
**THREE OAKS RENEWABLE
ENERGY PARK
EXTENSION**

**Environmental
Statement Appendix 6.2:
Geophysical Survey**

MAY 2026





**magnitude
surveys**

Geophysical Survey Report
Three Oaks Renewable Energy Park Extension, Bridlington

For
Ridge Clean Energy Ltd (RCE)

Magnitude Surveys Ref: MSTA2234

November 2026



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Abstract

Magnitude Surveys was commissioned to assess the subsurface potential of a c. 26ha area of land at Three Oaks Renewable Energy Park Extension, Bridlington, East Riding of Yorkshire. Anomalies indicative of archaeological activity were detected in the survey area, along with anomalies of agricultural and natural origins. Archaeological activity has been identified with anomalies suggestive of enclosures alongside further anomalies possibly relating to settlement activity and possible ditches and banks. Agricultural activity has been identified with anomalies corresponding to mapped former field boundaries, drainage features, modern ploughing, and ridge-and-furrow cultivation trends. Anomalies of natural origin have been identified, including amorphous anomalies related to variations in the underlying bedrock or superficial deposits. Anomalies of an industrial origin resulting from extraction have also been identified. Anomalies for which no confident interpretation could be made were detected and categorised as undetermined in origin. Magnetic disturbance was present near the survey edges associated with field boundaries and tracks.

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1. Introduction

- 1.1. Magnitude Surveys Ltd (MS) was commissioned by Ridge Clean Energy Ltd (RCE) to undertake a geophysical survey over a c. 26ha area of land near Bridlington, East Riding of Yorkshire (TA 11318 65419).
- 1.2. The geophysical survey comprised a hand-carried GNSS-positioned fluxgate gradiometer survey. Magnetic survey is the standard primary geophysical method for archaeological applications in the UK due to its ability to detect a range of different features. The technique is particularly suited for detecting fired or magnetically enhanced features, such as ditches, pits, kilns, sunken featured buildings (SFBs) and industrial activity (David *et al.*, 2008).
- 1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England (David *et al.*, 2008), the Chartered Institute for Archaeologists (CIfA, 2020) and the European Archaeological Council (Schmidt *et al.*, 2015).
- 1.4. The survey was conducted in line with a Written Scheme of Investigation (WSI) produced by MS (Marr 2025).
- 1.5. The survey commenced on September 25th 2025, and took 4 days to complete.

2. Quality Assurance

- 2.1. Magnitude Surveys is a Registered Organisation of the Chartered Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, and a corporate member of ISAP (International Society for Archaeological Prospection).
- 2.2. The directors of MS are involved in cutting edge research and the development of guidance/policy. Specifically, Dr Chrys Harris has a PhD in archaeological geophysics from the University of Bradford, is a Member of CIfA and was the Vice-Chair of the International Society for Archaeological Prospection (ISAP); Finnegan Pope-Carter has an MSc in archaeological geophysics and is a Fellow of the London Geological Society, as well as a member of GeoSIG (CIfA Geophysics Special Interest Group); Dr Paul Johnson has a PhD in archaeology from the University of Southampton, is a Fellow of the Society of Antiquaries of London and a Member of CIfA, has been a member of the ISAP Management Committee since 2015, and is currently the Chair of the Archaeological Prospection Community of the European Archaeological Association.
- 2.3. All MS managers, field and office staff have degree qualifications relevant to archaeology or geophysics and/or field experience.

3. Objectives

- 3.1. The objective of this geophysical survey was to assess the subsurface archaeological potential of the survey area.

4. Geographic Background

4.1. The survey area was located c. 5.5km west of Bridlington, East Riding of Yorkshire, and 1.5km north of Burton Agnes (Figure 1). Gradiometer survey was undertaken across five fields under arable cultivation. The survey area is surrounded by arable fields with Woldgate Road c. 200m to the north (Figure 2).

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	Arable stubble field sloping down to the south.	No physical boundaries were present to the north or south. The survey area was bordered by a track and hedgerow to the east and a hedgerow to the west.
2	Arable stubble field sloping down to the south.	No physical boundaries were present to the north or south. The survey area was bordered by tracks and hedgerows to the east and west.
3	Arable stubble field sloping down to the south.	No physical boundaries were present to the north or south. The survey area was bordered by a track and hedgerow to the west and a hedgerow to the east.
4	Arable stubble field sloping down to the south.	No physical boundaries were present to the north or south. The survey area was bordered by a track and hedgerow to the west and a hedgerow to the east.
5	Arable stubble field sloping down to the south.	No physical boundaries were present to the north or south. The survey area was bordered by trackways and hedgerows to the east and west.

4.3. The underlying geology comprises Flamborough chalk across the whole survey area. Superficial deposits of Devensian diamicton are recorded in Areas 2, 3, 4, & 5, with no superficial deposits recorded in Area 1 (British Geological Survey, 2026).

4.4. The soils consist of shallow lime-rich soils over chalk or limestone within Areas 1, 2, & 3. Areas 4 & 5 comprise freely draining, slightly acid but base-rich soils with small areas of shallow lime-rich soils along their shared boundary (Soilscapes, 2026).

5. Archaeological Background

5.1. The following information is from the Humber Historic Environmental Record (Heritage Gateway, 2025).

5.2. Prehistoric finds in the vicinity of the survey area include Neolithic and Bronze Age settlements located c. 500m north of the survey area. Enclosure, pit and round barrow features, along with associated finds including arrowheads, pots, flints, stone tools, a cremation and an inhumation burial, were identified through excavation.

5.3. Iron Age activity consists of a round house and a crouched inhumation burial located c. 250m north of the survey area. An Iron Age square barrow identified through aerial photography was

located c. 500m east of the survey area, and enclosures and a pit were identified c. 200m west of the survey area.

- 5.4. Roman activity has previously been identified very close to the survey area. Numerous pits and ditches of Romano-British origin were recorded c. 100m south of the survey area. Between the two survey areas, a likely Romano-British enclosure and field system has been identified on aerial photography. A Roman silver coin of Salonia was found c. 500m north of the survey area.

6. Methodology

6.1. Data Collection

6.1.1. Magnetometer surveys are generally the most cost effective and suitable geophysical technique for the detection of archaeology in England. Therefore, a magnetometer survey should be the preferred geophysical technique unless its use is precluded by any specific survey objectives or the site environment. For this site, no factors precluded the recommendation of a standard magnetometer survey. Geophysical survey therefore comprised the magnetic method as described in the following section.

6.1.2. Geophysical prospection comprised the magnetic method as described in the following table.

6.1.3. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Magnetic	Bartington Instruments Grad-13 Digital Three-Axis Gradiometer	1m	200Hz reprojected to 0.125m

6.1.4. The magnetic data was collected using MS' bespoke hand-carried GNSS-positioned system.

6.1.4.1. MS' hand-carried system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a multi-channel, multi-constellation GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The RTK GPS is accurate to 0.008m + 1ppm in the horizontal and 0.015m + 1ppm in the vertical.

6.1.4.2. Magnetic and GPS data were stored on an SD card within MS' bespoke datalogger. The datalogger was continuously synced, via an in-field Wi-Fi unit, to servers within MS' offices. This allowed for data collection, processing and visualisation to be monitored in real-time as fieldwork was ongoing.

6.1.4.3. A navigation system was integrated with the RTK GPS, which was used to guide the surveyor. Data was collected by traversing the survey area along the longest possible lines, ensuring efficient collection and processing.

6.2. Data Processing

6.2.1. Magnetic data was processed in bespoke in-house software produced by MS. Processing steps conform to the EAC and Historic England guidelines for 'minimally enhanced data' (see Section 3.8 in Schmidt *et al.*, 2015: 33 and Section IV.2 in David *et al.*, 2008: 11).

Sensor Calibration – The sensors were calibrated using a bespoke in-house algorithm, which conforms to Olsen *et al.* (2003).

Zero Median Traverse – The median of each sensor traverse is calculated within a specified range and subtracted from the collected data. This removes striping effects caused by small variations in sensor electronics.

Projection to a Regular Grid – Data collected using RTK GPS positioning requires a uniform grid projection to visualise data. Data are rotated to best fit an orthogonal grid projection and are resampled onto the grid using an inverse distance-weighting algorithm.

Interpolation to Square Pixels – Data are interpolated using a bicubic algorithm to increase the pixel density between sensor traverses. This produces images with square pixels for ease of visualisation.

6.3. Data Visualisation and Interpretation

6.3.1. This report presents the gradient of the sensors' total field data as greyscale images (Figures 12, 15, 18, 21, 24), as well as the total field data from the lower sensors (Figures 3, 6 & 9). The gradient of the sensors minimises external interferences and reduces the blown-out responses from ferrous and other high contrast material. However, the contrast of weak or ephemeral anomalies can be reduced through the process of calculating the gradient. Consequently, some features can be clearer in the respective gradient or total field datasets. Multiple greyscale images of the gradient and total field at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plot (Figures 14, 17, 20, 23 & 26). XY trace plots visualise the magnitude and form of the geophysical response, aiding anomaly interpretation.

6.3.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against open street maps, satellite imagery, historical maps, LiDAR data, and soil and geology maps. Google Earth (2026) was also consulted to compare the results with recent land use.

6.3.3. Geodetic position of results – All vector and raster data have been projected into OSGB36 (ESPG27700) and can be provided upon request in ESRI Shapefile (.SHP) and Geotiff (.TIF), respectively. Figures are provided with raster and vector data projected against OS Open Data.

7. Results

7.1. Qualification

- 7.1.1. Geophysical results are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is inherently subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency, it is often not possible to classify all anomaly sources. Where possible, an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports. MS actively seek feedback on their reports, as well as reports from further work, in order to constantly improve our knowledge and service.

7.2. Discussion

- 7.2.1. The geophysical results are presented in combination with satellite imagery and historical maps (Figures 4, 7 & 10).
- 7.2.2. A fluxgate gradiometer survey was completed across c. 26ha of land at Three Oaks Renewable Energy Park Extension, Bridlington, East Riding of Yorkshire. The survey has identified anomalies of archaeological, agricultural, natural and undetermined origins. Further anomalies relating to the extraction of material have also been identified. Magnetic disturbance is limited to field boundaries.
- 7.2.3. Anomalies of probable archaeological origin have been identified across the survey area. A concentration of probable and possible archaeological anomalies have been identified in Area 4 related to probable settlement activity (Figures 21 & 22). In the centre of Area 4, anomalies have been detected some with possible internal linear anomalies suggestive of division. Discrete anomalies of different increased magnetic enhancement have also been detected within this area that could relate to pits or areas of burning. This collection of anomalies may form part of a wider complex of possible settlement activity extending outside of this survey area. To the east of Area 4 a pair of parallel linear anomalies have been identified, these anomalies have a northeast-southwest orientation and may be a trackway or a series of ditches. In the west of Area 4, a broad curvilinear anomaly has been detected. This anomaly has a different magnetic appearance from the other anomalies in Area 4, which may represent an earthwork, such as a bank.
- 7.2.4. A linear anomaly has been detected in Area 2 **[2a]** (Figures 15 and 16), a similar anomaly which follows the same alignment has been detected south of this in Area 5 **[5a]** (Figures 24 and 25). Both anomalies are to the east of an anomaly that has been detected and interpreted as a former field boundary due to its correlation with one depicted on historical mapping. Aerial photography of the survey area supports this interpretation, as a cropmark can be seen continuing from Area 2 into Area 5. This feature may be a ditch or other cut feature. In the centre of Area 2, linear and rectilinear

anomalies have been detected [2b]. These anomalies have a different orientation to the linear anomaly in the east of the area, and their regular appearance suggests enclosure systems, this is also likely for anomalies in the west of Area 2 [2c].

- 7.2.5. Additional anomalies of a possible archaeological origin have been identified in Areas 1 and 3 (Figures 12, 13, 18 & 19). These anomalies may be enclosures or possible trackways. Anomaly [1a] comprises a pair of parallel linear anomalies with a northwest-southeast orientation, which lead towards several known tumuli and earthworks recorded on historical mapping and the HER c. 770m to the northwest of the survey area (see section 5.1).
- 7.2.6. Agricultural activity has been identified across the survey area. Linear anomalies corresponding to the recorded position of former field boundaries visible on historical mapping have been identified in Areas 2 and 5 (Figures 15, 16, 24 & 25). In Areas 1 and 3, parallel curvilinear anomalies with an approximately east-west orientation have been detected. The appearance of these anomalies and their close spacing is typical of ridge and furrow cultivation (Figures 12, 13, 18 & 19). In the west of Area 1, dipolar anomalies typical of drainage features have been detected.
- 7.2.7. Across the survey area, amorphous anomalies with a speckled enhancement distinct from the surrounding areas have been detected (Figures 12, 13, 15, 16, 18, 19, 21, 22, 24 and 25). These anomalies are typically of the chalk bedrock of the survey area.
- 7.2.8. Discrete anomalies have been identified in Areas 2 and 5; these anomalies have a magnetic appearance typical of extraction pits (Figures 15, 16, 24 & 25). The anomalies in Area 2 are located within the anomalies identified as a possible paleochannel, and the ones in Area 5 are located on either side of a field boundary. Chalk pits are recorded on historical mapping within the broader context of the survey area; it is possible that these anomalies are unrecorded chalk pits.
- 7.2.9. Within the survey, discrete and curvilinear anomalies were detected. These anomalies do not correspond to any recorded features and lack sufficient diagnostic criteria to allow for a confident interpretation. Whilst a natural or agricultural origin is likely for these anomalies, an archaeological one cannot be ruled out.

7.3. Interpretation

7.3.1. General Statements

- 7.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.
- 7.3.1.2. **Data Artefact** – Data artefacts usually occur in conjunction with anomalies with strong magnetic signals due to the way in which the sensors respond to very strong point sources. They are usually visible as minor ‘streaking’ following the line of data collection. While these artefacts can be reduced in post-processing through data filtering, this would risk removing ‘real’ anomalies. These artefacts

are therefore indicated as necessary in order to preserve the data as 'minimally processed'.

- 7.3.1.3. **Ferrous (Spike)** – Discrete dipolar anomalies are likely to be the result of isolated pieces of modern ferrous debris on or near the ground surface.
- 7.3.1.4. **Ferrous/Debris (Spread)** – A ferrous/debris spread refers to a concentration of multiple discrete, dipolar anomalies usually resulting from highly magnetic material such as rubble containing ceramic building materials and ferrous rubbish.
- 7.3.1.5. **Magnetic Disturbance** – The strong anomalies produced by extant metallic structures, typically including fencing, pylons, vehicles and service pipes, have been classified as 'Magnetic Disturbance'. These magnetic 'haloes' will obscure weaker anomalies relating to nearby features, should they be present, often over a greater footprint than the structure causing them.
- 7.3.1.6. **Undetermined** – Anomalies are classified as Undetermined when the origin of the geophysical anomaly is ambiguous and there is no supporting contextual evidence to justify a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes, although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally distinct from those caused by ferrous sources.

7.3.2. Magnetic Results - Specific Anomalies

- 7.3.2.1. **Archaeology Probable and Possible (Weak) Area 1** – In Area 1, weakly positive linear anomalies were detected (Figures 12 and 13). These anomalies are oriented northwest-southeast and may be a trackway. Historical mapping of the survey area records several tumuli and Rudston Beacon as being located c. 770m northwest of Area 1, which gives an increased likelihood of archaeological potential to these anomalies. A linear anomaly located to the east of Area 1, oriented northeast-southwest, may be related to [1a], as the two appear to meet at a right angle in aerial photography of the survey area (Google Earth, 2025).
- 7.3.2.2. **Archaeology Probable (Strong/Weak) Area 2 & 5** – A strong and weak positive linear anomaly has been identified in the centre of Area 2 [2a]. This anomaly has a north-south orientation (Figures 15 and 16). An anomaly with a similar magnetic appearance has been detected in Area 5 [5a], which is immediately south of Area 2 (Figures 24 and 25). Both anomalies are located east of a former field boundary visible on historical mapping. Cropmarks visible in aerial photography of the survey area do correspond to the anomalies and suggest that they are possibly connected, as the cropmark continues into the field between the two. This anomaly may be an infilled ditch associated with enclosure systems.

- 7.3.2.3. **Archaeology Probable (Weak) Area 2** – In the centre and west of Area 2, linear, curvilinear and rectilinear anomalies have been detected [2b] and [2c] measuring c. 11m x 9m and c. 10m x 10m respectively (Figures 15 and 16). These anomalies have a different orientation to [2a] and to the possible strip fields recorded on historical mapping within the survey area (Figures 4, 7 and 10). These anomalies are suggestive of enclosures that may relate to the archaeological anomalies identified to the southwest (see section 5.4).
- 7.3.2.4. **Archaeology Probable/Possible (Weak) Area 3** – Weakly positive linear anomalies with a west-east and north-south orientation have been identified in Area 3 (Figures 18 and 19). These anomalies do not correspond to any recorded field systems. These are possibly part of a wider enclosure system.
- 7.3.2.5. **Archaeology Probable (Strong & Weak) Area 4** – Strongly and weakly positive magnetic rectilinear anomalies containing internal subdivisions formed of linear, curvilinear and discrete anomalies of varied enhancement have been identified in Area 4 (Figures 21 and 22). The most southern of these anomalies [4a] is c. 80m x 80m and has a north-south orientation, whereas to the north, a similar anomaly [4b] has an east-west orientation and measures c. 40m x 60m. These two anomalies may be part of a wider complex, considering their proximity and similarities in response and morphological appearance. The discrete anomalies identified across this section of the survey area may be possible pit-like features or small localised burning. The wider rectilinear anomalies may be either enclosure systems or evidence of settlement activity. To the east of these, positive, parallel linear anomalies have been detected [4c]. It is possible that these anomalies form a trackway that may form part of a rectilinear boundary enclosing [4a] and [4b], as a linear anomaly has also been detected on the southern edge of Area 4.
- 7.3.2.6. **Archaeology, Possible (Weak & Strong) Area 4** – In the west of Area 4, a c. 10m wide curvilinear anomaly with mixed positive enhancement has been detected. This anomaly does not correspond to any recorded features. This anomaly is possibly an earth bank that may be natural or anthropogenic in origin.
- 7.3.2.7. **Agricultural (Weak)** – A pair of weakly positive linear anomalies have been detected in Area 2; these anomalies correspond to a former field boundary recorded on historical mapping. The same field boundary has also been detected in Area 5 (Figures 15, 16, 24 and 25). These anomalies are distinct from those identified to their east that have been interpreted as archaeological in origin. However, it is possible that the field boundary may be an earlier, reused ditch, and therefore may contain some archaeological material.
- 7.3.2.8. **Paleochannel (Weak)** – A broad amorphous anomaly has been identified within the survey area, likely related to a paleochannel, in Areas 1 and 2. The contrast between these anomalies and the surrounding area is most evident in the Total Field data (Figure 3). The anomaly appears to follow the topographic slope of the survey area.

- 7.3.2.9. **Natural (Spread)** – Across Areas 1, 2, 3, and 5 amorphous anomalies with an enhancement distinct from the surrounding background have been detected (Figures 12, 15, 18 and 24). The bedrock of the survey area is chalk of the Flamborough Chalk Formation, and the distinct speckled enhancement of these anomalies is typical of areas of chalk bedrock.
- 7.3.2.10. **Industrial Modern** – In Areas 2 and 5, discrete anomalies of varying enhancement have been detected (Figures 16 and 25). These anomalies exhibit a morphology typical of an extraction area. The underlying bedrock of the survey area is chalk, and former chalk pits are recorded on historical mapping in the wider environs, however none are recorded in the survey area.
- 7.3.2.11. **Ridge and Furrow** – Parallel curvilinear anomalies have been detected across Areas 1 and 3; these anomalies appear to follow the orientation of field boundaries visible on historical mapping (Figures 4 and 7). The appearance and c. 4-10m spacing of anomalies like these are typical of ridge and furrow cultivation.
- 7.3.2.12. **Drainage (Trend)** – Numerous linear anomalies were identified within Area 1 (Figure 4). These anomalies appear magnetically different to the ridge and furrow trends and do not match modern agricultural trends. These anomalies display a weak, discrete dipolar signal typical of drainage features and are best seen on the Total Field data (Figure 3).
- 7.3.2.13. **Undetermined** - Across the survey area, several linear and curvilinear anomalies of varying enhancements were detected. These anomalies do not correspond to any recorded features and do not have a diagnostic morphology. Whilst they are possibly of agricultural or natural origin, an archaeological interpretation cannot be excluded.

8. Conclusions

- 8.1. A magnetic gradiometer survey was successfully undertaken across c. 26ha of land at Three Oaks Renewable Energy Park Extension, Bridlington. The survey has identified anomalies of archaeological, agricultural, natural and undetermined origins. Anomalies of a possible industrial origin have also been identified. Magnetic disturbance is limited to field boundaries.
- 8.2. Archaeological anomalies comprising enclosure systems and trackways have been identified. Further archaeological anomalies possibly relating to settlement activity and pit-like features have also been identified in the south of the survey area.
- 8.3. Agricultural anomalies were identified in the survey area. Linear anomalies corresponding to former mapped field boundaries have been identified alongside evidence of ridge and furrow cultivation, modern ploughing trends and drainage features.
- 8.4. Natural anomalies relating to variations within the superficial deposits and to geological processes within the bedrock have also been identified.
- 8.5. Anomalies relating to possible unrecorded chalk extraction pits have been identified.

- 8.6. Several anomalies of an undetermined origin were also detected; their provenance was ultimately unclear.



9. Archiving

- 9.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This stores the collected measurements, minimally processed data, georeferenced and un-georeferenced images, XY traces and a copy of the final report.
- 9.2. MS contributes reports to the ADS Grey Literature Library upon permission from the client, subject to any dictated time embargoes.

10. Copyright

- 10.1. Copyright and intellectual property pertaining to all reports, figures and datasets produced by Magnitude Services Ltd is retained by MS. The client is given full licence to use such material for their own purposes. Permission must be sought by any third party wishing to use or reproduce any IP owned by MS.

11. References

British Geological Survey, 2026. Geology of Britain. Thornholme, East Riding of Yorkshire. [<http://mapapps.bgs.ac.uk/geologyofbritain/home.html/>]. Accessed 23/10/2026.

Chartered Institute for Archaeologists, 2020. Standards and guidance for archaeological geophysical survey. ClfA.

David, A., Linford, N., Linford, P. and Martin, L., 2008. Geophysical survey in archaeological field evaluation: research and professional services guidelines (2nd edition). Historic England.

Google Earth, 2026. Google Earth Pro V 7.1.7.2606.

Heritage Gateway, 2025, Online resource, www.HeritageGateway.org.uk. (accessed on 5/11/25)

Marr, R., 2025, Written Scheme of Investigation for a Geophysical Survey at Three Oaks Energy Park 2. Magnitude Surveys

Olsen, N., Toffner-Clausen, L., Sabaka, T.J., Brauer, P., Merayo, J.M.G., Jorgensen, J.L., Leger, J.M., Nielsen, O.V., Primdahl, F., and Risbo, T., 2003. Calibration of the Orsted vector magnetometer. Earth Planets Space 55: 11-18.

Schmidt, A. and Ernenwein, E., 2013. Guide to good practice: geophysical data in archaeology (2nd edition). Oxbow Books: Oxford.

Schmidt, A., Linford, P., Linford, N., David, A., Gaffney, C., Sarris, A. and Fassbinder, J., 2015. Guidelines for the use of geophysics in archaeology: questions to ask and points to consider. EAC Guidelines 2. European Archaeological Council: Belgium.

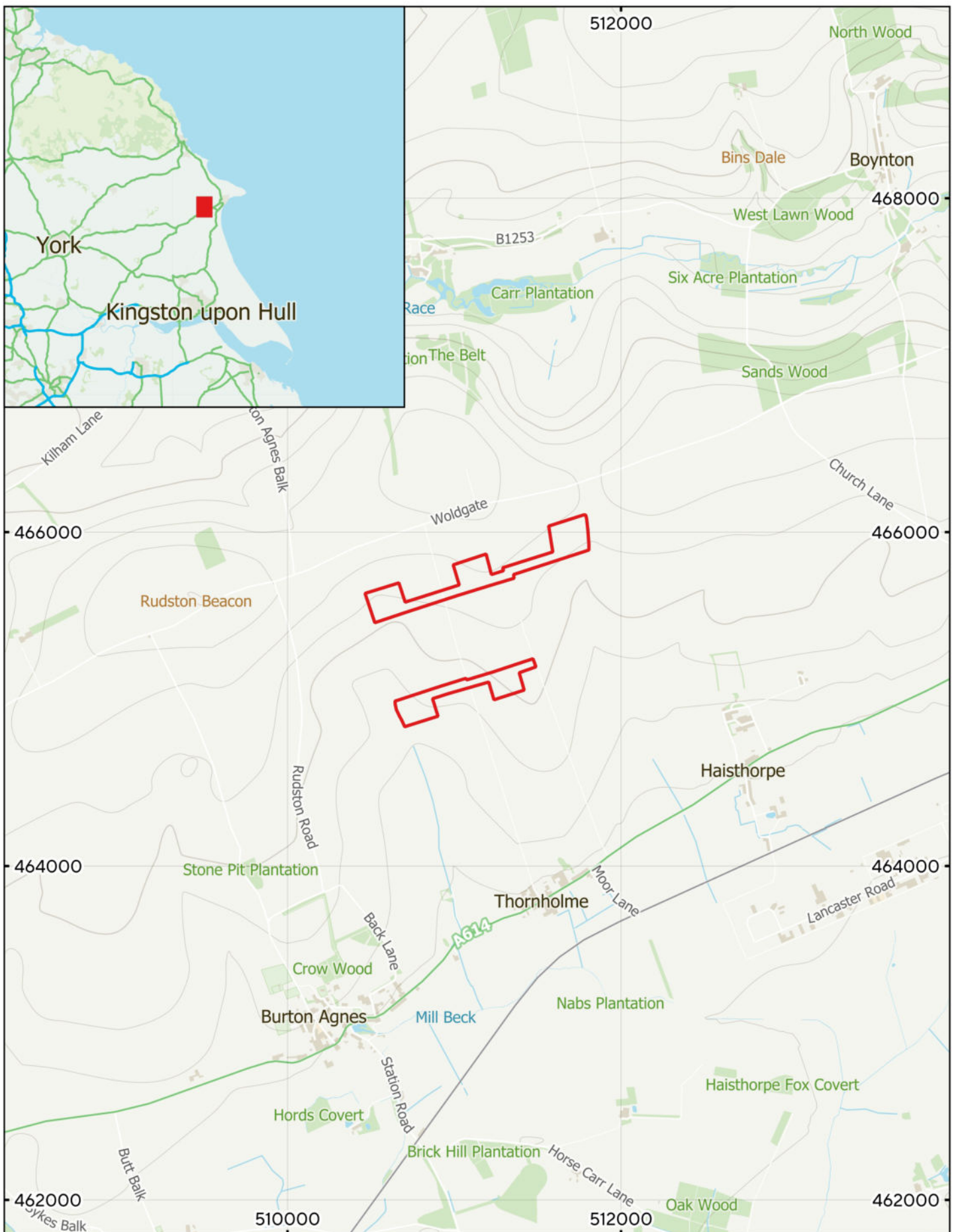
Soilscapes, 2026. Thornholme, East Riding of Yorkshire. Cranfield University, National Soil Resources Institute. [<http://landis.org.uk>]. Accessed 23/10/2026.

12. Project Metadata

MS Job Code	MSTA2234
Project Name	Three Oaks Renewable Energy Park Extension, Bridlington
Client	Ridge Clean Energy Ltd (RCE)
Grid Reference	TA 11318 65419
Survey Techniques	Magnetometry
Survey Size (ha)	26ha
Survey Dates	2025-09-25 to 2025-09-30
Project Lead	Sean Parker BSc (Hons) ACIFA
Project Officer	Sean Parker BSc (Hons) ACIFA
HER Event No	tbc
OASIS No	tbc
S42 Licence No	N/A
Report Version	1.0

13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Lead to Review	MS	SP	29 October 2025
0.2	Revisions	MS	SP	03 November 2025
0.3	Sign off	SP	LAG	05 November 2025
1.0	Client Comments	SP	SP	11 March 2026



MSTA2234 - Three Oaks Energy Park 2, Bridlington

Figure 1 - Geophysical Survey Location

1:30,000 @ A4

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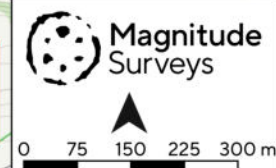
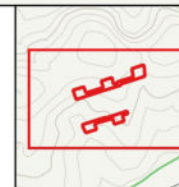
 Geophysical Survey Location

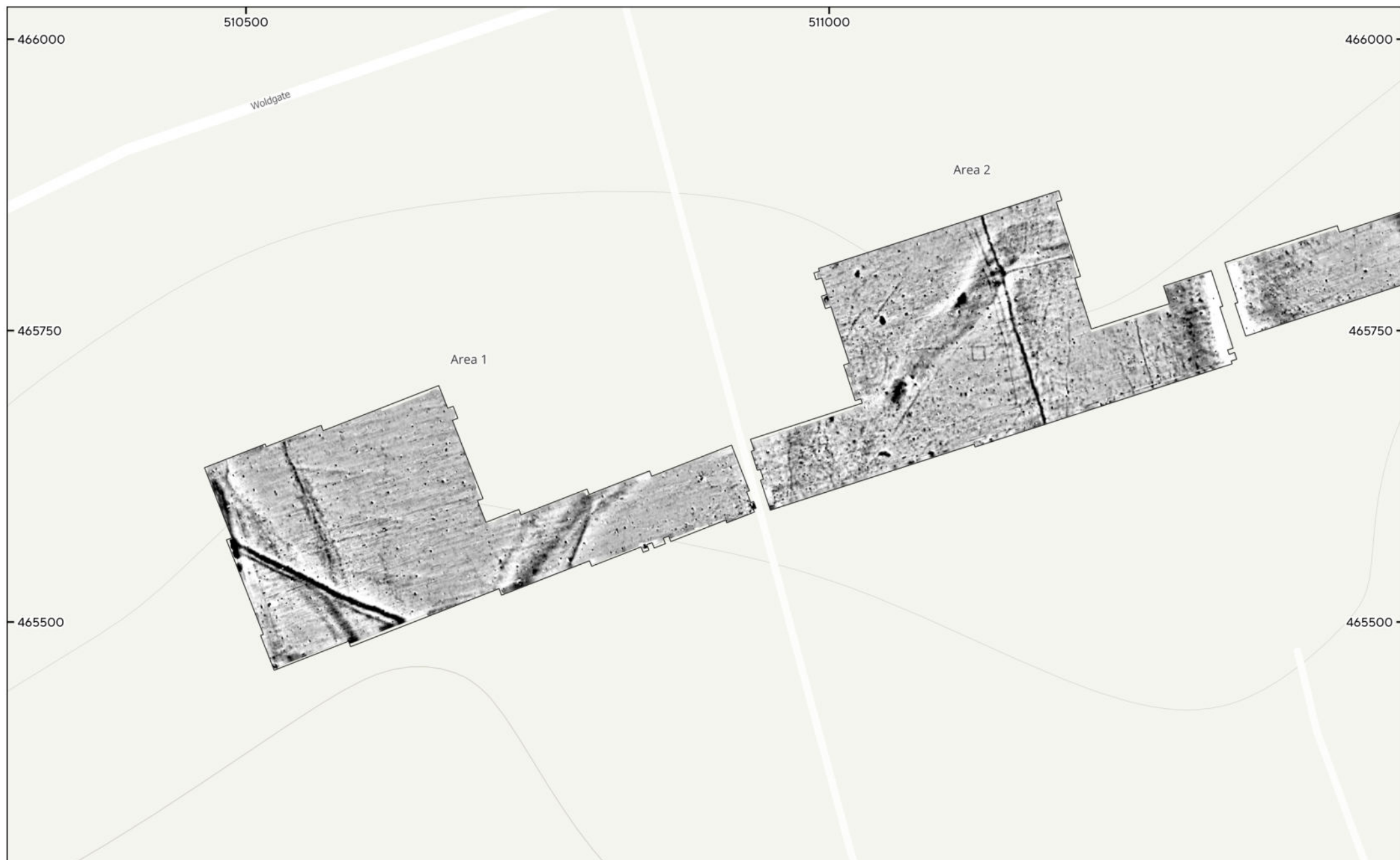




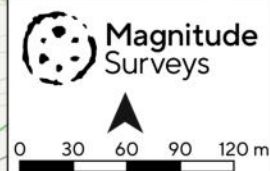
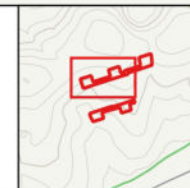
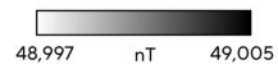
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 2 - Geophysical Survey Areas
1:7,500 @ A3
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 Survey Extents





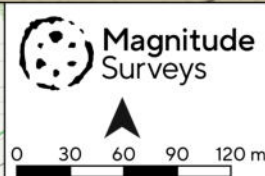
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 3 - Magnetic Total Field (Lower Sensors) (Areas 1 & 2)
1:3,000 @ A3
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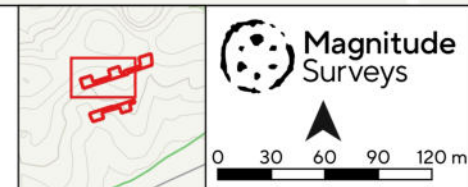
MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 4 - Magnetic Interpretation over Historical Mapping & Satellite Imagery (Areas 1 & 2), 1:3,000 @ A3
 © Magnitude Surveys 2025
 Contains historical mapping © CLS Data 2025: Ordnance Survey, 6" 2nd edition c. 1882-1913
 Contains satellite imagery © Bing Satellite 2025

- | | | | |
|---------------------------------|------------------------|------------------------------|----------------------|
| ■ Archaeology Probable (Strong) | ■ Extraction | ■ Undetermined (Strong) | --- Ferrous (Trend) |
| ■ Archaeology Probable (Weak) | ■ Paleo Channel | ■ Undetermined (Weak) | --- Drainage Feature |
| ■ Archaeology Possible (Weak) | ■ Natural (Spread) | --- Ridge and Furrow (Trend) | • Ferrous (Spike) |
| ■ Agricultural (Weak) | ■ Magnetic Disturbance | --- Agricultural (Trend) | |



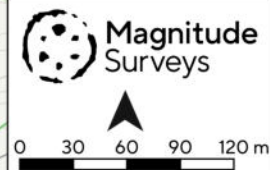
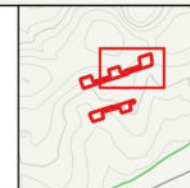
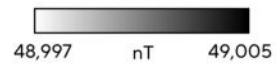


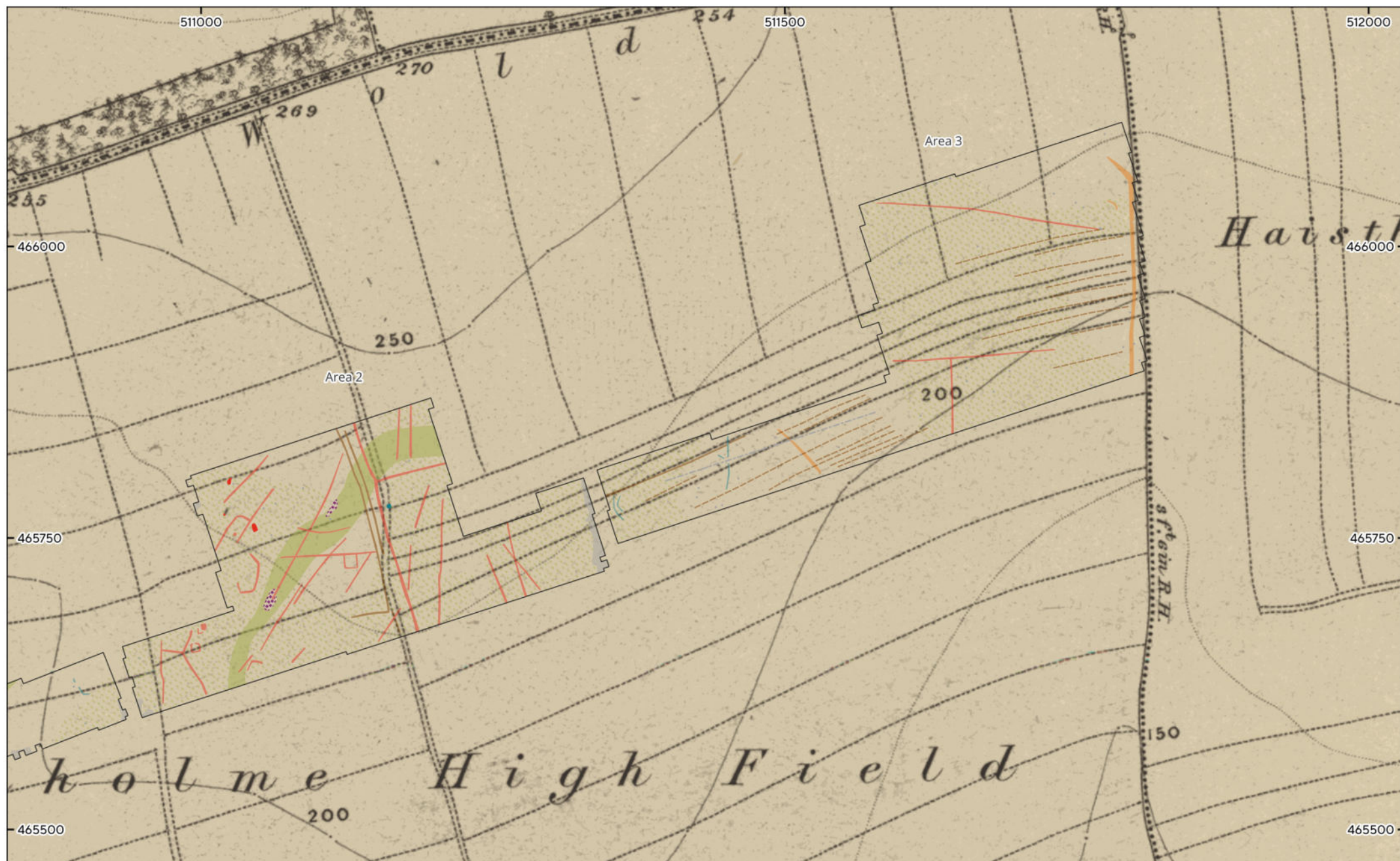
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 5 - GNSS Plot (Areas 1 & 2)
1:3,000 @ A3
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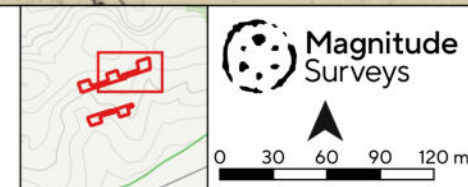
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 6 - Magnetic Total Field (Lower Sensors) (Areas 2 & 3)
1:3,000 @ A3
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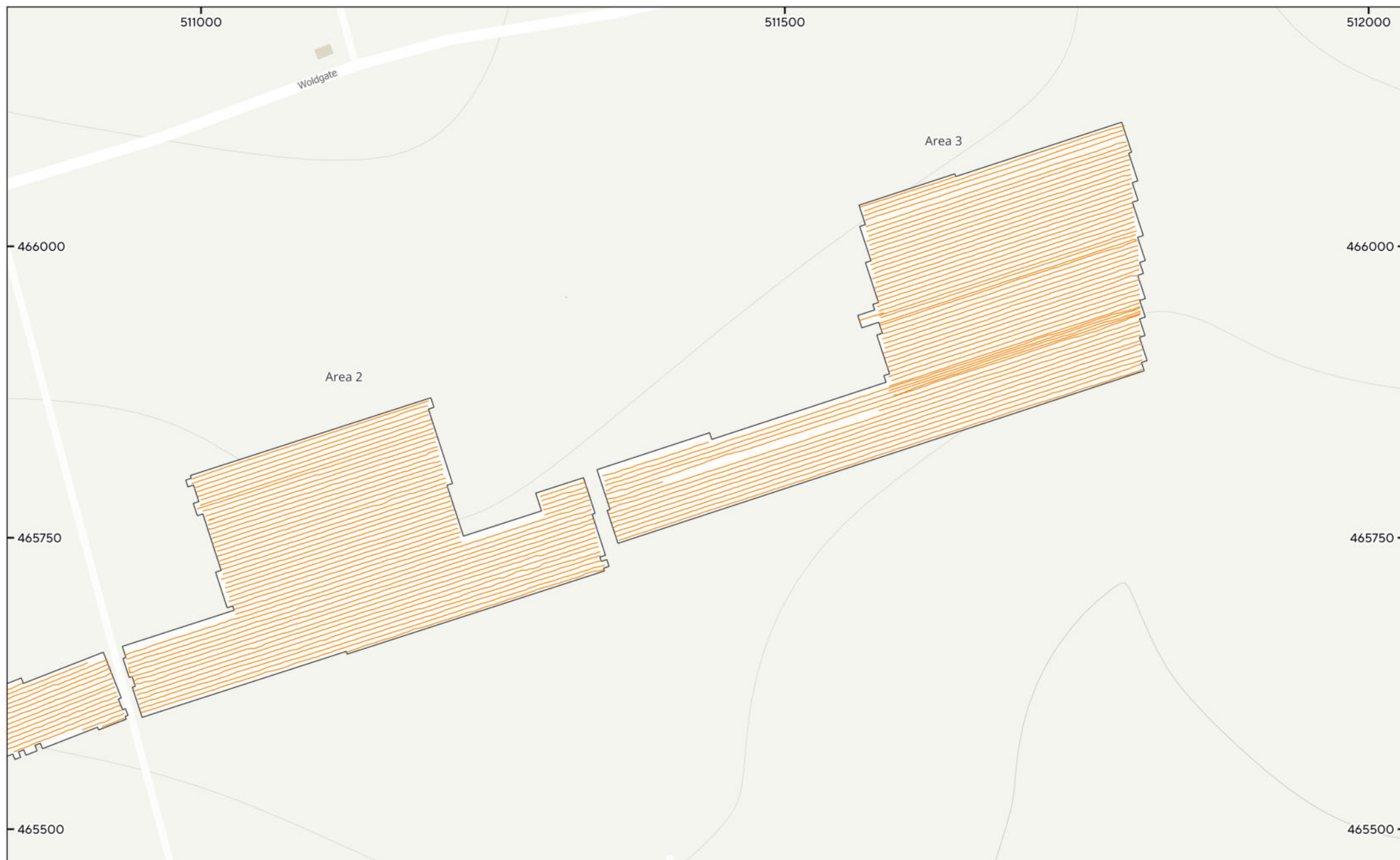




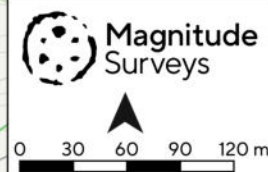
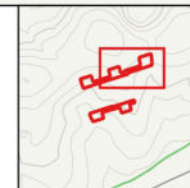
MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 7 - Magnetic Interpretation over Historical Mapping & Satellite Imagery (Areas 2 & 3), 1:3,000 @ A3
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 Contains historical mapping © CLS Data 2025: Ordnance Survey, 6" 2nd edition c. 1882-1913
 Contains satellite imagery © Bing Satellite 2025

- | | | | |
|---------------------------------|------------------------|------------------------------|---------------------|
| ■ Archaeology Probable (Strong) | ■ Extraction | ■ Undetermined (Strong) | --- Ferrous (Trend) |
| ■ Archaeology Probable (Weak) | ■ Paleo Channel | ■ Undetermined (Weak) | · Ferrous (Spike) |
| ■ Archaeology Possible (Weak) | ■ Natural (Spread) | --- Ridge and Furrow (Trend) | |
| ■ Agricultural (Weak) | ■ Magnetic Disturbance | | |



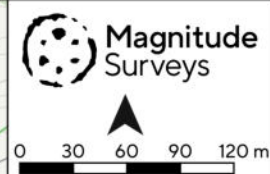
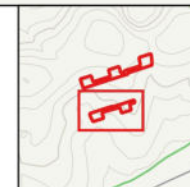
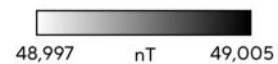


MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 8 - GNSS Plot (Areas 2 & 3)
1:3,000 @ A3
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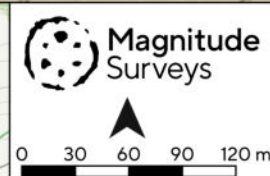
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 9 - Magnetic Total Field (Lower Sensors) (Areas 4 & 5)
1:3,000 @ A3
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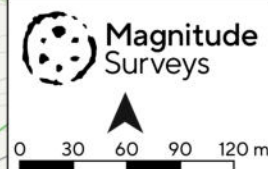
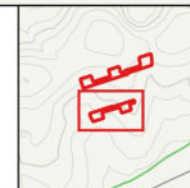
MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 10 - Magnetic Interpretation over Historical Mapping & Satellite Imagery (Areas 4 & 5), 1:3,000 @ A3
 © Magnitude Surveys 2025
 Contains historical mapping © CLS Data 2025: Ordnance Survey, 6" 2nd edition c. 1882-1913
 Contains satellite imagery © Bing Satellite 2025

- | | | | |
|---------------------------------|-------------------------------|------------------------|-------------------|
| ■ Archaeology Probable (Strong) | ■ Archaeology Possible (Weak) | ● Natural (Spread) | ● Ferrous (Spike) |
| ■ Archaeology Probable (Weak) | ■ Agricultural (Weak) | ■ Magnetic Disturbance | |
| ■ Archaeology Possible (Strong) | ● Extraction | — Agricultural (Trend) | |





MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 11 - GNSS Plot (Areas 4 & 5)
1:3,000 @ A3
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510500

510750

Area 1

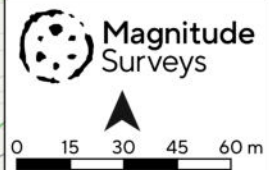
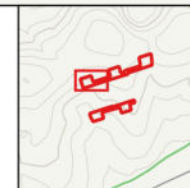
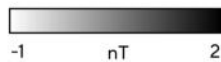
465675

465675

465500

465500

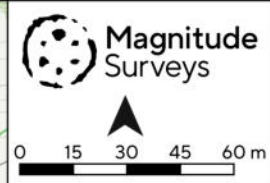
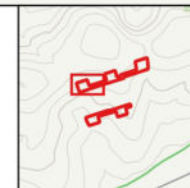
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 12 - Magnetic Gradient (Area 1)
1:1,500 @ A3
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MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 13 - Magnetic Interpretation (Area 1)
 1:1,500 @ A3
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- | | | | |
|-----------------------------|----------------------|--------------------------|-----------------|
| Archaeology Probable (Weak) | Natural (Spread) | Ridge and Furrow (Trend) | Ferrous (Spike) |
| Archaeology Possible (Weak) | Magnetic Disturbance | Agricultural (Trend) | |
| Paleochannel | Undetermined (Weak) | Drainage Feature | |



510500

510750

Area 1

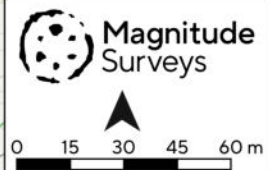
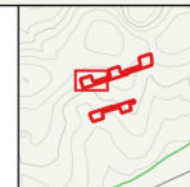
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465675

465500

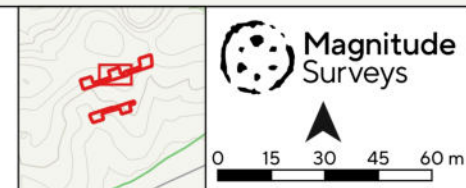
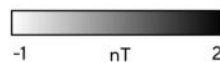
465500

MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 14 - XY Trace Plot (Area 1)
90nT/cm at 1:1,500 @ A3
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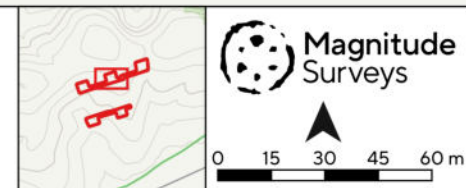
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 15 - Magnetic Gradient (Area 2)
1:1,500 @ A3
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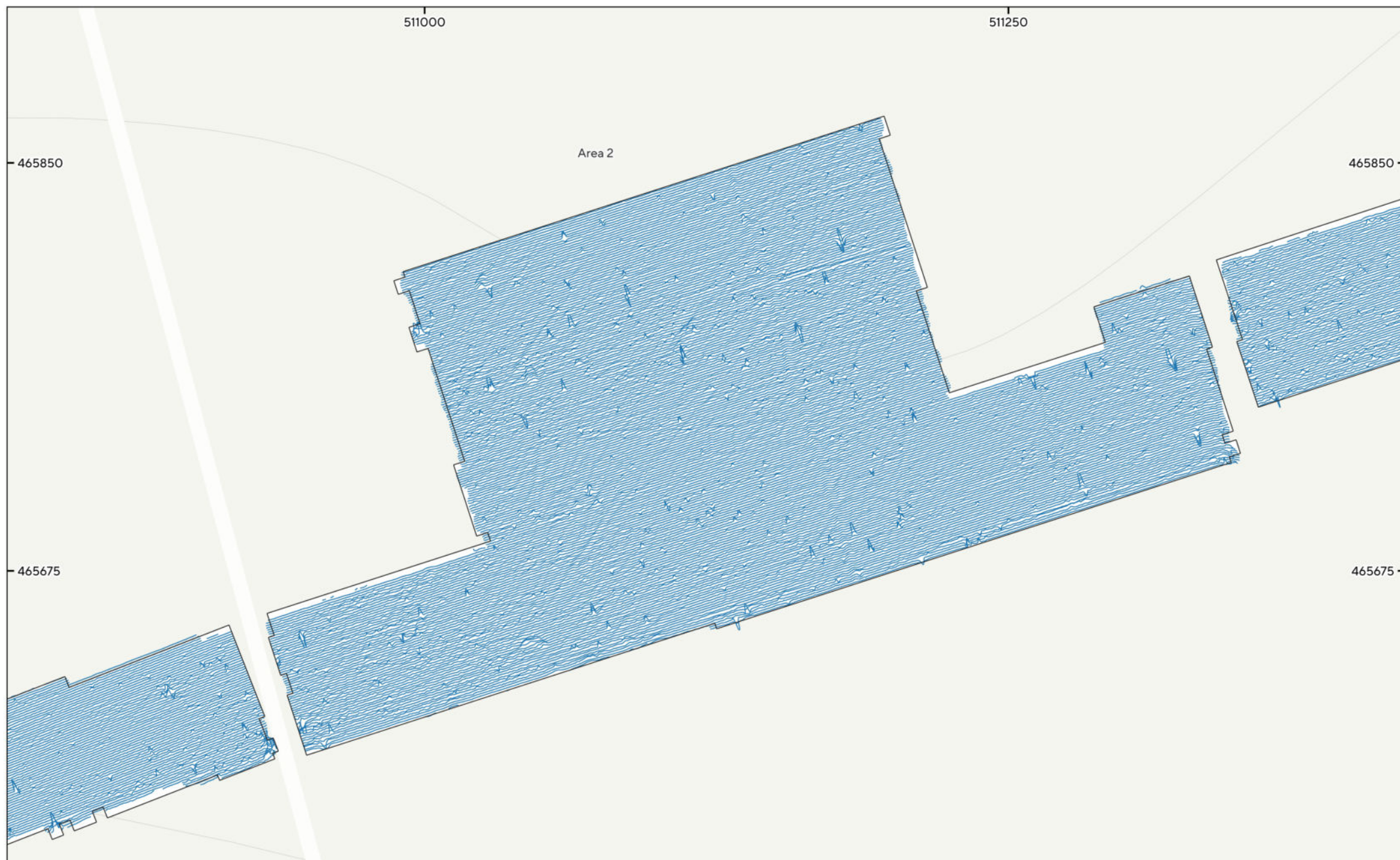




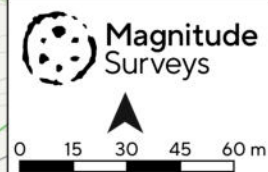
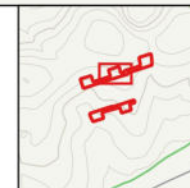
MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 16 - Magnetic Interpretation (Area 2)
 1:1,500 @ A3
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- | | | | |
|---------------------------------|------------------------------|-------------------------|------------------------------|
| ■ Archaeology Probable (Strong) | ■ Industrial/Modern (Spread) | ■ Magnetic Disturbance | --- Ridge and Furrow (Trend) |
| ■ Archaeology Probable (Weak) | ■ Paleochannel | ■ Undetermined (Strong) | --- Data Artifact |
| ■ Agricultural (Weak) | ■ Natural (Spread) | ■ Undetermined (Weak) | · Ferrous (Spike) |



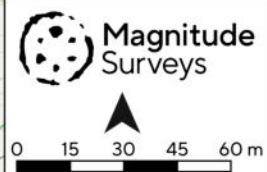
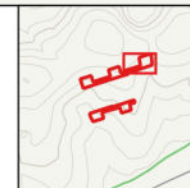
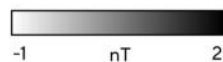


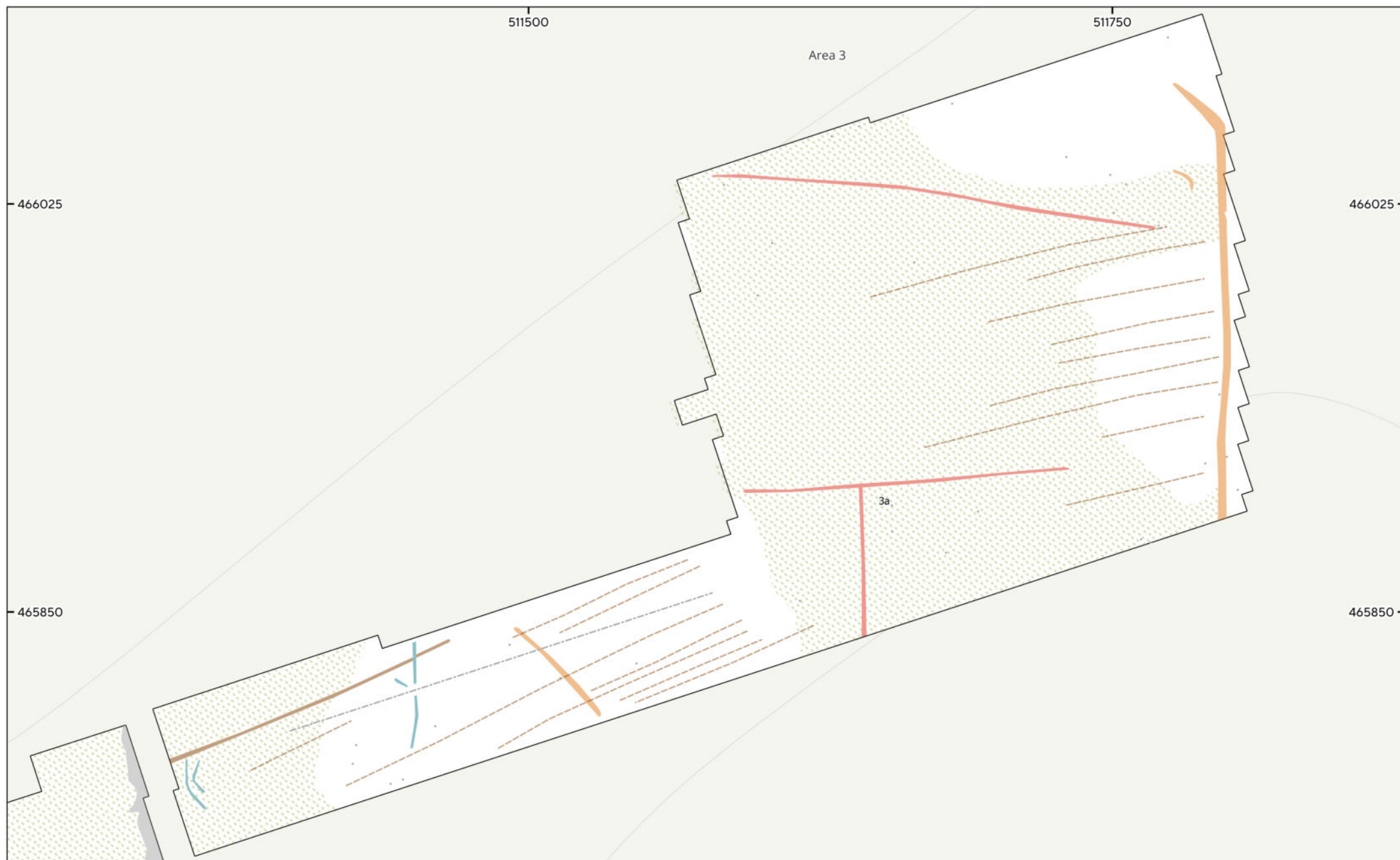
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 17 - XY Trace Plot (Area 2)
90nT/cm at 1:1,500 @ A3
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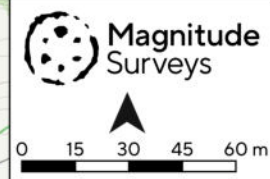
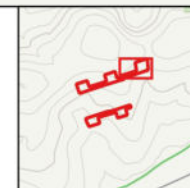
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 18 - Magnetic Gradient (Area 3)
1:1,500 @ A3
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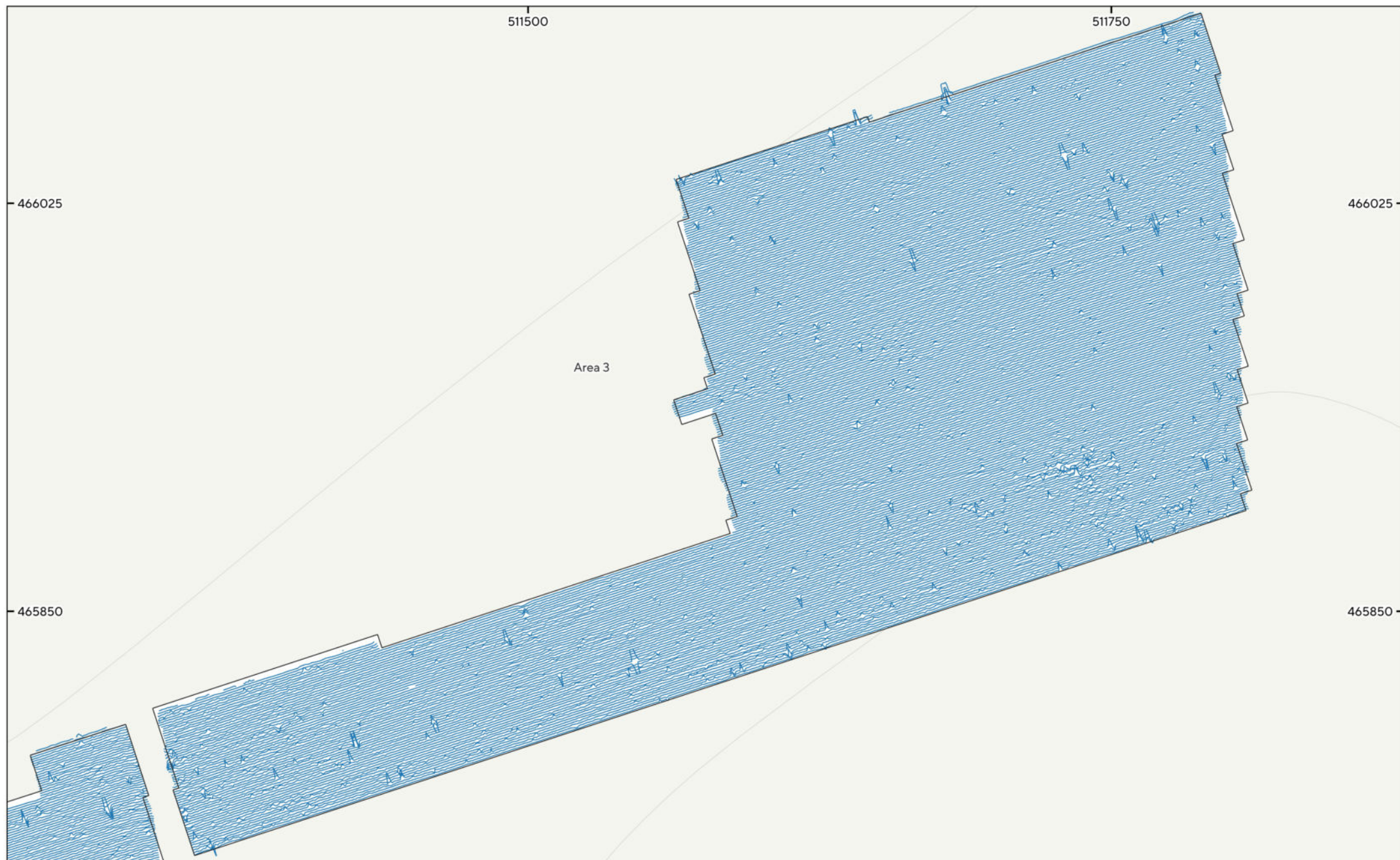




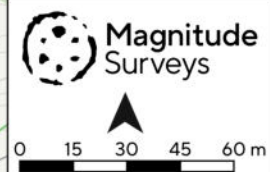
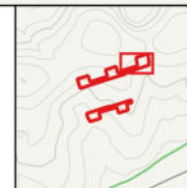
MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 19 - Magnetic Interpretation (Area 3)
 1:1,500 @ A3
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Archaeology Probable (Weak)	Natural (Spread)	Ridge and Furrow (Trend)	Ferrous (Spike)
Archaeology Possible (Weak)	Magnetic Disturbance	Data Artifact	
Agricultural (Weak)	Undetermined (Weak)		



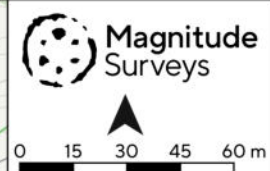
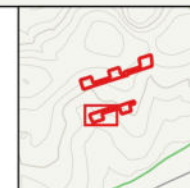
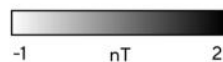


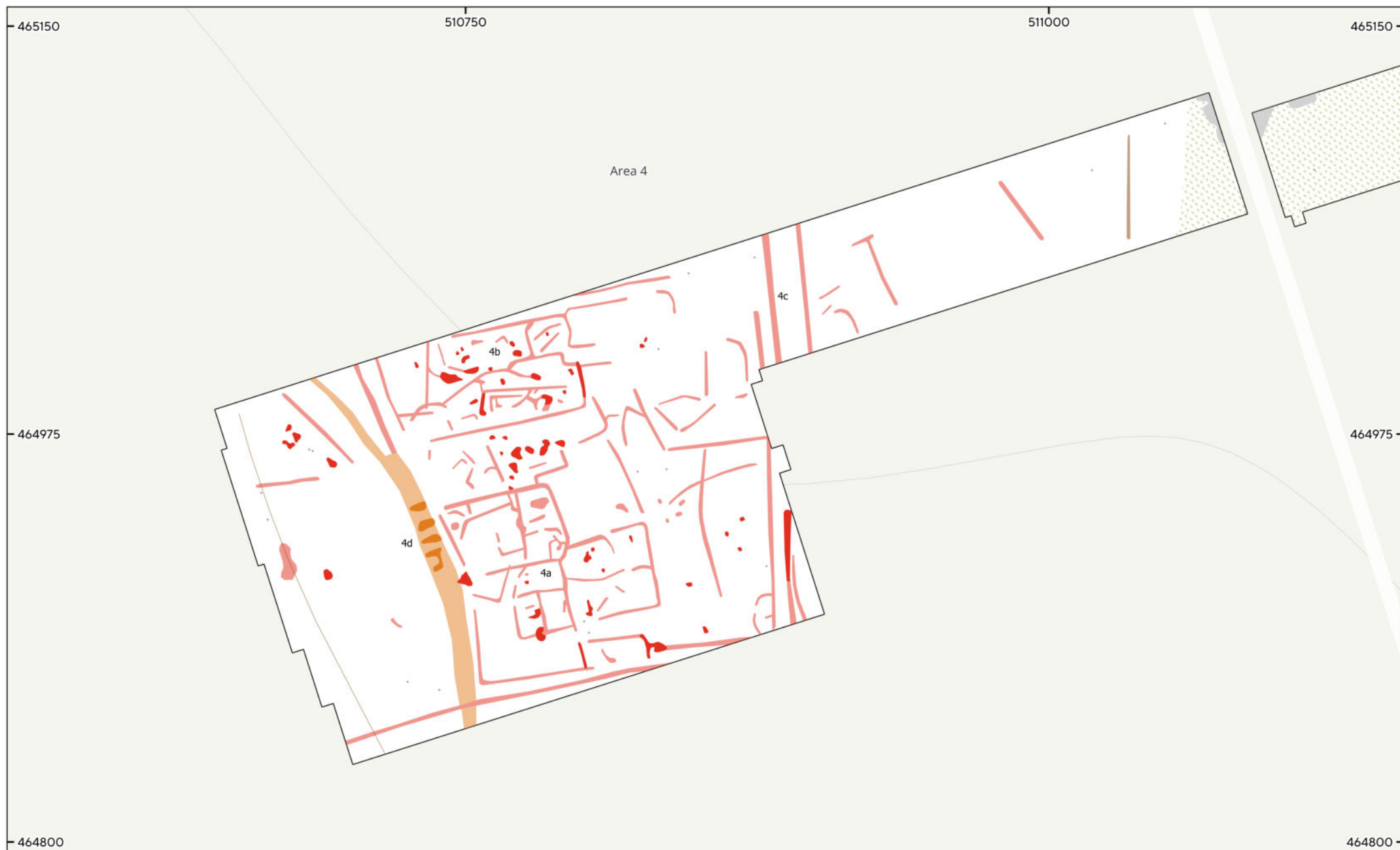
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 20 - XY Trace Plot (Area 3)
90nT/cm at 1:1,500 @ A3
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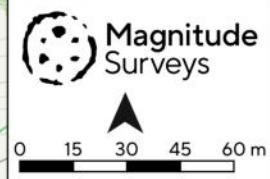
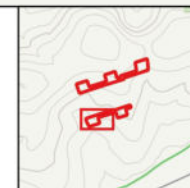
MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 21 - Magnetic Gradient (Area 4)
1:1,500 @ A3
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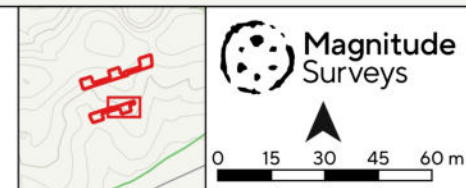
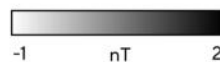
MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 22 - Magnetic Interpretation (Area 4)
 1:1,500 @ A3
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- | | | | |
|---|---|---|--|
| ■ Archaeology Probable (Strong) | ■ Archaeology Possible (Weak) | ■ Magnetic Disturbance | • Ferrous (Spike) |
| ■ Archaeology Probable (Weak) | ■ Agricultural (Weak) | — Agricultural (Trend) | |
| ■ Archaeology Possible (Strong) | ■ Natural (Spread) | | |





MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 24 - Magnetic Gradient (Area 5)
1:1,500 @ A3
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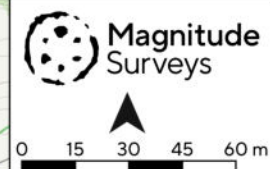


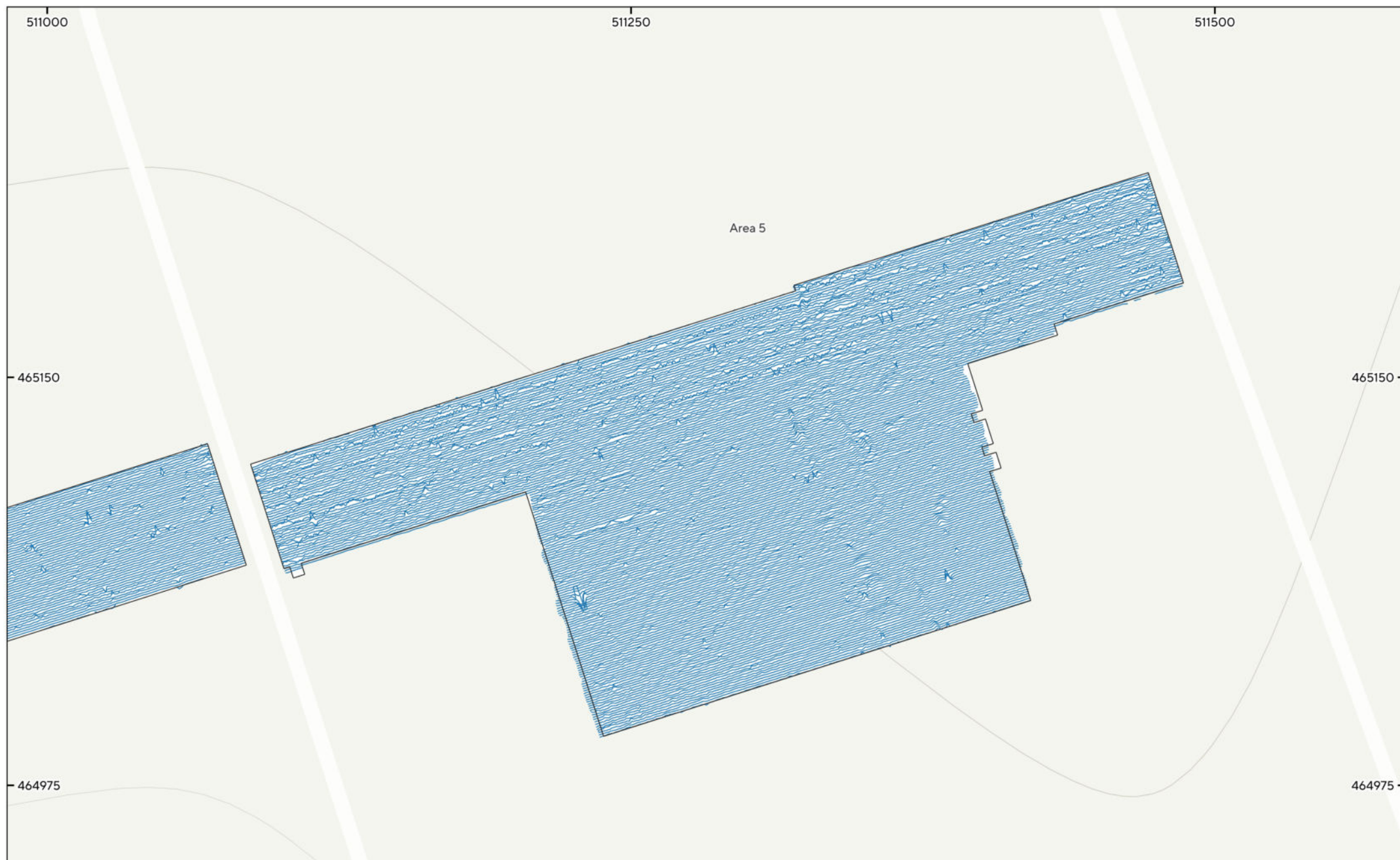


MSTA2234 - Three Oaks Energy Park 2, Bridlington
 Figure 25 - Magnetic Interpretation (Area 5)
 1:1,500 @ A3
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■ Archaeology Probable (Weak)
 ■ Agricultural (Weak)
 ■ Natural (Spread)
 ■ Ferrous (Spike)

■ Archaeology Possible (Weak)
 ■ Industrial/Modern (Spread)
 ■ Magnetic Disturbance





MSTA2234 - Three Oaks Energy Park 2, Bridlington
Figure 26 - XY Trace Plot (Area 5)
90nT/cm at 1:1,500 @ A3
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