Bassetlaw Garden Village
Morton, Nottinghamshire

Archaeological Geophysical Survey

National Grid Reference:
AOC Project No: 40161
Date: December 2021

AOC Archaeology Group

ARCHAEOLOGY | HERITAGE | CONSERVATION

Bassetlaw Garden Village

Nottinghamshire

Archaeological Geophysical Survey

On Behalf of:	**Bassetlaw District Council** **Queens Buildings** **Potter Street** **Worksop** **Nottinghamshire** **S80 2AH**
National Grid Reference (NGR):	**SK 65670 78460 (centred)**
AOC Project No:	**40161**
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Date of survey:	**XX XXX 2021 and XX XXXX 2022**
Surveyors:	**S. O'Connor, F. Forrester, C. Sykes. N. Holt**

This document has been prepared in accordance with AOC standard operating procedures.

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Non-Technical Summary

*AOC Archaeology Group was commissioned by Bassetlaw District Council to undertake an archaeological geophysical gradiometer and targeted earth resistance survey on *** 2021 and 2022 to investigate the potential for buried archaeological remains ahead of a proposed development on land to the east of the A1, Bassetlaw (centred at SK 65670 78460).*

A total of 156.28 hectares across twenty two fields were surveyed with fluxgate gradiometers. Four areas were targeted with Earth Resistance covering a total area of 1.89ha. The results of the survey have identified the following.

TO BE UPDATED ON COMPLETION OF SURVEY

1 Introduction

1.1 AOC Archaeology Group was commissioned by Bassetlaw District Council to undertake an archaeological geophysical gradiometer and targeted earth resistance survey of a site at Bassetlaw, Nottinghamshire. The survey was conducted during *** to *** 2021 and 2022 as part of a wider scheme of archaeological assessment in advance of the proposed development of the site.

1.2 Archaeological geophysical survey uses non-intrusive and non-destructive techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits, as far as is reasonably possible (CIfA, 2014).

1.3 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 The proposed development site (hereafter 'the Site') is located to the east of the A1 and to the west of Retford, Nottinghamshire, centred at SK 65670 78460 (Figure 1).

2.2 The Site is roughly triangular, enclosing an area of approximately 220 hectares, and currently in use as arable farmland. The Site is bound by the Sheffield to Lincoln railway line to the north, by the A1 to the west and southwest and by arable farmland to the east. The Site has the B6420 Mansfield Road running through it (aligned southwest to northeast from the A1 towards Retford) as well as several smaller roads providing access to Morton Hill Farm and Upper Morton as well as fields.

2.3 The Site lies at a height of approximately 45 m OD at its southwestern corner, 45 m OD at its northwestern corner and generally descends from its western edge to approximately 38m OD at its north eastern corner (Street Map, 2021).

2.4 The Site sits on the Chester Formation sandstone (BGS, 2021). This is a pebbly (gravelly), sedimentary bedrock formed approximately 247 to 250 million years ago in the Triassic Period. This sandstone formation is fluvial in origin and detrital, ranging from coarse to fine grained and form beds and lenses of deposits reflecting the channels, floodplains, and levees of rivers. Only part of the northern section of the Site has any superficial deposits recorded. These were described as Till (Sand and Gravel) (BGS, 2021).

2.5 The soils within the Site are classed as freely draining slightly acid sandy soils (Soilscapes, 2021).

2.6 Gradiometer survey is suggested to provide an average response over sandstones, river terrace and alluvial formations (David *et al.* 2008, 15).

2.7 Earth resistance survey can be affected by the season, depending on how saturated the ground conditions are and if water pooling has occurred against buried surfaces or foundations. If there are temperate conditions and the ground is neither too saturated nor too waterlogged, then it is likely that anomalies of interest will be identified and not be adversely affected by the background readings.

3 Archaeological Background

3.1 The archaeological background below is drawn from the desk-based assessment of the site, undertaken by AOC Archaeology in 2021 (AOC, 2021). Any references found below can be found within the AOC DBA, which is turn is referenced in the bibliography of this report.

Prehistoric (500,000 BC – AD 43) and Roman (AD 43 – 410)

3.2 The earliest known prehistoric evidence within the study area are findspots and artefact scatters (Sites 6, 40 and 47) and the extensive cropmark evidence (Sites 7 to 25, 31 to 35, 37 to 39, 48 to 54, 56, 58 and 59) identified though aerial photography and the National Mapping Programme (Deegan, 1999).

3.3 The nearest major Roman settlement to the site was the town of Segelocum (recorded in the NHLE as Scheduled Monument no.1003669), located at Littleborough c.15 km east of the Site boundary. This town sat on the road between Doncaster (Danum) and Lincoln (Lindum) and guarded a ford point across the River Trent.

3.4 Finds identified within the 1 km study area include a Roman coin hoard (Site 6) which contained copper and silver coins dating AD54 though to AD180 found just to the south of Morton Hall. Further finds dating from the 1st century BC through to the 3rd century AD (Site 40) are recorded as an artefact scatter in the Nottinghamshire HER. The description of this entry indicates that the finds were recovered from stratified deposits during the excavation of a multi-phased site which included evidence for an enclosure, timber framed buildings and a palisade. No further details of this excavation were noted. The only findspot identified within the Site (Site 47) was a fragment from the upper stone of a beehive quern made from coarse grained millstone grit thought to date to the Iron Age or Romano British period.

3.5 The National Mapping Programme, a programme of air photo interpretation and mapping (Deegan, 1999) has identified a large and complex arrangement of cropmarks within the Site, previously identified by Riley in 1980, which were assigned the nomenclature “brickwork plan” fields (Figure 10). The “Brickwork Plan” landscape covers over 10 square miles in North Nottinghamshire and is named for the rectilinear fields. Archaeological investigation of systems of this type has revealed that these landscapes are typically made up of several elements, phases and settlement types, with a chronological depth which begins before the Roman conquest and extends to the 4th century. They are characterised by simple rectangular enclosures of varying sizes, with varying depths and widths of ditches, and clusters of enclosures belonging to various Roman phases. Excavation of one such cluster at Dunstan’s Clump revealed occupation spanning the 1st to 3rd centuries, whilst excavation of another ditched rectangular enclosure, at Menagerie Wood, Worksop, showed settlement from the 2nd to 4th centuries with several phases of ditch digging, pits, post-hole, and possible palisades (Bishop, 2018, 4). A geophysical survey and trial trench evaluation in 2004, adjacent to the south western part of the Site, revealed a series of ditches, forming field boundaries (which appear to correlate to the cropmark evidence) and a pair of pits (OA, 2004).

3.6 The 12 areas of cropmarks identified within the Site boundary comprise; two rectangular enclosures (one double ditched) and adjoining linear cropmarks (Site 17), square enclosures linked to east west aligned, and north south aligned linear features (Site 18), a small square enclosure with an entrance on its southern side (Site 19), linear features (Site 21), linked rectangular enclosures east of Morton Hill Farm (Site 22), a group of three rectangular enclosures in a line aligned west to east (Site 23), an irregular shaped enclosure with possible entrance in its eastern corner (Site 24), linear features (Site 25), rectangular enclosures (one double ditched) with adjoining linear cropmarks (Site 51), an irregular series of linked enclosures (quite dense) including one circular feature (Site 52), linked rectangular enclosures east of Morton Hill Farm (Site 53) and a group of three rectangular enclosures in a line aligned west to east (Site 54).

3.7 There are a further 25 areas of cropmarks (Sites 7-16, 20, 31-35, 37-39, 48-50, 56, 58 and 59) identified within the 1 km study area, outside the Site boundary. These cropmarks conform to a similar pattern of rectilinear and square enclosures, with associated linear features, some possibly forming

trackways. These “brickwork” field patterns are thought to relate to Romano British, or potentially Iron Age, settlement, and land use. Further details of the cropmarks outlined above can be accessed in the gazetteer.

3.8 The National Mapping Programme records that “dating evidence for the expansive field systems and enclosures recorded across much of the arable areas of the Sherwood Sandstones is limited. The area is generally under-developed and thus excavation in the current climate of archaeological funding is uncommon. Furthermore, the recovery of culturally diagnostic material and environmental data is rare. However, investigations of features at Dunstans Clump, Babworth and ScroobyTop,Ranby indicate late Iron Age and Romano-British dates for those elements of the landscapes” (Deegan, 1999, 78). Babworth is close (1.6 km) to the north eastern boundary of the Site so there appears to be some potential for finds dating to this period to be recovered from these “brickwork” fields.

3.9 This extensive network of cropmarks appears to indicate widespread settlement and land use. There is, therefore judged to be a High potential for Prehistoric and Roman remains to survive on the Site. Any such Prehistoric and Roman remains have the potential to provide dating evidence and further detail regrading settlement patterns and economic structure in Nottinghamshire in this period and thus have the potential to be of Regional significance.

Early Medieval (AD 410 – 1066) and Medieval (AD 1066 – 1540)

3.10 The place names most closely associated with the Site are Mortune et alia, Mortune, Nordermortune, or Nortmortun in the Domesday survey. The etymology of Mortun is derived from the Saxon words for a settlement (tun) or farm close to a (more) mar

3.11 No remains of Early Medieval date are recorded within the Site boundary or the 1 km study area.

3.12 There are three entries within the Domesday book that appear to relate to the study area. Domesday lists a Morton and Little Morton which are both recorded under the same entry (these appear to be located to the east of the study area and relate to the recorded deserted medieval village). This entry details that prior to the Norman Conquest (1066) Earl Tosti is noted as the lord. King William is recorded as the lord and tenant in chief in 1086. Seven freemen, one smallholder, four ploughlands, and three men’s plough teams are documented as well as one acre of meadow. The second entry names ‘free men’ or ‘five’ as the lord in 1066 which is perhaps evidence of the small nature of the village. Robert Bigot is again recorded as lord and tenant in chief in 1086 as well as five freemen and 2.5 men’s plough teams and six acres of meadow.

3.13 Another entry, named North Morton, is mapped by the Open Domesday project within the north western part of the Site (broadly correlating to the modern location of Morton Hill Farm). The entry for North Morton details that prior to the Norman conquest (1066) Asfrith or Leofketel of Morton were named as the lord. Roger of Bully is named as lord and tenant in chief in 1086, as well as two ploughlands and 1.5 furlongs of woodland. A second entry detailing the Land of Ernwin the priest was also recorded for this location. Prior to the Norman conquest (1066) Eskil of Nuthall is named as lord. Ernwin the priest is named as lord and tenant in chief in 1086 but no other details were recorded.

3.14 No Medieval remains are recorded within the Site boundary. The only Medieval assets recorded within the 1 km study area are the location of the Morton in Babworth deserted medieval village (Site 55) and elements of the Grade II Listed Rushey Inn Cottages (Site 5).

3.15 The location of the deserted medieval village of Morton in Babworth (Site 55) is identified by a cluster of cropmarks which reveal the plan of a network of small fields which bears no relation to the

''brickwork'' pattern of fields seen in the wider study area. This settlement is thought to have been abandoned by 1504.

3.16 The above indicates that there was limited occupation of the area around the Site throughout the Medieval period and it is likely that the Site was in use as agricultural fields. It is assessed, therefore, that there is a Low potential for remains dating to this period to survive. Any such remains that do survive will likely relate to agricultural activities. Any surviving archaeological features relating to the Medieval period are likely to be of Local significance.

Post medieval – Industrial Period (AD 1540 – 1901)

3.17 The Site lies within agricultural land within the parish of Babworth which was described by Throsby in the Post-Medieval period as "bound on the east by West-Retford and on the West by Worksop. It comprehends the hamlets of Great Morton, Little Morton, Norton Grange & Ranby; the whole contains nearly 6000 acres of land, sandy soil, most of which has been enclosed lately from the forest. It is cultivated as most of the forest land is by a succession of wheat, turnips, barley, & grass-seeds" (Throsby, 1796, 447-449).

3.18 Within the wider 1 km Study Area the post-medieval remains relate to the development of Clumber Park (Sites 1, 4 and 36), Morton Park (Sites 2, 42, 66 and 67), and features associated with isolated farmsteads (Sites 3, 26, 27, 60, 62, 64, 65) as well as a milestone (Site 29).

3.19 The earliest maps of Nottinghamshire such as Blaeu's Comitatvs Nottinghamensis of 1662-65 are schematic and do not record settlements and land use in detail, although they do show a settlement at Ofburton between Worksop and Babworth. John Cary's 1794 map of England, Wales and Scotland (Figure 5) shows in detail the layout of the roads connecting the settlements of Worksop, Morton, Babworth and Retford as well as some detail of the extent and internal layout of Clumber Park (Site 1) and the location of Rumney Inn (Site 5).

3.20 Detailed mapping of the Site commences with the Babworth Tithe and Apportionment Map of 1839. This shows the Site to consist of 48 plots (not all fully within the Site boundary), most of which are described as closes or crofts used for arable purposes. Two landowners are noted with His Grace, the Duke of Newcastle owning most of the land and the Earl of Scarborough owning the southernmost fields (plots 497-506). George Hickson is recorded as the tenant for all of the arable plots owned by the Duke of Newcastle, whilst a John Lister was the tenant for all the arable plots owned by the Earl of Scarborough. The Duke of Newcastle and Earl of Scarborough were both named as the tenants for the plantations and wooded areas that they owned (plots 471, 476, 479, 483, 486 and 497) within the Site boundary. Two of the arable field plots are named Near Clay Pit Close (plot 466) and Far Clay Pit Close (plot 467) but no clay pit is denoted on this map. Given the later appearance of mapped clay pits, and a brickworks, within this area it seems likely that clay extraction had previously occurred in this area.

3.21 The layout of Morton Hill Farm (Site 63, plots 477 and 478), Morton Hill Cottages and gardens (Site 87, plots 460-463), the south west to north east aligned and the farm access roads (plots 475, 478 and 503), and the layout of the fields to the south of the access road to Upper Morton Farm have remained relatively unchanged from the tithe map of 1839 (except for the A1 and alterations to the Apleyhead junction which replace the earlier Blyth Road).

3.22 There are, however, major changes to the layout of the area north of Morton Hill Farm visible on the 1885 Ordnance Survey map. The construction of the Manchester, Sheffield and Lincolnshire Railway (Site 83), Checker House Station (Site 78) and a milepost adjacent to the line (Site 28) are all depicted on this map. The railway line runs from west to east bisecting all the fields to the north of Morton Hill Farm creating further subdivisions of the land. The field layout in this area had also apparently change somewhat since the 1839 tithe map with a number of the smaller fields (plots 454 to 468 from the map)

having been consolidated into larger long fields prior to the railway lines construction. This railway line was constructed at some point before 1849, when the Checker house station is recorded as being opened. Also depicted are a footpath running between Morton Hill Farm and Morton Hill Cottages, a cottage (Site 85) just to the east of Morton Hill Farm, the site of a Pumphouse (Site 86) and associated boggy ground (Site 80) as well as a pump (Site 79) adjacent to the Morton Hill Cottages.

3.23 The 1885 Ordnance Survey map also shows the layout of the Grade I Registered Clumber Park (Site 1), the Grade I Listed Apleyhead Lodge (Site 4), and its associated non-designated gateway, attached lodges, gates, bollards and railings (Site 36). Clumber Park was landscaped in the 18th century with Apleyhead Lodge being built in 1770. Morton Park's (Site 67) layout is also drawn in detail with Morton Hall (Sites 42 and 66) and the location of the Grade II listed commemorative stone (Site 2), built in 1802 to commemorate finding of a Roman coin hoard, clearly depicted. Morton Park was landscaped in the 1870s with the Hall being built between 1865 and 1869. The 1885 Ordnance Survey map also depicts the locations of the Grade II listed Little Morton Farmhouse (Site 3), built in early 19th century, and Rushey Inn (Site 5), originally built in the 15th century but heavily modified in the early 18th century. The other Post- Medieval remains within the 1 km study area that are depicted on the 1885 OS map include a windpump (Site 26) at Little Morton Farmhouse, a cattle well (Site 27) to the east of Upper Morton Grange, Apley Head Farm (Site 60), Upper Morton Grange (Site 62), Morton Forest Farm (Site 64) Elkesley Forest Farm (Site 65) and a milestone (Site 29) close to Little Morton Farmhouse.

3.24 The 1900 Ordnance Survey map shows that the railway network had been extended with a "Morton Siding" (Site 88) clearly depicted to the north east of Morton Hill Farm. This siding appears to have been built to facilitate transportation of materials from a nearby brickworks (Site 81) which also has an access road running down to what appear to be two newly built cottages (Site 82) possibly for workers. The Pumphouse (Site 86) is annotated as "Hydraulic Ram". There are no other changes shown within the Site boundary on the Post-Medieval mapping.

3.25 The above indicates that there was occupation of the area around the Site throughout the PostMedieval period and that most of it was in use as agricultural fields. There is, however, a concentration of industrial activity in the northern portion of the Site associated with clay extraction and brickmaking as well as a railway station and siding. It is assessed, therefore, that there is a Medium potential for remains dating to this period to survive and that any such remains will likely include features and finds relating to clay extraction, brick making, the railway (all in the northern portion of the Site) and agricultural practises (elsewhere). Any surviving archaeological features relating to the Post-Medieval period are likely to be of up to Local significance

Modern (1901 – present)

3.26 No Modern remains are recorded within the Site boundary (excluding the modification of extant buildings originally constructed in the 19th century). The modification of the Apleyhead Junction for the A1 in 2008, and the construction of a Solar farm in 2014, to the northeast of the Site, are the only recent modern developments in the vicinity of the Site.

3.27 Later Ordnance Survey mapping continues to show that the farms and fields layouts remained virtually unchanged up to the modern day. The 1921 Ordnance Survey map (not reproduced) shows a few more details of the brickworks with "an old clay pit" (Sites 30 and 57) clearly denoted on its eastern side. Also associated with these clay pits, but not clearly denoted on the map, are the non-designated remnants of a kiln (Sites 41 and 61). The cottage (Site 85) to the northeast of Morton Hill Farm is annotated as "Foreman's Cottage" and the Morton Hill Cottages (Site 87) are annotated with their name for the first time. The Pumphouse or Hydraulic Ram depicted on the earlier mapping is no longer visible on the 1921

Ordnance Survey map. The 1950 Ordnance Survey map (not reproduced) is virtually identical to the 1921 edition with the only exception being the disappearance of the brickworks (Site 81).

3.28 The 1968 Ordnance Survey map (Figure 9) shows that Morton Hill Siding had been removed (although earthworks are depicted) and that the two cottages (Site 82) were now named "Brickwork Cottages". To the west of the Site boundary the main road running north to south had been widened (to form an early section of the A1) and a large roundabout is shown. Morton Hall is also no longer depicted on this map (it was demolished c.1946).

3.29 The only later changes within the Site boundary involve the demolition of the Brickyard Cottages at some point after 1980 (still visible on 1980 OS map) and an alteration of the alignment of part of Mansfield Road because of the adjustment to the Apleyhead junction in 2008.

3.30 The above indicates that there was occupation of the area around the Site throughout the Modern period and that the industrial activities relating to the brickyard and railway continued up until c.1950. The rest of the Site continued to be in use as agricultural fields. It is assessed, therefore, that there is a Medium potential for remains dating to this period to survive and that any such remains will likely include features and finds relating to clay extraction, brick making, the railway (all in the northern portion of the site) and agricultural practises (elsewhere). Any surviving archaeological features relating to the Modern period are likely to be of up to Local significance.

4 Aims

4.1 The aim of the geophysical survey was to identify any potential archaeological anomalies that would enhance the current understanding of the archaeological resource within the proposed survey area.

4.2 Specifically, the aims of the geophysical survey were;

- To locate, record and characterise any surviving sub-surface archaeological remains within the survey area,
- To help determine the next stage of works as per the client's instruction,
- To provide an assessment of the potential significance of any identified archaeological remains in a local, regional and (if relevant) national context,
- To produce a comprehensive site archive (Appendix 2) and report.

5 Methodology

5.1 The geophysical survey was undertaken between *** and *** 2021 and 2022.

5.2 All geophysical survey work was carried out in accordance with recommended good practice specified in the EAC guideline documents published by Historic England (Schmidt et al. 2016) and the Chartered Institute for Archaeologists Standard and Guidance for archaeological geophysical survey (2014).

5.3 Parameters and survey methods were selected that were suitable for the prospective aims of the survey and in accordance with recommended professional good practice (Schmidt et al. 2016).

5.4 Digital photographs of every survey parcel were taken before, during and after geophysical survey to show any changes to field conditions following the programme of works. The photos were downloaded and stored off site.

5.5 The gradiometer survey over three of the fields (10.74ha) was carried out using handheld Bartington Grad601-2 fluxgate gradiometers (see Appendix 3). The survey was conducted within a grid system, across grids measuring 30m by 30m which were marked out using temporary markers at each grid node.

5.6 Grid nodes were set out and recorded using a Trimble R8 / R10 dGPS with an error no greater than +/- 0.05m. The GPS system uses the Trimble "VRS Now" service to provide instant access to real-time kinematic (RTK) corrections enabling an accuracy of < 2cm. It was connected via a SIM card run on the Vodafone network with good cellular signal in the survey areas, meaning a repeater was not required.

5.7 Data was collected in the field on an east-west alignment using zig-zag traverses, with a sample interval of 0.25m and a traverse interval of 1m.

5.8 Before each session of use, each gradiometer was balanced around a single set up point within the Site specifically chosen for use by all machines. This point is magnetically quiet and in balancing the machine around this point, produces a more uniform dataset throughout and allows all data to be plotted with ease within the standard range of -1nT to 2nT. Where significant drift occurred on a machine throughout a survey session, the affected grids were re-surveyed. Striping of the data may occur due to machine drift and it is decided in the field if this is within a sensible and acceptable limit.

5.9 Care was also taken to attempt to avoid metal obstacles present within the survey area, such as metal fencing around hedge boundaries as gradiometer survey is affected by 'above-ground noise' and avoiding these improves the overall data quality and results obtained.

5.10 The gradiometer data were downloaded using Bartington Grad601 PC Software v313 and processed using Geoscan Geoplot v4.0, the details of which can be found in Appendices 3 and 4. 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).

5.11 Interpretations of the data were created as layers in ArcGIS Pro and the technical terminology used to describe the identified features can be found in Appendix 5.

5.12 The gradiometer survey was carried out using a Bartington Non-Magnetic Cart over the remaining 19 fields (145.54ha). The cart system utilises Grad-01 fluxgate gradiometer sensors mounted 1m apart on a carbon fibre frame, along with data logging equipment and batteries (see Appendix 3). Before each session of use, the cart system was balanced around a single set up point within the Site specifically chosen for being magnetically quiet. In balancing the machine around this point, it produces a more uniform dataset throughout and allows all data to be plotted with ease.

5.13 Data was collected using zig-zag traverses alongside a constant stream of GPS data collected through a Trimble R10 GPS, enabling the collected data to be spatially georeferenced without the need for a pre-determined grid system. The data was collected through a laptop mounted to the cart using Geomar MLGrad601 software.

5.14 Care was taken to attempt to avoid metal obstacles present within the survey area, such as metal fencing around hedge boundaries as gradiometer survey is affected by 'above-ground noise' and avoiding these improves the overall data quality and results obtained.

5.15 The data was downloaded from MLGrad601 and converted into a .xyz file in Geomar MultiGrad601 before being processed along with the GPS data in TerraSurveyor v3.0.34.10. The details of these processed can be found in Appendices 3 and 4.

5.16 Interpretations of the data were created in ArcGIS Pro and the technical terminology used to describe the identified features can be found in Appendix 5.

5.17 Resistance survey was carried out within four of the fields (I, M, Q and S). The Earth Resistance survey was carried out using a Geoscan Research RM15 resistance meter, utilising a MPX15 multiplexor

attachment (see Appendix 3). The survey was conducted within a system of grids measuring 30m by 30m each, which were marked out using temporary markers at each grid node.

5.18 For each area two sets of data were collected: 0.5m Twin Probe with data collected at 0.5m intervals; and 1m Twin Probe with data collected at 0.5m by 1m intervals.

5.19 Grid nodes were set out and recorded using a Trimble R8 / R10 dGPS with an error no greater than +/- 0.05m. The GPS system uses the Trimble "VRS Now" service to provide instant access to real-time kinematic (RTK) corrections enabling an accuracy of < 2cm. It was connected via a SIM card run on the Vodafone network with good cellular signal in the survey areas, meaning a repeater was not required.

5.20 The data were downloaded and processed using Geoscan Geoplot v4.0 and the details of these processes can be found in Appendices 3 and 4.

5.21 Interpretations of the data were created as layers in ArcGIS Pro and the technical terminology used to describe the identified features can be found in Appendix 5.

6 Results and Interpretation

6.1 The gradiometer survey results have been visualised as greyscale images and XY traces. Figure 2 shows the areas which were surveyed and their assigned field prefix. The processed data is displayed as an overview greyscale image in Figure 3 with an accompany overview interpretation in Figure 4, both at a scale of 19000. Summary greyscale images are displayed in Figures 5 - 8 at a scale of 1:3500 plotted at -1 to 2nT. Accompanying summary interpretations are provided in Figures 9 - 12, at the same scale. Minimally processed XY Traces data (plotted at 30nT/cm) processed greyscale images and interpretations are displayed in the archive section at 1:1250 in Figures 13 69.

6.2 Individual characterisation of the identified anomalies can be seen in Appendix 1. Anomaly numbers are prefixed with the field letter, which are indicated on Figure 2. For the most part, only trends of a possible archaeological or historical origin have been assigned an anomaly number on the interpretation figures. Trends that are integral to the discussion have also been assigned anomaly numbers.

6.3 For ease of discussion the results are discussed by field.

Field A (Figures 3, 4, 5, 9, 13-14, 32-33, 51-52)

Archaeology

6.4 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.5 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Unclear Origins

6.6 Several linear trends and areas of enhanced magnetism are visible across the dataset which have unclear origins.

6.7 Weak linear trends (**A1**) are likely to indicate former field boundaries or a former field system, although they are not indicated on past mapping.

6.8 Poorly defined curving trends (**A2**) have been noted in the south of the survey area. The origin of these is unclear. While it is likely that these responses are potentially due to natural variations or agricultural activity, an archaeological origin cannot be dismissed.

6.9 A very ephemeral suggestion of a rectangular enclosure (**A3**) has been noted in the south of this field. However, it is possible that the trends forming the postulated enclosure are simply due to modern ploughing.

6.10 Broad, but weak, trends (**A4**) on a southwest-northeast orientation are visible throughout this area. A natural origin is likely, but their origin is unclear.

6.11 Discrete areas of magnetic enhancement have been noted throughout this survey area. Although an archaeological origin cannot be dismissed for all of these, it is likely that most are due to natural variations in the superficial sand and gravels or more deeply buried modern fired and ferrous material.

Agricultural

6.12 Ploughing trends, modern in age, run approximately north-south across the dataset.

Non - Archaeology

6.13 Areas of modern magnetic disturbance in the northern half of the survey area are associated with telegraph poles.

6.14 Some magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.15 A high level of [illegible] dipolar anomalies (ferrous/iron spikes) is visible throughout the dataset which are likely modern in origin and are not considered to be of archaeological value. Only the most prominent of these are noted in the interpretation figures.

Field B (Figures 3, 4, 5, 9, 13-14, 32-33, 51-52)

Archaeology

6.16 A negative linear trend (**B1**) has been detected in the north of this survey area and corresponds with a cropmark feature transcribed in the National Mapping Programme (NMP) which appears to be part of an extensive earlier field system.

Possible Archaeology

6.17 No anomalies indicating the presence of a possible archaeological remains have been identified in the dataset.

Unclear Origins

6.18 Several trends are visible across the dataset which have unclear origins. The trends (**B2**) are a continuation of the fragmentary trends detected in Field A to the west and continue into Field C to the east. They are likely to be associated with earlier field system, potentially associated with the system recorded as cropmarks (B1), but some may have a natural origin.

6.19 Very weak curving trends and areas of magnetic enhancement (**B3**) have been noted throughout this survey parcel. Their origin is uncertain, but they have the appearance of possible ring ditches. However, such an interpretation is extremely tentative given their ephemeral nature and the relatively high level of background response.

6.20 Additional amorphous trends (**B4**) have also been noted. The form of the responses suggests they are due to natural variations, but the possibility that they are due to plough damaged archaeological deposits cannot be excluded.

Agricultural

6.21 Modern ploughing trends are visible on an approximately north south alignment throughout the dataset.

Non - Archaeology

6.22 Magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.23 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin. Only the most prominent of these are noted on the interpretation figures.

Field C (Figures 3, 4, 5, 9, 13-14, 32-33, 51-52)

Archaeology

6.24 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.25 No anomalies indicating the presence of possible archaeological remains have been identified in the dataset.

Unclear Origin

6.26 Several well-defined linear trends of an unclear origin have been detected within this survey area.

6.27 Trends (**C1**) and (**C2**) suggest portions of a field system. However, these are not depicted on past OS mapping or the NMP transcription. They may have a more recent origin such as a modern track or service trench.

6.28 There is an ephemeral suggestion of a D-shaped enclosure (**C3**) in the north of the area. Its origin is unclear, but it may be associated with anomalies (B3) detected immediately to the west.

6.29 As with Fields A and B to the west curving trends (**C4**) suggestive of possible ring ditches have been noted within this field. However, such an interpretation is extremely cautious, and a natural or agricultural origin is equally plausible.

6.30 Irregular zones of slightly enhanced magnetism (**C5**) have been noted in the north and south of the area. The origin of these is unclear, but a natural origin is most likely.

Agricultural

6.31 Modern ploughing trends are visible on an approximately NNE-SSW orientation throughout the dataset.

Non - Archaeology

6.32 A zone of elevated response has been detected in the centre of the area and is associated with an area of very low magnetic enhancement. This is typical of responses from natural changes such as depth of bedrock and / or variations in the superficial sand and gravel deposits.

6.33 Magnetic disturbance is visible around the periphery of the field and relates to ferrous material within the field boundaries and modern debris at the field edges.

6.34 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin. Only the most prominent of these are noted on the interpretation figures.

Field D (Figures 3, 4, 5, 9, 15, 34, 53)

Archaeology

6.35 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.36 No anomalies indicating the presence of possible archaeological remains have been identified in the dataset.

Unclear Origins

6.37 Parallel linear trends (D1) have been detected in the east of this survey area. The origin of these is unclear and they may have a modern origin such as field drains.

Agricultural

6.38 Linear trends on a WSW-ENE alignment have been recorded throughout the survey area and are associated with modern agricultural activity.

Non - Archaeology

6.39 A modern utility runs through the centre of the survey area.

6.40 Extensive magnetic disturbance is apparent in the northern half of the survey area and is due to the railway line defining the northern limit of the field and electricity pylons running through the field.

6.41 Magnetic disturbance is visible along the southern edge of the field and is due to modern metallic boundary fencing, and modern debris at the field edges.

6.42 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) is visible throughout the dataset which are likely modern in origin. Only the most prominent of these are noted on the interpretation figures.

Field E (Figures 3, 4, 5, 9, 16, 35, 54)

Archaeology

6.43 A weak linear trend (**E1**) has been detected the southwest of this field. This anomaly corresponds with the NMP transcription and appears to be a continuation of (B1) detected in Field B to the west, although the response is not as clear in Field C.

Possible Archaeology

6.44 No anomalies indicating the presence of possible archaeological remains have been identified in the dataset.

Unclear Origins

6.45 The well-defined trend (**E2**) is a continuation of trend (C1) detected in Field C immediately to the west.

6.46 Additional fragmentary trends (**E3**) have been noted. They are very weak, and a precise interpretation is difficult. They may indicate remnants of past field systems, but could simply be associated with past ploughing or natural subsurface variations.

6.47 Large areas of slightly enhanced magnetism (**E4**) have been detected along the eastern limits of the survey area. These may have a natural or modern origin, but an archaeological one cannot be dismissed given the potential enclosure that has been detected immediately to the east in Field H.

6.48 Smaller discrete areas of enhanced magnetism have been noted within this field. While they may indicate pit-type features, a natural origin is more likely.

Agricultural

6.49 Modern ploughing trends on an approximately north to south alignment have been noted throughout the survey area.

Non - Archaeology

6.50 Magnetic disturbance is visible around the periphery of the field and relates to ferrous material within boundary fencing, adjacent infrastructure and modern debris at the field edges.

6.51 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field F (Figures 3, 4, 5, 9, 17, 36, 55)

Archaeology

6.52 A negative linear trend (**F1**) has been detected in the east of this field. These corresponds with a recorded cropmark feature which is part an extensive undated prehistoric field system.

Possible Archaeology

6.53 The short trend (**F2**) appears to be associated with the known cropmark (F1), but it is not as well-defined.

Unclear Origins

6.54 The origin of linear trends (**F3**) is unclear. They do not correspond with any recorded cropmark features or former field boundaries and may be associated with past agricultural activity.

6.55 Some discrete areas of enhanced magnetism have been noted. The origin of these is unclear, although natural origin is thought likely.

Non - Archaeology

6.56 Small areas of magnetic disturbance are visible around the periphery of the survey area and relate to modern metallic boundary fencing, adjacent infrastructure and modern debris at the field edges.

6.57 A low level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field G (Figures 3, 4, 5, 9, 15-16, 34-35, 53-54)

Archaeology

6.58 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset. Although cropmarks are recorded within this field, no clear anomalies have been detected. However, the area has a high level of background response which may be masking weaker response of an archaeological origin.

Possible Archaeology

6.59 A very weak trend (**G1**) has been detected in the south of the area. This may be associated with a recorded cropmark. While it is on the same alignment it is very weak and lies some 10m to the south and as a result it has been noted as only having a possible archaeological origin.

6.60 An additional trend (**G2**) has been detected which appears to be associated with (G1). This does not correspond with any recorded cropmarks but is likely to be part of the same complex.

Unclear Origins

6.61 Several linear trends and areas of enhanced magnetism are visible across the dataset which have unclear origins.

6.62 These are very weak and ill-defined and given the high level of background response within this field a precise interpretation is difficult. They may all have natural or modern agricultural origins.

Agricultural

6.63 Modern ploughing trends run approximately east to west across the dataset.

Non - Archaeology

6.64 The mottled appearance of the data is thought to partly be due to superficial sand and gravel deposits.

6.65 Some magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.66 Isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin and are not considered to be of archaeological value.

Field H (Figures 3, 4, 5, 1[illegible])

Archaeology

6.67 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.68 Linear trends (**H1**) and linear zones of enhanced magnetism (**H2**) have been detected in the south of the field. These show broad correlation with the recorded cropmarks, but they are very weak and hence have been note das only having a possible archaeological origin.

6.69 The origin of linear zones of slightly enhanced magnetism (**H3**) and associated linear trends is uncertain. They do not correspond with the record cropmarks but their spatial relationship with the recorded cropmarks suggests a possible archaeological origin.

Unclear Origins

6.70 Several trends are visible across the dataset which have unclear origins.

6.71 The linear trend (**H4**) does not correspond with any recorded cropmarks but is suggestive of a former field boundary and may be a continuation of similar responses detected in Field E to the west and Field J to the east.

6.72 There is a suggestion of part of a possible rectilinear enclosure (**H5**) along the western edge of the field. However, it is very weak and as a result has been noted as having an unclear origin as an agricultural origin is plausible.

Agricultural

6.73 Parallel trend shave been noted in the eats of the area. It is not clear if these are associated with modern ploughing or past ridge and furrow cultivation.

Non - Archaeology

6.74 A zone of elevated response and trends (**H6**) have been noted toward the centre of the survey area. This is thought to have a natural origin.

6.75 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field I (Figures 3, 4, 5, 9, 17, 36, 55)

Archaeology

6.76 Several linear trends (**I1**) have been noted which show good correlation with the cropmarks recorded in this field. However, the recorded cropmark complex is far more extensive than has been detected by the gradiometer survey. It is possible that the features have been truncated by ploughing, or that the high level of background response is masking weaker anomalies from possible archaeological features.

Possible Archaeology

6.77 The very ephemeral trends (**I2**) coincide with recorded cropmark features. However due to their extremely ephemeral nature they have been noted as only having a possible archaeological origin.

Unclear Origins

6.78 Some weak trends and discrete areas of enhanced magnetism have been noted within the survey area. While an archaeological origin for these cannot be dismissed, a natural or modern origin is likely given their lack of coherent form.

Agricultural

6.79 Ploughing trends, likely modern in age, aligned approximately east-west cross the survey area.

Non - Archaeology

6.80 Some magnetic disturbance is visible around the periphery of the field and relates to ferrous material within the field boundaries and modern debris at the field edges.

6.81 A high level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Earth Resistance Survey

6.82 **TO BE UPDATED ON COMPLETION OF SURVEY**

Field J (Figures 3, 4, 5, 9, 18-20, 37-39, 56-58)

Archaeology

6.83 The weak linear trends (J**1**) towards the centre of this field correspond with known cropmarks recorded as part of the NMP. However, as with other areas within the Site, the gradiometer survey has not identified all of the recorded cropmarks within this field.

Possible Archaeology

6.84 The linear trend (**J2**) is thought to have a possible archaeological origin. It does not correspond exactly with one of the recorded cropmarks. However, it does appear to be a continuation of trend (I1) detected in Field I in the west which does correspond with a known cropmark.

Unclear Origins

6.85 Several weak curving trends (**J3**) have been noted. While these have the suggestion of possible ring ditches, interpretation is tentative due to their ephemeral nature.

6.86 The linear trend (**J4**) appears to be a continuation of trends detected in fields to the east and west and may indicate former field division.

6.87 Throughout the field several short fragmentary trends have been noted together with discrete areas of enhanced magnetism. The origin of these is unclear. Although a natural or agricultural origin is likely, an archaeological one cannot be dismissed given the wider context.

Agricultural

6.88 Linear trends have been recorded throughout the survey area and are associated with modern agricultural activity.

Non - Archaeology

6.89 Magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, and modern debris at the field edges.

6.90 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) is visible throughout the dataset which are likely modern in origin.

Field K (Figures 3, 4, 5, 9, 18-20, 37-39, 56-58)

Archaeology

6.91 Linear trends (**K1**) have been detected the north of this field suggesting a series of prehistoric enclosures. These anomalies appear to correspond with the transcription of undated enclosures visible as cropmarks although the cropmark complex is far more extensive than the gradiometer anomalies. It is not clear if the cropmark features are not being detected due to truncation of the features.

6.92 The linear rend (**K2**), which lies to the south of anomalies (K1), also coincides with a cropmark and is a continuation of trend (J1) detected in Field J to the west.

Possible Archaeology

6.93 Curving linear trends (**K3**) have been detected which may be associated with enclosure complex (K1). These are not recorded as cropmarks.

Unclear Origins

6.94 The trend (**K4**) appears to be a continuation the trend detected in Field J to the west and may indicate a former field division although it is not recorded as a cropmark or indicated on past mapping of the area.

6.95 Throughout the field several short fragmentary trends have been noted together with discrete areas of enhanced magnetism. As with elsewhere across the Site, the origin of these is unclear. Although a natural or agricultural origin is likely, an archaeological one cannot be dismissed given the wider context.

Agricultural

6.96 Modern ploughing trends on an approximately north-south alignment have been noted throughout the survey area.

Non - Archaeology

6.97 A modern service runs through the western half of the field.

6.98 Magnetic disturbance is visible around the periphery of the field and relates to ferrous material within boundary fencing, adjacent infrastructure and modern debris at the field edges.

6.99 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field L (Figures 3, 4, 6, 10, 18, 37, 56)

Archaeology

6.100 A series of linear trends (**L1**) have been detected in the western half of this field suggesting a series of enclosures or field systems. These show good correlation with the recorded cropmark although the anomalies are offset approximately 12m to the southwest. As with survey results elsewhere within the Site the responses are not very strong and not all elements of the recorded cropmarks have been detected.

Possible Archaeology

6.101 The weak trends (**L2**) appear to be associated with the known cropmark complex (L1) and do correspond with the recorded cropmarks, allowing for the displacement. However, they are very ephemeral hence they have been categorised as only possible archaeology.

Unclear Origins

6.102 A curving trend (**L3**) has been detected in the west of the area. The origin of this is unclear but it may be associated with the recorded complex.

6.103 Parallel linear trends (**L4**) in the east of the area have an unclear origin but may potentially be associated with past ridge and furrow cultivation.

6.104 Ephemeral, but discrete areas of enhanced magnetism (**L5**) have been noted in the northeast of the area. The form suggests a possible small enclosure, but a natural origin is equally plausible.

Agricultural

6.105 The short trend (**L6**) in the centre of the area corresponds with a former field boundary indicated on the 1839 Babworth Tithe Map and is still present on the OS map of 1968 (AOC, 2021).

6.106 Modern ploughing trends on a NNE-SSW alignment have been noted in the west of the survey area.

Non - Archaeology

6.107 A linear response typical of a service has been detected in the southwest of the area.

6.108 Magnetic disturbance is visible around the periphery of the area and relates to modern metallic boundary fencing, adjacent infrastructure and modern debris at the field edges.

6.109 A high level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field M (Figures 3, 4, 6, 10, 21-22, 40-41, 59-60)

Archaeology

6.110 Well-defined linear trends (**M1**) have been detected in the south-eastern quadrant of this field. These anomalies are indicative of prehistoric enclosures. They have been noted as archaeological in origin as comparable cropmarks have been recorded although the gradiometer anomalies are offset approximately 20m to the west.

6.111 The weak linear trends (**M2**) do show good correlation with the recorded cropmarks and continue into Field O to the east.

Possible Archaeology

6.112 The weak trends (**M3**) appear to be a continuation of the enclosure complex (M1) but they are not recorded as cropmarks.

6.113 The well-defined linear trend (**M4**) along the northern limits of the survey area appears archaeological in nature, but its exact origin is not clear. Given its association with ridge and furrow cultivation, it may simply indicate a former field division. However, it may be associated with weak trends detected Field N immediately to the north.

Unclear Origins

6.114 The origin of trend (**M5**) is unclear, but its spatial relationship with the presumed ridge and furrow cultivation suggests it is likely to be a former field division.

6.115 Additional trends have been noted within this field. While they may be archaeological in origin, a modern or natural origin is equally likely.

Agricultural

6.116 Regular parallel trends indicative of ridge and furrow cultivation have been detected in the northwest of this field.

6.117 Ploughing trends, likely modern in age, run NNE to SSW across the dataset.

Non - Archaeology

6.118 Magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.119 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) is visible throughout the dataset which are likely modern in origin.

Earth Resistance Survey

6.120 **TO BE UPDATED ON COMPLETION OF SURVEY**

Field N (Figures 3, 4, 6, 10, 21, 40, 59)

Archaeology

6.121 The linear trend (**N1**) appears to coincide with recorded cropmarks. However, the cropmark transcription is far more complex indicating multiple parallel trends in the vicinity suggesting two possible trackways. The lack of magnetic response from the recorded cropmarks may be due to truncation of the features by ploughing. Alternatively, the nature of the features may be such that there is very low magnetic enhancement.

Possible Archaeology

6.122 No anomalies indicating the presence of a possible archaeological remains have been identified in the dataset.

Unclear Origins

6.123 Several trends are visible across the dataset which have unclear origins.

6.124 The linear and curvilinear trends (**N2**) may have an archaeological origin, but they do not correspond with the cropmarks recorded in the area.

6.125 Very weak trends indicating a possible enclosure (**N3**) have been noted along the southern limits of the survey area. However interpretation is tentative, and the trends could be due to modern ploughing.

6.126 A circular trend (**N4**) has been detected in the west of the area. The response is suggestive of a possible ring ditch, but interpretation is cautious due to magnetic disturbance from adjacent telegraph poles.

6.127 Additional trends and areas of enhanced magnetism have been noted in the east of the survey area. While an archaeological origin for these cannot be dismissed give the recorded cropmarks in the area, a natural origin is likely

Agricultural

6.128 Modern ploughing trends run northwest to southeast across the dataset.

Non - Archaeology

6.129 Extensive magnetic disturbance is apparent along the north-western limits of the survey area and is due to electricity pylons running through the field.

6.130 Additional magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.131 A high level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field O (Figures 3, 4, 6, 10, [illegible]-22, [illegible], 41, 59-6[illegible])

Archaeology

6.132 The two linear trends (O1) are likely to be associated with comparable trends recorded on the cropmark transcription although, as with elsewhere in the Site there is an offset of some 12m. However, other recorded cropmark features have not be detected.

Possible Archaeology

6.133 Linear trends (**O2**) have been detected the southwest of the survey area. It is likely that these are associated with the enclosure system recorded from cropmarks. However, there is no clear correlation between the cropmarks and the anomalies. It is not clear if this is due to a 30m error in the cropmark transcription, or if the gradiometer is detecting additional features, while not detecting the know features. A transcription error is more likely.

Unclear Origins

6.134 Several well-defined linear trends of an unclear origin have been detected within this survey area.

6.135 Trend (**O3**). which runs southwest to northeast through the field. is likely to have a modern origin.

6.136 The origin of (**O4**) is unclear but may be associated with trend (N3) immediately to the north.

Agricultural

6.137 Modern ploughing trends run WNE-ESW through the survey area.

Non - Archaeology

6.138 The gap in the data and associated magnetic disturbance is due to overhead powerlines and their associated pylons.

6.139 Magnetic disturbance is visible around the periphery of the field and relates to ferrous material within the field boundaries and modern debris at the field edges.

6.140 A high level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field P (Figures 3, 4, 6, 10, 23-24, 42-43, 61-62)

Archaeology

6.141 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.142 No anomalies indicating the presence of a possible archaeological remains have been identified in the dataset.

Unclear Origins

6.143 A negative rectilinear trend (**P1**) has been detected in the southwest of this area. The response is very similar to the response from some of the recorded cropmarks, but none have been identified within this area.

6.144 Additional trends and discrete areas of magnetic enhancement have been noted within this survey area. While an archaeological origin cannot be excluded, they are likely to be due to natural variations and agricultural activity.

Agricultural

6.145 Linear trends on a southwest-northeast alignment have been recorded throughout the survey area and are associated with modern agricultural activity.

Non - Archaeology

6.146 Extensive magnetic disturbance is apparent in the northern half of the survey area and is due to the railway line defining the northern limit of the field and electricity pylons running through the field.

6.147 The gaps in the data and associated magnetic disturbance is due to overhead powerlines and their associated pylons.

6.148 Additional magnetic disturbance is visible around the periphery of the area and relates to modern metallic boundary fencing, and modern debris at the field edges.

6.149 A high level of isolated dipolar anomalies (ferrous / iron spikes) is visible throughout the dataset which are likely modern in origin.

Field Q (Figures 3, 4, 7, 11, 17, 20, 25, 36, 39, 44, 55, 58, 63)

Archaeology

6.150 Negative linear trends (**Q1**) have been detected the centre of this field. These anomalies appear to correspond with the transcription of undated enclosures visible as cropmarks. However, as with previous areas, the recorded cropmark complex is more extensive than suggested by the gradiometer data.

Possible Archaeology

6.151 Additional linear and curving trends (**Q2**) have been detected which appear to be associate the recorded cropmark complex but are very ephemeral and as a result they have been categorised as possible archaeology.

Unclear Origins

6.152 Additional ephemeral trends (**Q3**) and areas of enhanced magnetism have been detected. These are poorly defined and may indicate natural geological variations although an archaeological origin cannot be dismissed given the wider context.

6.153 Linear trend (**Q4**) has the appearance of a former field division and continues into Field R to the southwest, although none is indicated on past mapping of the Site.

Agricultural

6.154 Modern ploughing trends on a southwest-northeast alignment have been noted throughout the survey area.

Non - Archaeology

6.155 Zones of elevated response have been recorded throughout this field. The responses suggest natural geological variations.

6.156 Magnetic disturbance is visible around the periphery of the field and relates to ferrous material within boundary fencing, adjacent infrastructure and modern debris at the field edges.

6.157 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Earth Resistance Survey

6.158 **TO BE UPDATED ON COMPLETION OF SURVEY**

Field R (Figures 3, 4, 7-11, 20, 25-26, 39, 44-45, 58, 63-64)

Archaeology

6.159 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset. Extensive cropmarks have been recorded within this field. It is not clear if the gradiometer is not detecting the features due to truncation from ploughing, geological or soil conditions or a lack of magnetic enhancement in the feature fill.

Possible Archaeology

6.160 No anomalies indicating the presence of a possible archaeological remains have been identified in the dataset.

Unclear Origins

6.161 Linear trend (**R1**) is a continuation of trend (Q4) detected in Field Q to the northwest and is thought to indicate an unrecorded former field boundary.

6.162 Additional trends of an unclear origin have been noted. While an archaeological origin for these cannot be dismissed, particularly given the recorded cropmarks within the area, the responses are very ephemeral and may have natural or agricultural origins.

Agricultural

6.163 Modern ploughing trends on a north-south alignment have been noted throughout the survey area.

Non - Archaeology

6.164 Small zones of elevated response have been recorded in the southwest and east of the field. The responses are a continuation of those recorded in Fields Q and S, and are suggestive of natural geological variations.

6.165 Some magnetic disturbance is visible around the periphery of the area and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.166 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field S (Figures 3, 4, 7, 11, 25-28, 44-48, 63-67)

Archaeology

6.167 Well-defined linear trends (**S1**) forming a series of enclosures have been detected in the north of this field and show excellent correlation with recorded cropmarks. As with elsewhere on the Site the gradiometer survey has not detected the full extent of the recorded cropmarks which may be due to truncation of the features by modern ploughing.

Possible Archaeology

6.168 Weak trends (**S2**) have been noted and are likely to be associated with enclosures (S1). They do correspond with the recorded cropmarks, but they are very weak and as a result have been noted as having a possible archaeological origin.

Unclear Origins

6.169 Several linear trends and ares of enhanced magnetism are visible across the dataset which have unclear origins. While they may have an archaeological origin given the wider context, a modern or natural origin is equally likely.

Agricultural

6.170 Ploughing trends, likely modern in age, run approximately east-west across the dataset.

Non - Archaeology

6.171 In the west of the field a zone of enhanced magnetism has been noted which is thought to have a natural origin indicating a change in the nature of the near surface geology or drift deposits.

6.172 A utility crosses the south-eastern corner of the field.

6.173 Magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.174 A high level of isolated dipolar anomalies (ferrous / iron spikes) is visible throughout the dataset which are likely modern in origin and are not considered to be of archaeological value.

Earth Resistance Survey

6.175 **TO BE UPDATED ON COMPLETION OF SURVEY**

Field T (Figures 3, 4, 8, 12, 27-31, 46-50, 65-69)

Archaeology

6.176 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.177 No anomalies indicating the presence of possible archaeological remains have been identified in the dataset.

Unclear Origins

6.178 Several trends are visible across the dataset which have unclear origins.

6.179 The linear trend (**T1**) is likely to indicate a former field division, although none is indicted on past mapping.

6.180 Additional linear trends and discrete areas of enhanced magnetism have been noted throughout this field. These are generally fragmentary and poorly defined making a precise interpretation difficult. It is likely that the majority have natural and agricultural origins.

Agricultural

6.181 A well-defined zone magnetic enhancement (**T2**) has been recorded in the west of the field. This corresponds with a former road indicate don past mapping.

6.182 Ploughing trends, likely modern in age, run southwest to northeast and north – south across the dataset.

Non - Archaeology

6.183 A zone of elevated response has been noted in the east of the survey area. These are typical of responses from geological variations such as near surface bedrock and variations in superficial deposits.

6.184 Magnetic disturbance is visible around the periphery of the Site and relates to modern metallic boundary fencing, adjacent infrastructure, and modern debris at the field edges.

6.185 A high level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field U (Figures 3, 4, 8, 12, 28-31, 47-50, 66-69)

Archaeology

6.186 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.187 No anomalies indicating the presence of possible archaeological remains have been identified in the dataset.

Unclear Origins

6.188 Several weak linear trends of an unclear origin have been detected within this survey area.

6.189 Trends (**U1**) is a continuation of the trend (T1) detected to the west and is thought to indicate a former field division.

Agricultural

6.190 Ploughing trends, likely modern in age, aligned north-south cross the survey area.

Non - Archaeology

6.191 Small zones of elevated response has been detected within this area. These are typical of responses from geological variations.

6.192 Magnetic disturbance is visible around the periphery of the Field and relates to ferrous material within the field boundaries and modern debris at the field edges.

6.193 A moderate level of isolated dipolar anomalies (ferrous / iron spikes) are visible throughout the dataset which are likely modern in origin.

Field V (Figures 3, 4, 8, 12, 28-31, 47-50, 66-69)

Archaeology

6.194 No anomalies indicating the presence of definitive archaeological remains have been identified in the dataset.

Possible Archaeology

6.195 Linear trend (**V1**) along the western edge of the survey area may be associated with a cropmark recorded in the area. However if so there is a 32m displacement.

Unclear Origins

6.196 A relatively well-defined circular anomaly has been noted (**V2**) which may indicate a possible ring ditch although such an interpretation is tentative.

6.197 Linear trends (**V3**) at the eastern limits of the survey area may be associated with the cropmark complex which lies immediately to the east.

Agricultural

6.198 Linear trends on a north-south alignment have been recorded throughout the survey area and are associated with modern agricultural activity.

Non - Archaeology

6.199 Magnetic disturbance is visible around the periphery of the field and relates to modern metallic boundary fencing, and modern debris at the field edges.

6.200 A moderate le[illegible] of [illegible]lated [illegible]olar [illegible]omalies [illegible]rous / [illegible] spikes) is [illegible] throughout the dataset which are likely [illegible] modern [illegible] ori[illegible]n.

Field W

6.201 **CURRENTLY [illegible]ING SURVEY**

Field X

6.202 **CURRENTLY AWAITING SURVEY**

7 Conclusion

7.1 TO BE UPDATED ON COMPLETION OF SURVEY

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 the archaeological remains within a survey area.

9 Archive Deposition

9.1 In accordance professional standard practice an 'Online Access to the Index of archaeological investigations' ('OASIS') record will be completed for submission to the HER and Archaeological Data Service (ADS) (Appendix 2).

9.2 One digital and hard copy of the report and data will be submitted to the relevant Historic Environment Record (HER) at the Client's discretion.

9.3 A digital copy of the report and data will also be submitted to the ADS at the Client's discretion.

10 Bibliography

AOC, 2021 *Bassetlaw Garden Village, Morton Nottinghamshire: Desk Based Assessment*. AOC Archaeology. Unpublished report

Aspinall, A., Gaffney, C. Schmidt, A., 2008 *Magnetometry for Archaeologists (Geophysical Methods for Archaeology)*

Bartington Instruments, 2007 *Operation Manual for Grad601 Single Axis Magnetic Field Gradiometer System*

Bartington Instruments, 2016 *Operation Manual for Non-Magnetic Cart*

British Geological Survey, Geology of Britain Viewer, h*ttp://www.bgs.ac.uk/data/mapViewers/home* (last accessed 26.7.2021)

CIfA, 2014 *Standards and Guidance for Archaeological Geophysical Survey*

Clark, A., 1996 *Seeing Beneath the Soil: Prospecting Methods in Archaeology*, Second Edition. London

David, A. Linford, N. Linford, P., 2008, English Heritage (Historic England): *Geophysical Survey in Archaeological Field Evaluation*, Swindon

Gaffney, C. and Gater, J., 2003 *Revealing the Buried Past Geophysics for Archaeologists*. Stroud: Tempus Publishing Ltd.

Geoscan Research, 2005 *Geoplot – Instruction Manual,* Version 1.97

Heron, C. and Gaffney, C., 1987 'Archaeogeophysics and the site: ohm sweet ohm? in C. Gaffney and V. Gaffney (eds.) *Pragmatic Archaeology: Theory in crisis?* British Archaeological Report, British Series 167:71-81.

Lowe, K., Fogel., 2010 *Understanding Northeastern Plains Village sites through archaeological geophysics,* Archaeological Prospection 24

Schmidt, A. and Ernenwein, E., 2009 *Archaeology Data Service: Geophysical Data in Archaeology: A Guide to Good Practice*

Schmidt, A. Linford, P. Linford, N. David, A. Gaffney, C. Sarris and A. Fassbinder, J. 2015. *EAC Guidelines for the Use of Geophysics in Archaeology: Questions to Ask and Points to Consider.* EAC Guidelines 2, Archaeolingua, Belgium

Sharma, P.V., 1997 *Environmental and Engineering Geophysics*

Soilscapes, *http://www.landis.org.uk/soilscapes2* (last accessed 26.7.2021)

11 Plates

Plate 1. Field E facing Southwest

Plate 2. Field I facing southeast

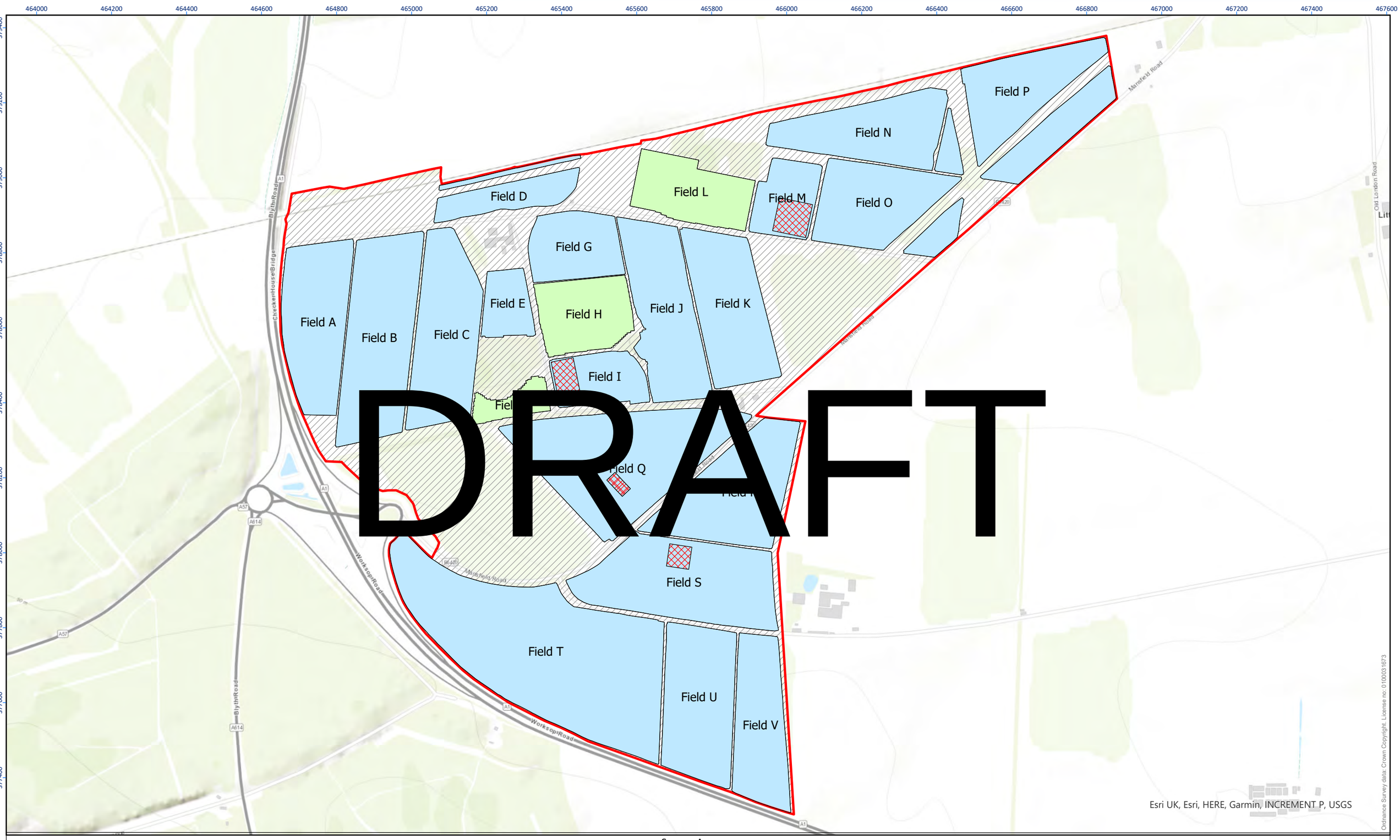
Plate 3. Field R facing north

Plate 4. Field R facing northwest

12 Figures

05/40161/GEO/01/01

Figure 1: Site Location



Survey Areas

Figure 2

- Red Line Boundary
- Unsuitable for Survey
- Resistance Survey - Geoscan RM85
- Gradiometer Survey - Bartington Cart
- Gradiometer Survey - Bartington 601-2

N

0 210m

Scale: 1:9,000 @ A3

Drawing Number: 05/40161/GEO/2/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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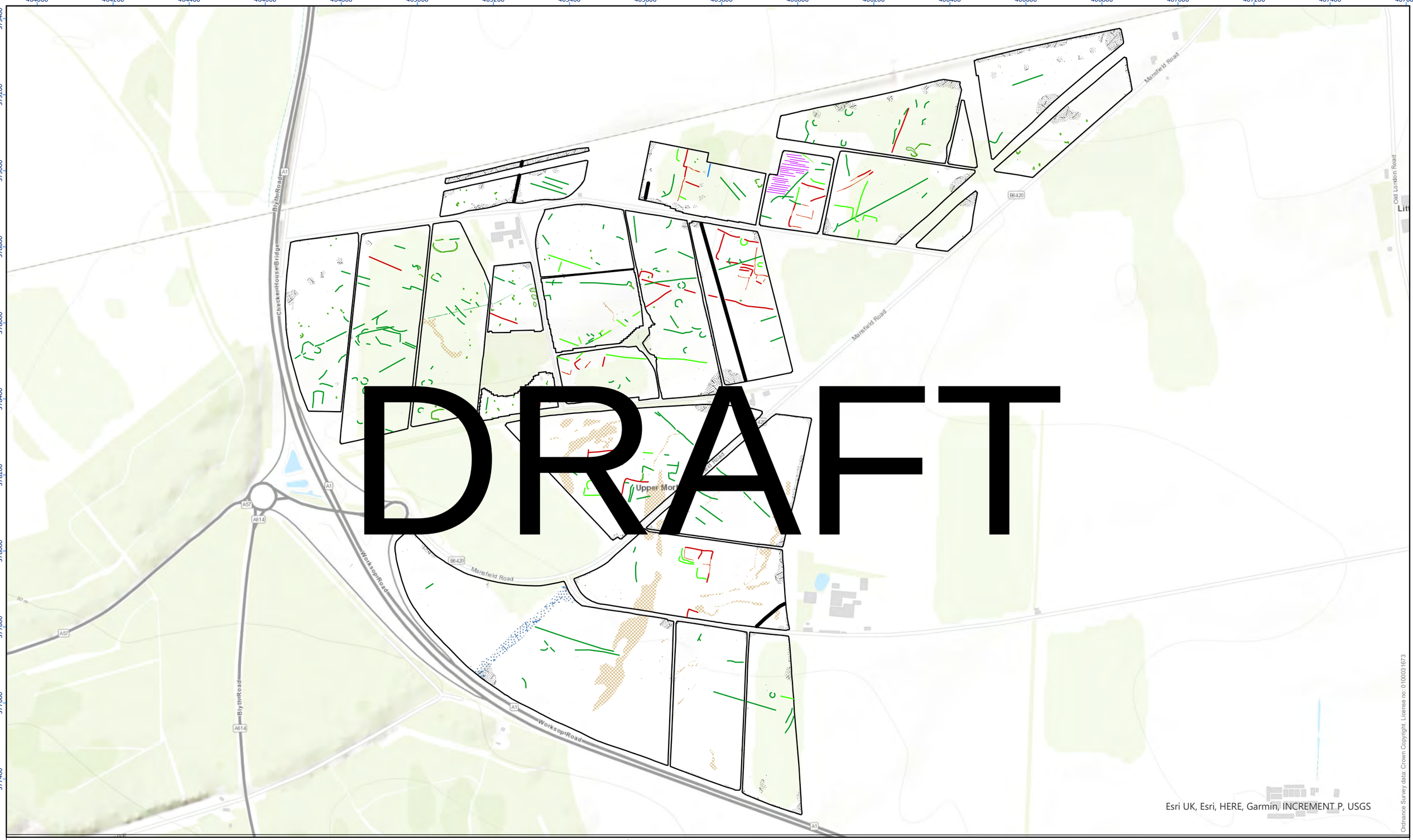
Processed Gradiometer Data - Overview

Figure 3	2nT / -1nT	N; 0 – 210m; Scale: 1:9,000 @ A3	Drawing Number: 05/40161/GEO/00/01 Created by: SO Date: 20/10/2021 Checked by: JL Date: 20/10/2021 Approved by: JL Date: 20/10/2021	AOC Archaeology Group



Interpretation of Processed Gradiometer Data - Overview

Figure 4

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Historic Feature)
- Enhanced Magnetism (Modern)
- Linear Trend (Possible Archaeology)
- Enhanced Magnetism (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)
- Linear Trend (Unclear Origin)
- Trend (Archaeology)
- Linear Trend (Historic Feature)
- Trend (Possible Archaeology)
- Linear Trend (Ridge and Furrow)
- Linear Trend (Utility)
- Trend (Unclear Origin)

N

0 210m

Scale: 1:9,000 @ A3

Drawing Number: 05/40161/GEO/4/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Processed Gradiometer Data - Summary

Figure 5

2nT
-1nT

N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/5/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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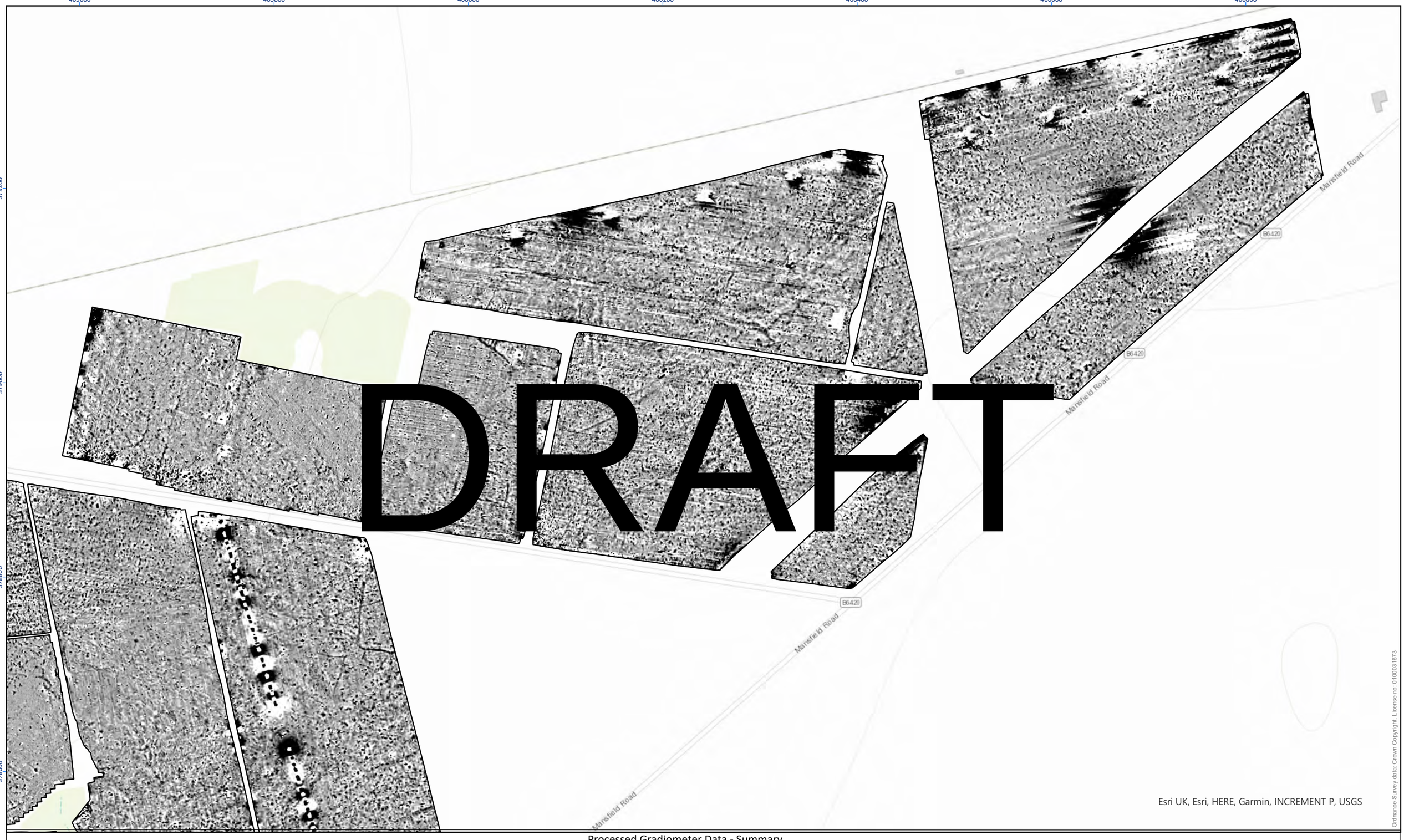

Processed Gradiometer Data - Summary

Figure 6

2nT
-1nT

N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/6/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Processed Gradiometer Data - Summary

Figure 7

2nT
-1nT

N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/7/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Processed Gradiometer Data - Summary

Figure 8

2nT
-1nT

N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/8/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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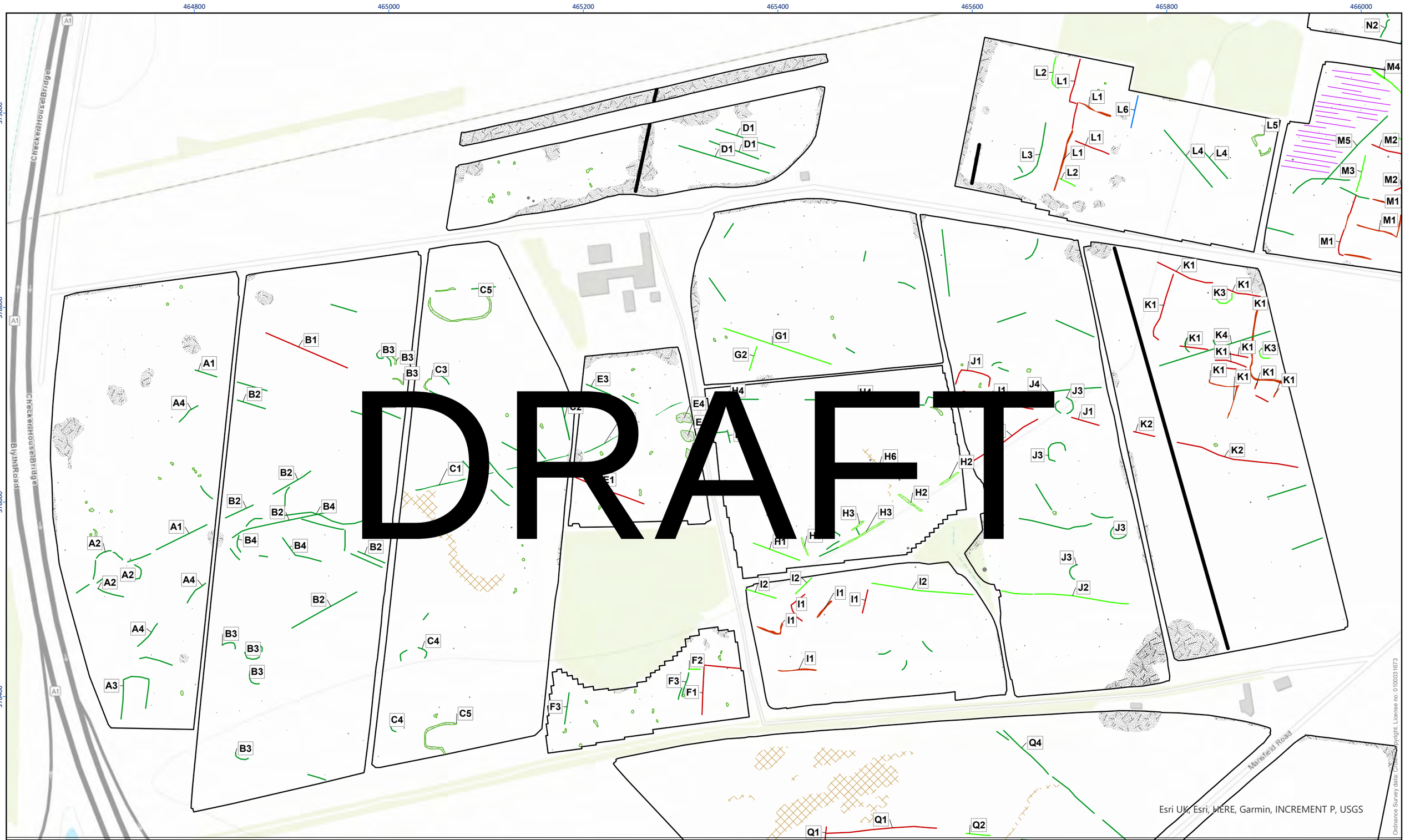


Interpretation of Processed Gradiometer Data - Summary

Figure 9

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Modern)
- Linear Trend (Possible Archaeology)
- Enhanced Magnetism (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)
- Linear Trend (Unclear Origin)

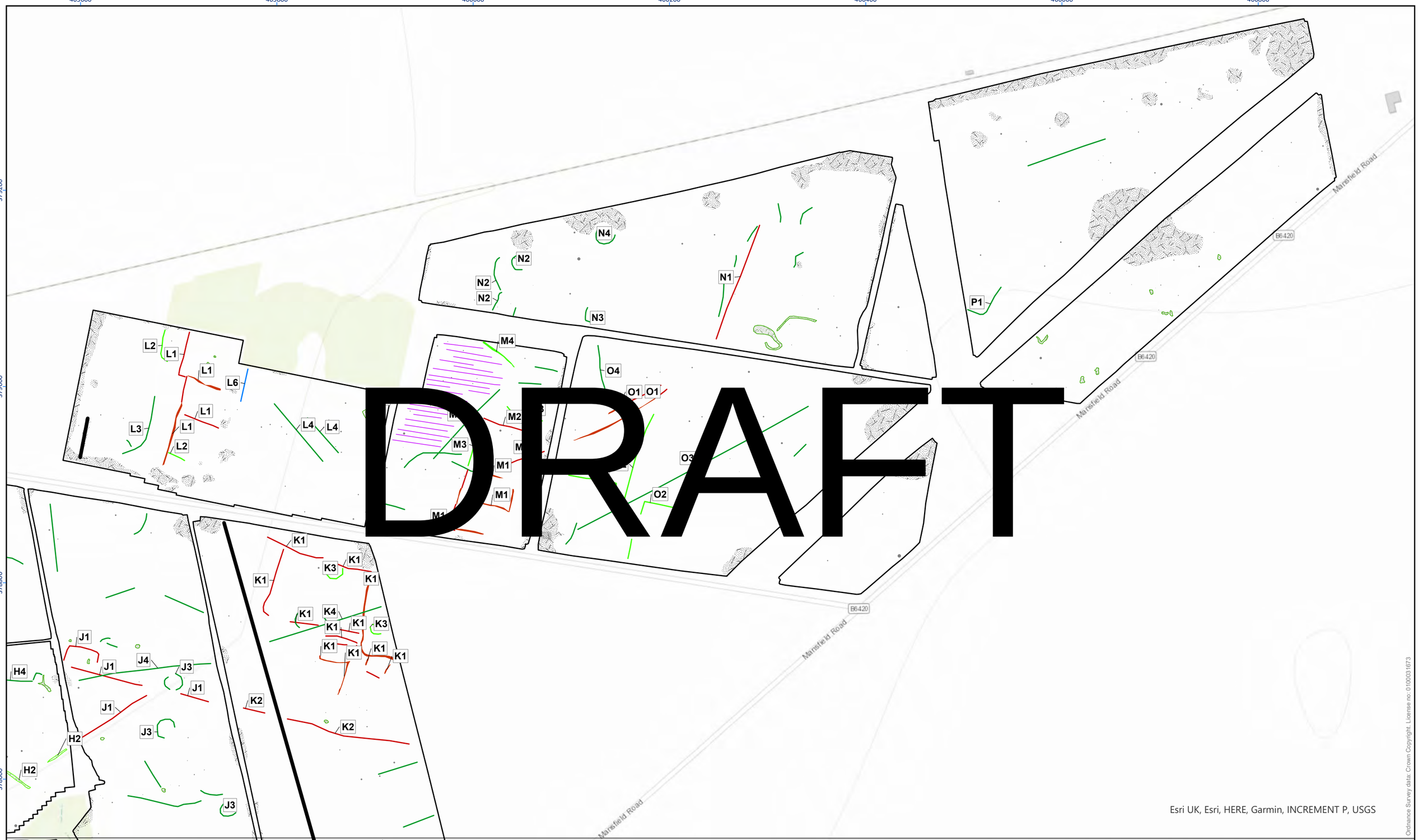
N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/9/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data - Summary

Figure 10

- Linear Trend (Archaeology)
- Enhanced Magnetism (Modern)
- Linear Trend (Possible Archaeology)
- Enhanced Magnetism (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/10/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Interpretation of Processed Gradiometer Data - Summary

Figure 11

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Historic Feature)
- Enhanced Magnetism (Modern)
- Enhanced Magnetism (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/11/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Interpretation of Processed Gradiometer Data - Summary

Figure 12

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Historic Feature)
- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike

N

0 90m

Scale: 1:3,500 @ A3

Drawing Number: 05/40161/GEO/12/01	
Created by: SO	Date: 14/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

464800

465000

378800

378600

Minimally Processed Gradiometer Data - XY Trace

Figure 13

30nT

-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/13/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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464800

465000

378400

A1

WORKSOP ROAD

A1

A1

WORKSOP ROAD

Minimally Processed Gradiometer Data - XY Trace

Figure 14

30nT

-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/14/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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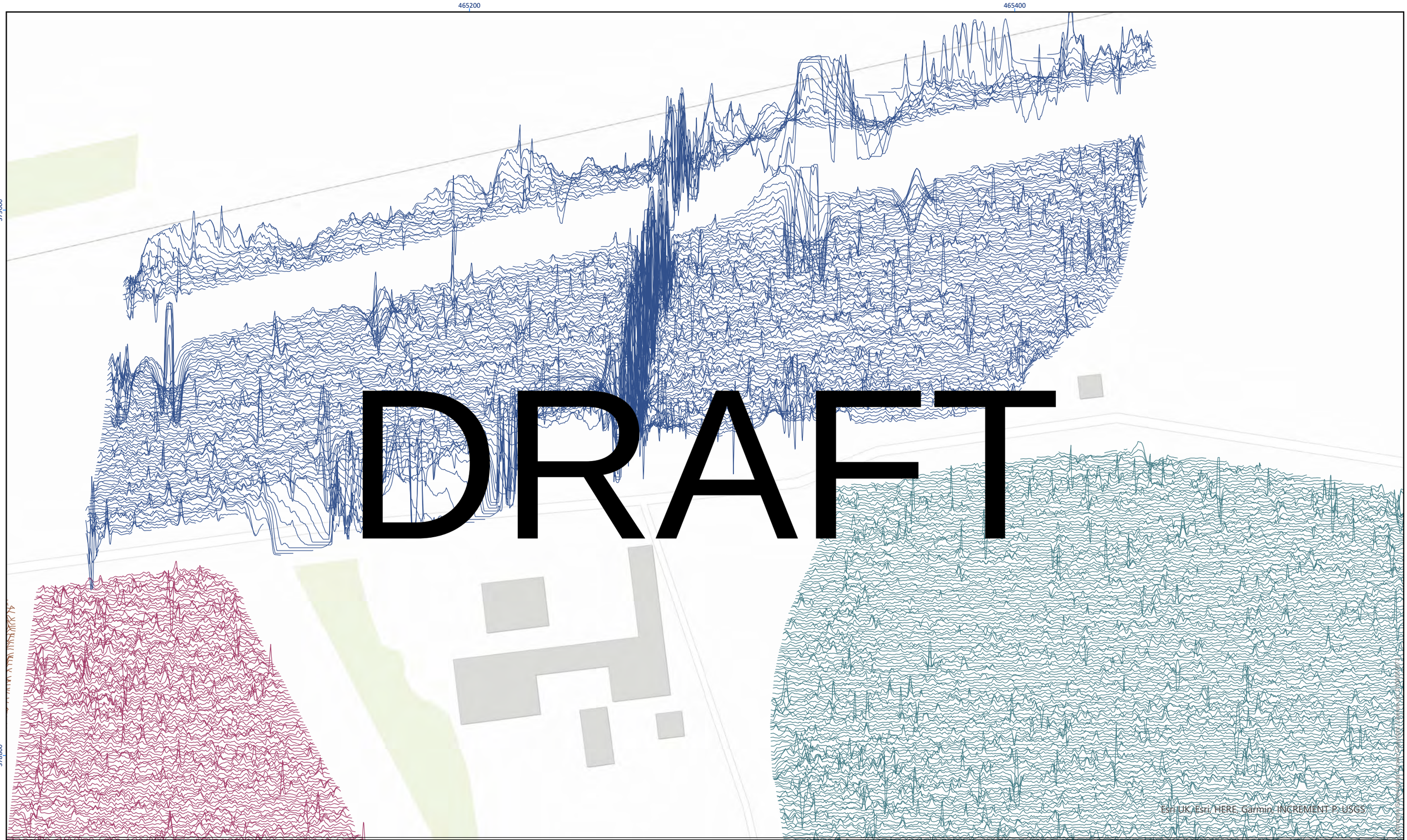

Minimally Processed Gradiometer Data - XY Trace

Figure 15

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/15/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Minimally Processed Gradiometer Data - XY Trace

Figure 16

30nT
-30nT

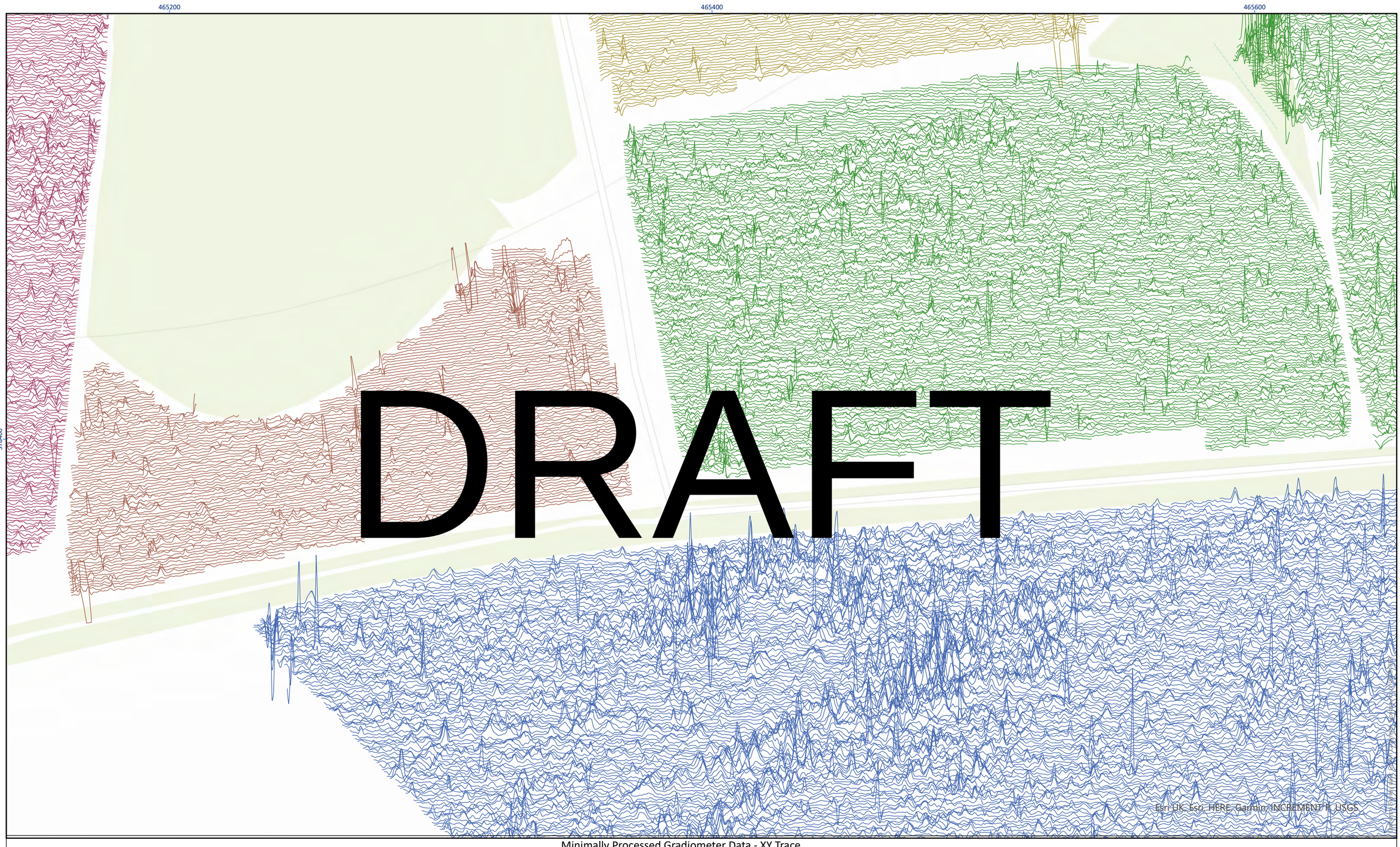
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/16/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Minimally Processed Gradiometer Data - XY Trace

Figure 17

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/17/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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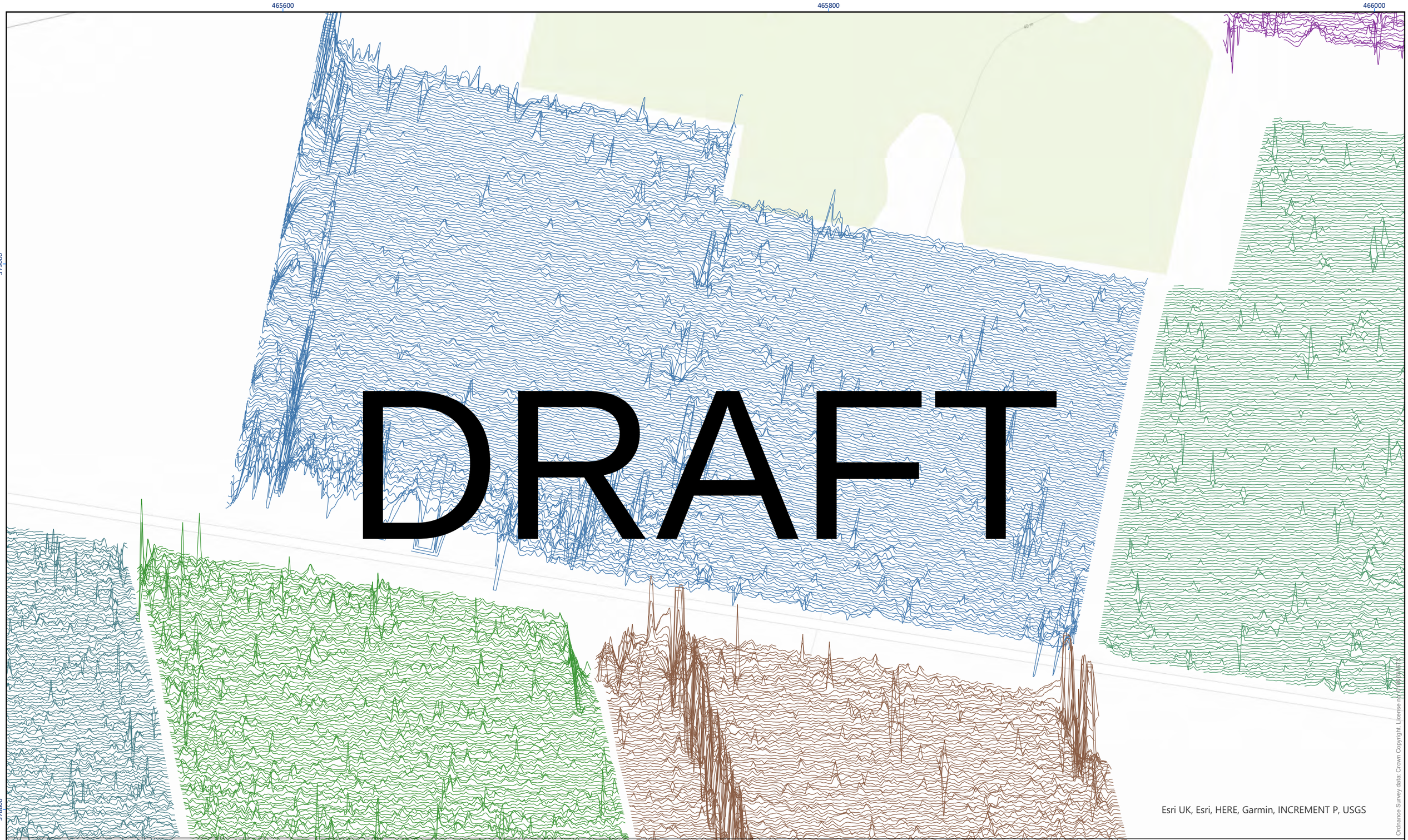

Minimally Processed Gradiometer Data - XY Trace

Figure 18

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/18/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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465600

465800

466000

378600

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Minimally Processed Gradiometer Data - XY Trace

Figure 19

30nT

-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/19/01	
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Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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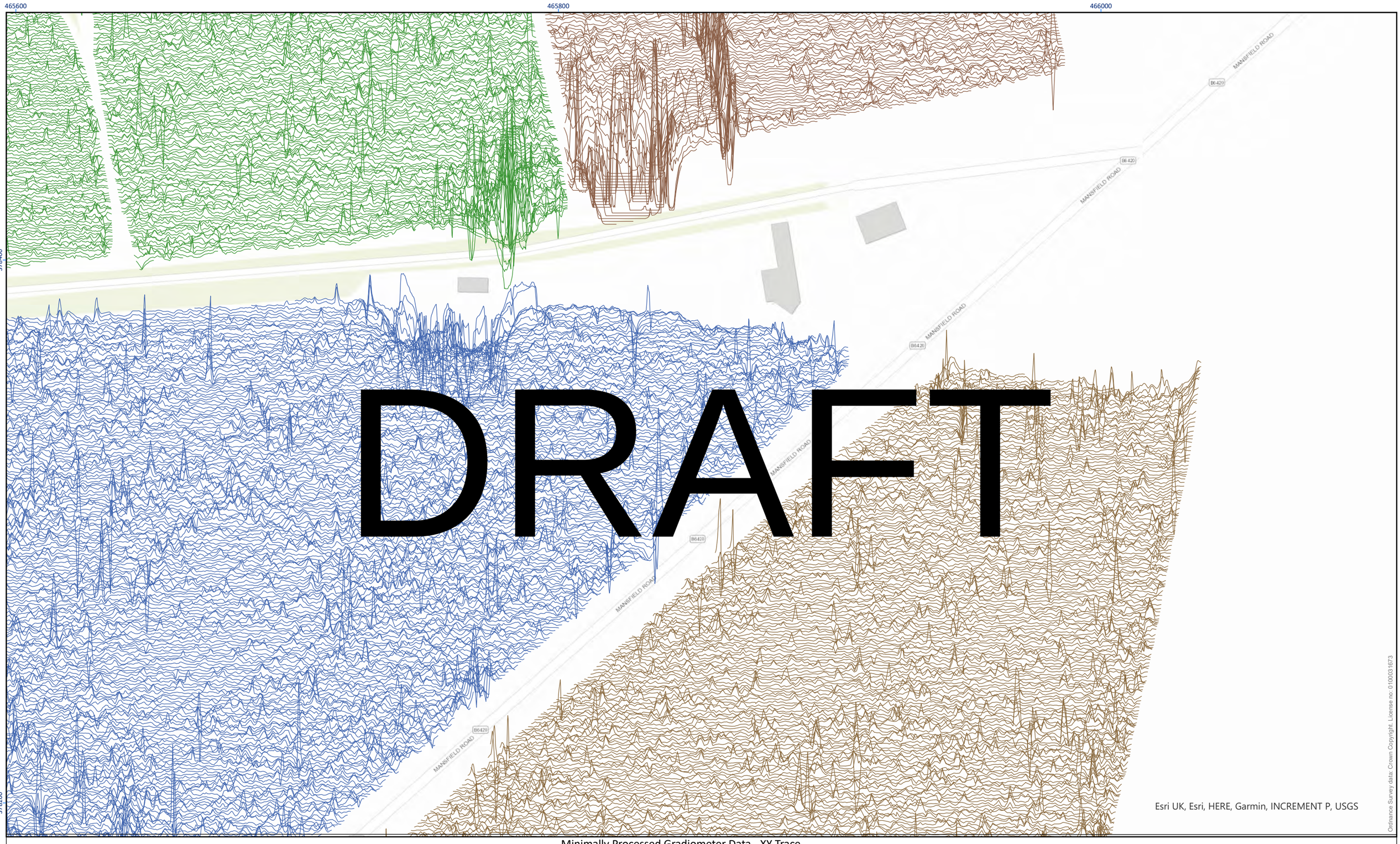

Minimally Processed Gradiometer Data - XY Trace

Figure 20

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/20/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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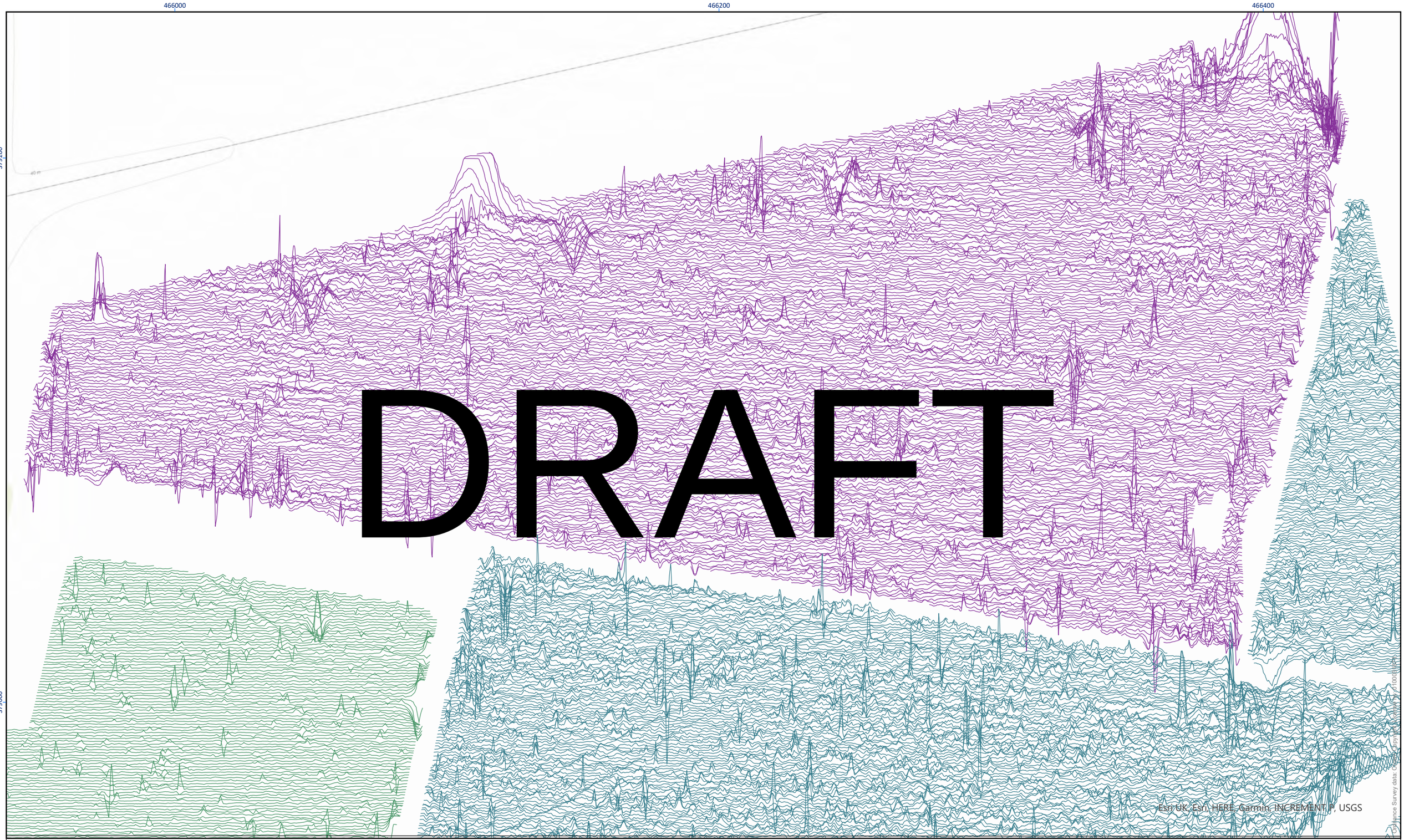

Minimally Processed Gradiometer Data - XY Trace

Figure 21

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/21/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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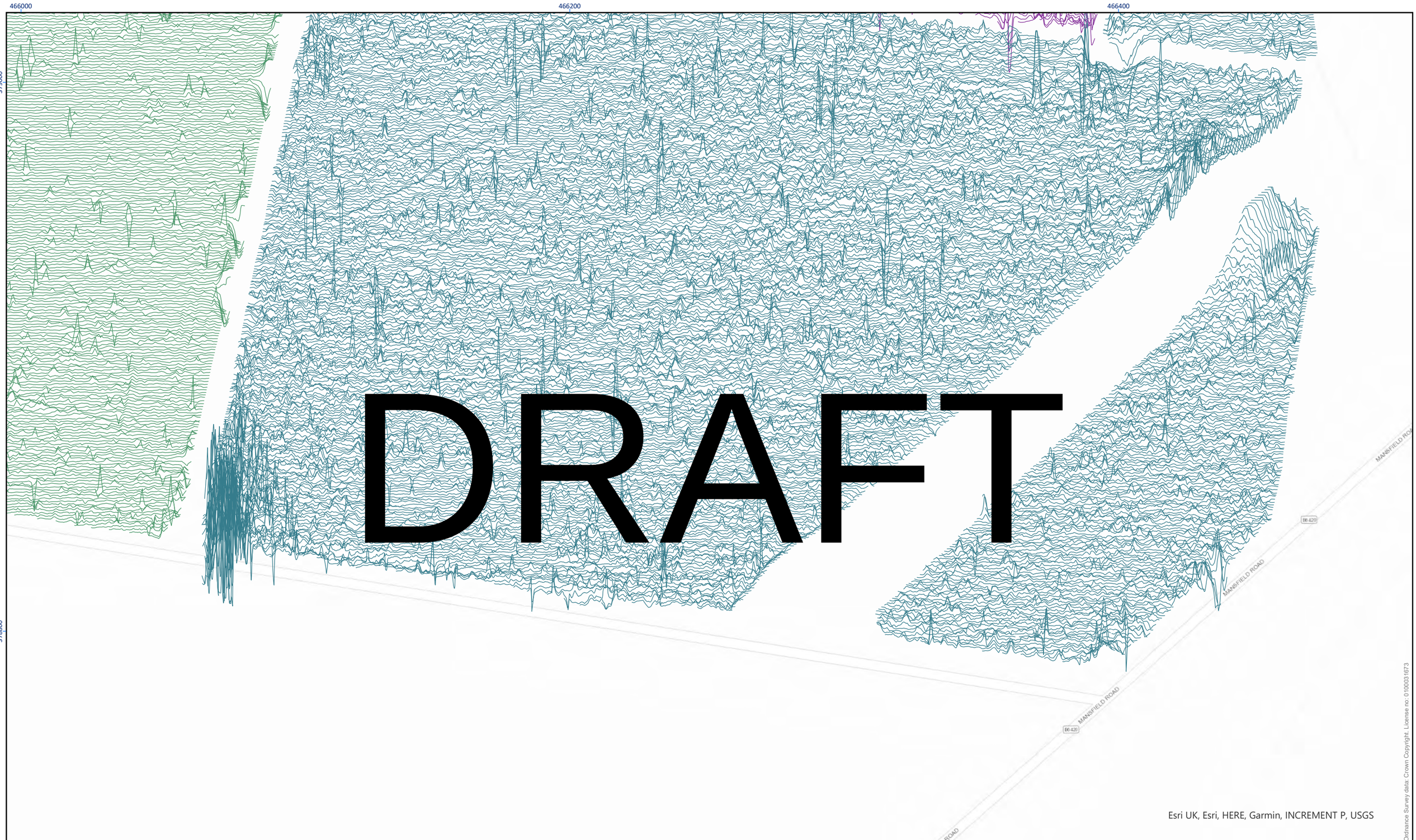


Minimally Processed Gradiometer Data - XY Trace

Figure 22

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

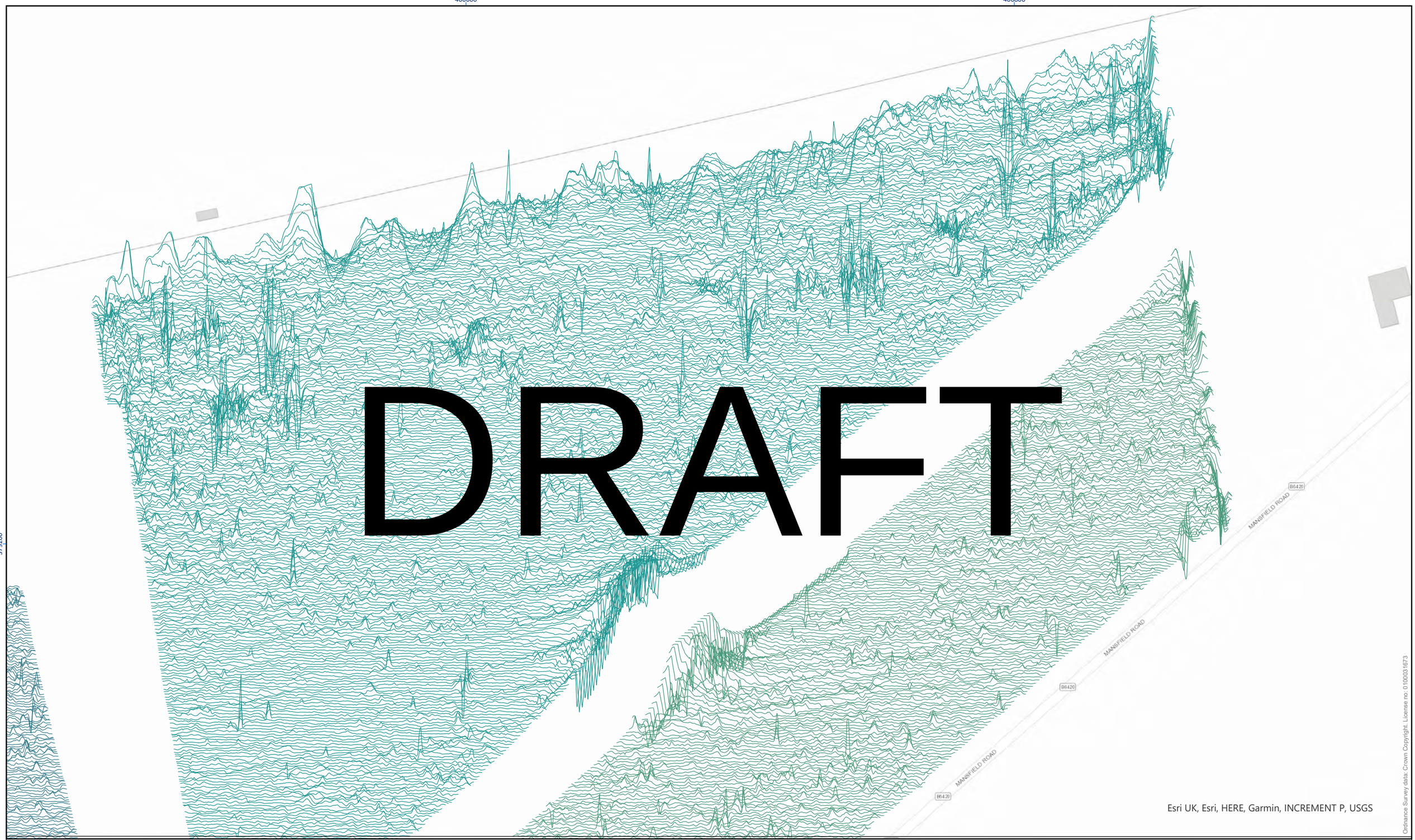
Drawing Number: 05/40161/GEO/22/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

466600

466800

379200



Minimally Processed Gradiometer Data - XY Trace

Figure 23

30nT

-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/23/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Minimally Processed Gradiometer Data - XY Trace

Figure 24

30nT
-30nT

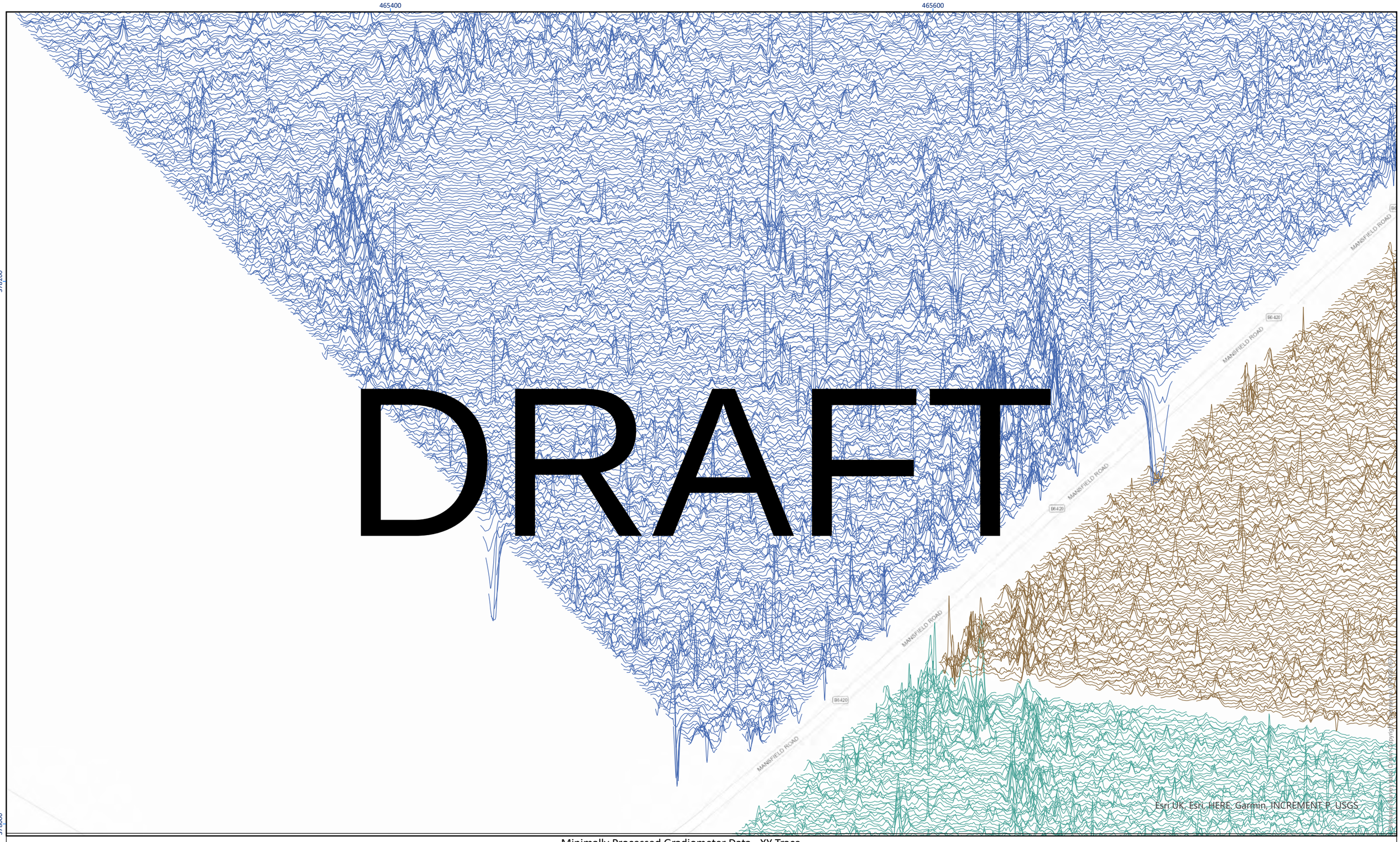
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/24/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Minimally Processed Gradiometer Data - XY Trace

Figure 25

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/25/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Minimally Processed Gradiometer Data - XY Trace

Figure 26

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/26/01	
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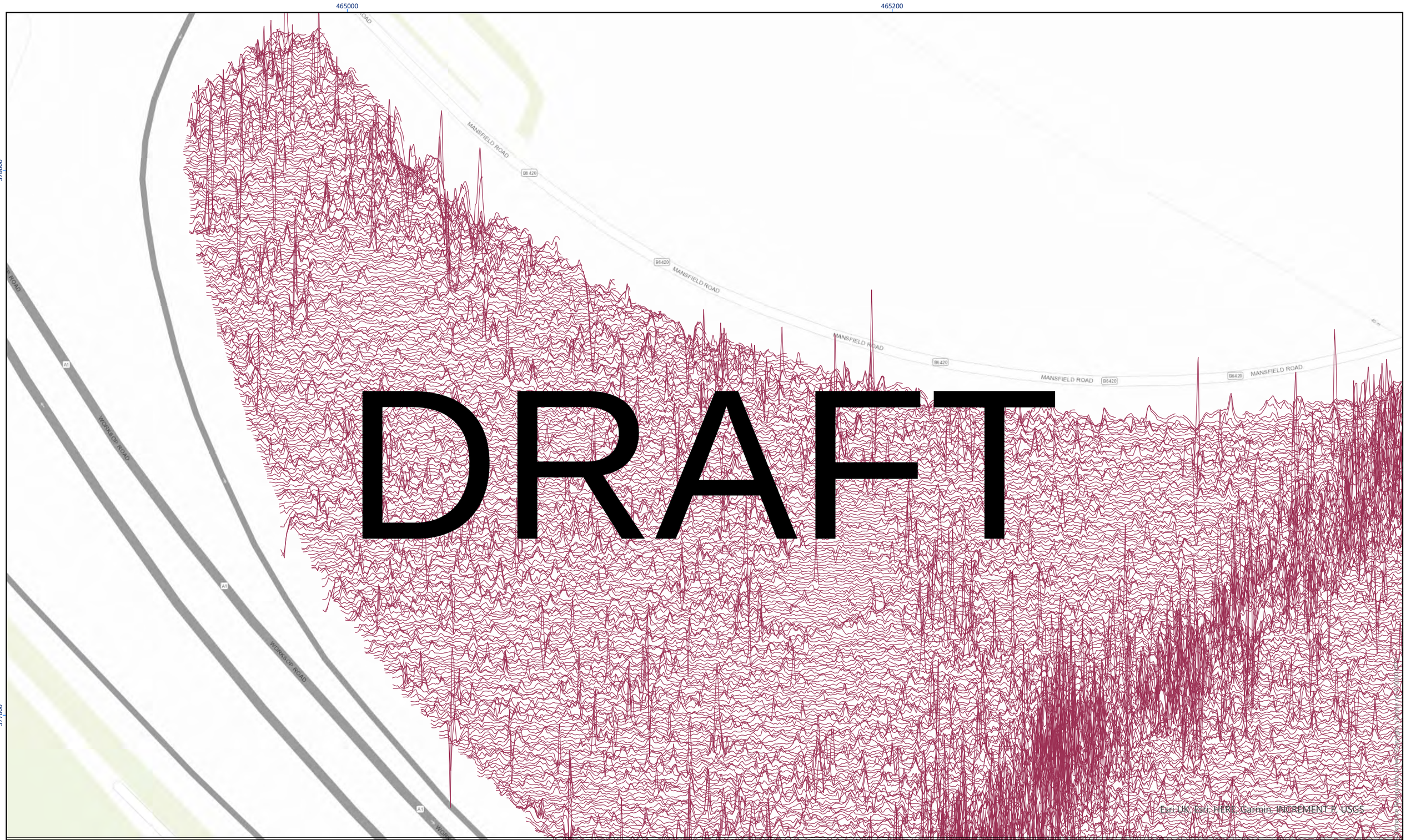
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Minimally Processed Gradiometer Data - XY Trace

Figure 27

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/27/01	
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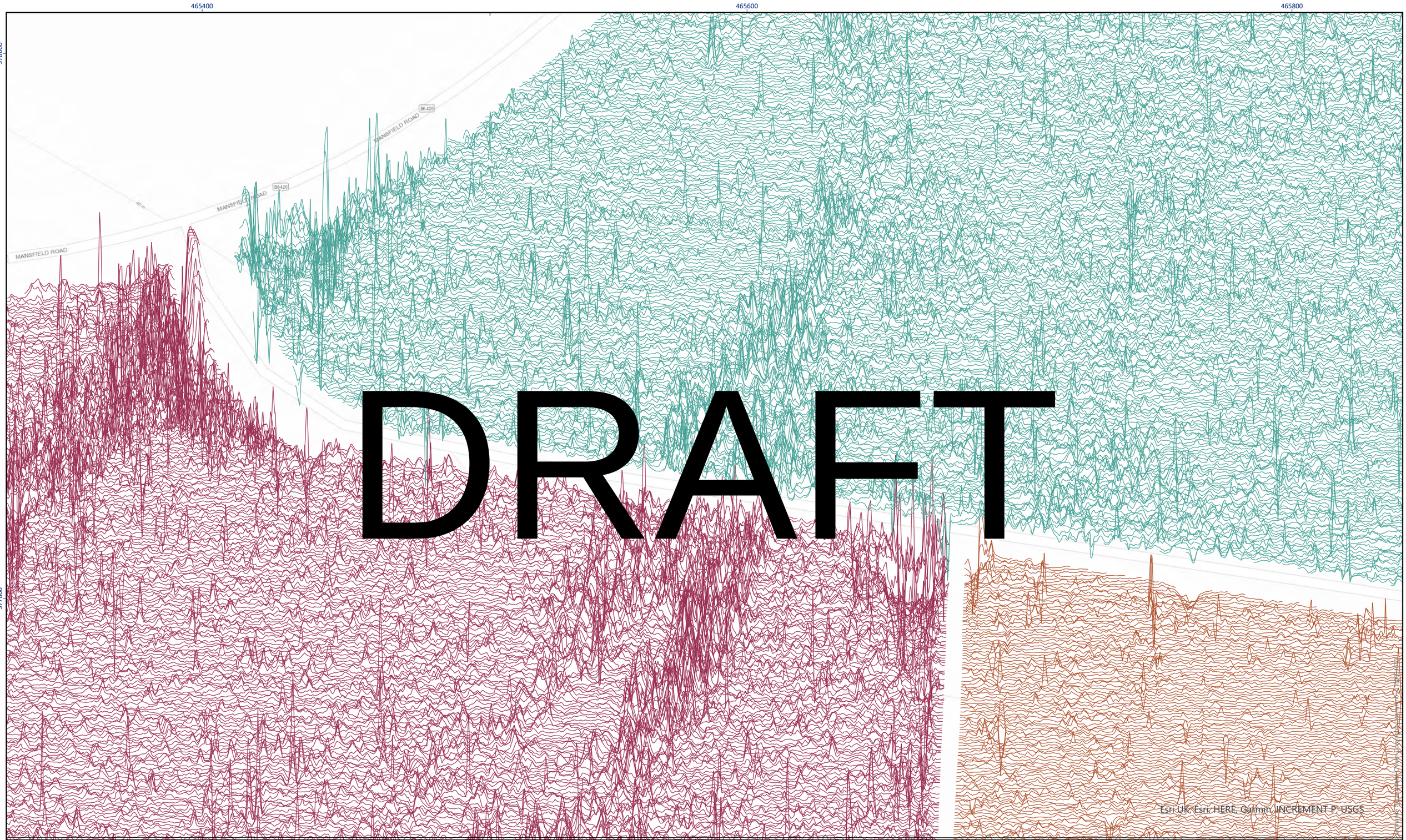
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Minimally Processed Gradiometer Data - XY Trace

Figure 28

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/28/01	
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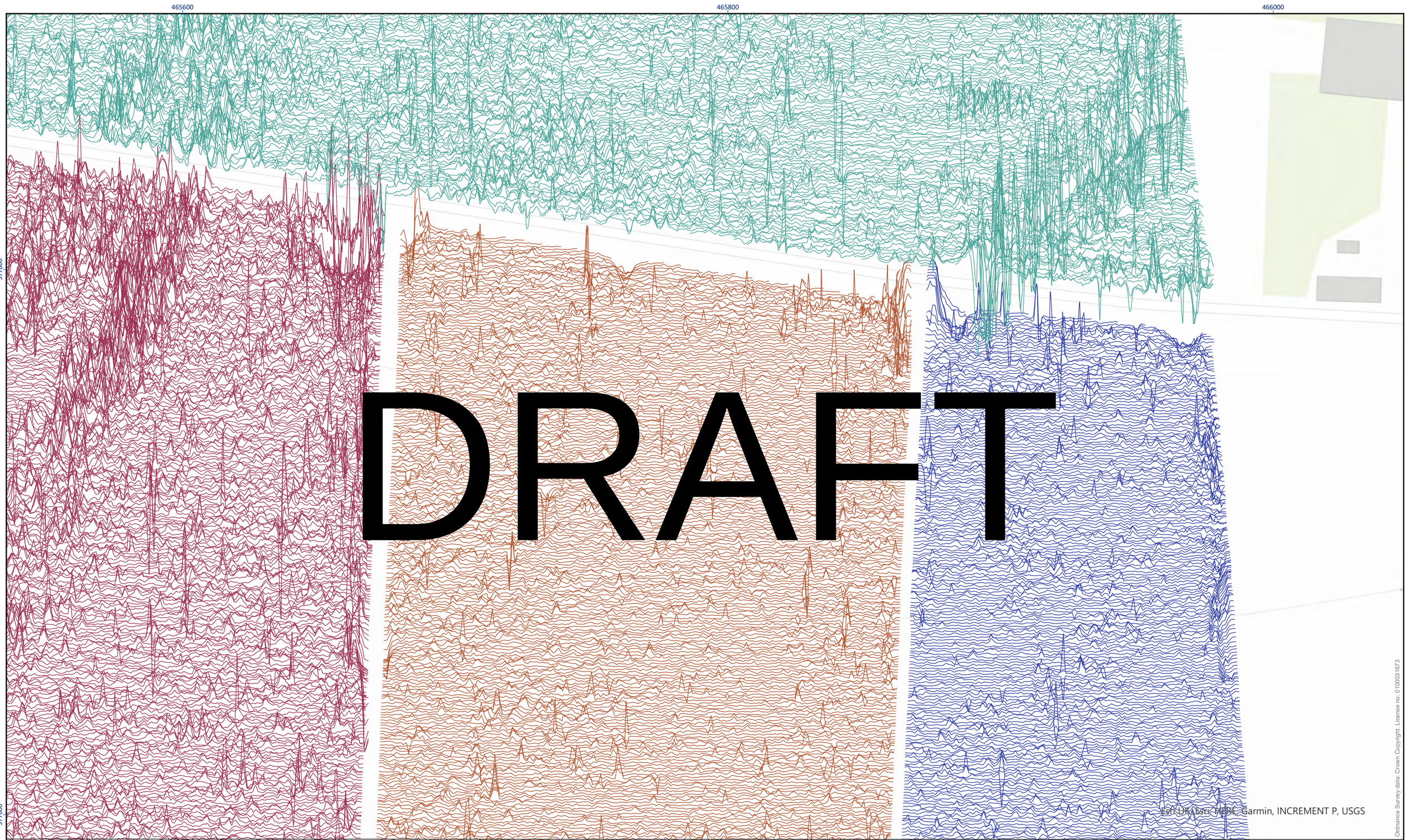
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Minimally Processed Gradiometer Data - XY Trace

Figure 29

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/29/01	
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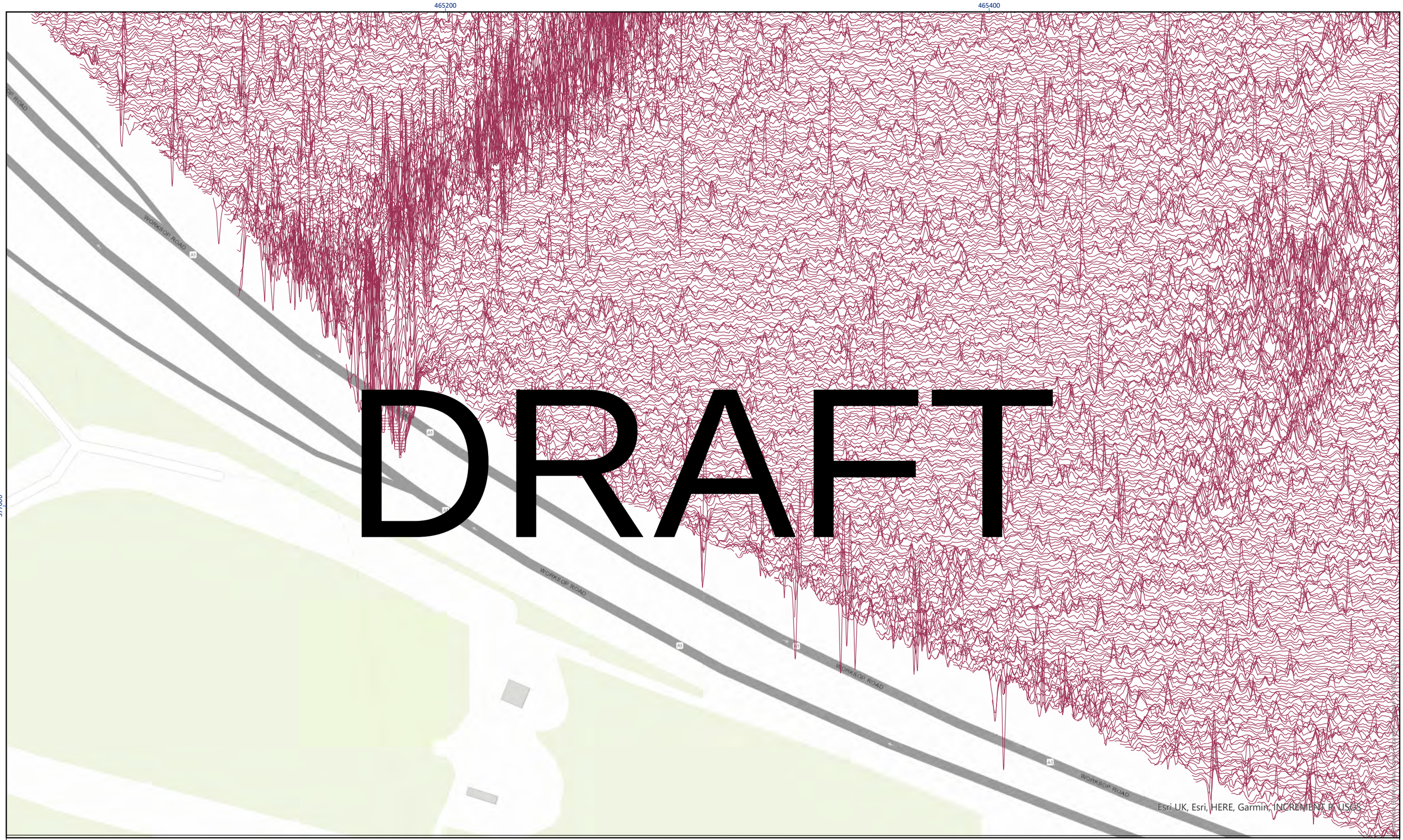
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Minimally Processed Gradiometer Data - XY Trace

Figure 30

30nT
-30nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/30/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

465600

465800

466000

377400

Minimally Processed Gradiometer Data - XY Trace

Figure 31

30nT

-30nT

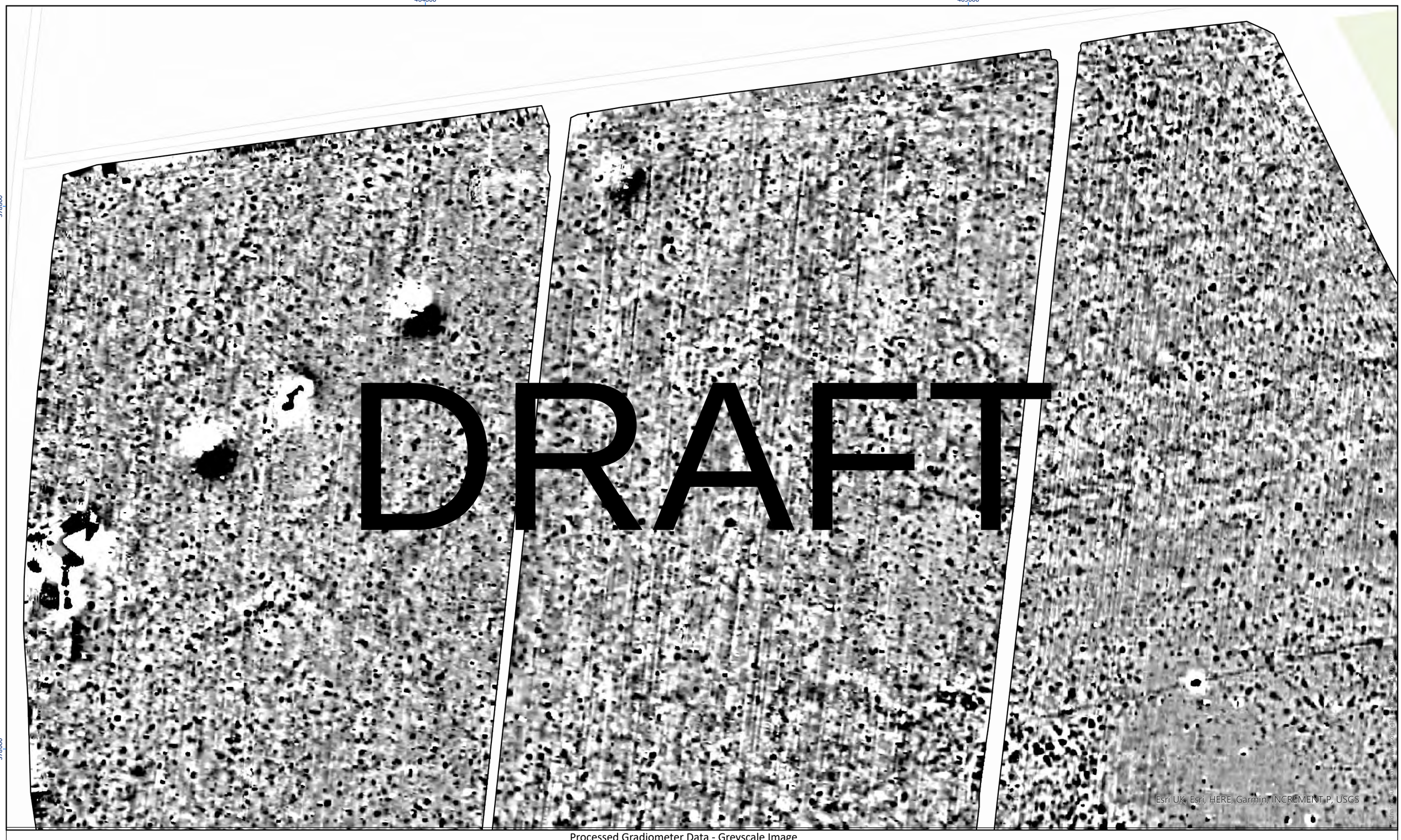
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/31/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Processed Gradiometer Data - Greyscale Image

Figure 32

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/32/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 33

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/33/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 34

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/34/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 35

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/35/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 36

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/36/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Processed Gradiometer Data - Greyscale Image

Figure 37

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/37/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

465600

465800

466000

378600

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Processed Gradiometer Data - Greyscale Image

Figure 38

2nT

-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/38/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 39

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/39/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

466000 466200 466400

379200

379000

Processed Gradiometer Data - Greyscale Image

Figure 40

2nT

-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/40/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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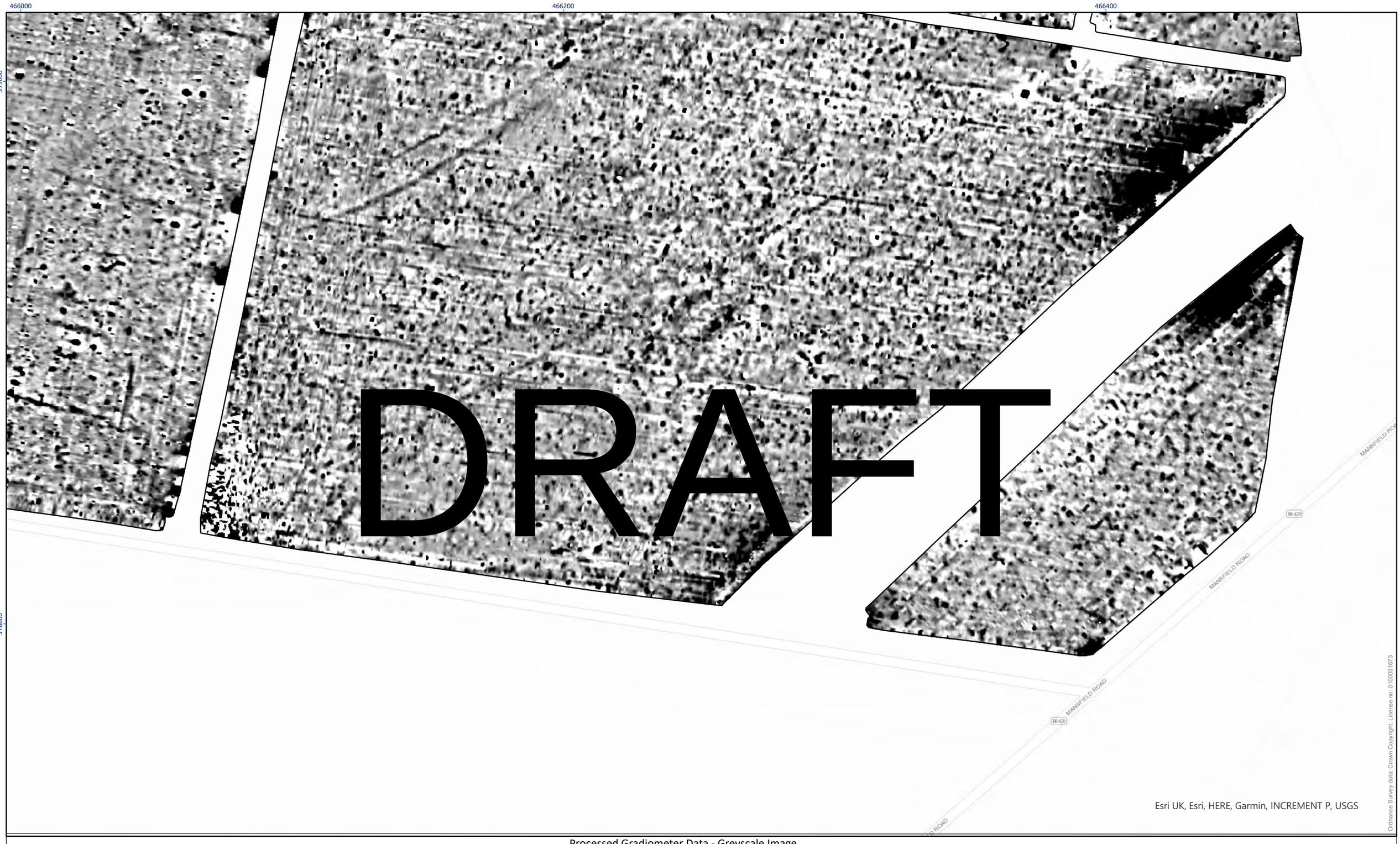


Processed Gradiometer Data - Greyscale Image

Figure 41

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/41/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 42

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/42/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 43

2nT
-1nT

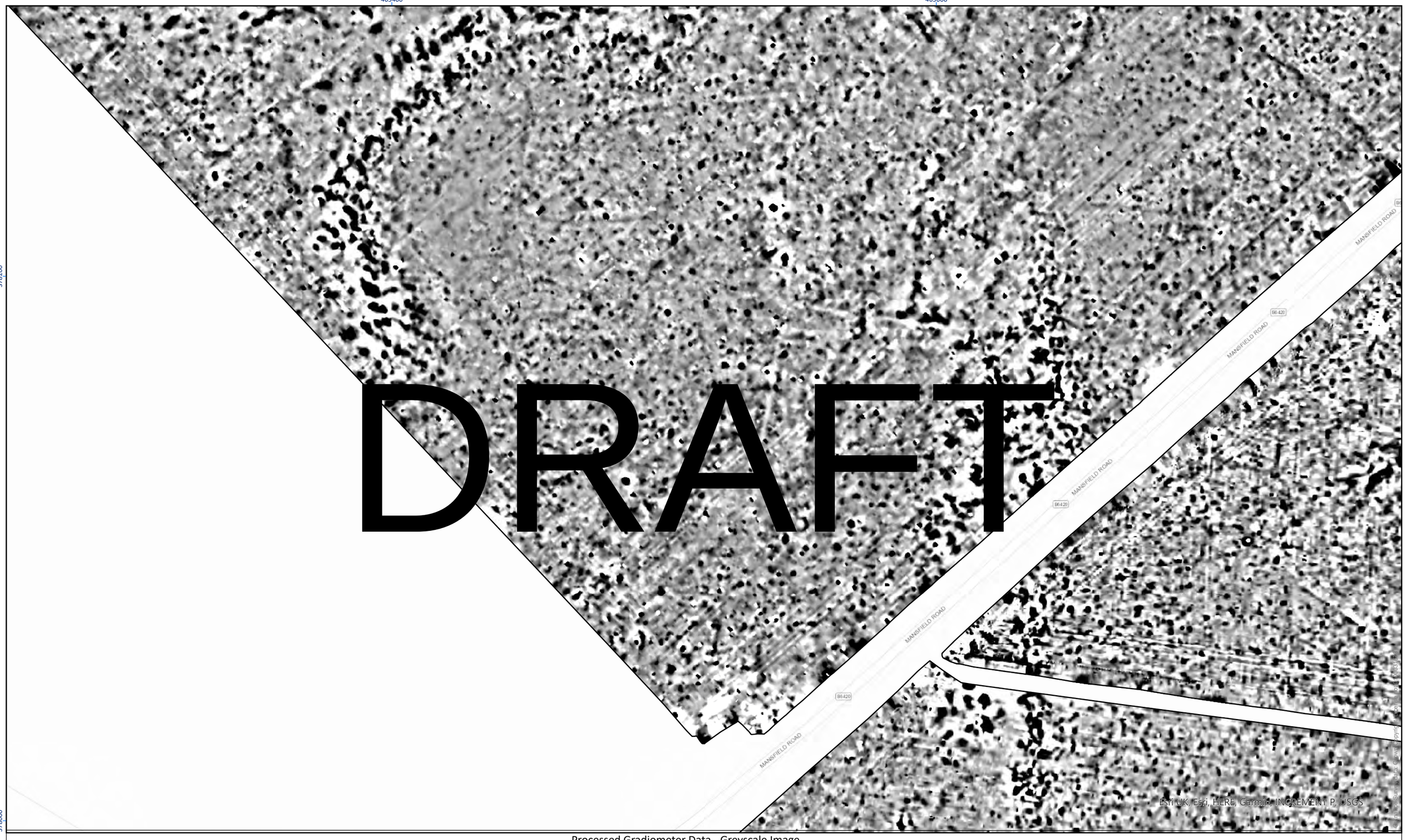
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/43/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Processed Gradiometer Data - Greyscale Image

Figure 44

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

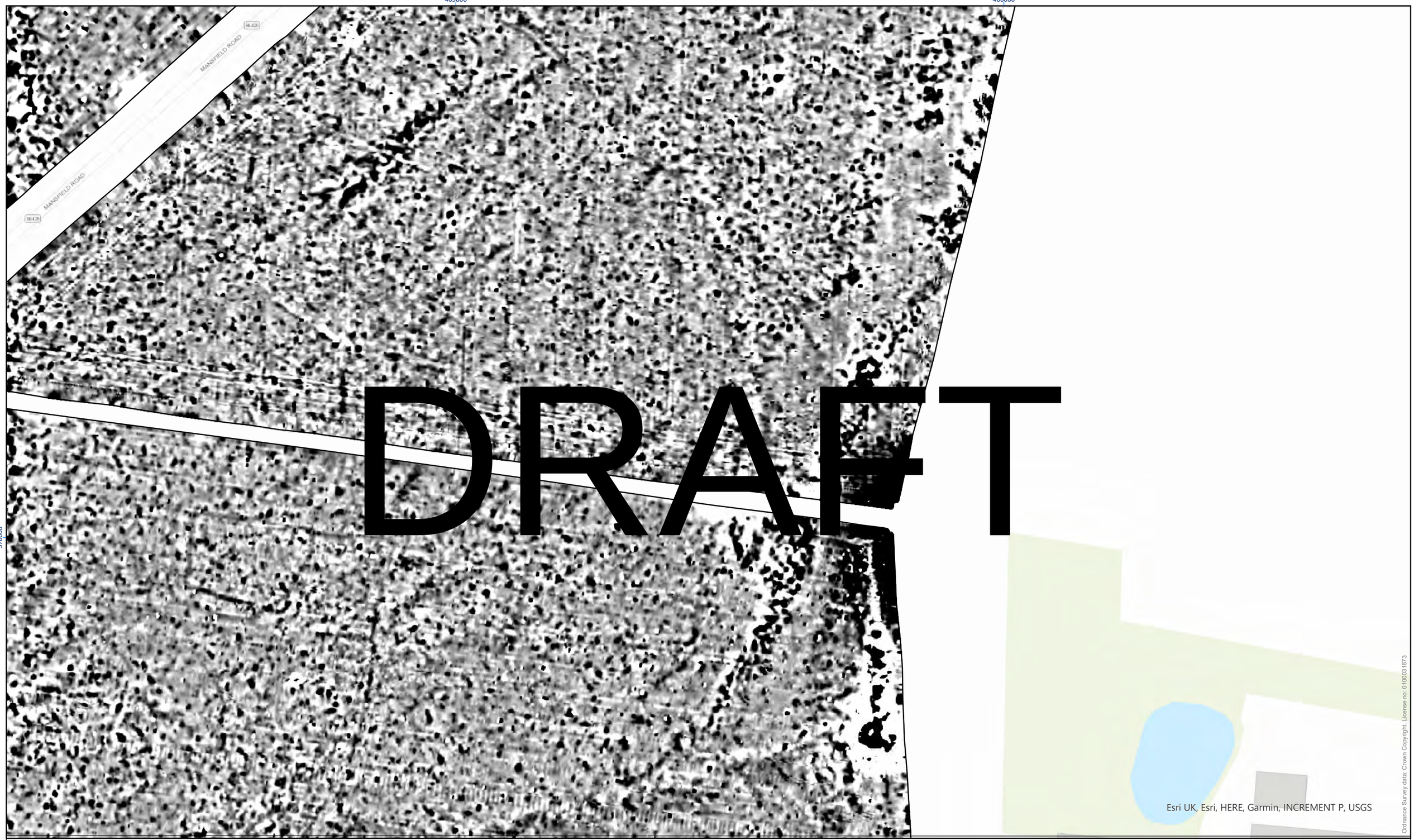
Drawing Number: 05/40161/GEO/44/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

465800

466000

378000



Processed Gradiometer Data - Greyscale Image

Figure 45

2nT

-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/45/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Processed Gradiometer Data - Greyscale Image

Figure 46

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/46/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 47

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/47/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

Processed Gradiometer Data - Greyscale Image

Figure 48

2nT
-1nT

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/48/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

465200

465400

377600

Processed Gradiometer Data - Greyscale Image

Figure 49

2nT

-1nT

N

0 30m

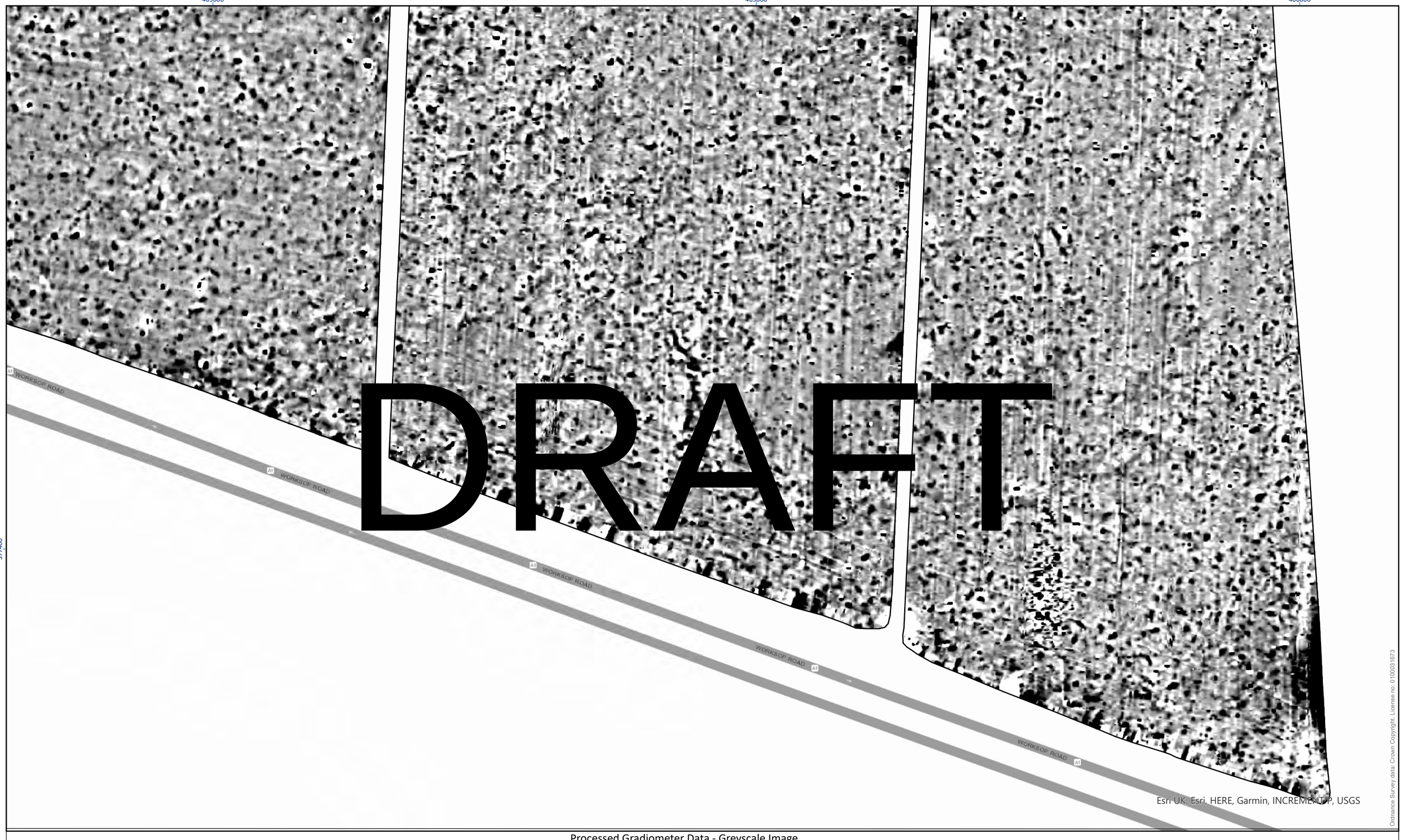
Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/49/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

465600 465800 466000

377400



Processed Gradiometer Data - Greyscale Image

Figure 50

2nT
-1nT

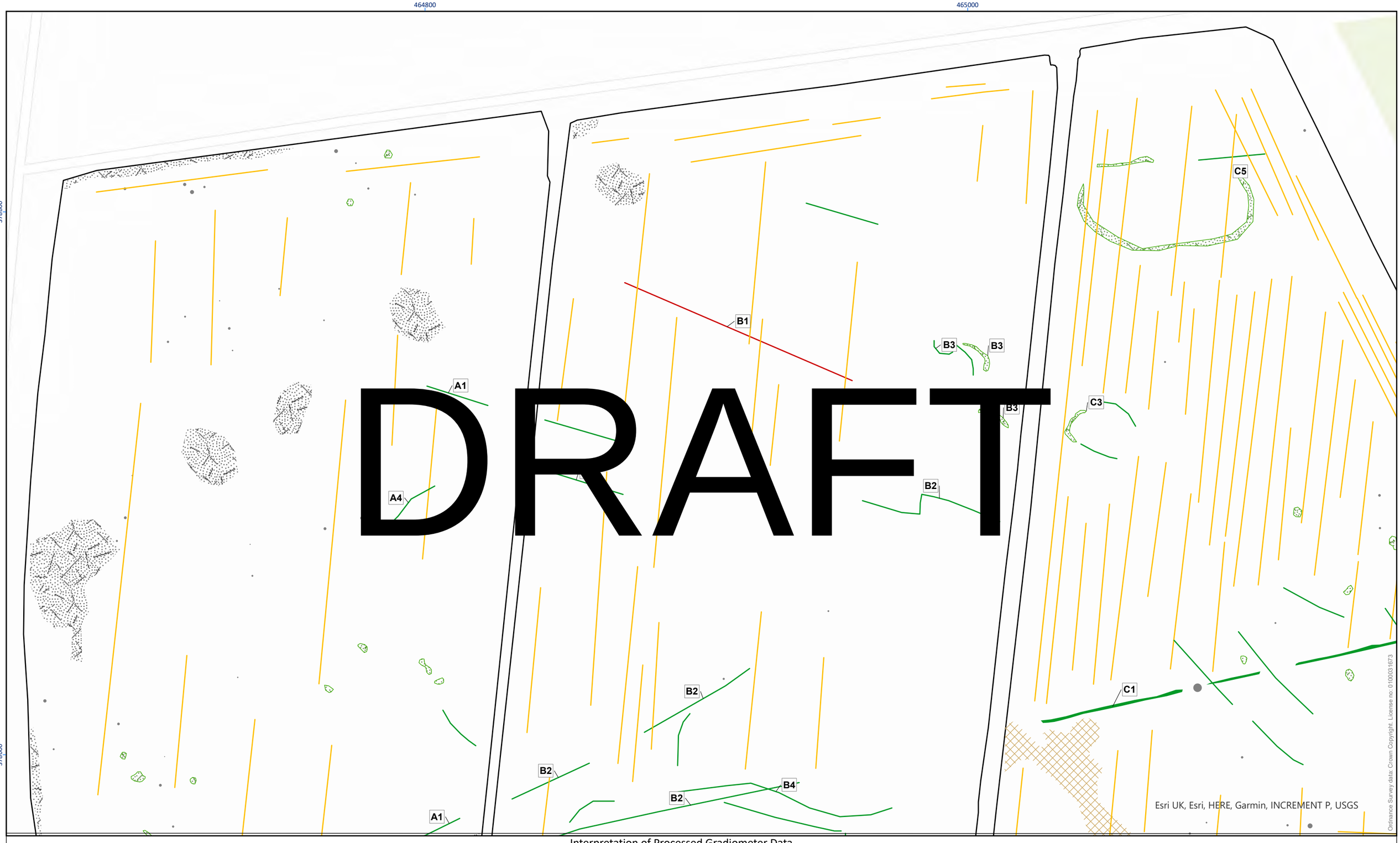
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/50/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 51

- Geology/Natural
- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)
- Linear Trend (Unclear Origin)

N

0 30m

Scale: 1:1,250 @ A3

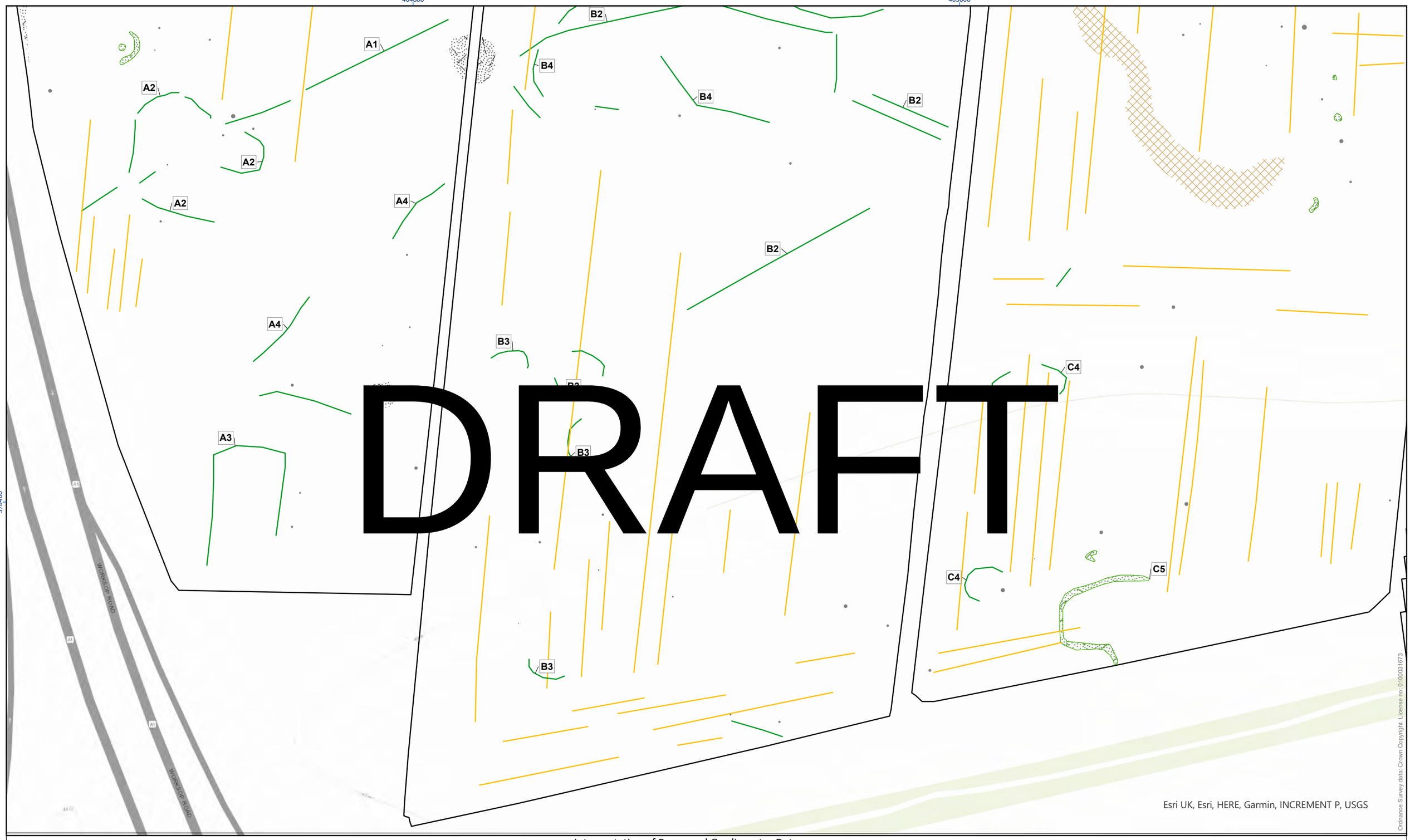
Drawing Number: 05/40161/GEO/51/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

464800

465000

378400



Interpretation of Processed Gradiometer Data

Figure 52

Geology/Natural
Enhanced Magnetism (Modern)
Ferrous/Iron Spike
Enhanced Magnetism (Unclear Origin)

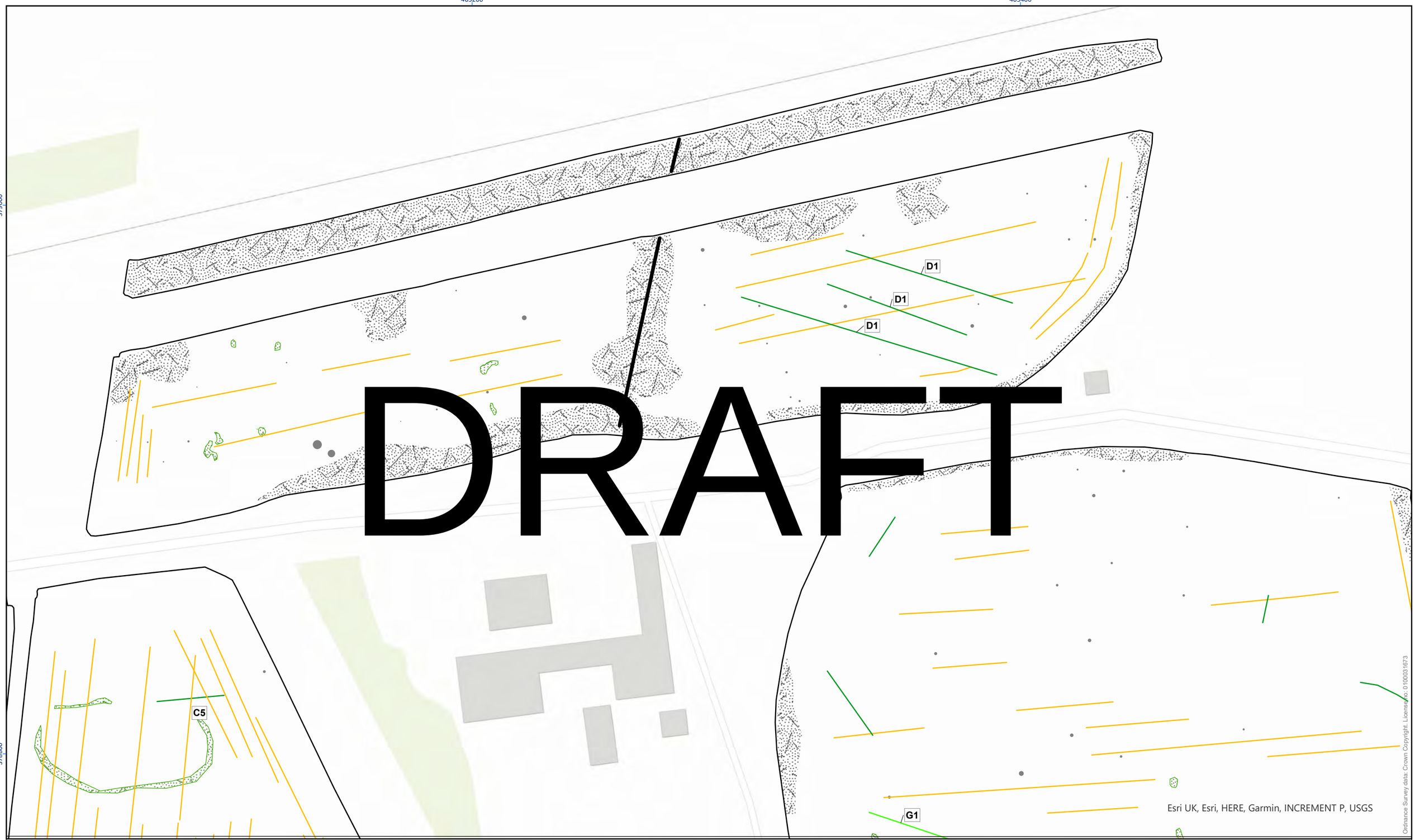
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/52/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 53

- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

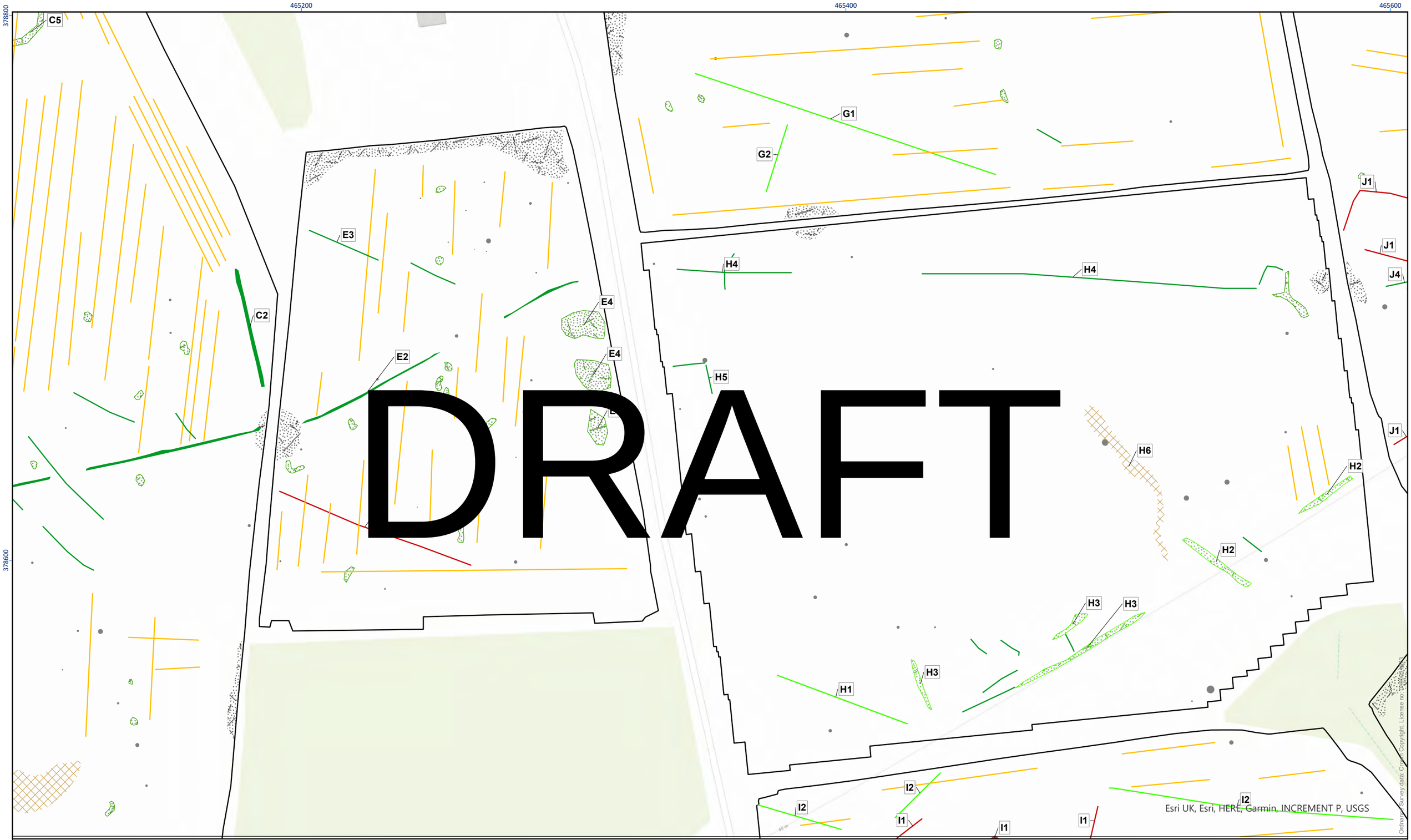
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/53/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 54

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Modern)
- Enhanced Magnetism (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)
- Linear Trend (Unclear Origin)

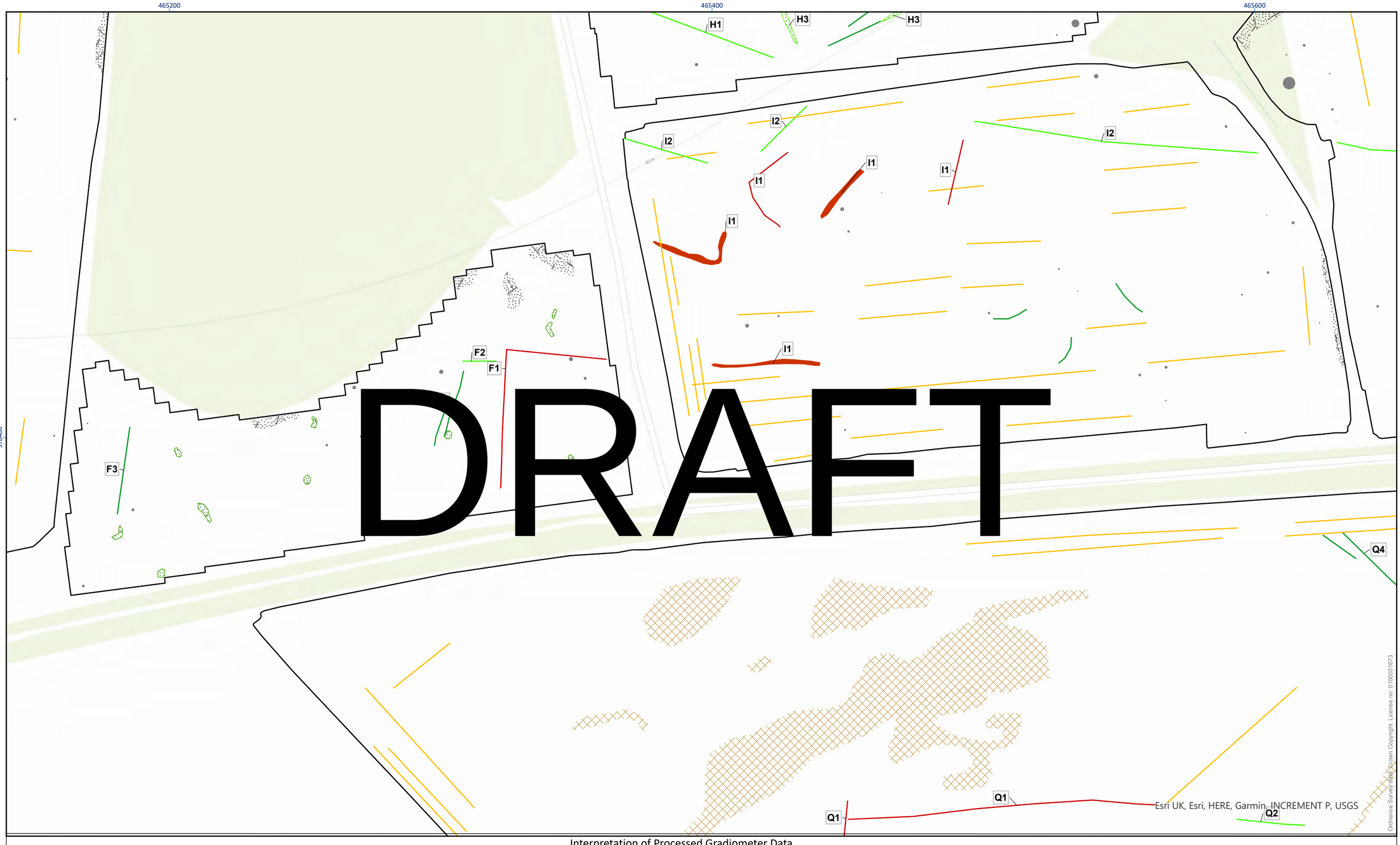
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/54/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 55

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Modern)
- Enhanced Magnetism (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

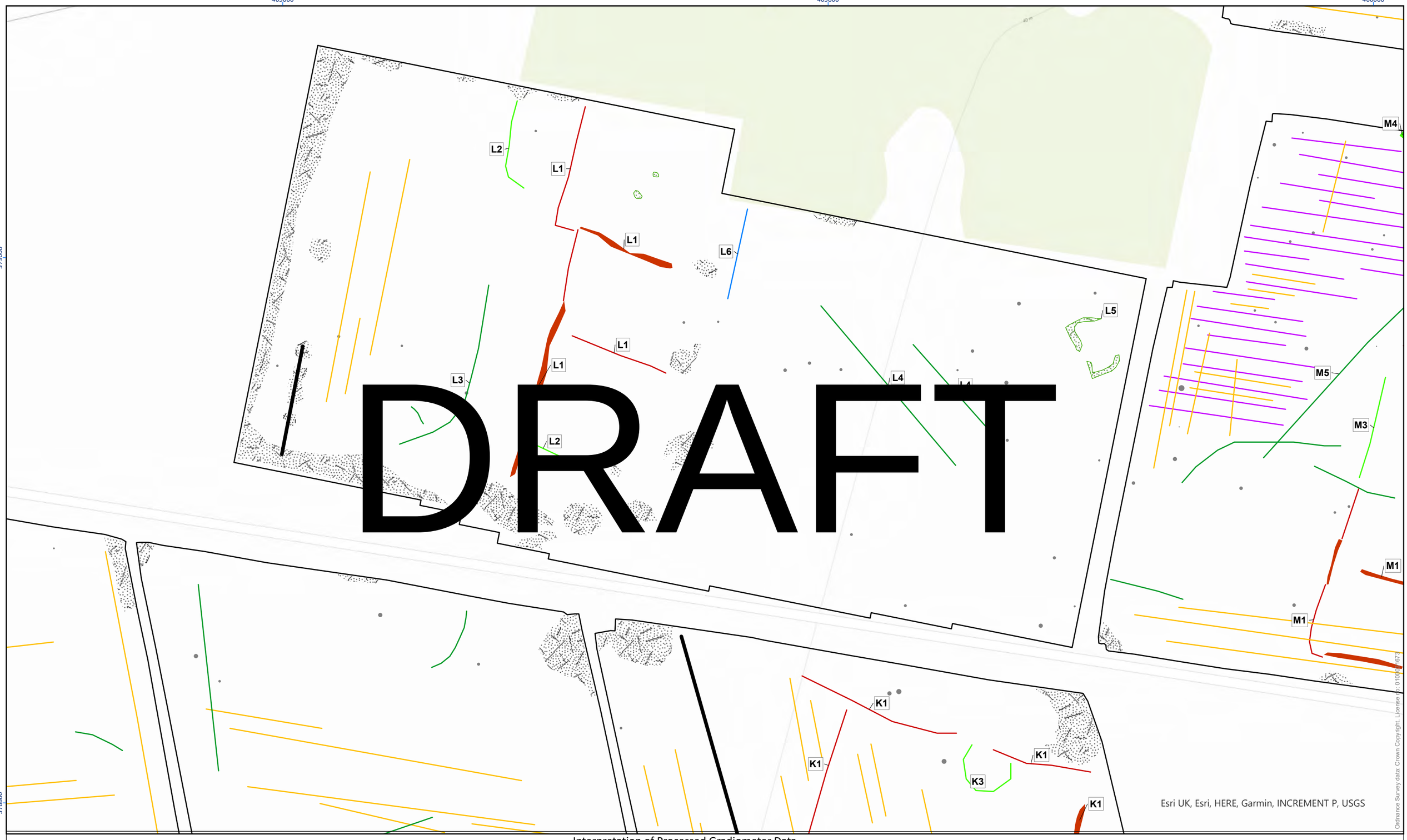
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/55/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 56

- Linear Trend (Archaeology)
- Enhanced Magnetism (Modern)
- Linear Trend (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

N

0 30m

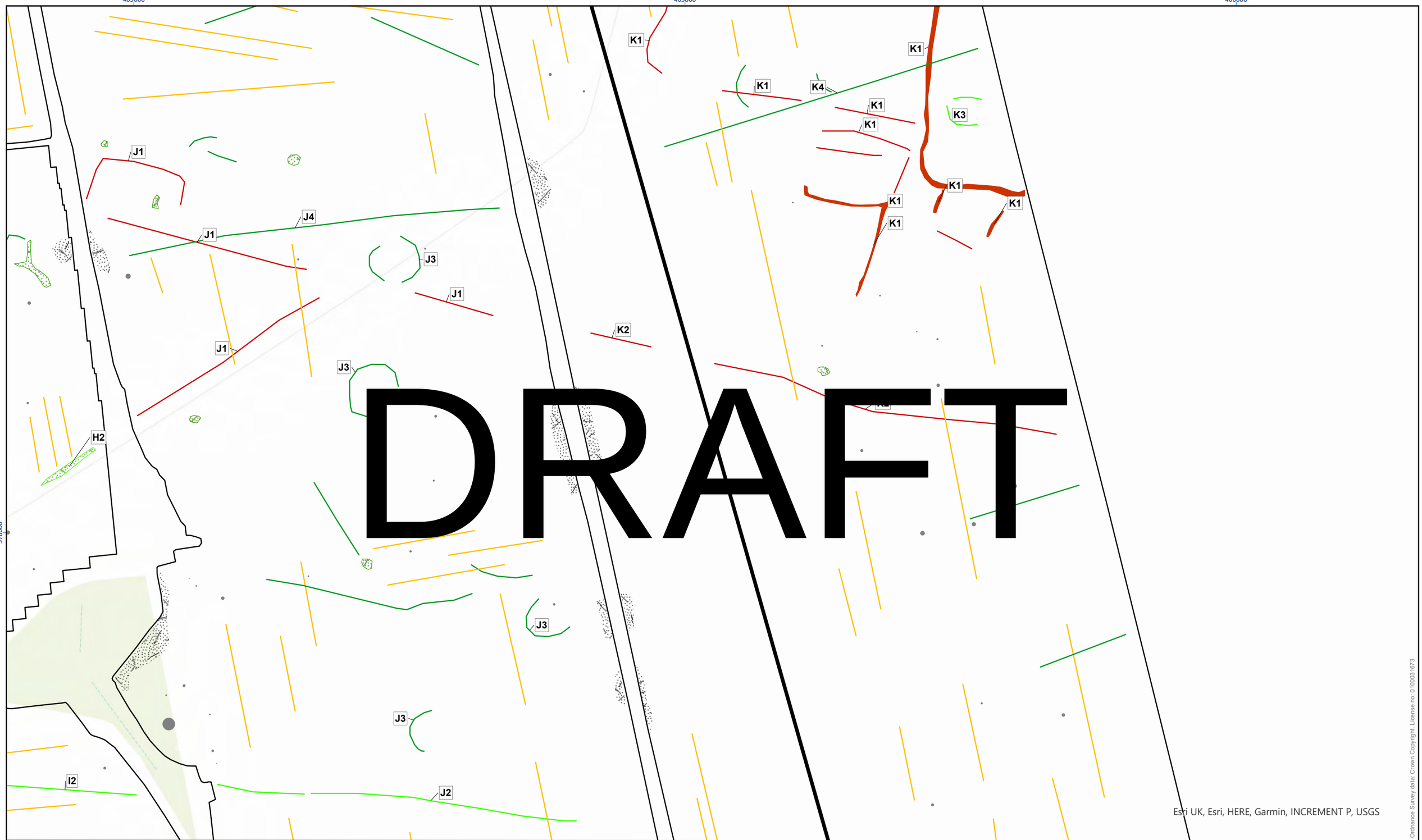
Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/56/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

465600 465800 466000

378600



Interpretation of Processed Gradiometer Data

Figure 57

- Linear Trend (Archaeology)
- Enhanced Magnetism (Modern)
- Enhanced Magnetism (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

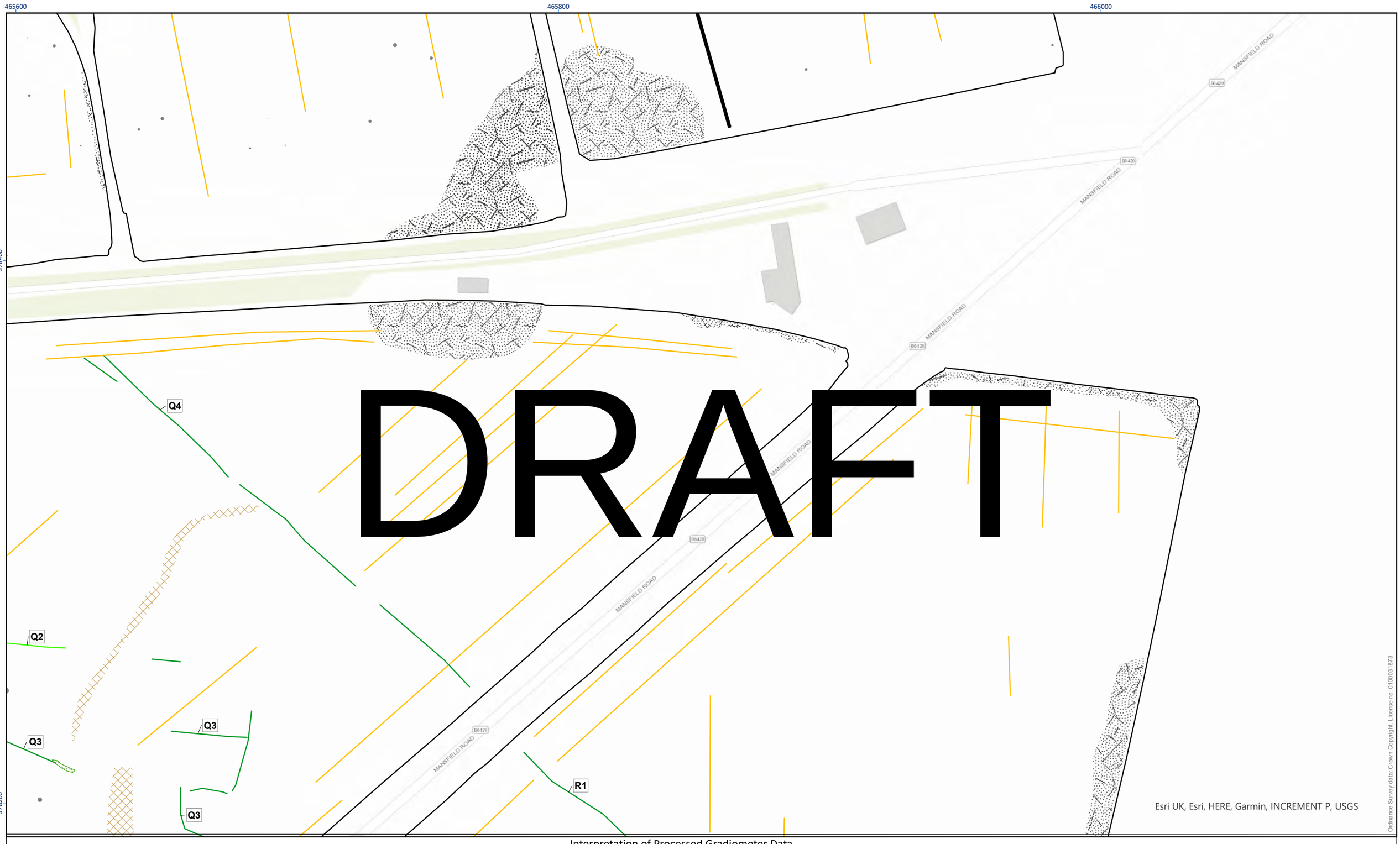
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/57/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 58

Geology/Natural
Enhanced Magnetism (Modern)
Ferrous/Iron Spike
Enhanced Magnetism (Unclear Origin)

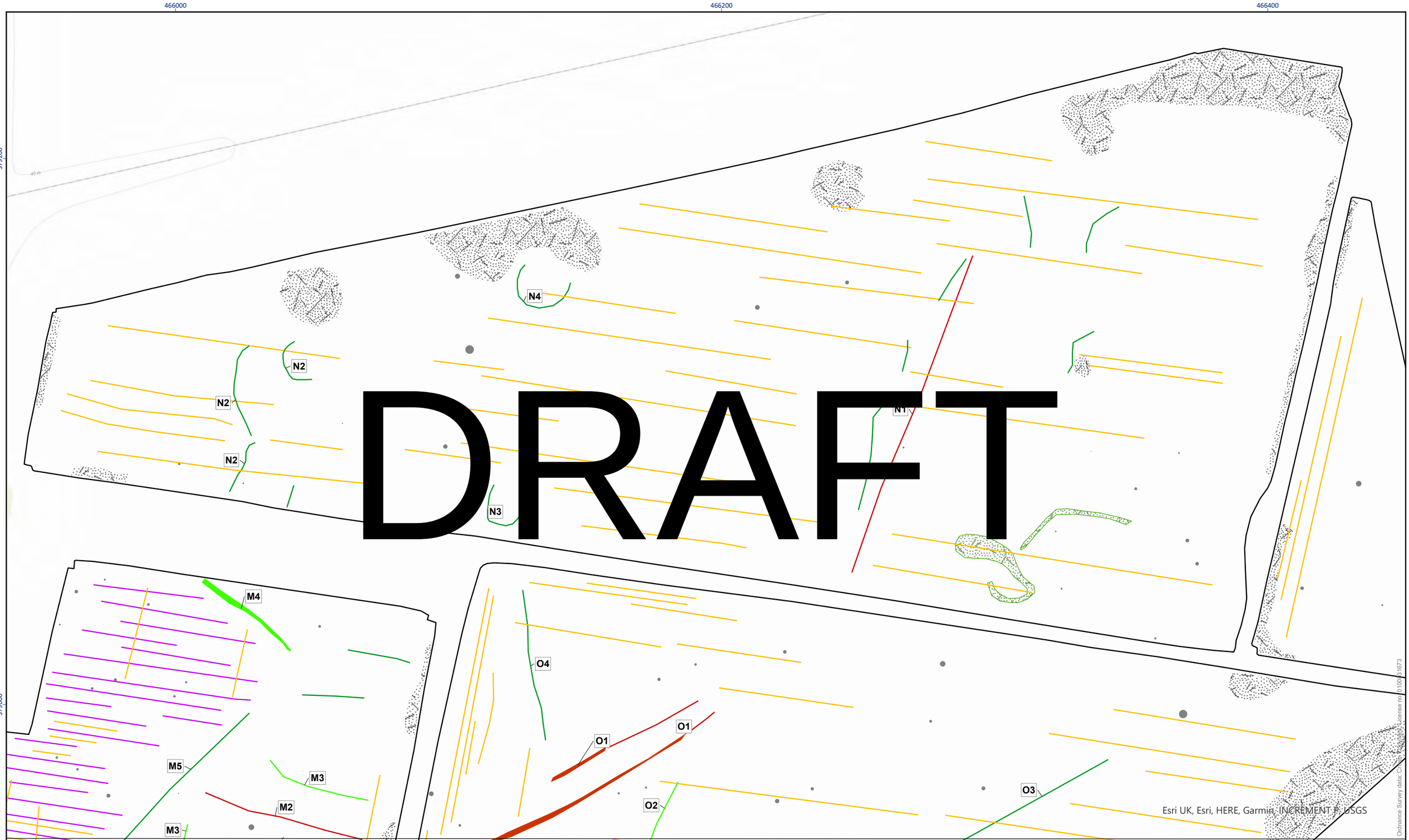
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/58/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 59

- Linear Trend (Archaeology)
- Enhanced Magnetism (Modern)
- Linear Trend (Possible Archaeology)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

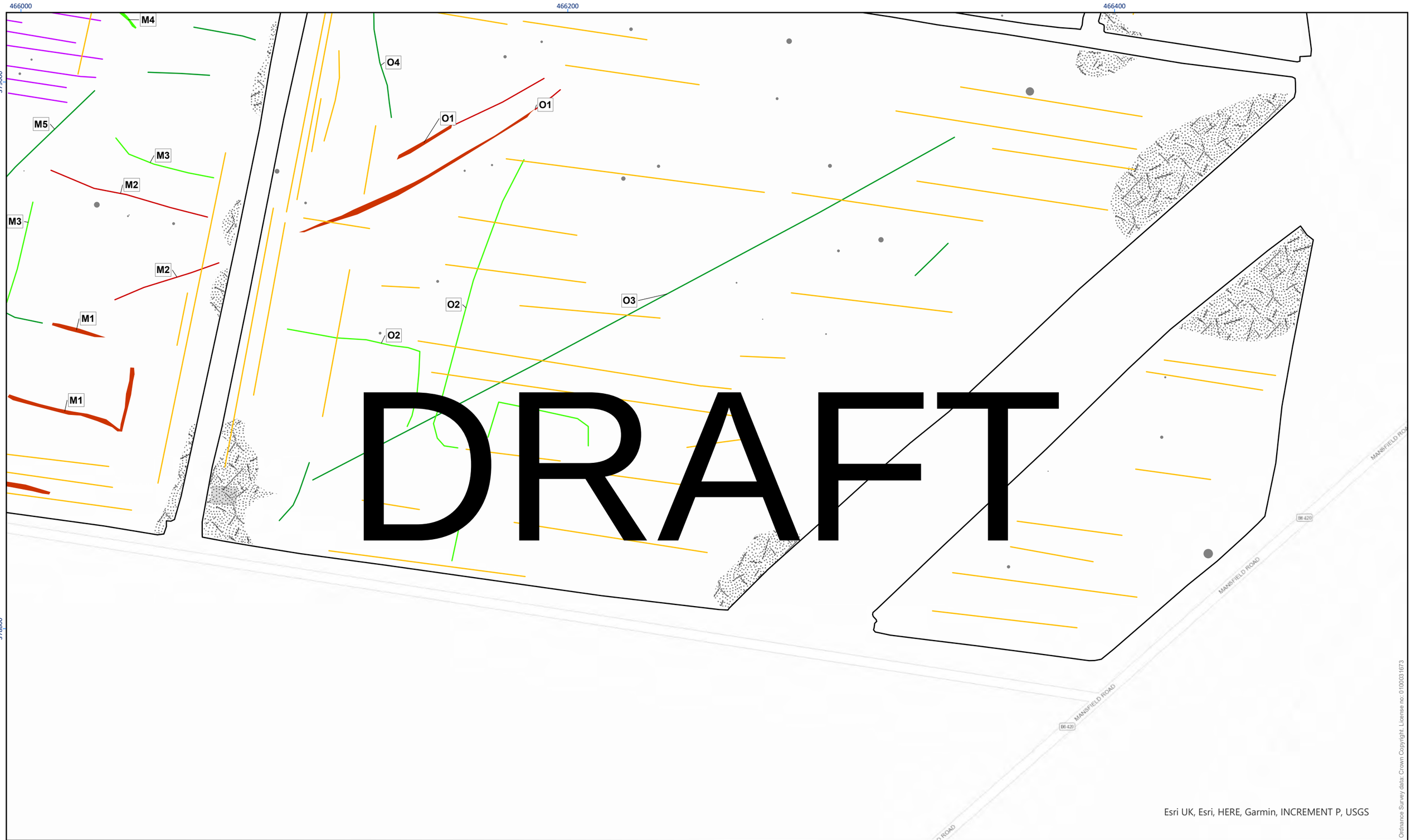
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/59/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 60

Linear Trend (Archaeology)
Linear Trend (Possible Archaeology)
Enhanced Magnetism (Modern)
Ferrous/Iron Spike

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/60/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Interpretation of Processed Gradiometer Data

Figure 61

- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

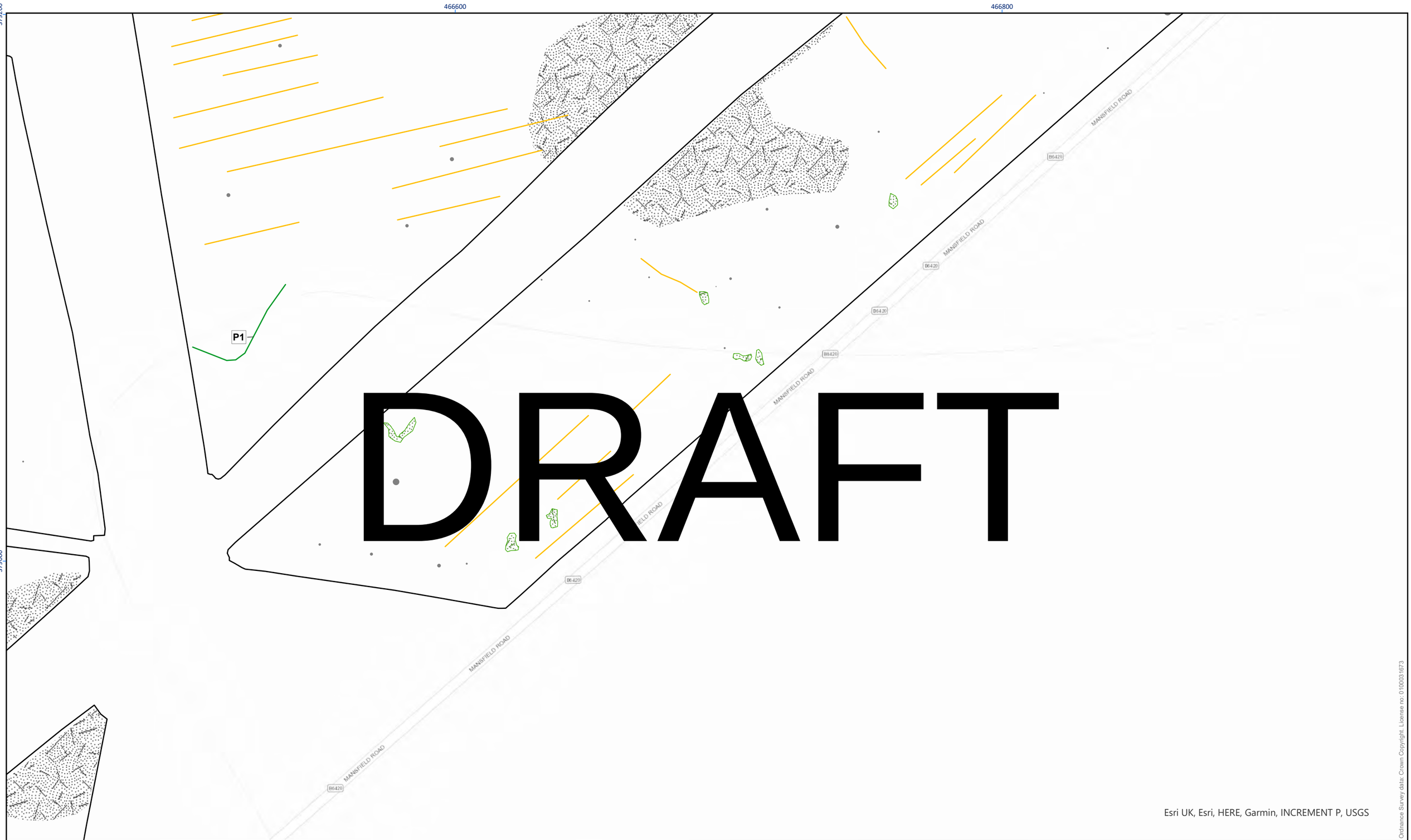
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/61/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 62

- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

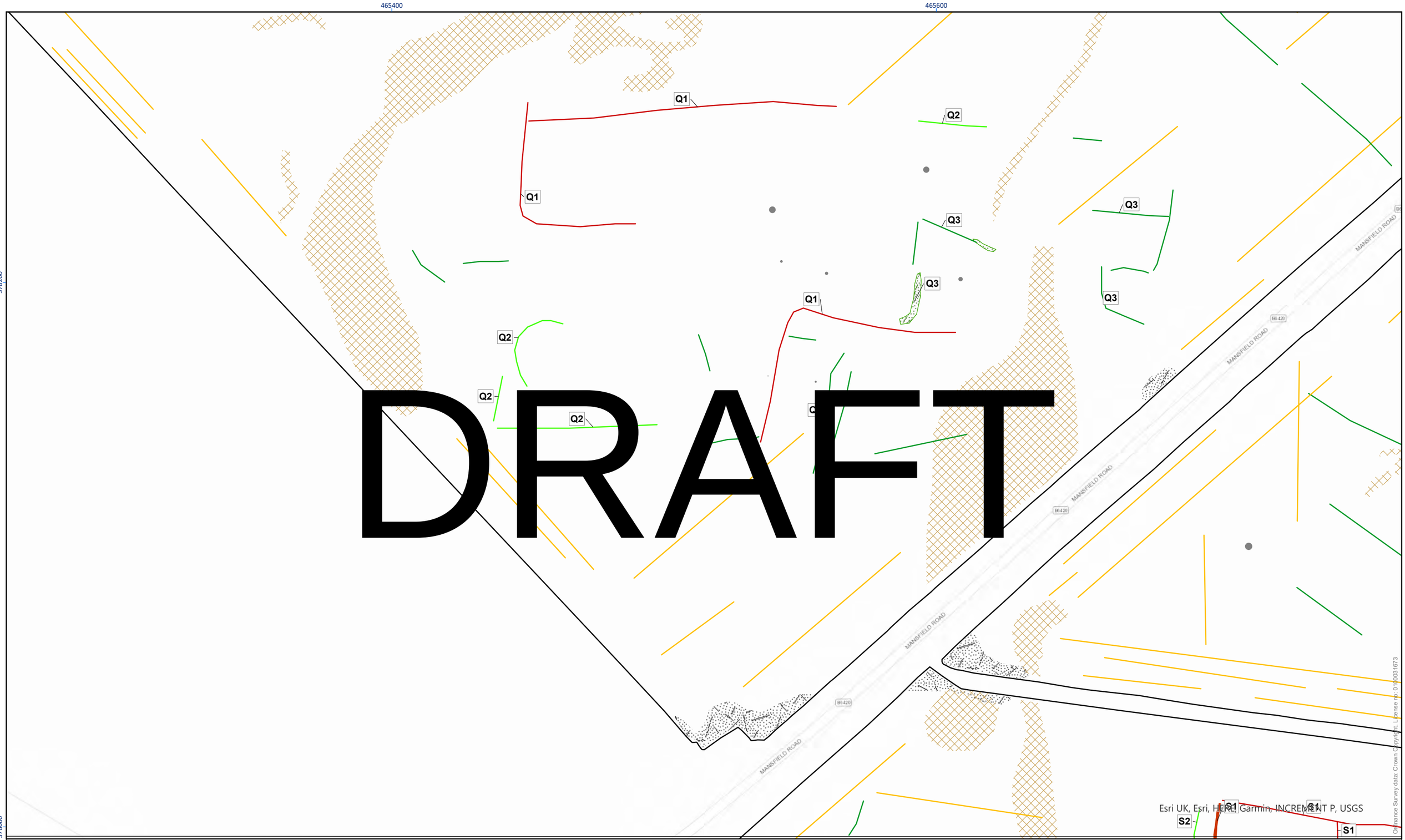
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/62/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 63

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike
- Enhanced Magnetism (Unclear Origin)

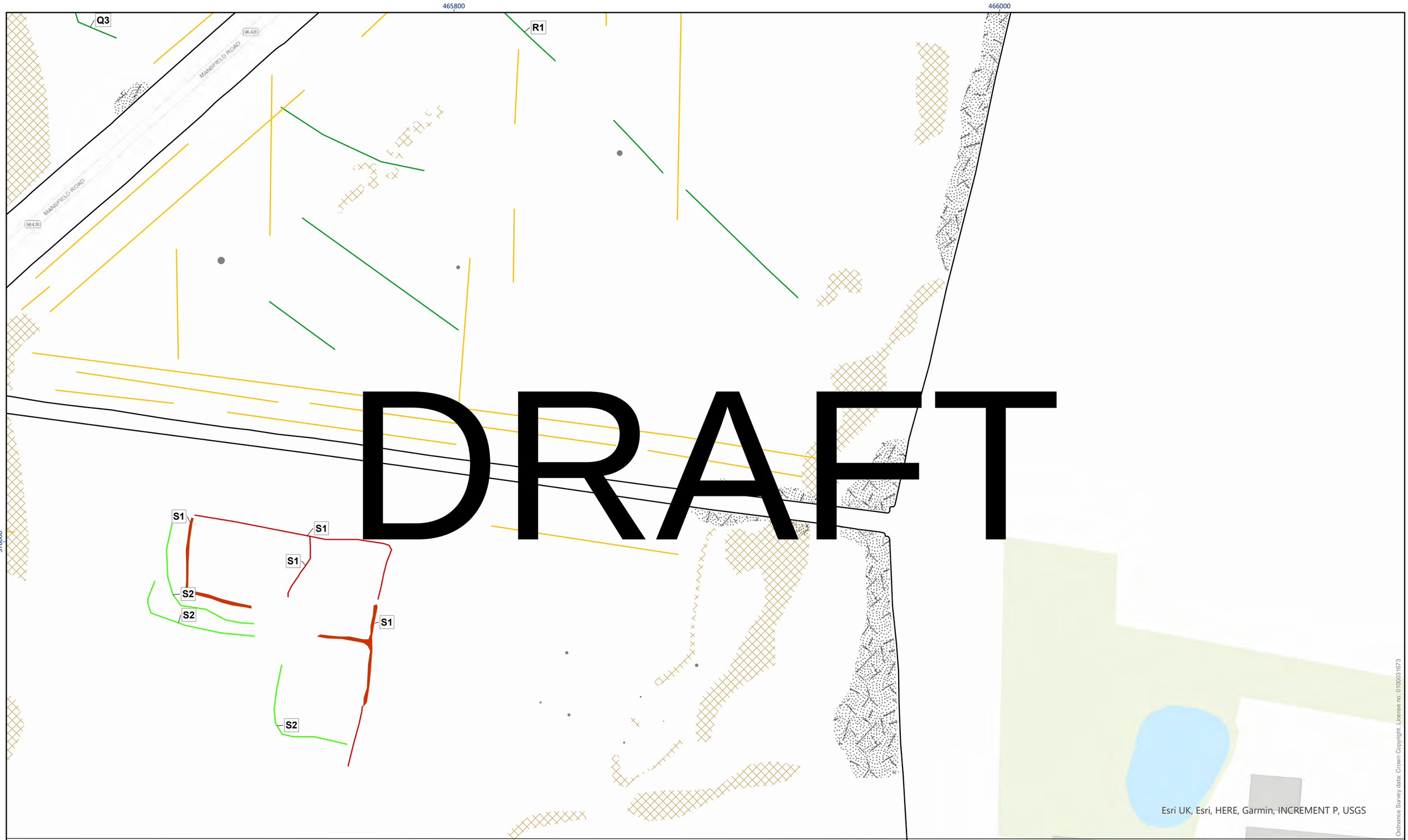
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/63/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 64

Linear Trend (Archaeology)
Geology/Natural
Enhanced Magnetism (Modern)
Ferrous/Iron Spike

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/64/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Interpretation of Processed Gradiometer Data

Figure 65

- Enhanced Magnetism (Historic Feature)
- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike

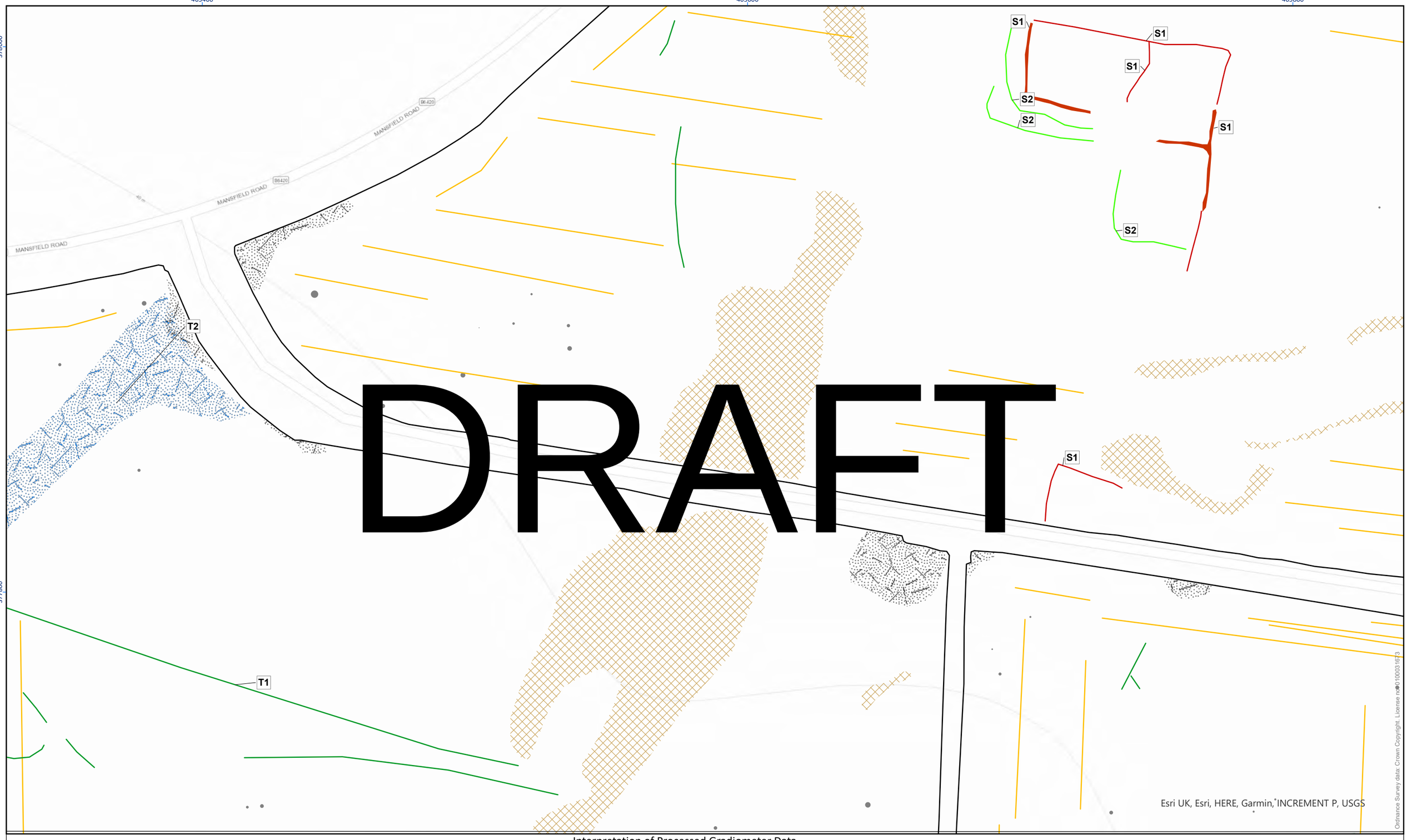
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/65/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 66

- Linear Trend (Archaeology)
- Geology/Natural
- Enhanced Magnetism (Historic Feature)
- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike

N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/66/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

465600 465800 466000

377800

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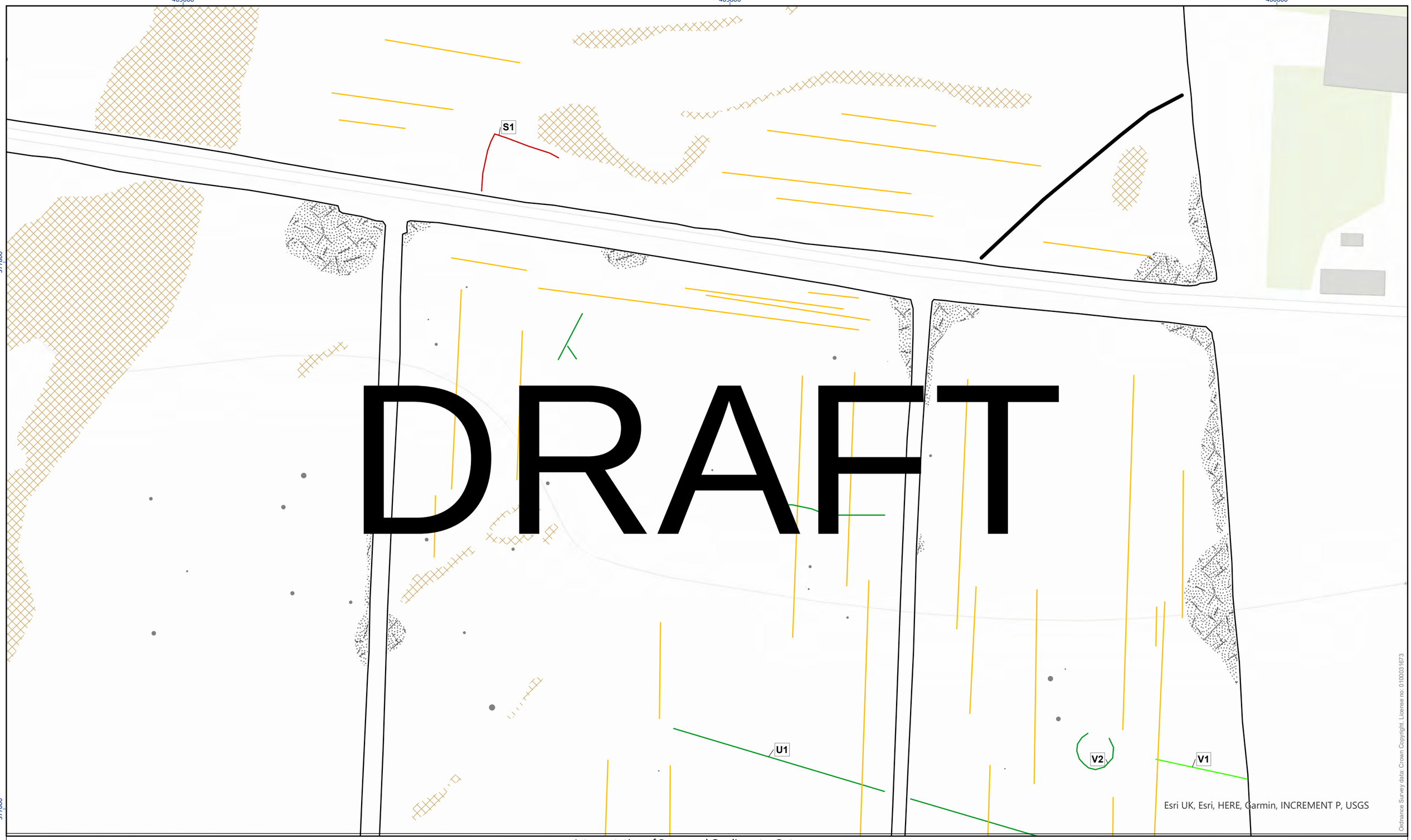


Interpretation of Processed Gradiometer Data

Figure 67

Geology/Natural
Enhanced Magnetism (Modern)
Ferrous/Iron Spike

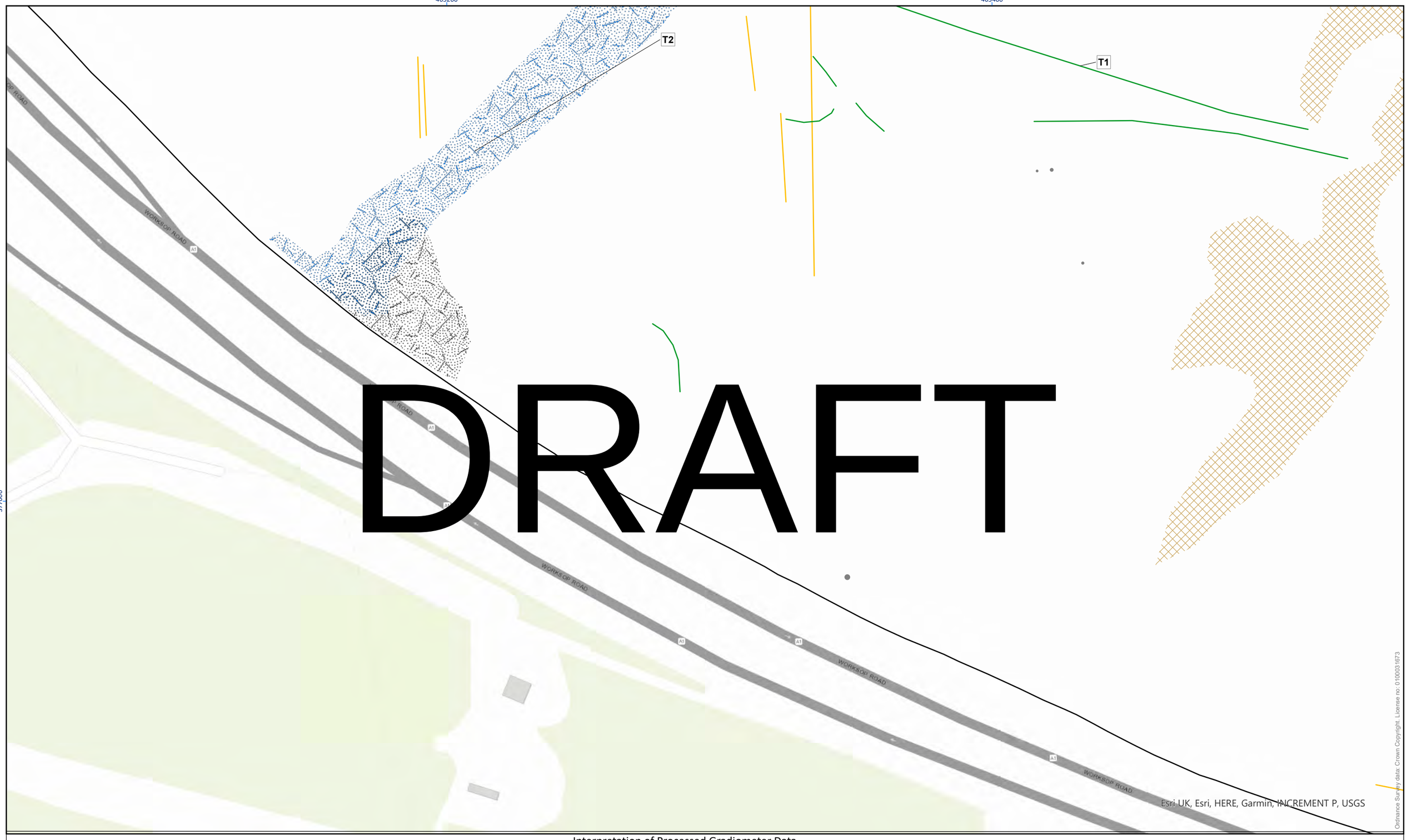
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/67/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Interpretation of Processed Gradiometer Data

Figure 68

Geology/Natural
Enhanced Magnetism (Historic Feature)
Enhanced Magnetism (Modern)
Ferrous/Iron Spike

N
0 30m
Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/68/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group

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Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Interpretation of Processed Gradiometer Data

Figure 69

- Geology/Natural
- Enhanced Magnetism (Modern)
- Ferrous/Iron Spike

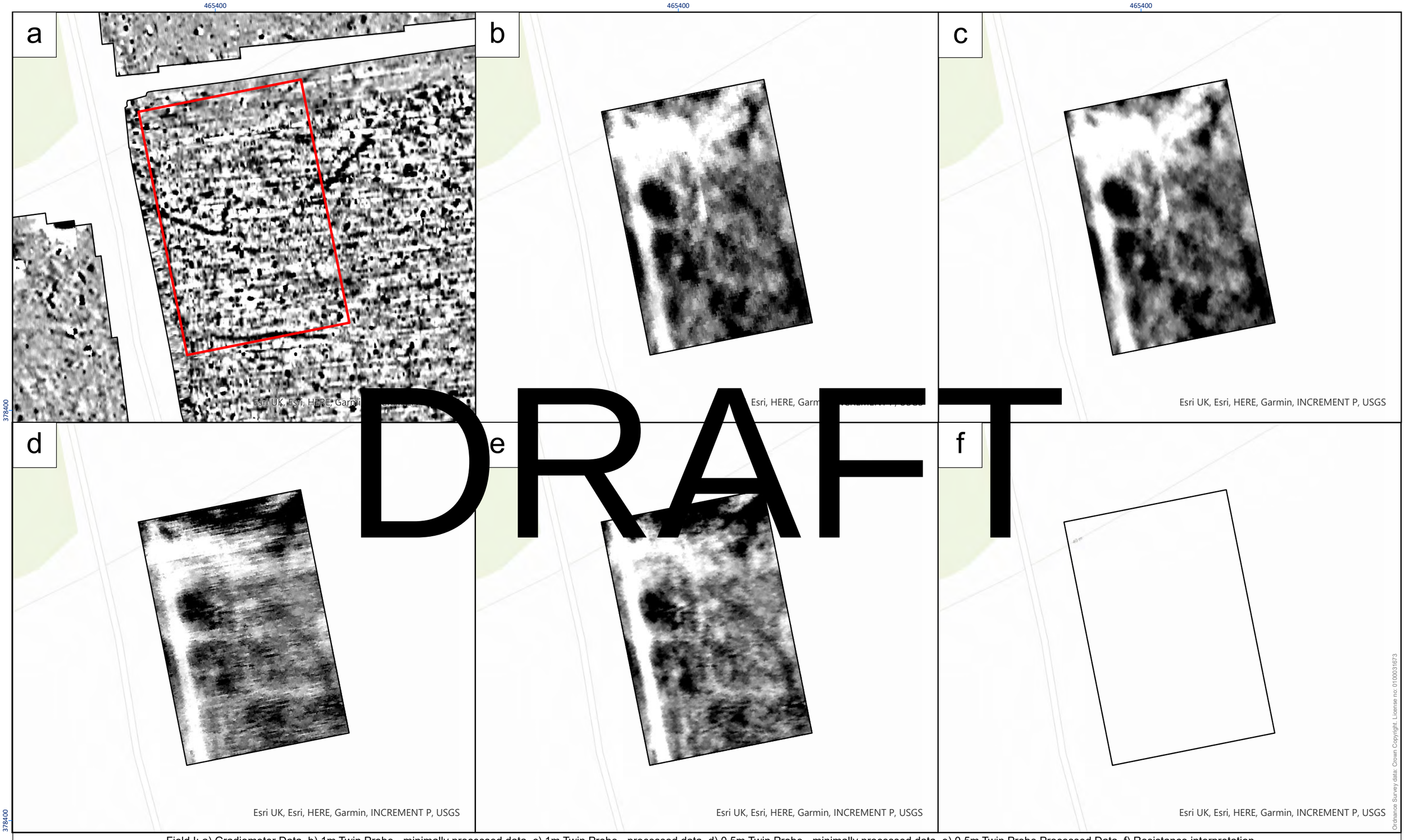
N

0 30m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/69/01	
Created by: SO	Date: 15/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Field I: a) Gradiometer Data, b) 1m Twin Probe - minimally processed data, c) 1m Twin Probe - processed data, d) 0.5m Twin Probe - minimally processed data, e) 0.5m Twin Probe Processed Data, f) Resistance interpretation

Figure 70

Gradiometer: 2nT / -1nT

Resistance: 1.25 SD / -1.25 SD

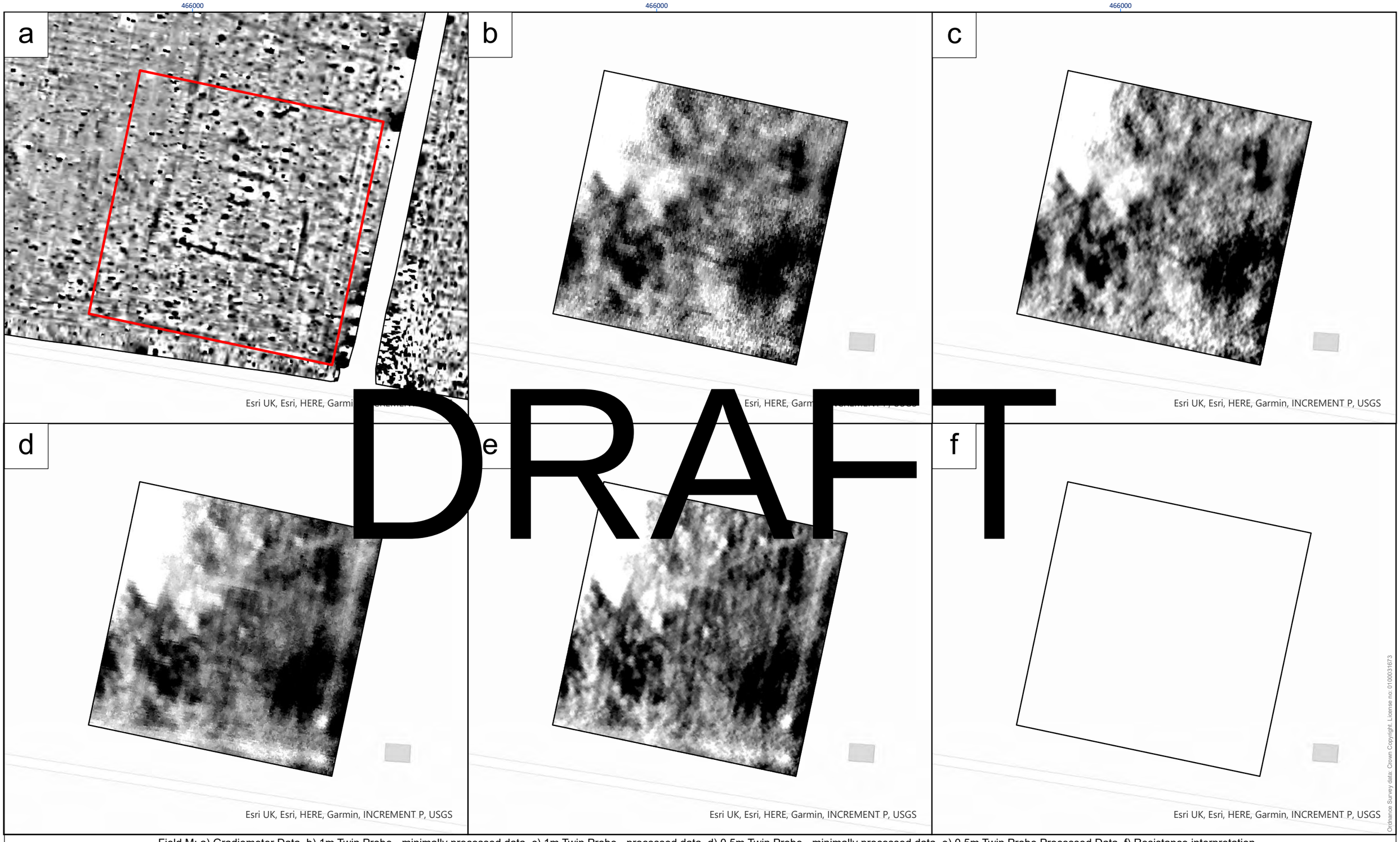
N

0 60m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/70/01	
Created by: SO	Date: 16/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

AOC Archaeology Group



Field M: a) Gradiometer Data, b) 1m Twin Probe - minimally processed data, c) 1m Twin Probe - processed data, d) 0.5m Twin Probe - minimally processed data, e) 0.5m Twin Probe Processed Data, f) Resistance interpretation

Figure 71

Gradiometer: 2nT / -1nT

Resistance: 1.25 SD / -1.25 SD

N

0 60m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/71/01	
Created by: SO	Date: 16/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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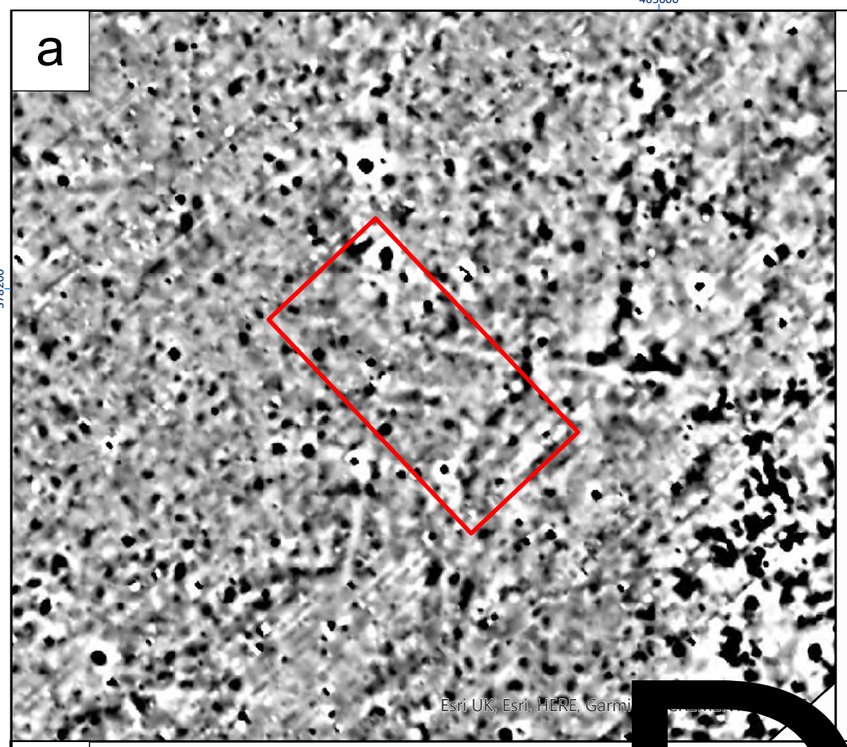
465600 465600 465600

378200 378200

a



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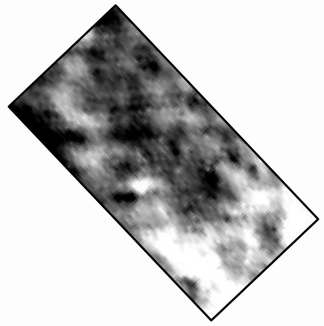

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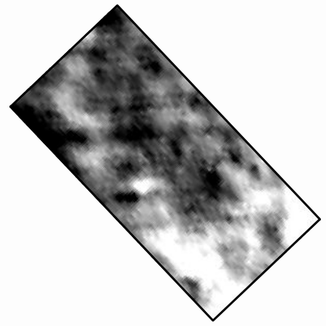

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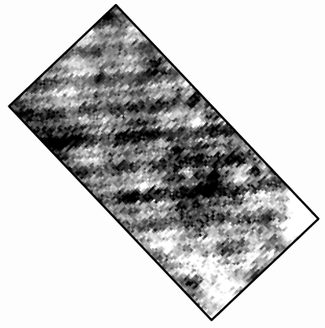
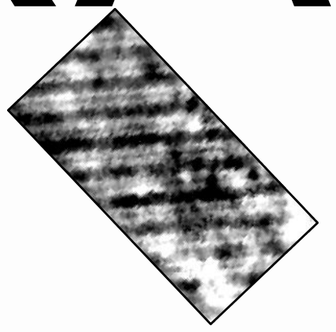
Esri, HERE, Garm

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

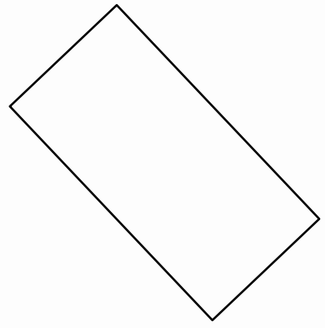
d



e



f



Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Esri UK, Esri, HERE, Garmin, INCREMENT P, USGS

Field Q: a) Gradiometer Data, b) 1m Twin Probe - minimally processed data, c) 1m Twin Probe - processed data, d) 0.5m Twin Probe - minimally processed data, e) 0.5m Twin Probe Processed Data, f) Resistance interpretation

Figure 72

Gradiometer 2nT -1nT

Resistance 1.25 SD -1.25 SD

N

0 60m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/72/01	
Created by: SO	Date: 16/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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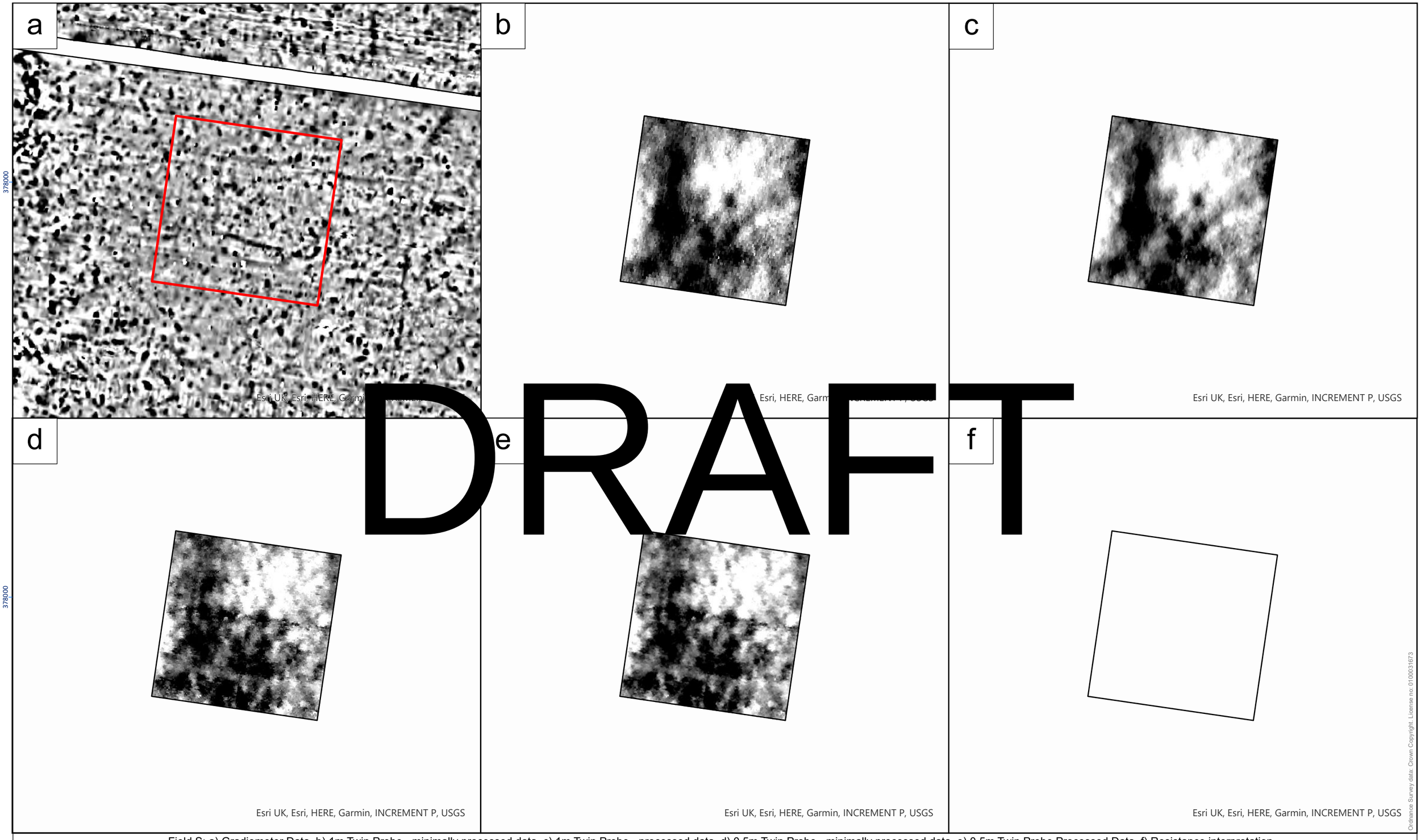

Field S: a) Gradiometer Data, b) 1m Twin Probe - minimally processed data, c) 1m Twin Probe - processed data, d) 0.5m Twin Probe - minimally processed data, e) 0.5m Twin Probe Processed Data, f) Resistance interpretation

Figure 73

Gradiometer: 2nT / -1nT

Resistance: 1.25 SD / -1.25 SD

N

0 60m

Scale: 1:1,250 @ A3

Drawing Number: 05/40161/GEO/73/01	
Created by: SO	Date: 16/12/2021
Checked by: JL	Date: 17/12/2021
Approved by: JL	Date: 17/12/2021

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Appendix 1: Characterisation of Anomalies

Gradiometer survey

Field A

Anomaly	Type of Anomaly
A1	Linear trend – Unclear Origin
A2	Linear trend – Unclear Origin
A3	Linear trend – Unclear Origin
A4	Linear trend – Unclear Origin

Field B

Anomaly	Type of Anomaly
B1	Linear trend – Archaeology
B2	Linear trend – Unclear Origin
B3	Linear trend – Unclear Origin
B4	Linear trend – Unclear Origin

Field C

Anomaly	Type of Anomaly
C1	Linear trend – Unclear Origin
C2	Linear trend – Unclear Origin
C3	Linear trend – Unclear Origin
C4	Linear trend – Unclear Origin
C5	Enhanced magnetism – Unclear Origin

Field D

Anomaly	Type of Anomaly
D1	Linear trend – Unclear Origin

Field E

Anomaly	Type of Anomaly
E1	Linear trend - Archaeology
E2	Linear trend – Unclear Origin
E3	Linear trend – Unclear Origin
E4	Enhanced magnetism – Unclear Origin

Field F

Anomaly	Type of Anomaly
F1	Linear trend - Archaeology
F2	Linear trend – Possible Archaeology

F3	Linear trend – Unclear Origin

Field G

Anomaly	Type of Anomaly
G1	Linear trend – Possible Archaeology
G2	Linear trend – Possible Archaeology

Field H

Anomaly	Type of Anomaly
H1	Linear trend – Possible Archaeology
H2	Enhanced Magnetism – Possible Archaeology
H3	Enhanced Magnetism – Possible Archaeology
H4	Linear trend – Unclear Origin
H5	Linear trend – Unclear Origin
H6	Geology / Natural

Field I

Anomaly	Type of Anomaly
I1	Linear trend - Archaeology
I2	Linear trend – Possible Archaeology

Field J

Anomaly	Type of Anomaly
J1	Linear trend - Archaeology
J2	Linear trend – Possible Archaeology
J3	Linear trend – Unclear Origin
J4	Linear trend – Unclear Origin

Field K

Anomaly	Type of Anomaly
K1	Linear trend - Archaeology
E2	Linear trend - Archaeology
E3	Linear trend – Possible Archaeology
E4	Linear trend – Unclear Origin

Field L

Anomaly	Type of Anomaly
L1	Linear trend - Archaeology
L2	Linear trend – Possible Archaeology
L3	Linear trend – Unclear Origin
L4	Linear trend – Unclear Origin
L5	Enhanced magnetism – Unclear Origin

L6	Linear trend – Historic Feature

Field M

Anomaly	Type of Anomaly
M1	Linear trend – Archaeology
M2	Linear trend – Archaeology
M3	Linear trend – Possible Archaeology
M4	Linear trend – Possible Archaeology
M5	Linear trend – Unclear Origin

Field N

Anomaly	Type of Anomaly
N1	Linear trend – Archaeology
N2	Linear trend – Unclear Origin
N3	Linear trend – Unclear Origin
N4	Linear trend – Unclear Origin

Field O

Anomaly	Type of Anomaly
O1	Linear trend – Archaeology
O2	Linear trend – Possible Archaeology
O3	Linear trend – Unclear Origin
O4	Linear trend – Unclear Origin

Field P

Anomaly	Type of Anomaly
P1	Linear trend – Unclear Origin

Field Q

Anomaly	Type of Anomaly
Q1	Linear trend - Archaeology
Q2	Linear trend – Possible Archaeology
Q3	Linear trend – Unclear Origin
Q4	Linear trend – Unclear Origin

Field R

Anomaly	Type of Anomaly
R1	Linear trend – Unclear Origin

Field S

Anomaly	Type of Anomaly
S1	Linear trend –Archaeology

S2	Linear trend – Possible Archaeology

Field T

Anomaly	Type of Anomaly
T1	Linear trend – Unclear Origin

Field U

Anomaly	Type of Anomaly
U1	Linear trend – Unclear Origin

Field V

Anomaly	Type of Anomaly
V1	Linear trend – Possible Archaeology
V2	Linear trend – Unclear Origin
V3	Linear trend – Unclear Origin

Appendix 2: Survey Metadata

Oasis ID: aocarcha1-432983

Field	Description
Surveying Company	AOC Archaeology
Data collection staff	James Lawton, Chris Sykes, Alistair Galt, Sacha O'Connor, Frank Forrester, Natalie Holt
Client	Bassetlaw District Council
Site name	Bassetlaw Garden Village
County	Nottinghamshire
NGR	SK 65670 78460
Land use/ field condition	Arable stubble
Duration	
Weather	Overcast/Sunny
Survey type	Gradiometer Survey & Earth Resistance Survey
Instrumentation	Bartington Grad 601-2 Bartington Non-Magnetic Cart, three Bartington Grad 601-2, Trimble R10 GNSS System Earth Resistance survey: Trimble GXOR system, RM85
Area covered	Approx 145.54 ha (Gradiometry) / 1.89ha (Earth Resistance)
Download software	Grad601 PC Software v313 / MLGrad601 / Geoplot v4.0
Processing software	Ge[illegible]mar, MultiGrad6[illegible] and Te[illegible]aSurveyor / G[illegible]oplot v4.0
Visualisation software	Ar[illegible]GIS Pro
Geology	Ch[illegible]ster F[illegible]mati[illegible]n sands[illegible]ne (BGS, 2021). O[illegible]y part of the northern section of the Site has any superficial deposits recorded. These were described as Till (Sand and Gravel) (BGS, 2021).
Soils	Freely draining slightly acid sandy soils (Soilscapes, 2021).
Scheduled Ancient Monument	No
Known archaeology on site	None
Historical documentation/ mapping on site	None
Report title	Bassetlaw Garden Village, Nottinghamshire: Archaeological Geophysical Survey
Project number	40161
Report Author	Sacha O'Connor & Susan Ovenden
Quality Checked by	James Lawton

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 inhabitation 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 thermoremnant magnetization (Aspinall et al., 2008, 21; Heron and Gaffney 1987, 72).

Ditches and pits can be easily detected through gradiometer survey as the topsoil is generally suggested to have a greater magnetisation than the subsoil caused by human habitation. Areas of burning or materials which have been subjected to heat commonly also have high magnetic signatures, such as 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 to the surrounding soil, the surrounding soil will consequently have a greater magnetization, resulting in the feature in question 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 dataset.

Ferrous objects – iron and its alloys – are strongly magnetic and 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 or thick layers of alluvium or till. All magnetic geophysical surveys must therefore take the effects of background geological and geomorphological conditions into account.

Gradiometer Survey Instrumentation and Software

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.

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 to create final data plots).

Bartington Non-Magnetic Cart Instrumentation and Software

AOC Archaeology's cart-based surveys are carried out using a Bartington Non-Magnetic Cart. The cart enables multiple traverses of data to be collected at the same time, increasing the speed at which surveys may be carried out and offers the benefits of reduced random measurement noise and rapid area coverage (Schmidt et al 2015, 60-62, David et al. 2008, 21).

The cart uses a configuration of four Grad-01-1000L sensors mounted upon a carbon fibre frame along with two DL601 dataloggers and one BC601 battery cassette. The sensors are normally positioned at 1m intervals on a horizontal bar, with the datalogger taking readings every 12.5cm along each traverse, though this can be altered to increase / reduce resolution if required. The data is georeferenced via a Trimble R10 Real Time Kinematic (RTK) VRS Now GNSS GPS which streams data throughout survey and allows the data to be recorded relative to a WGS1984 UTM coordinate system.

The gradiometer data is collected through Geomar MLGrad601 software on a laptop in real-time during the survey. The data is downloaded and converted into a .xyz file in Geomar MultiGrad601 before being processed along with the GPS data in TerraSurveyor v3.0.34.10 (see Appendix 4 for a summary of the processes used in Geoplot to create final data plots).

Earth Resistance Survey

Earth resistance surveys measure the flow of electrical currents that have been inserted into the ground through electrodes. Earth resistance works by recording high and low resistance readings which enable the surveyor to identify archaeological features buried within the ground. High resistance anomalies include walls and structures, rubble, made surfaces, roads, coffins and cists and low resistance anomalies include ditches and pits, gullies, drains, graves and metal pipes (Gaffney, 2003, 26). The surveys identify features such as ditches and pits because they retain more / less moisture than the surrounding soil (David 2008, 24). Changes in resistance will also occur where there are variations in topography, vegetation and agricultural practice as well as modern man-made features (Gaffney 2003, 112).

Earth resistance survey is affected by the season, however, and in saturated conditions it can be difficult to distinguish low or high resistance anomalies from the background geology. In waterlogged conditions, water can pool against impermeable surfaces such as walls or floors and give a false impression of a low resistance anomaly (Gaffney 2003, 27). It is prudent to take into consideration the ground conditions and soil moisture content when interpreting earth resistance datasets.

Earth resistance is more useful than gradiometer surveys in areas which are built up or contain a high amount of building features and foundations. The two methods can complement each other, especially where targeted earth resistance is undertaken over possible archaeological remains

Earth Resistance Survey Instrumentation and Software

AOC Archaeology's Earth Resistance Surveys are conducted using a Geoscan Research RM15 resistance meter, with a set number of probes and remote probes depending on the chosen survey methodology. Typically, either two or four probes are used, in conjunction with an MPX15 multiplexor attachment if required (see Appendix 2).

Data is typically collected on an east-west alignment using zig-zag traverses, with a set sample interval depending on the degree of resolution required. The gain is set appropriate to ground conditions and the local geology and the same readings are maintained when moving the location of the remote probes to ensure consistency between the grids of collected data.

Following completion of the survey, the earth resistance data is downloaded directly from the instrument using Geoscan Geoplot v4.0. The survey grids are then assembled into composites and enhanced using a range of processing techniques using Geoscan Geoplot v4.0 (see Appendix 4 for a summary of the processes used in Geoplot to create final data plots).

Appendix 4: Summary of Data Processing

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.
Discard Overlap (TerraSurveyor)	Removes datapoints which occur too closely together and can cause digital artefacts in the data which are caused by the overlapping of parallel traverses.
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.
Remove Turns (TerraSurveyor)	Uses analysis of the direction of travel derived from the GNSS data to break continuous streams of data into individual traverses.
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.

Processing Steps

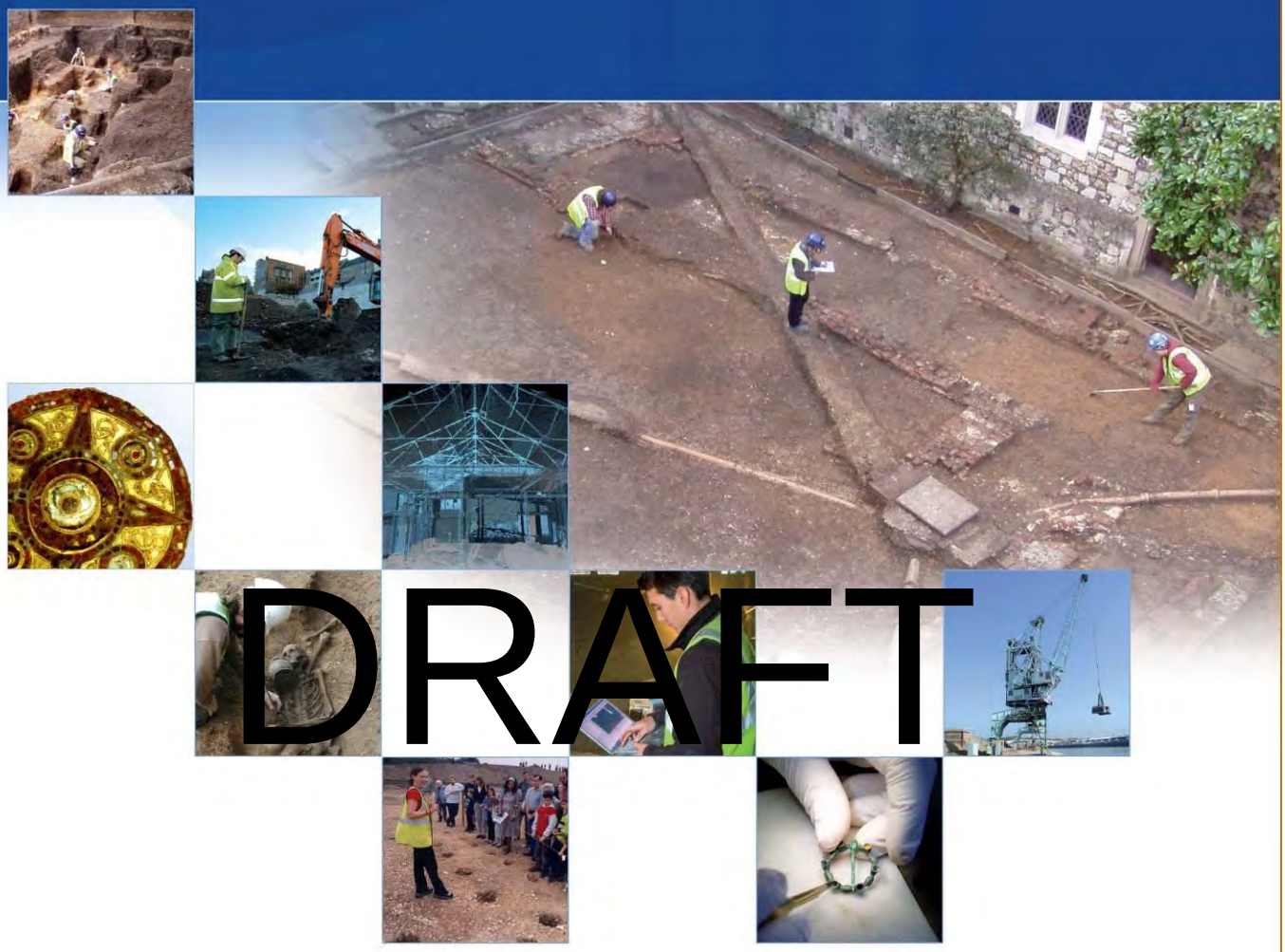
Bartington Grad601-2 survey	
Process	**Extent**
Zero Mean Traverse	All LMS =on, threshold -5 to 5
De-spike	X=1 Y=1 Thr = 3 Repl = Mean
De-stagger	All grids dir Shift = 2 Line Pattern 34-78 Dual-DS
Low Pass filter	X=1 Y=1 Wt=G
Interpolate	Y, Expand – Expand –SinX/X x2
Palette Scale	Grey08 Min= -1nT Max= 2nT

Bartington Cart survey	
Process	**Extent**
Base Settings	Interval 0.121m, Track Radius 1.06m
Remove Turns	Threshold Angle 90°, Cut Length 5m
Discard Overlap	Threshold Distance 0.4m, Minimum Track 5, Newest
Despike	Mean Diameter 3 Threshold 12
Destripe	Mean Traverse SD 1.5
High Pass Filter	Uniform (Median) 12
Clip	-30/30nT

Earth Resistance survey	
Process	**Extent**
Despike	X=1 Y=1 Thr = 3 Repl = Mean
Clip	Min = -5 Max = 5
High Pass filter	HPF x=10 y=10 wt =u
Interpolate	X, Expand – sin x/x Y, Expand – sin x/x
Palette Scale	Grey08 Min= -1S Max= =1SD

Appendix 5: Technical Terminology

Type of Anomaly	Description
Archaeology	*Interpretation is supported by the presence of known archaeological remains or by other forms of evidence such as HER records, LiDAR data or cropmarks identified through aerial photography.*
Trend	Linear / curvilinear / rectilinear anomalies either characterised by an increase or decrease in values compared to the magnetic background.
Area of enhanced magnetism	A zone of enhanced magnetic responses over a localised area. These anomalies do not have the high dipolar response which are manifested in an 'iron spike' anomaly and likely have a relationship with nearby archaeological trends.
Pit	An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is pit-like in appearance.
Possible Archaeology	*Trends are likely to have an archaeological origin, however without supporting evidence from known archaeological remains, HER records, LiDAR or aerial photography, they can only be classed as having a possible archaeological origin.*
Trend	Linear / curvilinear / rectilinear anomalies either characterised by an increase or decrease in values compared to the magnetic background.
Area of enhanced magnetism	A zone of enhanced magnetic responses over a localised area. These anomalies do not have the high dipolar response which are manifested in an 'iron spike' anomaly but lacks definitive records to be classed as being archaeological.
Pit-like anomaly	An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is pit-like in appearance.
Burnt area	An anomaly with a patterning on the XY trace plot that is suggestive of industrial activity such as a kiln or hearth.
Unclear Origin	*Trends are magnetically weak, fractured or isolated and their context is difficult to ascertain. Whilst an archaeological origin is possible, an agricultural, geological or modern origin is also likely.*
Trend	Linear / curvilinear / rectilinear anomalies which are composed of a weak or different change in magnetic values. The trends do not appear to form a patterning that is suggestive of archaeological remains, such as enclosures or trackways.
Area of enhanced magnetism	A zone of enhanced magnetic response which lacks context for a confident interpretation. They do not appear to have a relationship with nearby trends of an archaeological origin. Can often be caused by areas of former woodland, geological variations or agricultural activity.
Agricultural	*Trends associated with agricultural activity, either historical or modern.*
Old Field Boundary	These isolated long linear anomalies, most often represented as a negative or fractured magnetic trend, relate to former field boundaries when their positioning is cross referenced with historical mapping.
Historical Features	Features observed on historical mapping that correspond with anomalies or trends in the data. Areas of enhanced magnetism could relate to former buildings, trackways, quarries or ponds.
Ridge and Furrow / Rig and Furrow	A series of regular linear or curvilinear anomalies either composed of an increased or decreased magnetic response compared to background values. The wide regular spacing between the anomalies is consistent with that of a ridge and furrow / rig and furrow ploughing regime. The anomalies often present as a positive 'ridge' trend adjacent to a negative 'furrow' trend.
Ploughing Trends	A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. Anomalies seen parallel to field edges are representative of headlands caused by ploughing.
Field Drainage	A series of magnetic linear anomalies of an indeterminate date, usually with a regular or herringbone patterning.
Non - Archaeology	*Trends which are likely to have derived from non-archaeological processes or activities.*
Geology / Natural	An area of enhanced magnetism that is composed of irregular weak increases or decreases in magnetic values compared with background readings. It is likely to indicate natural variations in soil composition or reflect variations in the bedrock or superficial geology.
Possible Modern Service	Anomalies of a linear form often composed of contrasting high positive and negative dipolar values. Such anomalies usually signify a feature with a high level of magnetisation and are likely to belong to modern activity such as pipes or modern services.
Magnetic Disturbance	A zone of highly magnetic disturbance that has been caused by or is a reflection of modern activity, such as metallic boundary fencing, gateways, roads, boreholes, adjacent buildings, rubbish at field edges or a spread of green waste material.
Isolated Dipolar Anomalies / Ferrous (iron spikes) and Ferrous Zones	A response caused by ferrous materials on the ground surface or within the subsoil, which causes a 'spike' in the data representing a rapid variation in the magnetic response. These generally represent modern material often re-deposited during manuring.



DRAFT

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