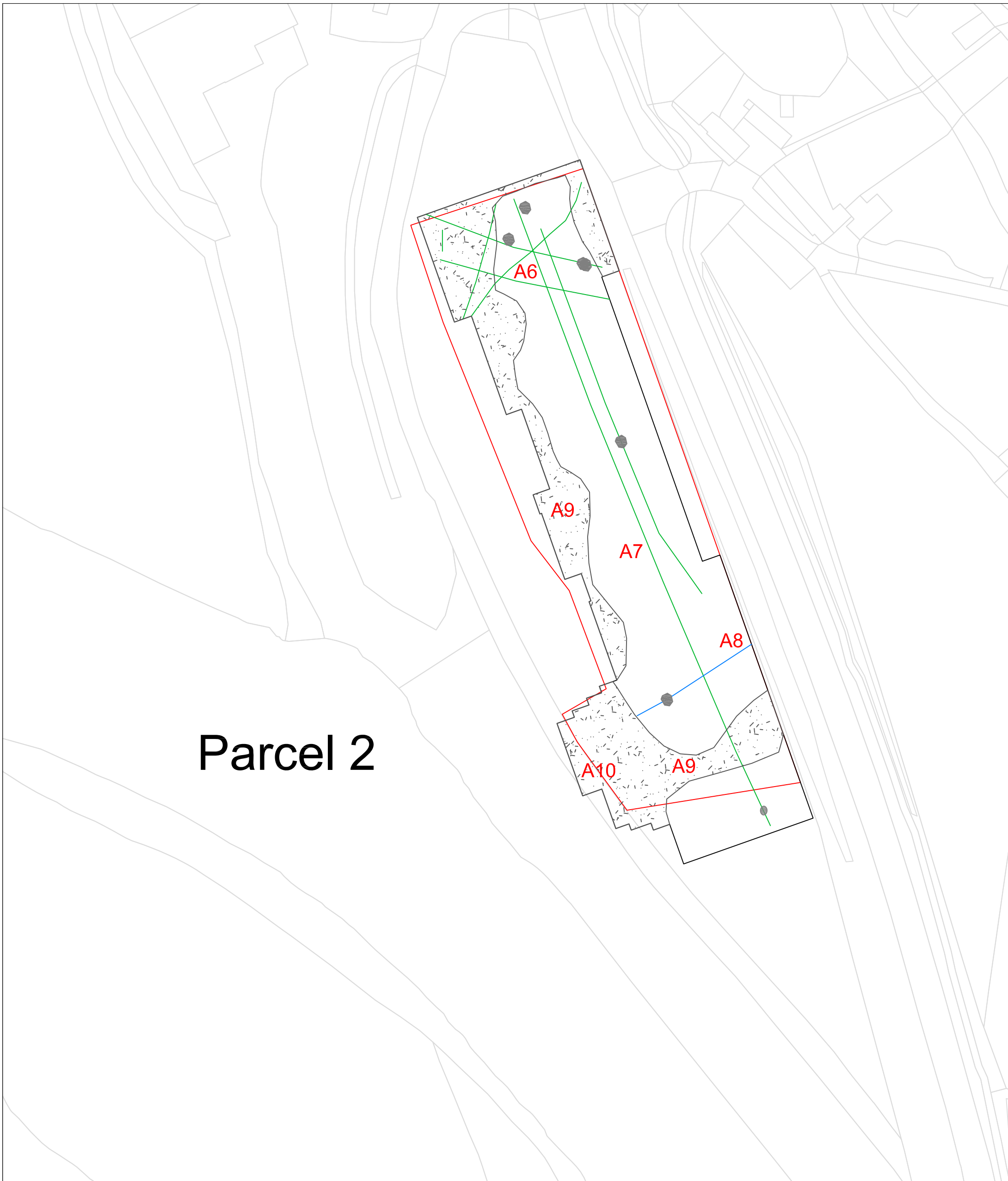


Figure 7: Processed gradiometer survey results - greyscale plot - Parcel 2



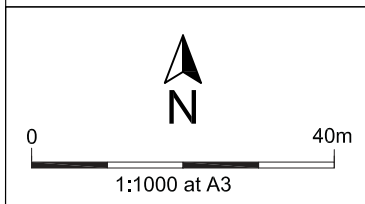
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Project No: 51736		
Stage 3		
Drawing Title: Figure 7		
Processed gradiometer survey results - Parcel 2		
V1/51736/GEO/F7/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Parcel 2

Figure 8: Interpretation of gradiometer survey results - Parcel 2








-  Trend (Unclear Origin)
-  Old Field Boundary
-  Area of Disturbance (Modern)
-  Ferrous / Iron Spikes
-  Red line boundary

Figure
8

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

Drawing Title: Figure 8
Interpretation of gradiometer survey results - Parcel 2

V1/51736/GEO/F8/25.05.17

Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



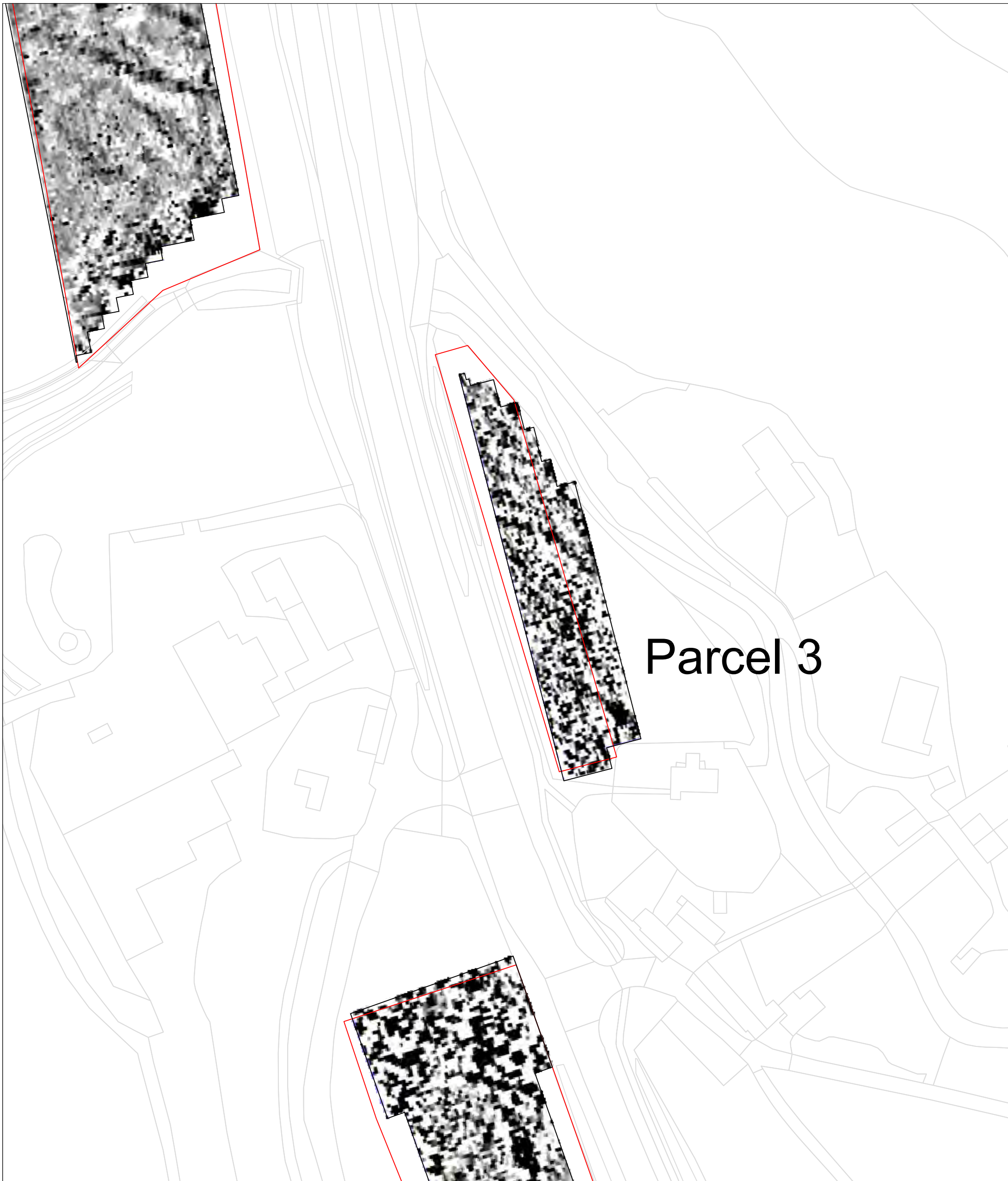


Figure 9: Minimally processed gradiometer survey results - greyscale plot - Parcel 3

Figure 9

Scale

2nT

-1nT

0 40m

1:1000 at A3

N

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 9		
Minimally processed gradiometer survey results - Parcel 3		
V1/51736/GEO/F9/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



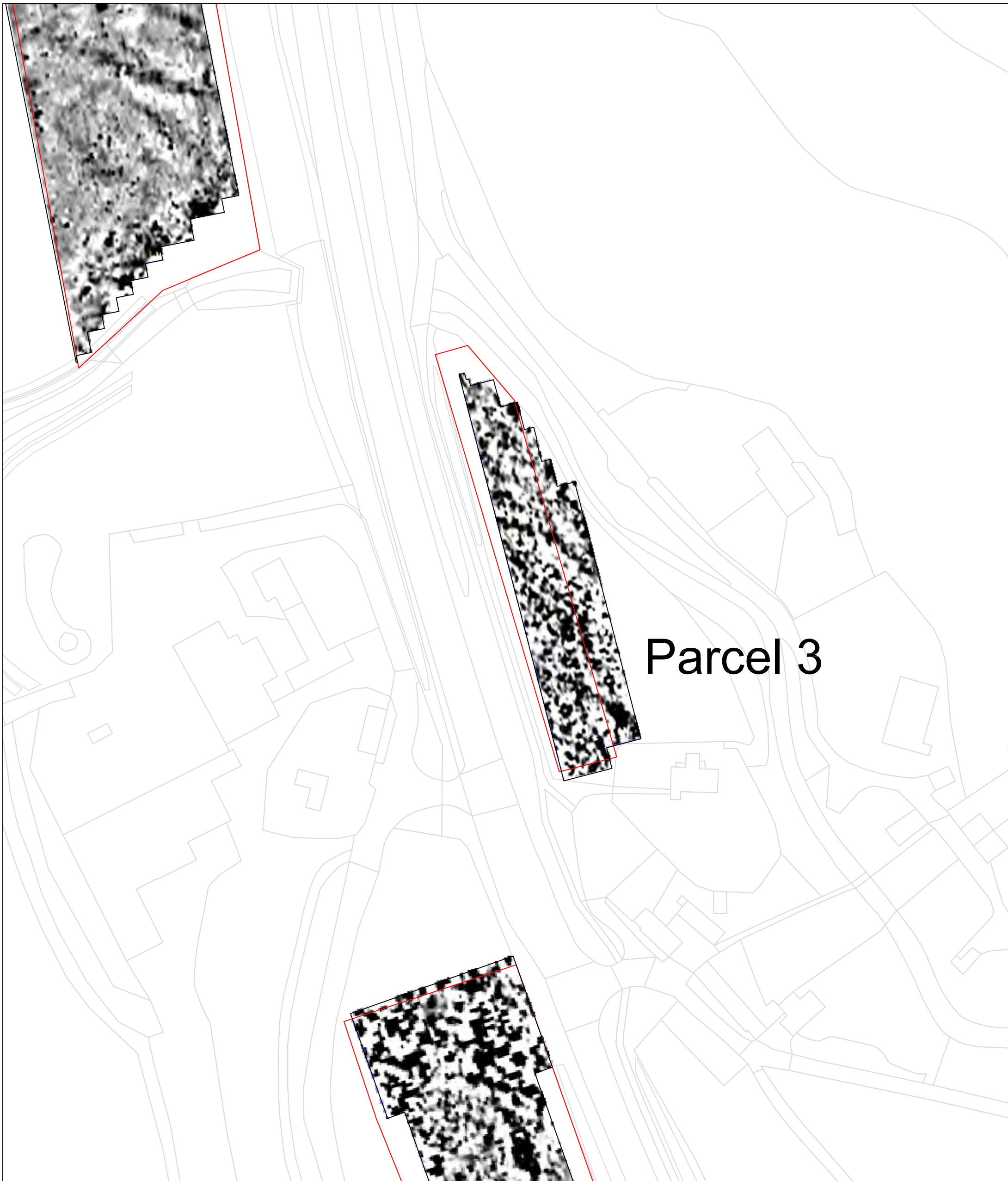


Figure 10: Processed gradiometer survey results - greyscale plot - Parcel 3

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1:1000 at A3

Figure
10

Scale

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Project No: 51736		Stage 3
Drawing Title: Figure 10		
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V1/51736/GEO/F10/25.05.17		
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25/05/2017	25/05/2017	25/05/2017



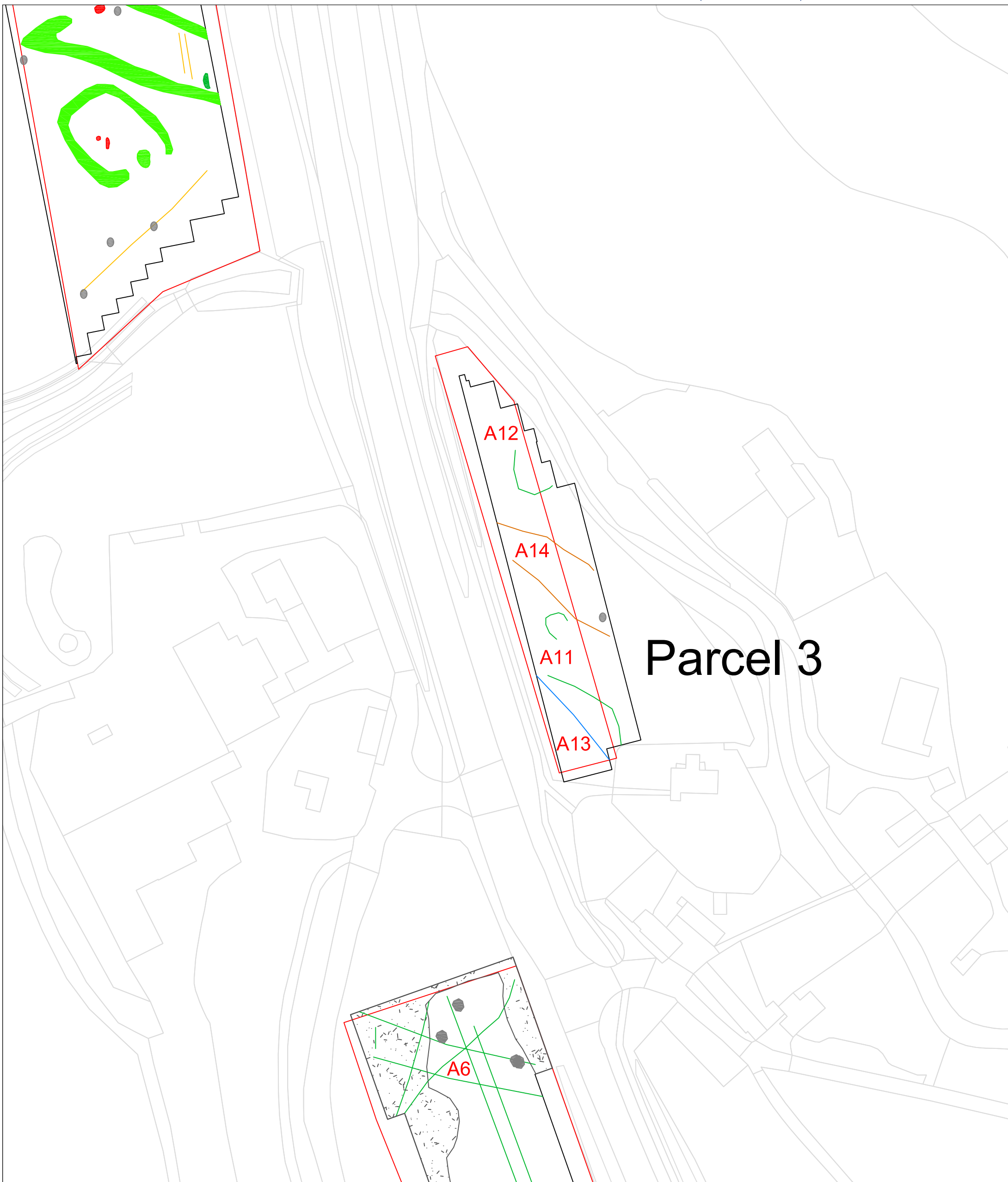
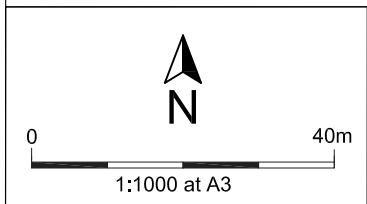


Figure 11: Interpretation of gradiometer survey results - Parcel 3



- Trend (Unclear Origin)
- Old Field Boundary
- Geology / Natural
- Ferrous / Iron Spikes
- Red line boundary

Figure
11

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

Drawing Title: Figure 11
Interpretation of gradiometer survey results - Parcel 3

V1/51736/GEO/F11/25.05.17

Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Figure 12: Minimally processed gradiometer survey results - greyscale plot - Parcels 4 and 4a

Figure 12

Scale

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-1nT

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 12		
Minimally processed gradiometer survey results - Parcels 4 and 4a		
V1/51736/GEO/F12/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Parcel 4a

Parcel 4

Figure 13: Processed gradiometer survey results - greyscale plot - Parcels 4 and 4a

Figure 13

Scale

2nT

-1nT

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 13		
Processed gradiometer survey results - Parcels 4 and 4a		
V1/51736/GEO/F13/25.05.17		
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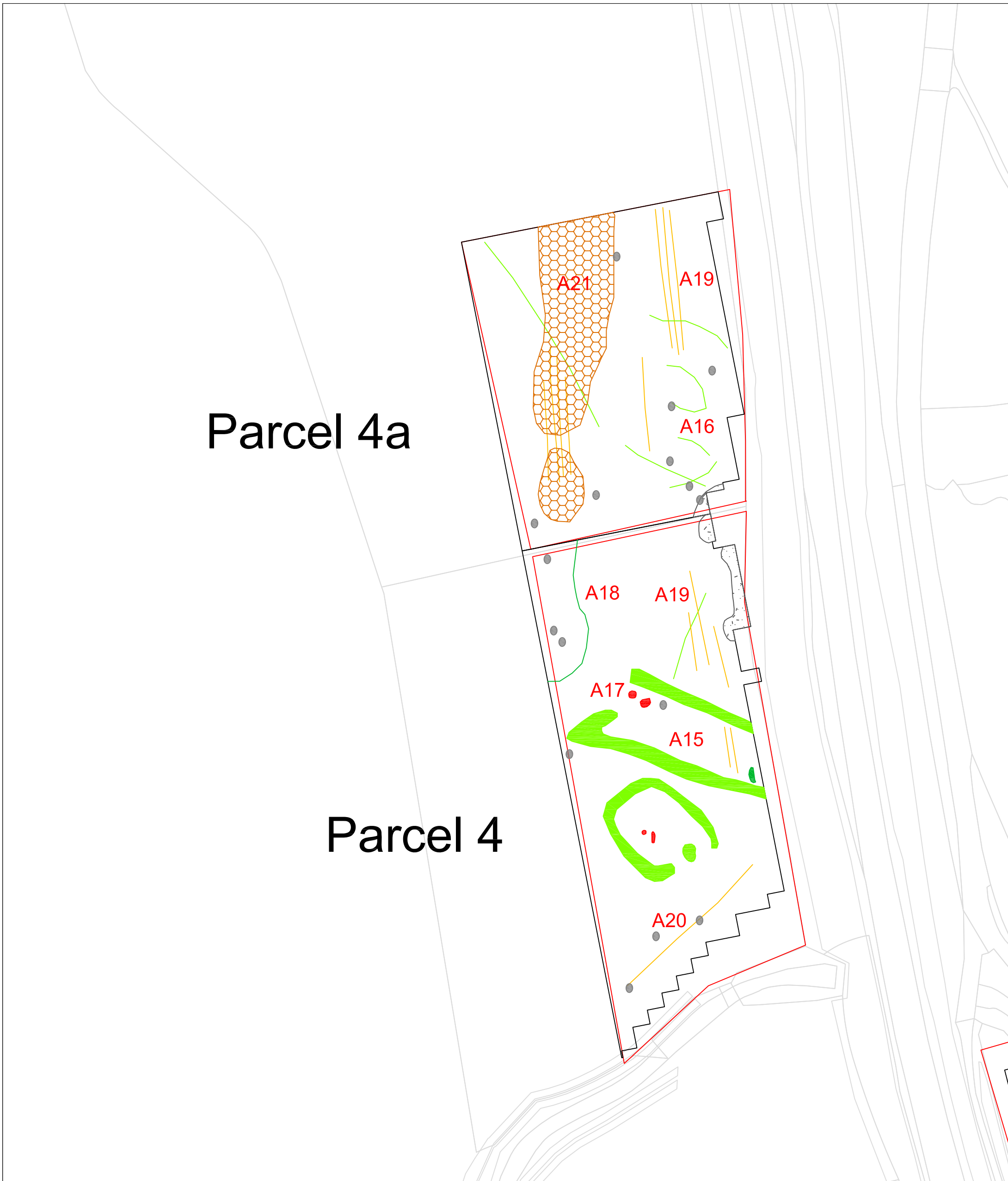
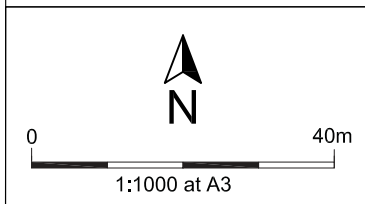


Figure 14: Interpretation of gradiometer survey results - Parcels 4 and 4a



- | | | |
|-------------------------------|------------------------------|-------------------|
| Discrete Trend (Archaeology?) | Geology / Natural | Red line boundary |
| Trend - unclear origin | Area of Disturbance (Modern) | |
| Pit (Archaeology?) | Ferrous / Iron Spikes | |
| Linear Trend (Ploughing) | | |

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

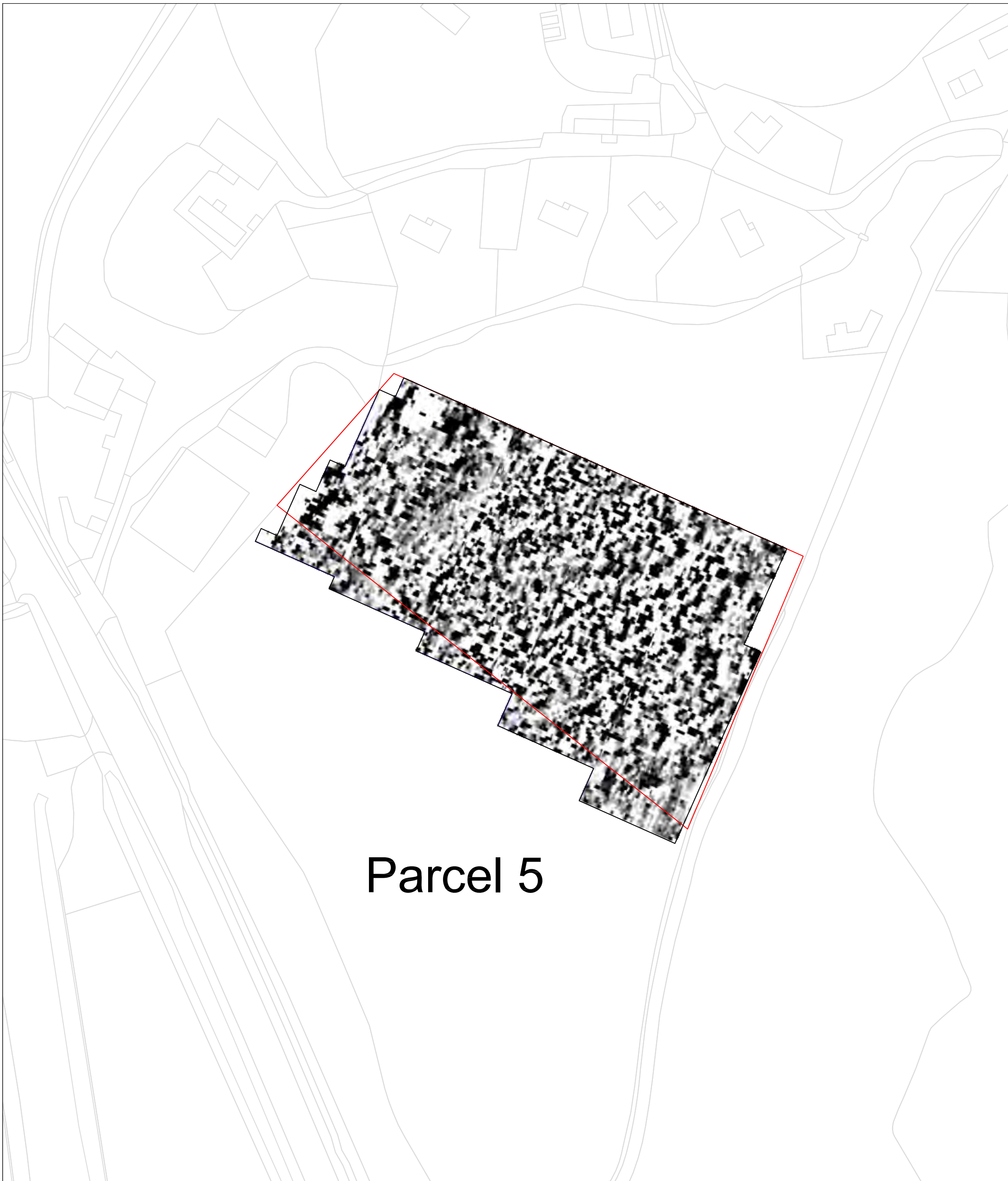
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Interpretation of gradiometer survey results - Parcels 4 and 4a

V3/51736/GEO/F14/12.06.17

Drawn by: KT	Checked by: JL	Approved by: JL
12/06/2017	12/06/2017	12/06/2017

Figure
14





Parcel 5

Figure 15: Minimally processed gradiometer survey results - greyscale plot - Parcel 5

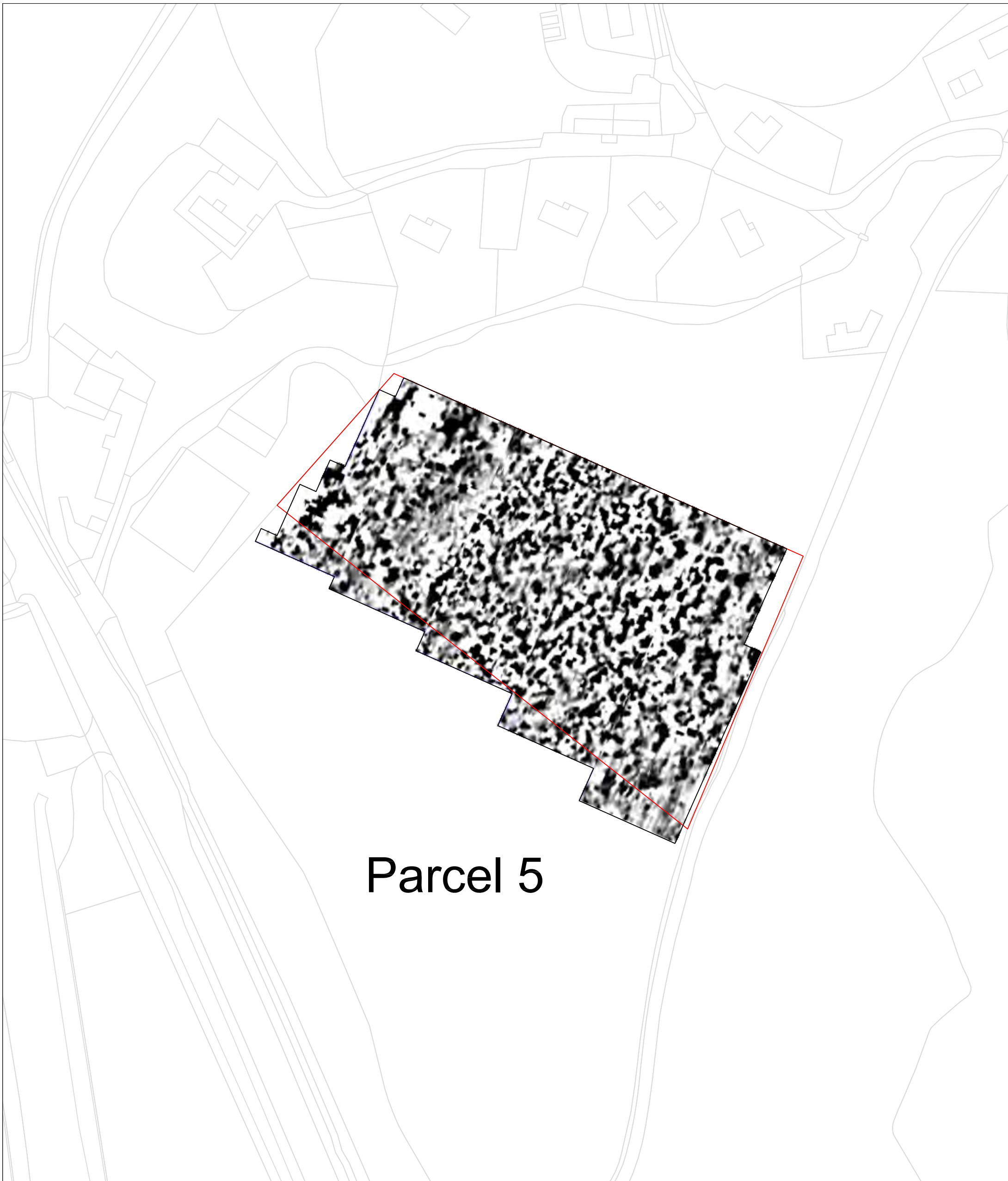
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Figure
15

Scale

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 15		
Minimally processed gradiometer survey results - Parcel 5		
V1/51736/GEO/F15/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Parcel 5

Figure 16: Processed gradiometer survey results - greyscale plot - Parcel 5

Figure 16

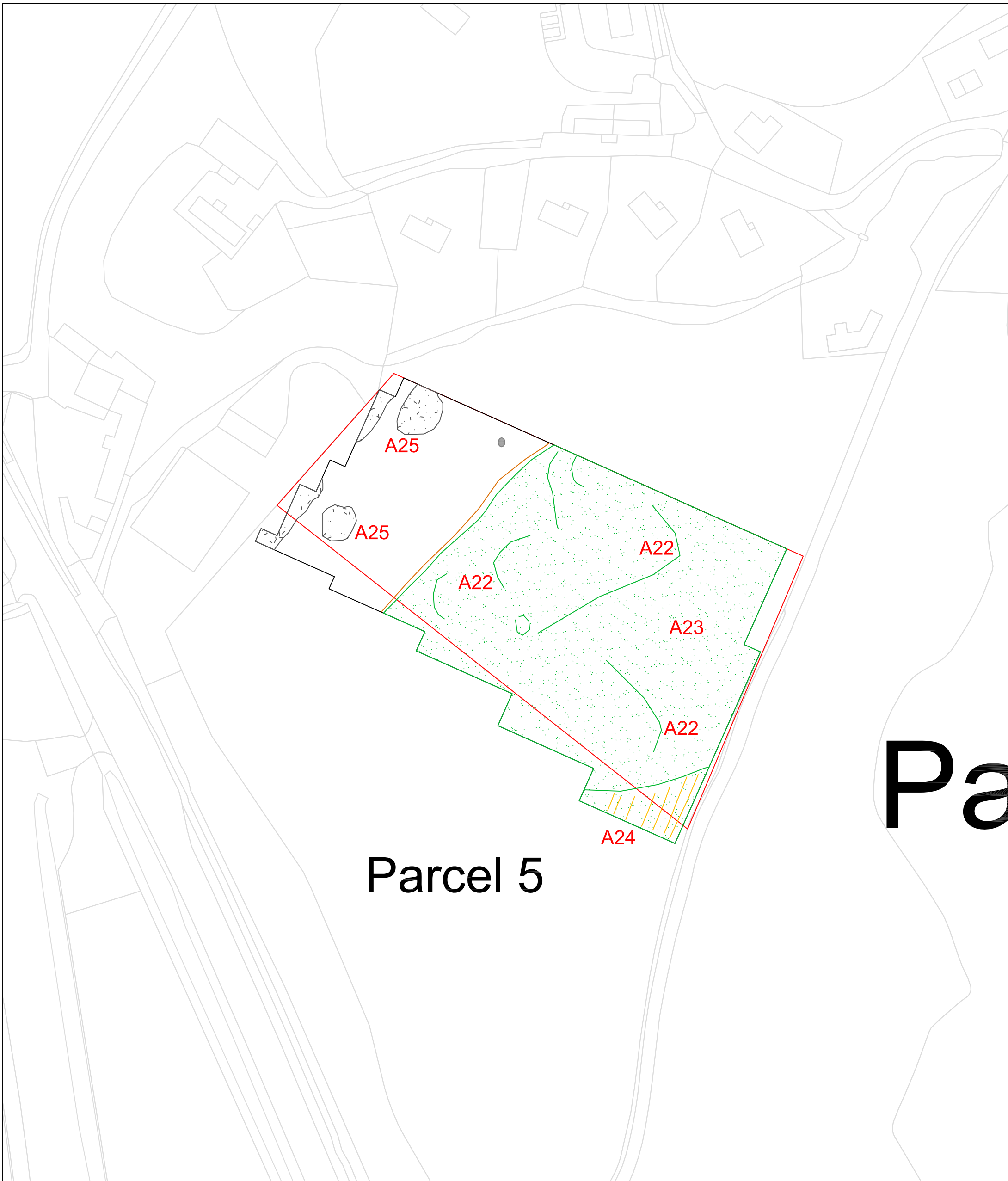
Scale

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Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 16		
Processed gradiometer survey results - Parcel 5		
V1/51736/GEO/F16/25.05.17		
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25/05/2017	25/05/2017	25/05/2017

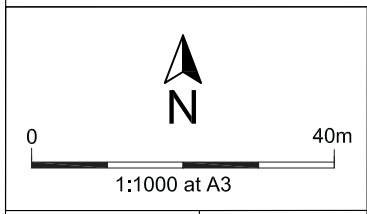




Parcel 5

Pa

Figure 17: Interpretation of gradiometer survey results - Parcel 5



- Trend (Unclear Origin)
- Area of Disturbance (Unclear Origin)
- Linear Trend (Ploughing)
- Area of Disturbance (Modern)
- Ferrous / Iron Spikes
- Red line boundary

Figure
17

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

Drawing Title: Figure 17
Interpretation of gradiometer survey results - Parcel 5

V1/51736/GEO/F17/25.05.17

Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



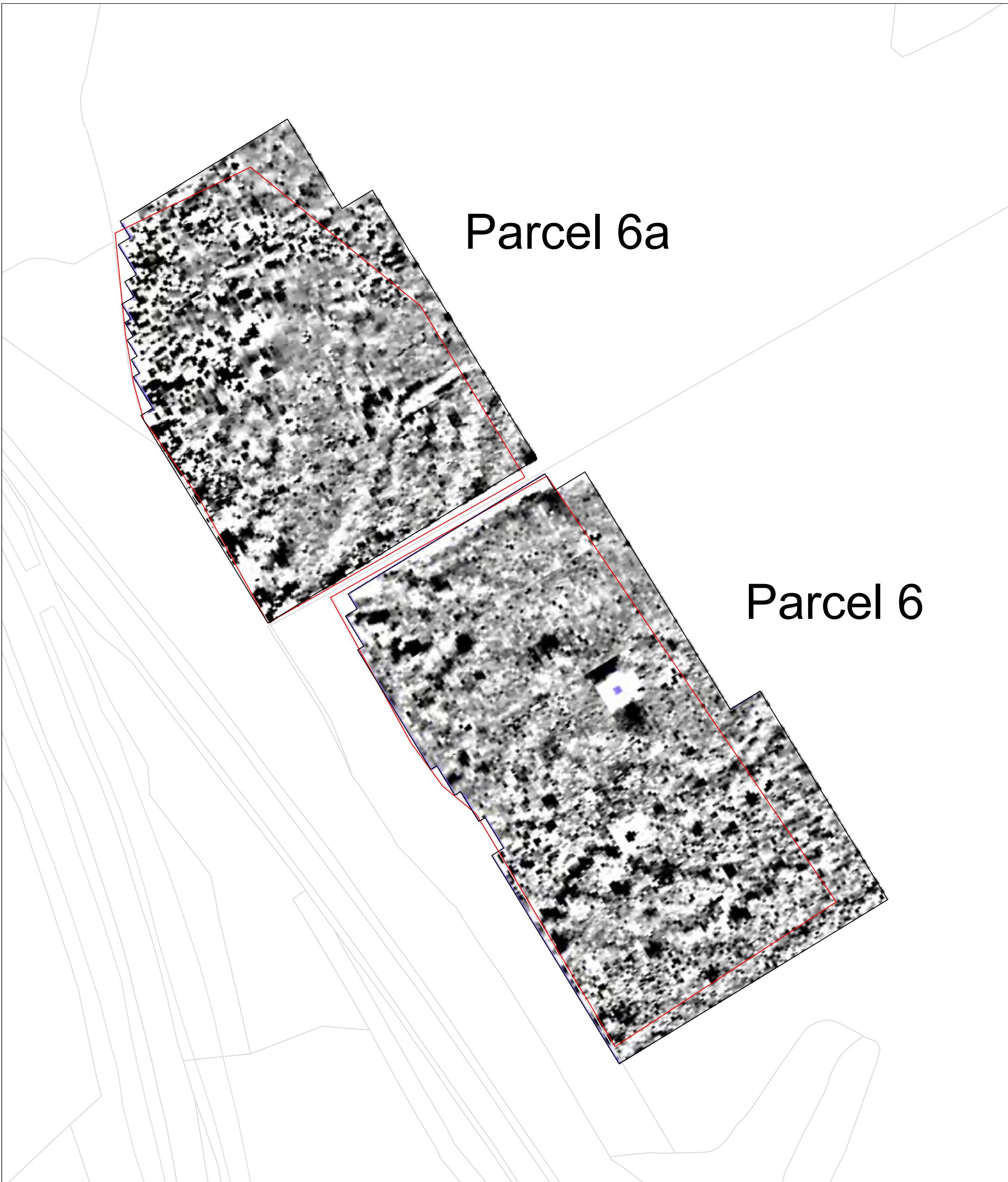


Figure 18: Minimally processed gradiometer survey results - greyscale plot - Parcels 6 and 6a

0 40m

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Figure
18

Scale

2nT
-1nT

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 18		
Minimally processed gradiometer survey results - Parcels 6 and 6a		
V1/51736/GEO/F18/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



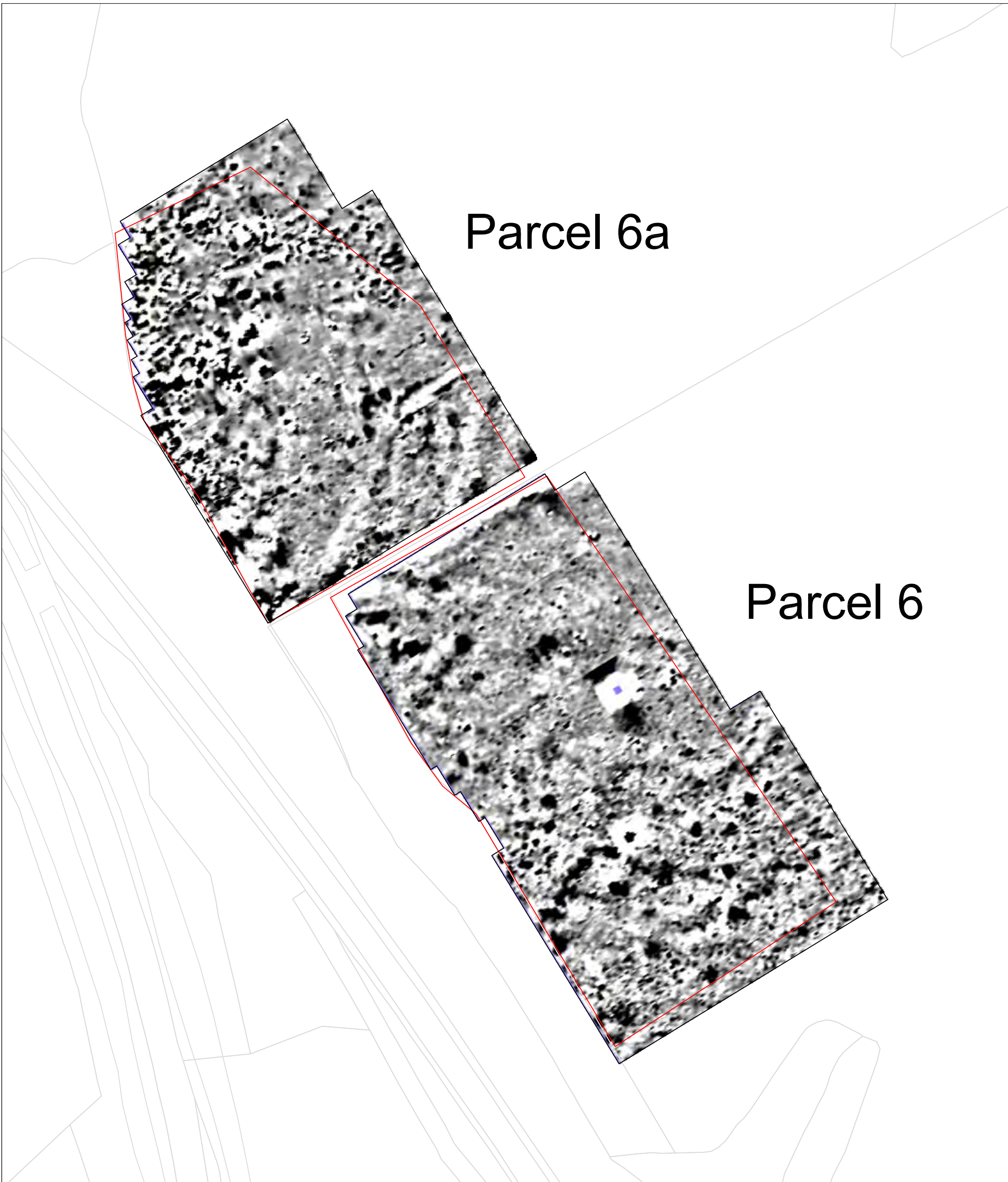


Figure 19: Processed gradiometer survey results - greyscale plot - Parcels 6 and 6a

Figure 19

Scale

2nT

-1nT

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 19		
Processed gradiometer survey results - Parcels 6 and 6a		
V1/51736/GEO/F19/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



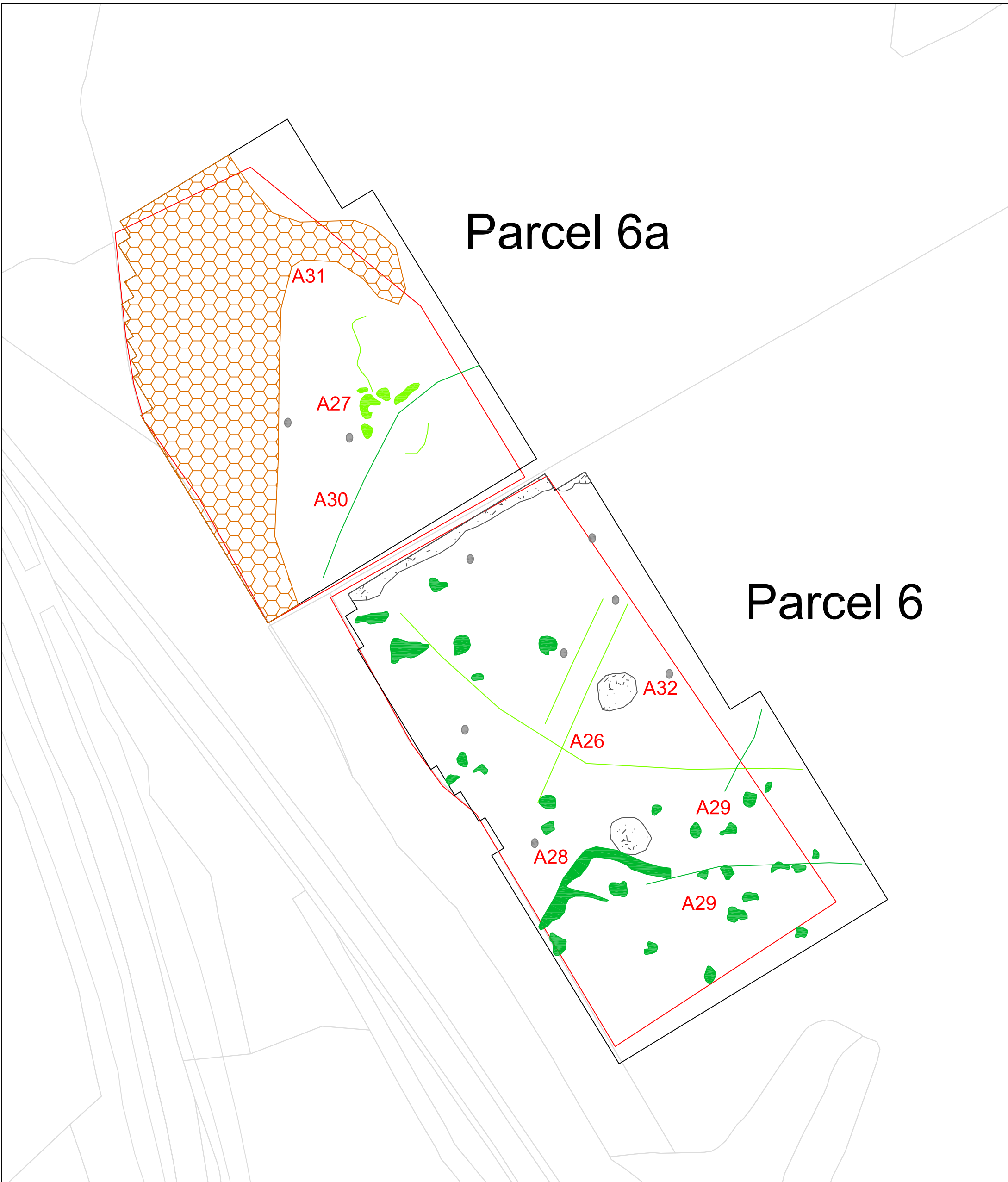
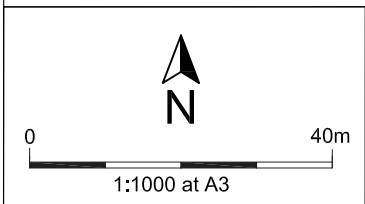


Figure 20: Interpretation of gradiometer survey results - Parcels 6 and 6a



- Discrete Trend (Archaeology?)
- Trend (Unclear Origin)
- Geology / Natural
- Area of Disturbance (Modern)
- Ferrous / Iron Spikes
- Red line boundary

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

Drawing Title: Figure 20
Interpretation of gradiometer survey results - Parcels 6 and 6a

V3/51736/GEO/F20/12.06.17

Drawn by: KT	Checked by: JL	Approved by: JL
12/06/2017	12/06/2017	12/06/2017



Figure
20

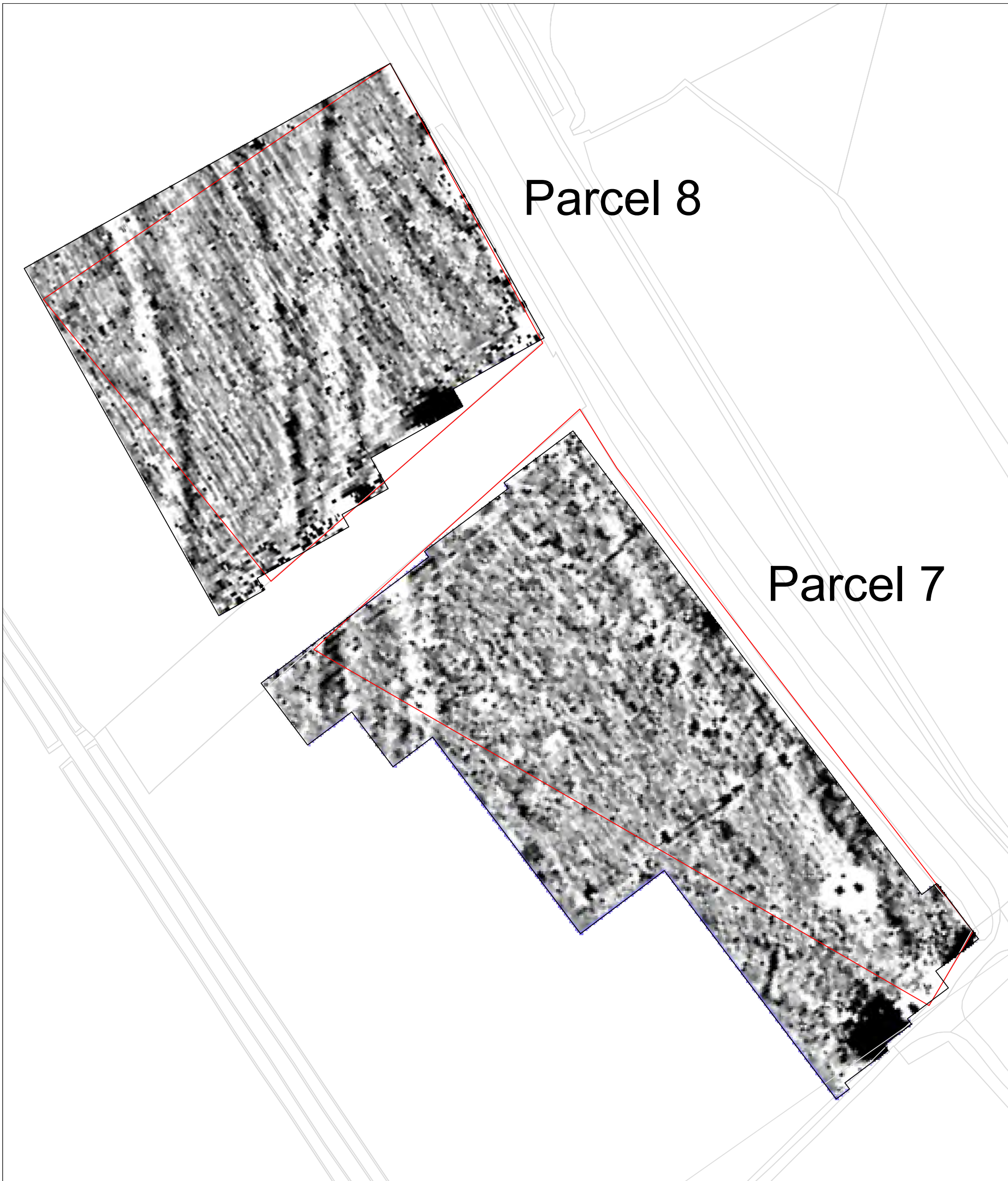


Figure 21: Minimally processed gradiometer survey results - greyscale plot - Parcels 7 and 8

Figure 21

Scale

2nT

-1nT

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 21		
Minimally processed gradiometer survey results - Parcels 7 and 8		
V1/51736/GEO/F21/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



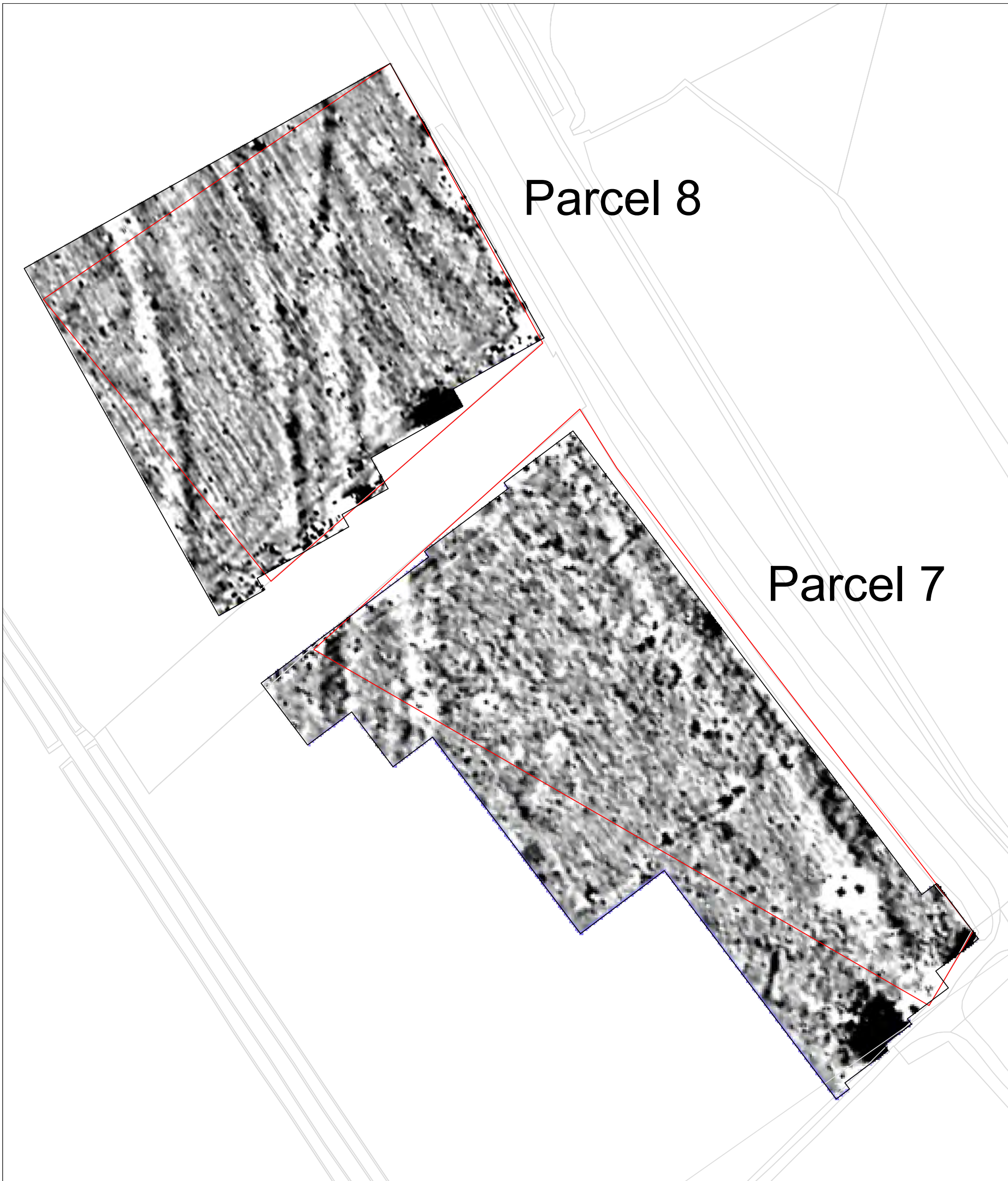


Figure 22: Processed gradiometer survey results - greyscale plot - Parcels 7 and 8

0 40m

1:1000 at A3

Figure
22

Scale

2nT

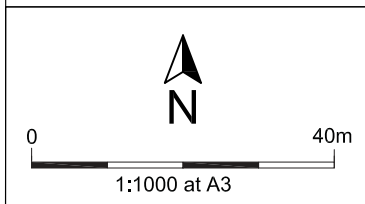
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Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 22		
Processed gradiometer survey results - Parcels 7 and 8		
V1/51736/GEO/F22/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Figure 23: Interpretation of gradiometer survey results - Parcels 7 and 8



- | | | |
|--------------------------------------|------------------------------|-------------------|
| Discrete Trend (Archaeology?) | Linear Trend (Ploughing) | Red line boundary |
| Pit (Archaeology) | Geology / Natural | |
| Trend (Unclear Origin) | Area of Disturbance (Modern) | |
| Area of Disturbance (Unclear Origin) | Ferrous / Iron Spikes | |

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

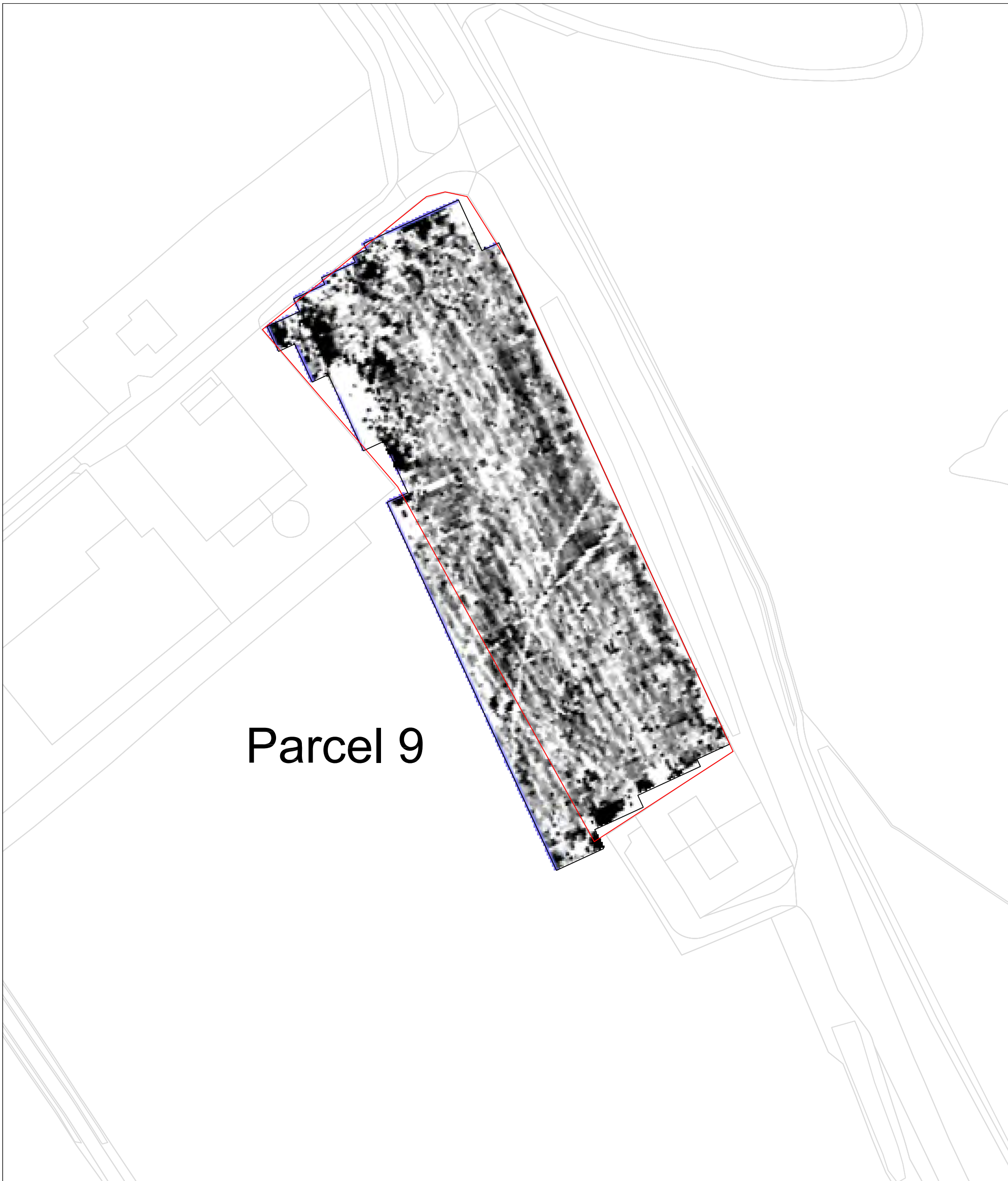
Drawing Title: Figure 23
Interpretation of gradiometer survey results - Parcels 7 and 8

V2/51736/GEO/F23/12.06.17

Drawn by: KT	Checked by: JL	Approved by: JL
12/06/2017	12/06/2017	12/06/2017

Figure
23





Parcel 9

Figure 24: Minimally processed gradiometer survey results - greyscale plot - Parcel 9

Figure 24

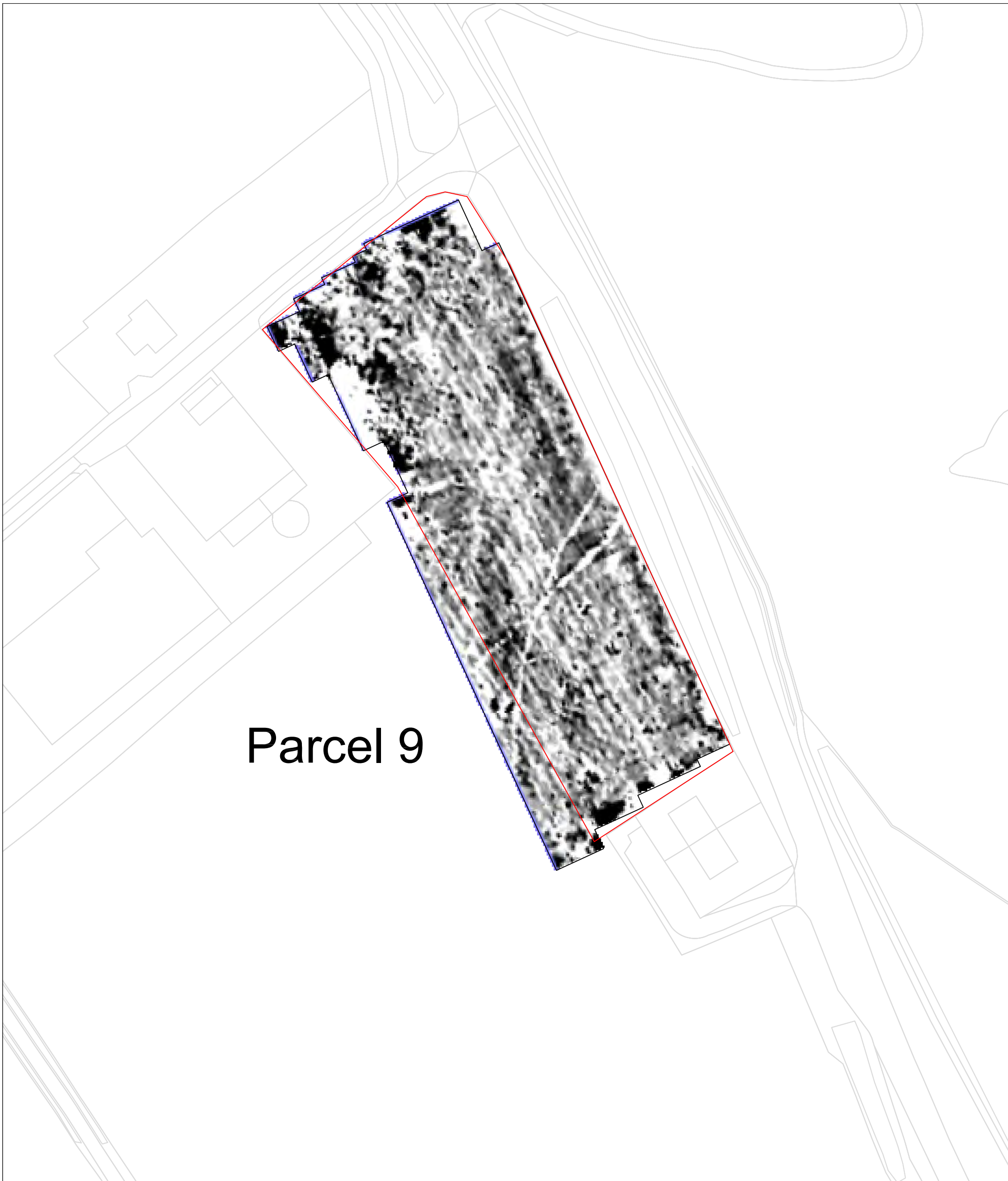
Scale

2nT

-1nT

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 24		
Minimally processed gradiometer survey results - Parcel 9		
V1/51736/GEO/F24/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017





Parcel 9

Figure 25: Processed gradiometer survey results - greyscale plot - Parcel 9

Figure 25

Scale

2nT

-1nT

Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 25		
Processed gradiometer survey results - Parcel 9		
V1/51736/GEO/F25/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



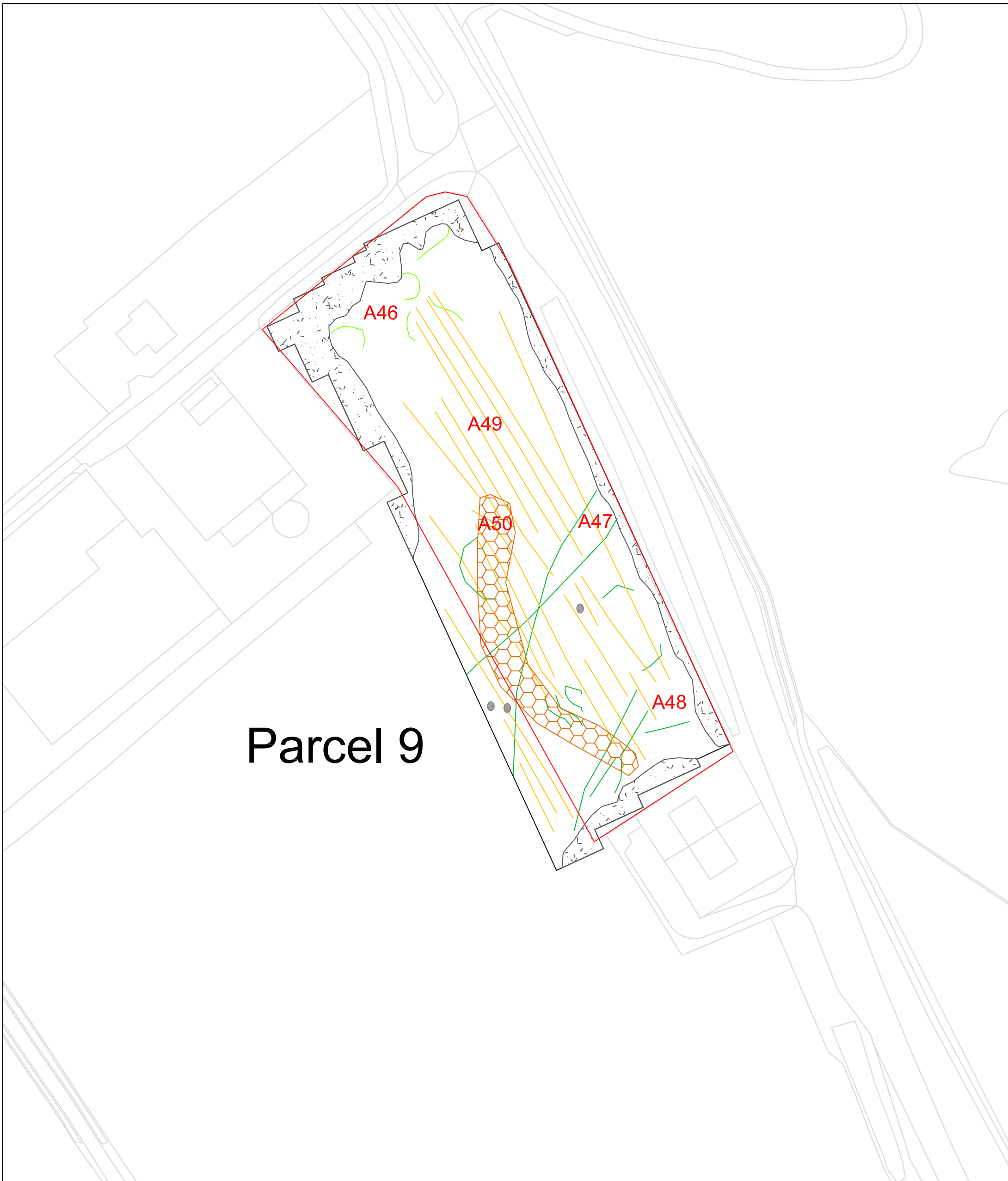
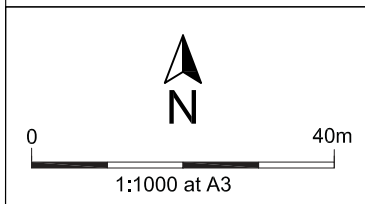


Figure 26: Interpretation of gradiometer survey results - greyscale plot - Parcel 9



- | | | |
|-------------------------------|------------------------------|-------------------|
| Discrete Trend (Archaeology?) | Geology / Natural | Red line boundary |
| Trend (Unclear Origin) | Area of Disturbance (Modern) | |
| Linear Trend (Ploughing) | Ferrous / Iron Spikes | |

Project Title: A9 Dualling: Pass of Birnam to Glen Garry
Project No: 51736 Stage 3

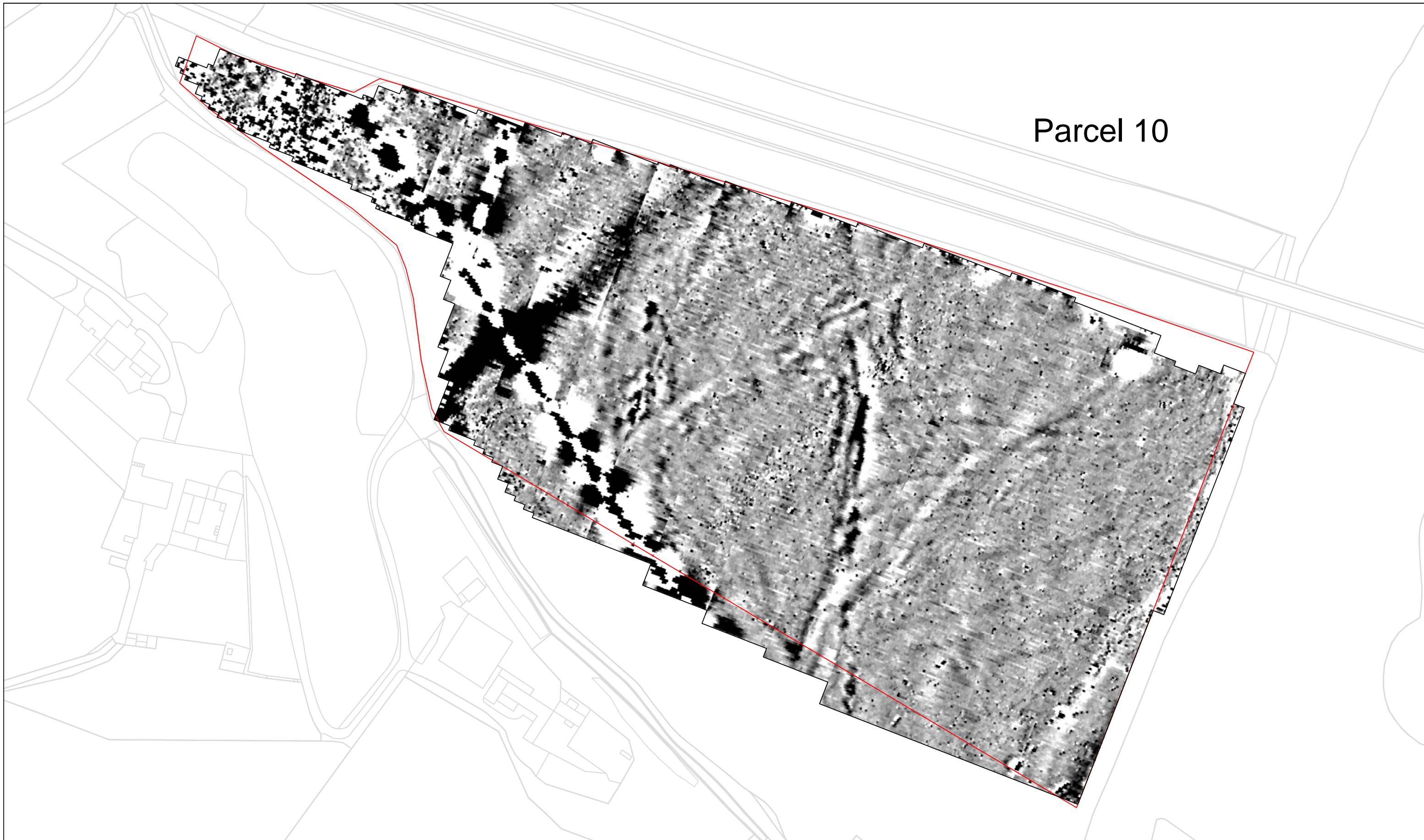
Drawing Title: Figure 26
Interpretation of gradiometer survey results - Parcel 9

V3/51736/GEO/F26/12.06.17

Drawn by: KT	Checked by: JL	Approved by: JL
12/06/2017	12/06/2017	12/06/2017

Figure
26

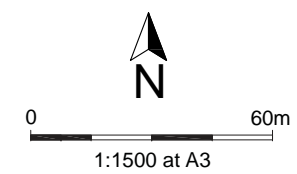
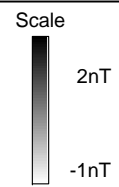




Parcel 10

Figure 27: Minimally processed gradiometer survey results - greyscale plot - Parcel 10

Figure
27



Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 27		
Minimally processed gradiometer survey results - Parcel 10		
V1/51736/GEO/F27/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



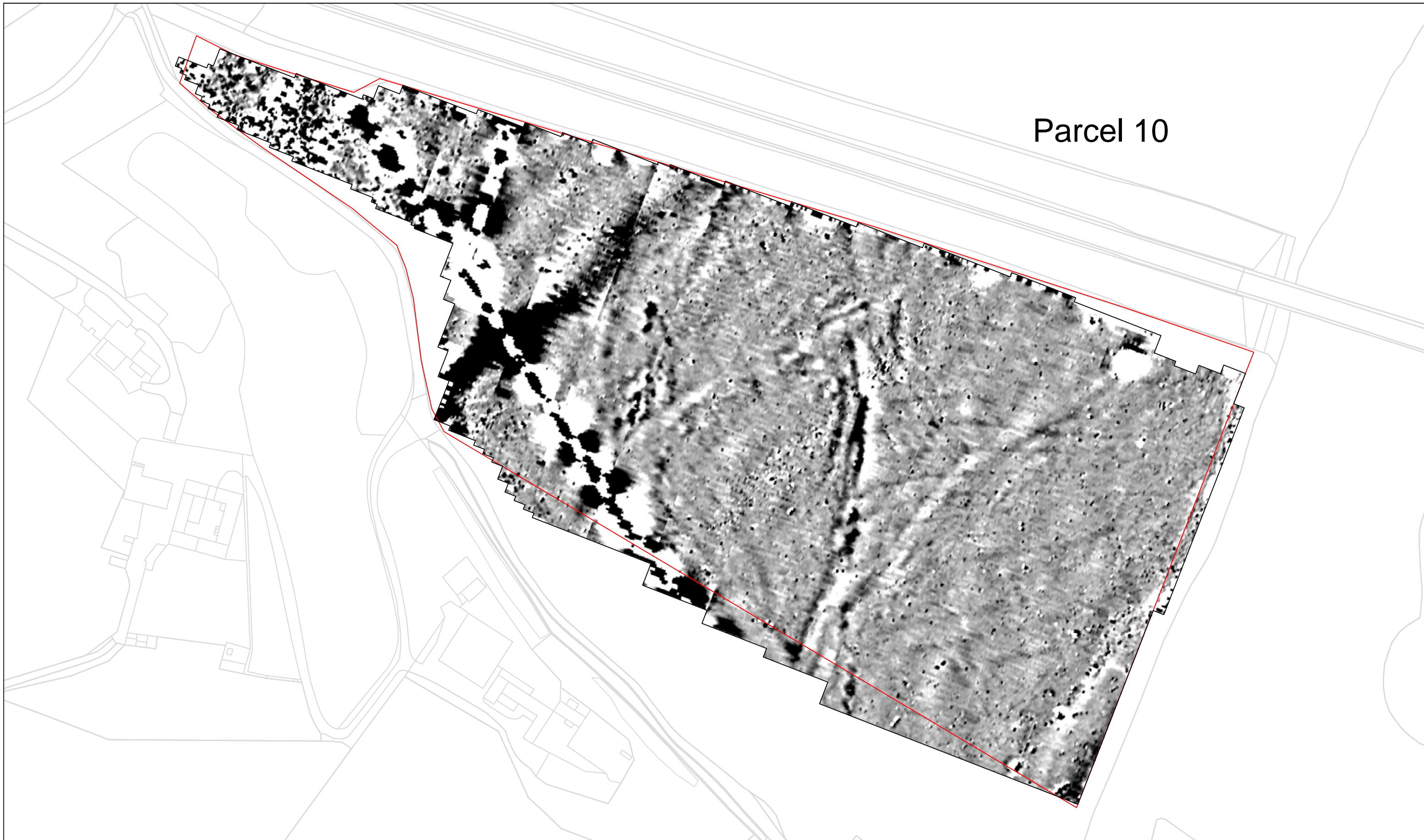
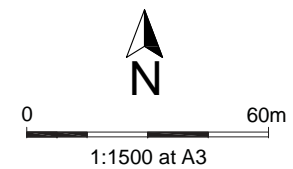
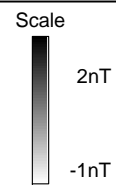


Figure 28: Processed gradiometer survey results - greyscale plot - Parcel 10

Figure
28



Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736 Stage 3		
Drawing Title: Figure 28		
Processed gradiometer survey results - Parcel 10		
V1/51736/GEO/F28/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



Parcel 10

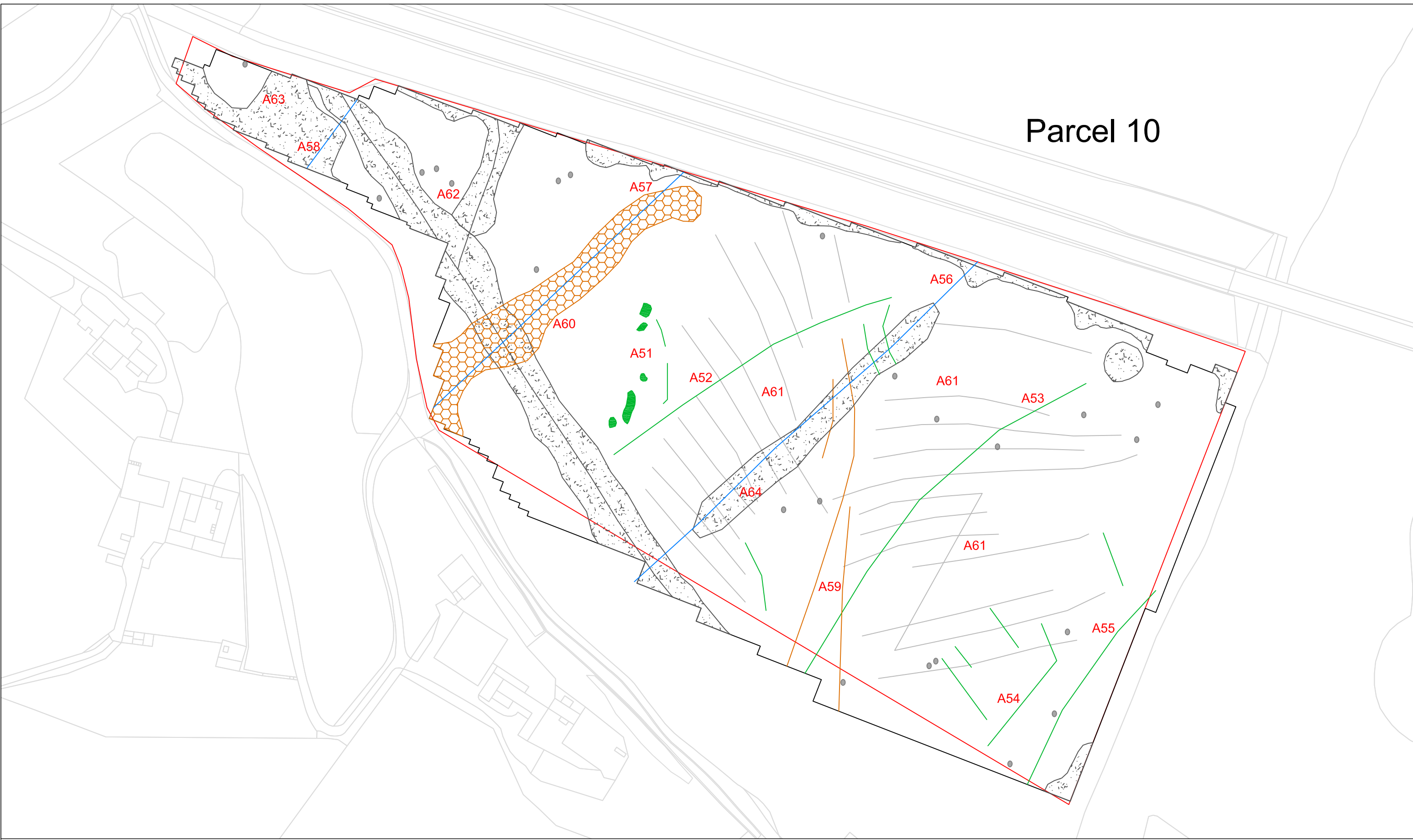
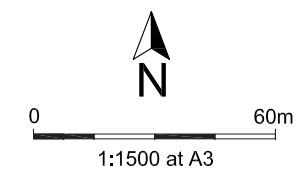


Figure 29: Interpretation of gradiometer survey results - Parcel 10

Figure 29

- | | | |
|-----------------------------|-------------------------------|-----------------------|
| Trend (Unclear Origin) | Geology / Natural | Ferrous / Iron Spikes |
| Old Field Boundary | Linear Trend (Modern Service) | Red line boundary |
| Linear Trend (Field Drains) | Area of Disturbance (Modern) | |



Project Title: A9 Dualling: Pass of Birnam to Glen Garry		
Project No: 51736		
Stage 3		
Drawing Title: Figure 29		
Interpretation of gradiometer survey results - Parcel 10		
V1/51736/GEO/F29/25.05.17		
Drawn by: KT	Checked by: JL	Approved by: JL
25/05/2017	25/05/2017	25/05/2017



Appendix 1: Characterisation of Identified Anomalies

Gradiometer survey

Site Specific Anomaly Code: **A**

Anomaly	Type of Archaeology
A1	Linear trend – unclear origin
A2	Linear trends / sub-circular trends – unclear origin
A3	Trends – unclear origin
A4	Linear trend – unclear origin
A5	Geological trends
A6	Linear trend – unclear origin
A7	Linear trend – unclear origin
A8	Linear trend – Old field boundary
A9	Magnetic disturbance
A10	Magnetic disturbance
A11	Curvilinear trend – unclear origin
A12	Sub-circular trend – unclear origin
A13	Linear trend – Old field boundary
A14	Geology
A15	Discrete trend – Archaeology?
A16	Discrete curvilinear trend – Archaeology?
A17	Pits
A18	Linear trend – unclear origin
A19	Linear trend - agricultural
A20	Linear trend - agricultural
A21	Geology
A22	Discrete trends – unclear origin
A23	Magnetic disturbance – unclear origin
A24	Linear trend - plough
A25	Magnetic disturbance - modern
A26	Discrete linear trend – Archaeology?
A27	Discrete trend – Archaeology?
A28	Discrete rectilinear trend – unclear origin
A29	Sub-circular anomalies – unclear origin
A30	Curvilinear trend – unclear origin
A31	Geology
A32	Magnetic disturbance – modern
A33	Discrete sub-circular trend – Archaeology?
A34	Sub-circular and linear trends – Archaeology?
A35	Rectilinear trend – Archaeology?
A36	Rectilinear trend – Archaeology?
A37	Pit
A38	Trend / disturbance – unclear origin
A39	Anomaly – magnetic disturbance
A40	Linear trend - plough

A41	Geology
A42	Discrete linear trend – unclear origin
A43	Discrete curvilinear trend – unclear origin
A44	Linear trend – agricultural
A45	Geology
A46	Discrete trend – Archaeology?
A47	Discrete trend – unclear origin
A48	Discrete trend – unclear origin
A49	Linear trend – plough
A50	Geology
A51	Sub circular / sub rectangular trends – unclear origin
A52	Linear trend – unclear origin
A53	Linear trend – unclear origin
A54	Rectilinear trend – unclear origin
A55	Linear trend – unclear origin
A56	Linear trend – Old field boundary
A57	Linear trend – Old field boundary
A58	Linear trend – Old field boundary
A59	Geology
A60	Geology
A61	Linear trend – field drains
A62	Linear trend – Possible service
A63	Magnetic disturbance – modern?

Appendix 2: Survey Metadata

Field	Description
Surveying Company	AOC Archaeology
Data collection staff	Kimberley Teale, Genevieve Shaw, Alistair Galt
Client	Jacobs UK
Site name	A9 Dualling Project – Pass of Birnam to Glen Garry – Phase 3
County	Perthshire and Kinross
NGR	NO 00252 47094 to NN 94600 56785
Land use/ field condition	Mixed pasture, scrub and arable
Duration	19/4/17 – 21/4/17 / 24/4/17 – 26/4/17 / 9/5/17 – 11/5/17
Weather	Overcast / Sunny / Snow / Showers
Survey type	Gradiometer Survey
Instrumentation	Trimble GXOR system Bartington Grad 601-2
Area covered	Approx 16.05 ha (242 full and partial)
Download software	Grad601 PC Software v313
Processing software	Geoplot v3.0 and v4.0
Visualisation software	AutoCAD LT 2009
Geology	<p>From the Tay Crossing to Ballinluig; metamorphic bedrock of Dalradian age, belonging to the Southern Highland Group. This is recorded by the BGS GeoIndex as psammities and semipelites, with an area of micaceous psammite at the southern end of the section (Jacobs, 2017).</p> <p>From Pitlochry to Killiecrankie, the underlying bedrock geology comprises predominantly metasedimentary and metavolcanic rocks. The southern extent of the section, to the south of Pitlochry, is primarily underlain by psammities and semipelites belonging to the Southern Highland Group. A small section of metalava and metatuff, also belonging to the Southern Highland Group, underlies the route at ch3250 - ch3550. The northern extent of the route is underlain by metamorphic rocks of the Argyll Group, successively the Loch Tay Limestone Formation (meta-limestone), Ben Lui Schist Formation (semi pelite), Farragon Volcanic Formation (meta-limestone and metatuff), Ben Lawers Schist Formation (calcareous pelite), Ben Eagagh Schist Formation (graphitic pelite) and Carn Maig Quartzite Formation (gritty psammite) (Jacobs, 2017).</p>
Soils	<p>From the Tay Crossing to Ballinluig; superficial deposits within the study area are primarily composed of alluvium (consisting of clay, silt, sand and gravel) and glaciofluvial deposits (consisting of gravel, sand and silt). There are also isolated areas of river terrace deposits along the existing A9 (consisting of gravel, sand, silt and clay). Glacial till is indicated to lie over the lower hillsides. Typically, the existing A9 lies to the eastern edge of the floodplain, at the limit</p>

between the alluvium/river terrace deposits and the glaciofluvial deposits (Jacobs, 2017).

From Pitlochry to Killiecrankie, superficial deposits within the study area are primarily composed of alluvium (consisting of clay, silt, sand and gravel), with the northern section of the route at Faskally underlain by river terrace deposits (consisting of gravel, sand, silt and clay). There is also an isolated area of river terrace deposits from ch2200 to ch2900, located to the south-west of Pitlochry (Jacobs, 2017).

Scheduled Ancient Monument

No

Known archaeology on site

CANMORE IDs: 26229 – Parcel 4a, 82113 – Parcel 6a

Historical documentation/
mapping on site

None

Report title

A9 Dualling – Pass of Birnam to Glen Garry – Phase 3

Project number

51736

Report Author

Kimberley Teale

Report approved by

Graeme Cavers

Appendix 3: Archaeological Prospection Techniques, Instrumentation and Software Utilised

Gradiometer survey

Gradiometer surveys measure small changes in the earth's magnetic field. Archaeological materials and activity can be detected by identifying changes to the magnetic values caused by the presence of weakly magnetised iron oxides in the soil (Aspinall *et al.*, 2008, 23; Sharma, 1997, 105). Human habitation often causes alterations to the magnetic properties of the ground (Aspinall *et al.*, 2008, 21). There are two physical transformations that produce a significant contrast between the magnetic properties of archaeological features and the surrounding soil: the enhancement of magnetic susceptibility and thermoremanent magnetization (Aspinall *et al.*, 2008, 21; Heron and Gaffney 1987, 72).

Ditches and pits can be easily detected through gradiometer survey as the top soil is generally suggested to have a greater magnetisation than the subsoil caused by human habitation. Also areas of burning or materials which have been subjected to heat commonly have high magnetic signatures, examples include: hearths, kilns, fired clay and mudbricks (Clark 1996, 65; Lowe and Fogel 2010, 24). It should be noted that negative anomalies can also be useful for characterising archaeological features. If the buried remains are composed of a material with a lower magnetisation compared with the surrounding soil, the surrounding soil will consequently have a greater magnetisation resulting in the feature displaying a negative signature. For example stone materials of a structural nature that are composed of sedimentary rocks are considered non-magnetic and so will appear as negative features within the data set.

Ferrous objects- i.e. iron and its alloys- are strongly magnetic and are typically detected as high-value peaks in gradiometer survey data, though it is not usually possible to determine whether these relate to archaeological or modern objects.

Although gradiometer surveys have been successfully carried out in all areas of the United Kingdom, the effectiveness of the technique is lessened in areas with complex geology, particularly where igneous and metamorphic bedrock is present. All magnetic geophysical surveys must therefore take the effects of background geological and geomorphological conditions into account.

Gradiometer survey instrumentation

AOC Archaeology's gradiometer surveys are carried out using Bartington Grad601-2 magnetic gradiometers. The Grad601-2 is a high-stability fluxgate magnetic gradient sensor, which uses a 1m sensor separation. The detection resolution is from 0.03 nT/m to 0.1nT/m, depending on the sensor parameters selected, making the Grad601-2 an ideal instrument for prospective survey of large areas as well as detailed surveys of known archaeology. The instrument stores the data collected on an on-board data-logger, which is then downloaded as a series of survey grids for processing.

Gradiometer survey software

Following the survey, gradiometer data is downloaded from the instrument using Grad601 PC Software v313. Survey grids are then assembled into composites and enhanced using a range of processing techniques using Geoscan Geoplot v3.0 / v4.0 (see Appendix 4 for a summary of the processes used in Geoplot and Appendix 5 for a list of processes used to create final data plots).

Appendix 4: Summary of Processes used in Geoplot

Process	Effect
Clip	Limits data values to within a specified range
De-spike	Removes exceptionally high readings in the data that can obscure the visibility of archaeological features. In resistivity survey, these can be caused by poor contact of the mobile probes with the ground. In gradiometer survey, these can be caused by highly magnetic items such as buried ferrous objects.
De-stagger	Corrects a misalignment of data when the survey is conducted in a zig-zag traverse pattern.
Edge Match	Counteracts edge effects in grid composites by subtracting the difference between mean values in the two lines either side of the grid edge.
High pass filter	Removes low-frequency, large scale detail in order to remove background trends in the data, such as variations in geology.
Interpolate	Increases the resolution of a survey by interpolating new values between surveyed data points, creating a smoother overall effect.
Low Pass filter	Uses a Gaussian filter to remove high-frequency, small scale detail, typically for smoothing the data.
Periodic Filter	Used to either remove or reduce the appearance of constant and reoccurring features that distort other anomalies, such as plough lines.
Wallis filter	Applies a locally adaptive contrast enhancement filter.
Zero Mean Grid	Resets the mean value of each grid to zero, in order to counteract grid edge discontinuities in composite assemblies.
Zero Mean Traverse	Resets the mean value of each traverse to zero, in order to address the effect of striping in the data and counteract edge effects.

Appendix 5: Survey Processing Steps

Gradiometer survey	
Process	Extent
Zero Mean Traverse	All LMS =on, threshold -5 to 5
Despike	X=1 Y=1 Thr = 3 Repl = Mean
Clip	Min =-5 Max = 5
Destagger	All grids dir Shift = 2 Line Pattern 34-78 Dual-DS
Low Pass filter	X=1 Y=1 Wt=G
Interpolate	Y, Expand – Expand –SinX/X x2
Raw Palette Scale	Grey08 Min= -1nT Max= 2nT
Palette Scale	Grey08 Min= -1nT Max= 2nT

Appendix 6: Technical Terminology

Type of Anomaly	Description
Archaeology	
Archaeology - Trend	<p>These are made up of linear / curvilinear / rectilinear anomalies and are either characterised by an increase or decrease in values compared to the magnetic background.</p> <p>This evidence is normally supported by the presence of archaeological remains and is confirmed by other forms of evidence such as HER records and aerial photography.</p>
Archaeology - Area of Disturbance	<p>This is characterised by a general increase and decrease of magnetic responses over a localised area and does not appear as having a linear form. These anomalies do not have the high dipolar response which are manifested in an 'iron spike' anomaly. This anomaly may be supported by the known location of a former building, or other forms of evidence such as HER records and aerial photography.</p>
Archaeology - Pit	<p>An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit.</p> <p>This evidence is normally supported by the presence of archaeological remains and is confirmed by other forms of evidence such as HER records and aerial photography.</p>
Discrete Archaeology	
Archaeology? – Trend	<p>Anomalies of a linear / curvilinear / rectilinear form either composed of an increased or decreased signal compared to magnetic background values.</p> <p>It is possible these anomalies belong to archaeological remains, but poor patterning or weaker response values makes interpretation difficult.</p> <p>Where historical records are present, the anomalies would appear to be weak or inconclusive.</p>
Archaeology? - Area of Disturbance	<p>Anomalies with an increase or decrease in magnetic values compared with the magnetic background over a localised area. Poor patterning or weak signal changes creates difficulty in defining the origin of the anomaly and so interpretation is only tentative. The anomaly lacks definitive records to confirm its origin as being archaeological.</p> <p>Disturbed areas could indicate the presence of buried rubble relating to fallen structures, or instead denote modern material from either quarrying or agricultural activity. On certain geologies these anomalies could be caused by in-filled natural features.</p>
Archaeology? – Pit	<p>An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit, but is isolated in its location and association with other features.</p>
Unclear Origin	
Linear Trend	<p>Anomalies of a linear / curvilinear form which are composed of a weak or different change in magnetic values. Coupled with poor patterning, the anomaly is difficult to interpret and it is unclear whether it has an archaeological origin.</p>
Area of Disturbance	<p>An area of magnetic disturbance which consists of a variety of increased and decreased magnetic values compared with background readings, but lacks sufficient patterning or context for a conclusive interpretation. It is likely that these readings are caused by modern disturbances, but interpretation is tentative.</p>

<i>Agricultural</i>	
Linear Trend (Old Field Boundary)	These isolated long linear anomalies, most often represented as a negative magnetic trend, are likely to relate to former field boundaries. The magnetic signal may appear inconsistent but when the positioning is cross referenced with historic mapping, it is confirmed as a former field boundary.
Linear Trend (Old Field Boundary?)	These isolated long linear anomalies, most often represented as a negative magnetic trend, are likely to relate to former field boundaries. The positioning is not supported by historic mapping, but is often confirmed with adjacent ploughing patterns.
Linear Trend (Ridge and Furrow / Rig and Furrow)	A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. The width between the anomalies is consistent with that of a Ridge and Furrow ploughing regime, which is normally wider than conventional ploughing methods.
Linear Trend (Conventional ploughing)	A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. The regular patterning is likely to denote the presence of ploughing, however isolated trends can occasionally be observed that follow the orientation of ploughing trends seen elsewhere in the area. Anomalies seen adjacent to field edges are representative of headlands caused by ploughing.
Linear Trend (field drainage)	A series of linear anomalies of an indeterminate date, usually with a regular or herringbone patterning and regular spacing. These are likely to represent agricultural activity such as land drainage.
<i>Non - Archaeology</i>	
Geology / Natural	An area of disturbance that is composed of irregular significant increases or decreases in magnetic values compared with background readings and is likely to indicate natural variations in soil composition or geology.
Linear Trend (possible modern service)	Anomalies of a linear form often composed of contrasting high positive and negative values. Such anomalies usually signify a feature with a high level of magnetisation and are likely to belong to modern activity such as pipe lines or modern services.
Disturbed Area (modern disturbance?)	An area of disturbance that is likely to be caused by modern activity and is characterised by significant increases or decreases in magnetic values compared with background readings.
Isolated Dipolar Anomalies / Ferrous (iron spikes)	A response normally caused by ferrous materials on the ground surface or within the top soil, which causes a 'spike' representing a rapid variation in the magnetic response. These are generally not assessed to be archaeological when surveying on rural sites, and generally represent modern material often re-deposited during manuring.

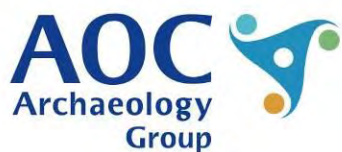
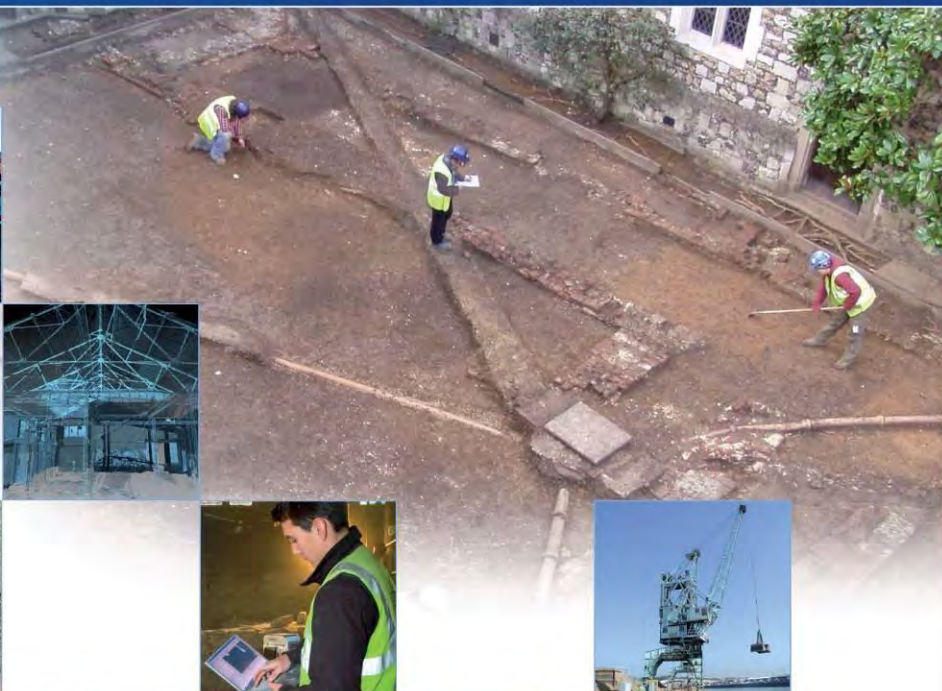
Appendix 8: Discovery and Excavation in Scotland text

Appended to OASIS entry:

As part of the A9 dualling programme, magnetometry survey of thirteen parcels, totalling approximately 16.05 hectares, was carried out between Dowally and Pitlochry. The results produced evidence for possible enclosures in the northern section (just south of Pitlochry) as well as possible enclosures and ditches in the central section of the scheme. Several other features of an unclear origin were identified across the survey areas, including discrete linear trends and pit like features.

Sponsor: Jacobs UK

Contributors: James Lawton, Kimberley Teale, Alistair Galt



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