GEOPHYSICAL SURVEY REPORT

STRATASCAN™

SUMO Survey Services
SUMO Group Member

Project name:

Angelinos Pipeline, Oxfordshire

Client:

Skanska

October 2015

Job ref:
J8928

Report author:
Thomas Richardson MSc ACIfA

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Techniques:
Detailed magnetic survey – Gradiometry

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Survey date:
9th-16th September, 21st September - 9th October & 19th-20th October 2015

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1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 55.4 hectares of mixed arable and grassland, along a proposed pipeline running for 18.5km. The survey has identified areas of probable prehistoric settlement activity and enclosures, as well as the route of a Roman road (Akeman Street) and a possibly Romano-British enclosure. A number of possible archaeological anomalies are seen along the route, some of which may be evidence of further settlement activity, however the narrow nature of the survey makes a more confident interpretation difficult. Areas of ridge and furrow cultivation have been detected in the north and centre of the route, mostly around Deddington, North Aston, and Middle Aston. This suggests that these areas are likely to have been used for agricultural purposes since the medieval period. The remaining anomalies are natural or modern in origin, relating to underground services, trackways, scattered magnetic debris, ferrous objects, and fencing.

2 INTRODUCTION

2.1 *Background synopsis*

Stratascan were commissioned to undertake a geophysical survey of an area outlined for a proposed pipeline. This survey forms part of an archaeological investigation being undertaken by Skanska.

2.2 *Site location*

The route runs from Tackley at OS ref. SP 460 186 to Milton at OS ref. SP 452 349, covering 18.5km. The site is centred at OS ref. SP 466 271.

2.3 *Description of site*

The survey area is approximately 61.8ha, covering a 30m wide strip running for 18.5km. However areas of road, buildings, and overgrown field boundaries reduced the surveyable area to approximately 55.4ha of mixed agricultural and grassland.

2.4 *Geology and soils*

Tables showing the geology and soils for the site can be found in Appendix A. The geology of the site is mostly limestone across the south of the site, with areas of sandstone and mudstone across the centre, and limestone and ironstone in the north.

2.5 *Site history and archaeological potential*

The Oxfordshire Historic Environment Record (HER) records a number of monuments in the area surrounding the route of the pipeline. A number of areas of prehistoric activity are seen including find spots, areas of Iron Age settlement, and a possible Iron Age Banjo enclosure. Roman activity is recorded as including possible villas, areas of settlement, and field systems.

The Roman road of Akeman Street is also seen crossing the route in the south. The remaining records relate to medieval and post-medieval activity, which is mostly agricultural with a number of post-medieval buildings (Oxfordshire County Council 2015).

2.6 Survey objectives

The objective of the survey was to locate any features of possible archaeological origin in order that they may be assessed prior to development.

2.7 Survey methods

This report and all fieldwork have been conducted in accordance with both the English Heritage guidelines outlined in the document: *Geophysical Survey in Archaeological Field Evaluation, 2008* and with the Chartered Institute for Archaeologists document *Standard and Guidance for Archaeological Geophysical Survey.*

Given the potential for prehistoric and Roman activity, detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in Appendix B.

2.8 Processing, presentation and interpretation of results

2.8.1 Processing

Processing is performed using specialist software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all minimally processed gradiometer data used in this report:

1. *Destripe* (Removes striping effects caused by zero-point discrepancies between different sensors and walking directions)
2. *Destagger* (Removes zigzag effects caused by inconsistent walking speeds on sloping, uneven or overgrown terrain)

2.8.2 Presentation of results and interpretation

The presentation of the data for each site involves a print-out of the minimally processed data both as a greyscale plot and a colour plot showing extreme magnetic values. Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site.

3 RESULTS

The detailed magnetic gradiometer survey conducted along the Angelinos pipeline route has identified a number of anomalies that have been characterised as being either of a *probable* or *possible* archaeological origin.

The difference between *probable* and *possible* archaeological origin is a confidence rating. Features identified within the dataset that form recognisable archaeological patterns or seem to be related to a deliberate historical act have been interpreted as being of a probable archaeological origin.

Features of possible archaeological origin tend to be more amorphous anomalies which may have similar magnetic attributes in terms of strength or polarity but are difficult to classify as being archaeological or natural.

The following list of numbered anomalies refers to numerical labels on the interpretation plots.

3.1 Probable Archaeology

1 A positive linear anomaly in the north of Field 1. This is indicative of a former cut feature, and is likely a ditch related to the Roman Akeman Street.

2 Positive linear and curvilinear anomalies in the south of Fields 19 and 20. These are indicative of former cut features, and are likely to relate to former settlement activity. The anomalies appear to form a complex of enclosures likely related to the possible Banjo enclosure recorded in the HER.

3 A number of small, discrete, positive anomalies in Fields 19 and 20. These are indicative of small former cut features, such as backfilled pits, and are likely related to the settlement activity seen in Anomaly 2.

4 Positive linear anomalies in the north of Field 20. These are indicative of former cut features, and are likely related to former enclosure features. These may relate to the settlement activity seen in Anomalies 2 and 3.

5 Two parallel liner positive anomalies in the south-west of Field 23. These are indicative of former cut features, and likely relate to a double ditch feature.

6 A positive sub-rectilinear anomaly in the north of Field 25. This is indicative of a former cut feature, and is likely related to a former enclosure.

7 A positive curvilinear anomaly in the centre of Field 26. This is indicative of a former cut feature, and is likely of archaeological origin. The feature possibly forms part of a larger enclosure, however the extents of the survey area make a more confident interpretation difficult.

8 A right angled linear anomaly in the centre of Field 29. This is indicative of a former cut feature, and is likely related to a former enclosure.

9 Positive linear and curvilinear anomalies in the centre of Field 29. This is indicative of a former cut feature. Although the feature’s exact origin is unknown it is likely to be archaeological. Due to the extents of the survey area it is not clear whether Anomalies 8 and 9 are contemporary with each other.

10 A positive curvilinear anomaly in the north of Field 48, and a positive linear anomaly in the south of Field 49. These are indicative of a former cut feature, and are likely to form two sides of an enclosure.

3.2 Possible Archaeology

11-23 A number of positive linear anomalies along the route of the survey. These are indicative of former cut features, and may be of either archaeological or natural origin. The extents of the survey area make more confident interpretation difficult.

24-51 A number of positive linear anomalies along the route. These are indicative of former cut features, and may be of either archaeological or agricultural origin. The extents of the survey area make more confident interpretation difficult.

52-58 Areas of small, discrete, positive anomalies along the route of the survey. These are indicative of small former cut features, such as backfilled pits, and may be of archaeological or natural origin.

59-60 Areas of positive responses in the north of Field 31 and the south of Field 32. These are indicative of former cut features, and may relate to former settlement activity or be natural in origin.

61 A negative linear anomaly in the south of Field 48. This is indicative of former bank or earthwork feature, and may be of either archaeological or natural origin. The extents of the survey area make more confident interpretation difficult.

3.3 Medieval/Post-Medieval Agriculture

62 A positive linear anomaly in the west of Field 28. This is likely related to a former field boundary not present on available mapping.

63-65 Three positive linear anomalies in Fields 23, 26 and 28. These relate to former field boundaries present on available mapping 1881-1955.

66 Areas of widely spaced, curving, parallel linear anomalies along the route of the survey. These are indicative of ridge and furrow cultivation.

67 Areas of closely spaced, parallel linear anomalies along the route of the survey. These are indicative of modern agricultural activity, such as ploughing.

3.4 *Other Anomalies*

68 A number of high amplitude, bipolar linear anomalies along the route of the survey. These are indicative of underground services, such as pipes or cables.

69 Positive linear anomalies in Fields 12 and 13, 23, 37 and 38, and 40. These relate to modern trackways.

70 A large number of areas of magnetic variation along the route of the survey. These anomalies are likely to be geological or pedological in origin. Areas of natural pitting are present across much of the area, as would be expected with a limestone bedrock across the majority of the site.

71 Areas of scattered magnetic debris in Fields 15, 23, 30, and 37. These are likely to be modern in origin.

72 Areas of magnetic disturbance are the result of substantial nearby ferrous metal objects such as fences and underground services. These effects can mask weaker archaeological anomalies, but on this site have not affected a significant proportion of the area.

73 A number of magnetic 'spikes' (strong focussed values with associated antipolar response) indicate ferrous metal objects. These are likely to be modern rubbish.

4 DATA APPRAISAL & CONFIDENCE ASSESSMENT

Limestone covers the majority of the site and generally gives good responses to magnetic survey. Sandstone and mudstone geologies, such as those seen around the centre of the site, can give variable responses. Archaeological features are mostly seen between Fields 19 and 29; an area covered by limestone, mudstone, and sandstone. This would suggest that each of these geologies is suitable for magnetic survey. This combined with the number of possible archaeological responses and areas of ridge and furrow cultivation seen along the route of the survey would suggest that the survey has been effective for the majority of the area. There are areas covered by strong geological response, such as in Field 54, which may be masking weaker archaeological responses. A similar effect is caused by magnetic disturbance from underground services, which is particularly evident in Fields 4-9. Whilst these effects reduce the area of data visible, any archaeological anomalies are still likely to be visible in adjacent unaffected areas, it is therefore thought to be unlikely that any archaeology is being masked.

5 CONCLUSION

The survey along the route of the Angelinos pipeline has identified a number of probable and possible archaeological anomalies. The majority of the probable archaeology is located in an area between Fields 19 and 29 (Anomalies 2-9), and mostly comprises probable prehistoric settlement activity and enclosures. The route of a Roman road (Akeman Street) is evident as a ditch in the south of the site, whilst evidence of a possibly Romano-British enclosure is evident in the north. A number of possible archaeological anomalies are seen along the route, some of which may be evidence of further settlement activity, however the narrow nature of the survey makes a more confident interpretation difficult. Areas of ridge and furrow cultivation have been detected in the north and centre of the route, mostly around Deddington, North Aston, and Middle Aston. This suggests that these areas are likely to have been used for agricultural purposes since the medieval period.

A large number of geological anomalies are present across the site. This is normal for limestone and sandstone geologies, which are liable to weathering. The remaining anomalies are modern in origin. These relate to underground services, trackways, scattered magnetic debris, ferrous objects, and fencing.

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APPENDIX A – GEOLOGY AND SOILS

Field Number	Geology	Drift Geology	Soil	Soil Type	Soil Description
1, 2, 3, 4, 5, 6, 7	Cornbrash Formation - Limestone	None Recorded	Elmton 1	Calcareous fine loamy soil	Calcareous fine loamy soil over limestone. Some non-calcareous and calcareous clayey soils.
8, 9, 10, 11, 12, 13, 14	Great Oolite Group – Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	None Recorded	Aberford	Calcareous fine loamy soil	Shallow, locally brashy, well drained calcareous fine loamy soils over limestone. Some deeper calcareous soils in colluvium.
15	Chipping Norton Limestone Formation – Ooidal Limestone	None Recorded	Frilford	Sandy and coarse loamy soils	Well drained sandy and coarse loamy soils. Some ferruginous sandy and some coarse loamy soils.
16, 17, 18, 19, 20, 21, 22	Great Oolite Group – Interbedded Limestone And [subequal/subordinate] Argillaceous Rocks	None Recorded	Frilford	Sandy and coarse loamy soils	Well drained sandy and coarse loamy soils. Some ferruginous sandy and some coarse loamy soils.
23, 24	Horsehay Sand Formation - Sandstone	None Recorded	Frilford	Sandy and coarse loamy soils	Well drained sandy and coarse loamy soils. Some ferruginous sandy and some coarse loamy soils.
25, 26	Horsehay Sand Formation - Sandstone	None Recorded	Aberford	Calcareous fine loamy soil	Shallow, locally brashy, well drained calcareous fine loamy soils over limestone. Some deeper calcareous soils in colluvium.

27	Horsehay Sand Formation - Sandstone	None Recorded	Wickham 2	Fine silty or loamy over clayey soils	Fine loamy over clayey, fine silty over clayey and clayey soils. Small areas of slowly permeable calcareous soils.
28	Whitby Mudstone Formation - Mudstone	None Recorded	Wickham 2	Fine silty or loamy over clayey soils	Fine loamy over clayey, fine silty over clayey and clayey soils. Small areas of slowly permeable calcareous soils.
29	Succession of sandstones, mudstones and limestones. From South to North; Whitby Mudstone, Horsehay Sand, Marlstone, and Dyrham Formation of interbedded silt and Sand	None Recorded	Wickham 2	Fine silty or loamy over clayey soils	Fine loamy over clayey, fine silty over clayey and clayey soils. Small areas of slowly permeable calcareous soils.
30, 31	Charmouth Mudstone Formation - Mudstone	None Recorded	Wickham 2	Fine silty or loamy over clayey soils	Fine loamy over clayey, fine silty over clayey and clayey soils. Small areas of slowly permeable calcareous soils.
32	Dyrham Formation - Interbedded silt and Sand	None Recorded	Banbury	Brashy fine and coarse loamy ferruginous soils	Brashy fine and coarse loamy ferruginous soils over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils.
33, 34, 35, 36	Marlstone Rock Formation – Ferruginous Limestone and Ironstone	None Recorded	Banbury	Brashy fine and coarse loamy ferruginous soils	Brashy fine and coarse loamy ferruginous soils over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils.

37	Dyrham Formation - Interbedded silt and Sand	None Recorded	Banbury	Brashy fine and coarse loamy ferruginous soils	Brashy fine and coarse loamy ferruginous soils over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils.
38	Charmouth Mudstone Formation - Mudstone	None Recorded	Banbury	Brashy fine and coarse loamy ferruginous soils	Brashy fine and coarse loamy ferruginous soils over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils.
39	Marlstone Rock Formation – Ferruginous Limestone and Ironstone	None Recorded	Banbury	Brashy fine and coarse loamy ferruginous soils	Brashy fine and coarse loamy ferruginous soils over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils.
40, 41, 42, 43, 44	Whitby Mudstone Formation - Mudstone	None Recorded	Banbury	Brashy fine and coarse loamy ferruginous soils	Brashy fine and coarse loamy ferruginous soils over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils.
45, 46, 47, 48, 51, 54	Marlstone Rock Formation – Ferruginous Limestone and Ironstone	None Recorded	Banbury	Brashy fine and coarse loamy ferruginous soils	Brashy fine and coarse loamy ferruginous soils over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils.
49, 50, 52, 53	Whitby Mudstone Formation - Mudstone	None Recorded	Denchworth	Clayey soils with similar fine loamy over clayey soils	Seasonally waterlogged clayey soils with similar fine loamy over clayey soils. Some fine loamy over clayey coils and some calcareous clayey soils.

APPENDIX B – METHODOLOGY & SURVEY EQUIPMENT

Grid locations
The location of the survey grids has been plotted together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site or a Leica Smart Rover RTK GPS.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. A SmartNet RTK GPS uses Ordnance Survey's network of over 100 fixed base stations to give an accuracy of around 0.01m.

Survey equipment and gradiometer configuration
Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTeslas (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

Sampling interval
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

Depth of scan and resolution
The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m, though strongly magnetic objects may be visible at greater depths. The collection of data at 0.25m centres provides an optimum methodology for the task balancing cost and time with resolution.

Data capture
The readings are logged consecutively into the data logger which in turn is daily down- loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

APPENDIX C – BASIC PRINCIPLES OF MAGNETIC SURVEY

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

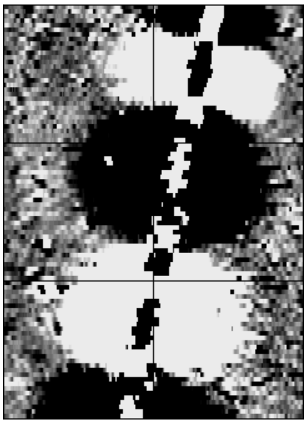
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

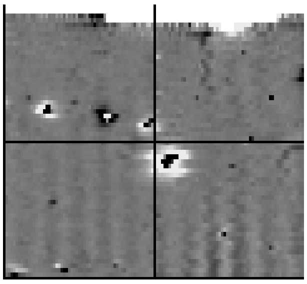
APPENDIX D – GLOSSARY OF MAGNETIC ANOMALIES

Bipolar



A bipolar anomaly is one that is composed of both a positive response and a negative response. It can be made up of any number of positive responses and negative responses. For example a pipeline consisting of alternating positive and negative anomalies is said to be bipolar. See also dipolar which has only one area of each polarity. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.

Dipolar

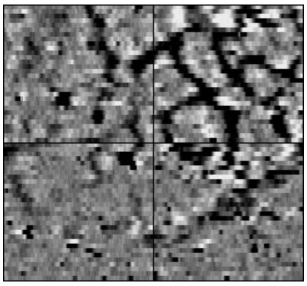


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very strong anomaly is likely to be caused by a ferrous object.

Positive anomaly with associated negative response

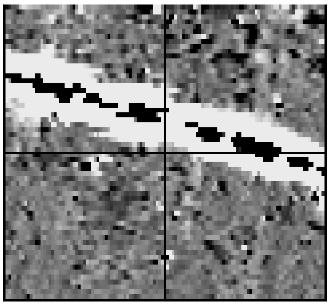
See bipolar and dipolar.

Positive linear



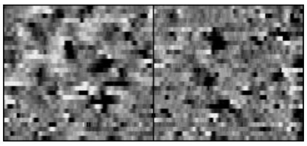
A linear response which is entirely positive in polarity. These are usually related to in-filled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity and some may even have a natural origin.

Positive linear anomaly with associated negative response



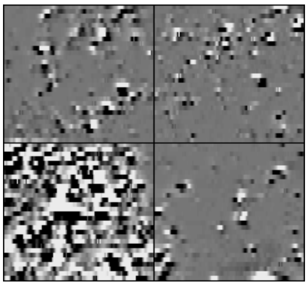
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field boundaries.

Positive point/area



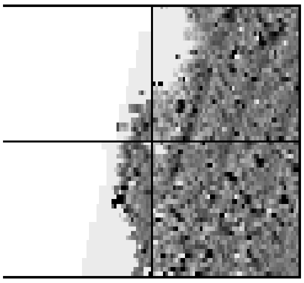
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by in-filled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally occurring depressions in the ground.

Magnetic debris



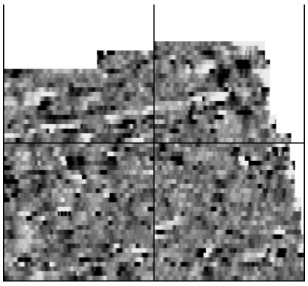
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low (+/-3nT) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly (+/-250nT) is more indicative of a spread of ferrous debris. Moderately strong anomalies may be the result of a spread of thermoremanent material such as bricks or ash.

Magnetic disturbance



Magnetic disturbance is high amplitude and can be composed of either a bipolar anomaly, or a single polarity response. It is essentially associated with magnetic interference from modern ferrous structures such as fencing, vehicles or buildings, and as a result is commonly found around the perimeter of a site near to boundary fences.

Negative linear

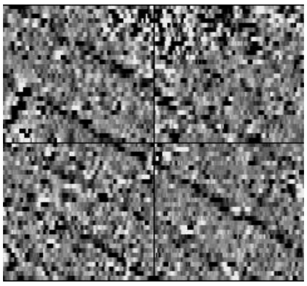


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative to the background top soil is built up. See also ploughing activity.

Negative point/area

Opposite to positive point anomalies these responses may be caused by raised areas or earthen banks. These could be of an archaeological origin or may have a natural origin.

Ploughing activity



Ploughing activity can often be visualised by a series of parallel linear anomalies. These can be of either positive polarity or negative polarity depending on site specifics. It can be difficult to distinguish between ancient ploughing and more modern ploughing. Clues such as the separation of each linear, straightness, strength of response and cross cutting relationships can be used to aid this, although none of these can be guaranteed to differentiate between different phases of activity.

Polarity

Term used to describe the measurement of the magnetic response. An anomaly can have a positive polarity (values above 0nT) and/or a negative polarity (values below 0nT).

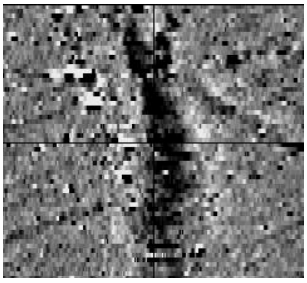
Strength of response

The amplitude of a magnetic response is an important factor in assigning an interpretation to a particular anomaly. For example a positive anomaly covering a 10m^2 area may have values up to around 3000nT, in which case it is likely to be caused by modern magnetic interference. However, the same size and shaped anomaly but with values up to only 4nT may have a natural origin. Colour plots are used to show the amplitude of response.

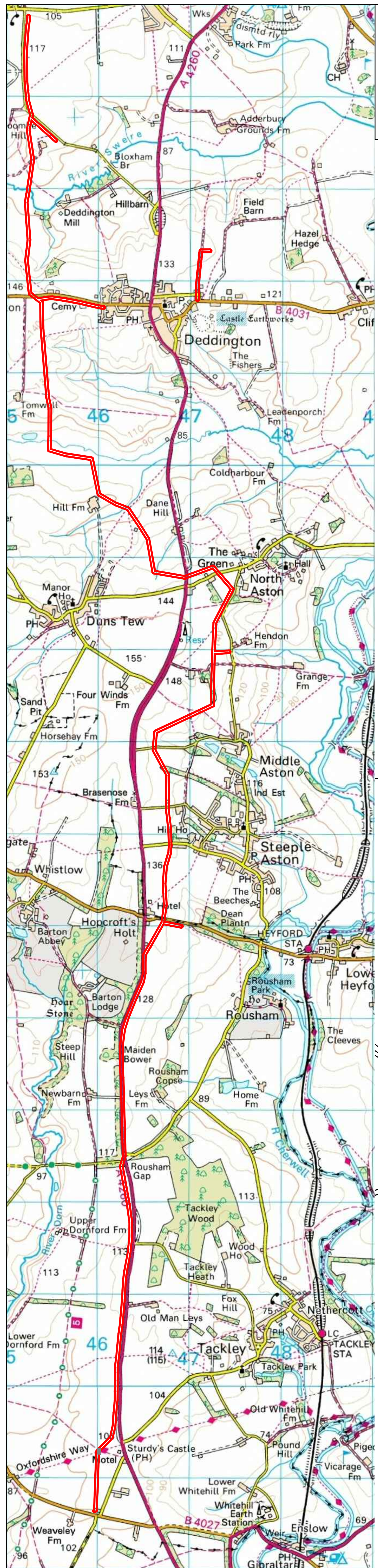
Thermoremanent response

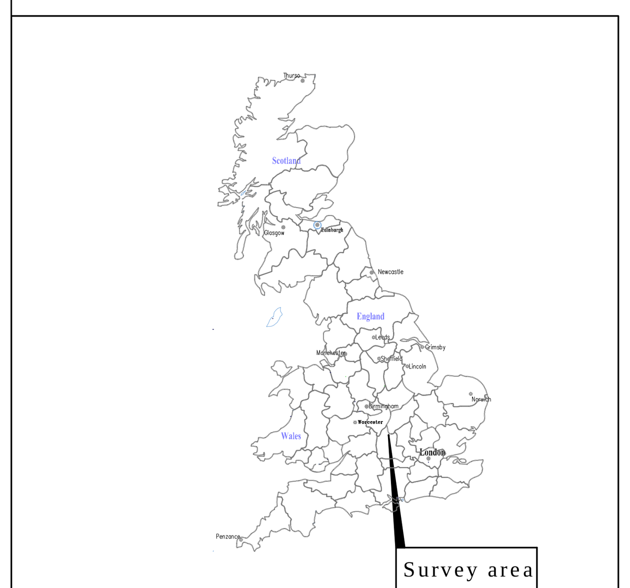
A feature which has been subject to heat may result in it acquiring a magnetic field. This can be anything up to approximately +/-100 nT in value. These features include clay fired drains, brick, bonfires, kilns, hearths and even pottery. If the heat application has occurred in situ (e.g. a kiln) then the response is likely to be bipolar compared to if the heated objects have been disturbed and moved relative to each other, in which case they are more likely to take an irregular form and may display a debris style response (e.g. ash).

Weak background variations



Weakly magnetic wide scale variations within the data can sometimes be seen within sites. These usually have no specific structure but can often appear curvy and sinuous in form. They are likely to be the result of natural features, such as soil creep, dried up (or seasonal) streams. They can also be caused by changes in the underlying geology or soil type which may contain unpredictable distributions of magnetic minerals, and are usually apparent in several locations across a site.





Site centred on NGR SP 467 319

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

OS REFERENCING INFORMATION

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B	446025.33, 219256.64
C	446057.67, 219334.21
D	446078.46, 219355.84
E	446120.88, 219356.67
F	446183.26, 219421.54
G	446217.26, 219506.92
H	446229.02, 219565.75
I	446237.84, 219646.37
J	446253.12, 219945.98
K	446226.19, 220034.52
L	446226.19, 220184.52
M	446257.89, 220229.24
N	446274.12, 220378.36
O	446250.79, 220441.26
P	446270.26, 220620.20
Q	446308.55, 220717.77
R	446321.71, 220897.28
S	446328.30, 220987.04
T	446337.07, 221106.72
U	446318.32, 221210.23
V	446352.52, 221417.43
W	446365.42, 221510.36
X	446374.67, 221599.88
Y	446377.66, 221642.66
Z	446377.53, 221732.66
AA	446397.09, 221854.35
AB	446316.01, 222327.45
AC	446302.56, 222558.00
AD	446291.79, 222887.82
AE	446320.96, 222918.82

Job No. J8928
Survey Date SEP-OCT 15

Client
SKANSKA

Project Title
ANGELINOS PIPELINE, OXFORDSHIRE

Subject
SITE LOCATION, SURVEY AREA & REFERENCING

STRATASCAN™
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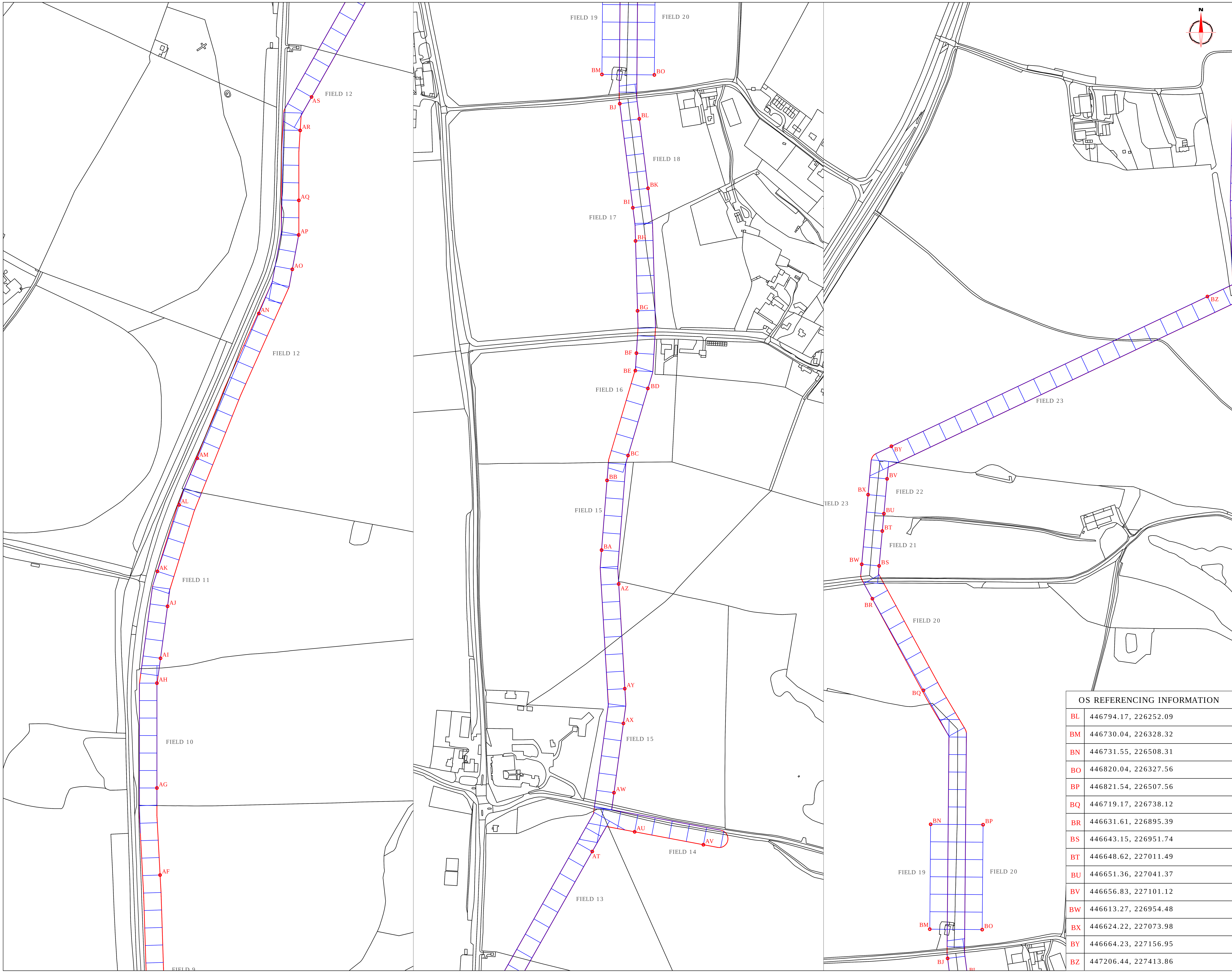
SUMO GROUP MEMBER

Scale 1:3000 (0m 30 60 90 120 150 180m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	01



Amendments

Issue No.	Date	Description
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-	-	-

OS REFERENCING INFORMATION

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AH	446300.27, 223727.95
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AJ	446318.46, 223859.74
AK	446301.06, 223919.73
AL	446338.28, 224033.81
AM	446369.40, 224113.75
AN	446475.11, 224362.20
AO	446532.57, 224438.12
AP	446543.47, 224497.12
AQ	446543.74, 224556.47
AR	446546.05, 224676.44
AS	446565.53, 224733.82
AT	446713.50, 224994.79
AU	446786.23, 225028.57
AV	446904.17, 225006.43
AW	446750.79, 225095.70
AX	446766.96, 225214.60
AY	446769.26, 225274.28
AZ	446758.81, 225453.98
BA	446729.46, 225512.09
BB	446738.84, 225631.72
BC	446774.81, 225674.39
BD	446808.85, 225789.46
BE	446787.41, 225820.08
BF	446789.26, 225850.02
BG	446791.17, 225922.71
BH	446787.70, 226042.66
BI	446783.11, 226099.54
BJ	446760.74, 226278.14
BK	446809.13, 226133.03

OS REFERENCING INFORMATION

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BP	446821.54, 226507.56
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BX	446624.22, 227073.98
BY	446664.23, 227156.95
BZ	447206.44, 227413.86

Job No. J8928

Survey Date SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

SURVEY AREA & REFERENCING

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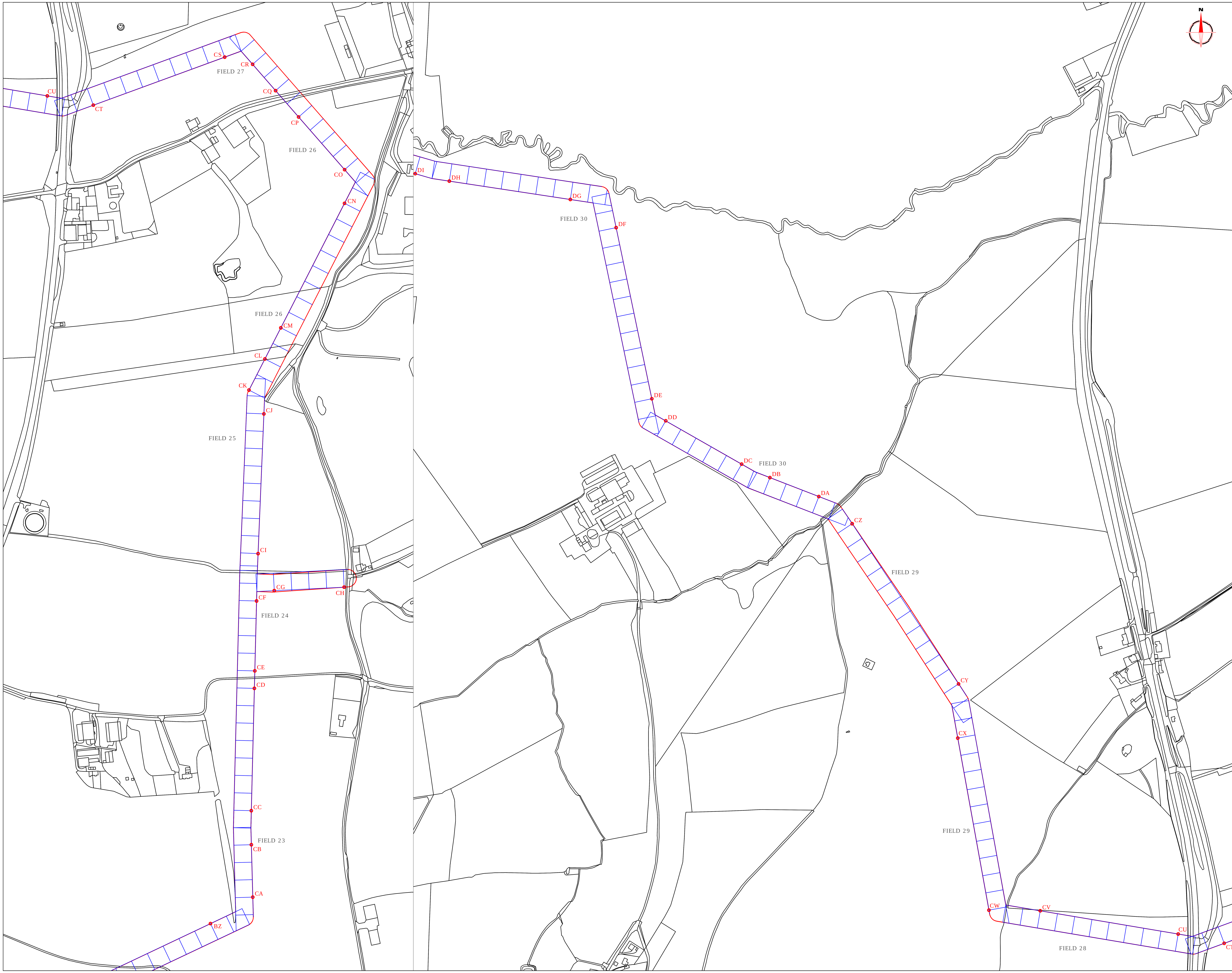
Scale 1:3000 (0m 30 60 90 120 150 180m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	02



Amendments

Issue No.	Date	Description
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-	-	-

OS REFERENCING INFORMATION

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CE	447282.47, 227847.71
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CV	446689.74, 228874.35
CW	446601.69, 228875.48
CX	446548.25, 229170.68
CY	446549.56, 229263.73
CZ	446367.00, 229538.64
DA	446309.80, 229585.25
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DC	446177.36, 229640.86
DD	446047.05, 229715.15
DE	446023.28, 229753.07
DF	445962.01, 230046.75

Job No.	Survey Date
J8928	SEP-OCT 15

Client

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ANGELINOS PIPELINE, OXFORDSHIRE

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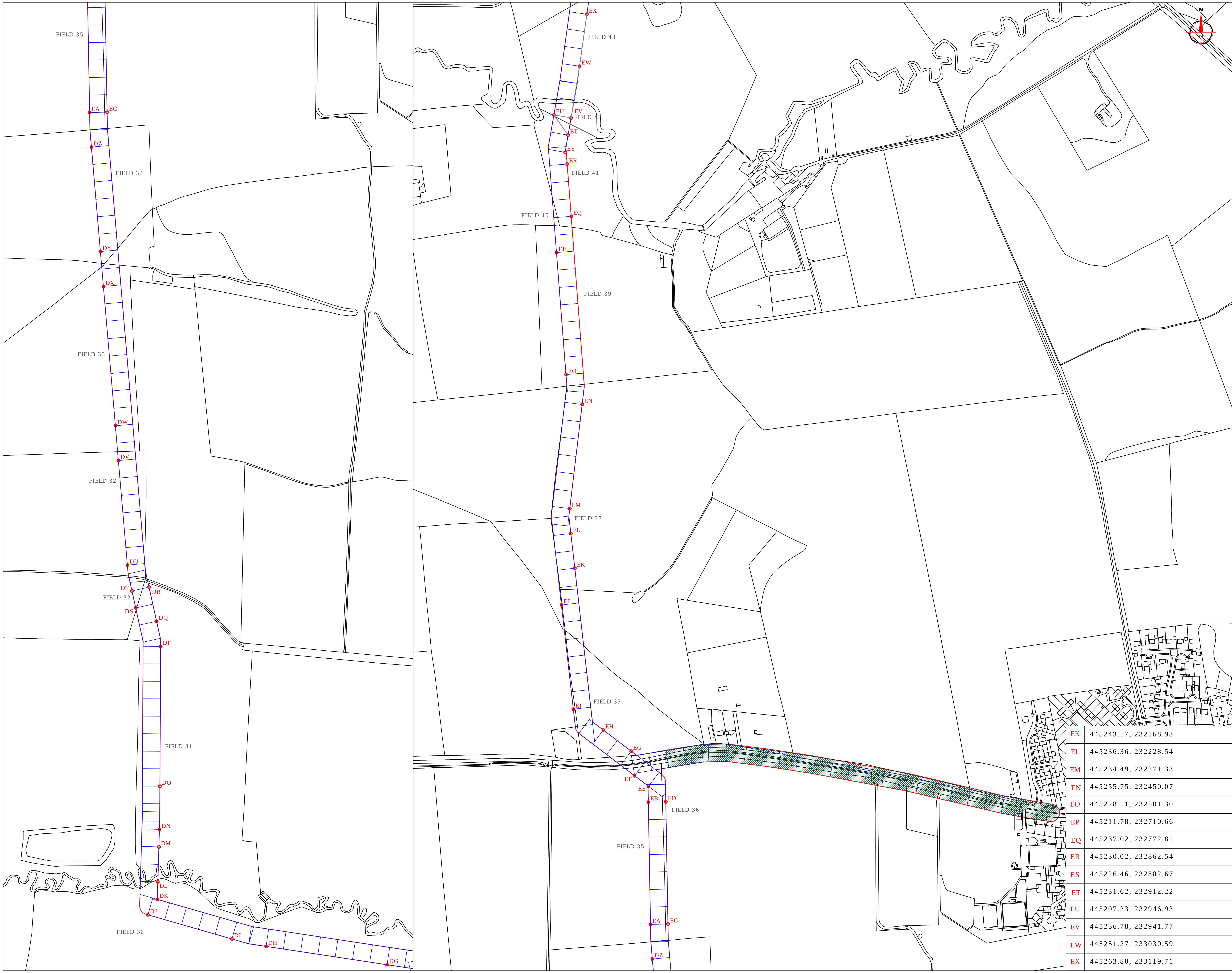
Scale 1:3000 (0m 30 60 90 120 150 180m)

Plot	Checked by	Issue No.
A1	DGE	01

Date	Drawn by	Figure No.
OCT 15	TR	03



Amendments		
Issue No.	Date	Description
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-	-	-

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KEY

Area unsurveyable

OS REFERENCING INFORMATION

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DI	445617.26, 230139.36
DJ	445473.08, 230180.73
DK	445489.16, 230207.32
DL	445490.07, 230237.30
DM	445491.90, 230297.28
DN	445492.81, 230327.26
DO	445493.56, 230401.42
DP	445494.85, 230641.41
DQ	445487.90, 230684.54
DR	445474.94, 230743.12
DS	445452.13, 230707.35
DT	445445.65, 230736.64
DU	445437.87, 230780.97
DV	445422.44, 230960.31
DW	445417.29, 231020.09
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DY	445396.71, 231259.21
DZ	445391.57, 231318.99
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EB	445369.26, 231767.62
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EF	445345.63, 231812.90
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EV	445236.78, 232941.77
EW	445251.27, 233030.59
EX	445263.80, 233119.71

Job No. J8928

Survey Date SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

SURVEY AREA & REFERENCING

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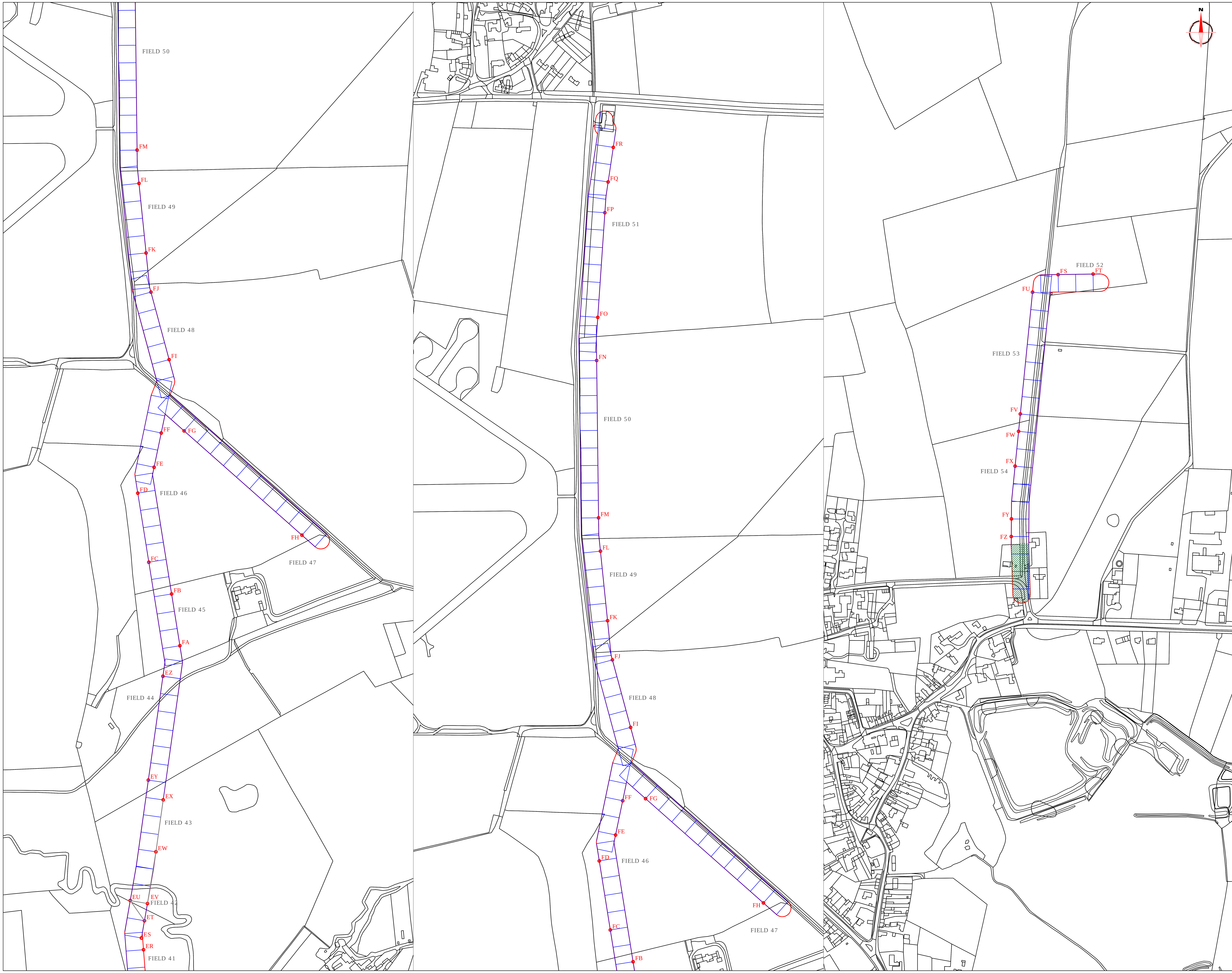
SUMO GROUP MEMBER

Scale 1:3000

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	04



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

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KEY

Area unsurveyable

OS REFERENCING INFORMATION

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FW	447077.85, 232116.16
FX	447071.87, 232056.45
FY	447065.61, 231965.70
FZ	447065.47, 231935.70

Job No. J8928

Survey Date SEP-OCT 15

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SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

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EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

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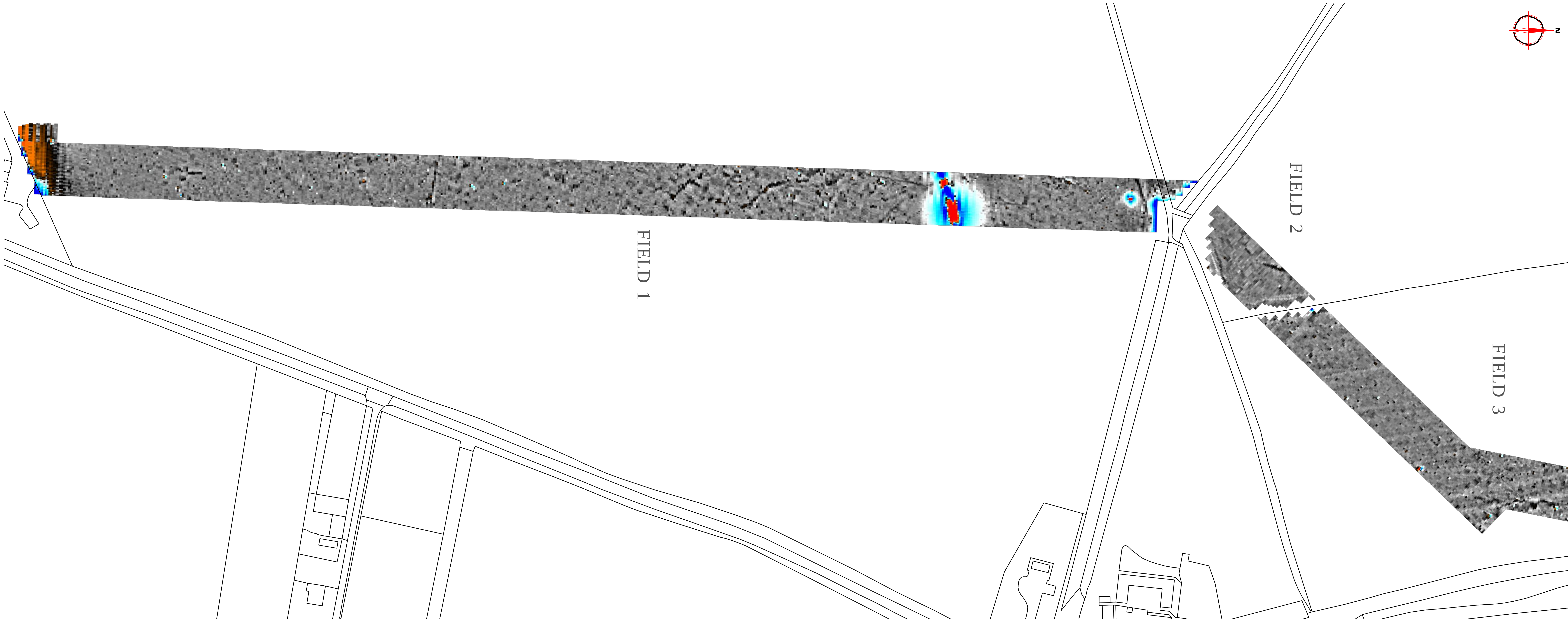
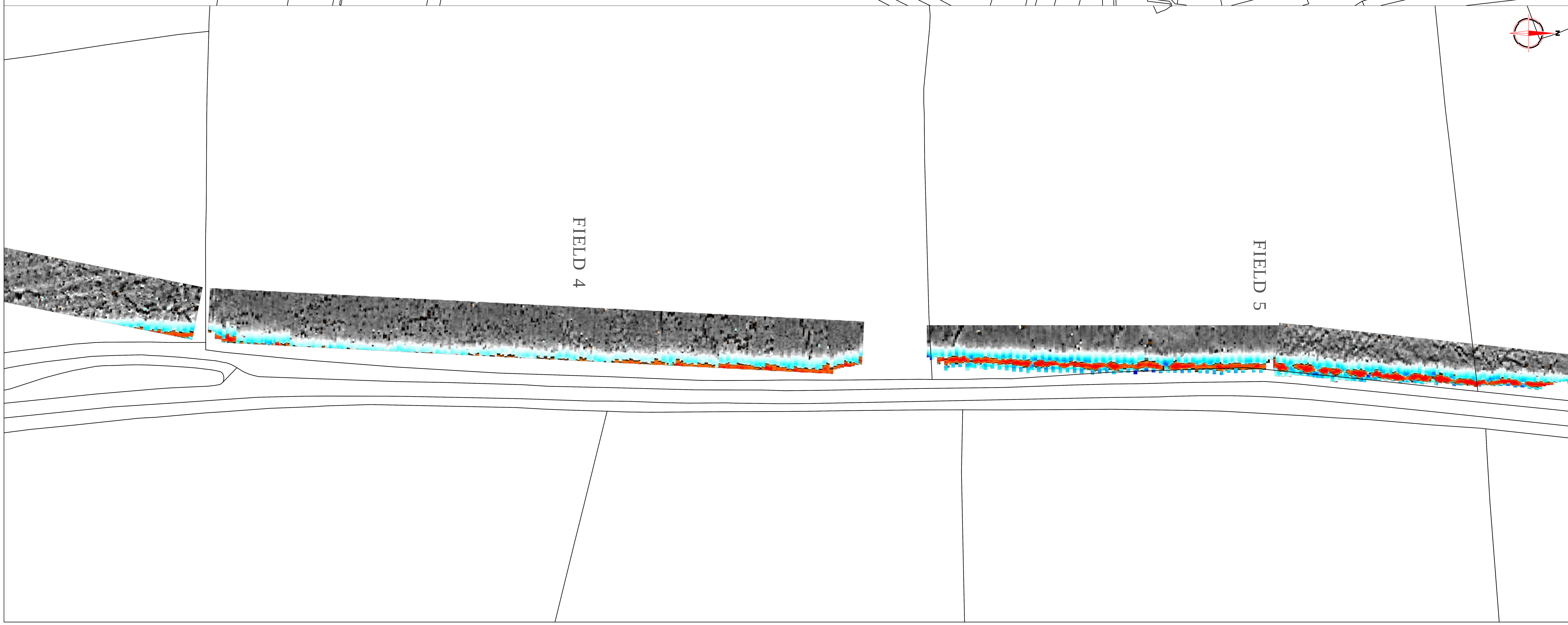
ISO 14001 certified

Scale 1:3000 — 0m 30 60 90 120 150 180m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	05





Amendments

Issue No.	Date	Description
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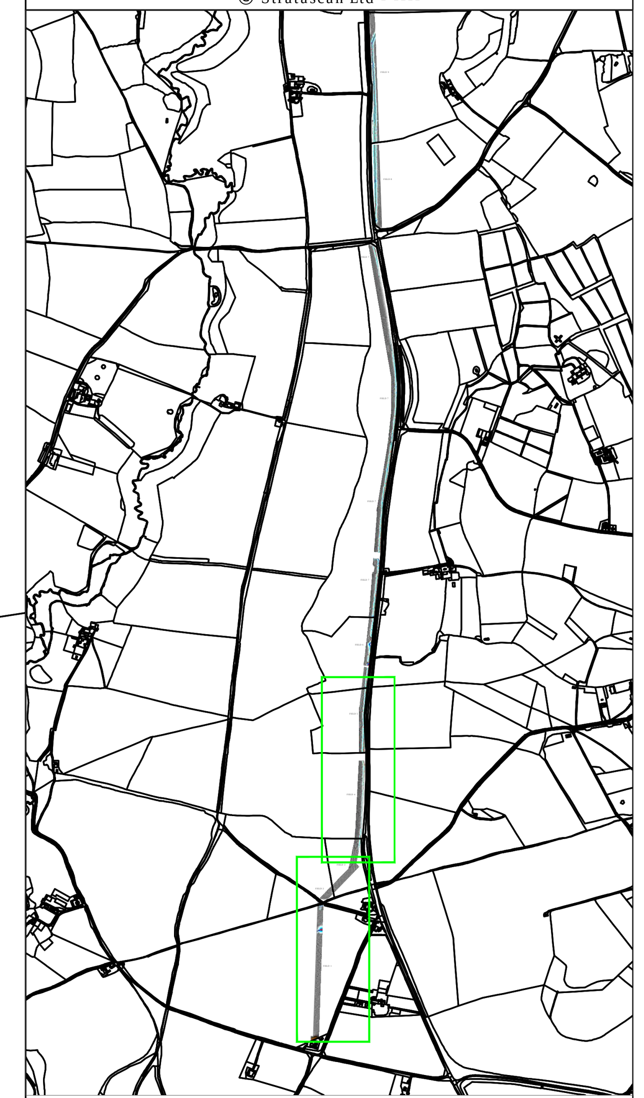
-	-	-



Plotting parameters

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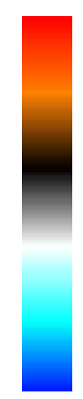
Minimum -100nT (blue)



Job No. J8928	Survey Date SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 1-2

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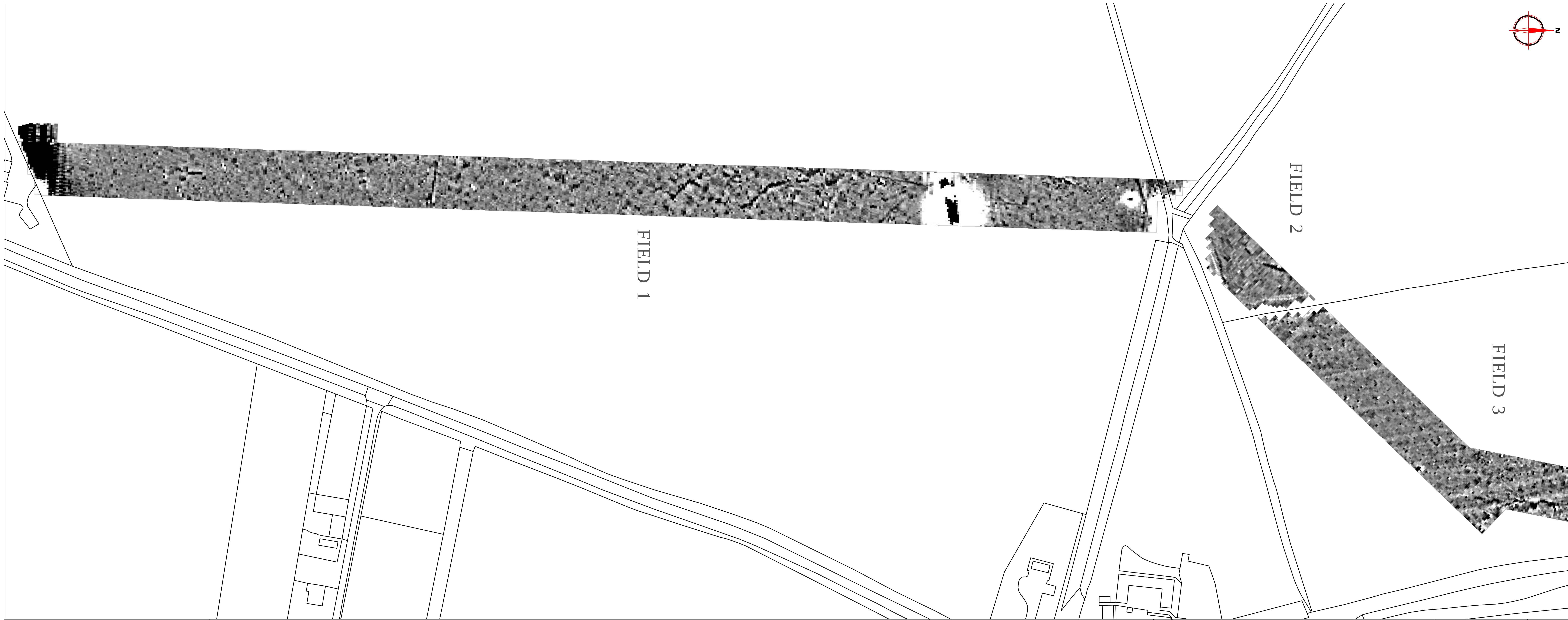
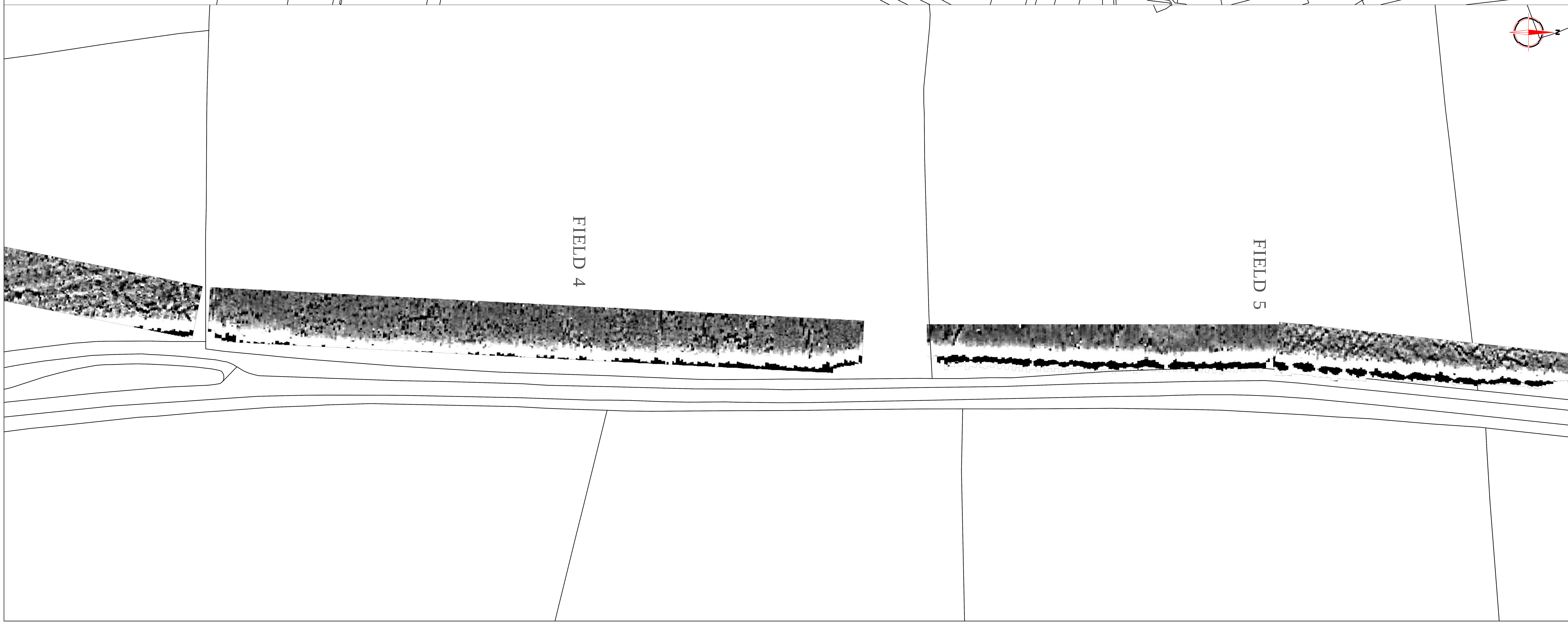
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot A1	Checked by DGE	Issue No. 01
Date OCT 15	Drawn by TR	Figure No. 06





Amendments

Issue No.	Date	Description
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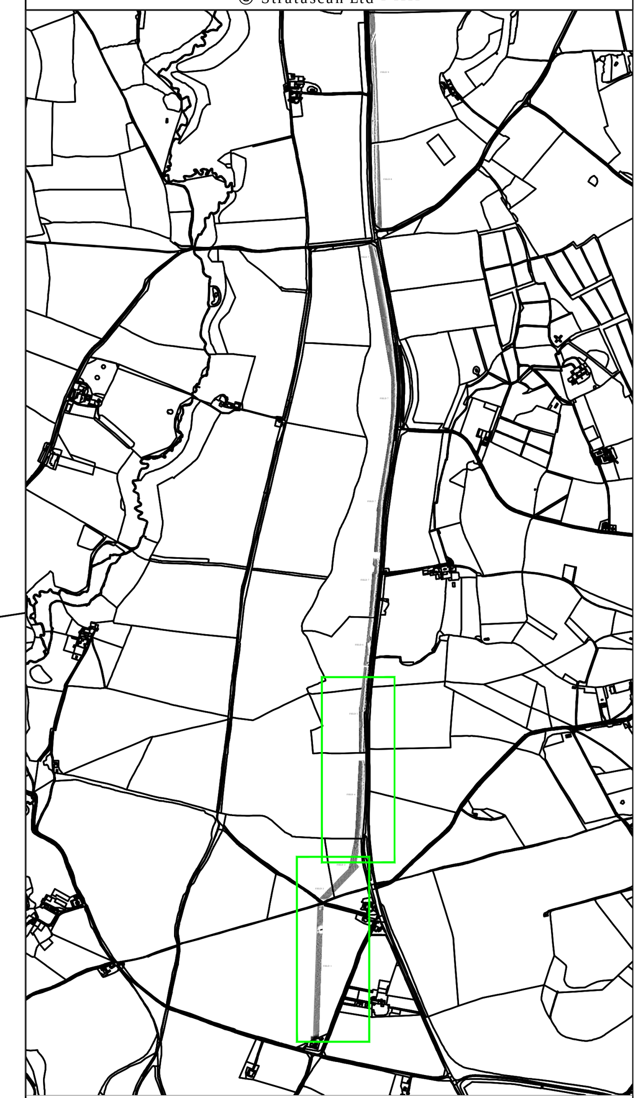
-	-	-



Plotting parameters

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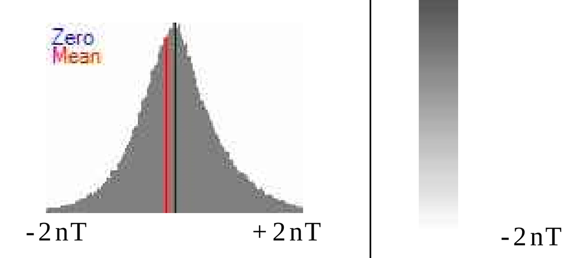
Minimum -2nT (white)



Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 1-2

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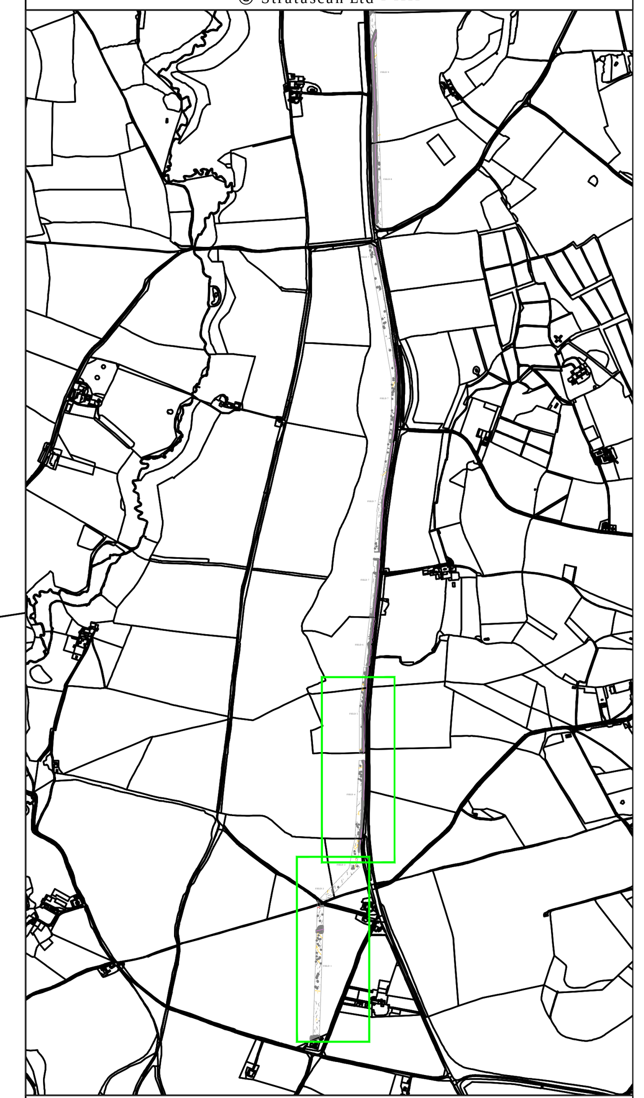
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	07

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



PROBABLE ARCHAEOLOGY

Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin

Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin

Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow

Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing

Linear anomaly - probably related to a former field boundary not present on available mapping

Linear anomaly - related to a former field boundary present on available mapping

OTHER ANOMALIES

Linear anomaly - probably related to pipe, cable or other modern service

Linear anomaly - possibly related to land drain

Linear anomaly - modern trackway

Magnetic disturbance associated with nearby metal object such as service or field boundary

Strong magnetic debris - possible disturbed or made ground

Scattered magnetic debris

Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin

Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 1-2

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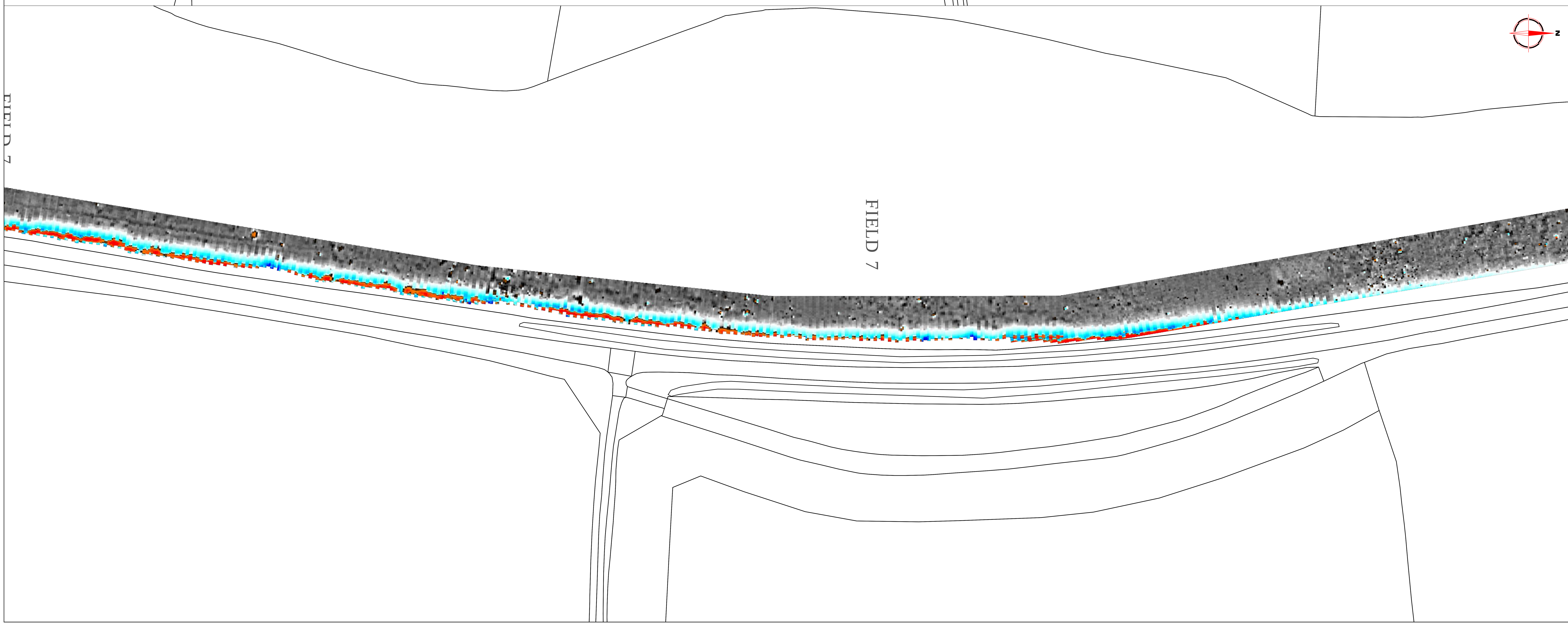
Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01

Date	Drawn by	Figure No.
OCT 15	TR	08



Amendments

Issue No.	Date	Description
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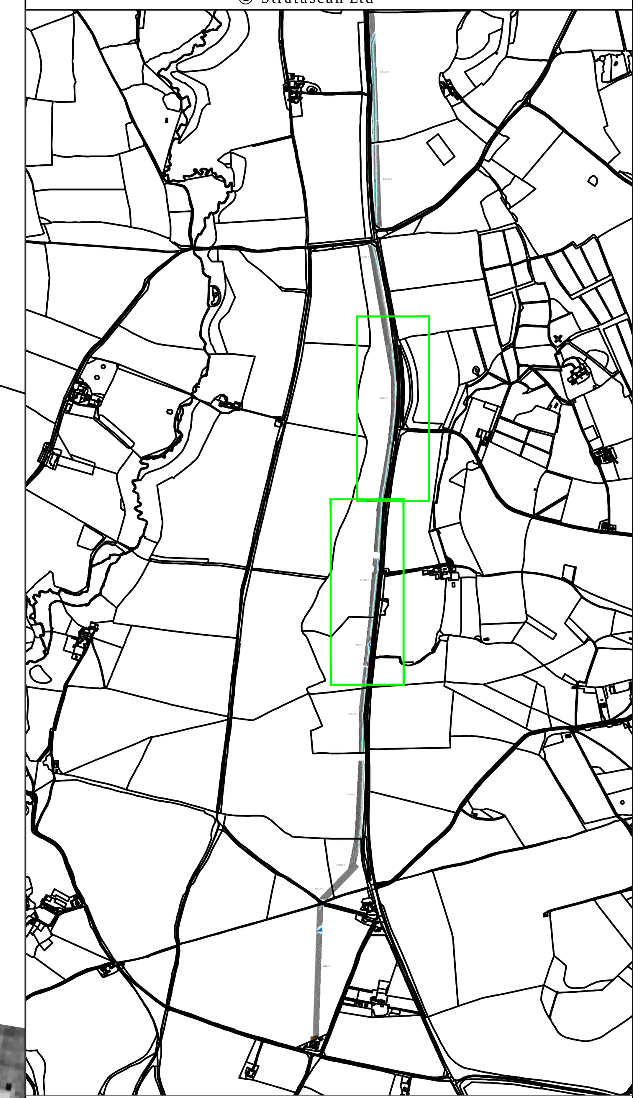
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 3-4

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SUMO GROUP MEMBER

Scale
1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	09

Amendments		
Issue No.	Date	Description
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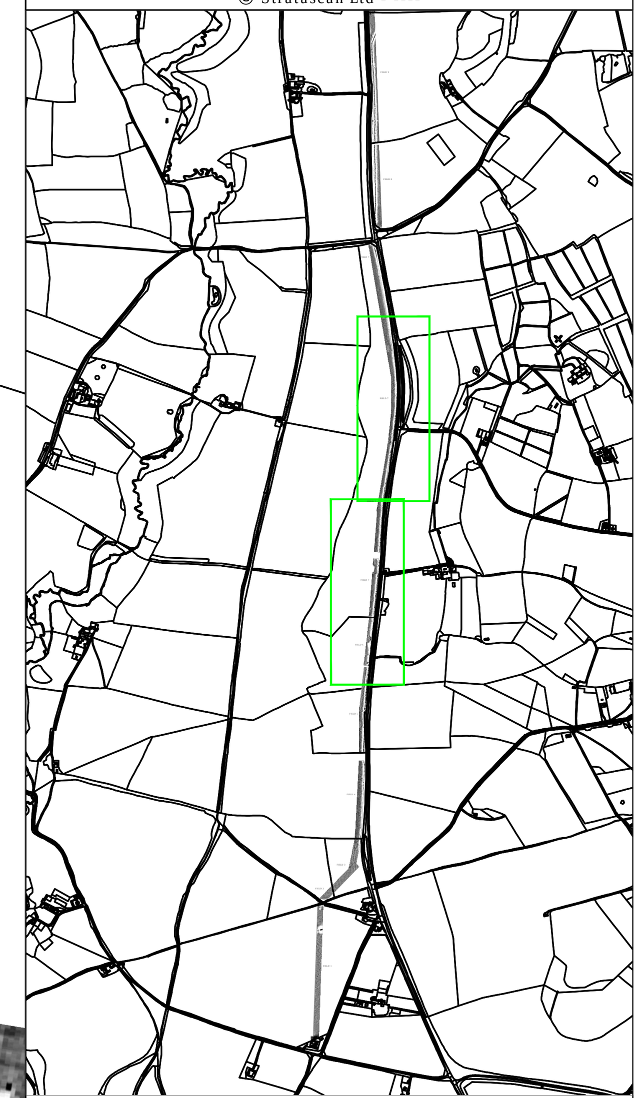
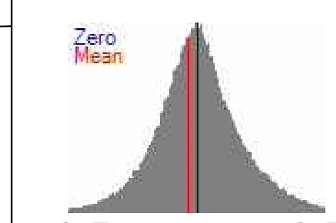
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



+2nT
-2nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

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Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 3-4

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Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	10

Amendments		
Issue No.	Date	Description
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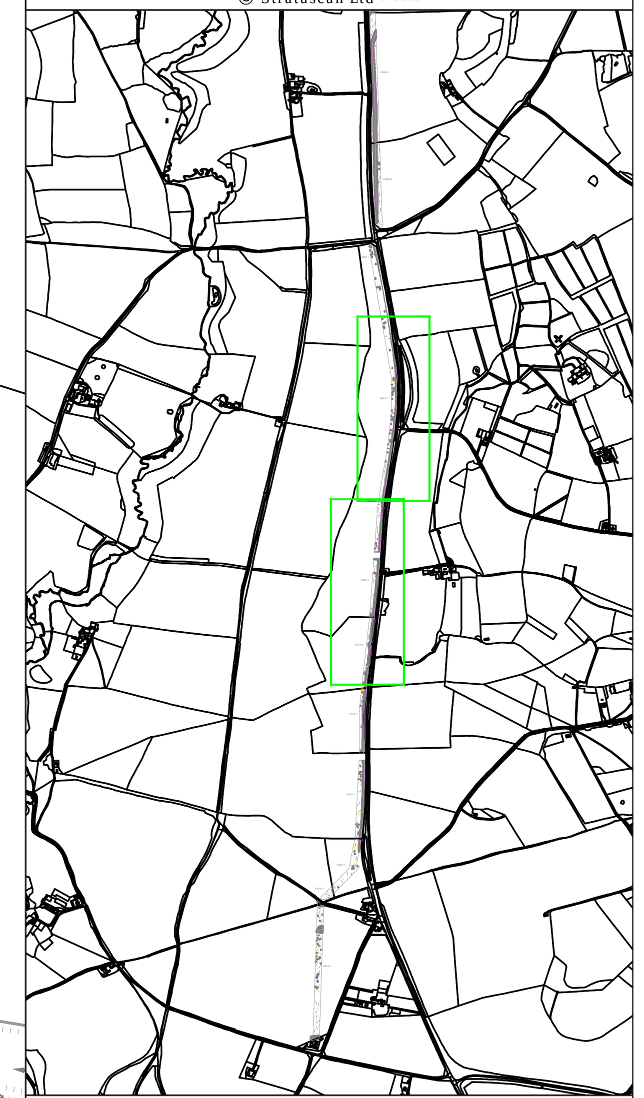
-	-	-



PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
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- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No. J8928
Survey Date SEP-OCT 15

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Subject
ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 3-4

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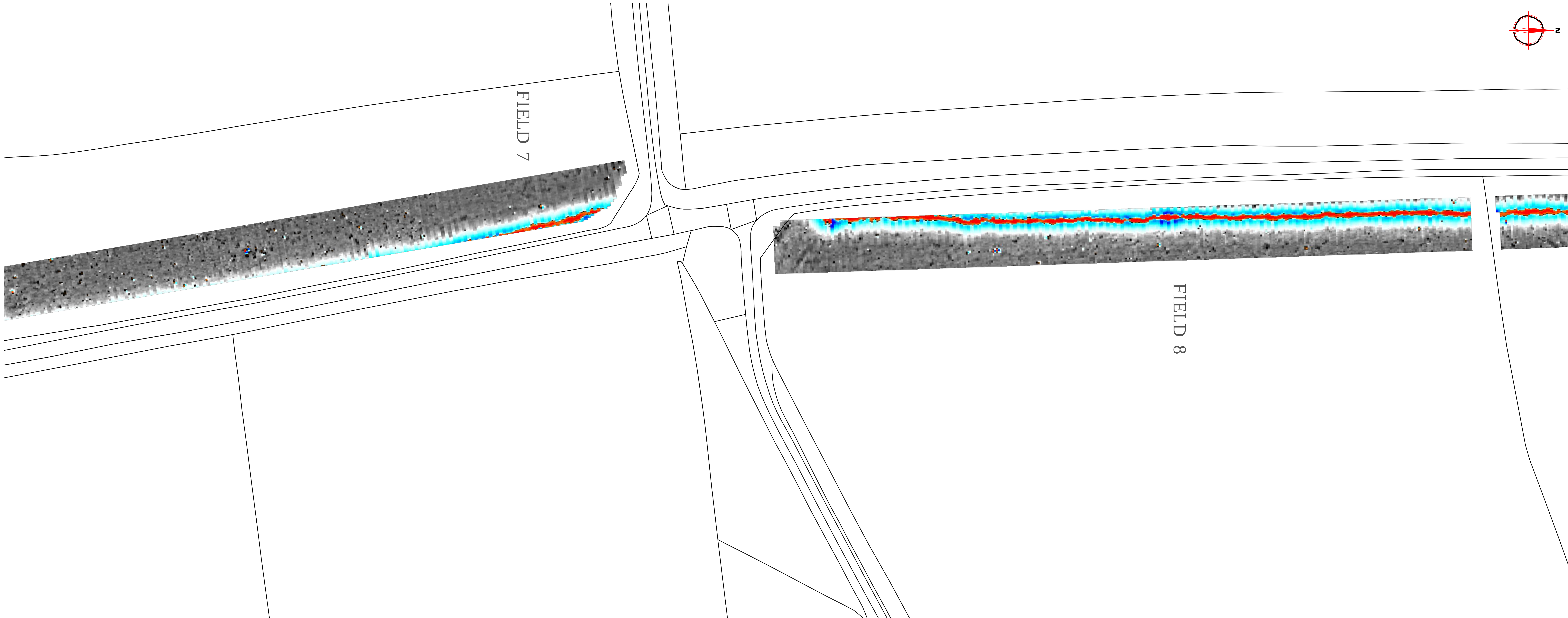
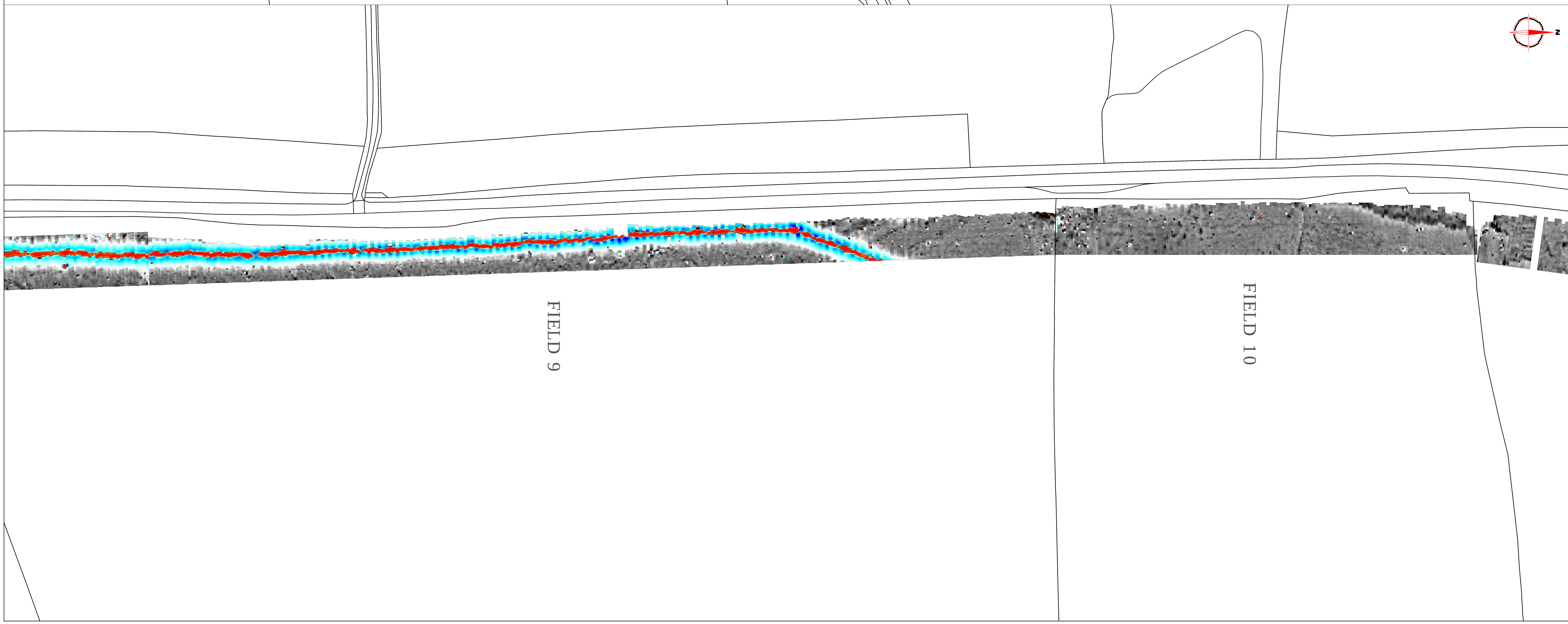
SUMO GROUP MEMBER

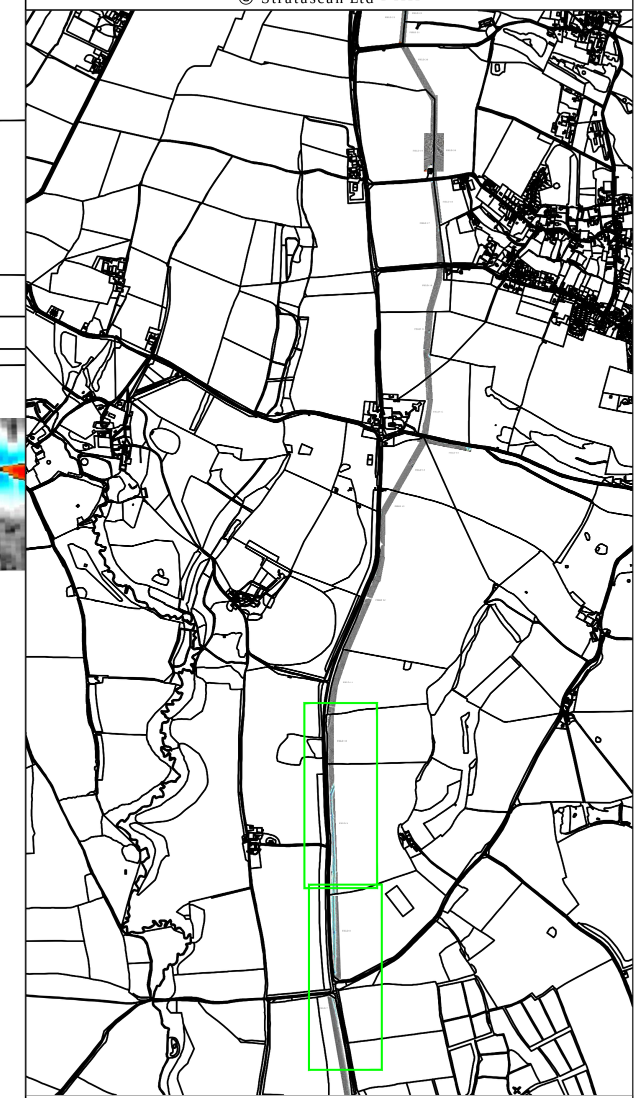
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	11





Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 5-6

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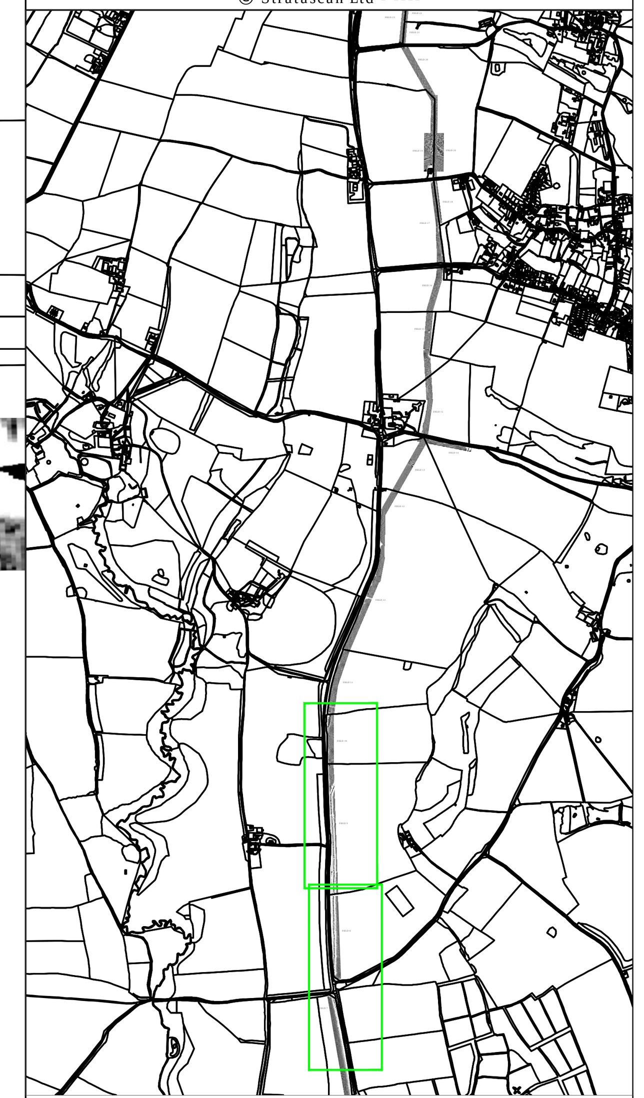
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

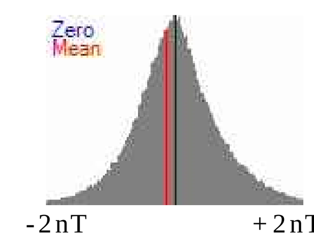
Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	12

Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



+2nT
-2nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 5-6

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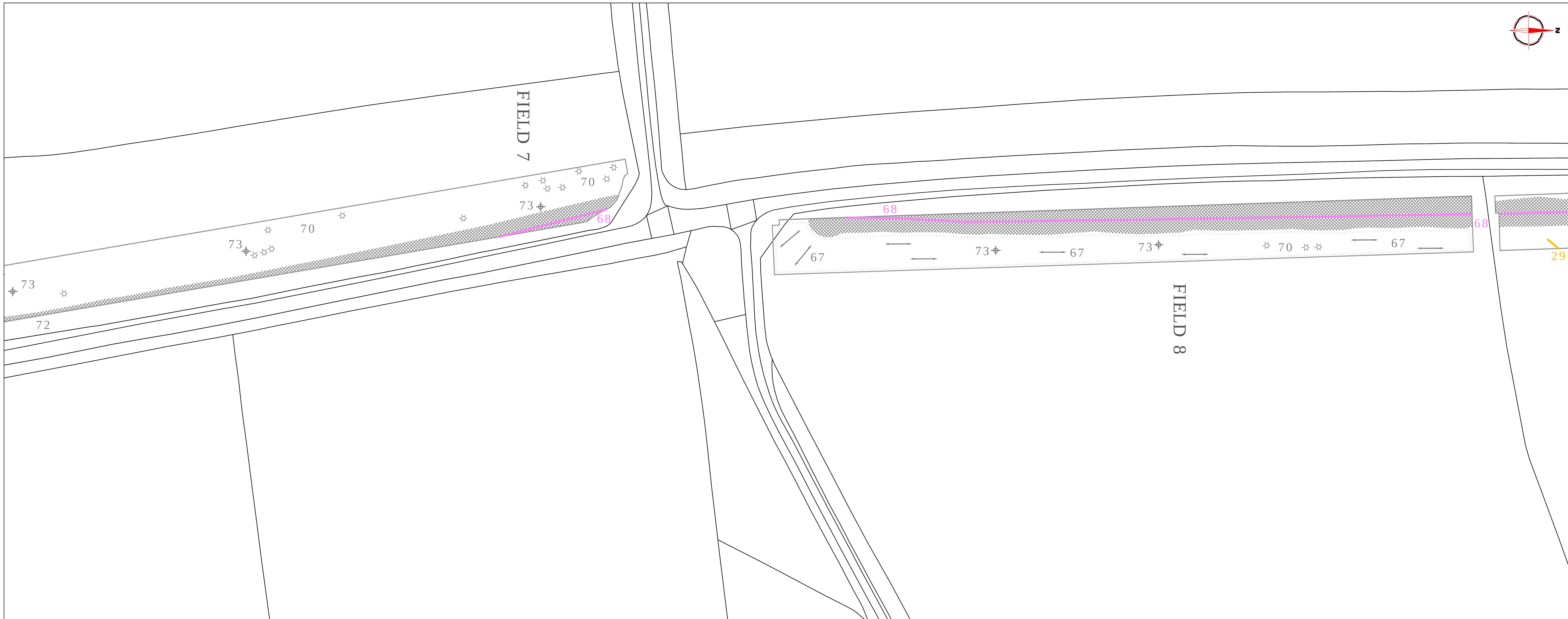
SUMO GROUP MEMBER

Scale
1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	13



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

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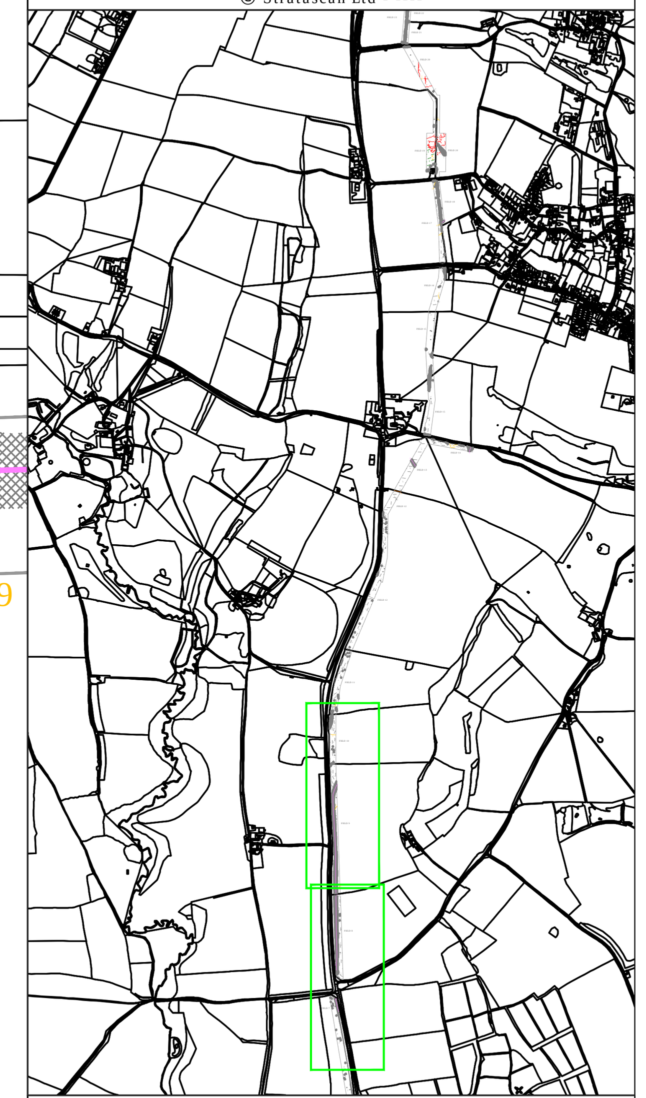

PROBABLE ARCHAEOLOGY
- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY
- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE
- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
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- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No. J8928 | Survey Date SEP-OCT 15

Client: SKANSKA

Project Title: ANGELINOS PIPELINE, OXFORDSHIRE

Subject: ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 5-6

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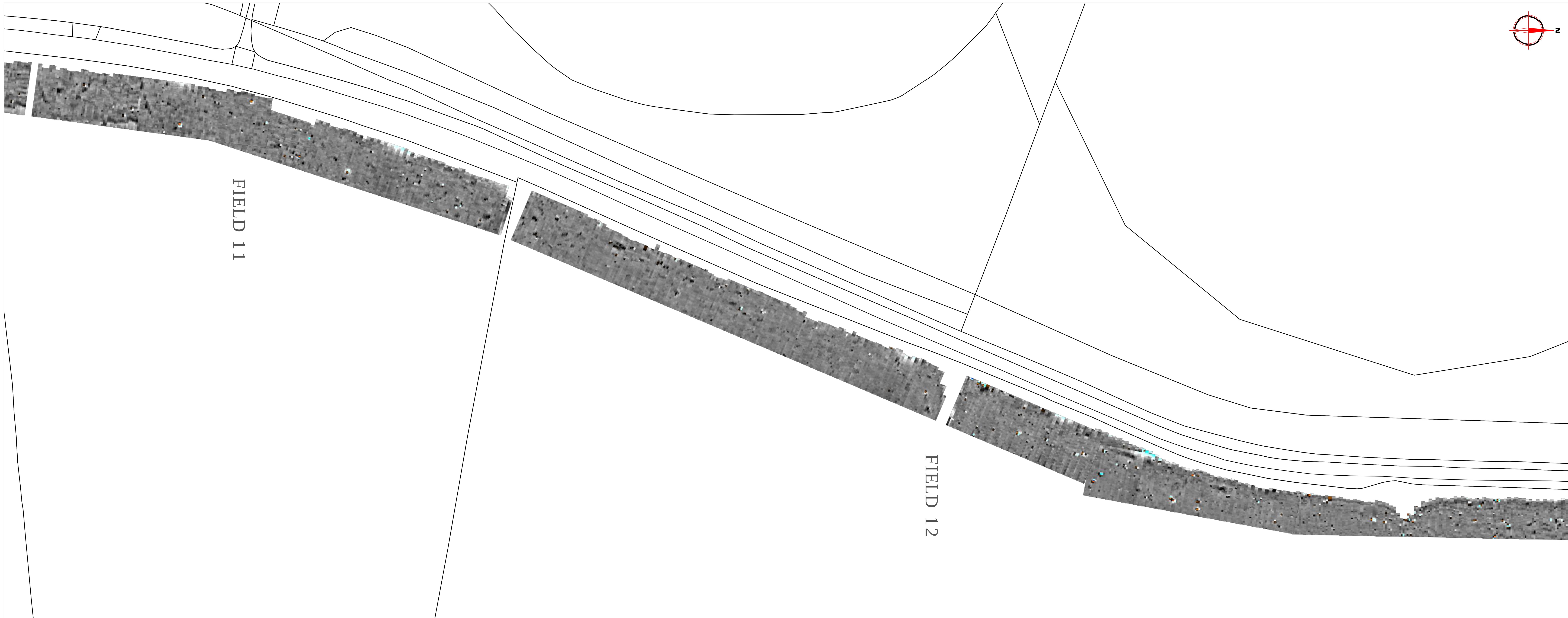
EUROPEAN GPR ASSOCIATION

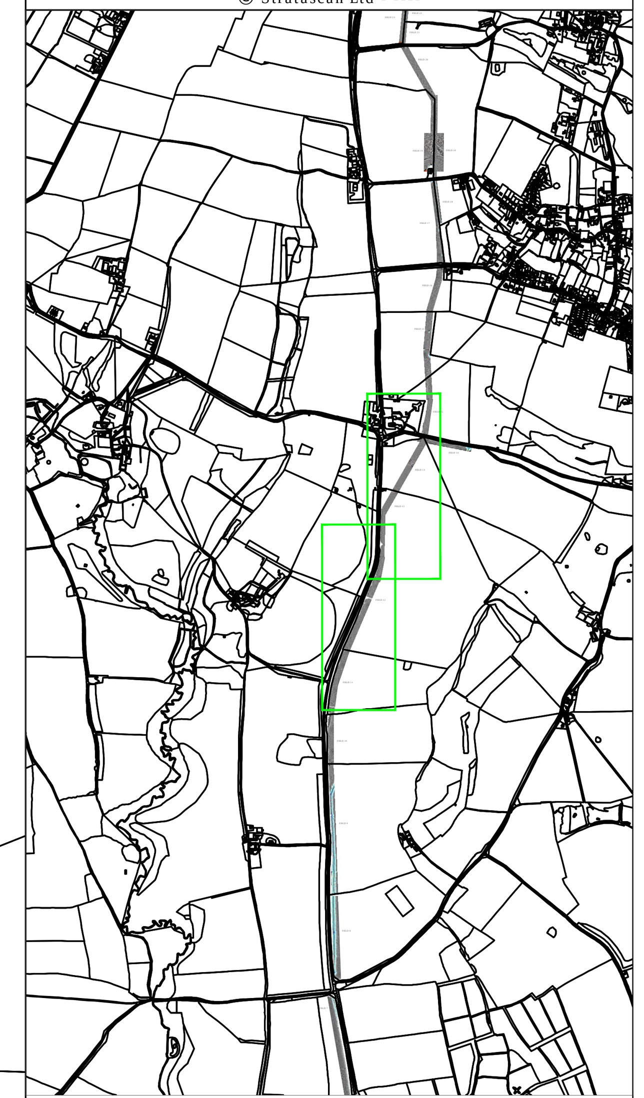
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	14



Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 7-8

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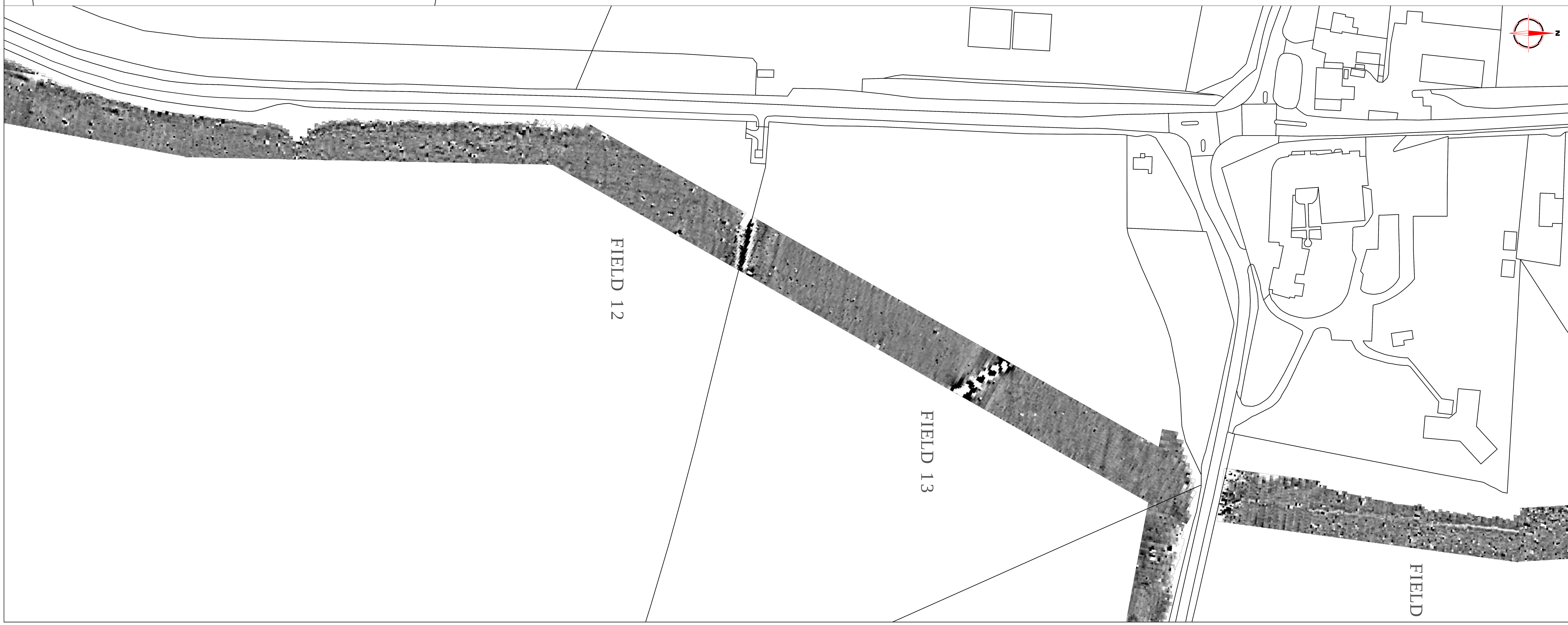
EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

ISO 9001 certified
ISO 14001 certified

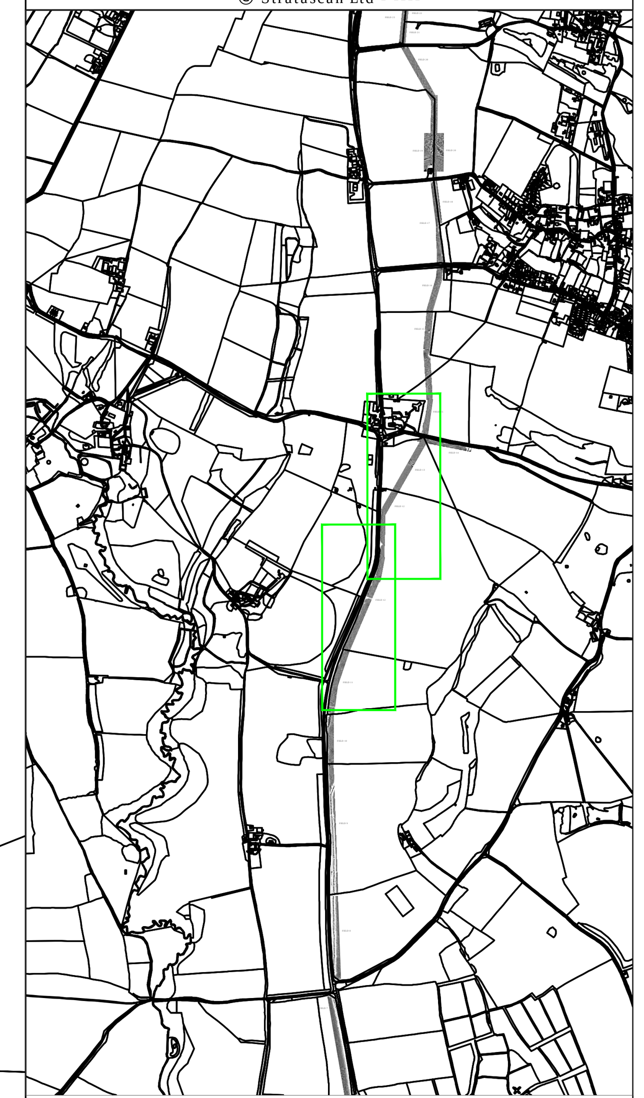
Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	15



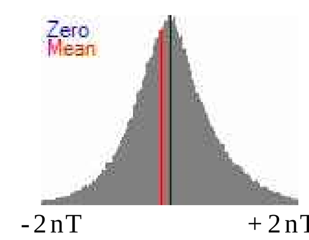
Amendments

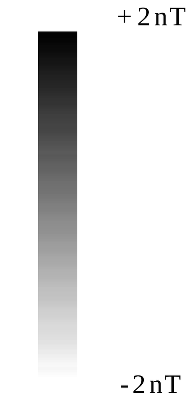
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)





Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 7-8

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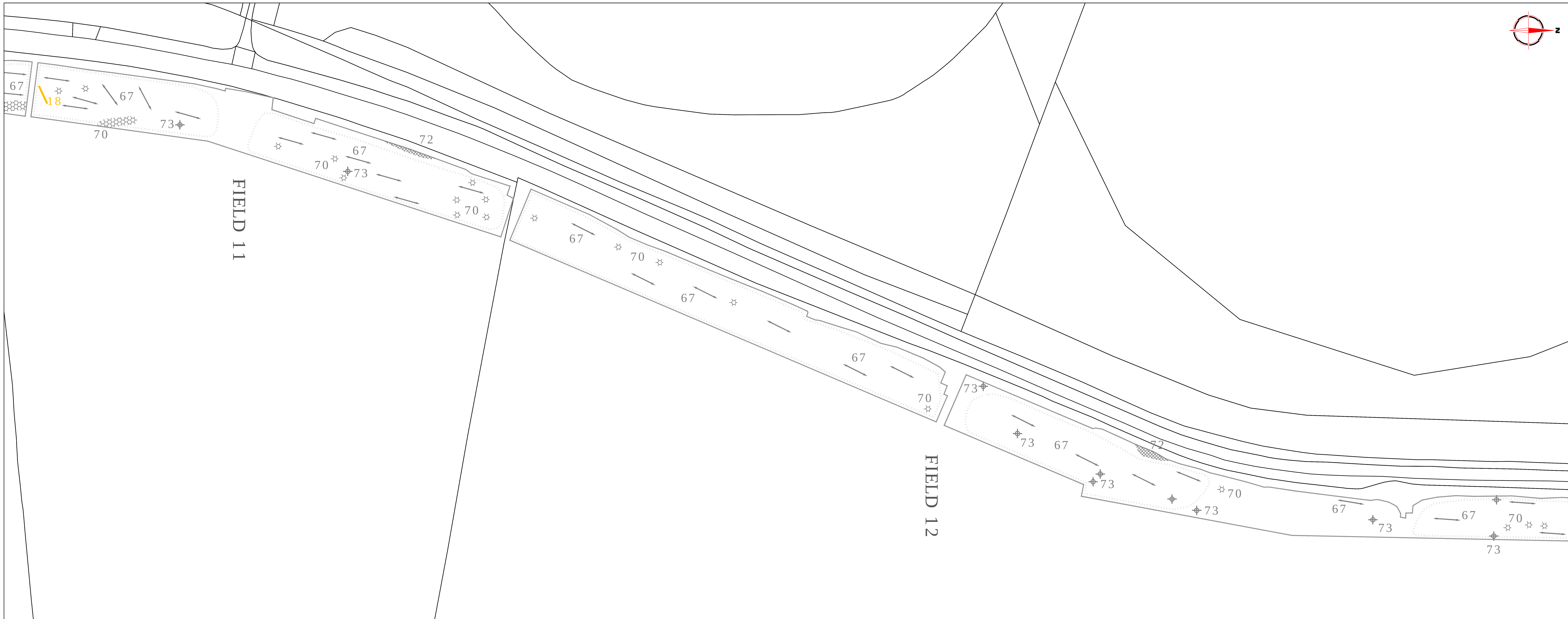
EUROPEAN GPR ASSOCIATION

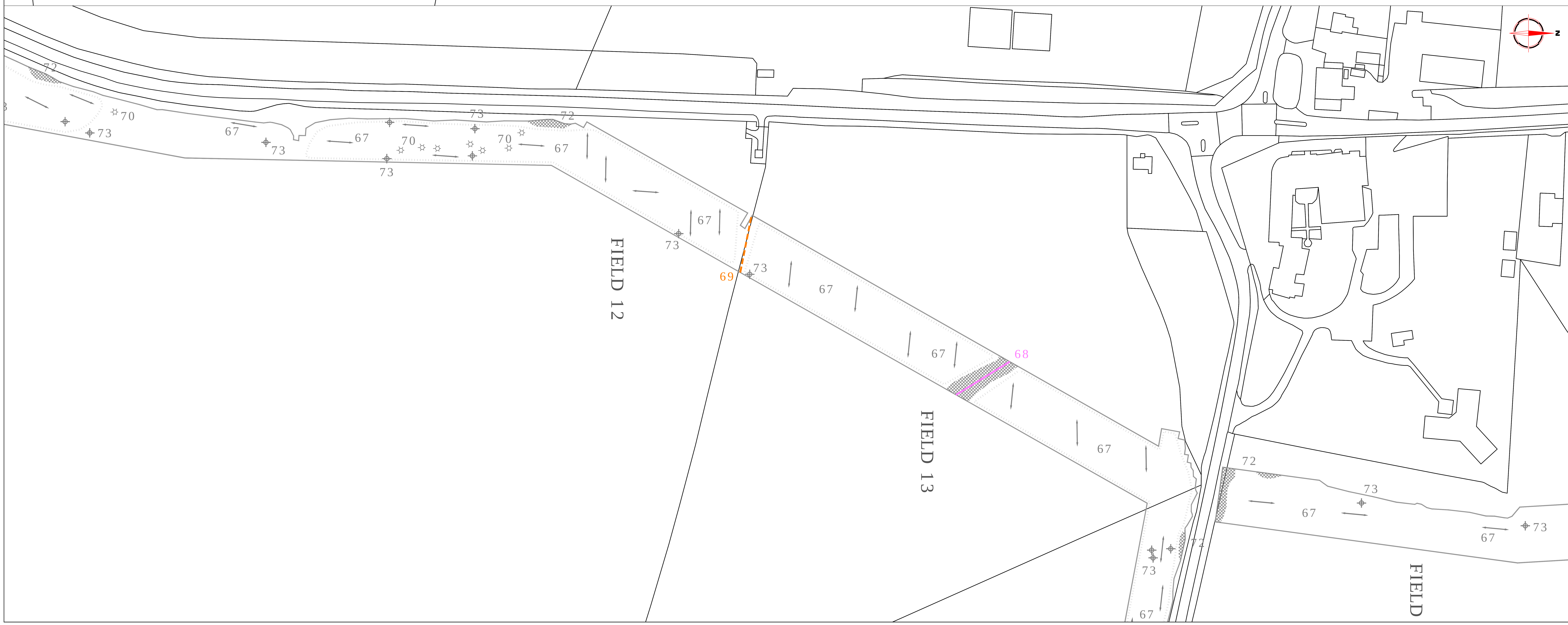
SUMO GROUP MEMBER

ISO 9001 certified
ISO 14001 certified

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

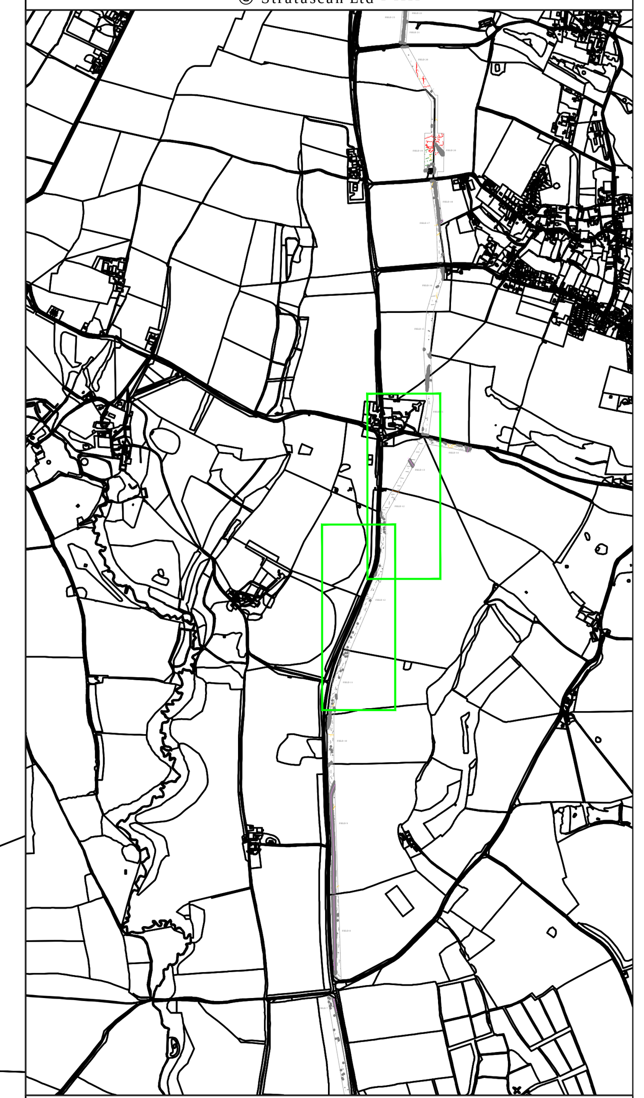
Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	16





Amendments

Issue No.	Date	Description
-	-	-
-	-	-



PROBABLE ARCHAEOLOGY

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- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
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- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 7-8

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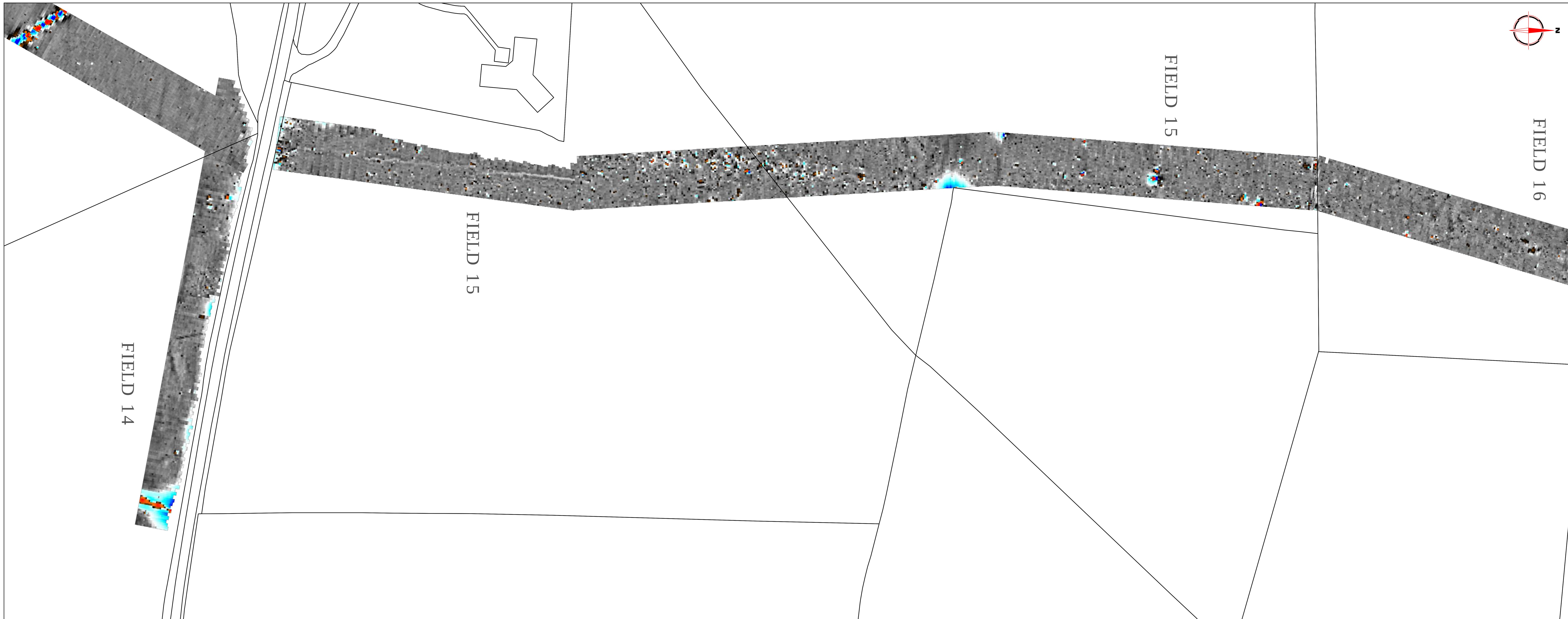
SUMO GROUP MEMBER

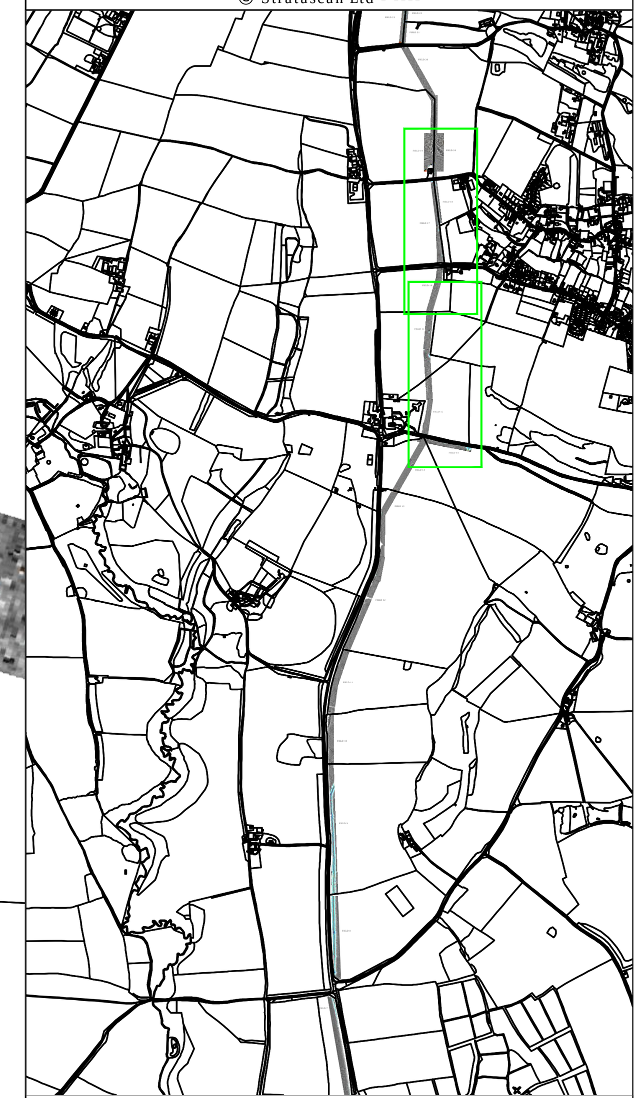
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	17



Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 9-10

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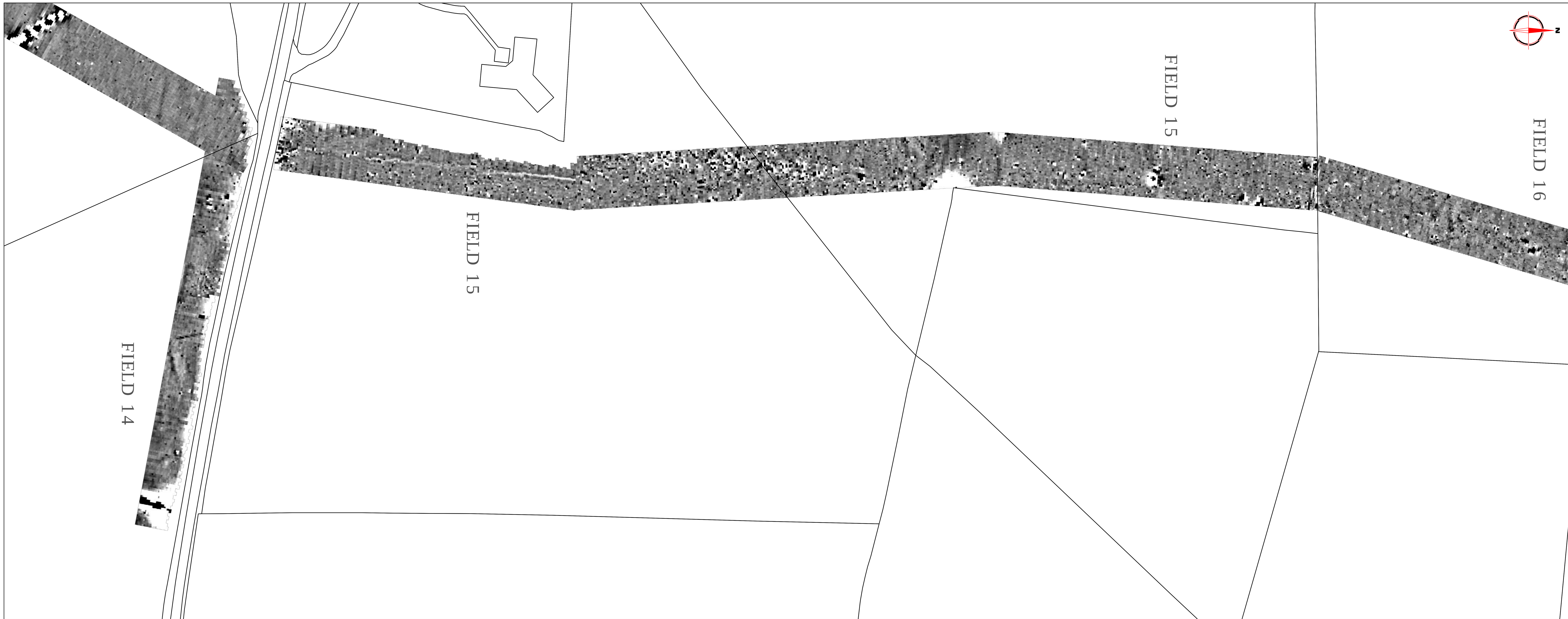
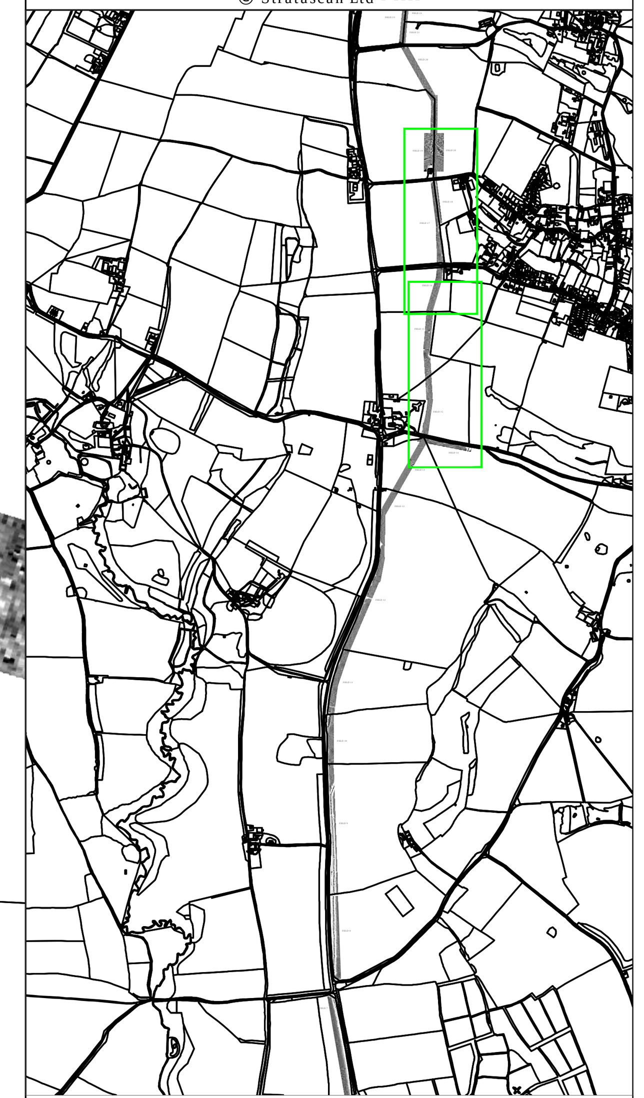
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	18

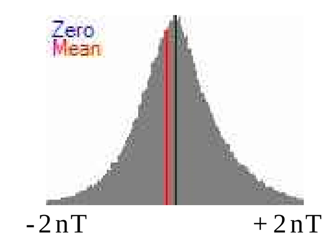


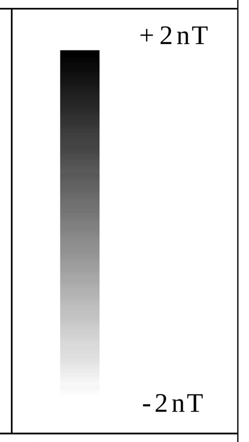
Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)





Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 9-10

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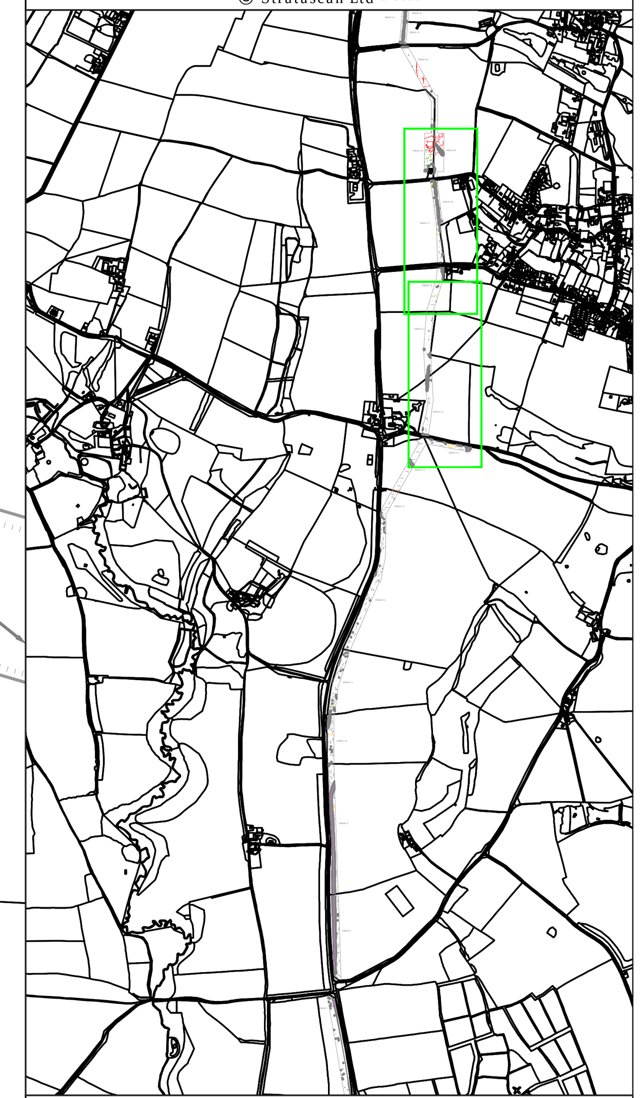
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	19

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
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POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
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- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 9-10

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SUMO GROUP MEMBER

Scale 1:1250 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	20

Amendments

Issue No.	Date	Description
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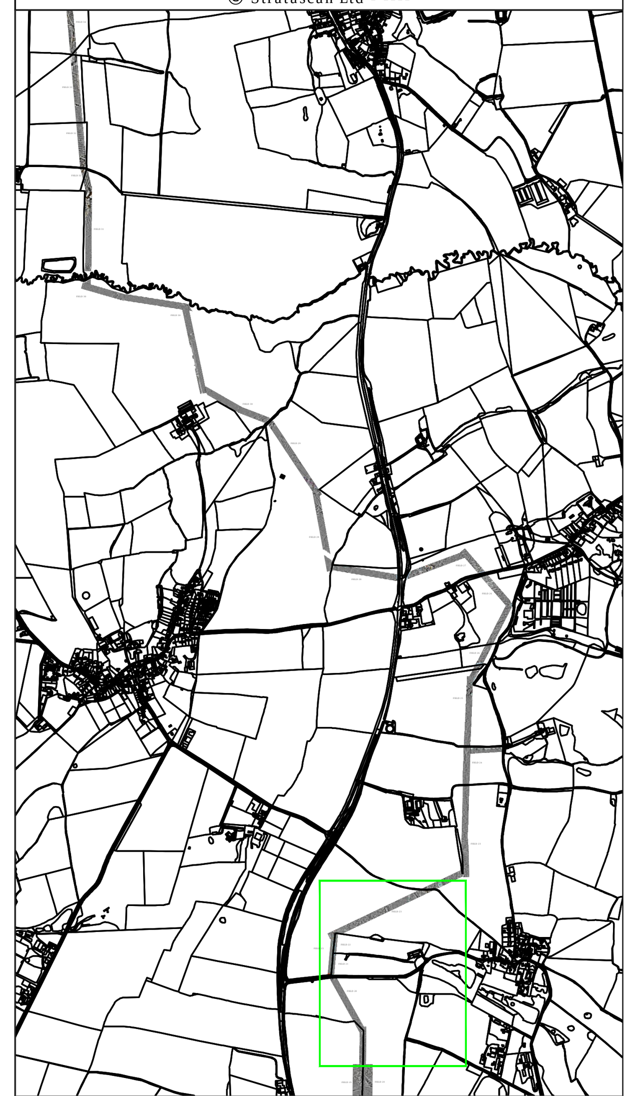
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 11

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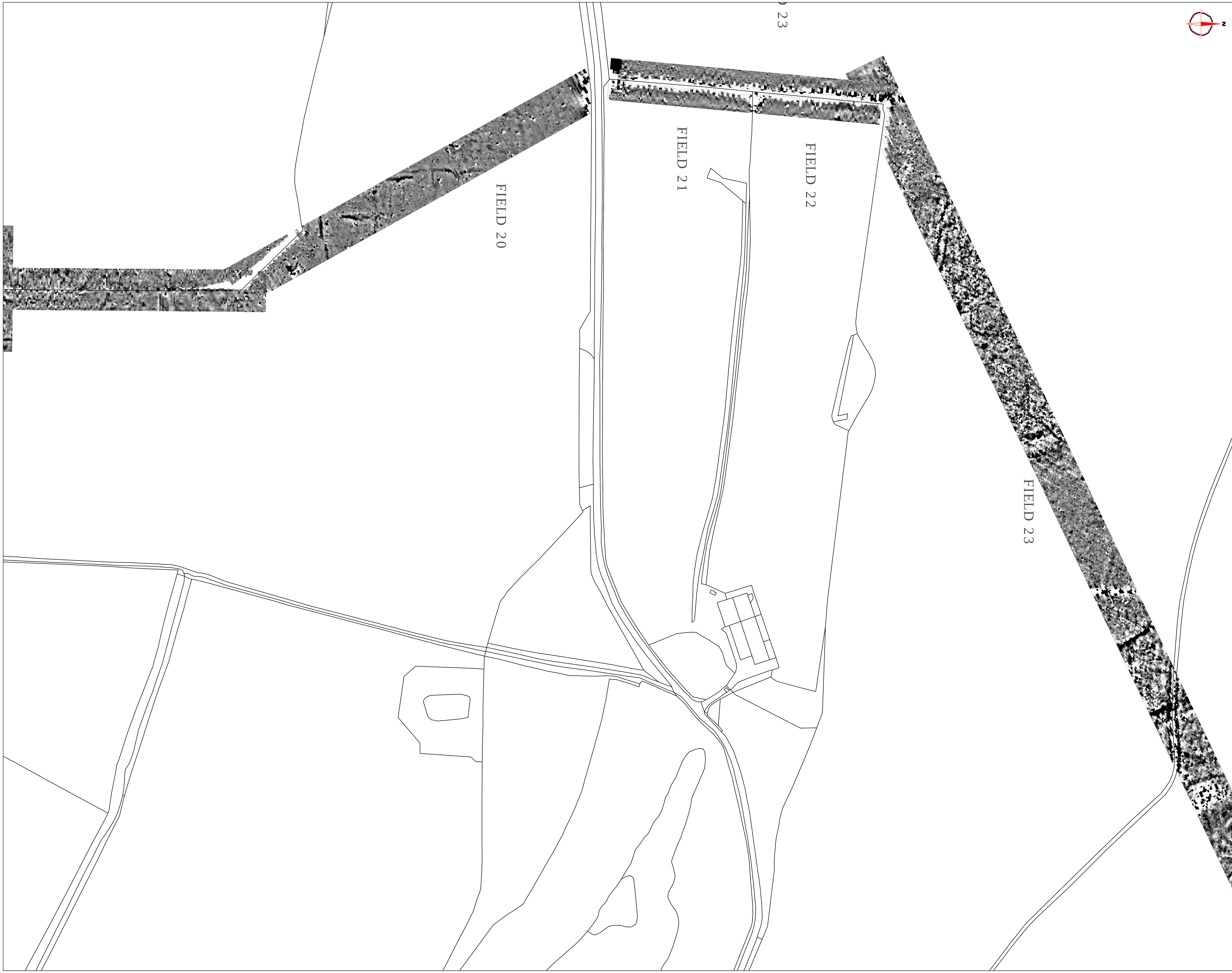
Scale
1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	21



Amendments		
Issue No.	Date	Description
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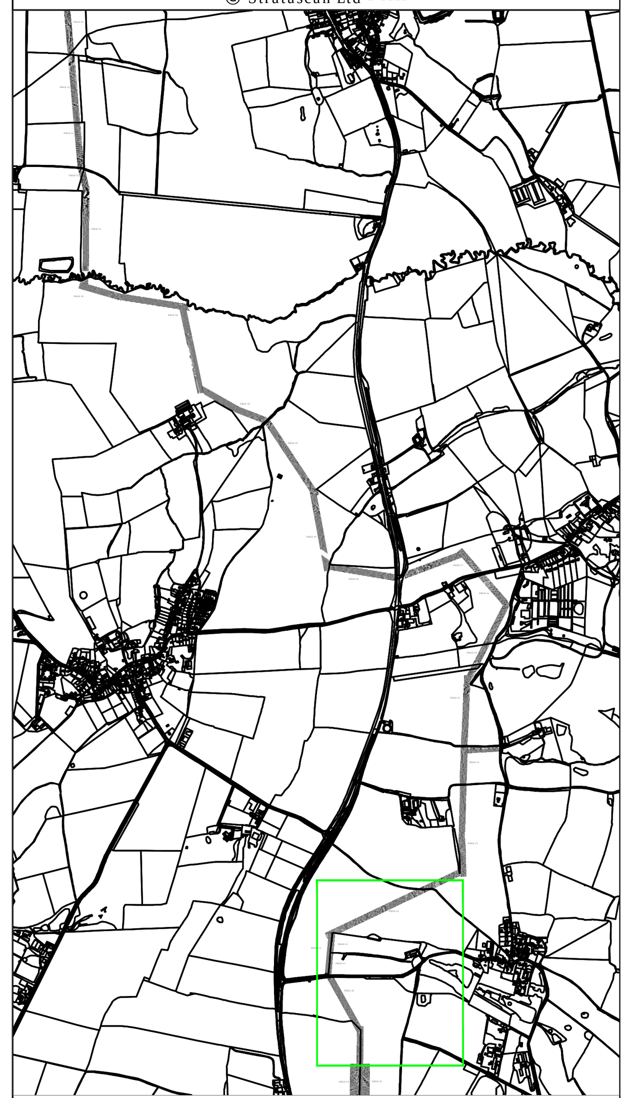
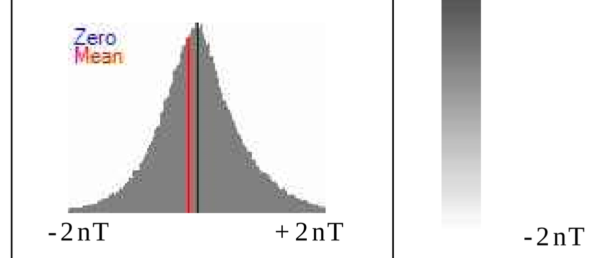
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



Job No. J8928

Survey Date SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 11

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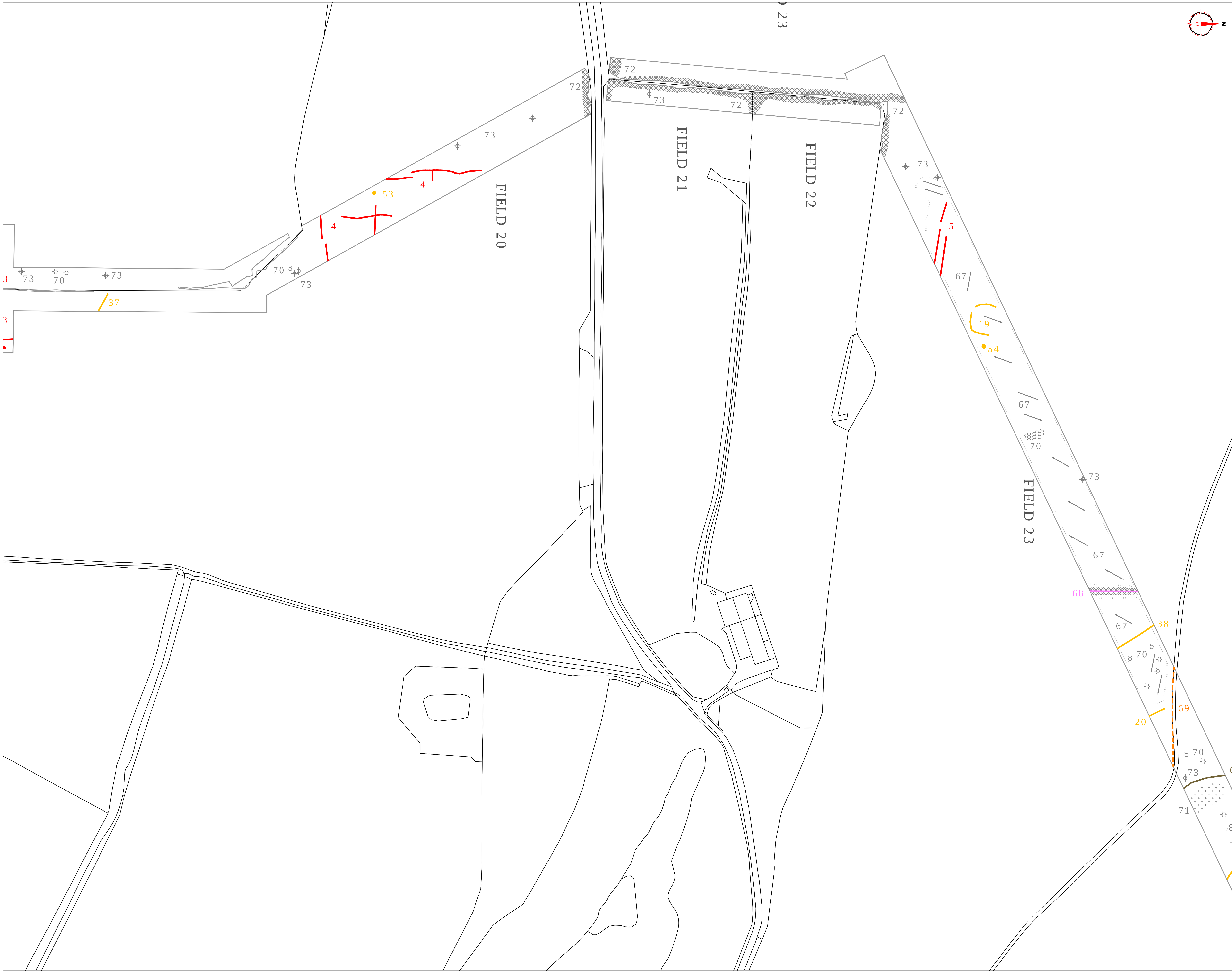
SUMO GROUP MEMBER

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	22



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
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POSSIBLE ARCHAEOLOGY

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Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 11

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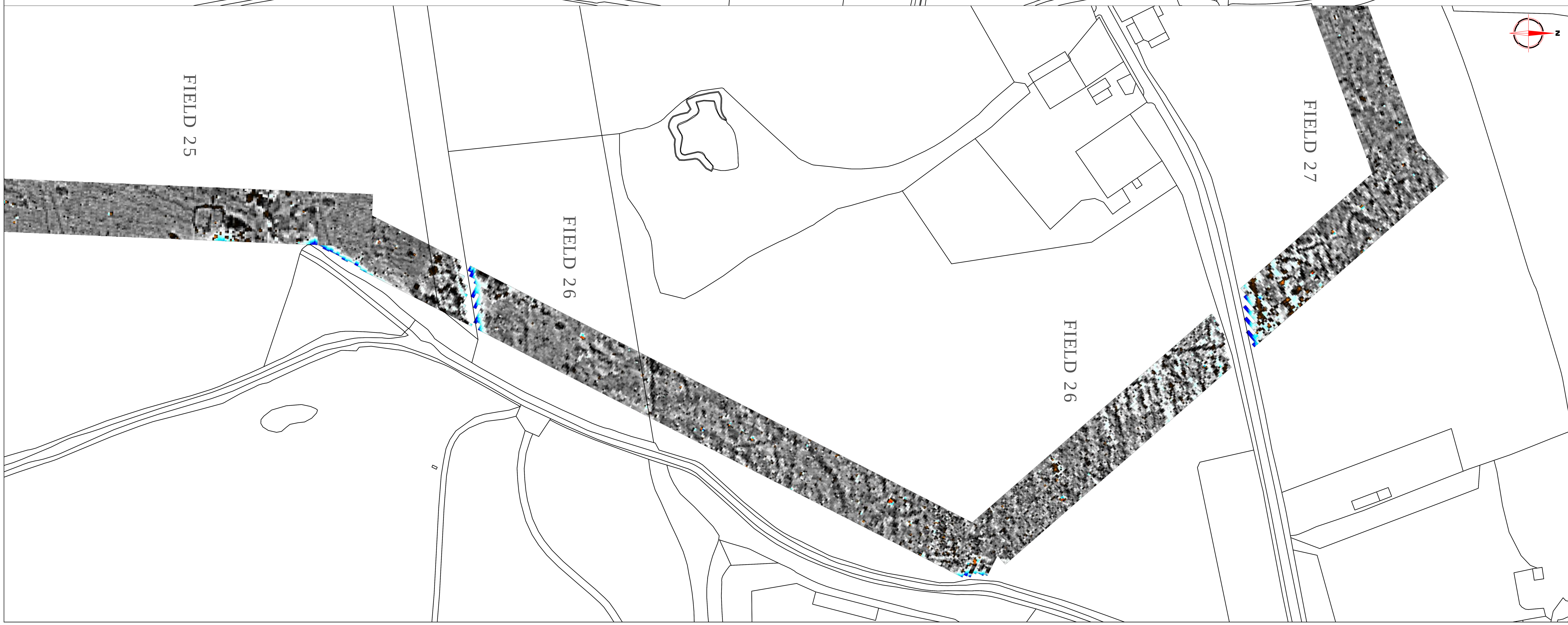
EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

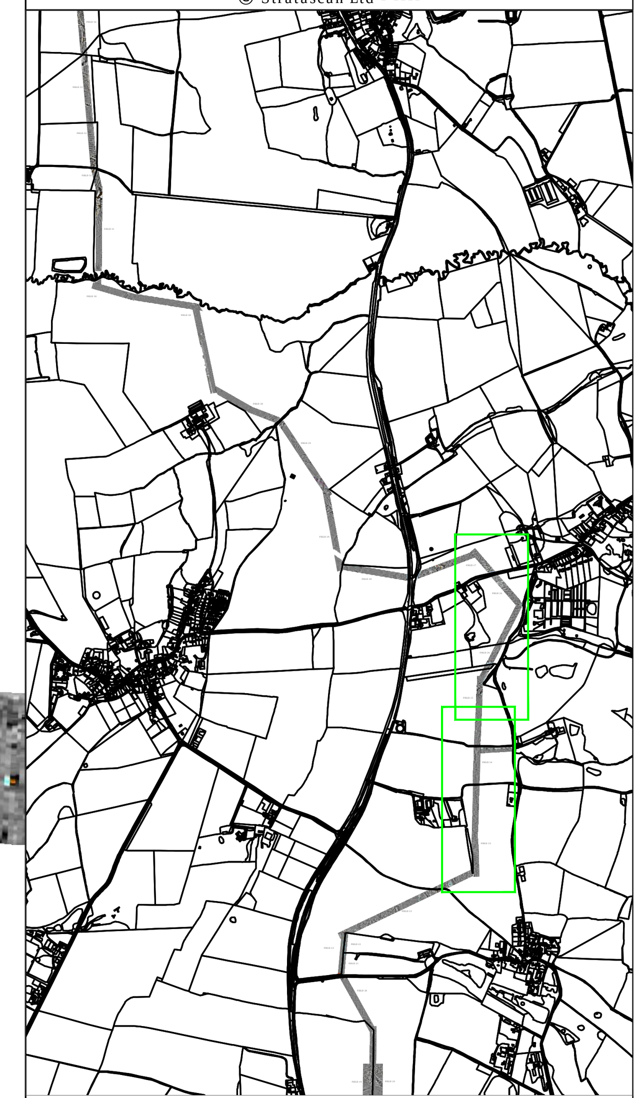
Plot	Checked by	Issue No.
A1	DGE	01

Date	Drawn by	Figure No.
OCT 15	TR	23



Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 12-13

STRATASCAN™
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EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

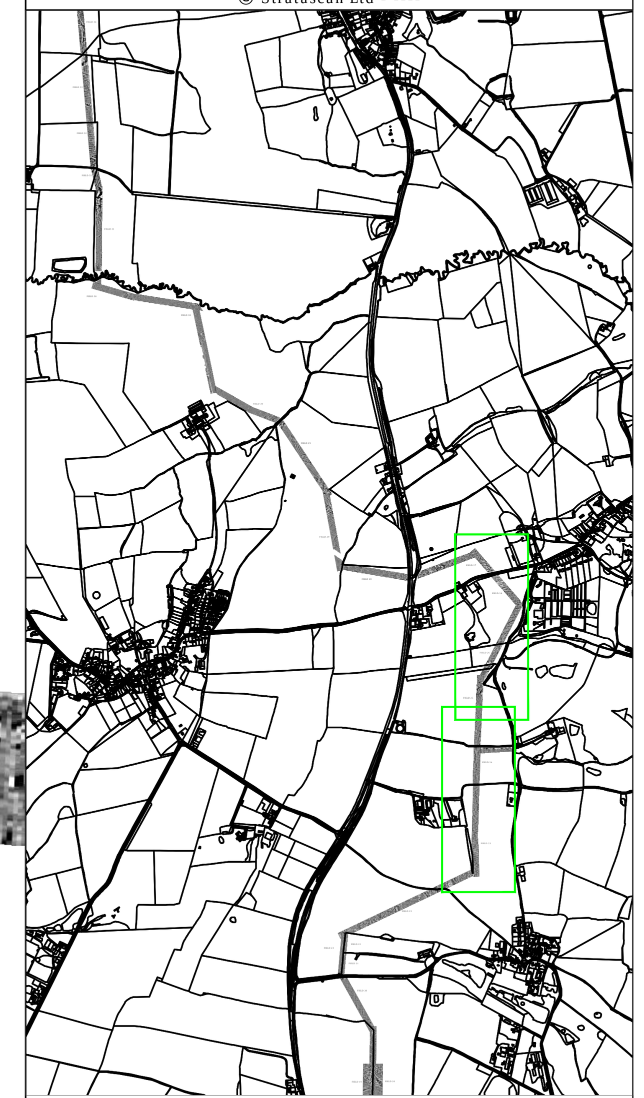
ISO 9001 certified ISO 14001 certified

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	24

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

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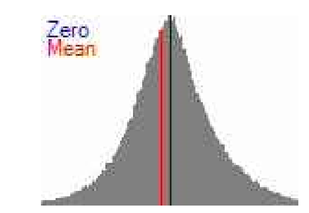
Minimum -2nT (white)



+2nT
-2nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 12-13

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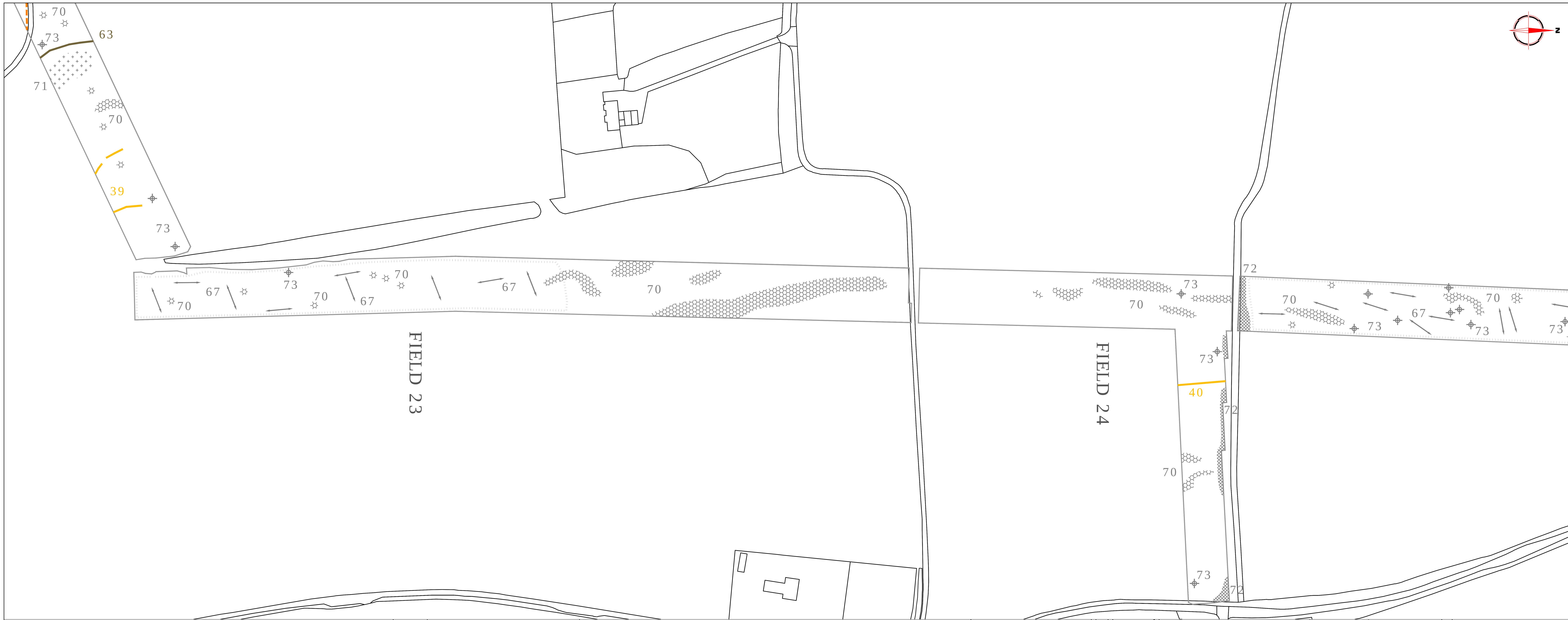
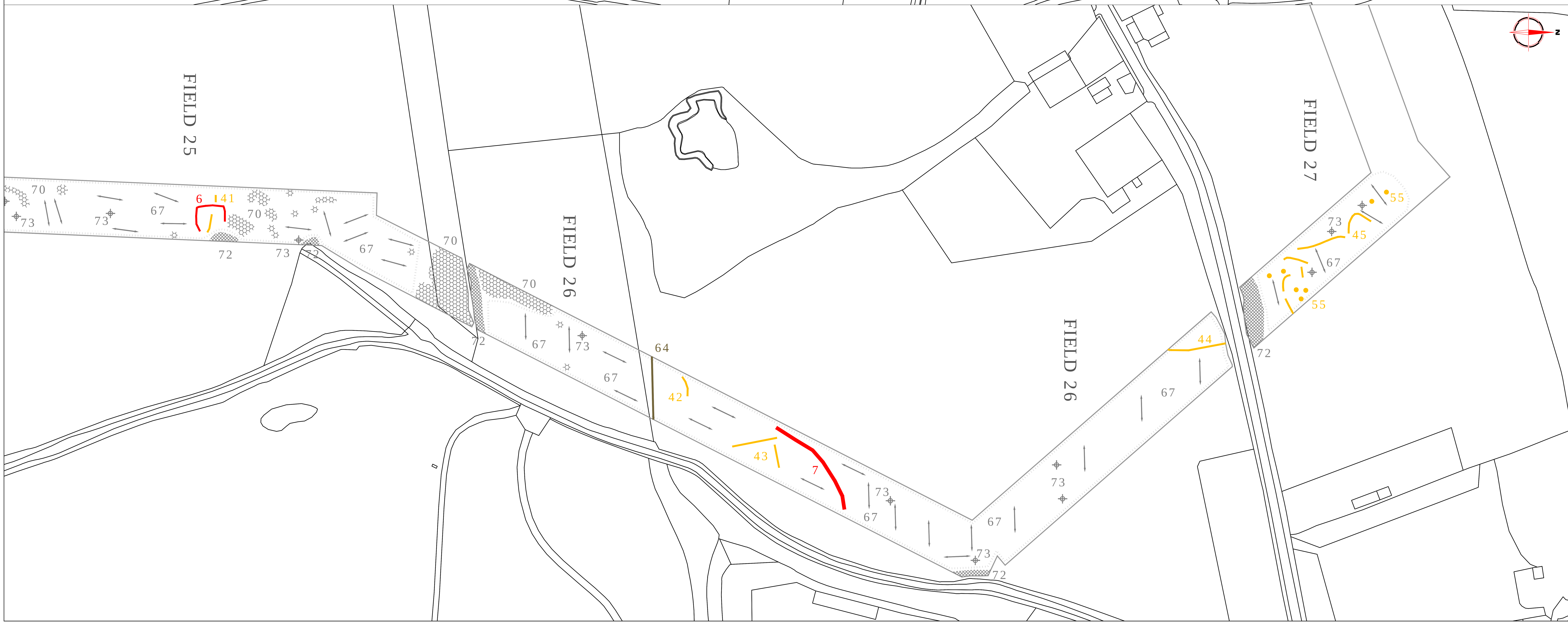
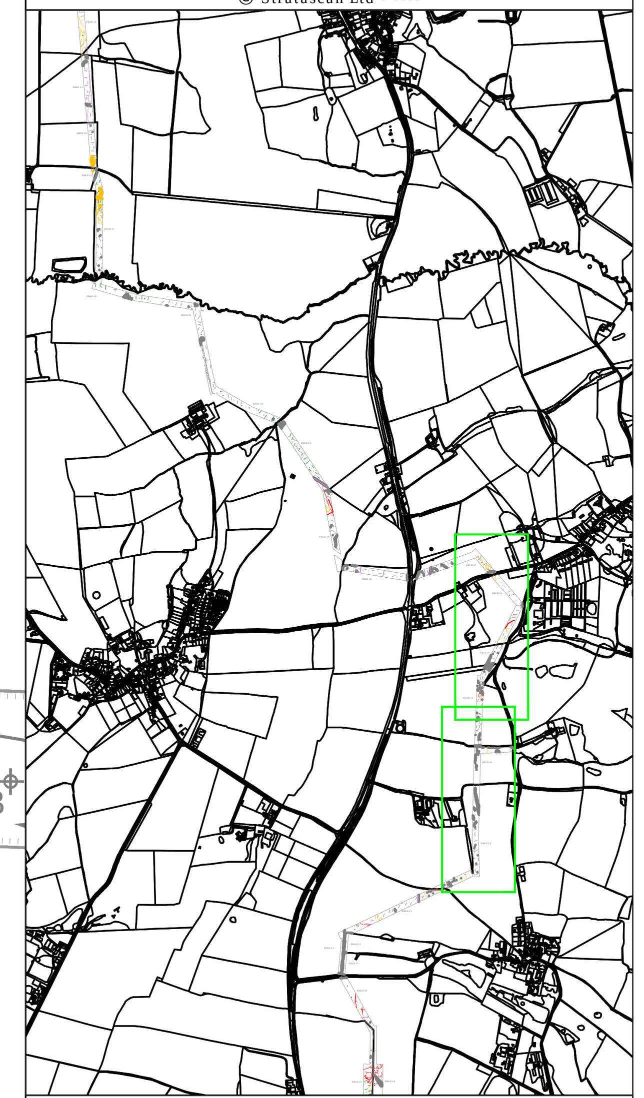
Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	25







Amendments

Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
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- Linear anomaly - possibly related to land drain
- Linear anomaly - modern trackway
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- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 12-13

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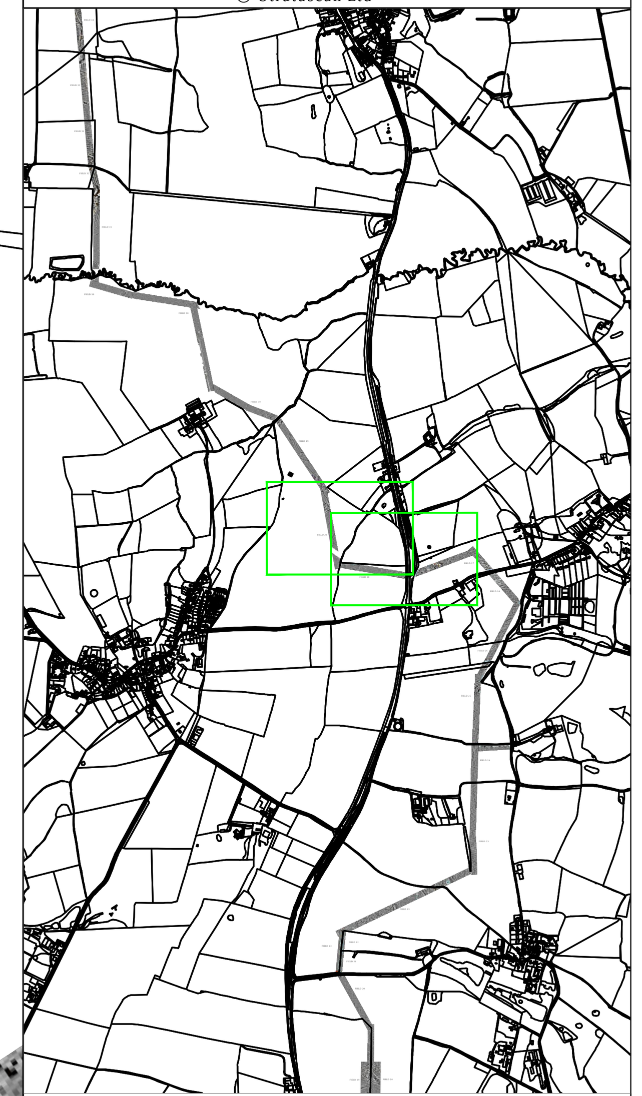
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

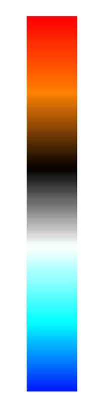
Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	26

Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)



Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 14-15

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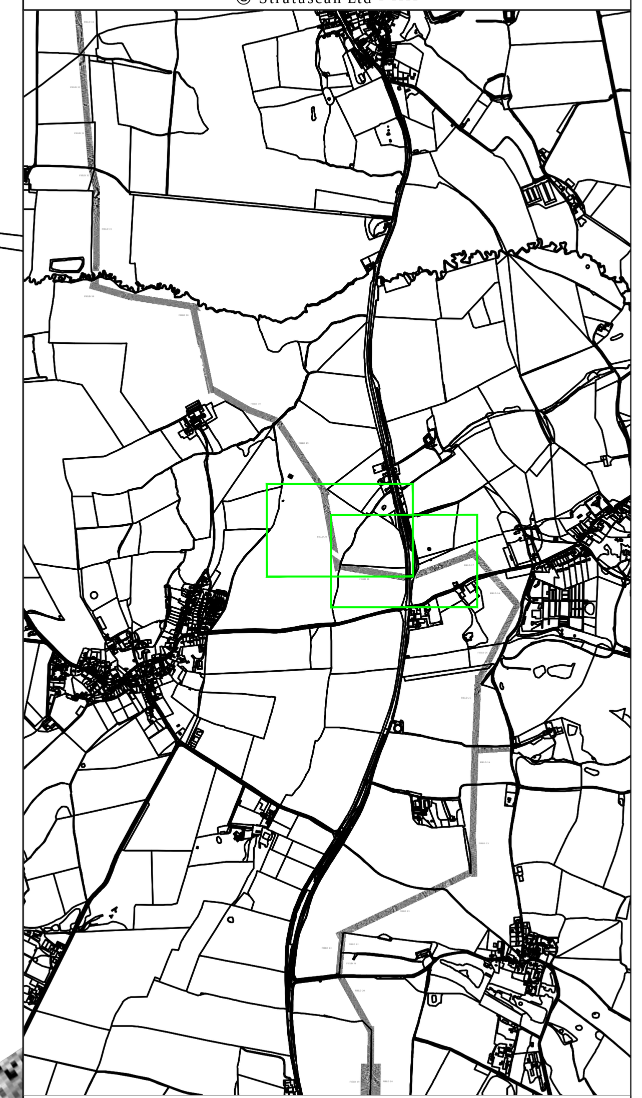
SUMO GROUP MEMBER

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	27

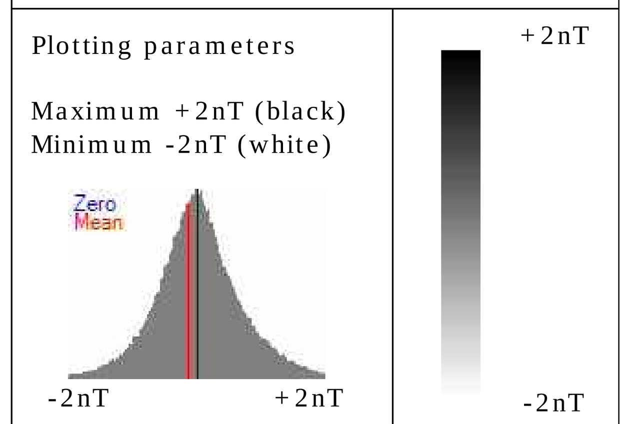
Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 14-15

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SUMO GROUP MEMBER

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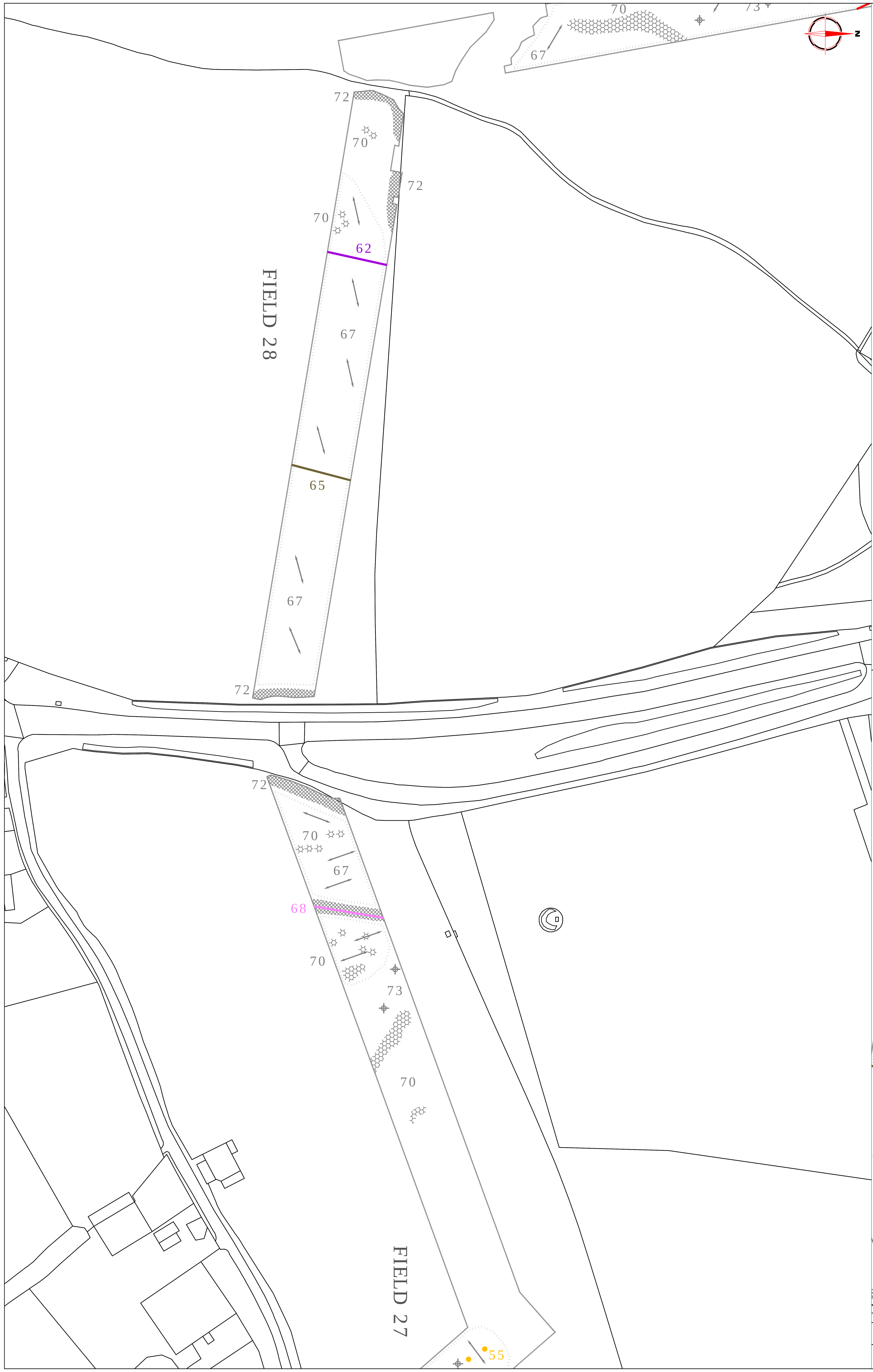
Scale
1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	28



Amendments		
Issue No.	Date	Description
-	-	-
-	-	-

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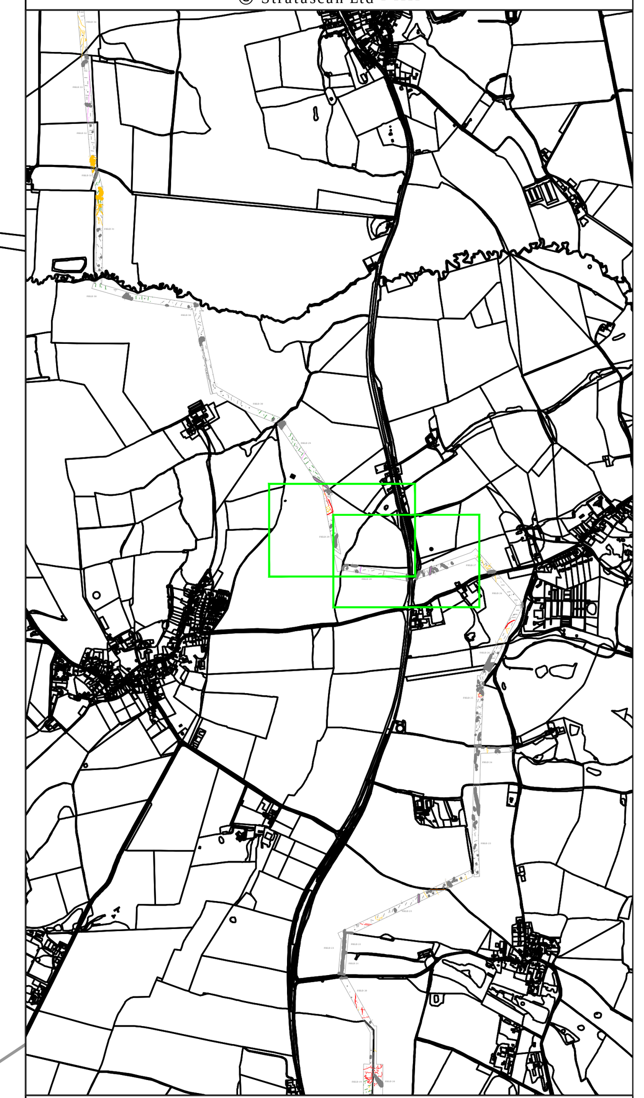

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
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MEDIEVAL/POST-MEDIEVAL AGRICULTURE

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- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No. J8928
Survey Date SEP-OCT 15

Client
SKANSKA

Project Title
ANGELINOS PIPELINE, OXFORDSHIRE

Subject
ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 14-15

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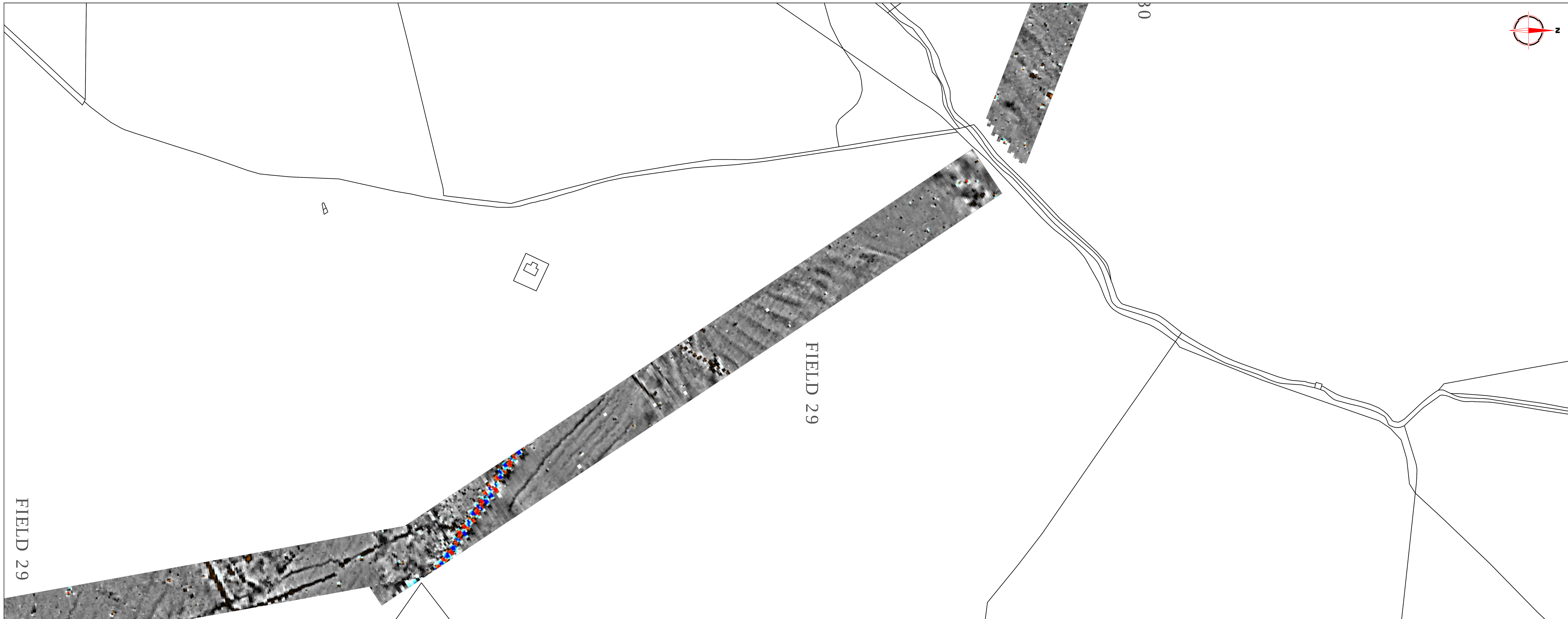
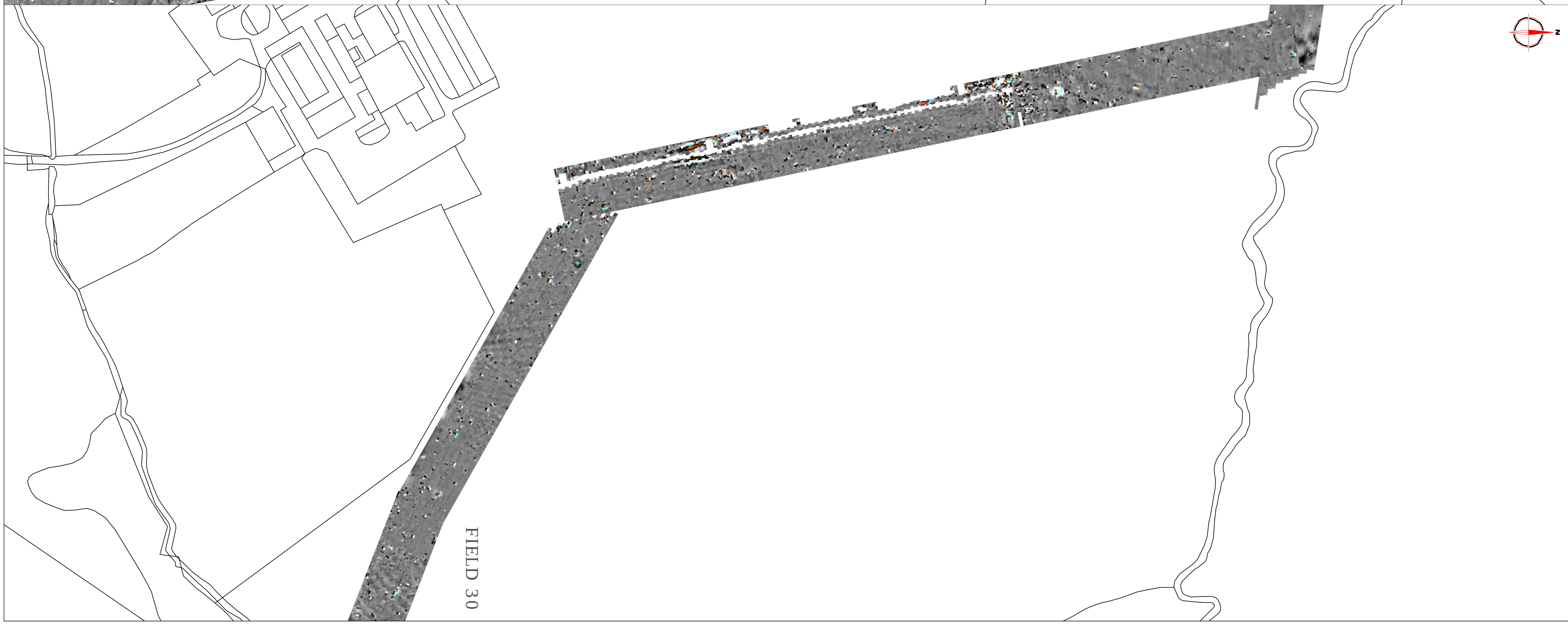
EUROPEAN GPR ASSOCIATION
SUMO GROUP MEMBER
ISO 9001 certified
ISO 14001 certified

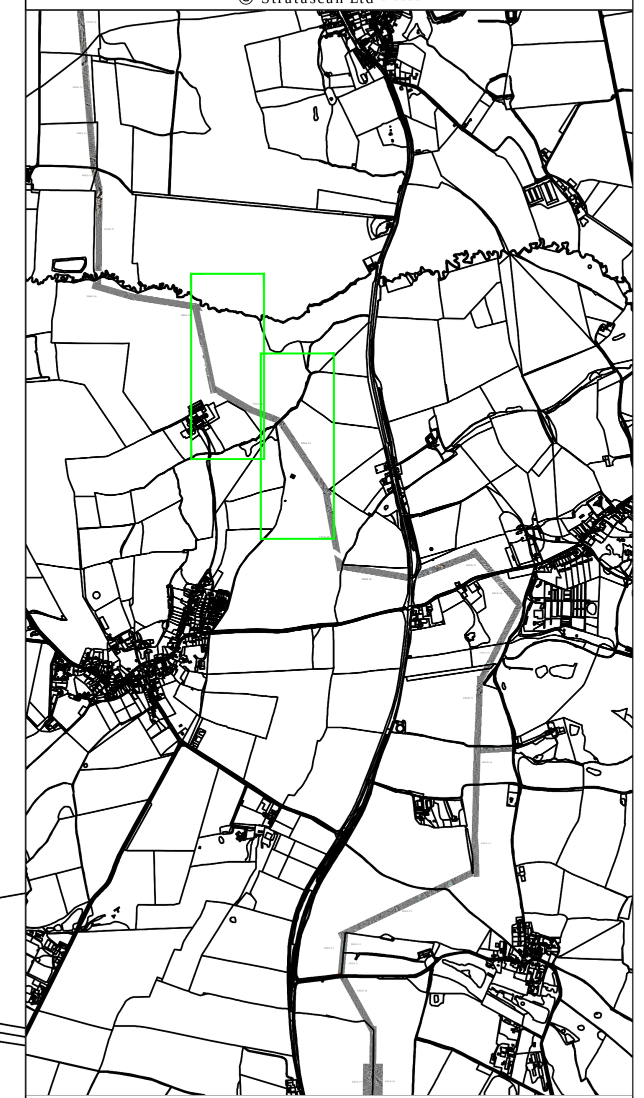
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	29





Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 16-17

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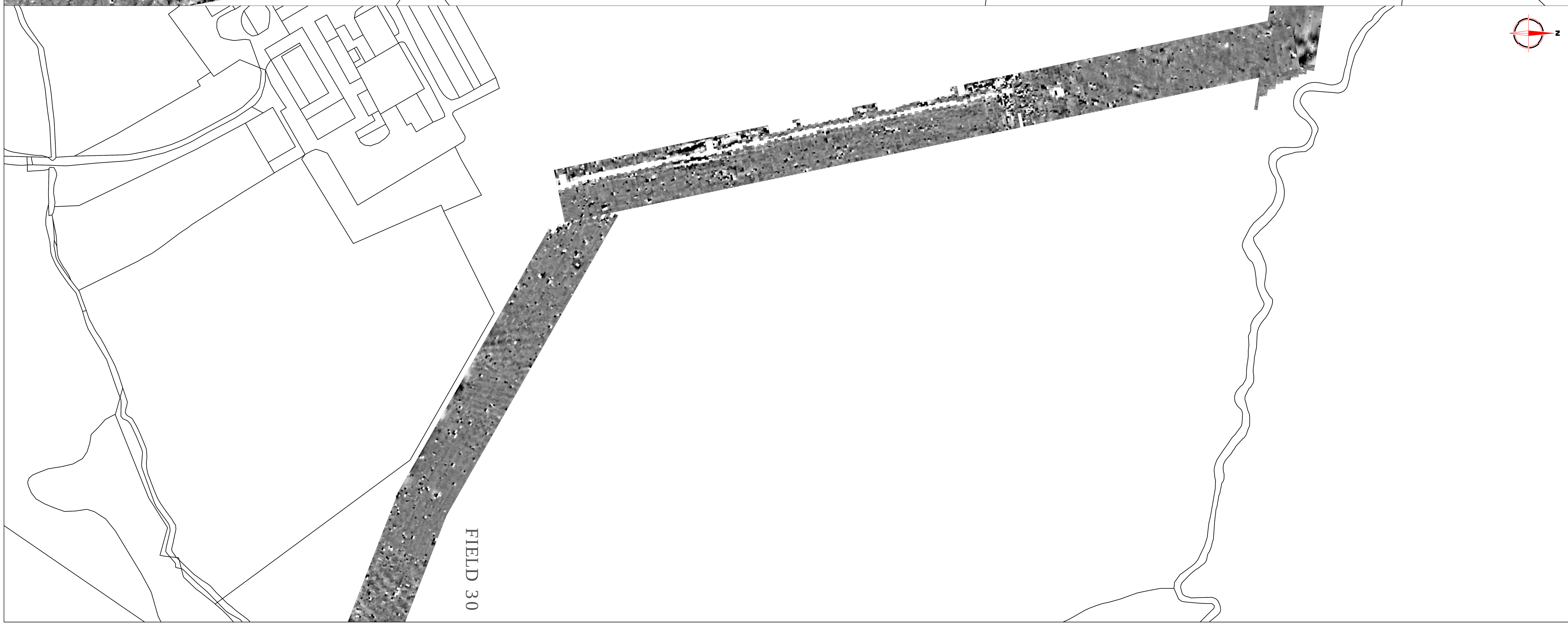
SUMO GROUP MEMBER

Scale 1:1250

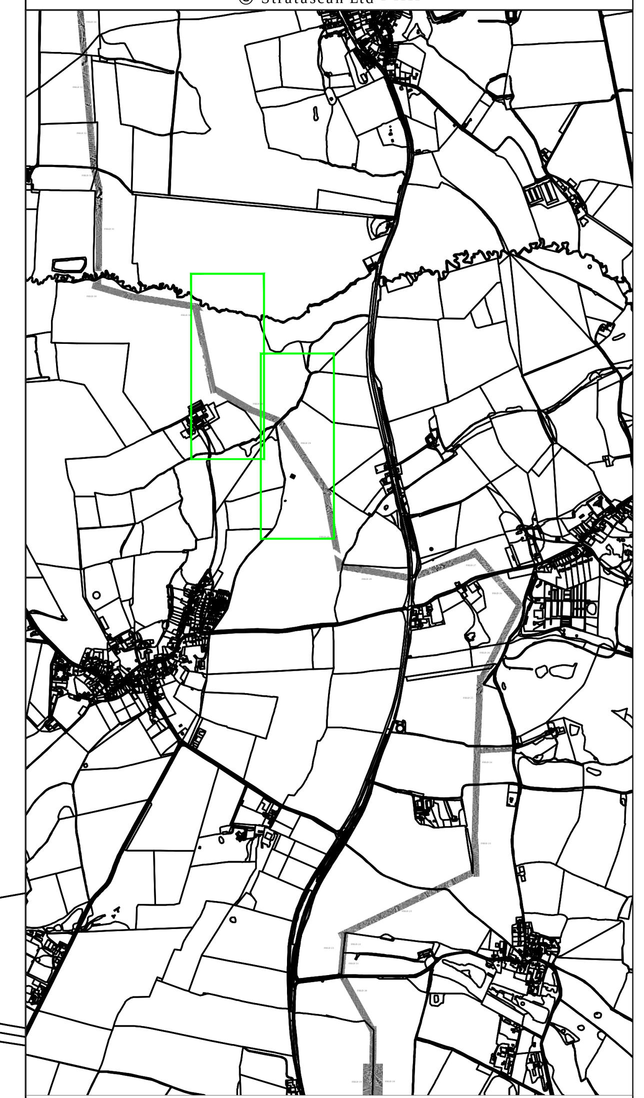
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	30



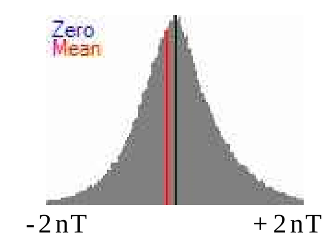
Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



+2nT
-2nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 16-17

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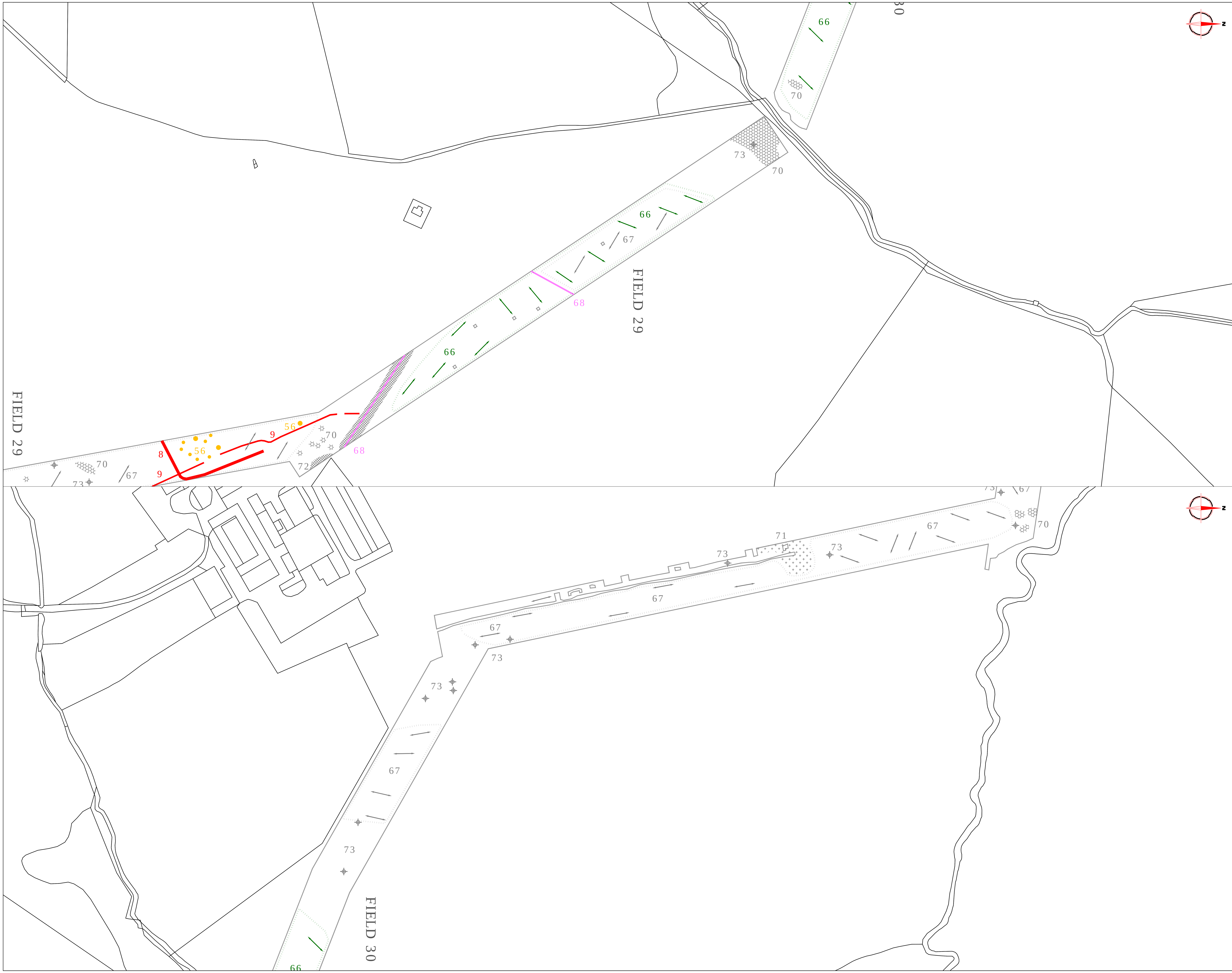
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

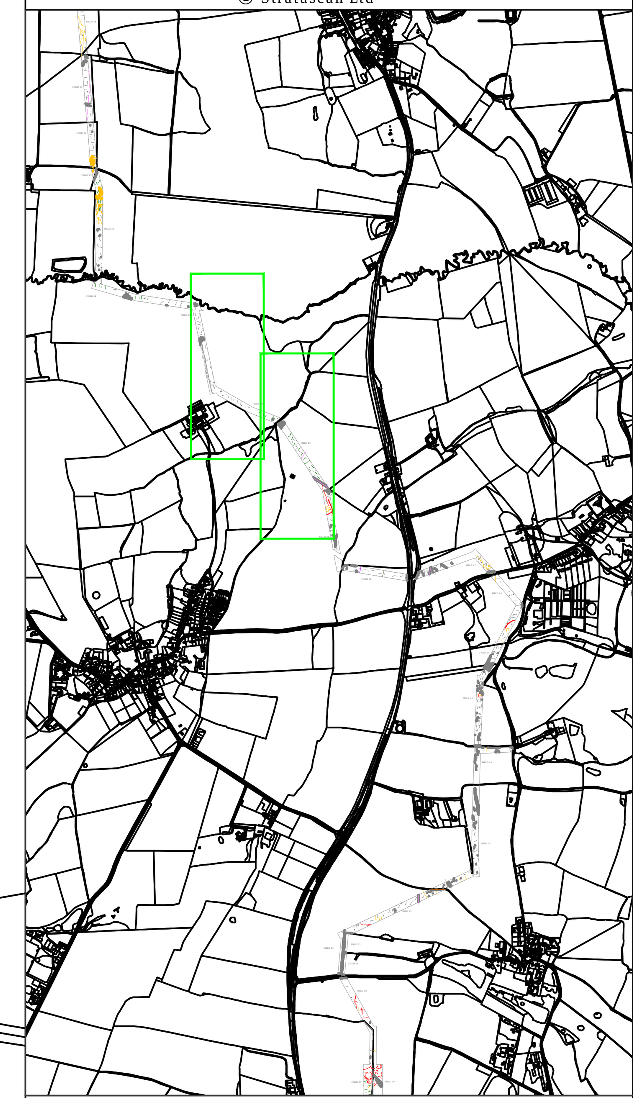
Plot	Checked by	Issue No.
A1	DGE	01

Date	Drawn by	Figure No.
OCT 15	TR	31



Amendments

Issue No.	Date	Description
-	-	-
-	-	-



PROBABLE ARCHAEOLOGY

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POSSIBLE ARCHAEOLOGY

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- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 16-17

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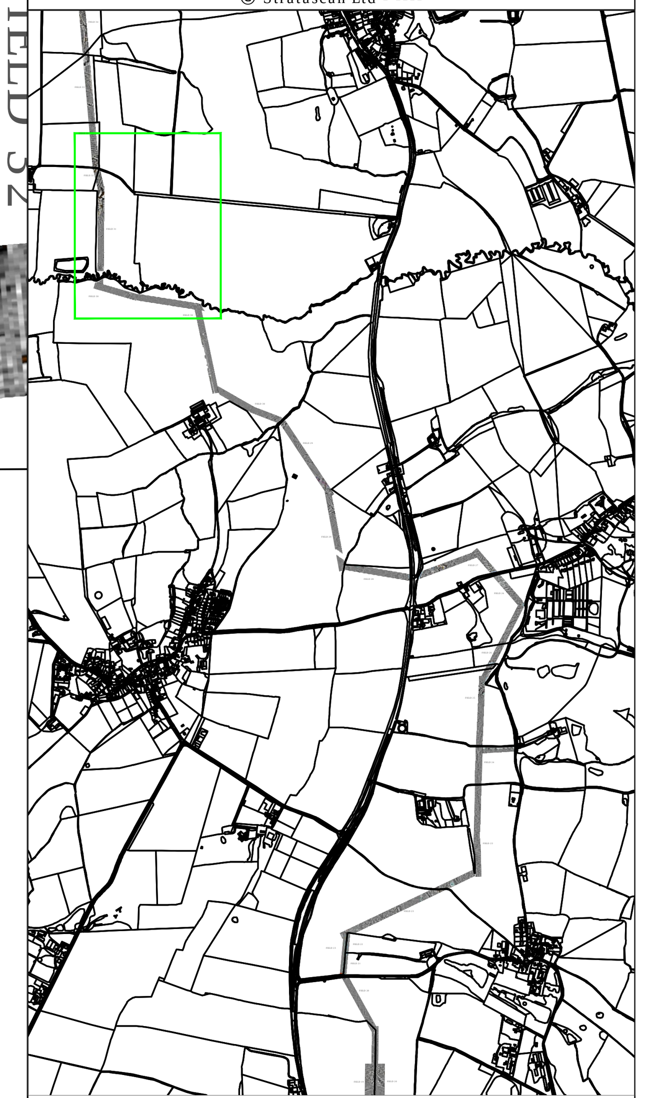
EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	32

Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No. J8928

Survey Date SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORT 18

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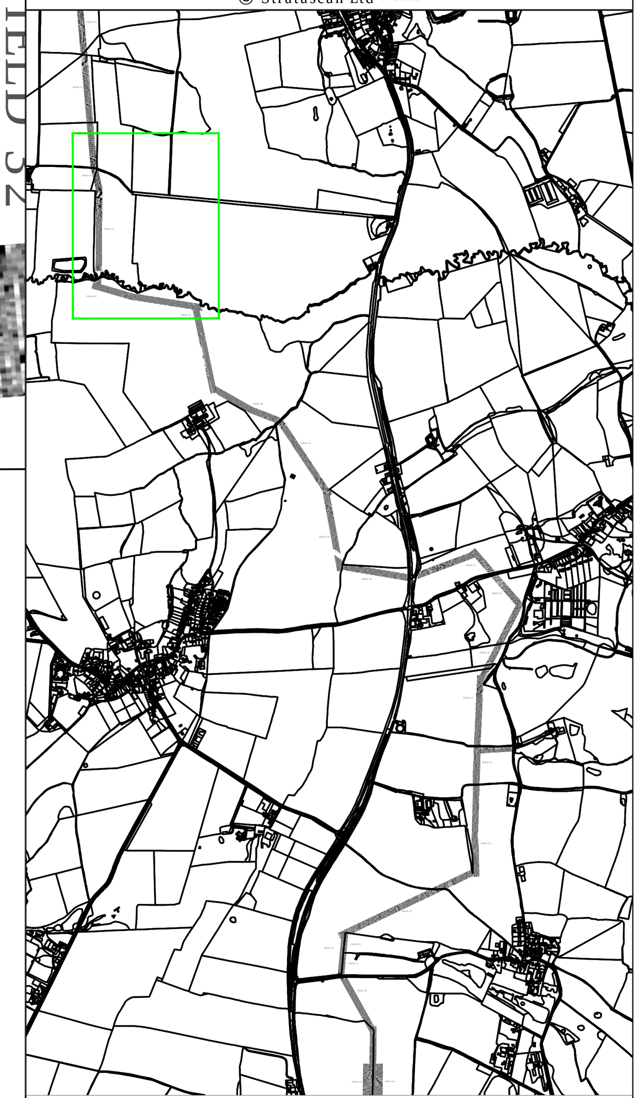
Scale 1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	33

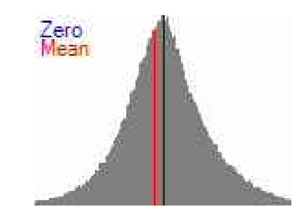
Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



+2nT
-2nT

Job No. J8928
Survey Date SEP-OCT 15

Client
SKANSKA

Project Title
ANGELINOS PIPELINE, OXFORDSHIRE

Subject
PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 18

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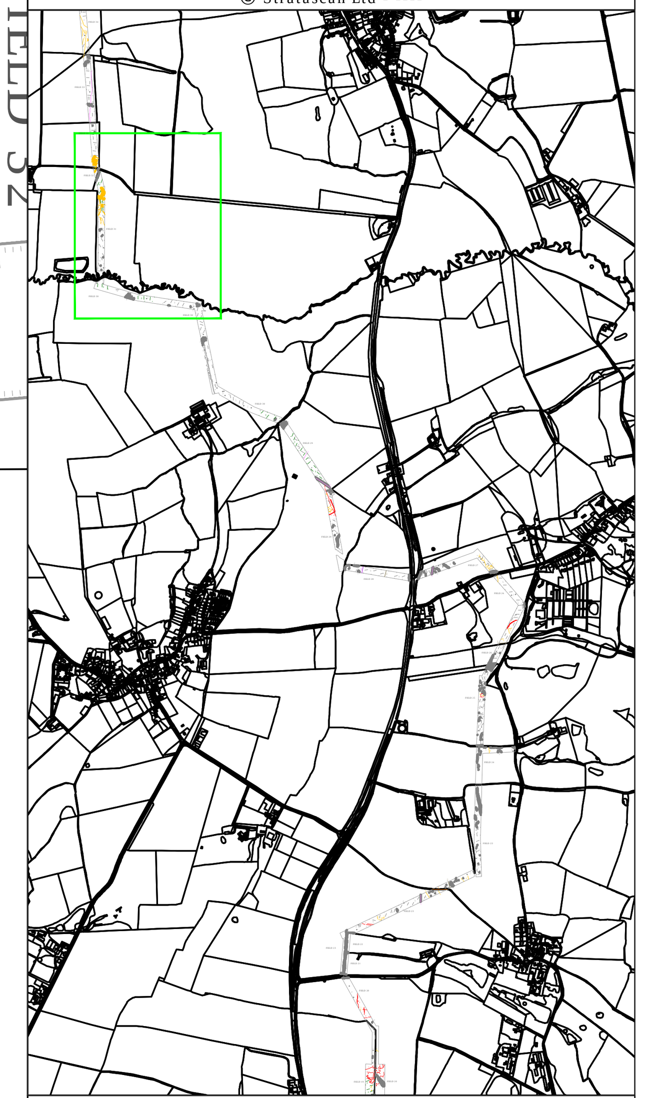
EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	34

Amendments		
Issue No.	Date	Description
-	-	-
-	-	-



PROBABLE ARCHAEOLOGY

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POSSIBLE ARCHAEOLOGY

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- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 18

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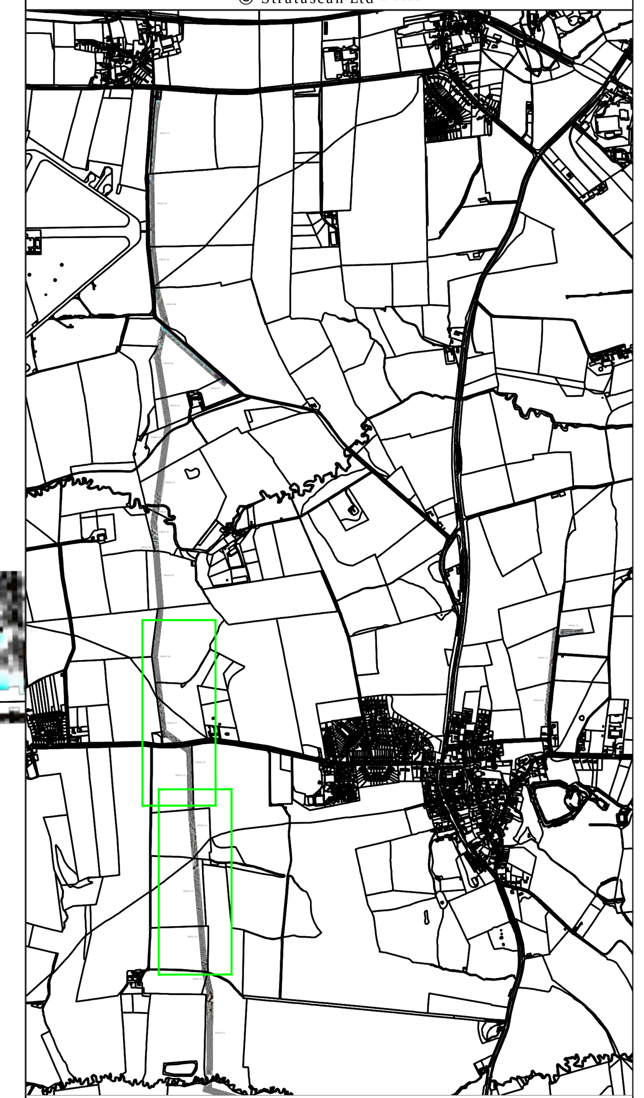
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	35

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No. J8928
Survey Date SEP-OCT 15

Client
SKANSKA

Project Title
ANGELINOS PIPELINE, OXFORDSHIRE

Subject
COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 19-20

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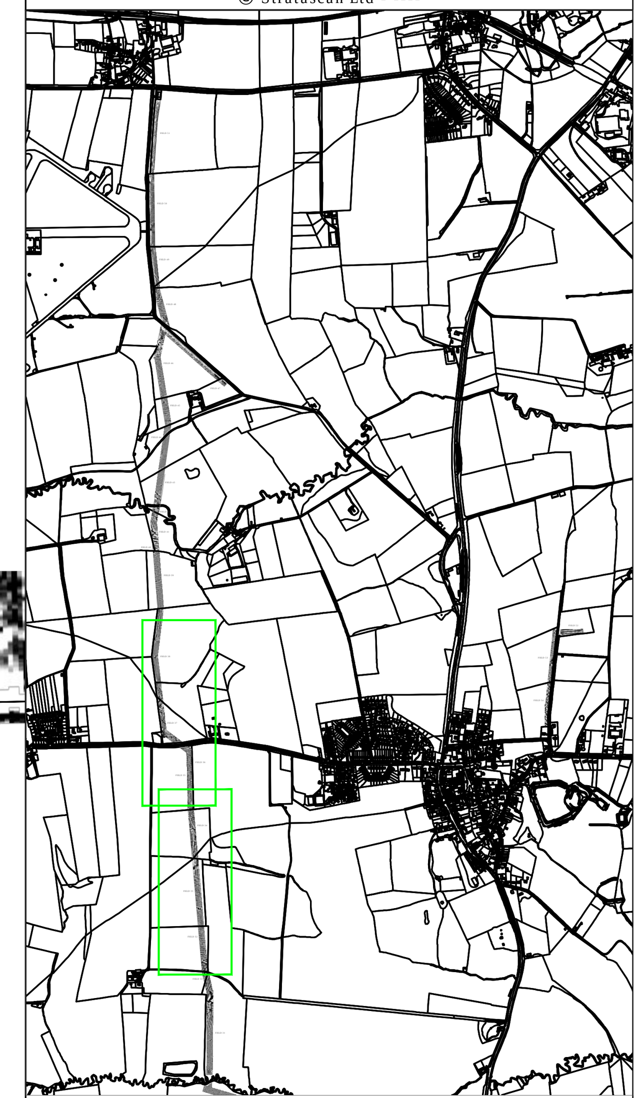
SUMO GROUP MEMBER

Scale 1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	36

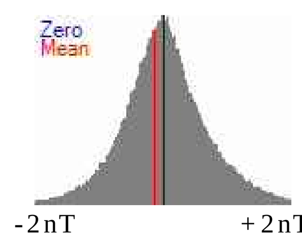
Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)



+2nT
-2nT

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 19-20

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EUROPEAN GPR ASSOCIATION

SUMO GROUP MEMBER

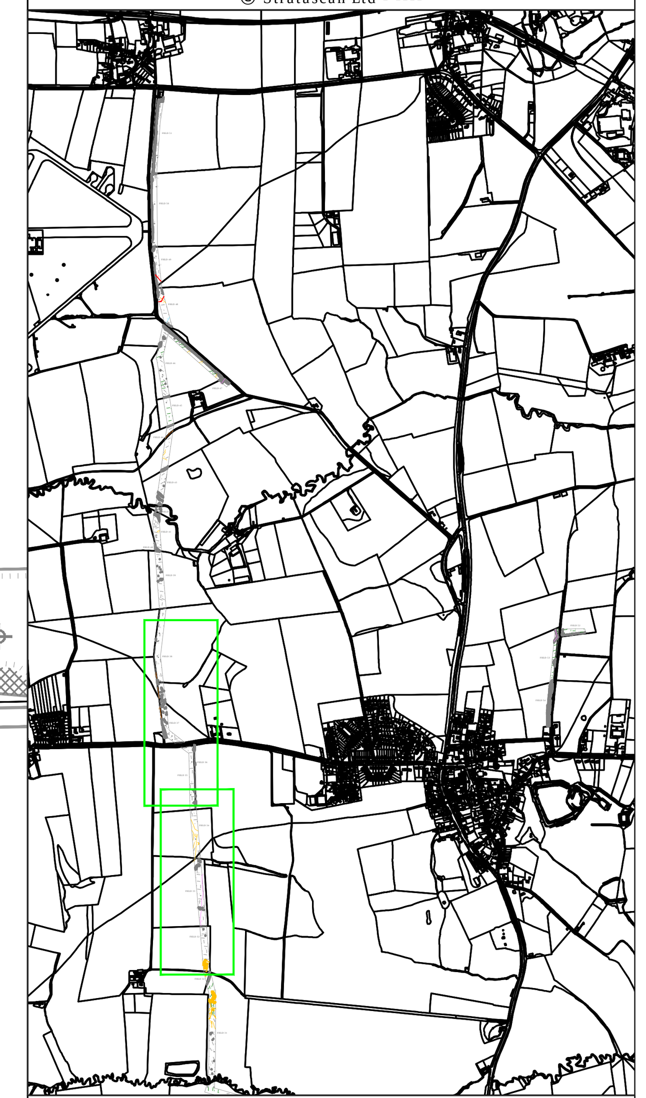
ISO 9001 certified
ISO 14001 certified

Scale
1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	37

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



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- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
- Linear anomaly - related to a former field boundary present on available mapping

OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - possibly related to land drain
- Linear anomaly - modern trackway
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 19-20

STRATASCAN™
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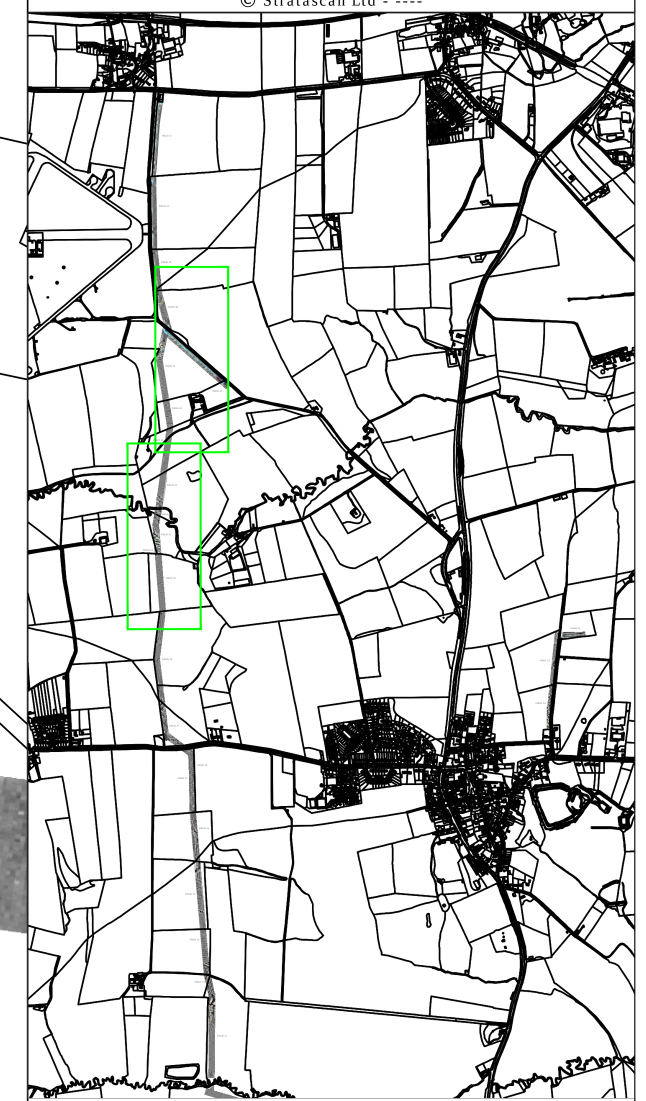
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	38

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.: J8928
Survey Date: SEP-OCT 15

Client: SKANSKA

Project Title: ANGELINOS PIPELINE, OXFORDSHIRE

Subject: COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 21-22

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EUROPEAN GPR ASSOCIATION
SUMO GROUP MEMBER
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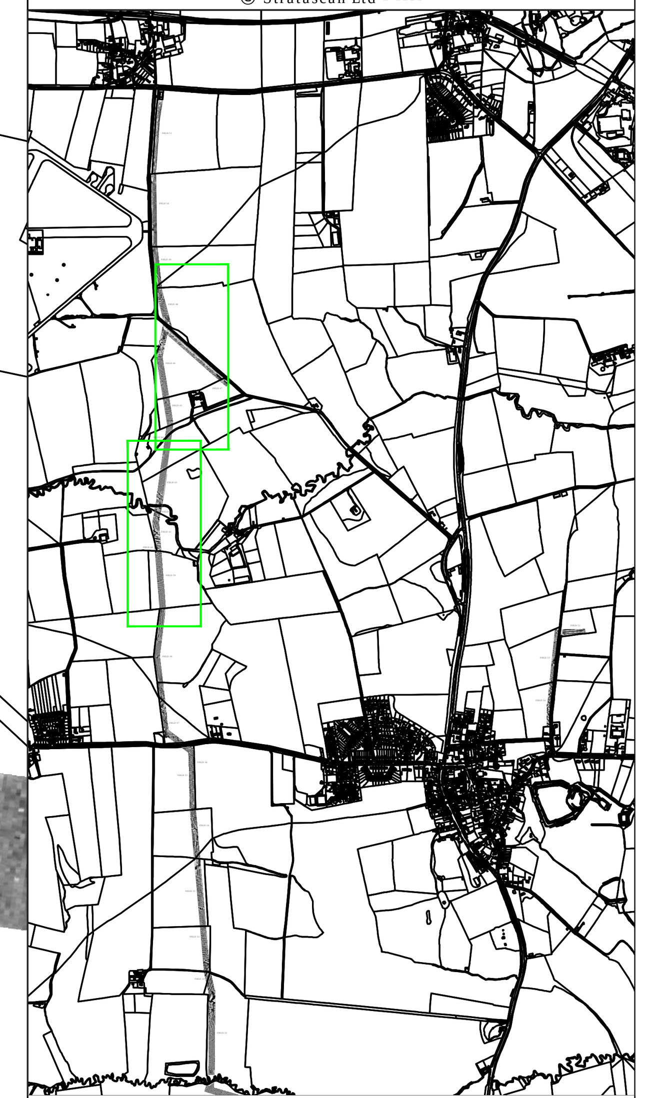
Scale 1:1250
0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01

Date	Drawn by	Figure No.
OCT 15	TR	39

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)

Zero Mean

-2nT +2nT

+2nT
-2nT

Job No. J8928

Survey Date SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 21-22

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Scale 1:1250

0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	40

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

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- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 21-22

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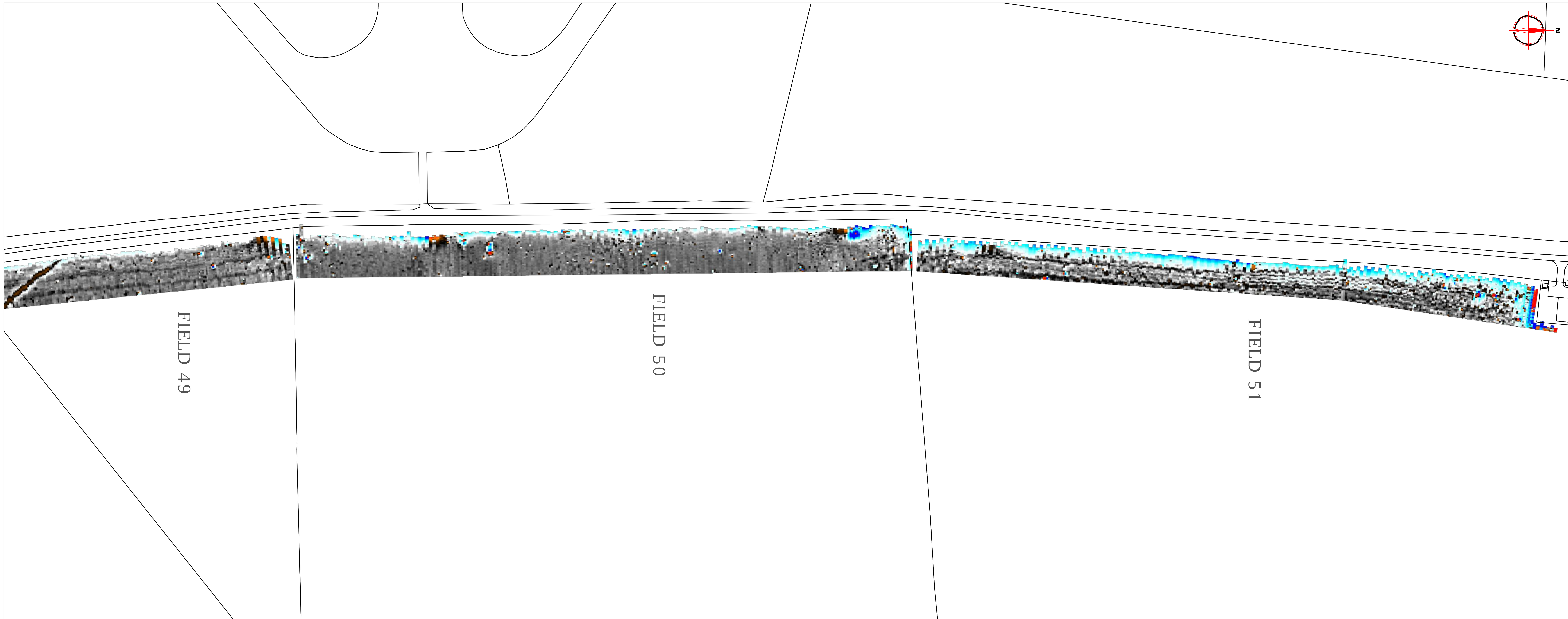
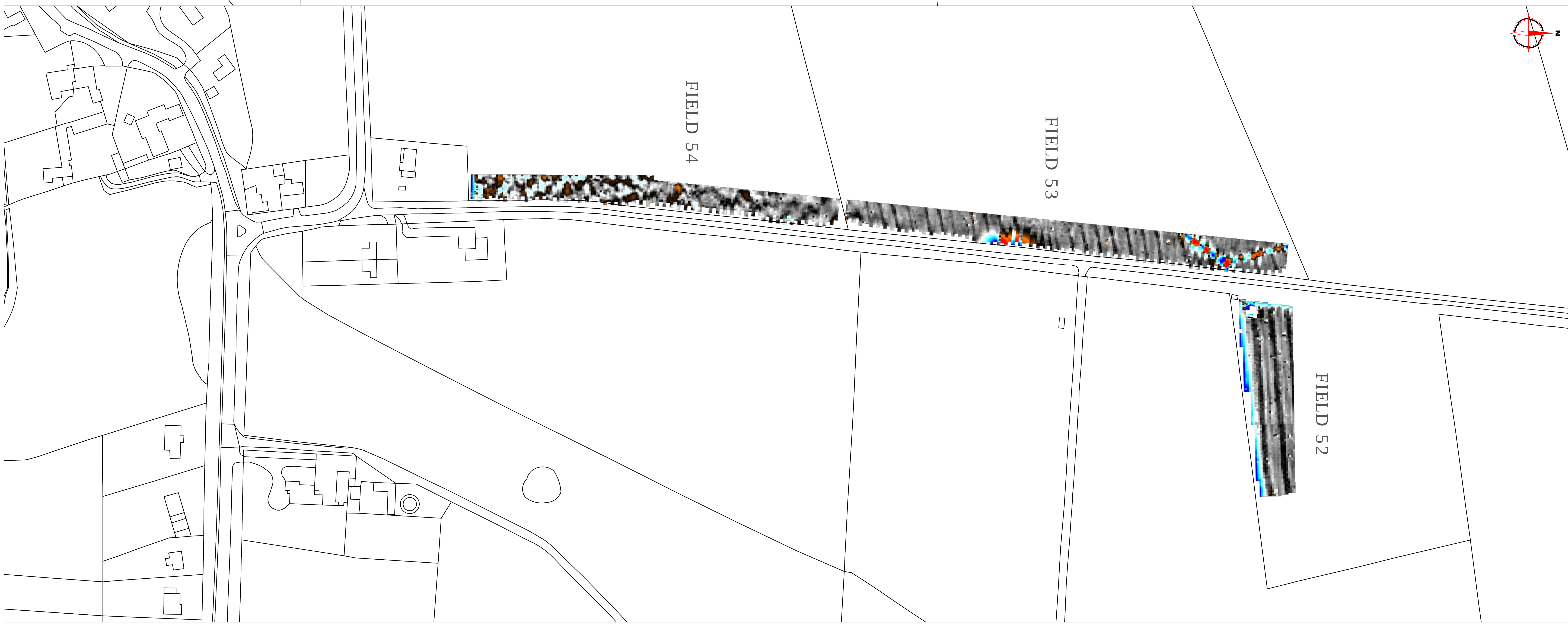
Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

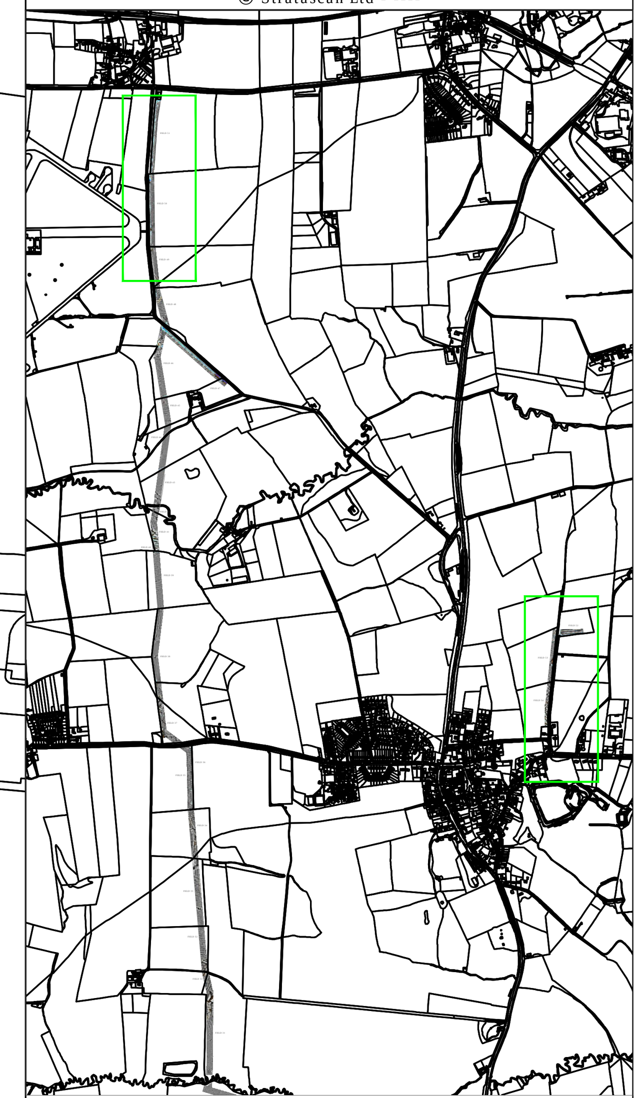
Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	41





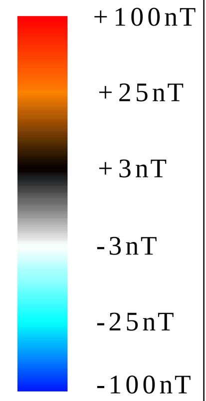
Amendments

Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)



Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES VIEWPORTS 23-24

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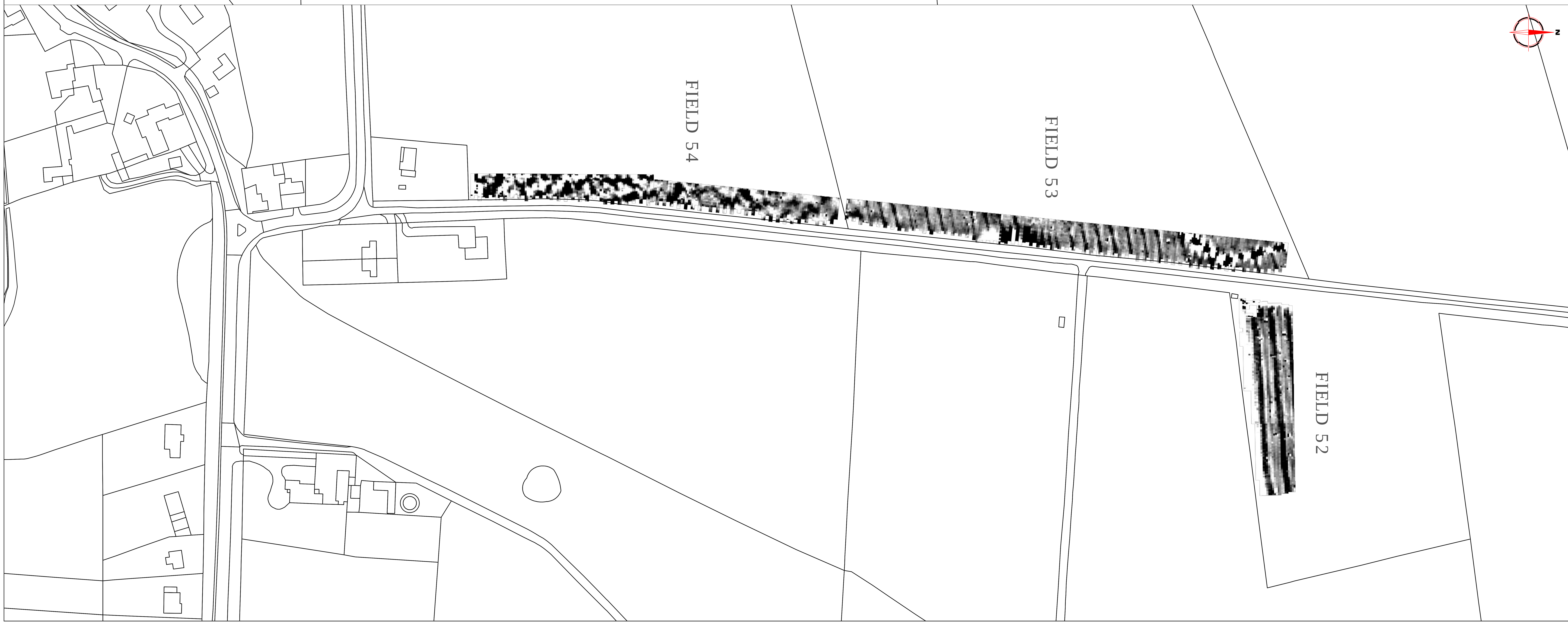
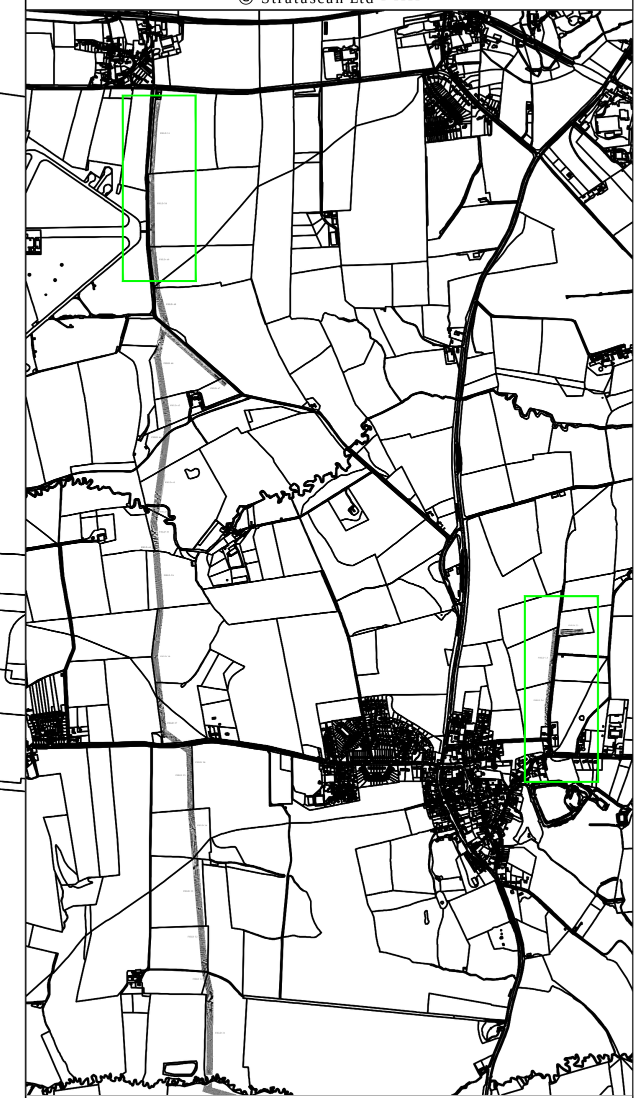
Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	42



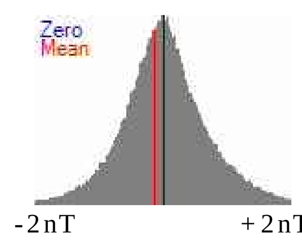
Amendments

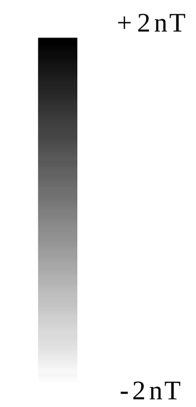
Issue No.	Date	Description
-	-	-
-	-	-



Plotting parameters

Maximum +2nT (black)
Minimum -2nT (white)





Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA VIEWPORTS 23-24

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EUROPEAN GPR ASSOCIATION

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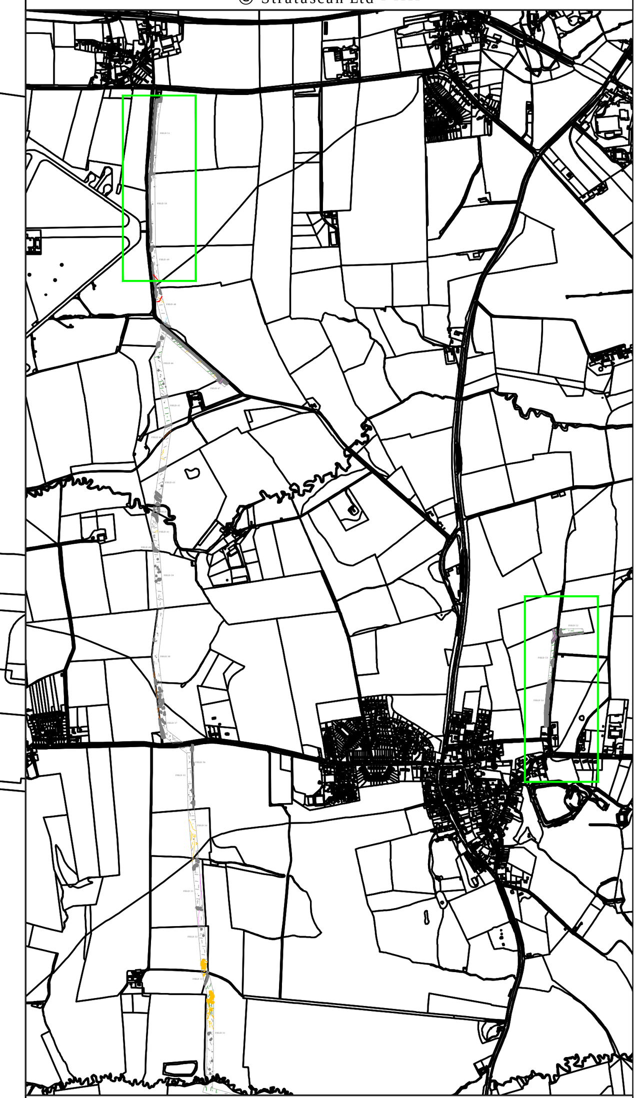
Scale 1:1250 — 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	DGE	01
Date	**Drawn by**	**Figure No.**
OCT 15	TR	43

Amendments

Issue No.	Date	Description
-	-	-
-	-	-



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- Magnetic spike - probable ferrous object

Job No.	Survey Date
J8928	SEP-OCT 15

Client

SKANSKA

Project Title

ANGELINOS PIPELINE, OXFORDSHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES VIEWPORTS 23-24

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Plot	Checked by	Issue No.
A1	DGE	01

Date	Drawn by	Figure No.
OCT 15	TR	44

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