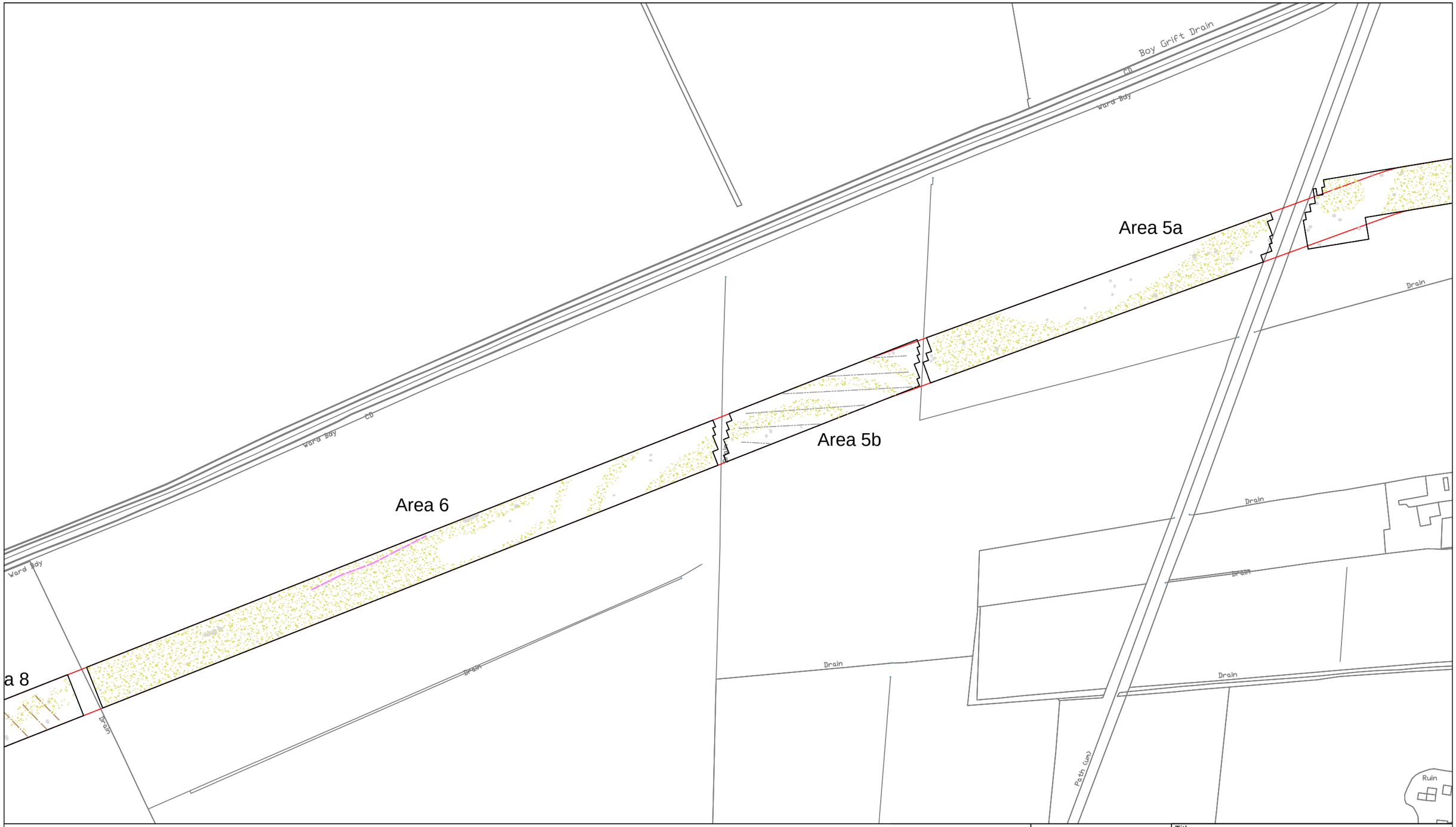


N

KEY

- 30m Survey Corridor
- Natural
- Pipe / Service
- Drain
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

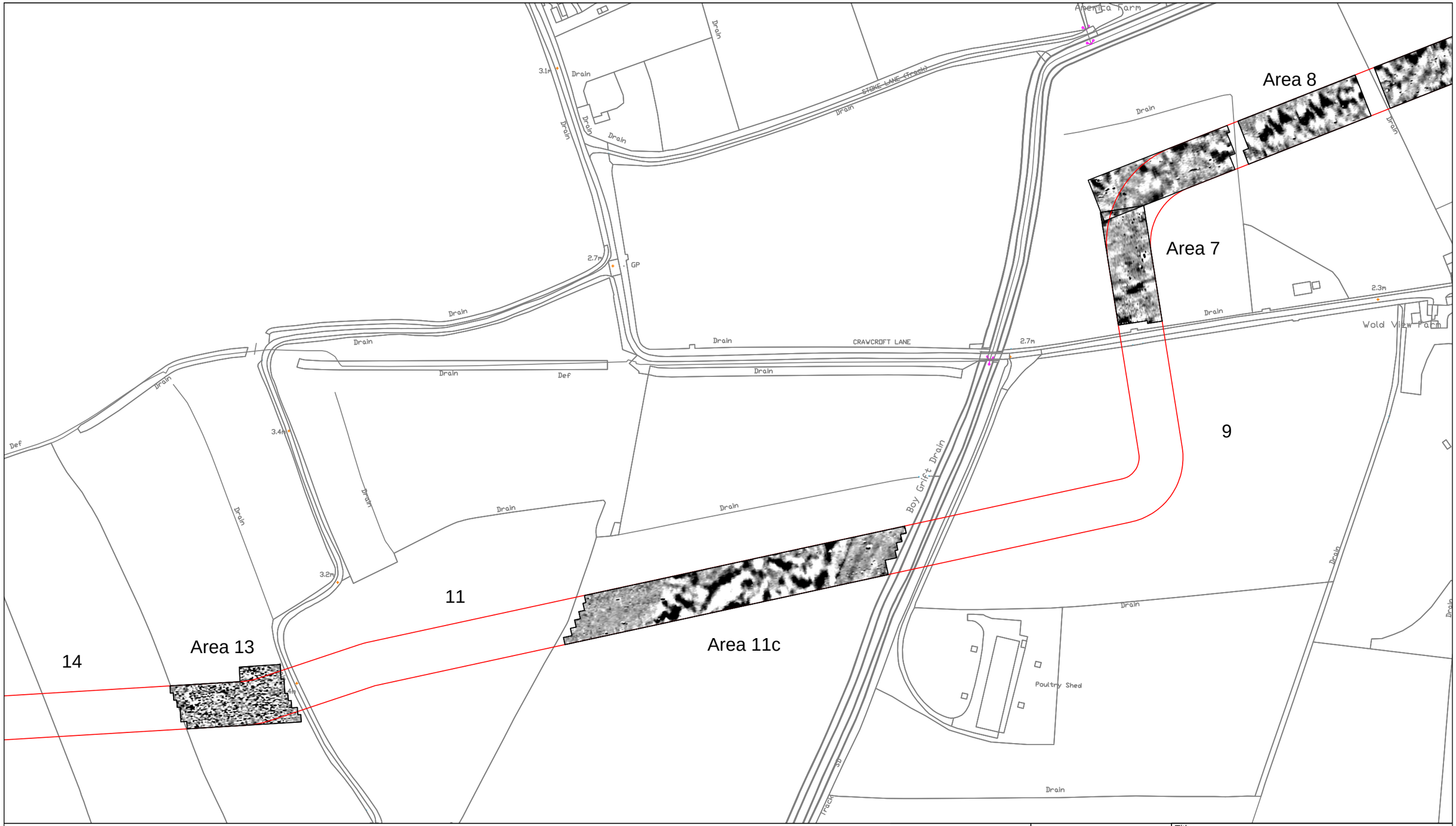
Title: Magnetometer Survey [Areas 5a, 5b and 6] Interpretation

Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 08



N

2
nT
-1

KEY

30m Survey Corridor

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

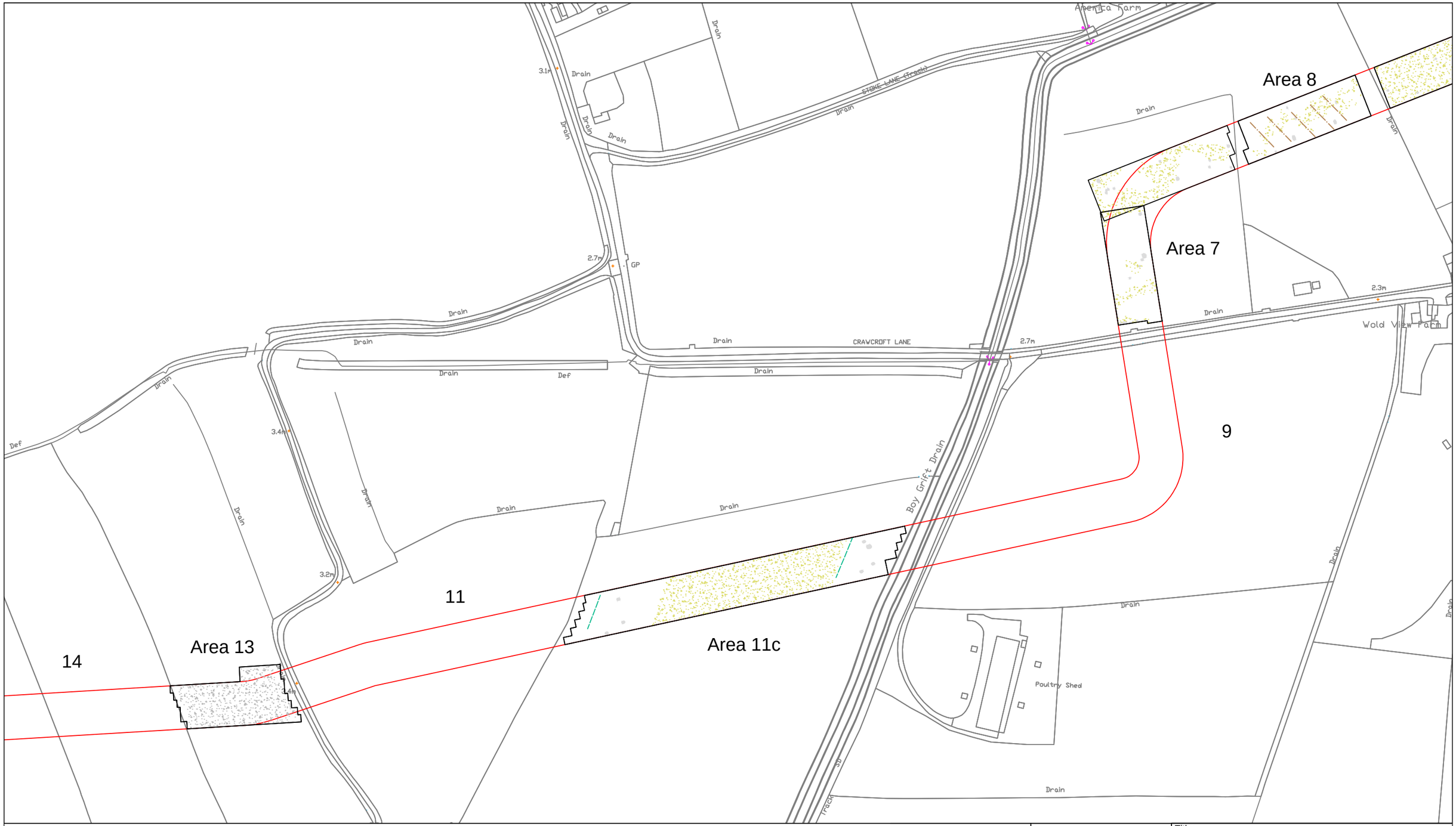
Title:
Magnetometer Survey [Areas 7, 8, 11c and 13]
Greyscale Plots

Client:
Arcadis

Project:
11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No:
09



N

KEY

- 30m Survey Corridor
- Uncertain Origin (trend)
- Natural
- Ridge and Furrow
- Magnetic Disturbance
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

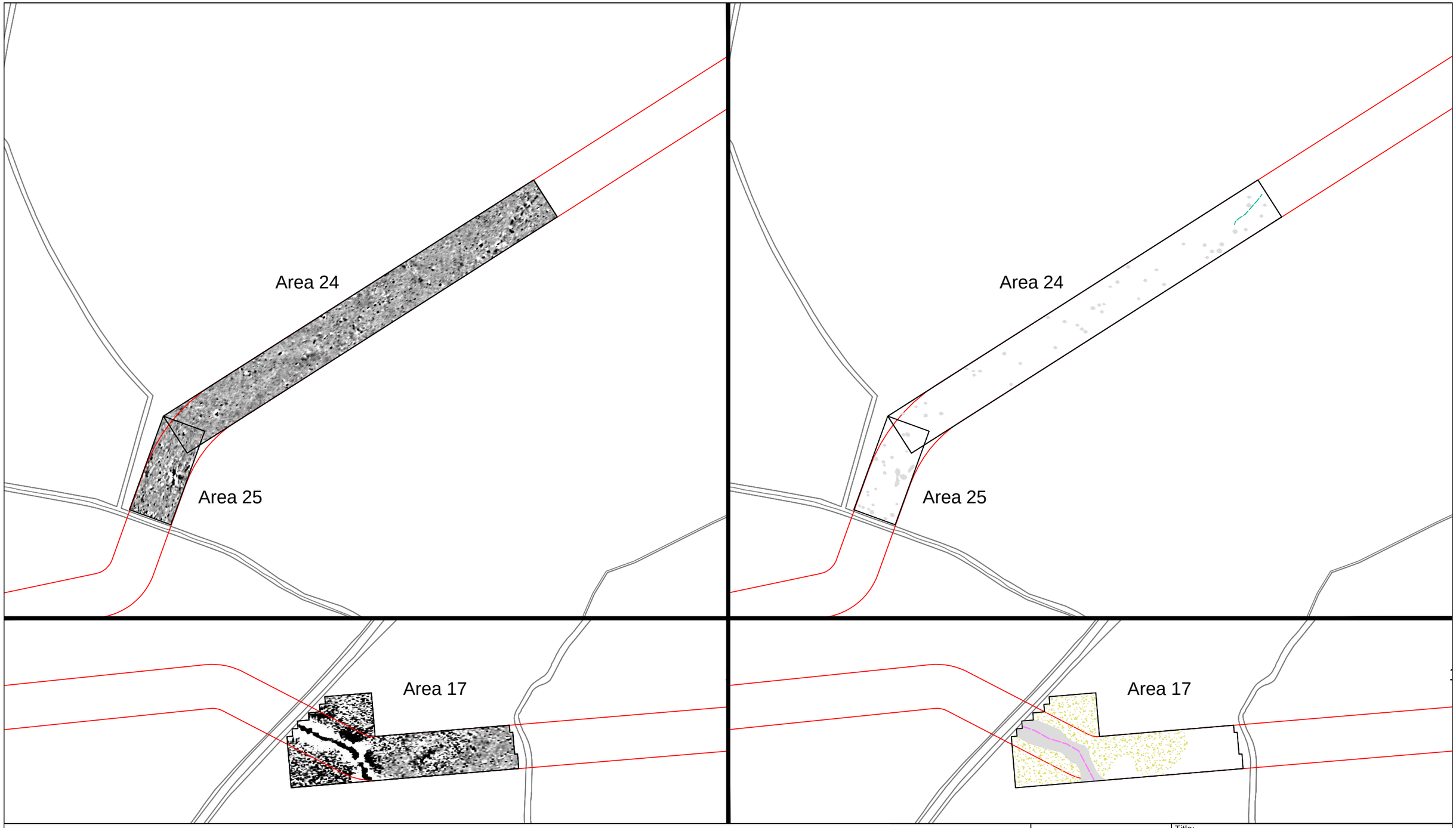
Title: Magnetometer Survey [Areas 7, 8, 11c and 13] Interpretation

Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 10



N

2
nT
-1

KEY

30m Survey Corridor

Natural

Uncertain Origin (trend)

Pipe

Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey [Areas 17, 24 and 25]
Greyscale Plots and Interpretation

Client:
Arcadis

Project:
11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No:
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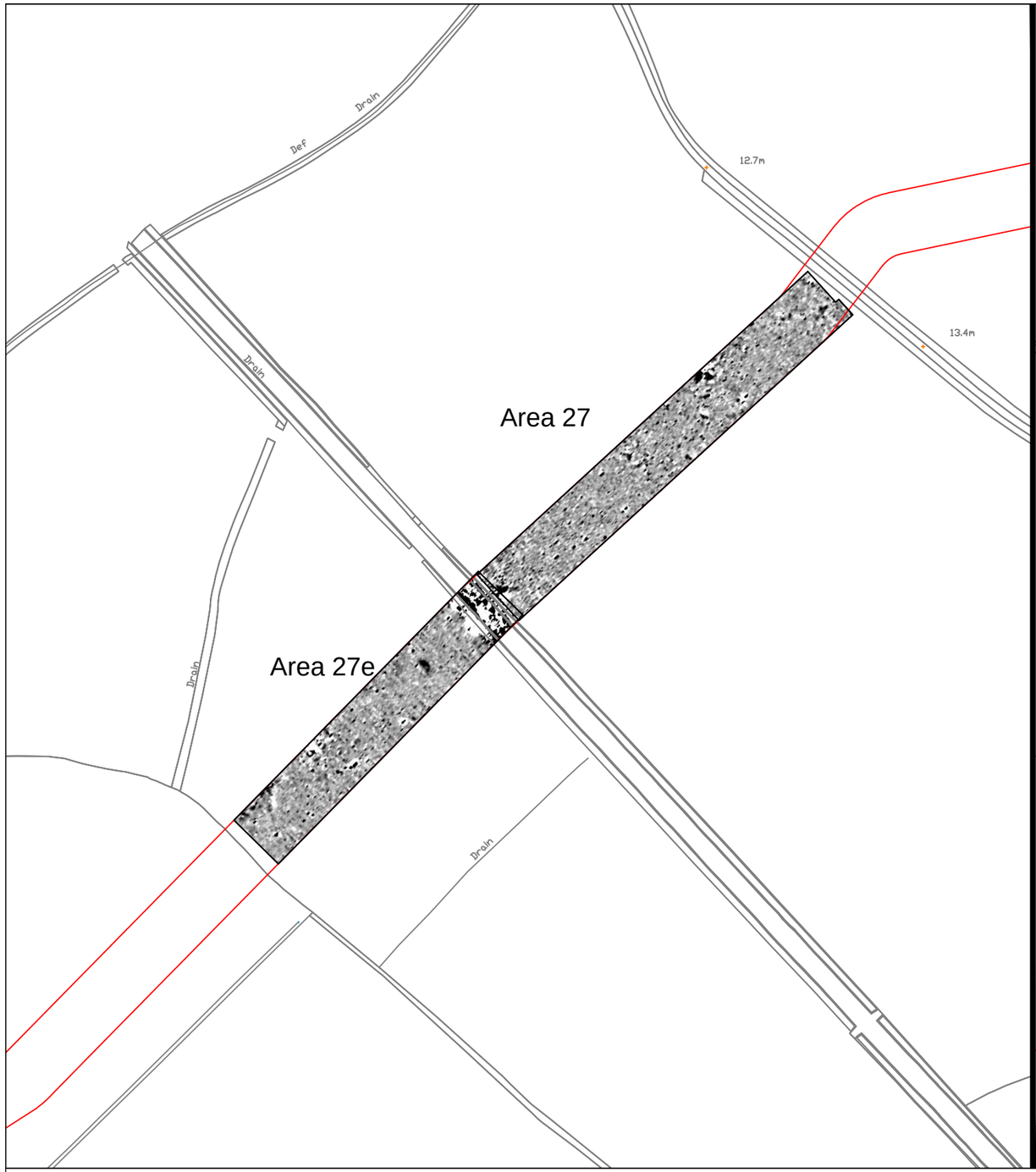

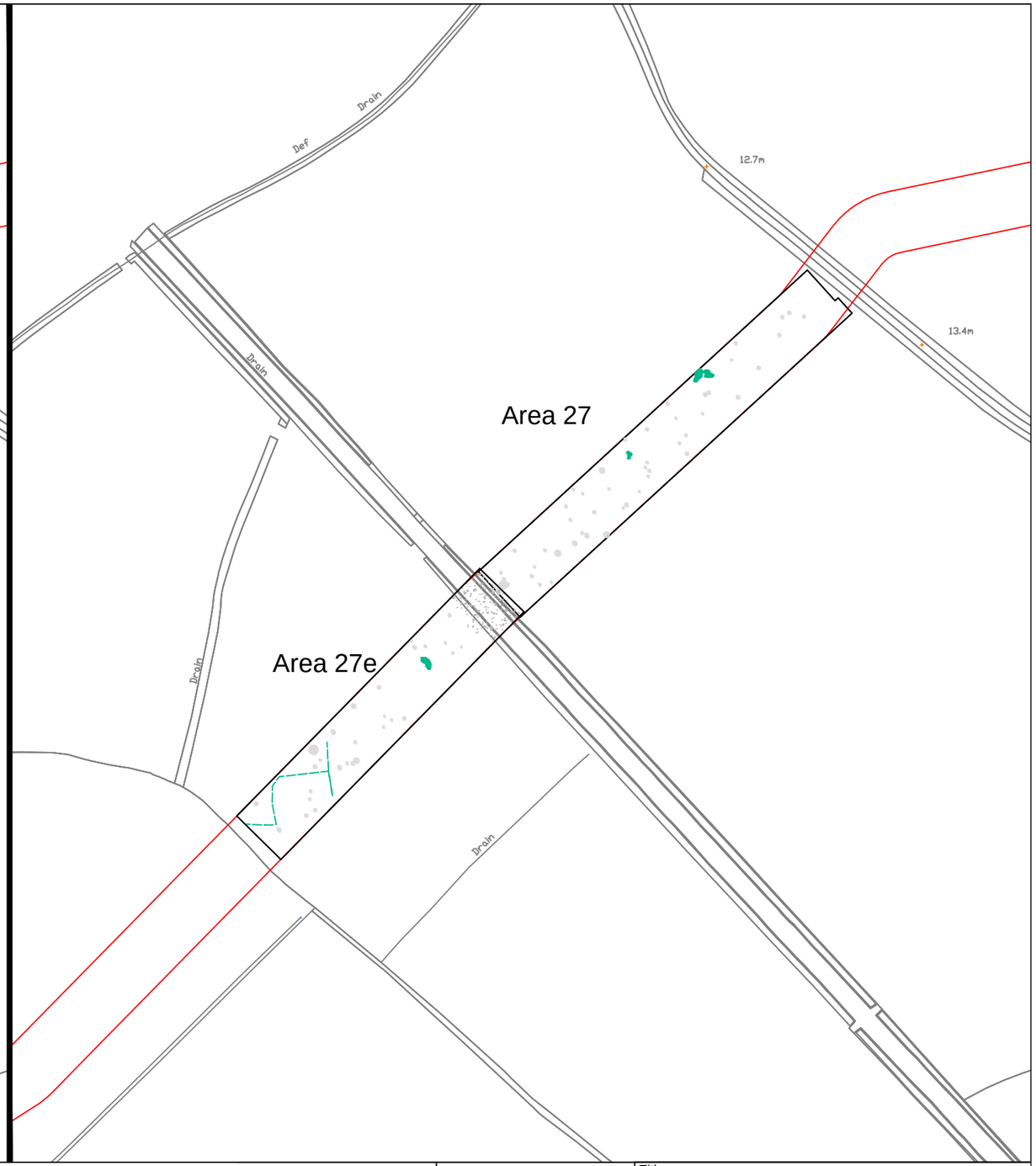

N

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KEY

- 30m Survey Corridor
- Uncertain Origin (discrete anomaly / trend)
- Magnetic Disturbance
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: Magnetometer Survey [Areas 27 and 27e] Greyscale Plots and Interpretation

Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
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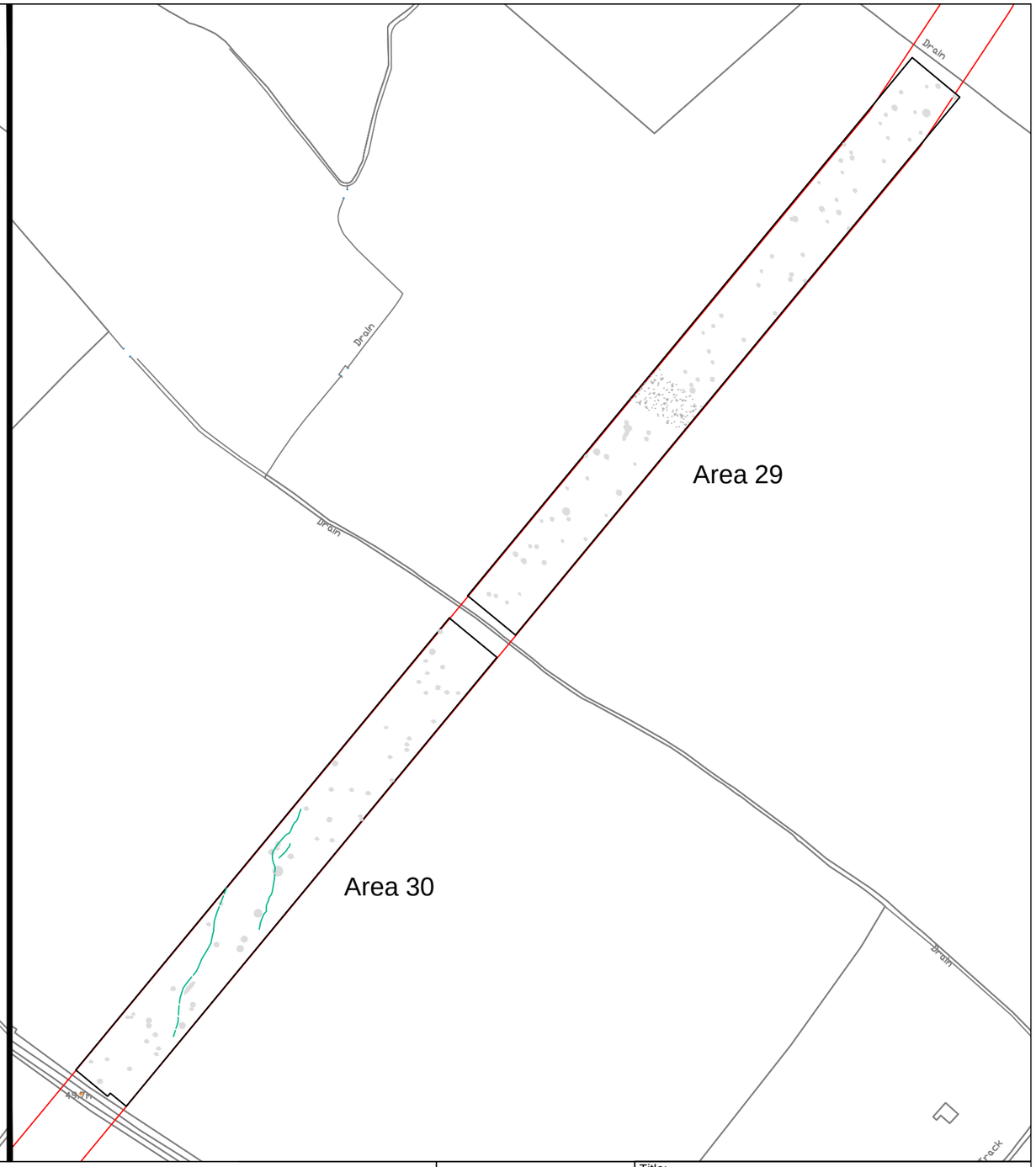


N

2
nT
-1

KEY

- 30m Survey Corridor
- Uncertain Origin (trend)
- Magnetic Disturbance
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

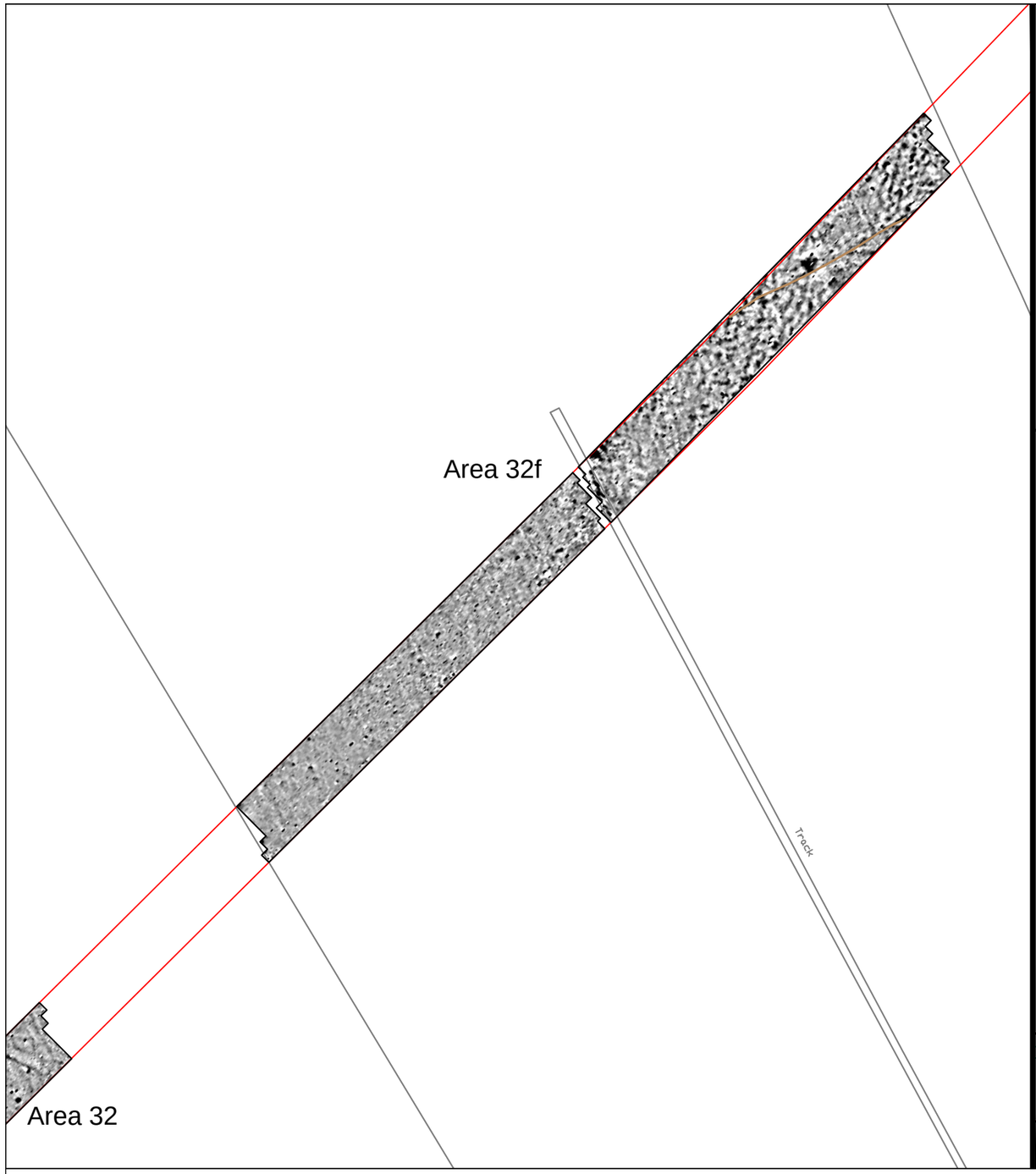
Title: Magnetometer Survey [Areas 29 and 30] Greyscale Plots and Interpretion

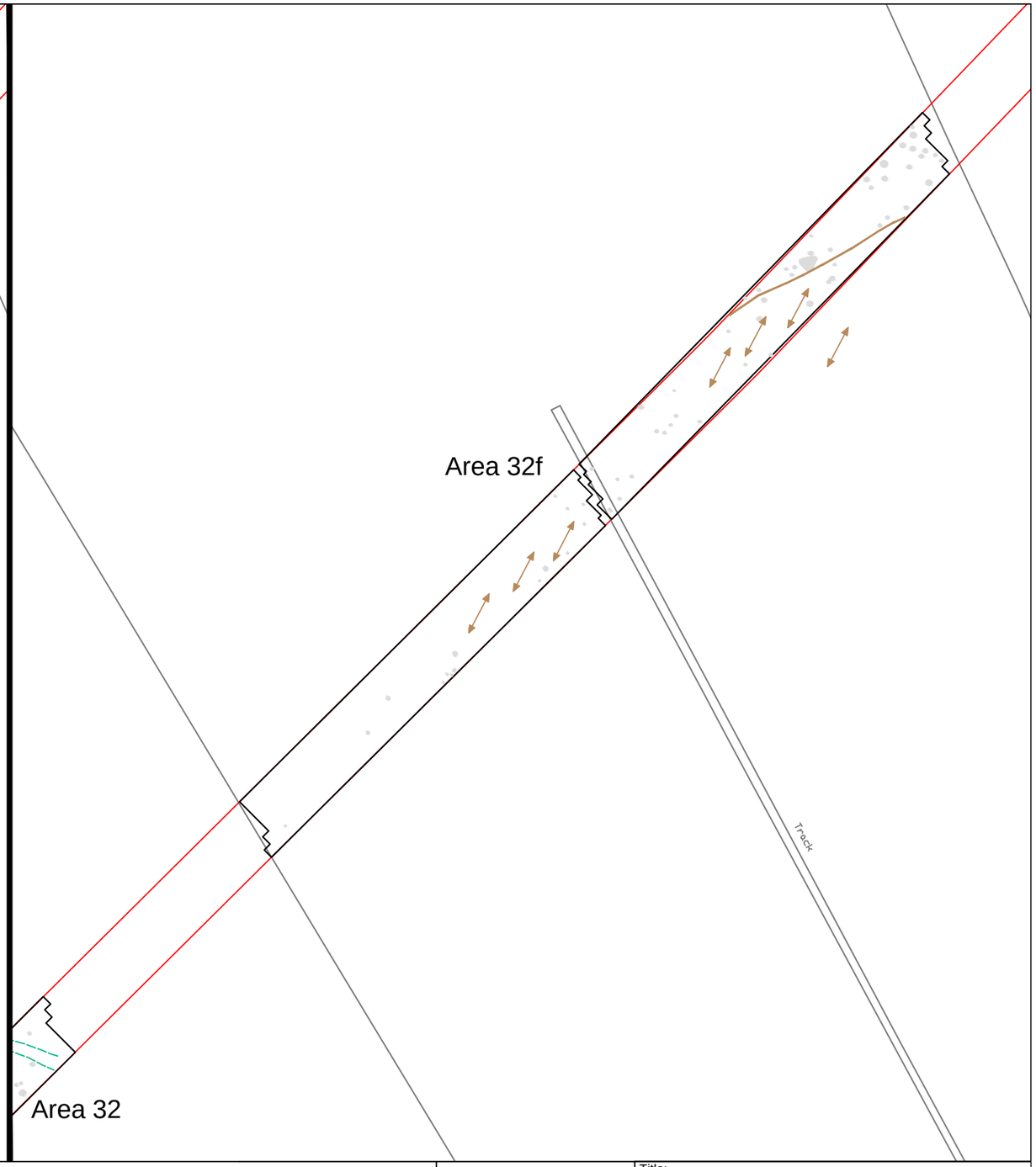
Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 13





N

2
nT
-1

KEY

30m Survey Corridor

Uncertain Origin (trend)

Former Field Boundary (Corroborated)

Ploughing

Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

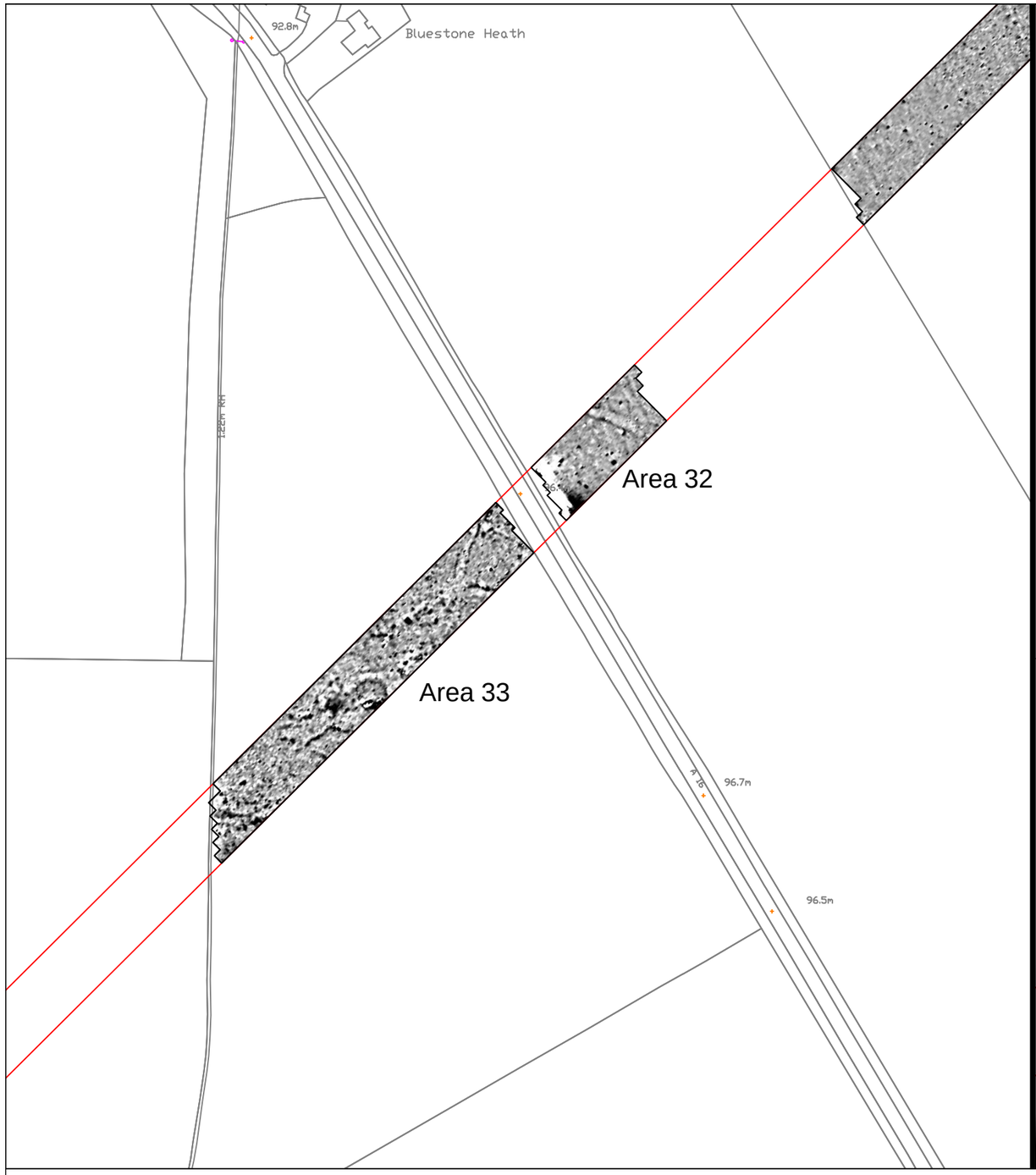
Title: Magnetometer Survey [Area 32f] Greyscale Plot and Interpretation

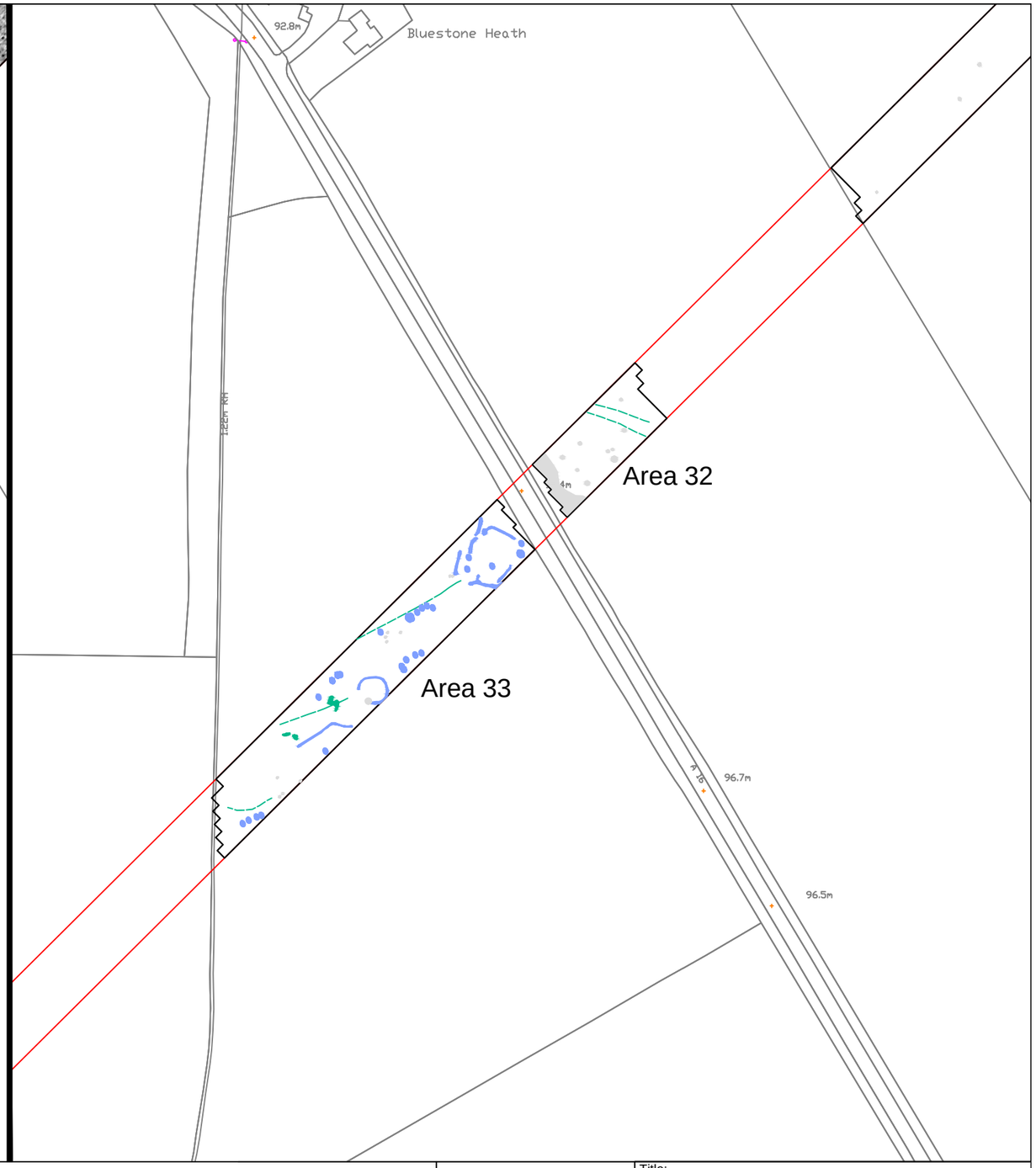
Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 14





N

2
nT
-1

KEY

- 30m Survey Corridor
- Possible Archaeology
- Uncertain Origin (discrete anomaly / trend)
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

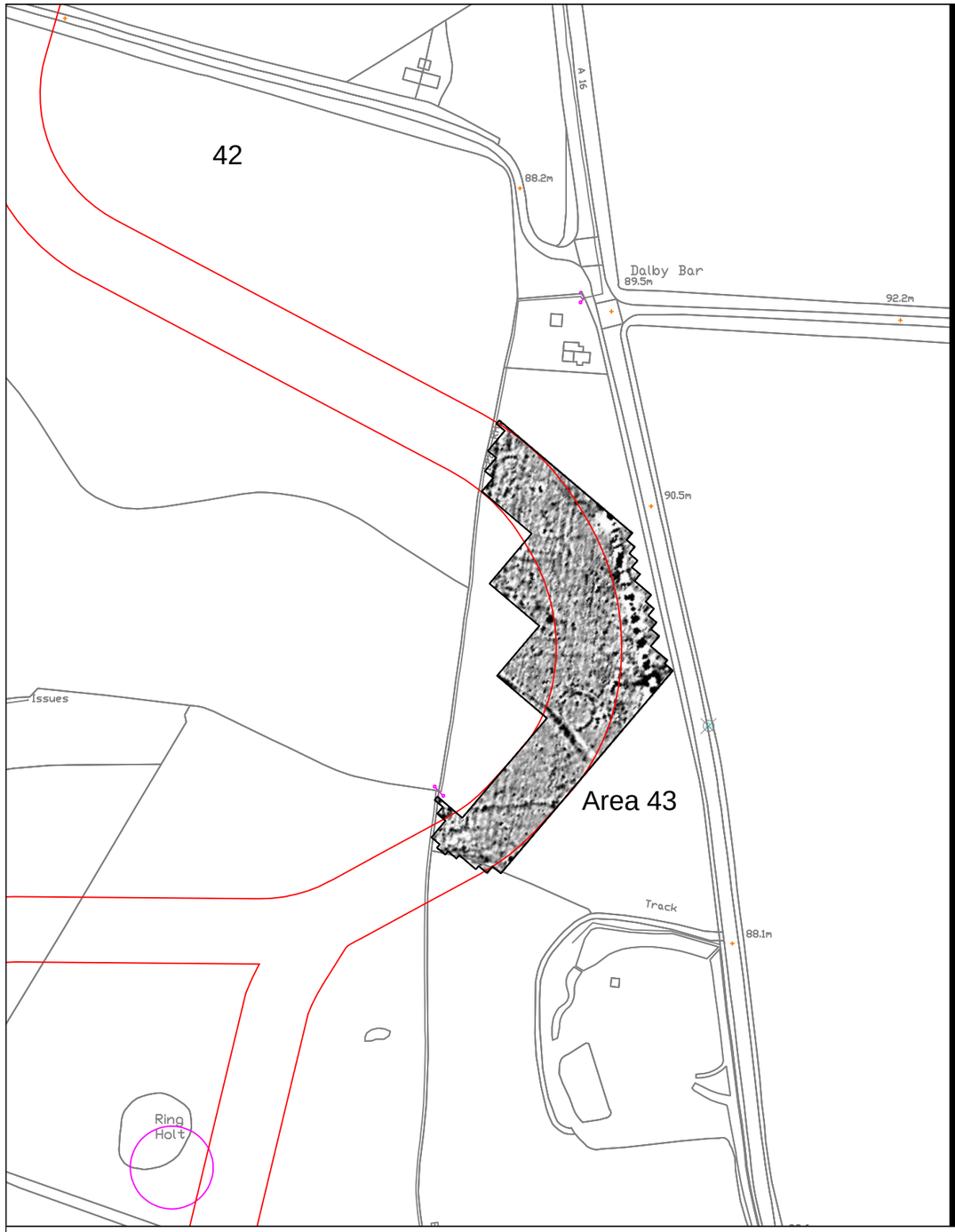
Title: Magnetometer Survey [Areas 32 and 33] Greyscale Plots and Interpretation

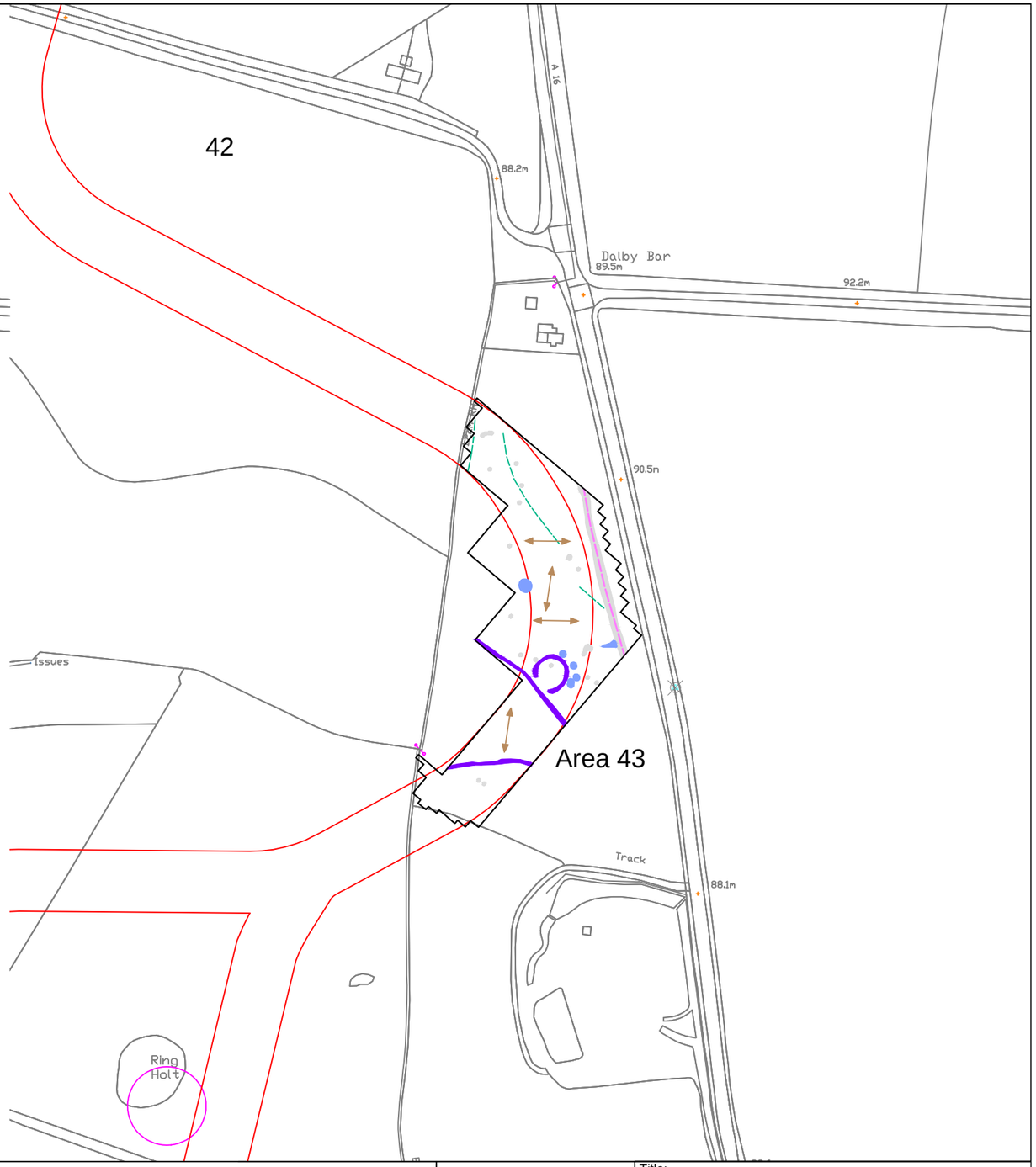
Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 15





N

2
nT
-1

KEY

- 30m Survey Corridor
- HER/Scheduling Record - Ring Holt Barrow
- Probable / Possible Archaeology
- Uncertain Origin (trend)
- Ploughing
- Pipe
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

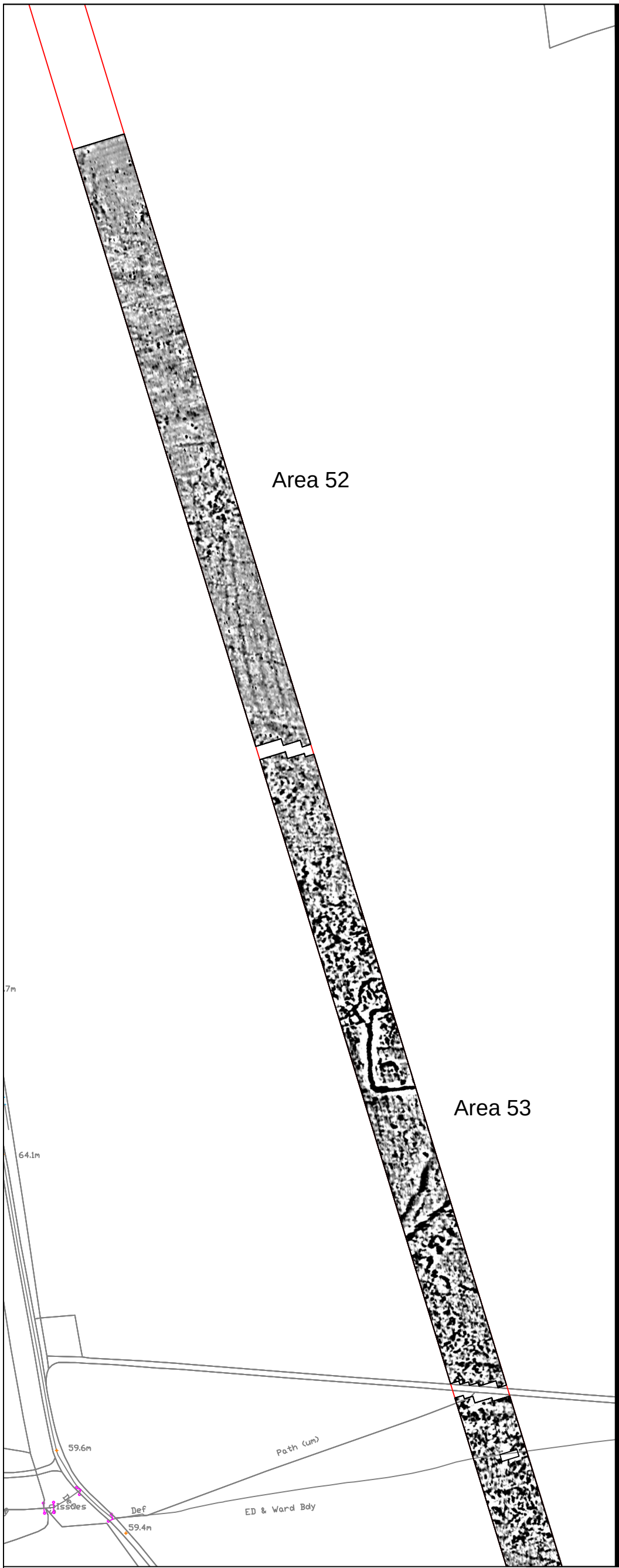
Title: Magnetometer Survey [Area 43] Greyscale Plot and Interpretation

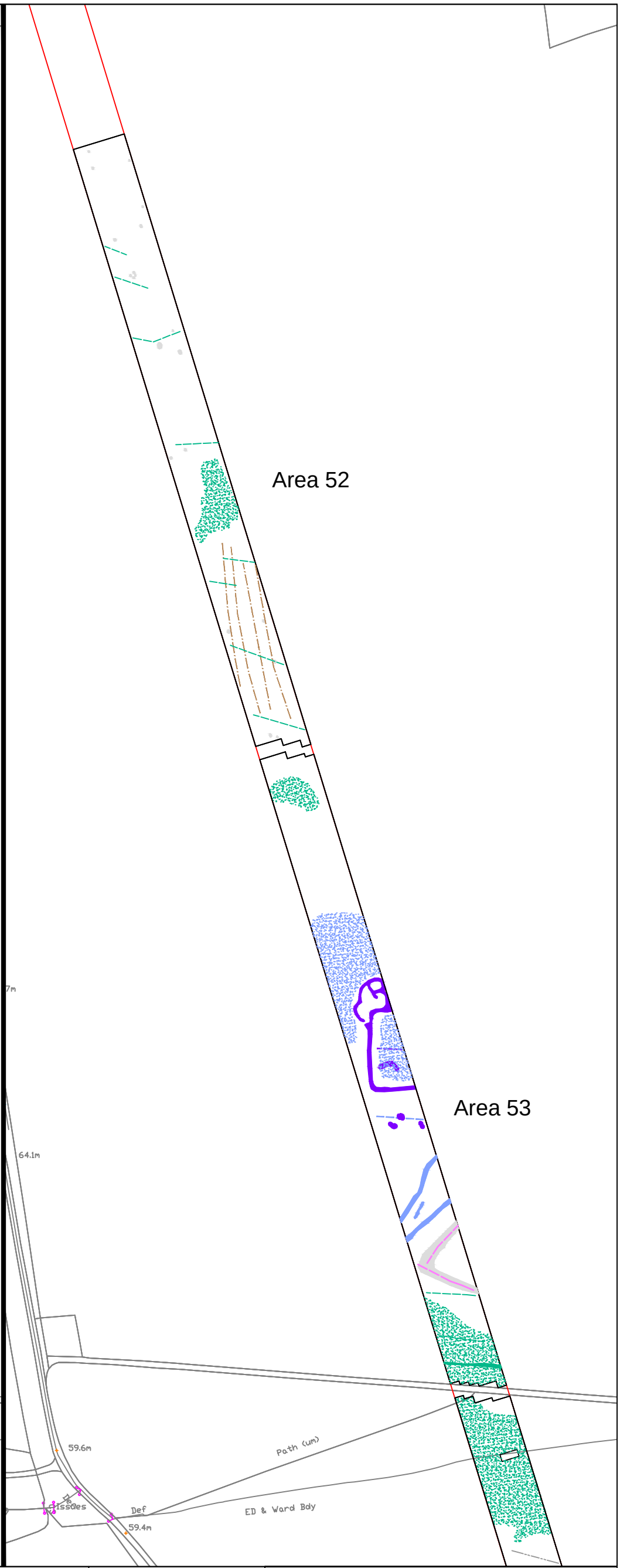
Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 16





KEY

N

2
nT
-1

- 30m Survey Corridor
- Probable Archaeology
- Possible Archaeology (discrete anomaly / trend)
- Increased Response (Possible Archaeology / Uncertain Origin)
- Uncertain Origin (discrete anomaly / trend)
- Ridge and Furrow
- Pipe
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

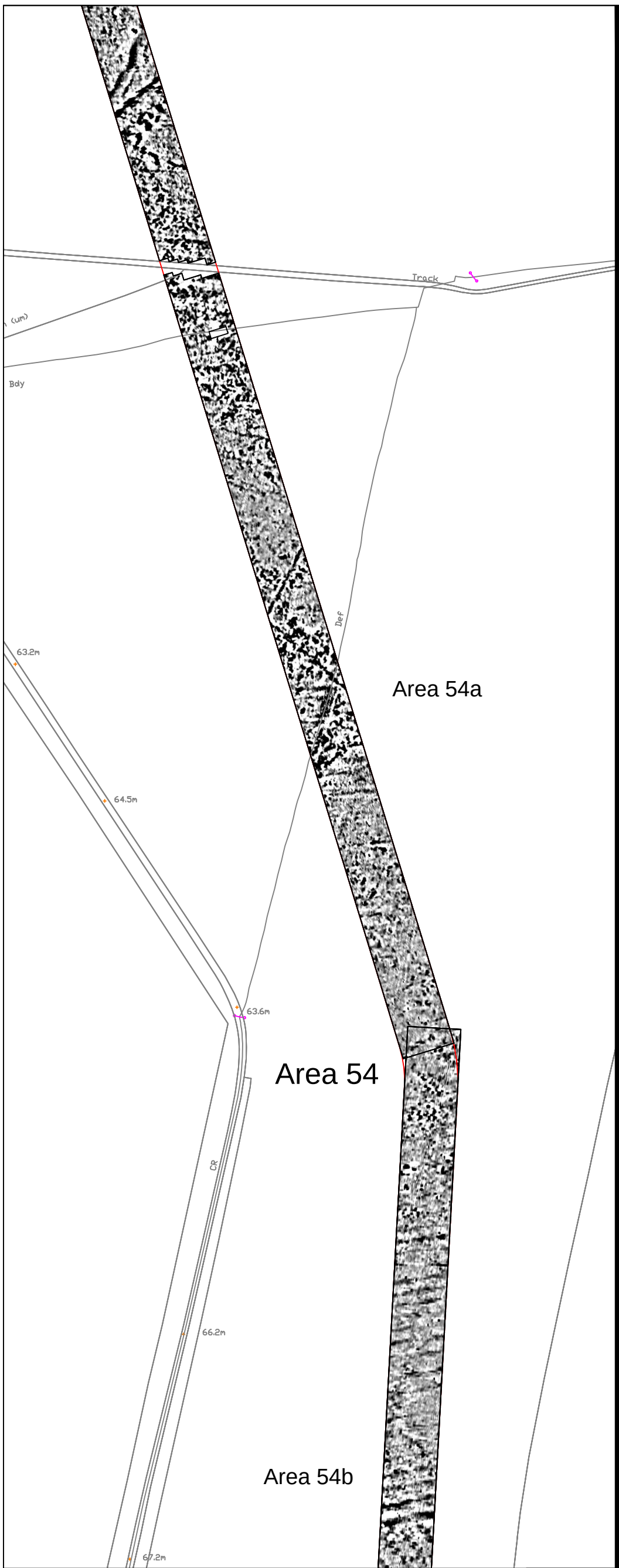
Title: Magnetometer Survey [Areas 52 and 53] Greyscale Plots and Interpretation

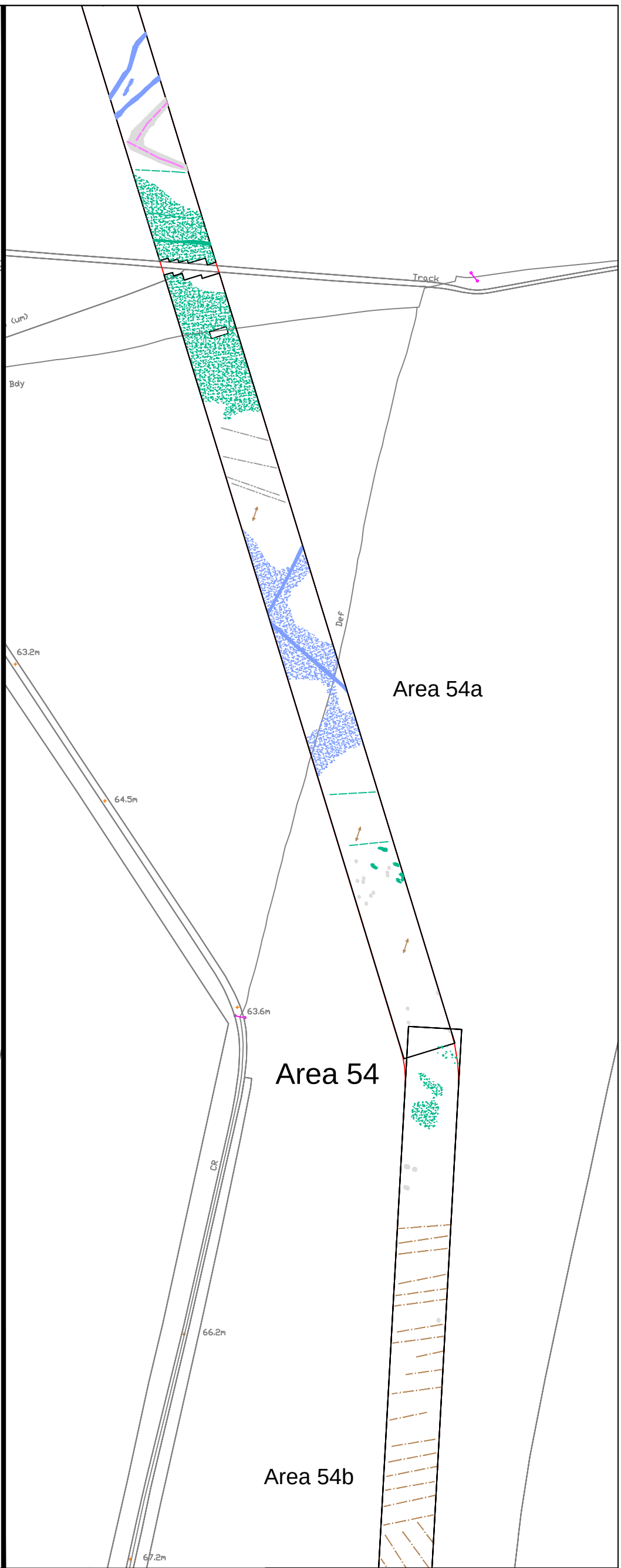
Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 17





N

2
nT
-1

KEY

- 30m Survey Corridor
- Possible Archaeology (discrete anomaly / trend)
- Increased Response (Possible Archaeology / Uncertain Origin)
- Uncertain Origin (discrete anomaly / trend)
- Ridge and Furrow
- Drain
- Drain
- Ploughing
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: Magnetometer Survey [Area 54a] Greyscale Plot and Interpretation

Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 18

KEY

- 30m Survey Corridor
- Possible Archaeology (discrete anomaly / trend)
- Uncertain Origin (discrete anomaly / trend / increased response)
- Ridge and Furrow
- Ferrous

N

2
nT
-1

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

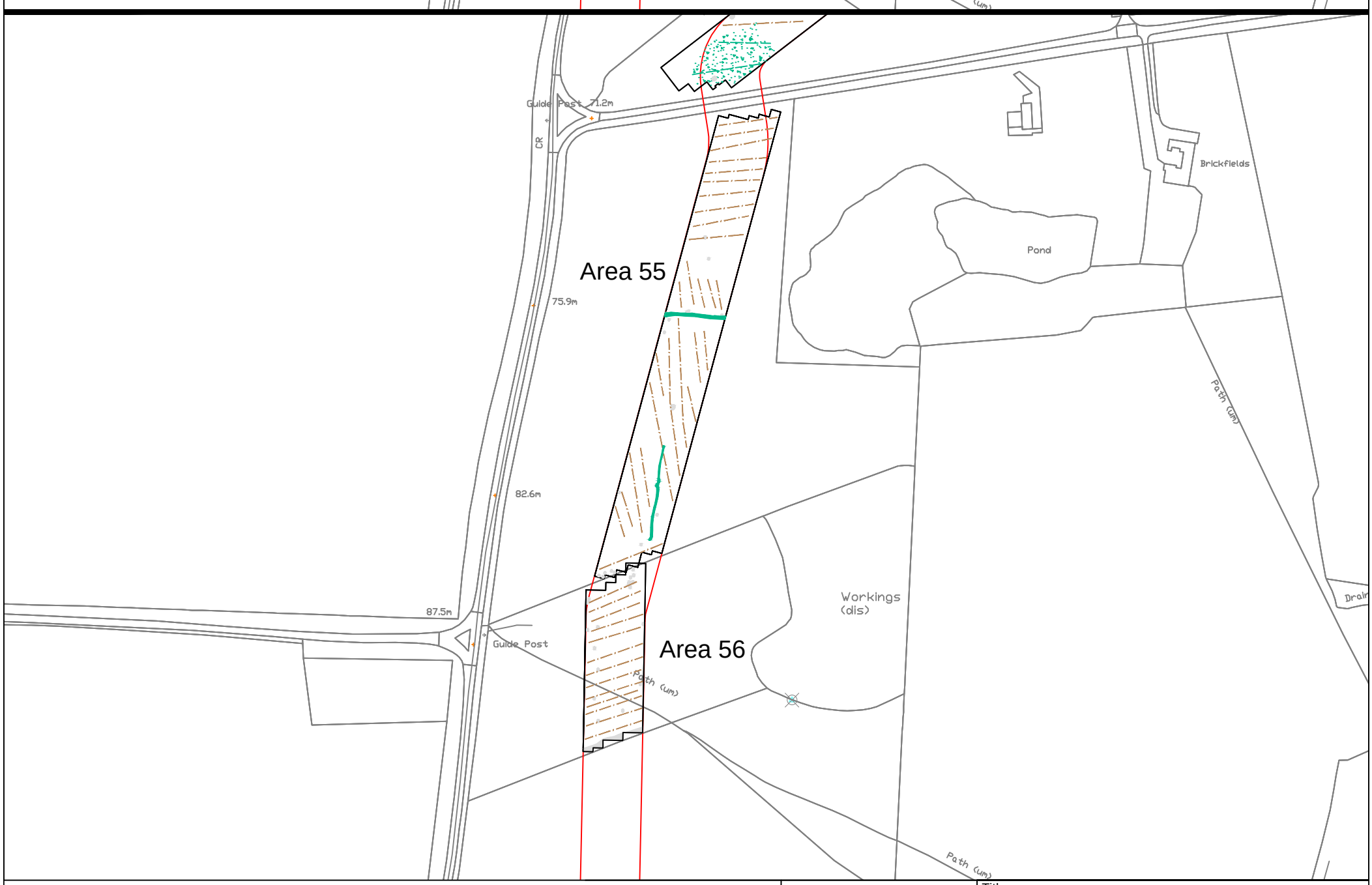
Title: Magnetometer Survey [Areas 54b and 54c] Greyscale Plots and Interpretation

Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 19



N

2
nT
-1

KEY

- 30m Survey Corridor
- Uncertain Origin (discrete anomaly)
- Ridge and Furrow
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

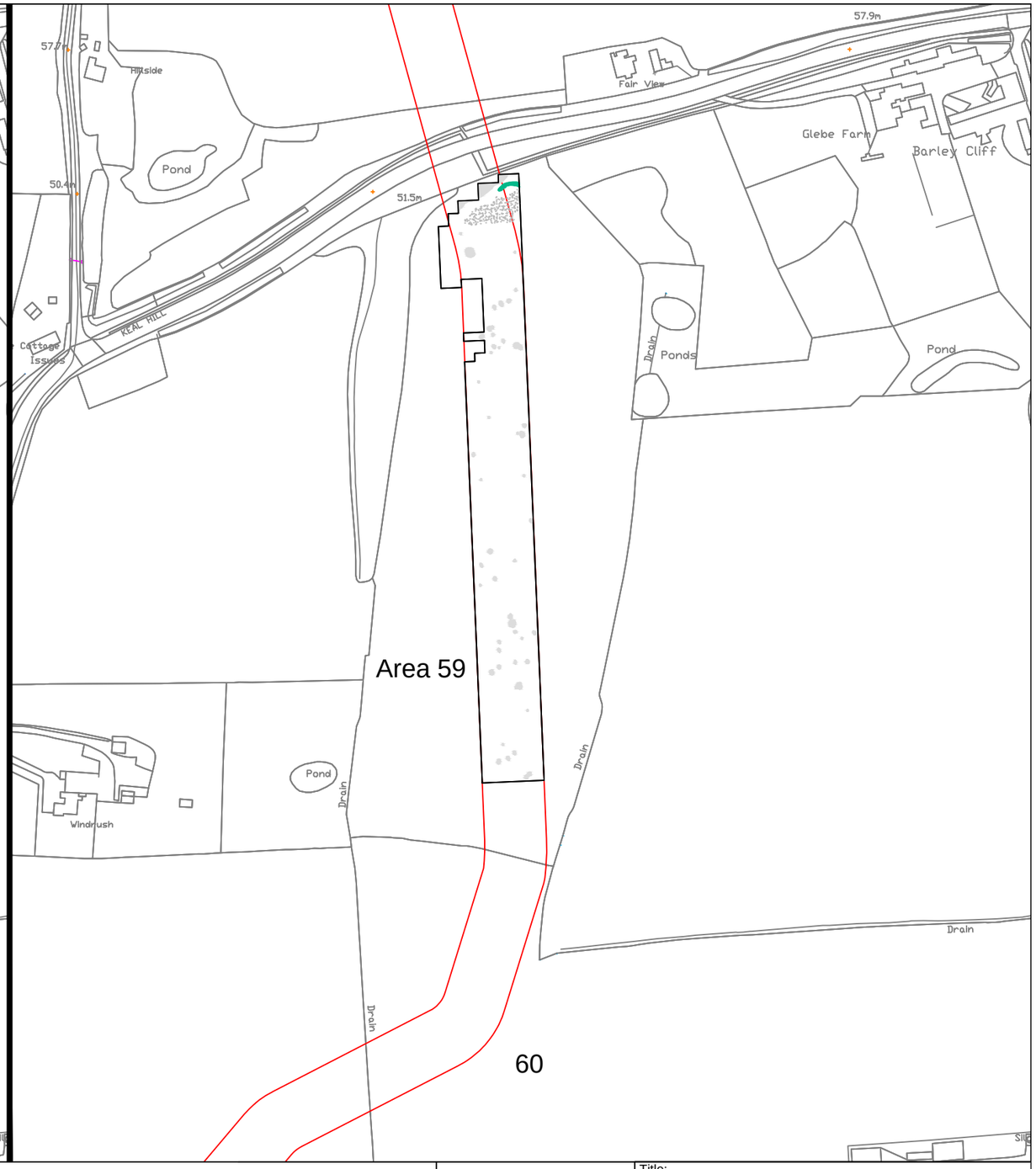
Title: Magnetometer Survey [Areas55 and 56] Greyscale Plots and Interpretation

Client: Arcadis

Project: 11360 Viking LInk

Scale: 0 metres 100
1:2500 @ A3

Fig No: 20



N

2
nT
-1

KEY

- 30m Survey Corridor
- Uncertain Origin
- Magnetic Disturbance
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

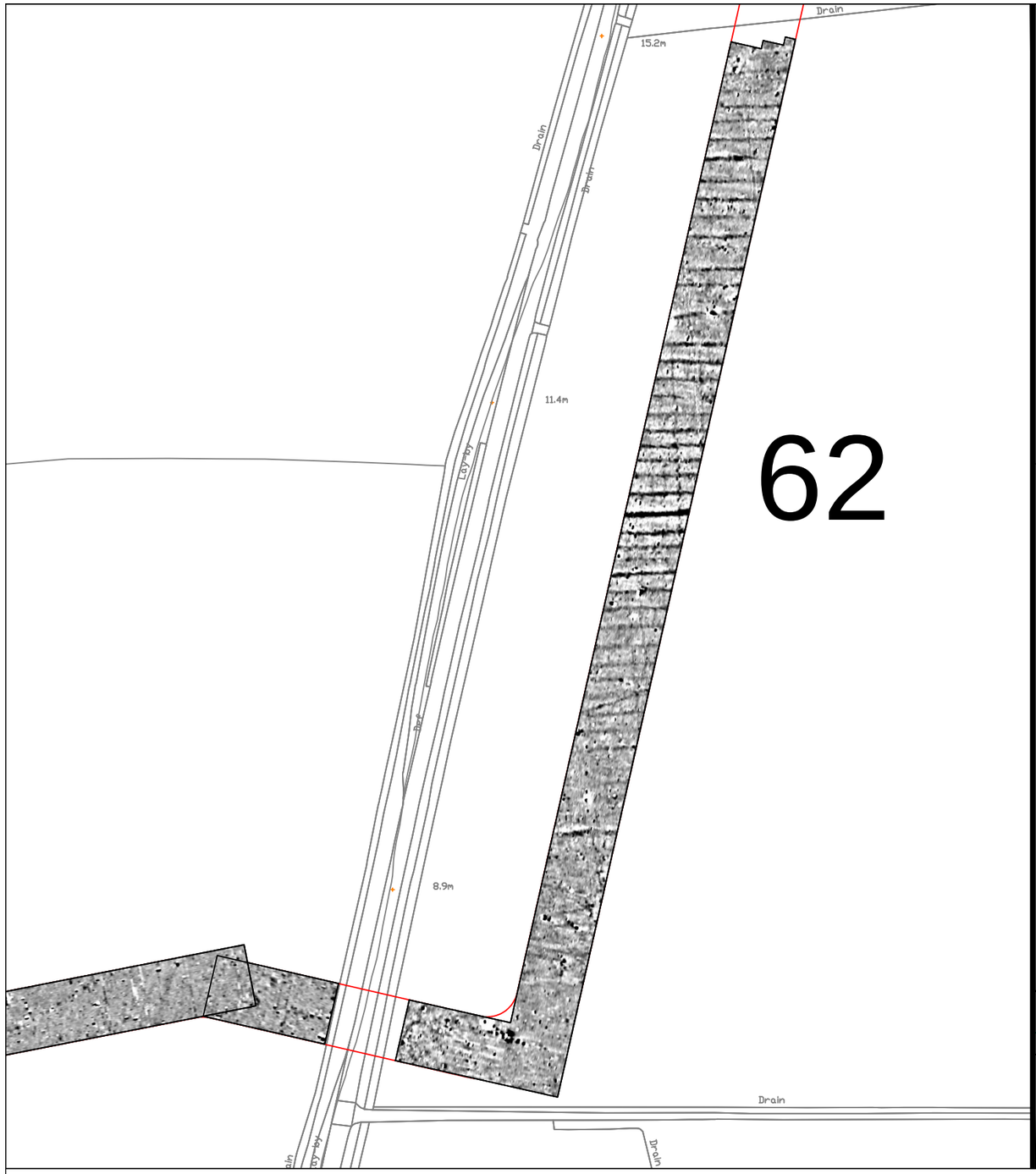
Title: Magnetometer Survey [Area 59]
Greyscale Plot and Interpretation

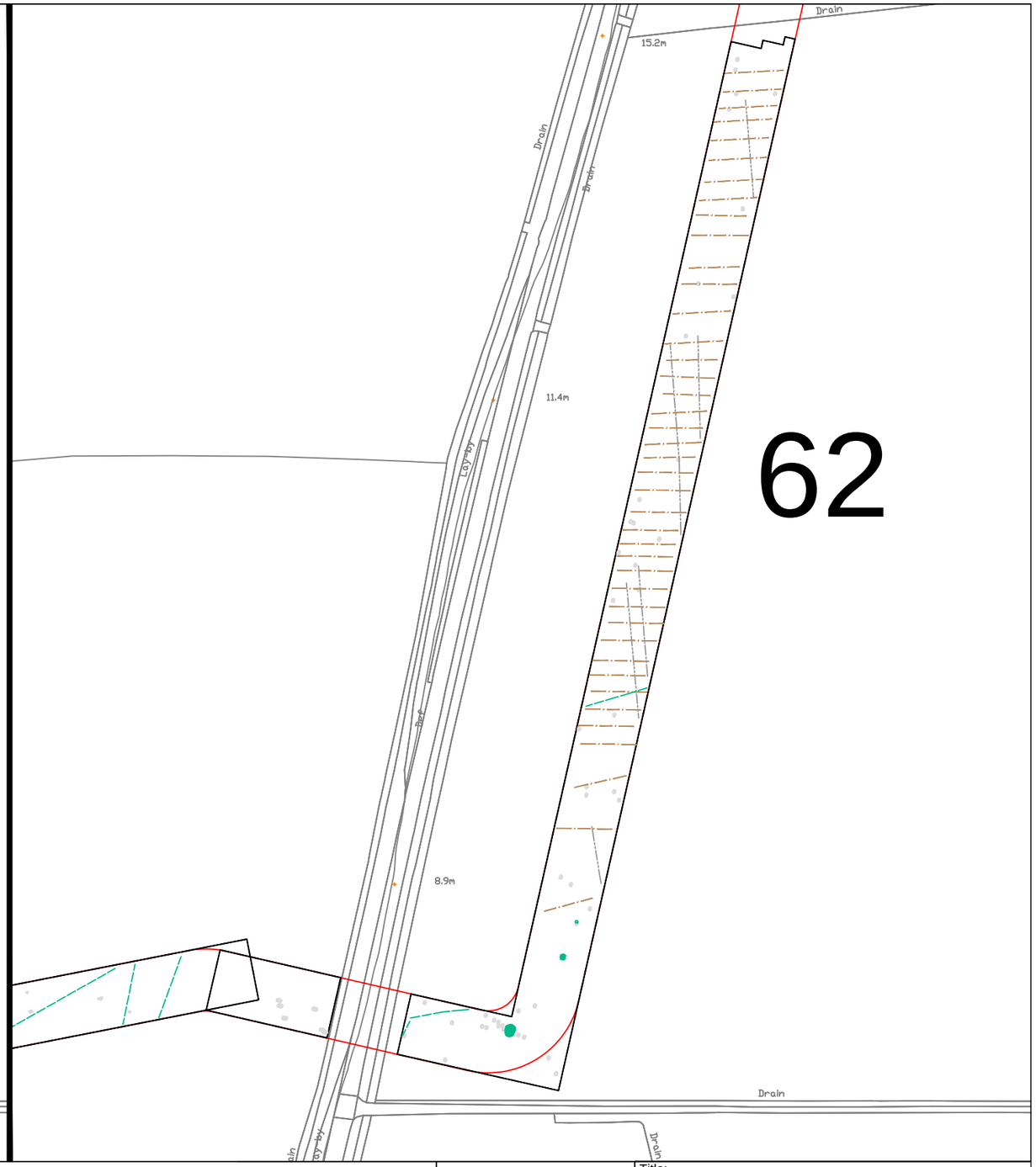
Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 21





N

2
nT
-1

KEY

- 30m Survey Corridor
- Uncertain Origin (discrete anomaly / trend)
- Ridge and Furrow
- ?Drain
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

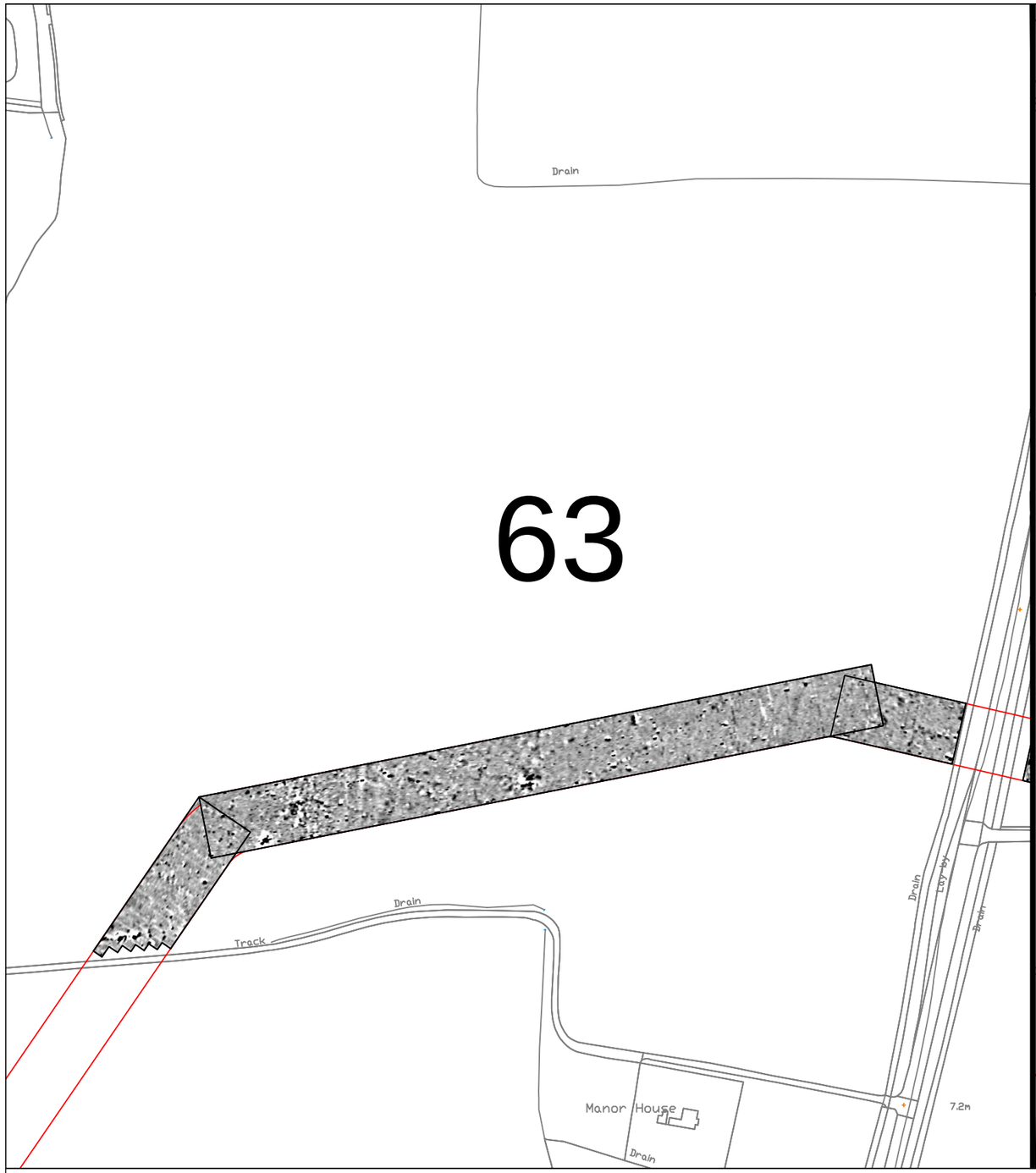
Title: Magnetometer Survey [Area 62] Greyscale Plot and Interpretation

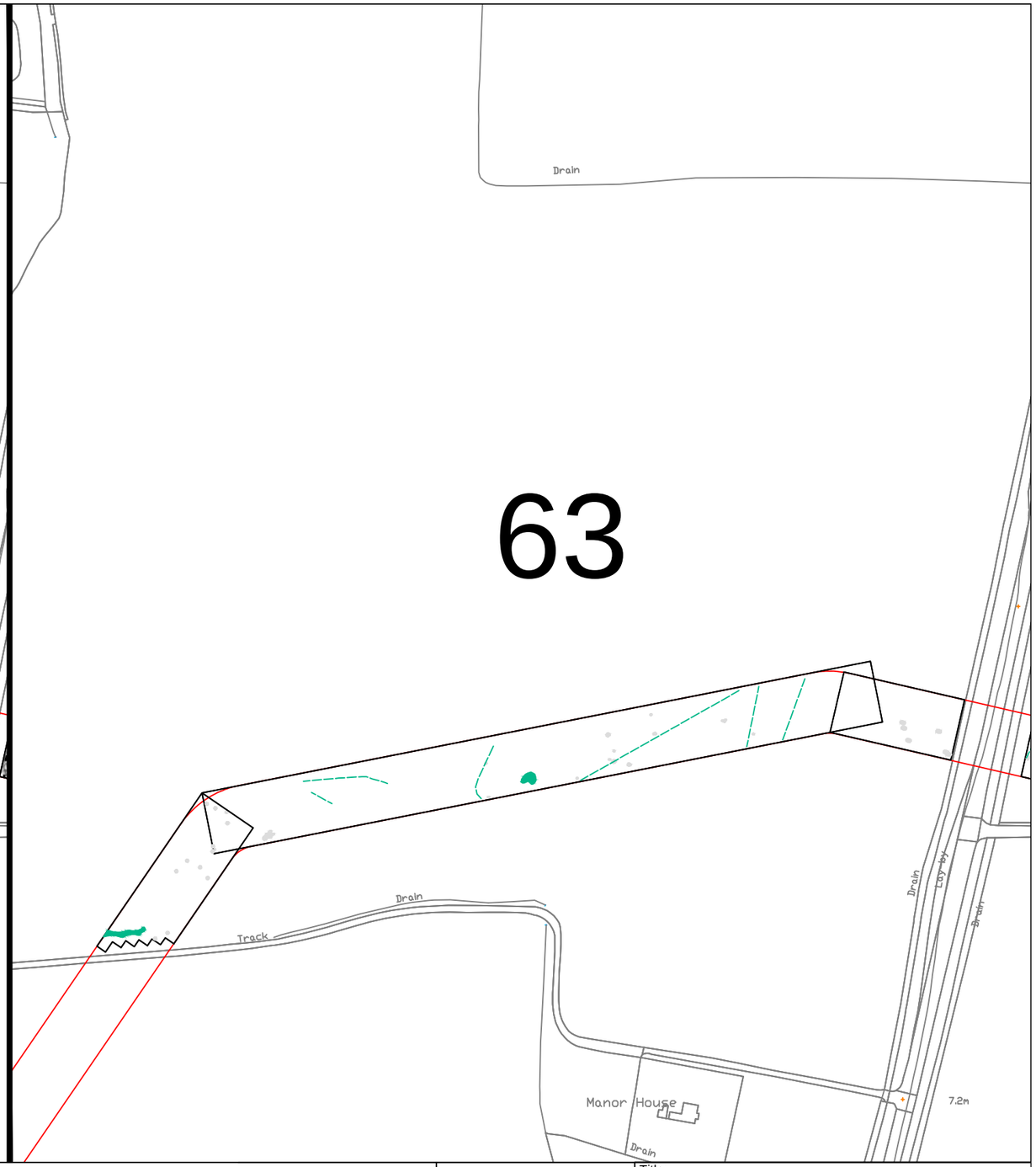
Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 22





N

2
nT
-1

KEY

30m Survey Corridor

Uncertain Origin
(discrete anomaly / trend)

Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

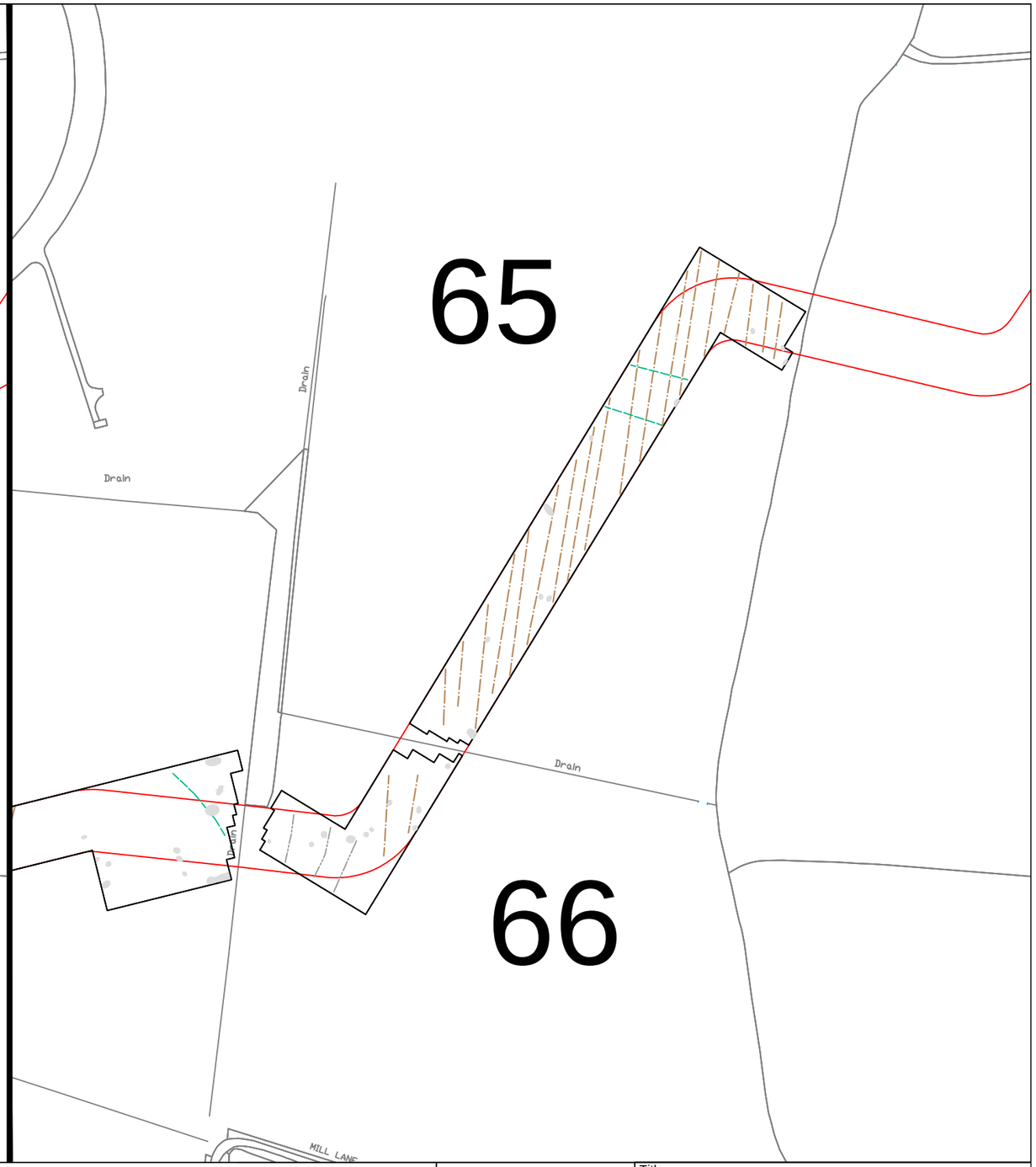
Title:
Magnetometer Survey [Area 63]
Greyscale Plot and Interpretation

Client:
Arcadis

Project:
11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No:
23



N

2
nT
-1

KEY

- 30m Survey Corridor
- Uncertain Origin (trend)
- Ridge and Furrow
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

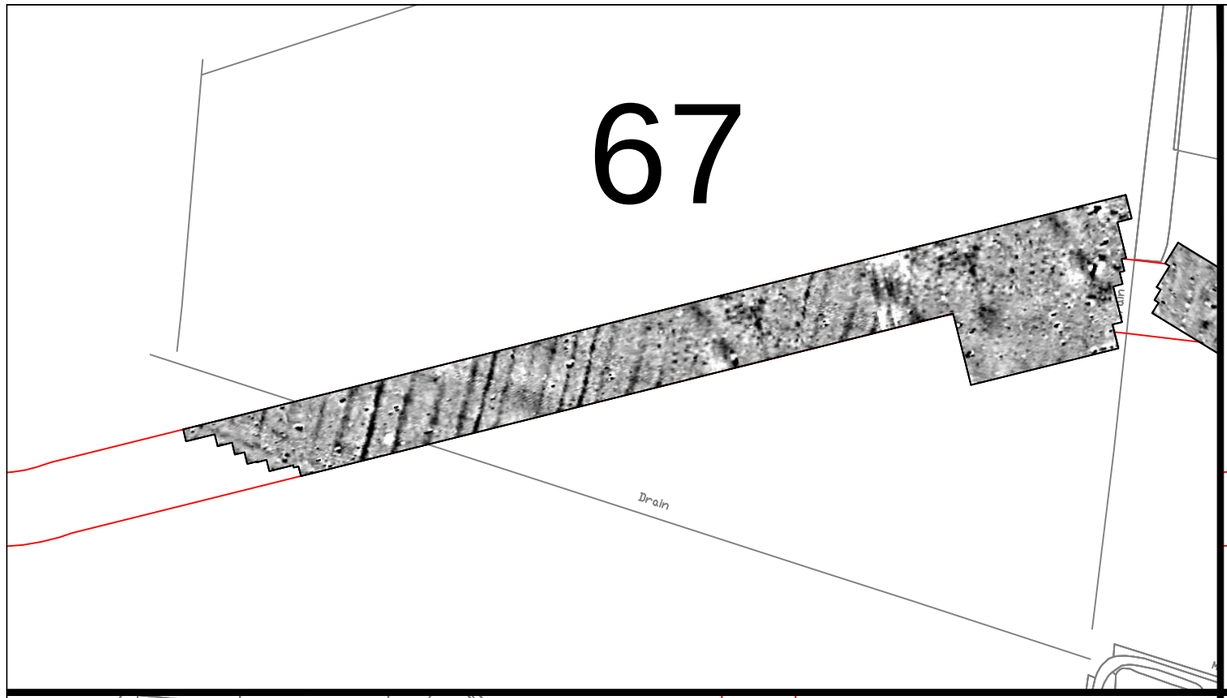
Title: Magnetometer Survey [Areas 65 and 66] Greyscale Plots and Interpretation

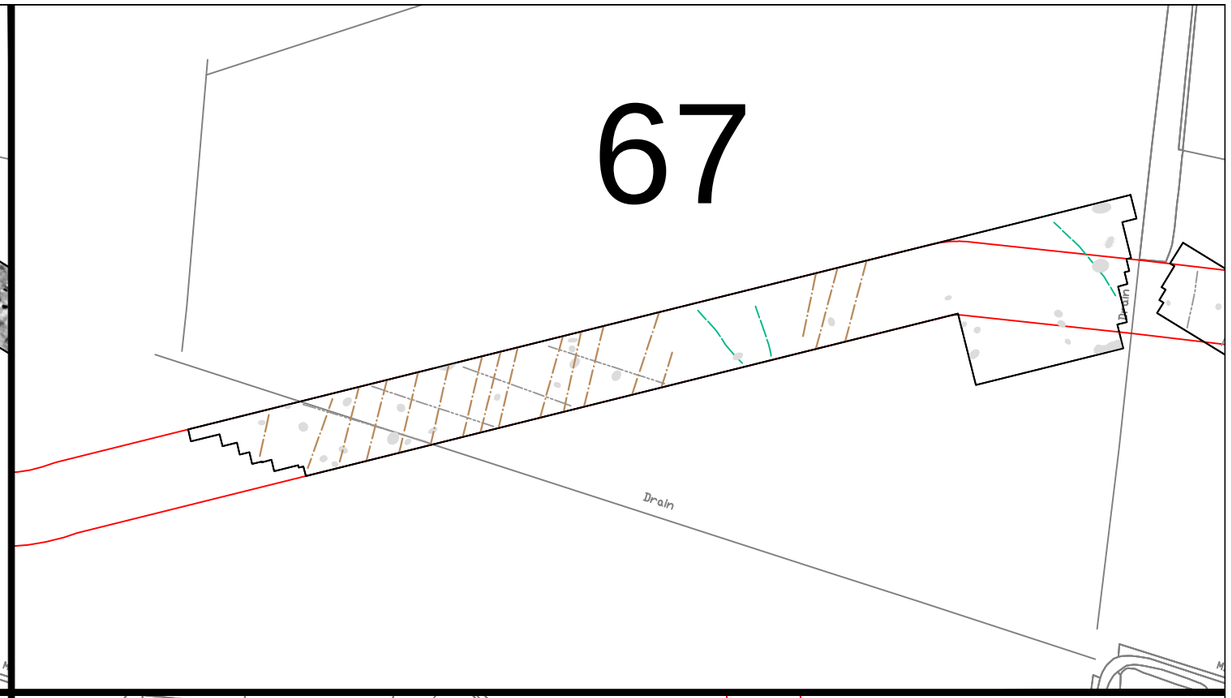
Client: Arcadis

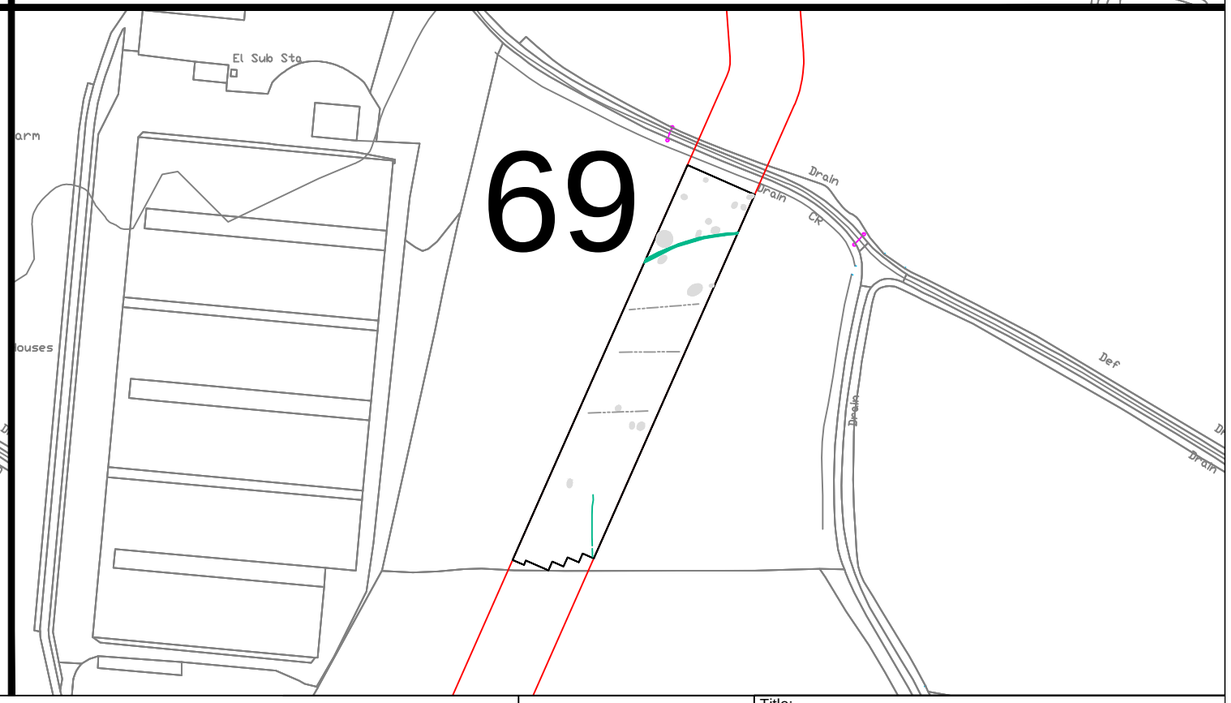
Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 24







N

2
nT
-1

KEY

- 30m Survey Corridor
- Uncertain Origin (discrete anomaly / trend)
- Ridge and Furrow
- Drain
- Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: Magnetometer Survey [Areas 67 and 69] Greyscale Plots and Interpretation

Client: Arcadis

Project: 11360 Viking Link

Scale: 0 metres 100
1:2500 @ A3

Fig No: 25

Appendix A - Technical Information: Magnetometer Survey Method

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

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. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: Bartington *Grad* 601-2

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. 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.

Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Display

Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology / Probable Archaeology	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
Possible Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Industrial / Burnt-Fired	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Former Field Boundary (probable & possible)	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
Agriculture (ploughing)	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Land Drain	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
Service	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
Ferrous	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology* / *Natural* or (in the case of linear responses) *Possible Archaeology* / *Agriculture*; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical Information: Magnetic Theory

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. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

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; 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 feature. The difference between the two sensors will relate to the strength of a magnetic field created by this 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 and disturbance from modern services.

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

SUMO Services Ltd, incorporated under the laws of England and Wales,
Company Registration No.4275993.
Registered Office Unit 8 Hayward Business Centre, New Lane, Havant, Hampshire, PO9 2NL

Appendix 12.4 Archaeology Mitigation Strategy

UK Onshore Scheme

Volume 4 Document ES-4-B.08

Appendix 12.4 Archaeological Mitigation Strategy

Archaeology & Cultural Heritage (Proposed Underground DC Cable)

VKL-08-39-G500-009

August 2017

Co-financed by the European Union
Connecting Europe Facility

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Note

The purpose of this Strategy is to set out how the mitigation commitments described within the Environmental Statement will be delivered during construction. The exact roles and responsibilities described in the Strategy are subject to the appointment of a Contractor and may change. The Strategy will be finalised by the Contractor prior to the commencement of construction taking into account a detailed scheme design and more precise information about construction methods and phasing.

1 Introduction

1.1 Introduction

1.1.1 This Mitigation Strategy and Initial Written Scheme of Investigation (WSI) has been prepared by Arcadis Consulting (UK) Limited for the UK Onshore Scheme. This document sets out the proposed archaeological mitigation which will be implemented at the proposed DC cable route component of the UK Onshore Scheme.

1.2 Project Background

1.2.1 Viking Link is a proposed 1400 megawatt (MW) High Voltage Direct Current (HVDC) electricity link between the Danish and British electricity transmission systems. It will allow electricity to be exchanged between Great Britain and Denmark. A detailed description of the project is provided in ES Chapter 12 Archaeology and Cultural Heritage (Ref.1).

1.2.2 As part of the application for the Scheme an EIA was carried out. The EIA included a Cultural Heritage assessment. To inform the Cultural Heritage assessment, a programme of archaeological assessment and recording has been carried out along the proposed DC cable route. This programme of investigation and assessment comprised:

- Desk-based Assessment (DBA);
- LiDAR and aerial photograph analysis; and
- geophysical survey.

1.2.3 The purpose of this document is to present an archaeological mitigation strategy, incorporating a draft WSI, to support the planning application for the Scheme.

1.2.4 The mitigation strategy presents only archaeological mitigation which would take place during the construction phase of the Scheme. Design and other forms of mitigation are dealt with in ES Chapter 12 Archaeology and Cultural Heritage (Ref.1).

1.3 Aims and Objectives

1.3.1 The overall aim for the mitigation strategy is to reduce the impact of the proposed DC cable route on the archaeological resource through a programme of archaeological investigation and recording. The programme of investigation and recording would aim to:

- Investigate and ‘preserve by record’ the significant aspects of the archaeology of the Scheme;
- Analyse and disseminate the archaeological information from the Scheme to the professional archaeological audience, adding to the corpus of archaeological knowledge and interpretation of the Lincolnshire region;

- Disseminate the archaeological information from the Scheme to public and non-technical audiences; and
- Ensure that a full archive, including written, drawn, and photographic records (digital and hard copies), as well as artefacts and environmental material, is deposited in an appropriate repository so that it is available for future research.

1.4 Scope of this Document

- Section 2. Summary Archaeological Baseline. Presents a summary of the known heritage assets heritage assets as outlined in the Environmental Statement.
- Section 3. Archaeological Mitigation Strategy. Presents the archaeological mitigation strategy for the proposed DC cable route.
- Section 4. Initial Written Scheme of Investigation. Presents initial WSI for delivery of the archaeological mitigation strategy.

2 Summary Archaeological Baseline

2.1 Introduction

2.1.1 This section will present a high-level summary of the known archaeological assets across the proposed DC cable route.

2.2 Baseline information

2.2.1 Archaeological remains have been recorded across the proposed DC cable route, the majority of which relate to Medieval settlement, however there are numerous areas of Prehistoric cropmark enclosures and contemporary burial landscapes.

2.2.2 The ES Chapter 12 Archaeology and Cultural Heritage (Ref.1) has identified receptors that may be affected by the proposed DC cable route. These receptors are listed in the table below. For further details on these receptors please refer to the ES chapter (Ref.1) and associated desk-based assessment (Ref. 2).

Table 1: List of receptors potentially affected by development of the Proposed DC Cable Route

Receptor
Route Section 1
The circular mound and linear features at Furzehill (**300**)
The earthwork enclosure and field boundary at Huttoft (**159**)
The shrunken Medieval village of Saleby (**103**)
The moated site at Saleby (**104**)
The tramway between Sutton on Sea and Alford (**117**)
Former field boundary and ridge and furrow to the north of Wold View Farm (**261**)
The wide ridging at Markby (**299**)
The watercourse to the west of Yarlsgate Farm (**297**)
The former field divisions, wide ridging and possible pond/quarry pit at Ailby House Farm (**301**)
Pits to the west of Ailby House Farm (**407**)
Potential ditch to the north-west of Rigsby (**408**)
Ridge and Furrow to the south of Rigsby Wood (**174**)
Linear hollow to the west of Sea Bank Farm (**295**)
Ridge and Furrow to the north-east of Yarlsgate Farm (**296**)

Table 1: List of receptors potentially affected by development of the Proposed DC Cable Route
Receptor
The disused railway to the west of Yarlsgate Farm (**411**)
The former field divisions at Wold View Farm (**298**)
The former field boundaries at Ailby House Farm (**302**)
Route Section 2
The enclosures, field boundaries and trackway to the north-east of Skirbeck Plantation (**386**)
The enclosure and boundary cropmarks to the east of Sausthorpe (**145**)
The enclosure and field boundaries that were identified to the north of Raithby cross roads (**315**)
The cropmarks of enclosures, field boundaries and pits at East Farm Partney (**387**)
Cropmarks to the south-east of Driby (**124**)
Cropmarks to the south of East Drilby (**125**)
Cropmarks at West Keal (**123**)
Possible round barrow to the north-west of Dalby (**120**)
Ring ditch and ditches to the south of Dalby Bar (**397**)
Cropmarks at Dalby (**230**)
Cropmark west of Home Farm, Dalby (**146**)
Neolithic Stone Axe findspot (**90**)
Barbed and Tanged Arrowheads findspot (**99**)
Enclosure and ditches to the south-east of Wheelabout Wood (**399)**
Enclosure and ditches to the north of Glebe Farm (**400**)
Potential ditch at Mardon Hill (**403**)
Findspots at East Keal (**115**, **76**, **80**)
Findspot at Langton by Spilsby (**98**)
The early/middle Saxon site at East Keal (**108**)
The old field boundary/drain to the north-west of Dalby Bar (**311**)
Ridge and furrow at Raithby (**130,132**)
Ridge and Furrow at Mardon Hill (**401**, **402**)
Medieval trackway at Raithby (**129**)
East Keal Park (**168**)
The crash site of the Lancaster Bomber at Ulceby Cross (**409**)
Chalk Pits south-west of Deersleap (**264**)
enclosure and trackways cropmarks to the north-west of Ulceby Cross (**126**)
cropmarks to the east of Dalby (**147**)

Table 1: List of receptors potentially affected by development of the Proposed DC Cable Route
Receptor
The two banks to the south of Partney Road (**319**, **320**)
undated settlement to the east of Sausthorpe (**137**)
sand-pit to the south-east of Sausthorpe (**114**)
undated pits to the south-west of Sausthorpe (**66**)
undated cropmark trackway to the north-north-west of Raithby (**131**)
The cropmark of the possible barrow to the south of Fulletby (**119**)
The stone axe findspot at Langton Hill (**266**)
The possible cropmarks of enclosures and boundaries to the north-west of Langton Hill (**144**)
The cropmarks of field boundaries and enclosures at Langton Grange Farm (**385**)
The ridge and furrow at Dalby Bar (**398**)
The disused railway to the north-west of Alford (**412**)
The cropmarks at Langton by Spilsby (**143**)
The cropmarks at Langton by Spilsby (**142**)
The early trackway site at Langton by Spilsby (**94**)
The curvilinear hollow to the south-west of Sausthorpe (**314**)
Route Section 3
Prehistoric find spots at Stickford (**83**, **86, 87**)
Scatter of Roman pottery and Quern fragments (**201**)
Ridge and furrow located to the west of Stickford (**171**)
Ridge and Furrow at Keal Cotes (**405**)
Ridge and furrow located at East Keal (**172**)
The potential former field divisions at Keal Cotes (**323**)
The former field boundary and widely spaced ridging to the west of Limes Farm (**326**)
The potential dylings at Hagnaby Lock (**329**)
Relict field boundary at Castle Dike Farm (**244**)
The former field divisions to the south-east of West Keal (**321**)
Linear anomalies to the north of Limes Farm (**404**)
The former field divisions and the rectangular enclosure to the south-west of Mager Farm (**327**)
The linear hollow to the north west of Hagnaby Lock (**330**)
Twelve roddons (**331**, **332**, **335**, **336**, **337**, **338**, **339**, **340**, **341**, **342**, **343, 344**)
The partially extant farmstead at West Fen (**190**)

Table 1: List of receptors potentially affected by development of the Proposed DC Cable Route
Receptor
The demolished farmstead at Sibsey (**194**)
The disused railway that runs along the eastern side of the River Witham (**413**)
The Pillbox at Short's Corner (**116**)
The former artificial channel of the River Witham (**346**)
Route Section 4
The Romano-British field boundaries at Swineshead Bridge (**354**)
The cropmarks of an enclosure, field boundaries, trackway and sinuous watercourse to the east of Old Sixteen Foot Drain (**358**)
The field boundaries, enclosure, trackway and sinuous watercourse to the west of Holt Hills (**359**)
The field boundaries and sinuous roddon to the south-west of Eau End Farm (**366**)
Prehistoric/Roman cropmarks at North Ing Drove (**21**)
The demolished unnamed farmstead at Little Hale (**52**) and Holland Fen with Brothertoft (**55**)
South Forty Foot Drain (**456**)
The late Post-Medieval settlement/parish of Amber Hill (**154**)
Fifteen roddon systems (**347**, **348**, **349**, **350**, **351**, **353**, **355**, **356**, **357**, **360**, **361**, **362**, **363**, **364**, **367**)
The field boundaries and trackway to the north-west of Laburnum House (**345**)

3 Archaeological Mitigation Strategy

3.1 Background

3.1.1 The following section presents the archaeological mitigation strategy for the proposed DC cable route. The strategy outlines the archaeological mitigation measures to be carried out in advance of, and during construction, in response to design and construction mitigation measure outlined in the Environmental Statement (ES).

3.1.2 Design mitigation for the proposed DC cable route has ensured that no designated assets are located within the Limits of Deviation for the DC route. The Archaeology and Cultural Heritage (Underground Cable) Volume 2, Chapter 12 ES details where design mitigation has been implemented to avoid designated assets (Ref.1).

3.2 Approach to mitigation

3.2.1 The proposed archaeological mitigation strategy for the proposed DC cable route takes a proportionate approach:

- In areas with the greatest archaeological potential detailed open area excavation will be undertaken;
- Strip, map and sample will be undertaken in areas where a known potential for heritage assets has been identified, but the concentrations or significance of archaeological features are expected to be less;
- Watching brief will be undertaken in areas where the potential for heritage assets is low; and
- In areas where the archaeological potential is unclear the mitigation will follow a phased approach. Initially a trial trench evaluation will be undertaken and following the results of the evaluation mitigation will either be open area excavation, strip, map and sample, watching brief or no mitigation dependent on the potential and significance of the archaeology identified.

3.2.2 The UXO risk assessment conducted by Zetica ltd (Ref.4) should be considered for all works conducted on behalf of Viking Link for the Scheme.

3.2.3 The purpose of open area excavation is to establish the relationship between detailed, intricate features, densely packed together, that cannot be established in trial trenching. Features may be contemporary or form part of a continual multiphase site. This approach will allow for a more detailed picture into the nature of the site and the extent of the archaeological remains to be understood, preserving them by record.

3.2.4 While ostensibly similar in approach to full excavation, strip, map and sample differs in nature by the scale of the process.

3.2.5 Initially the area will be 'stripped' of the current ground surface to expose any archaeological remains. Any archaeological features will then be surveyed, or 'mapped', using a GPS or Total Station to create an accurate plan.

3.2.6 Once the plan is complete, a 'sample' of the archaeological features would be hand-excavated, enough to allow for the clear identification of phases of activity in the area to be understood. The sampling level would likely be a lower sampling level than in the open area excavation.

3.2.7 Areas with low archaeological potential would be subject to an archaeological watching brief. The area would undergo a top soil strip for construction, in line with construction methodologies. An experienced archaeologist would watch the removal of the top soil, and any relevant subsoils to assess for the presence of any archaeology.

3.2.8 Where previous assessment and/or investigations indicate little archaeological interest, no more than a watching brief to mitigate potential impact would be required.

3.2.9 All archaeological investigations will be carried out in accordance with the Chartered Institute for Archaeologist (CIfA) standards and guidance (Ref.3); and by suitably qualified and experienced archaeological contractors.

Roddons and Paleo-channels.

3.2.10 The mitigation of roddons and paleo-channels would be approached differently. This is due to the nature of, and potential for, differing detailed information to be gained from these two types of assets.

3.2.11 Despite their origins as natural features, roddons are a "*testament to a vanished, natural landscape, now obliterated by human activities harnessing the land for agricultural, domestic and commercial needs*" (Ref.5). Due to the anthropogenic change which caused the former channels to become positive topographical features (Ref.5), Roddons would be considered for more detailed mitigation than paleo-channels.

3.2.12 Paleo-channels would be considered for investigation to provide information of geological formation processes, which cause their sequencing, after their demise as large areas of open water. While it is expected that some human interaction would have occurred during the time the paleo-channel was open, potential for retention of this evidence is limited to negligible in the archaeological record. Due to this low potential for evidence of human activity within paleo-channels they would not generally be considered for detailed mitigation.

3.2.13 Consequently, roddons would be subject to a preliminary phase of trial trenching investigation, to establish the extent of human interaction with the features. This preliminary stage, depending on the significance of any results, could lead to more detailed mitigation. This mitigation would be in the form of either open area excavation, strip, map and sample, or watching brief; decided upon through consultation with the archaeological advisors to LCC and Viking Link.

3.2.14 Paleo-channels on the other hand, would be subject to a less rigorous means of mitigation. Due to the low potential for human interaction with this type of asset, paleo-channels would be subject

to a programme of bore-holing which would be conducted as a means of attempting to gain a further insight into the formation process of any paleo-channels.

3.2.15 These approaches underpin the mitigation for all roddons or paleo-channels chosen for mitigation within the following route sections.

3.3 Route Section 1: Proposed Landfall to Well High Lane

3.3.1 The archaeological mitigation of Route Section 1 has been split into nine areas. These mitigation areas have been selected based on known concentrations of archaeology and are shown on **Figure 2** (Sheets 1 to 4).

Phased Approach

Yarlsgate Farm Site Huttoft

3.3.2 The earthworks (**159**), at Yarlsgate, are of local significance and are still visible on the ground. The earthworks are probably late-Medieval enclosures and field boundaries which related to the settlement of Yarlsgate or South Farm.

3.3.3 A phased mitigation strategy is proposed for the earthworks. Initial trial trenching will be conducted to establish the location, extent, and rate of survival of the enclosure and field boundaries. Should results from trial trenching reveal significant archaeological remains, mitigation may be required.

3.3.4 This mitigation would take the form of either open area excavation, strip, map and sample, or archaeological watching brief.

Saleby

3.3.5 The site of the shrunken Medieval village of Saleby (**103**) and its moated site (**104**) are clipped by the planning application boundary on their southern extent of these assets. Mitigation will look to confirm the extent of the activity associated with the asset.

3.3.6 Mitigation will take a phased approach. An evaluative phase of trial trenching will take place to establish the density of Medieval activity in the area, and the rate of survival of any assets.

3.3.7 Further mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

Strip, Map and Sample

Furzehill

3.3.8 The possible barrow (**300**), located through LiDAR survey will be mitigated through strip, map and sample within the planning application boundary. While the remains of the potential barrow lie outside of the planning application boundary, its presence, alongside rectilinear earthworks

which extend into the planning application boundary, represents a high potential of further Prehistoric activity to be present.

Watching Brief

Huttoft

3.3.9 Asset (**295**), identified as a linear hollow to the west of Sea Bank Farm, will be mitigated through an archaeological watching brief during the construction phase.

Yarlsgate Farm Site Huttoft

3.3.10 An area of ridge and furrow to the north-east of Yarlsgate Farm (**296**) will be mitigated through an archaeological watching brief during construction phase.

3.3.11 The disused railway to the west of Yarlsgate Farm (**411**) will be mitigated through an archaeological watching brief.

3.3.12 Impacts to the area surrounding the watercourse to the west of Yarlsgate farm (**297**) will be mitigated through an archaeological watching brief during construction phase.

Wold View

3.3.13 The dylings (earthworks) (**261**) are of medium/low local significance. Mitigation will be achieved through an archaeological watching brief.

3.3.14 A second asset of wide ridging (**298**) will also be mitigated through an archaeological watching brief.

Markby

3.3.15 Wide ridging by Markby (**299**) will be mitigated through an archaeological watching brief.

3.3.16 The former Sutton on Sea to Alford Tramway (**117**) will be mitigated through an archaeological watching brief.

North Alby House Farm

3.3.17 A possible quarry pit or pond (**301**) and potential pit features (**407**) will be mitigated by archaeological watching brief.

West Alby House farm

3.3.18 A potential for dylings (earthworks) (**302**) within this area will be mitigated through an archaeological watching brief.

3.3.19 The disused railway (**412**) to the north-west of Alford will be mitigated through an archaeological watching brief.

Rigsby

3.3.20 A potential ditch of unknown date (**408**) to the north-west of Rigsby will be mitigated through archaeological watching brief, in the hope of ascertaining a date for the feature.

3.4 Route Section 2: Well High Lane to A16/Keal Road

3.4.1 The archaeological mitigation of Route Section 2 has been split into 15 areas. These mitigation areas have been selected based on known concentrations of archaeology. The areas are shown on **Figure 2** (Sheet 4 to 9).

Phased Approach

South Bluestone Heath

3.4.2 This site has been identified for mitigation due to the likely high potential for human activity dating to the Prehistoric period, identified through aerial photography (**126**).

3.4.3 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Prehistoric features in the area.

3.4.4 Secondary mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief dependant on the results of the first phase.

Military Air Crash site

3.4.5 The remains of a second world war era military air crash site (**409**) may require archaeological mitigation. There is an uncertainty as to the exact location of the aircraft, but it has the potential to fall within the planning application boundary.

3.4.6 Military war grave records provide details for military burials with honours, of all seven crew members from the crashed plane in either Alford Cemetery, Dunfermline Cemetery, Hatherton (St Saviour) Churchyard, or Wokingham (St Paul) Churchyard; all seven have a registered date of death as the 04/03/1945 (Ref.6). Therefore, as all human remains were recovered, the crash site is not a war grave allowing for archaeological investigation to be conducted with the appropriate licensing.

3.4.7 Due to the nature of this asset, it is likely that a large radius of material surrounds a nucleus of the plane's fuselage exists. This is the result of the impact on the aircraft at the point of the crash. Consequently, it is key to ascertain to the most accurate degree possible, a central location for the remains of the aircraft.

3.4.8 Mitigation is proposed in two phases. The evaluative phase will utilise a form of remote sensing, through either a metal detecting survey, or geophysical survey (magnetometry), or both. It is hoped, that this type of survey would produce a plot of the concentration of metallic objects within the area, and consequently provide a location of the nucleus to the crash site.

3.4.9 Ministry of Defence guidance states that for any work conducted within a 100 m radius of the location (nucleus) of the crash site, a licence for excavation will need to be granted (Ref. 7). It would therefore be beneficial to survey a wider area, for the greatest opportunity to establish the exact location of the aircraft's remains. This would be subject to stakeholder agreement.

3.4.10 Depending on the results, there are two options for mitigation. The first option would be that no material deemed associated with the crash site would be located within the planning application boundary, and consequently no mitigation is necessary. The second option would be that materials associated with the crash site are located within the planning application boundary, requiring mitigation.

3.4.11 Should mitigation be required, this would likely take the form of a basic means of recovery, rather than strict archaeological works utilised as mitigation for other assets. The utilisation of the experienced community groups, could complement an agreed programme of works but use of such groups and volunteers would be determined by Viking Link.

North West Deersleap

3.4.12 This site may require mitigation due to the high significance of Prehistoric activity in the area, including cropmarks (**124**) which have been interpreted as an enclosure, and a later Prehistoric linear feature.

3.4.13 A phased approach to mitigation is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Prehistoric assets in the area

3.4.14 Mitigation, if required, would take the form of either open area excavation, strip, map and sample, or archaeological watching brief.

Langton Grange Farm

3.4.15 This site may require archaeological mitigation due to the medium/high significance of a round barrow cropmark (**119**), half of which would be impacted by the base scheme design. The presence of this feature could indicate a ceremonial landscape.

3.4.16 A phased approach is proposed. A primary evaluative phase of trial trenching will ascertain the rate of survival and nature of the asset.

3.4.17 Mitigation, if required, would occur in the form of either open area excavation, strip, map and sample, or archaeological watching brief.

Dalby Bar

3.4.18 Due to the medium/high significance of cropmark (**120**), which has been identified as a possible round barrow or ring ditch, this area may require mitigation. These cropmarks may relate to a ceremonial landscape.

3.4.19 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the survival and density of Prehistoric assets in the area

3.4.20 Secondary mitigation may occur, dependent on results, in the form of either open area excavation, strip, map and sample, or archaeological watching brief.

North Helen Firs

3.4.21 An area of cropmarks, of unknown date (**147**) is located directly to the south of a Bronze Age barrow (**SM3)** and falls within the planning application boundary of the proposed DC cable route. Due to the cropmark's proximity to the Bronze Age Barrow (**SM3**), there is a medium to high potential for Prehistoric activity.

3.4.22 A phased approach is proposed for asset **147**. A primary evaluative phase of trial trenching will establish the retention and density of Prehistoric assets in the area.

3.4.23 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

North East Stirbeck Plantation

3.4.24 The Roman enclosure cropmarks (**145**) and other cropmarks relating to potentially earlier activity (**386**), and given the location of a Bronze Age flint scatter (**98**) located to the south-west, and a scatter of barbed and tanged arrowheads and scrapers (**99**) to the north-east of these assets. Consequently, there is the potential for significant archaeological remains in this location, covering several periods.

3.4.25 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Prehistoric assets in the area.

3.4.26 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

South West Sausthorpe Bridge

3.4.27 The Romano-British to Medieval cropmarks (**315**) identified in the area through aerial photography are of medium/high significance. Also impacted by the base scheme design are several undated pits (**66**), and a Medieval field system (**130**) to the south-east. The location of Medieval ridge and furrow (**132**) to the west and within the 250 m Zone of Influence, provides a high potential for there to be significant archaeological assets relating to the Medieval period.

3.4.28 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Medieval assets in the area.

3.4.29 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

West Keal

3.4.30 This area will require archaeological mitigation due to the high potential for Prehistoric activity in the area; amounting to potential settlement activity. A range of Prehistoric find scatters (**115**, **76**, **80**) are located within the area. A later asset, in the form of an early/middle-Saxon site (**108**) would also be targeted as part of this mitigation. Potential for later Medieval material is also high, due to a pottery assemblage (**107**) within the planning application boundary.

3.4.31 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Prehistoric assets and any other features, within in the area.

3.4.32 Mitigation, if required, would be either open area excavation, strip, map and sample, or an archaeological watching brief.

Strip, Map and Sample

Langton Grange Farm

3.4.33 Located close to a barrow (**119**) and within the proposed DC cable route base planning application boundary are enclosure ditches (**143**) and an undated cropmark (**142)**. It is possible that these cropmarks are associated with the barrow. Further cropmarks, representing field boundaries and enclosures have been identified in the area through LiDAR survey (**385**). Mitigation of these assets will be through strip, map and sample, to establish the extent of the assets and their rate of survival.

Langton by Spilsby

3.4.34 A Prehistoric cropmark of a possible enclosure and associated boundaries (**144**) will be mitigated through a strip, map and sample. This approach would aim to establish the extent of the asset and true nature of the cropmark.

East Farm

3.4.35 An undated settlement (**137**) within an area of dense Roman to Medieval activity represented by cropmarks of enclosures and field boundaries (**387**) is partially located within the planning application boundary. The area relating to the assets within the planning application boundary will be mitigated through a strip, map and sample to establish the extent and retention of these assets.

South West Sausthorpe Bridge

3.4.36 The location of an undated trackway (**131**), identified as a cropmark, will require mitigation. Due to the high potential for Prehistoric material within the Lincolnshire Fen landscape, this asset has the potential to yield further material of this period. This asset will be mitigated through strip, map and sample to establish the extent and retention of the trackway.

Glebe Farm

An enclosure, with associated internal features (**400**), identified during geophysical survey will require mitigation. This asset has a medium value and is of an unknown date. Mitigation will also look to define an area of ridge and furrow (**401**), also identified during the geophysical survey. Mitigation will be strip, map and sample to establish the extent and retention of these assets.

Watching Brief

Langton Grange Farm

3.4.37 An early trackway site (**94**) at the location of Langton Grange farm will be mitigated through an archaeological watching brief.

North Langton by Spilsby

3.4.38 A watching brief will be conducted as mitigation for a stone axe findspot (**266**), located close to an artefact scatter (**96**), due to the potential for further high status Prehistoric artefacts or features to be present.

Dalby Bar

3.4.39 The area of an old field boundary/drain to the north-west of Dalby (**311**) will be mitigated through an archaeological watching brief.

3.4.40 An area to the south of Dalby Bar is the location an area of ridge and furrow (**398**), was identified through geophysical survey. This area will be mitigated through a watching brief.

North Helen Firs

3.4.41 An area of ridge and furrow (**388**) will be subject to mitigation through archaeological watching brief.

East Farm

3.4.42 The sand-pit (**114**) to the east of Sausthorpe, will be mitigated through an archaeological watching brief during construction.

3.4.43 Two undated banks to the south of Partney Road (**319, 320**) will be mitigated through an archaeological watching brief.

South West Sausthorpe Bridge

3.4.44 A curvilinear hollow, identified through LiDAR analysis will be mitigated through an archaeological watching brief (**314**).

North West Keal

Two assets located at Mardon Hill will be mitigated through an archaeological watching brief. These are Medieval ridge and furrow (**402**) and a possible ditch (**403**).

North West Deersleap

3.4.45 Impacts to chalk pits (**264**) will be mitigated through an archaeological watching brief.

3.5 Route Section 3: A16/Keal Road to River Witham

3.5.1 The archaeological mitigation of Route Section 3 has been split into 12 areas. These mitigation areas have been selected based on known concentrations of archaeology. The areas are shown on **Figure 2** (Sheet 9 to 16).

Phased Approach

North of Stickford

3.5.2 The site of a Middle Bronze Age site (**86**), North of Stickford has been identified for archaeological mitigation. This asset was identified through a pottery scatter. It is of medium value, and can provide evidence for Bronze Age activity, within the wider framework of the Lincolnshire Fen Landscape.

3.5.3 A phased approach of mitigation is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Prehistoric assets in the area.

3.5.4 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

Hagnaby Beck

3.5.5 This area contains a Bronze Age finds scatter (**83**) which may indicate a settlement site nearby. The area also contains an early to mid-Bronze Age pottery scatter (**87**).

3.5.6 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Prehistoric activity in the area.

3.5.7 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

Laburnum House

3.5.8 This area has a high density of archaeological features within the area. One feature which is of high/medium significance, is an area of substantial cropmarks (**345**) that could represent a Medieval or earlier activity site.

3.5.9 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Medieval or earlier assets in the area.

3.5.10 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

Roddons

3.5.11 Assets **342, 343** and **344** are all characterised as roddons, with **344** highlighted as a major roddon associated with the Prehistoric water course of the River Witham. These three assets will be mitigated through the approach outlined in section 3.3.

3.5.12 Assets **331**, **332**, **335**, **336**, **337**, **338**, **339**, and **341** are also all characterised as roddons. Each roddon is shown on Figure 2 (Sheet 9 to 16). Mitigation will follow the methods outlined in section 3.3.

Strip, Map and Sample

Mager Farm

3.5.13 A Romano British site (**201**) identified through a pottery scatter will be mitigated through strip, map and sample.

3.5.14 A second area to the south of the Romano-British site, will also be subject to mitigation through strip, map and sample. This would establish the extent and nature of any underlying archaeology, related to the former field boundaries and rectangular enclosures of an unknown date (**327**).

Watching Brief

West Keal

3.5.15 Impacts to a former field division (**321**) will be mitigated through an archaeological watching brief.

Keal Cotes

3.5.16 Former field divisions (**323**) at Keal Cotes will be mitigated through an archaeological watching brief.

North Limes Farm

3.5.17 Mitigation will be conducted on two assets identified during geophysical survey. These assets are located at North Lines Farm. The potential assets include two linear anomalies (**404**), which are masked and were difficult to identify using geophysics, due to the presence of extensive ridge and furrow (**405**) (Ref. 8). This area will be mitigated by archaeological watching brief.

3.5.18 A former field boundary and wide spaced ridging to the west of Limes Farm (**326**) will be mitigated through an archaeological watching brief.

Mager Farm

3.5.19 Medieval ridge and furrow (**171**) will be mitigated through archaeological watching brief.

Hagnaby Lock

3.5.20 The potential dylings at Hagnaby Lock (**329**) and linear hollows (**330**), to the north-west will be mitigated through an archaeological watching brief.

West Fen

3.5.21 An unlisted 19th century farm (**190**) will require archaeological mitigation. The farmstead is recorded as a partially extant 19th century farmstead located in the West Fen. Mitigation will be an archaeological watching brief.

South West Carrington

3.5.22 A demolished 19th century out farm (**194**), located to the south-west of Carrington will be mitigated through an archaeological watching brief.

North East Thornton

3.5.23 Impacts to a former field division and linear drainage (**340**) will be mitigated through an archaeological watching brief.

Laburnum House

3.5.24 The disused railway, recorded to the east of the River Witham (**413**) will be mitigated during construction by an archaeological watching brief.

3.5.25 Asset **346**, a former artificial channel of the River Witham will be mitigated during construction through an archaeological watching brief.

3.5.26 The relict field boundary at Castle Dike Farm (**244**) will be mitigated during construction through an archaeological watching brief.

3.6 Route Section 4: River Witham to the Proposed Converter Station

3.6.1 The archaeological mitigation of Route Section 4 has been split into eight areas. These mitigation areas have been selected based on known concentrations of archaeology. The areas are shown on **Figure 2** (Sheet 16 to 20).

Phased Approach

Laburnum House West

3.6.2 This area is a continuation of the Laburnum House mitigation area, located to the western extent of Route Section 3. A dense area of several roddon features (**344, 347, 348**) as potential indicators of archaeological potential they will be mitigated as outlined in section 3.3 of this report.

Holt Hills

3.6.3 A Romano-British enclosure (**358** and **359**) is of high significance within a landscape which is dense with Roman activity.

3.6.4 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the survival and density of Roman activity in the area.

3.6.5 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

Bicker Fen

3.6.6 A grouping of four roddons (**361, 362, 363, 364**) will be mitigated as outlined in section 3.3 of this report.

Eau End Farm

3.6.7 Cropmarks and a sinuous roddon (**366**) to the south-west of Eau End Farm, identified through aerial photography, will require mitigation. This asset may indicate Romano-British activity, and be associated with to the cropmark settlement assets of **20** and **21**, located to the south.

3.6.8 A phased approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Romano-British activity in the area.

3.6.9 Mitigation, if required, would be either open area excavation, strip, map and sample, or archaeological watching brief.

North Ing Drove

3.6.10 Cropmarks indicating a potential Romano-British shrine (**21**) adjacent to a high concentration of Romano-British settlement activity within the proposed converter station site (**20**) will require mitigation. The cropmarks around the shrine area have been identified as enclosure, farmstead, boundary ditch, double ditched enclosure, round house (domestic), multiple ditch system and a trackway.

3.6.11 A staged approach is proposed. A primary evaluative phase of trial trenching will establish the retention and density of Romano-British activity in the area.

3.6.12 Following the completion of trial trench evaluation in this area the proposed mitigation, if required, would be open area excavation.

3.6.13 Further detail of the proposed works within this area is provided within the proposed converter station mitigation strategy (Appendix 25.5).

Roddons

3.6.14 There are multiple examples of roddons across Route Section 4. These assets will be mitigated through the approach outlined in section 3.3 of this report. The roddons identified across this route section proposed for mitigation are: **347**, **348**, **349**, **350**, **351**, **353**, **355**, **356**, **360**, **357, 365** and **367**. These assets are detailed on Figure 2 (Sheets 16 to 20).

Strip, Map and Sample

Swineshead Bridge

A Romano-British field system (**354**) is of medium/high significance. Mitigation of this asset will be through strip, map and sample to establish the extent and retention of Romano-British activity in the area.

Watching Brief

Laburnum House West

3.6.15 The former artificial channel of the River Witham (**346**) will be mitigated by an archaeological watching brief.

Holland Fen

3.6.16 The demolished Post-Medieval farmstead at Holland Fen with Brothertoft (**55**) will be mitigated through an archaeological watching brief.

Ferry Farm

3.6.17 A Post-Medieval Farmstead (**52**) will be mitigated through an archaeological watching brief.

3.7 Approach to unknown archaeology

3.7.1 As part of the mitigation strategy for the proposed DC cable route consideration has been given to unknown archaeological assets, where the potential for their presence has been identified in the proposed DC cable route DBA or ES chapter. In addition; this approach considers possible unknown remains over and above the potential identified.

3.7.2 It is proposed that the following approach, outlined in the flow chart below (Table 2) be undertaken in order to manage mitigation of unknown archaeological remains.

3.7.3 In the flow chart, preservation in situ would be the first option considered if unknown archaeological remains are encountered. Preservation in situ would be achieved by utilising the LoD or a HDD solution to avoid the asset. However, in some circumstances, these options may not be feasible. In addition, in some cases the extent or significance of the archaeological asset may not warrant preservation in situ or it may prove more efficient to deal with the asset through excavation and recording. In these cases, mitigation through preservation by record will be applied.

3.7.4 At the point of discovery of unknown archaeology, construction works should cease on the instruction of the on-site archaeologist who should seek advice from the Scheme Archaeologist. A decision point is reached with two options to proceed.

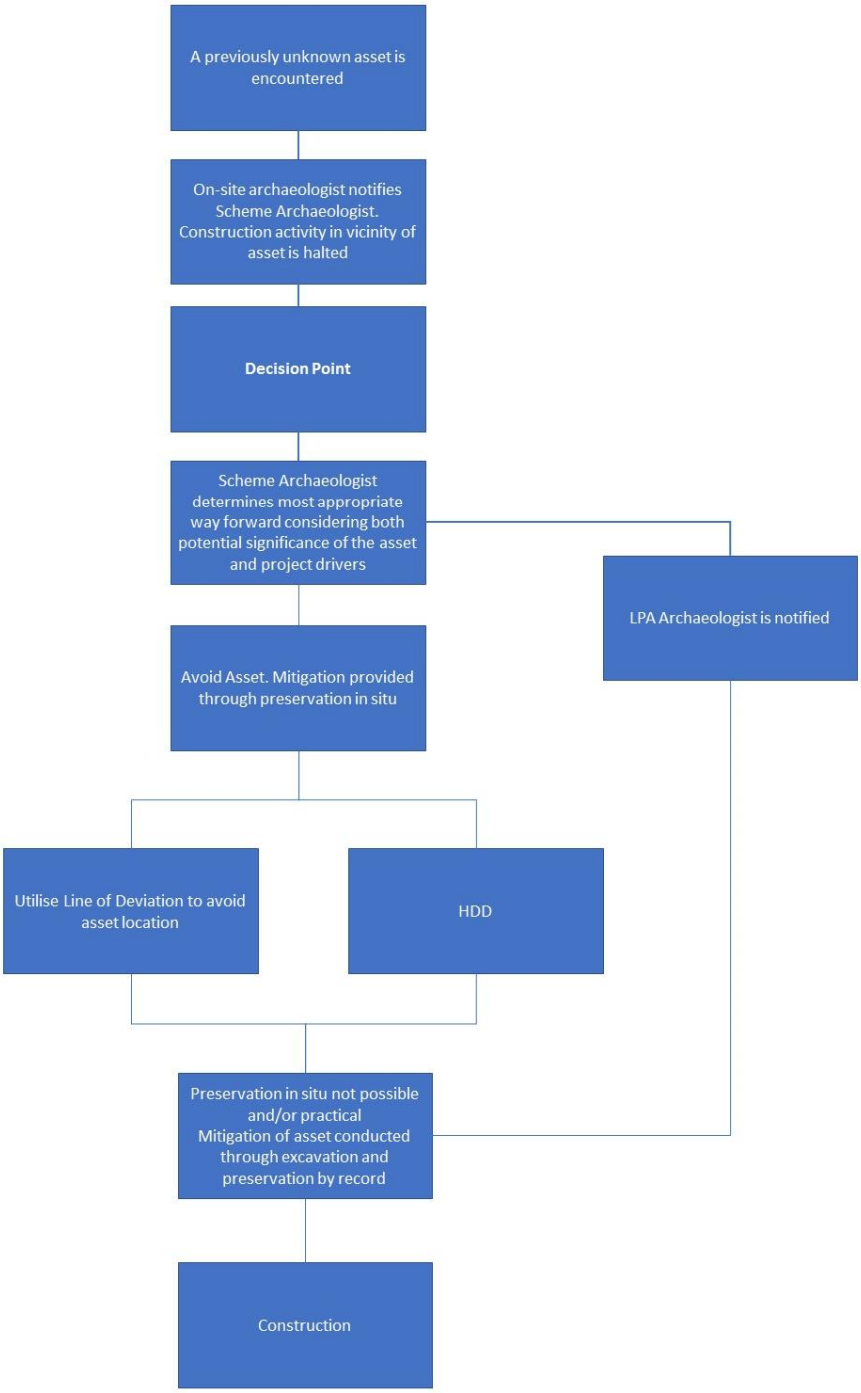
3.7.5 Initially, attempts will be made to avoid the discovered asset, and mitigate through preservation in situ. This would be considered if an asset is significant enough to warrant its preservation in situ and the circumstances on site allow for preservation in situ. Preservation in situ could be achieved through the re-routing of the proposed DC cable route within the limits of deviation, set out as part of the design. Some flexibility is given for a change in location of the proposed DC cable route to allow such deviation. Restrictions to the flexibility of the cable and the movement of the 30 m wide proposed DC cable working width would have to be accounted for. Movement of the DC route and proposed DC cable working width would have to adhere to the planning application boundary, and refrain from encroaching into the 250 m Zone of Influence.

3.7.6 In some locations avoidance through use of the LoD may be difficult. Consequently, a worst-case scenario strategy could consider the use of Horizontal Direct Drilling (HDD), to avoid the asset and drill under the asset, whilst maintaining the same alignment as per the base scheme design.

3.7.7 If preservation in situ is not possible or the assets significance does not warrant it, then it will be subject to sample excavation and recording. The sample should aim to gather information relating to the extent and nature of the archaeological resource, as well as to recover any artefactual evidence, as a means of dating and establishing a function for the asset.

3.7.8 The methodology outlined in the flow chart considers all options up to a worst-case scenario for dealing with the unforeseen situation and presents a pathway of options to be considered, taking into account the asset's significance along with key scheme drivers.

Table 2: Flow chart of proposed protocols to deal with the discovery of unknown archaeology.



4 Initial Written Scheme of Investigation

4.1 Introduction

4.1.1 This initial WSI provides the foundations for a programme of works to deliver the archaeological mitigation outlined above.

4.1.2 The archaeological contractors should use and adapt this document, to create a detailed WSI.

4.1.3 This initial WSI outlines the basic procedures for conducting the three-main methods of archaeological mitigation; open area excavation, strip, map and sample, and watching brief.

4.1.4 All archaeological works including the production of any detailed WSIs will be conducted following relevant guidance set out by CIfA (Ref.3 and Ref.9-14).

4.1.5 Further consideration is given to the handling of soil, during archaeological investigation, which will underpin the three mitigation methods.

4.2 Roles and Responsibilities

4.2.1 In order to deliver the archaeological mitigation, it is envisioned that the following roles and responsibilities will be required. These roles and responsibilities may be updated as required.

Scheme Archaeologist

4.2.2 It is anticipated that this will be a single person tasked with overseeing the delivery of the archaeological mitigation. This person will be the main point of contact between all parties and will be the primary archaeological decision maker. It is possible that this person may be appointed by Viking Link but they may also be appointed by the mains work contractor.

4.2.3 It will be the responsibility of the Scheme Archaeologist to monitor the on-site works either through regular monitoring visits or a permanent on-site presence. It will also be the responsibility of the Scheme Archaeologist to liaise with the LPA archaeologist.

Archaeological Contractor

4.2.4 The archaeological contractor will be a specialist archaeological organisation tasked with delivery of the archaeological mitigation. The archaeological contractor will produce the detailed WSI and supply the on-site archaeologists. It will be the responsibility of the archaeological contractor to ensure that the archaeological mitigation is delivered in accordance with the mitigation strategy and WSI.

4.2.5 The archaeological contractor will notify the Scheme Archaeologist in the event that unknown archaeology is encountered.

LPA Archaeologist

4.2.6 The LPA archaeologist is the archaeological advisor to the Local Planning Authority (LPA). The LPA archaeologist will monitor the archaeological mitigation to ensure that the work meets the requirement of any planning condition. This may include carrying out on-site visits. In addition, they will be invited to review and comment on the detailed WSI. The LPA archaeologist will also be notified in the event that unknown archaeology is encountered.

4.3 Soil Handling and Storage Protocol

4.3.1 The following comments regarding stripping of soil reflects the methodology stated within the Soil Handling and Storage Protocol (Ref.15).

4.3.2 The methods for dealing with soil handling and storage, are designed to best protect any archaeological assets in situ, while conducting intrusive archaeological works.

4.3.3 The stripping method should follow Sheet 1 of MAFF's Good Practice Guide to Handling Soils (Ref. 15). This method uses back-acting excavators, in combination with dump trucks to strip the topsoil and subsoil progressively down to the sub-base (basal layer).

4.3.4 Several areas of known archaeological significance or high archaeological potential have been identified and are proposed for strip, map and sample archaeological investigation prior to the commencement of main construction activities. In these areas, the soils will be stripped mechanically (under strict archaeological supervision) to a depth where archaeological deposits are exposed. The soil strip will be subject to the mitigation measures set out in this document with respect to the management and protection of soil resources. However, a toothless bucket should be employed to prevent damage to the underlying archaeology. It is expected that (in most locations) the excavated soil will be stored on the margin of the working area and that the use of dumper trucks will not be required (Ref.15).

4.4 Open Area Excavation

Aims and Objective

4.4.1 The aims and objectives of mitigation by open area excavation are:

- To determine the existence or absence of archaeological remains, and where these exist,
- To establish the character and complexity of any remains through excavation;
- To establish the date of the deposits encountered through recovery of artefacts;
- To establish further any understanding of heritage assets gained through trial trenching and preliminary field surveys;
- To establish the environmental significance of deposits with evidence of potential by targeted environmental sampling, processing, and assessment; and
- To place any archaeological discoveries into the local and, where appropriate, regional/national context, and to assess the implications of any such discoveries for our current understanding of the development of the area.

Excavation and Recording Methodology

4.4.2 The excavation areas will be laid out based upon the detail given in the detailed WSI.

4.4.3 Each area will be excavated by machine using a toothless bucket under close archaeological supervision. This will be to the top of the first archaeological horizon, or failing that, to the surface of the underlying geology. The spoil and the exposed surface will be scanned for finds by eye and, if deemed appropriate, using a metal detector. The topsoil will be excavated first and stored in the designated topsoil storage areas. Subsoil will be stored separately also within a designated spoil storage area. When backfilling (if required) the subsoil will be returned to the area first, followed by the topsoil.

4.4.4 Careful stripping of areas by machine under archaeological supervision should leave a surface that can be planned and photographed without the need for further hand-cleaning. Any areas left obscured or unclear after machine-stripping will be hand-cleaned before photographing and planning.

4.4.5 The revealed surface will be inspected for archaeological features, and where necessary cleaned by hand before being photographed and planned.

4.4.6 Discrete deposits will generally be excavated by hand, unless otherwise agreed with the Scheme Archaeologist and the LPA Archaeologist. Should thick sterile or well-dated recent deposits be encountered, sample areas will be dug by hand but further excavated by machine under archaeological supervision. The total area sampled of each linear feature will be sufficient to return meaningful data.

4.4.7 All excavation and recording of archaeological features will be undertaken in accordance with the general principles outlined in the detailed WSI.

Programme

4.4.8 Prior to commencement of work on site, the archaeological contractor will agree a programme for the site works with the Scheme Archaeologist, and provide this to the LPA Archaeologist. This programme will detail the proposed start date on site and the proposed length of time the archaeological contractor intends for the fieldwork.

4.4.9 This programme will allow sufficient time for the archaeological excavation to take place prior to the commencement of construction activity including any enabling works. It is likely that the archaeology mitigation programme will need to be developed in consultation with the mains work contractor.

Monitoring

4.4.10 All archaeological works will be monitored by the Scheme Archaeologist and the LPA Archaeologist. Notice of the commencement of the excavation will be given to the LPA Archaeologist by the Scheme Archaeologist.

4.4.11 The Scheme Archaeologist and the LPA Archaeologist will be free to access the site, and have access to all records to ensure that the work is being conducted in accordance with the detailed WSI and all relevant standards.

4.4.12 The frequency of monitoring visits thereafter will depend upon the specific requirements of the Scheme Archaeologist and the LPA Archaeologist and the extent of the survival of archaeological remains.

Reporting, Publication, and Archive Methodology

4.4.13 Upon completion of the archaeological site works the reporting, publication and archiving will be carried out in accordance with the principles outlined in the final document.

4.4.14 The post-excavation assessment will also undertake the further paleoenvironmental assessment of the samples returned from the evaluation as recommended in the evaluation post excavation assessment report. Appropriate methods should be implemented to extract the necessary data from the samples to add to our knowledge of the site.

4.5 Strip, Map and Sample

Aims and Objective

4.5.1 The aims and objectives of mitigation by strip, map and sample are:

- To determine the existence or absence of archaeological remains, and where these exist,
- To establish the character and complexity of any remains by sample excavation;
- To attempt to establish the date of the deposits encountered through recovery of artefacts;
- To establish the environmental significance of deposits with evidence of potential by targeted environmental sampling, processing, and assessment; and
- To place any archaeological discoveries into the local and, where appropriate, regional/national context, and to assess the implications of any such discoveries for our current understanding of the development of the area.

Excavation and Recording Methodology

4.5.2 The strip, map and sample area will be laid out based upon the final layout given in the detailed WSI.

4.5.3 Excavation will be conducted by machine using a toothless bucket under close archaeological supervision, down to the top of the first archaeological horizon, or failing that, to the surface of the underlying geology. The spoil and the exposed surface will be scanned for finds by eye and, if deemed appropriate, using a metal detector. When excavating, the topsoil will be excavated first and stored within a designated topsoil storage area. Subsoil will be stored separately also within a designated spoil storage area. When backfilling (if required) the subsoil will be returned to the trench first, followed by the topsoil.

4.5.4 Careful stripping of areas by machine under archaeological supervision should leave a surface that can be planned and photographed without the need for further hand-cleaning. Any areas left obscured or unclear after machine-stripping will be hand-cleaned before photographing and planning.

4.5.5 The revealed surface will be inspected for archaeological features, and where necessary cleaned by hand before being photographed and planned.

4.5.6 The revealed surface will be mapped using either GPS or Total Station. Following production of a plan of the area rapid consultation will take place to agree which archaeological features will be subject to sample excavation.

4.5.7 Discrete deposits will generally be excavated by hand, unless otherwise agreed with the Scheme Archaeologist and LPA Archaeologist. Should thick sterile or well-dated recent deposits be encountered, areas will be dug by hand but further excavated by machine under archaeological supervision.

4.5.8 All excavation and recording of archaeological features will be undertaken in accordance with the general principles outlined in the detailed WSI.

Programme

4.5.9 Prior to commencement of work on site, the main works contractor and their archaeological contractor will agree a programme for the site works with the Scheme Archaeologist, and provide this to the LPA Archaeologist. This programme will detail the proposed start date on site and the proposed length of time the archaeological contractor intends for the fieldwork.

4.5.10 The construction programme will allow sufficient time for the archaeological fieldwork to be completed before construction activity commences in the strip, map and sample area. It is likely that the programme will need to be developed in consultation with the mains work contractor.

Monitoring

4.5.11 All archaeological works will be monitored by the Scheme Archaeologist and the LPA Archaeologist. Notice of the commencement of the excavation will be given to the LPA Archaeologist by the Scheme Archaeologist.

4.5.12 The Scheme Archaeologist and the LPA Archaeologist will be free to access to the site, and have access to all records to ensure that the work is being conducted in accordance with the detailed WSI and all relevant standards.

4.5.13 The frequency of monitoring visits thereafter will depend upon the specific requirements of the Scheme Archaeologist and the LPA Archaeologist and the extent of the survival of archaeological remains.

Reporting, Publication, and Archive Methodology

4.5.14 Upon completion of the archaeological site works the reporting, publication and archiving will be carried out in accordance with the principles outlined in the detailed WSI.

4.6 Watching Brief

Aims and Objective

4.6.1 The aims and objectives of mitigation by watching brief are:

- To determine the existence or absence of archaeological remains, and where these exist;
- To establish the character and complexity of any remains by sample excavation;
- To attempt to establish the date of the deposits encountered through recovery of artefacts;
- To establish the environmental significance of deposits with evidence of potential by targeted environmental sampling, processing, and assessment; and
- To place any archaeological discoveries into the local and, where appropriate, regional/national context, and to assess the implications of any such discoveries for our current understanding of the development of the area.

Excavation and Recording Methodology

4.6.2 All areas subject to archaeological watching brief will be stripped of topsoil under archaeological monitoring using a toothless bucket. The spoil and the exposed surface will be scanned for finds by eye and, if deemed appropriate, using a metal detector.

4.6.3 The revealed surface will be inspected for archaeological features, and where necessary cleaned by hand before being photographed and planned. Where possible archaeological features will be excavated, and recorded upon identification and construction activity allowed to continue.

4.6.4 If significant concentrations of archaeological features are identified then it may be necessary to halt construction activity and demarcate an area for archaeological investigation. In these cases, the excavation of the features should proceed promptly and the area handed back for construction activity as soon as possible.

4.6.5 Discrete deposits will generally be excavated by hand, unless otherwise agreed with the Scheme Archaeologist and LPA Archaeologist. Should thick sterile or well-dated recent deposits be encountered, areas will be dug by hand but further excavated by machine under archaeological supervision. Discrete features will be half-excavated by hand, unless particularly large, when an alternative strategy may be agreed with the Scheme Archaeologist and LPA Archaeologist.

4.6.6 All excavation and recording of archaeological features will be undertaken in accordance with the general principles outlined in the detailed WSI.

Programme

4.6.7 Prior to commencement of work on site, the main works contractor and their Archaeological Contractor will agree a programme for the site works with the Scheme Archaeologist, and provide this to the LPA Archaeologist. This programme will detail the proposed start date on site and the expected duration of the watching brief.

Monitoring

4.6.8 All archaeological works will be monitored by the Scheme Archaeologist and the LPA Archaeologist. Notice of the commencement of the excavation will be given to the LPA Archaeologist by the Scheme Archaeologist.

4.6.9 The Scheme Archaeologist and the LPA Archaeologist will be free to access to the site, and have access to all records to ensure that the work is being conducted in accordance with the detailed WSI and all relevant standards.

4.6.10 The frequency of monitoring visits thereafter will depend upon the specific requirements of the Scheme Archaeologist and the LPA Archaeologist and the extent of the survival of archaeological remains.

Reporting, Publication, and Archive Methodology.

4.6.11 Upon completion of the archaeological site works the reporting, publication and archiving will be carried out in accordance with the principles outlined in the detailed WSI.

5 Health and Safety

5.1.1 All fieldwork associated with the mitigation will be subject to a site-specific Risk Assessment Method Statement (RAMS) which will be produced by the archaeological contractor and submitted to the Scheme Archaeologist prior to the commencement of work. This should include the CV of the supervising archaeologist on site and the archaeological project officer.

5.1.2 The RAMS will be written in accordance to the current regulations produced by the HSE (Ref. 16).

5.1.3 The RAMS will detail the archaeological contractor's scope of work, programme, staff responsibilities, welfare provision, personal protective equipment (PPE), equipment and tools, safe method of working, environmental protection measures, work-specific emergency procedures, and hazard and near miss reporting procedures.

5.1.4 All staff working on site will undertake a site-specific Health and Safety Induction, written, and conducted by the archaeological contractor, and will read and sign the RAMS prior to starting work on site.

5.1.5 The RAMS will include:

- Details on the work activities, tasks and steps that will be undertaken during the trial trenching event.
- Identify all hazards and foreseeable causes of harm that may be associated with the evaluation activities.
- Identify who or what might be harmed and how.
- Assess the risks associated with the hazards.
- Detail how risks will be controlled/mitigated.
- Detail how Health and Safety will be managed and monitored throughout this element of the Scheme.

5.1.6 The PPE required on site is:

- High-Vis jackets.
- Hard hats.
- Safety Boots (with suitable ankle support).
- High-Vis wet weather gear.
- Gloves.
- Safety goggles.

6 Reference

Ref.1 Arcadis 2017. Environmental Statement Vo. 2 Document ES-2-B.08 Chapter 12 Archaeology & Cultural Heritage (Underground Cable).

Ref.2 Arcadis, 2017, Viking Link UK Onshore Scheme, Environmental Statement, Volume 4, Chapter 12, Archaeology and Cultural Heritage Desk-based Assessment (DC Cable Route)

Ref.3 CIFA, 2014, Standard and Guidance for archaeological excavation, http://www.archaeologists.net/sites/default/files/CIfAS&GExcavation_1.pdf, (Accessed 11th April 2017).

Ref.4 Zeitica Ltd 2017. Viking Link, Lincolnshire- UXO Risk Assessment.

Ref.5 Smith, D et al, 2010 Holocene drainage systems of the English Fenland: roddons and their environmental significance.
http://nora.nerc.ac.uk/11349/1/Smith_et_al_2010_Roddons_paper.pdf. (Accessed 21st July 2017).

Ref.6 Commonwealth War Graves Commission, http://www.cwgc.org/find-war-dead/casualty/2416712/WALKER,%20ARTHUR%20HALL . (Accessed 11th April 2017).

Ref.7 HM Government, 1986, Protection of Military Remains Act 1986, Chapter 35.

Ref.8 Sumo Survey, 2017, Geophysical Survey Report proposed DC cable route.

Ref.9 CIfA, 2014, Code of Conduct

Ref.10 CIfA, 2014, Standard and guidance for historic environment desk-based assessment

Ref.11 CIfA, 2014, Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment

Ref.12 CIfA, 2014, Standard and guidance for the creation, compilation, transfer, and deposition of archaeological archives

Ref.13 CIfA, 2014, Standard and guidance for the collection, documentation, conservation, and research of archaeological materials

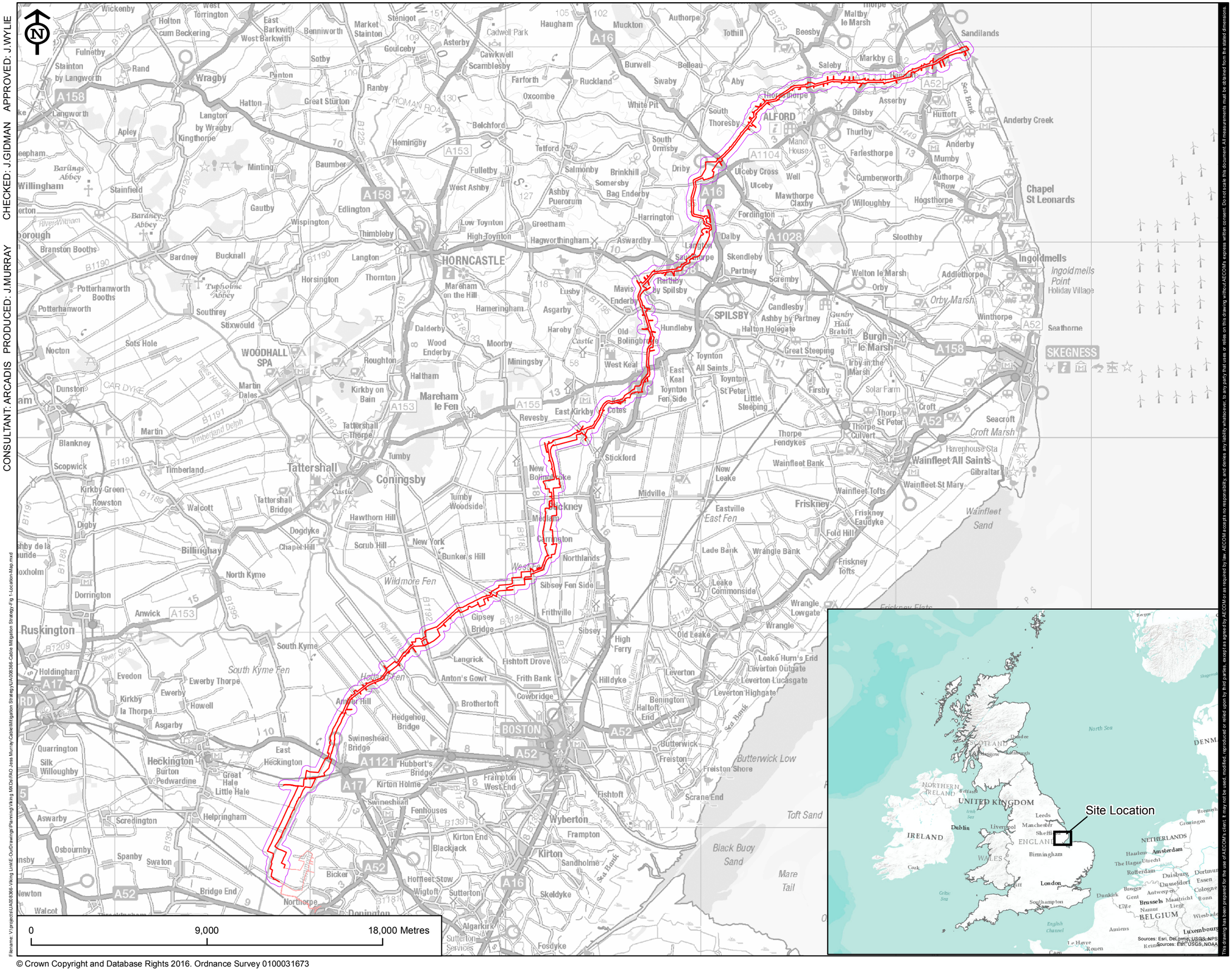
Ref.14 CIfA, 2014, Standard and guidance for an archaeological watching brief

Ref.15 Wardell Armstrong LLP, 2017, Soil Handling and Storage Protocol, VKL-08-39-G500-026.

Ref.16 HSE, 2017, Risk Management Guidance, http://www.hse.gov.uk/risk/index.htm. (Accessed 11th April 2017).

Figures

CONSULTANT: ARCADIS PRODUCED: J.MURRAY CHECKED: J.GIDMAN APPROVED: J.WYLIE



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VikingLink

LEGEND

- Planning Application Boundary
- 250m Zone of Influence

REVISION:

REV.	DATE	DESCRIPTION
01	24JUL17	Location Map
02	15AUG17	Amendments

FIGURE NO.

FIGURE 1

FIGURE TITLE

PROPOSED DC CABLE ROUTE LOCATION PLAN

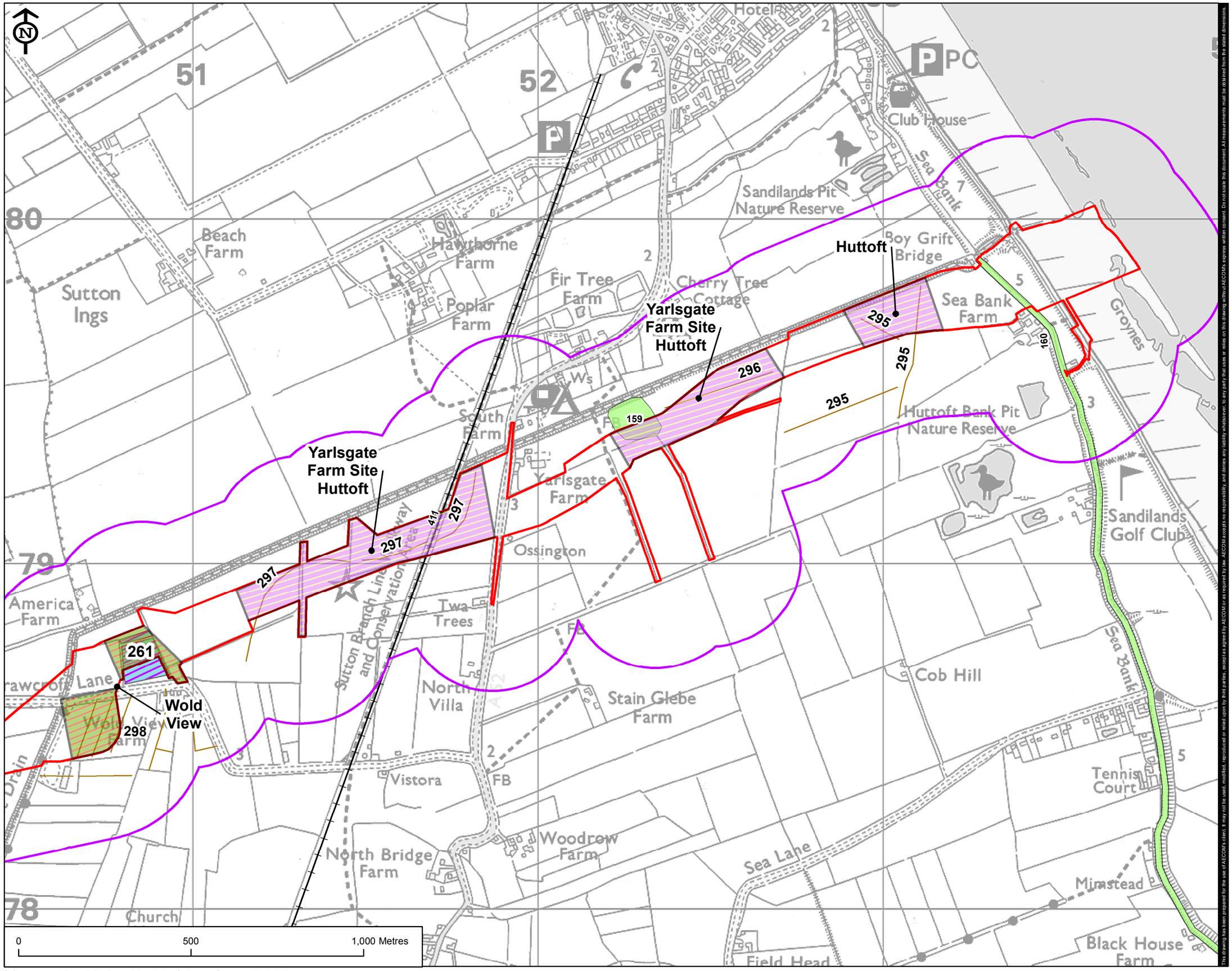
SHEET NUMBER

1 of 1

NOTES

Date:	Scale at A3:
16/08/17	1:175,000

CONSULTANT: ARCADIS PRODUCED: J. MURRAY CHECKED: J.GIDMAN APPROVED: J.WYLIE



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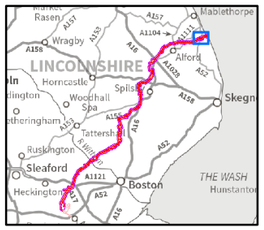
VikingLink

LEGEND

- Planning Application Boundary
- 250m Zone of Influence

Mitigation

- Multiple Approaches
- Watching Brief
- HER Asset
- HER Asset
- LiDAR Asset
- Previously Unrecorded Archaeology
- Disused Railways



REVISION:

REV.	DATE	DESCRIPTION
01	24JUL17	Original Issue
02	16AUG17	Amendments

FIGURE NO.

FIGURE 2

FIGURE TITLE

PROPOSED DC CABLE ROUTE: PROPOSED AREAS OF ARCHAEOLOGICAL MITIGATION

SHEET NUMBER

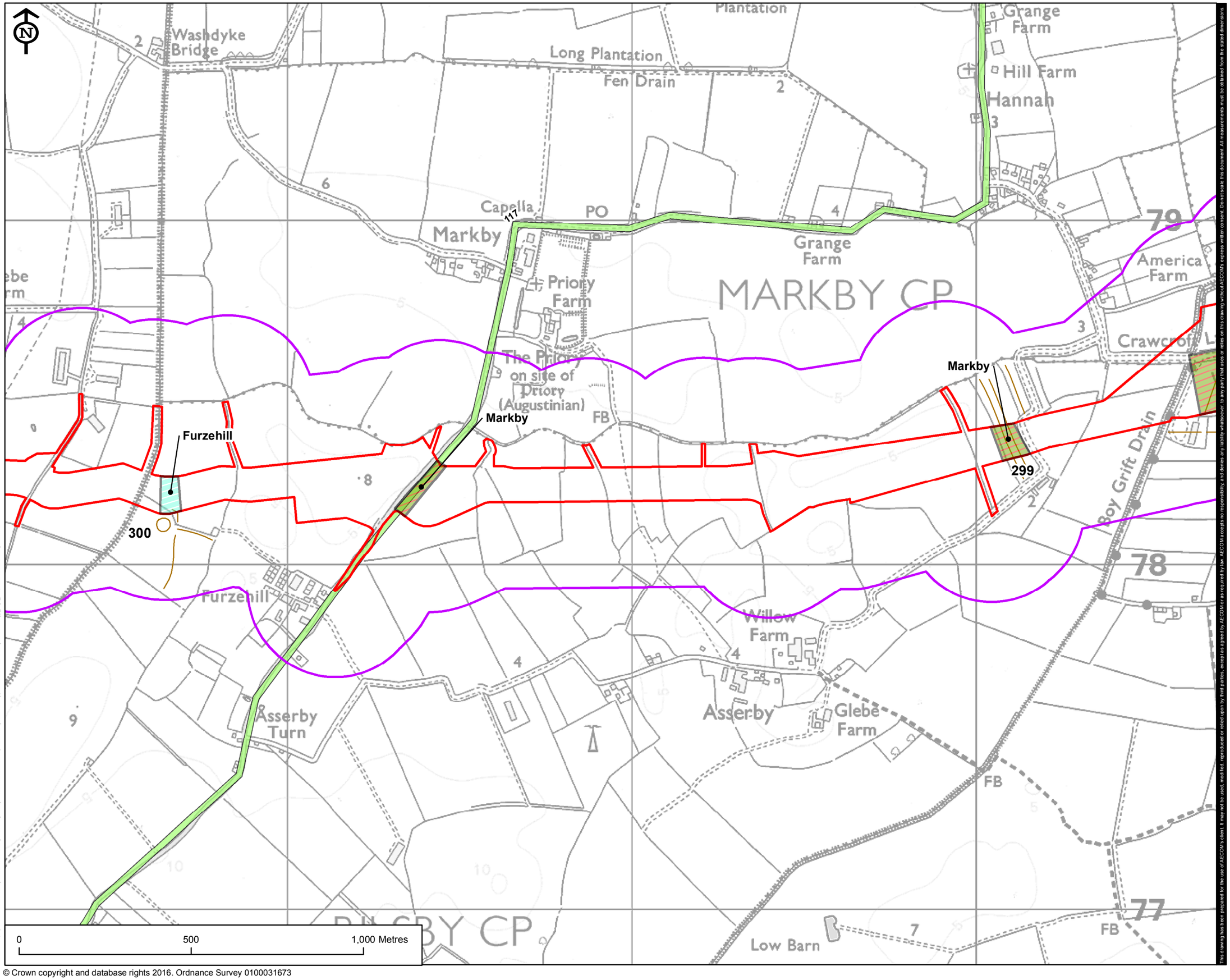
1 of 20

NOTES

Asset numbers displayed on figure relate to Project IDs discussed in text.

Date:	Scale at A3:
16/08/17	1:10,000

CONSULTANT: ARCADIS PRODUCED: J. MURRAY CHECKED: J.GIDMAN APPROVED: J.WYLIE



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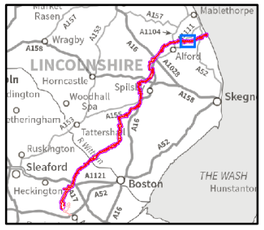
VikingLink

LEGEND

- Planning Application
- 250m Zone of Influence

Mitigation

- Strip, Map, and Sample
- Watching Brief
- HER Asset
- LiDAR Asset



REVISION:

REV.	DATE	DESCRIPTION
01	24JUL17	Original Issue
02	16AUG17	Amendments

FIGURE NO.

FIGURE 2

FIGURE TITLE

PROPOSED DC CABLE ROUTE: PROPOSED AREAS OF ARCHAEOLOGICAL MITIGATION

SHEET NUMBER

2 of 20

NOTES

Asset numbers displayed on figure relate to Project IDs discussed in text.

Date:	Scale at A3:
16/08/17	1:10,000