



NORTH FALLS

Offshore Wind Farm

Archaeological Geophysical Survey Report (Feb 2025) Part 2 of 8

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Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
0	May 2025	Deadline 5	Wessex Archaeology	NFOW	NFOW

19 AREA 30 ACCESS (NGR 622800 218900)

19.1 Location, topography, and geology

- 19.1.1 The survey comprises 21.8 ha of agricultural land. The site is bounded by Frinton Golf Club to the south and east. To the east, north, and west, it extends as further agricultural land.
- 19.1.2 The site slopes downwards from 17 m aOD at the north-western side to 1 m aOD at the south-eastern side.
- 19.1.3 The solid geology comprises Clay, Silt, and Sand of the Thames Group. Overlying superficial geological deposits comprise alluvial clays and silts (BGS 2021).
- 19.1.4 The soils underlying the site are likely to consist of pelo-stagnogley soils of the 712c (Windsor) association (SSEW SE Sheet 6 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

19.2 Archaeological and historical context

- 19.2.1 One Grade II listed building is located within the search radius of 500 m. It relates to early 20th century homesteads.
- 19.2.2 A Portable Antiquities Scheme reports a findspot of Late Mesolithic to Middle Neolithic date, 300 m south-east of the site.
- 19.2.3 A record of a findspot of a Neolithic polished axe head that was recorded 250 m north of the Area 30.
- 19.2.4 Bronze age perforated stone axe find spot is noted in the north-eastern corner of Area_30_1 in Essex HER.
- 19.2.5 Numerous cropmarks are recorded within the study area that likely relate to medieval and post-medieval pit and ditch-like features indicating field boundaries and trackways.
- 19.2.6 The former site of the Gunfleet Estuary on the Tendring peninsula between Frinton and Clacton is located in the southern part of the study area. The current area of low, flat, marshy land formed the estuary of Holland River (or Brook) which was known as the Gunfleet estuary in the medieval and Tudor periods.
- 19.2.7 The site of post-medieval copperas settling pans are shown on the 1783 plan of the Tendring levels, 280 m to the south of Area 30. While these are likely related to the copperas industry as settling pans, there is no evidence for a copperas house on the site.
- 19.2.8 The location of a post-medieval Martello tower that guarded Holland marshes is known 240 m to the south of the site. It was located in the centre of the present Frinton Golf Course.
- 19.2.9 Numerous WWII pillboxes are located along the southern, eastern and northern part of the study area.

19.3 Introduction

- 19.3.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 21 – 23 February 2023. Field conditions at the time of the survey were

acceptable throughout the period of the survey. An overall coverage of 21.3 ha was achieved.

- 19.3.2 The gradiometer survey has identified magnetic anomalies across the site. Results are presented as a series of greyscale plots and archaeological interpretations at a scale of 1:2,000 (**Figures 126 and 127**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale images.
- 19.3.3 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous responses, burnt or fired objects, and magnetic trends (**Figure 119**). Full definitions of the interpretation terms used in this report are provided in Appendix 2.
- 19.3.4 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.
- 19.3.5 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.
- 19.3.6 Gradiometer survey may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.

19.4 Gradiometer survey results and interpretation

- 19.4.1 Several positive linear anomalies **5600 - 5603** were identified within Area_30_01 (**Figure 119**). They are up to 2 m wide and up to 272 m long and have a general south-west to north-east orientation. **5601** is traversing the site along the southern edge, the remaining anomalies are more centrally located. They indicate ditch features of unknown origin that could be associated with former field boundaries. However, they could as well be indicating drainage channels.
- 19.4.2 An oval, positive anomaly **5604** is located at the centre of Area_30_1 (**Figure 119**). It occupies a space of 8 m by 5 m on an east to west orientation. This kind of anomaly is indicative of a larger pit feature, likely pertaining to an extraction pit. It could just as well be natural in origin considering the location within the Thames Group sedimentary formation.
- 19.4.3 A set of five small circular, positive anomalies with a diameter of up to 1 m was identified in the centre of Area_30_01 (**Figure 119**). The line is 18 m long with a 4 m to 5 m distance between the anomalies which are indicating pit-like features that could indicate a small palisade. 13 m to the west is another assemblage of small circular positive anomalies that are arranged in a circular manner with a diameter of 7 m. This could indicate a possible roundhouse or a small circular palisade, however, there is not enough evidence to support this thesis. They could just as likely be the results of undulation in superficial geology.
- 19.4.4 To the north of **5605** is a large oval area of increased magnetic response **5606** that occupies a space of 23 m by 21 m along north-west to south-east orientation (**Figure 119**). It indicates a large pit-like feature or a potential area where the high temperature was applied to create a thermoremanent anomaly. This feature could indicate historic activities possibly related to the Gunfleet Estuary, however, limited information from the geophysical survey does not

allow for a better interpretation. A ground truthing investigation would be required to confirm the origin of this feature.

- 19.4.5 Two areas of an increased magnetic response **5607** and **5608** were noted between Area_30_1 and Area_30_2 (**Figure 119**). They are noted along the path of Long Lane, identified from the maps.
- 19.4.6 Indications of modern agricultural processes have been identified in form of plough lines and land drains.
- 19.4.7 Numerous broad, weakly positive, linear, curvilinear, and sinuous anomalies have been identified throughout the site as superficial geology. They indicate natural ditches formed in a periglacial environment on aeolian soils during the last glacial period. Being a surface feature, they could accumulate archaeological material and could have been used as field boundaries in the past, however, further investigation would be required to confirm this theory. In addition, very broad weakly positive anomalies have been recognised in the survey. This suggests the presence of aeolian sediments with a very weak magnetic response. Such sediments could form on top of archaeological features and obscure detection.

19.5 Discussion

- 19.5.1 The gradiometer survey has detected several features, which can be identified as possible archaeological in origin. Several linear anomalies that could relate to past field arrangements were identified. Additionally, a linear and a circular pit arrangement were identified in the western portion of the survey area.
- 19.5.2 A broad oval feature that indicates a burning area or a large pit of an unknown origin was identified in the centre of the western area. The limited nature of geophysical information does not allow for a more accurate interpretation.
- 19.5.3 The remaining anomalies relate to a path, modern farming practices and superficial geology.

REFERENCES

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Cartographic and documentary sources

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Online resources

British Geological Survey Geology of Britain Viewer (accessed December 2022)

[REDACTED]

Google Earth website [REDACTED] (accessed December 2022)

Historic England (HE) website [REDACTED] (accessed December 2022)

Historic England Aerial Photography Maps [REDACTED] Accessed December 2022)

Heritage Gateway website [REDACTED] (accessed December 2022)

National Library of Scotland (NLS) [REDACTED] / (accessed February 2025)

APPENDICES

Appendix 1: Survey Equipment and Data Processing

Survey methods and equipment

Bartington gradiometer

The magnetic data for this project were acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1 m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03 nT over a ± 100 nT range. All of the data are then relayed to a CS35 tablet, running the MLgrad601 software, which is used to record the survey data from the array of Grad601 probes at a rate of 10 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

Sensys gradiometer

The magnetic data for this project were acquired using a non-magnetic cart fitted with four SenSys FGM650/3 magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 0.6 m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of ± 8 μ T over ± 1000 nT range. All of the data are then relayed to a CS35 tablet, running the MONMX program, which is used to record the survey data from the array of FMG650/3 probes at a rate of 20 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Leica Captivate system with rover and base station. This receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) for geophysical surveys.

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.01 m intervals along traverses spaced up to 0.25m apart.

Post-processing

The magnetic data collected during the detailed survey is downloaded from Bartington and Sensys systems for processing and analysis using in-house software. This software allows for both the

data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- GPS DeStripe – Determines the median of each transect and then subtracts that value from each datapoint in the transect. May be used to remove the striping effect seen within a survey caused by directional effects, drift, etc.
- GPS Base Interpolation – Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).
- Discard Overlaps - Intended to eliminate a track(s) that have been collected too close to one another. Without this, the results of the interpolation process can be distorted as it tries to accommodate very close points with potentially differing values.

Typical displays of the data used during processing and analysis:

- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.
- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.

Appendix 2: Geophysical Interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

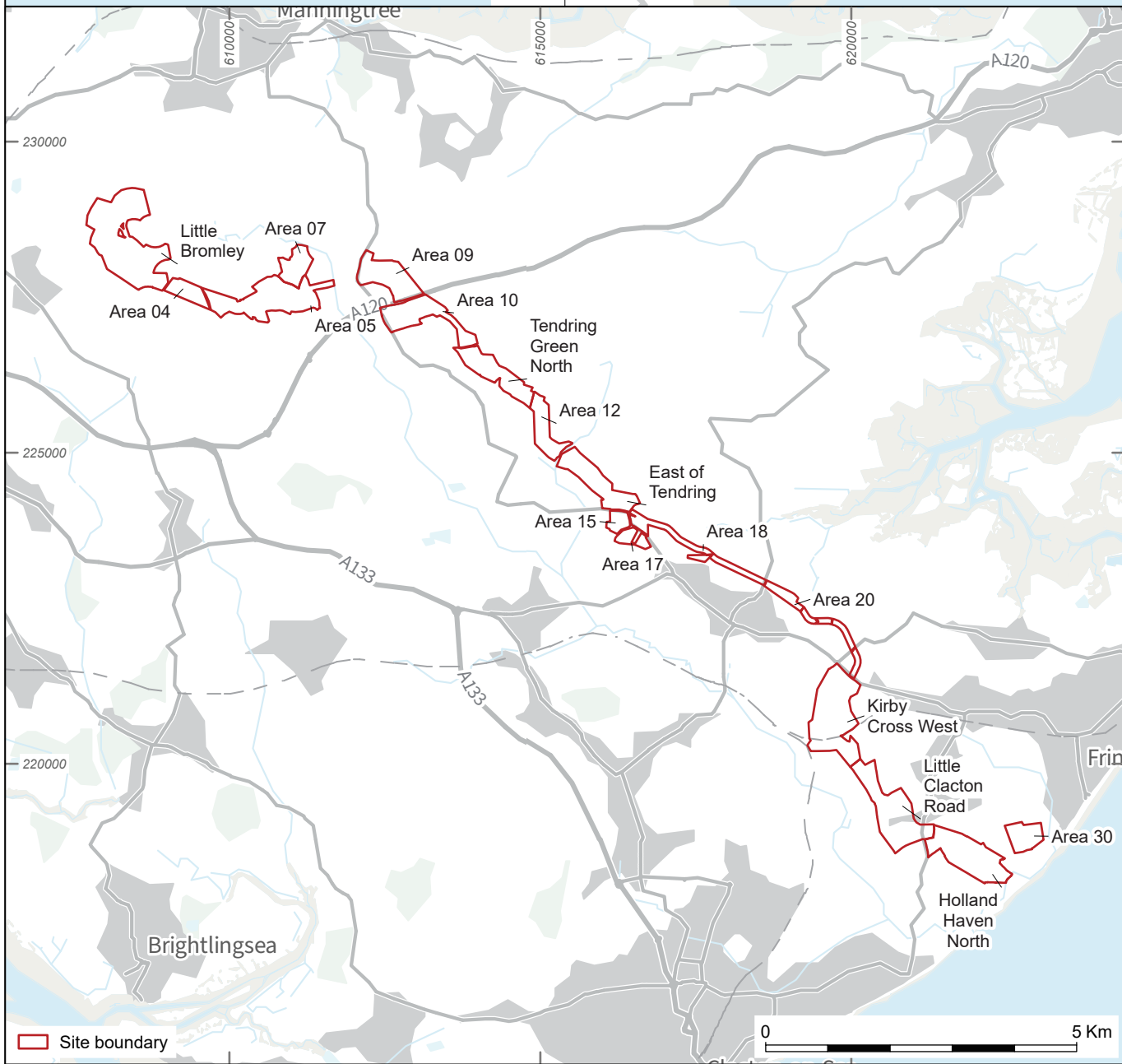
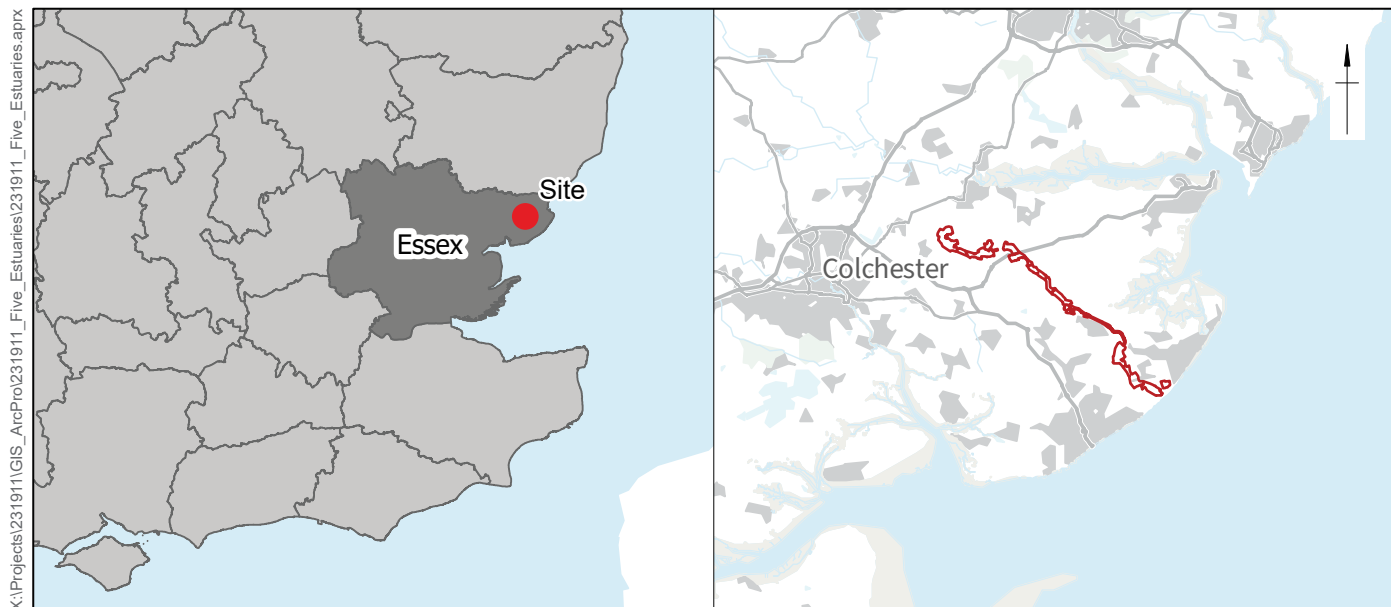
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:


- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

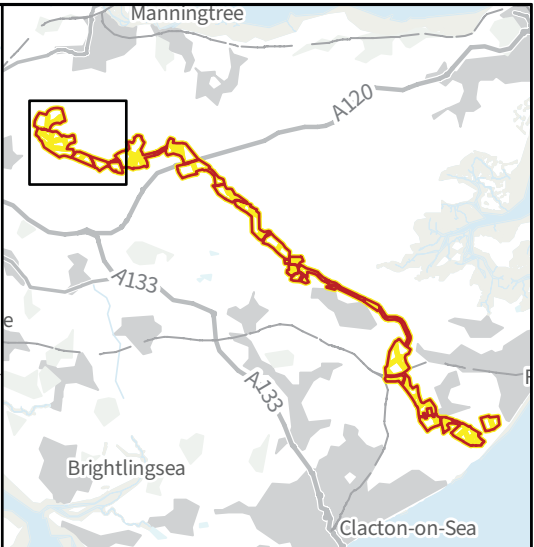
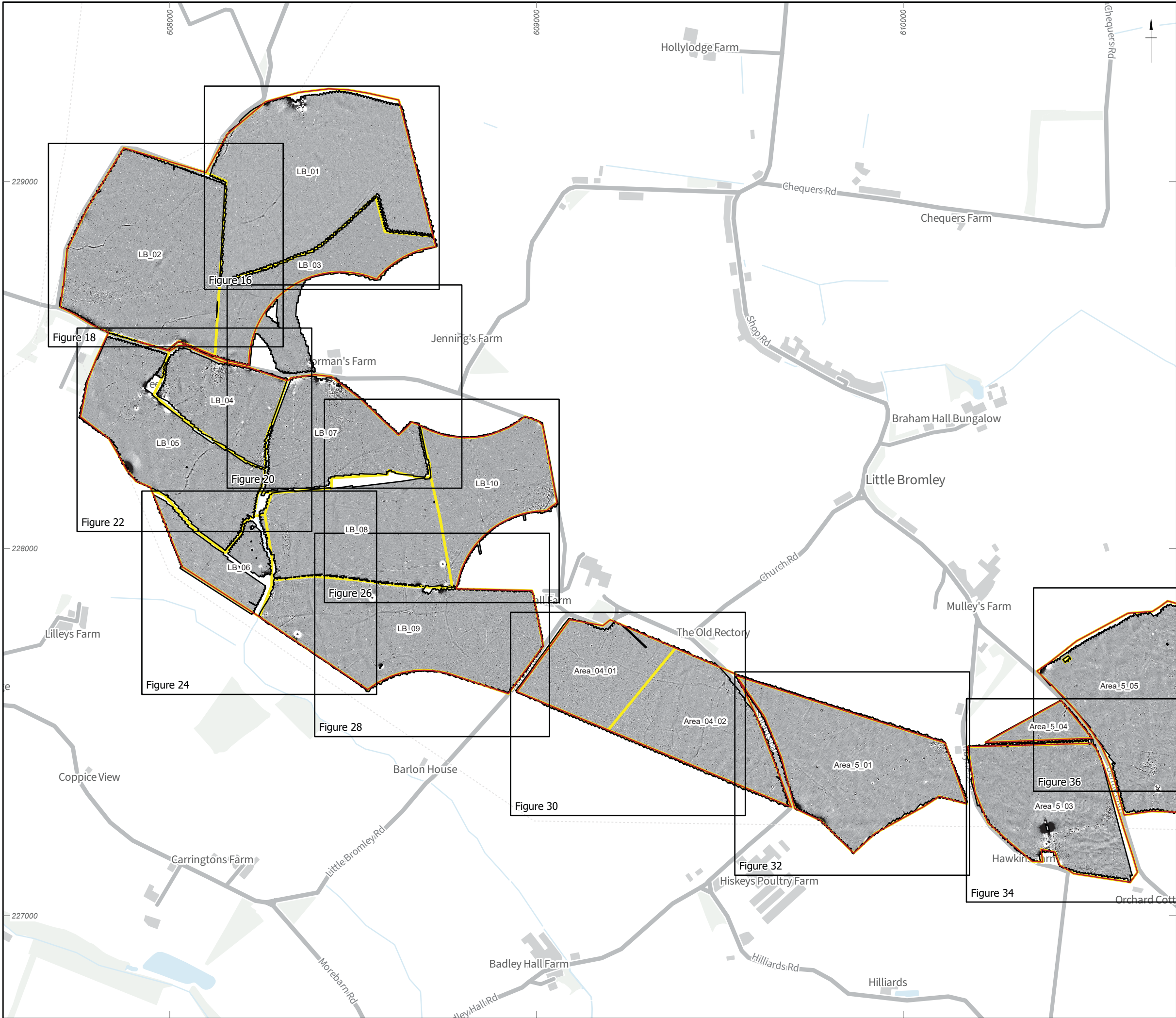
The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.



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Figure 1: Site location and survey extents				



- Site boundary
- Land parcel
- Detailed survey extent

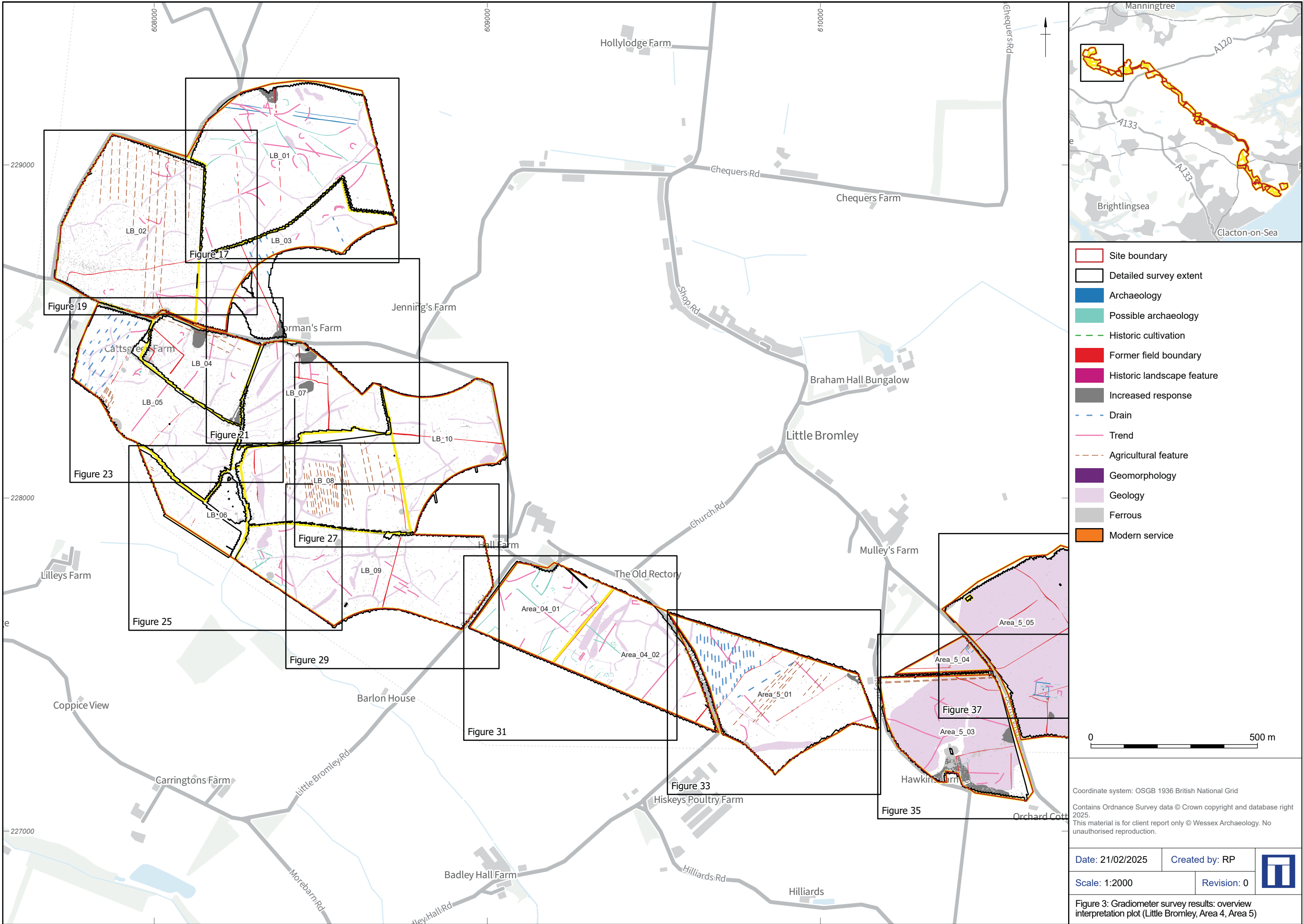


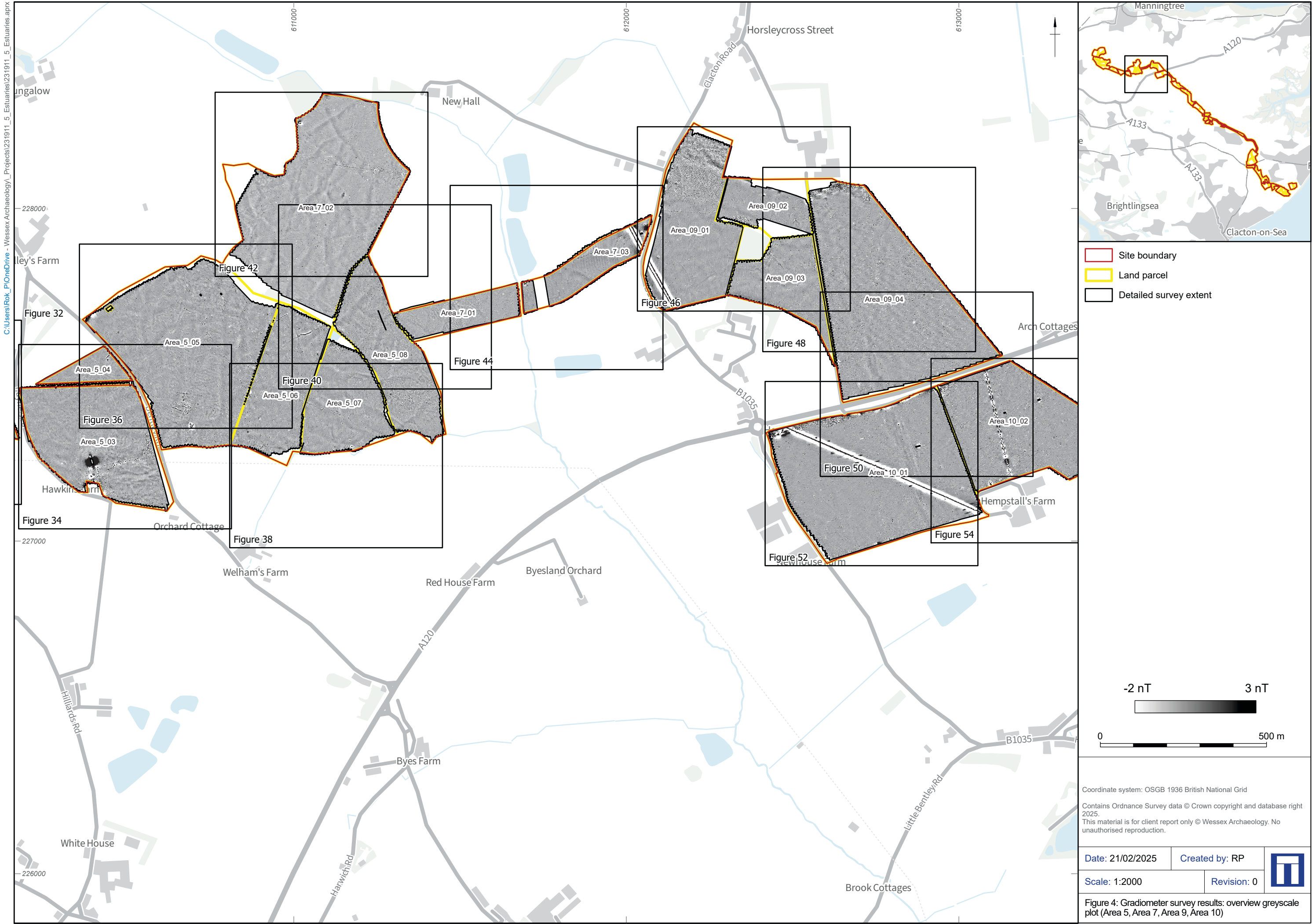
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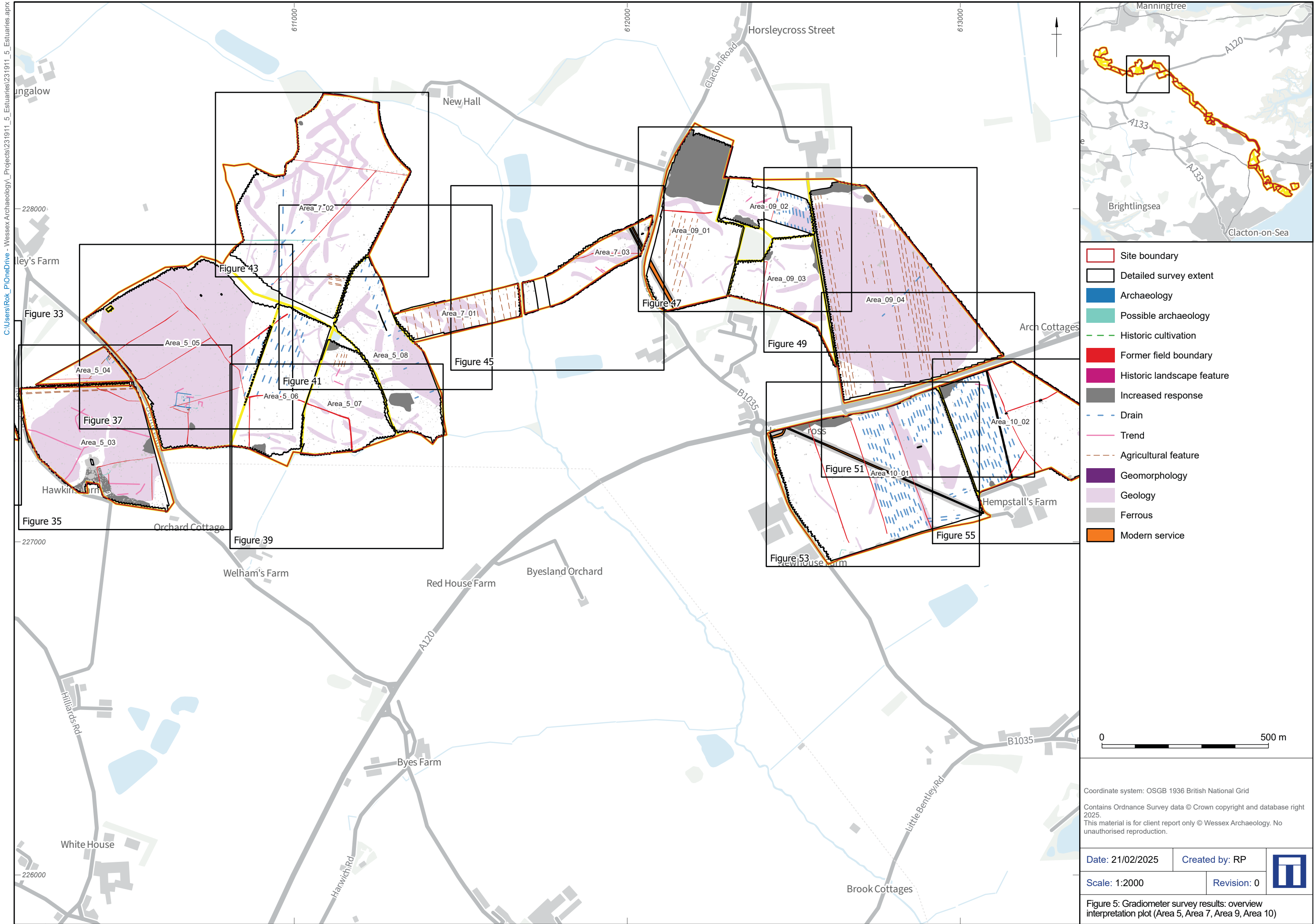
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Figure 2: Gradiometer survey results: overview greyscale plot (Little Bromley, Area 4, Area 5)

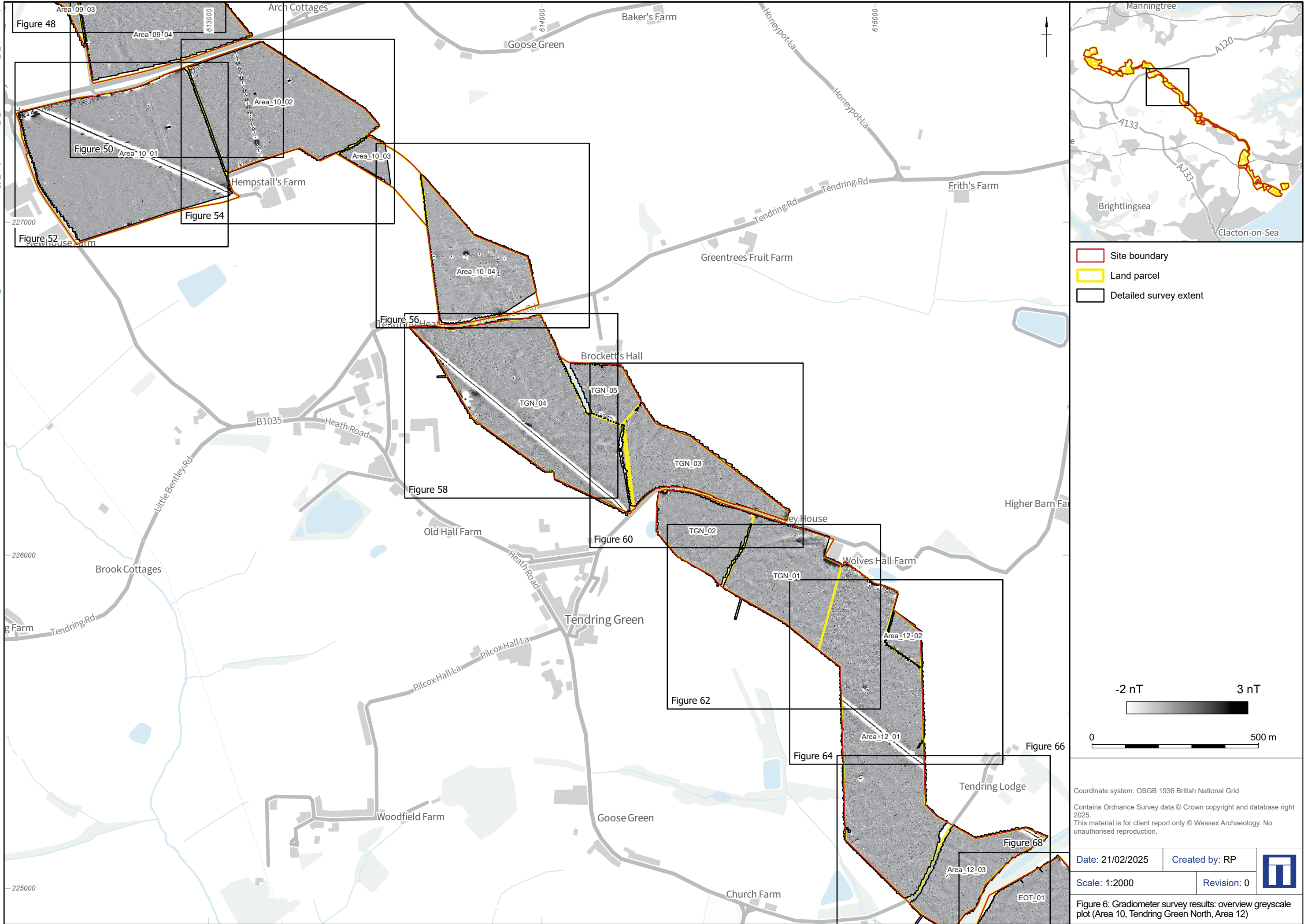
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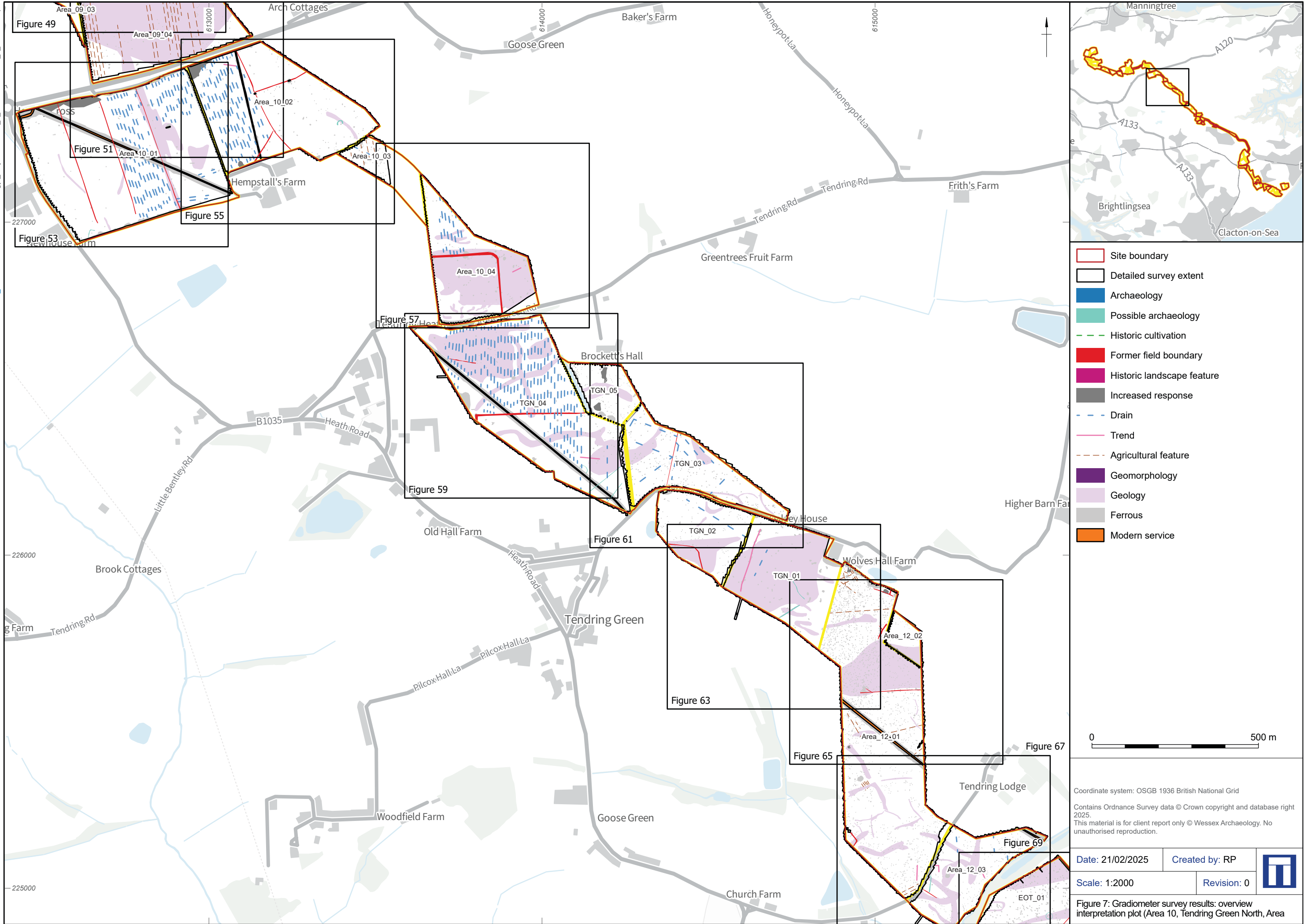


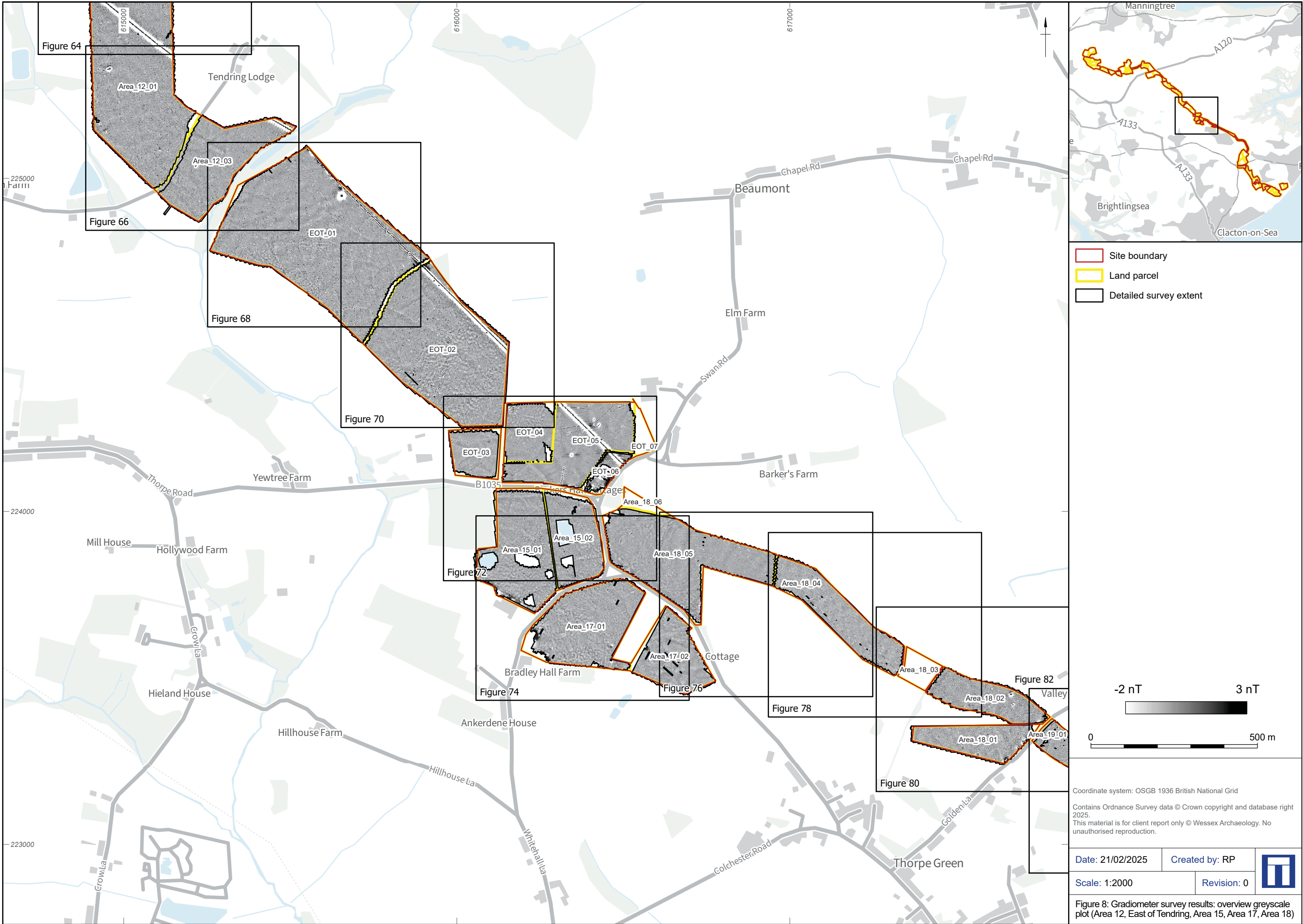


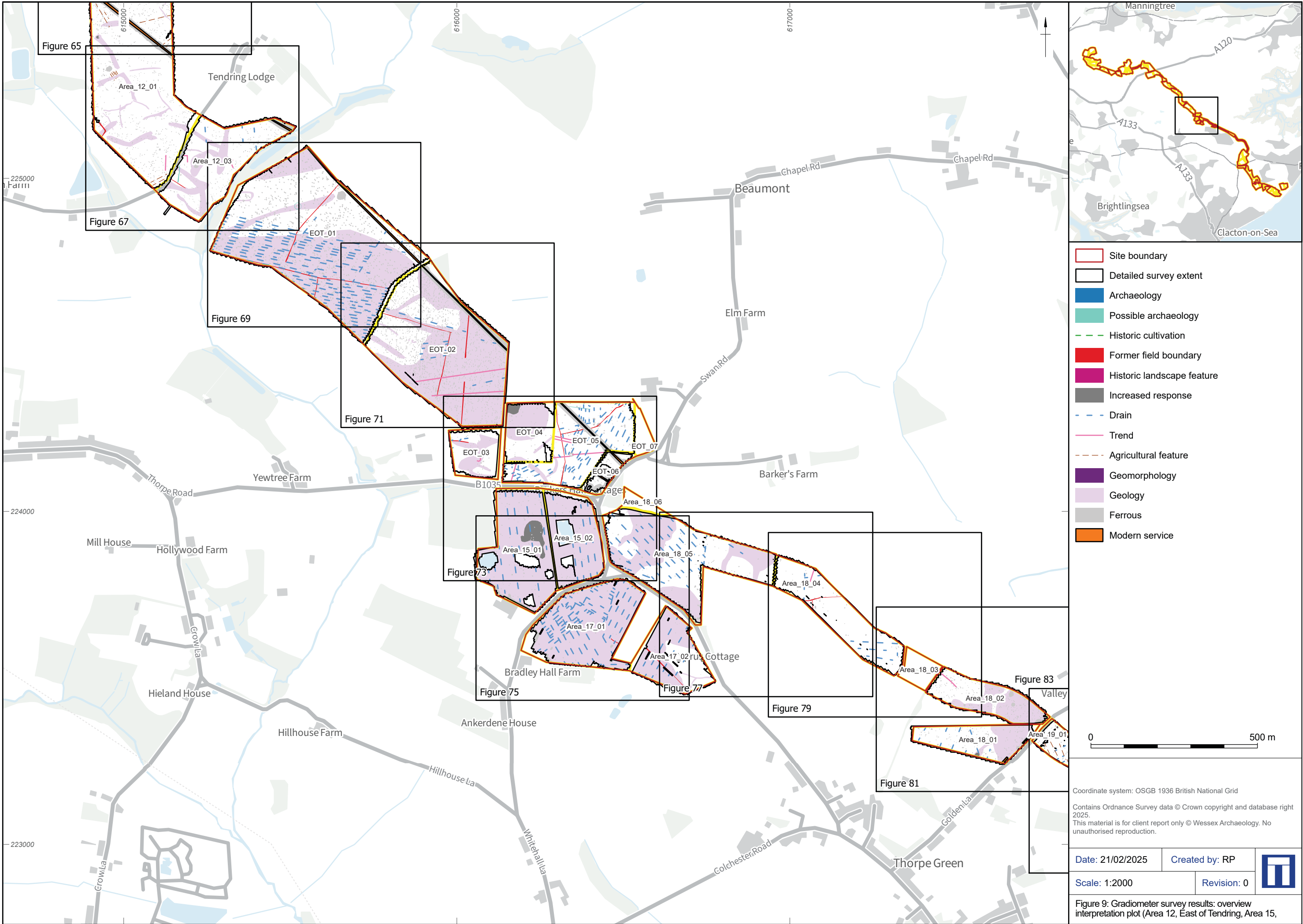
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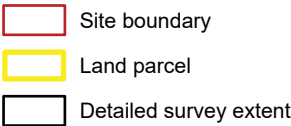


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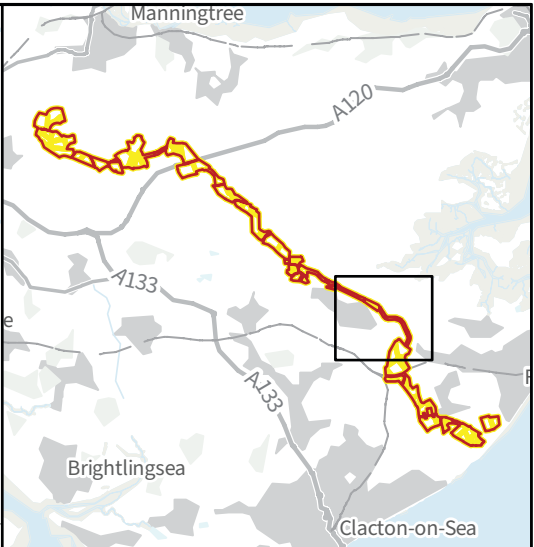
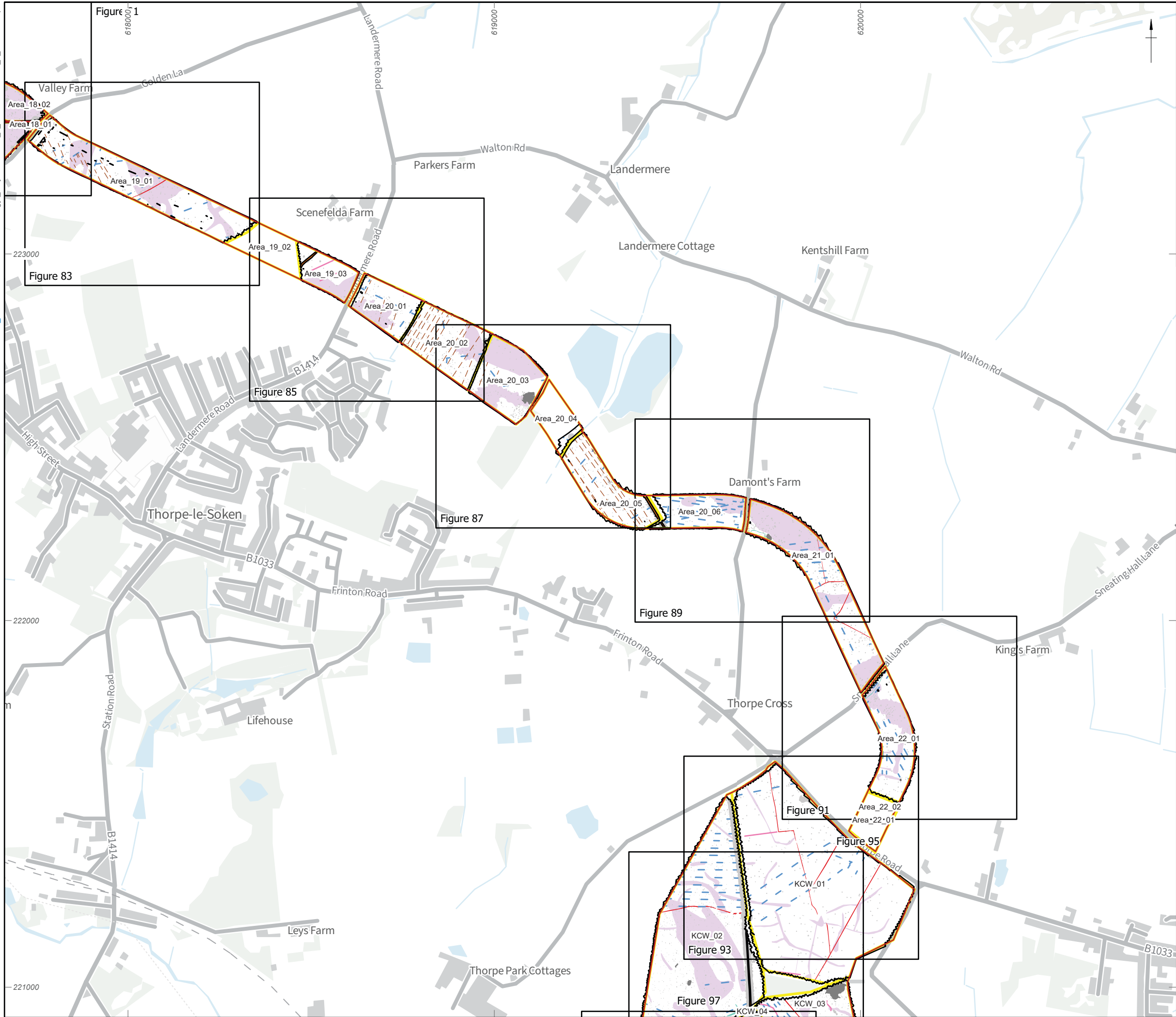
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Figure 10: Gradiometer survey results: overview greyscale plot (Area 18, Area 20)

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 Site boundary	
 Detailed survey extent	
 Archaeology	
 Possible archaeology	
 Historic cultivation	
 Former field boundary	
 Historic landscape feature	
 Increased response	
 Drain	
 Trend	
 Agricultural feature	
 Geomorphology	
 Geology	
 Ferrous	
 Modern service	

0 500 m

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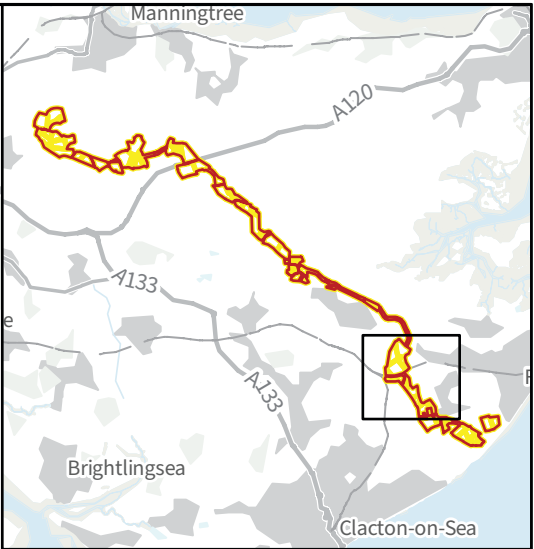
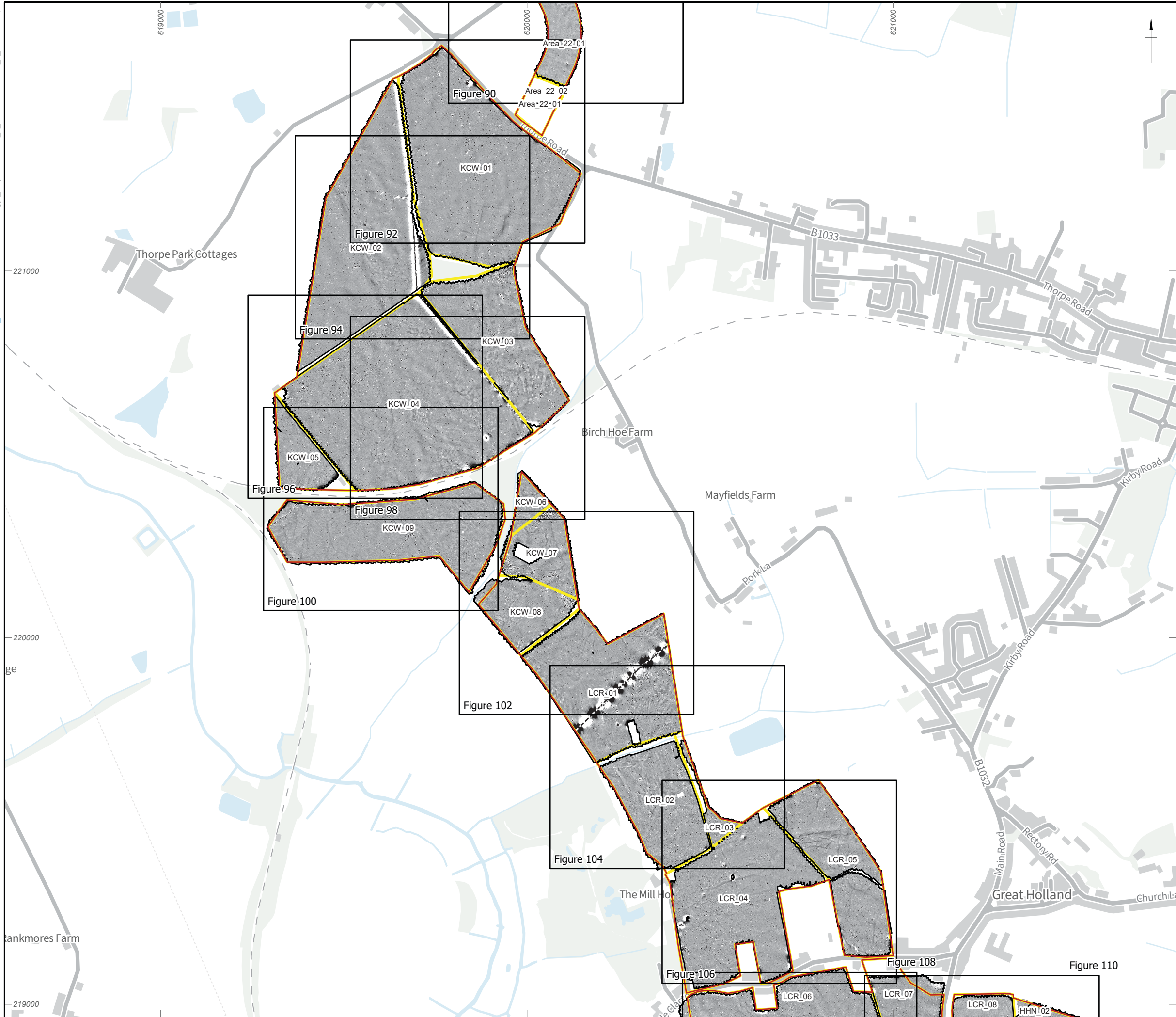
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Figure 11: Gradiometer survey results: overview interpretation plot (Area 18, Area 20)



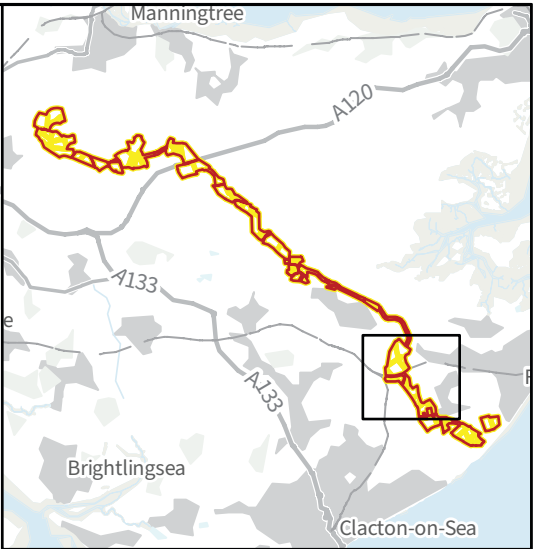
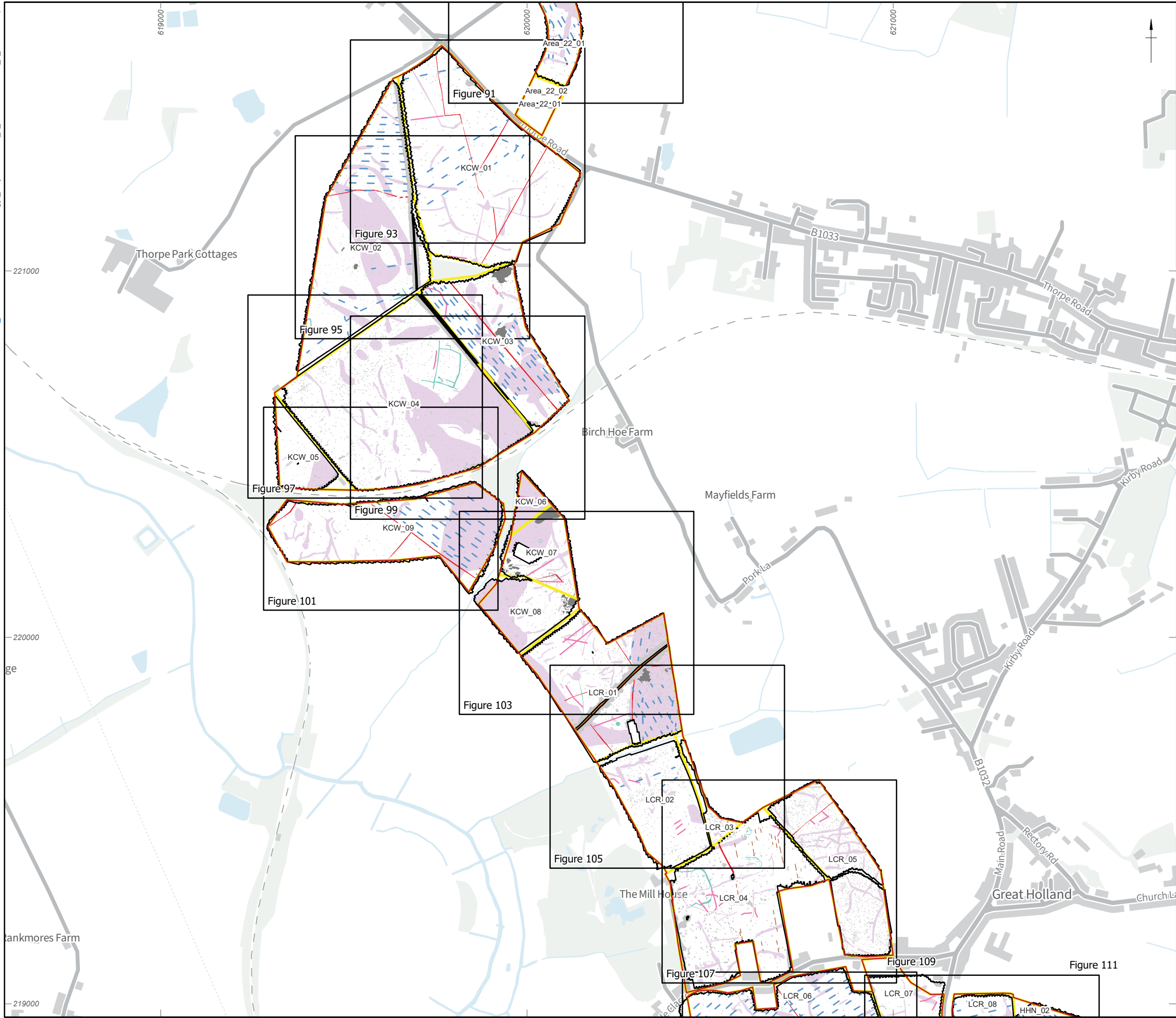
- Site boundary
- Land parcel
- Detailed survey extent



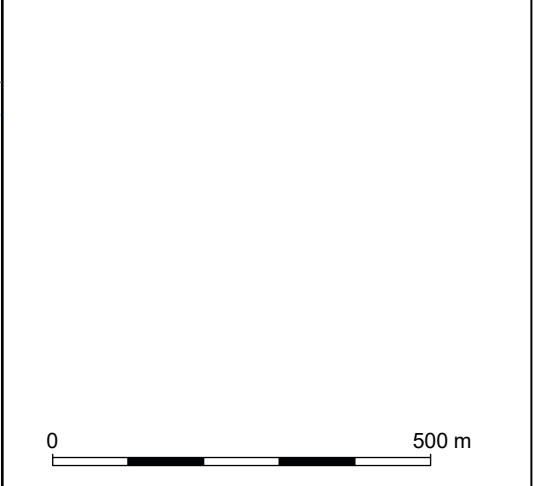
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Figure 12: Gradiometer survey results: overview greyscale plot Kirby Cross West, Little Clacton Road)



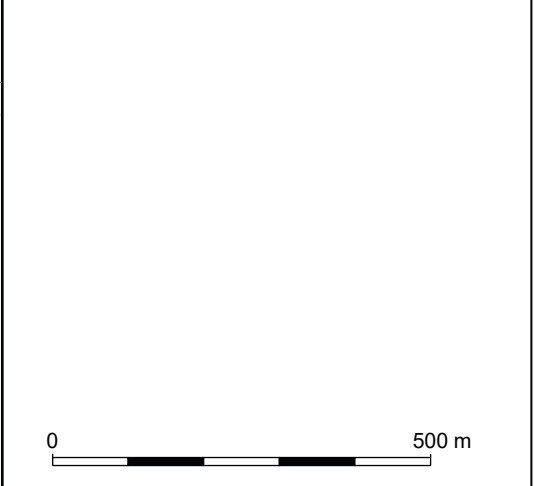
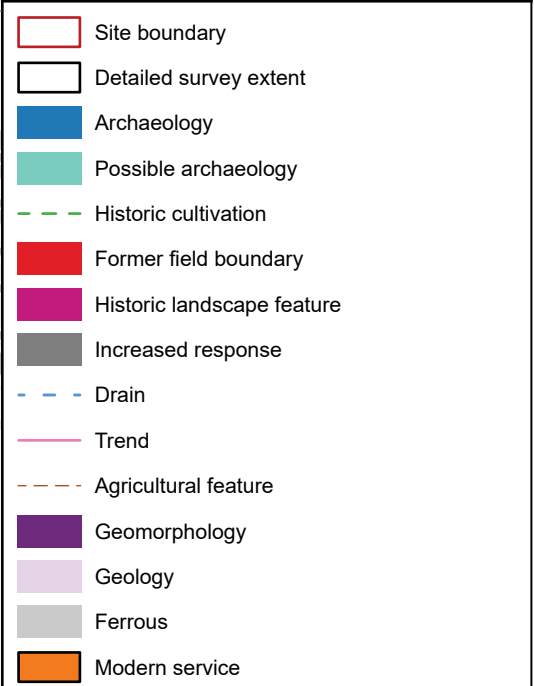
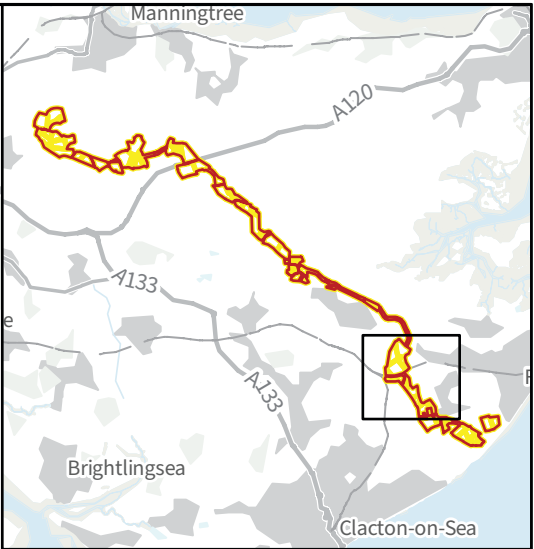
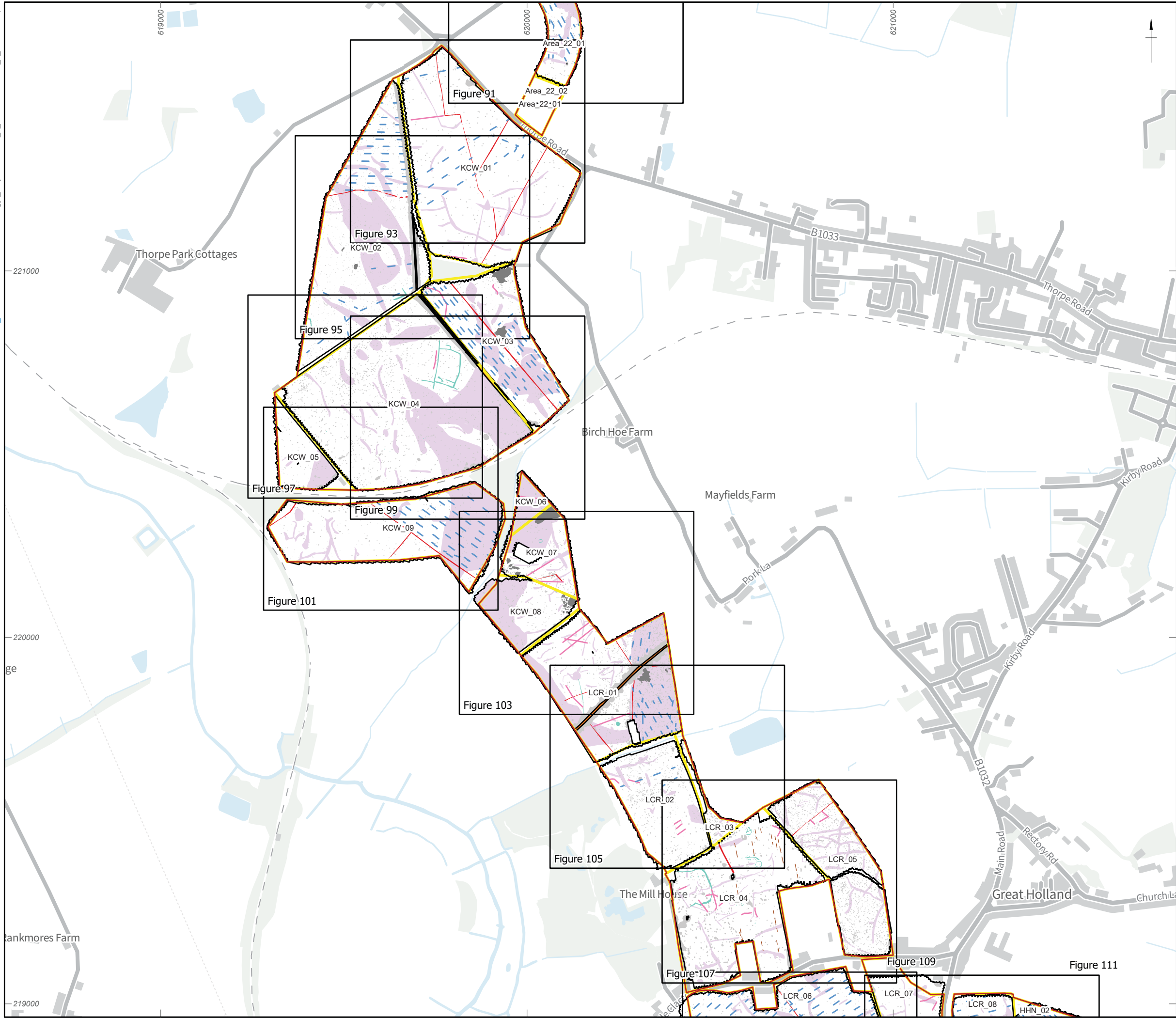
- Site boundary
- Detailed survey extent
- Archaeology
- Possible archaeology
- Historic cultivation
- Former field boundary
- Historic landscape feature
- Increased response
- Drain
- Trend
- Agricultural feature
- Geomorphology
- Geology
- Ferrous
- Modern service




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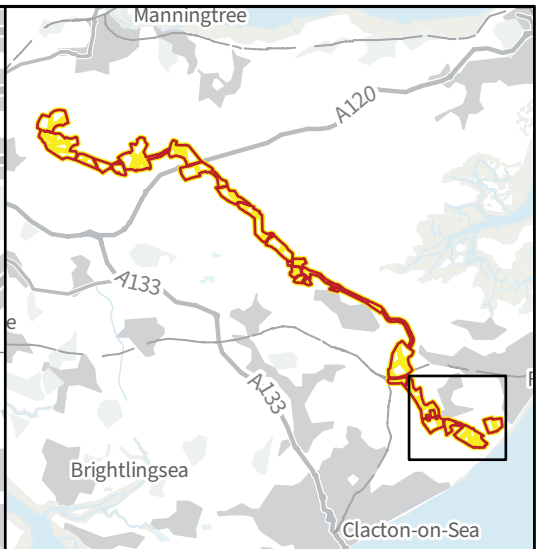
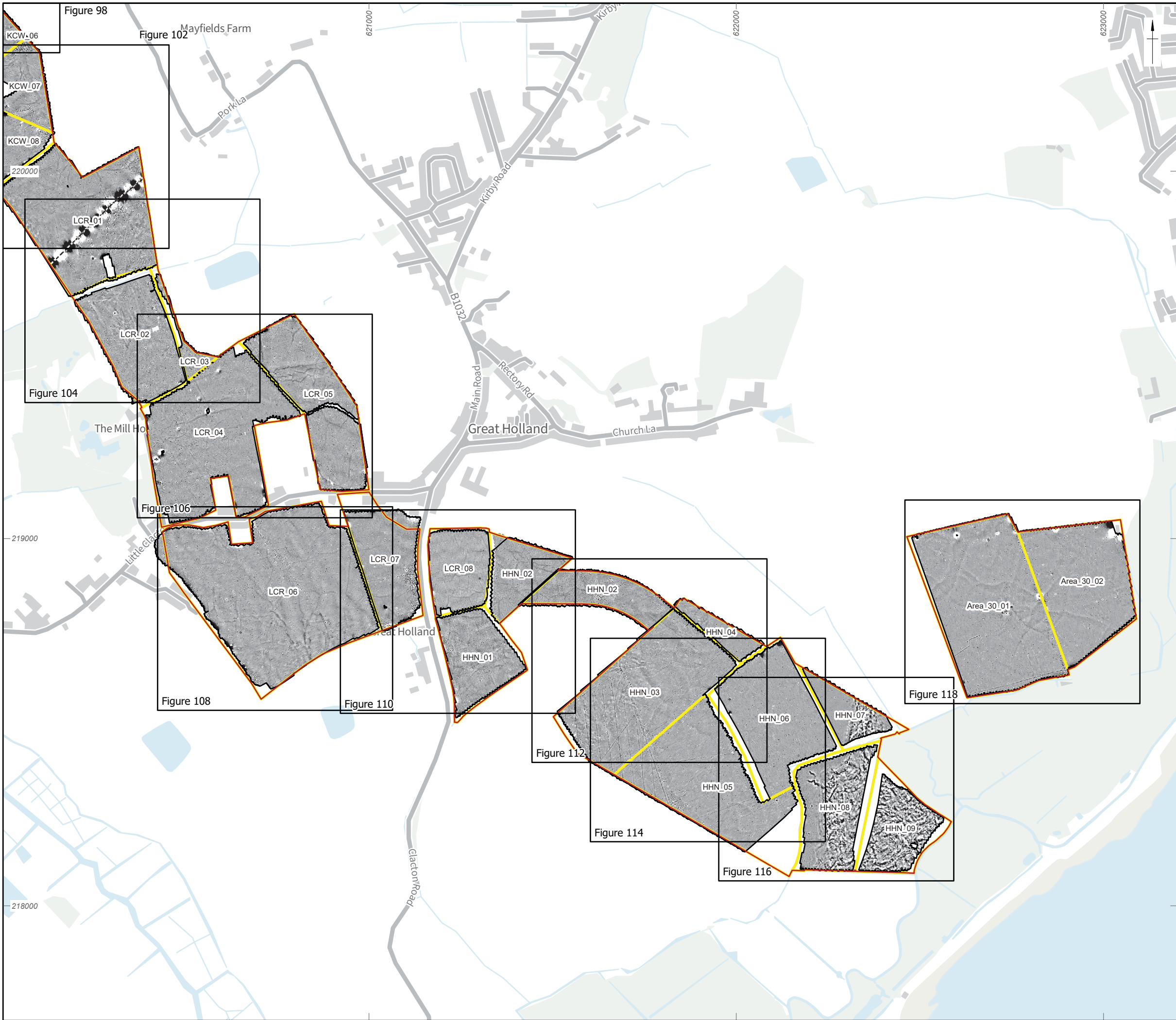
Figure 13: Gradiometer survey results: overview interpretation plot Kirby Cross West, Little Clacton Road)



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Figure 13: Gradiometer survey results: overview interpretation plot Kirby Cross West, Little Clacton Road)		

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- Site boundary
- Land parcel
- Detailed survey extent

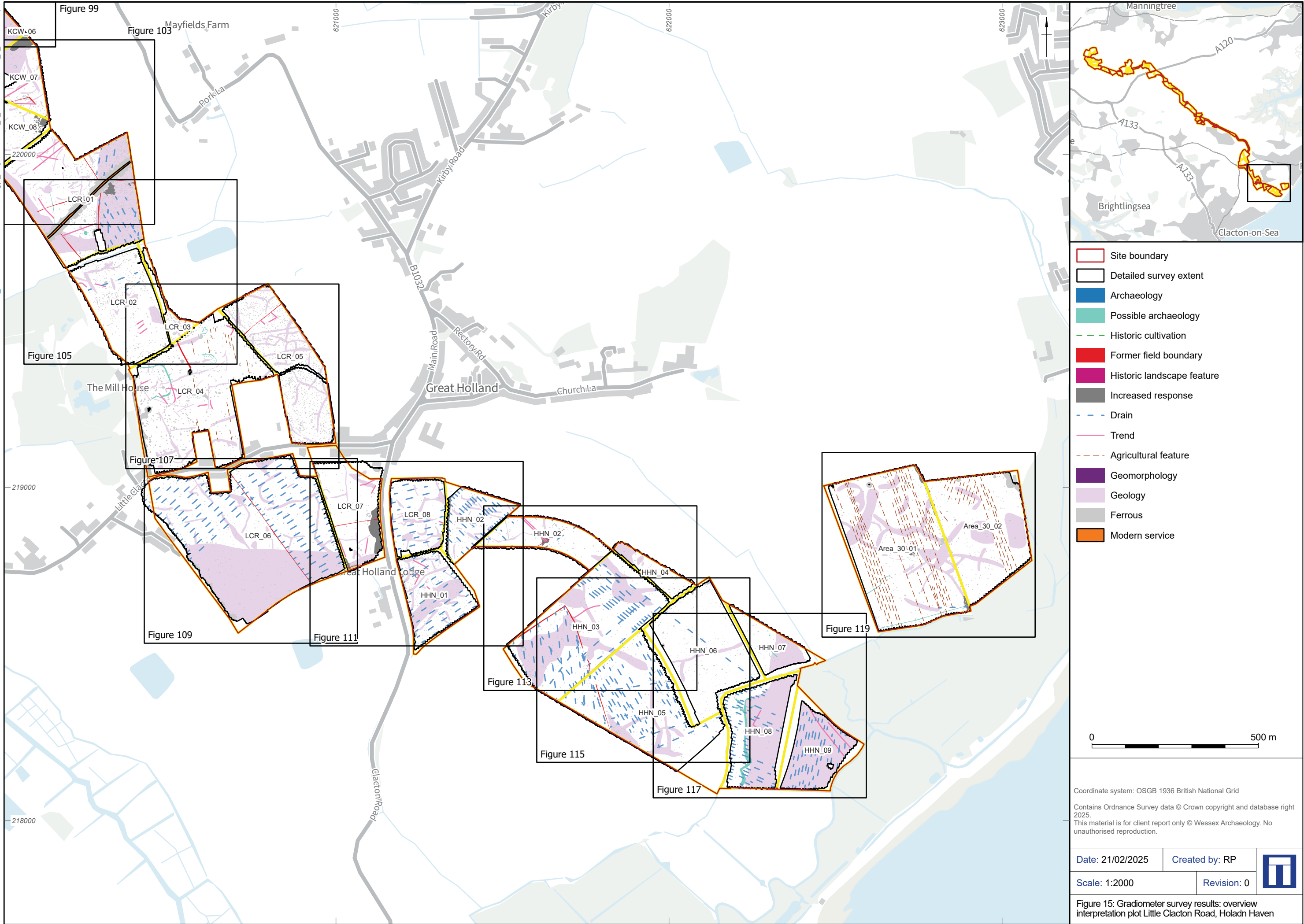


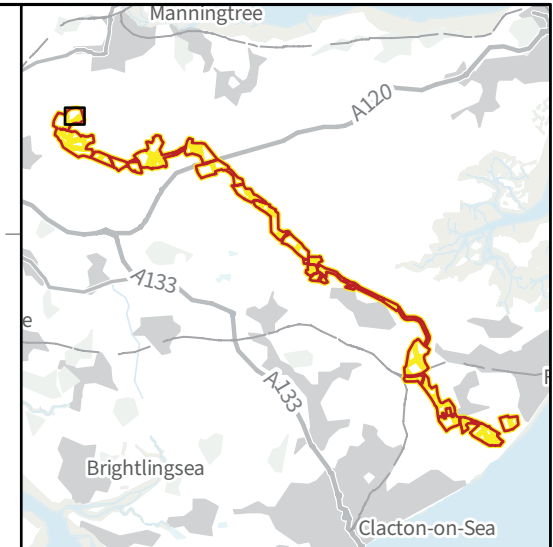
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Figure 14: Gradiometer survey results: overview greyscale plot Little Clacton Road, Holadn Haven North, Area 30)

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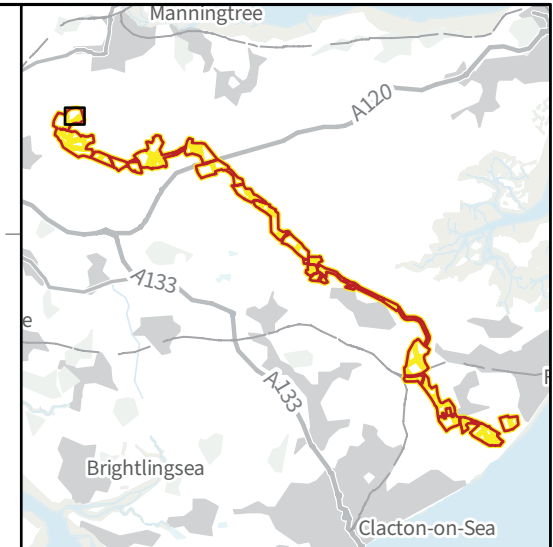
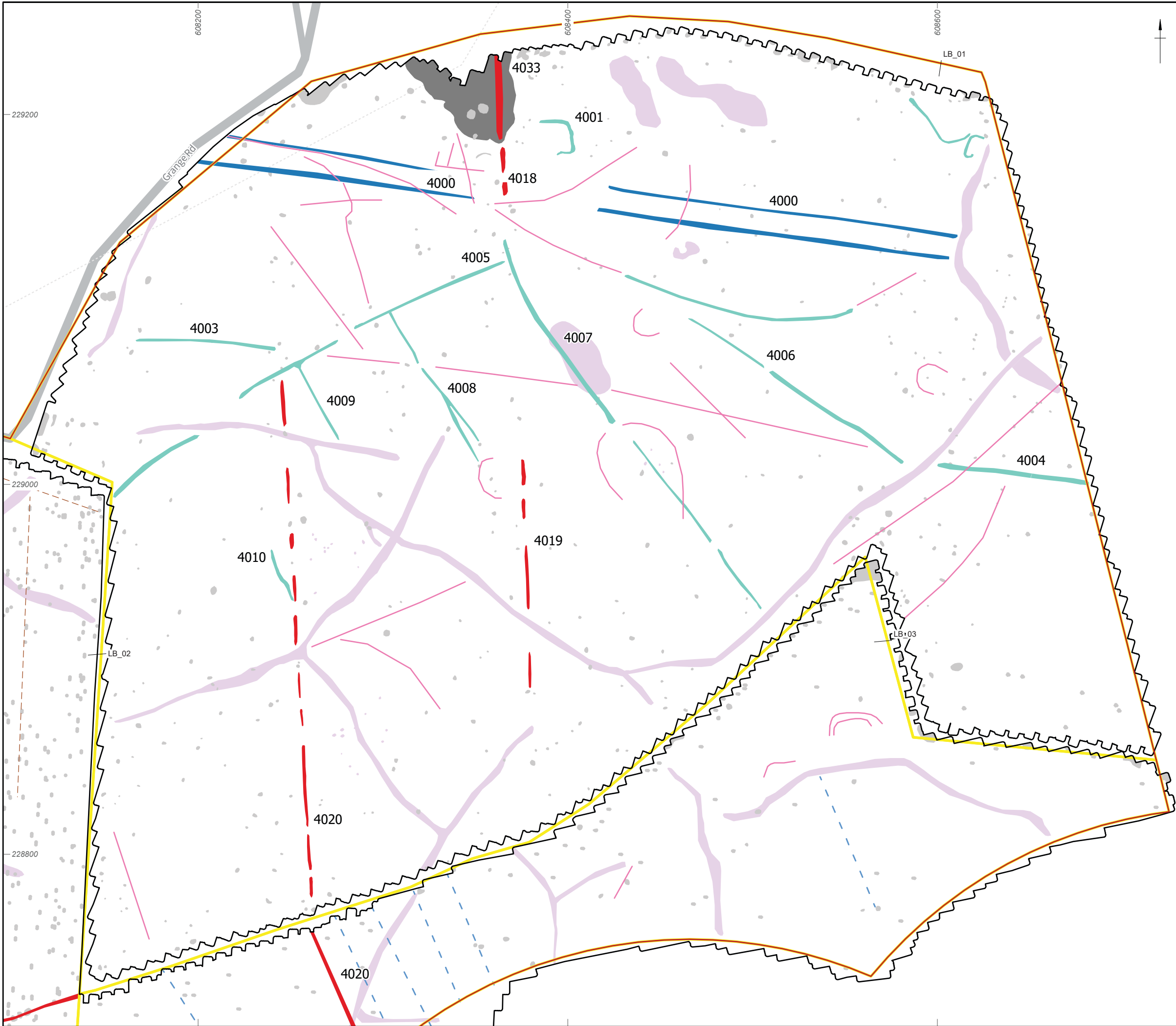
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Figure 16: Gradiometer survey results: greyscale plot (LB_03, LB_01, LB_02)



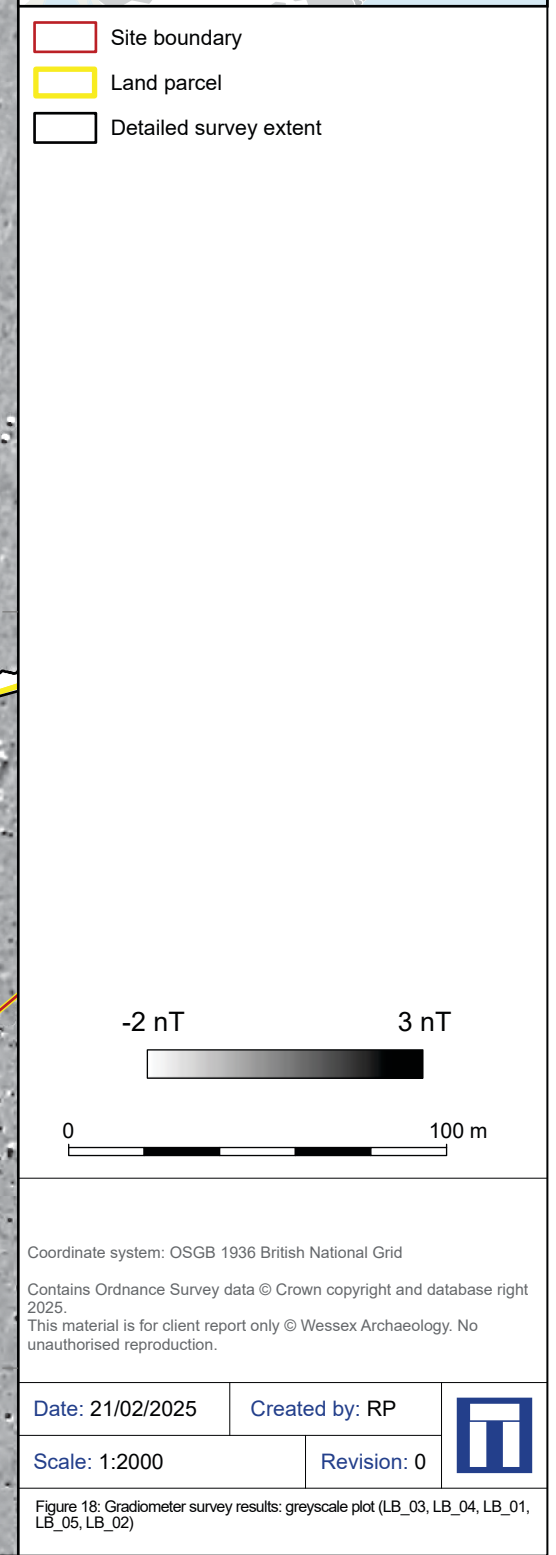
Site boundary
Land parcel
Detailed survey extent
Archaeology
Possible archaeology
Historic cultivation
Former field boundary
Historic landscape feature
Increased response
Drain
Trend
Agricultural feature
Geomorphology
Geology
Ferrous
Modern service

0 100 m

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Figure 17: Gradiometer survey results: interpretation (LB_03, LB_01, LB_02)





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HARNESSING THE POWER OF NORTH SEA WIND

North Falls Offshore Wind Farm Limited

A joint venture company owned equally by SSE Renewables and RWE.

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