



West Winch Housing Access Road

Environmental Statement Chapter 7: Archaeology and Heritage: Appendix 3: Geophysical Survey Report (SUMO 2023) – Part 1 of 3

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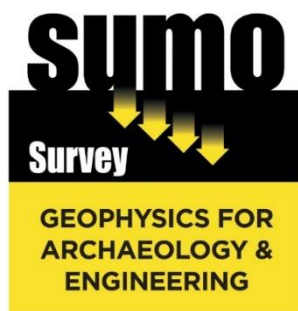
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1 Geophysical Survey Report

1.1 Introduction

1.1.1 The following is a report of a detailed magnetometer survey undertaken in March 2023 over an area of approximately 31 hectares, of the originally proposed 38 hectares, in order to inform archaeological potential within the footprint of the scheme. The survey has identified a small number of anomalies of both probable and possible archaeological interest.



GEOPHYSICAL SURVEY REPORT

**West Winch Housing Access Road (WWHAR),
Kings Lynn, Norfolk**

Client
WSP

Survey Report
08501

OASIS Ref. No.
sumogeop1-515018

NHER Number
ENF153605

Consultation Number
CNF48858

Norfolk Museums Accession Number
NWHCM : 2023. 118

Date
26 April 2023



Survey Report 08501: West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

Survey dates	20 – 31 March 2023
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Report Date	26 April 2023
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Appendix B	Technical Information: Magnetic Theory
Appendix C	OASIS Data Collection Sheet
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3 SURVEY TECHNIQUE

- 3.1 Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site. All survey techniques followed the guidance set out by CIFA (2014, updated 2020), Historic England (2008), and the European Archaeology Council (EAC) (2016).

Bartington Grad 601-2

Traverse Interval 1.0m

Sample Interval 0.25m

The only processes performed on data are the following unless specifically stated otherwise:

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes instrument 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.

4 SUMMARY OF RESULTS

- 4.1 A detailed magnetometer survey was conducted over approximately 31 hectares, of the originally proposed 38 hectares, land at West Winch and it has identified a small number of anomalies of both probable and possible archaeological interest. A probable partial rectilinear enclosure has been mapped, along with additional ditch-type responses and discrete anomalies that could have an archaeological provenance. A number of linear, curvilinear, and discrete anomalies and trends have an uncertain origin; they could be archaeological, agricultural or natural. Former field boundaries have been mapped, along with two possible land drains, ridge and furrow and ploughing effects. An area of magnetic disturbance associated with a former marsh / wetland area has been identified, and underground services have also been detected.

5 INTRODUCTION

- 5.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for the construction of a proposed housing access road. This survey forms part of an archaeological investigation being undertaken by **WSP**.

5.2 Site Details

NGR / Postcode	North: TF 6352 1794 / PE33 0QP South: TF 6349 1472 / PE33 0PB
Location	The site is located to the south of Kings Lynn, Norfolk and stretches approximately 3.25km from the Hardwick Interchange and A47 in the north to the south-east of West Winch. Rectory Lane and Chequers Lane cross the site from east-west.
HER	Norfolk
OASIS Ref. No.	sumogeop1- 515018
District	Kings Lynn and West Norfolk District
Parish	North Runcton CP / West Winch CP
Topography	Mostly flat
Land Use	Arable / pasture
Geology (BGS 2023)	Bedrock: Kimmeridge Clay Formation – mudstone is recorded over the northern and southern extents of the site, with Mintlyn Member – sand across the majority of the survey area and bands of Leziate Member – sand and Roxham Member and Runcton Member – sand in the north and west. Superficial: Lowestoft Formation – diamicton is present across the north and east of the area, with Tottenhill Gravel Member – gravel recorded in the southwest of the site.
Soils (CU 2023)	Soilscape 8: slightly acid loamy and clayey soils with impeded drainage are recorded across the north and east of the area. Soilscape 10: freely draining slightly acid sandy soils are present in the south and west.
Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	c. 38 ha – approximately 7 hectares (Sections 1 and 4) could not be surveyed due to dense vegetation and shrubs, reducing the total area surveyed to 31 hectares.

5.3 **Archaeological Background**

5.3.1 A Written Scheme of Investigation for archaeological geophysical survey (WSP 2022; NHER Enquiry 23_04_19; ENF153616) indicates that the main archaeological potential is for remains from the prehistoric, Roman, medieval and post-medieval periods. In the north-west of the survey area, at the Hardwick Interchange, the site of a prehistoric burnt mound (NHER 3360) has been identified, along with a large undated potboiler and burnt flint scraper. Within the northwest boundary of the site, a possible Roman settlement and industrial site (NHER 3364) has been discovered adjacent to the A47. An associated archaeological evaluation (AS 2015) identified extensive archaeological remains included a scatter of pottery and iron slag associated with Roman iron working. It is suggested that medieval settlement was likely focussed in Hardwick, immediately west of the site and there is a probable moated enclosure (NHER 3373) located 500m west of the survey area. In the north-west section of the site, a possible medieval enclosure, ditches and possible extraction pits (NHER 38258; 3360) have been identified from aerial photographs.

5.4 **Aims and Objectives**

5.4.1 To locate and characterise any anomalies of possible archaeological interest within the study area.

6 **RESULTS**

6.1 The survey has been divided into fifteen survey areas (Sections 1-15) and specific anomalies have been given numerical labels [1] [2] which appear in the text below, as well as on the Interpretation Figure(s).

6.2 **Probable / Possible Archaeology**

6.2.1 A partial rectilinear feature [1], some 71m east-west, has been identified in the south of Section 11, with a parallel ditch-type response to the north. Several small discrete positive anomalies and additional linear trends have also been mapped in close proximity. It is noted that c. 300m to the west, a scatter of Roman pottery sherds (NHER 17305) has been discovered, and it is likely that the rectilinear feature could represent an enclosure. Further linear ditch-like responses [2] of possible archaeological origin have been detected immediately to the south, in the north of Section 13. They could be associated with an additional enclosure or ditches, though the ferrous disturbance from the adjacent pipe makes further interpretation difficult.

6.3 **Uncertain**

6.3.1 Very weak linear, curvilinear and discrete anomalies [3] have been identified in Section 2 and have an uncertain origin. They lie within an area where a series of undated cropmarks, including a D-shaped enclosure, linear feature and pits (NHER 27954) have been identified, suggesting that an archaeological explanation cannot be entirely ruled out. However, the responses are very weak, and without the archaeological context they would simply be dismissed as being a result of natural or agricultural processes.

6.3.2 Two partial sub-circular anomalies [4] have been detected in Section 10, each of which contains discrete positive anomalies which could be indicative of pits. The anomalies could represent former enclosures, though such an interpretation is tentative at best; they could equally be natural or agricultural although their exact origin remains unclear.

6.3.3 A series of discrete anomalies, areas of enhancement and linear trends [5] have been mapped in Section 9 which also have an uncertain origin. The areas of enhancement could indicate areas of former occupation activity, though there is no archaeological evidence within the

immediate vicinity to support such an interpretation and they could simply be a result of modern activity or agricultural practices.

- 6.3.4 Further linear anomalies [6] have been identified in the west of Section 6 which have also been assigned to the category of *Uncertain*; they generally lack the defined morphology of anomalies that would usually be interpreted as being of archaeological interest. They could indicate former ditches, though the responses are obscured by the pipe running east-west through the area making further interpretation difficult.

6.4 **Former Field Boundary – Corroborated / Conjectural**

- 6.4.1 A number of linear anomalies [7-12] have been mapped in Sections 7, 11, 13 and 15, each of which can be corroborated with former field boundaries that are visible on historic Ordnance Survey maps of the area (Fig. 23).

- 6.4.2 A further linear anomaly [13] is visible in Section 7. It shares a similar alignment to the extant field system and former field boundaries that are visible on historic maps; as such, it is thought to indicate an additional old field boundary however, as it is not present on historic mapping its interpretation is conjectural.

6.5 **Agricultural – Ridge and Furrow / Ploughing / Land Drains**

- 6.5.1 Widely spaced, parallel linear anomalies have been identified in Sections 5, 12 and 15. They are indicative of former ridge and furrow cultivation.

- 6.5.2 Modern ploughing effects are visible across large parts of the site (Sections 3, 7, 9, 10, 11, 12, 13, 14 and 15) in the form of closely spaced, magnetically weak, parallel linear anomalies.

- 6.5.3 Two linear anomalies comprising positive and negative components can be seen in the north of Section 10 and south of Section 15. These are typical of the responses associated with modern land drains.

6.6 **Natural / Geological / Pedological / Topographic**

- 6.6.1 Amorphous and sinuous areas of magnetic enhancement are present in Sections 2, 5, 7, 12, 14 and 15. These are thought most likely to have a natural explanation, reflecting localised variations in the underlying geology or superficial deposits.

6.7 **Service**

- 6.7.1 Strong bipolar linear anomalies have been mapped running approximately east-west through Sections 2, 5, 6, and 13. They are a result of underground services, such as pipes.

6.8 **Ferrous / Magnetic Disturbance**

- 6.8.1 A discrete area of magnetic disturbance [14] has been identified in the south of Section 14. It corresponds with an area of former marsh / wetland that can be seen in the location on historic OS mapping.

- 6.8.2 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

7 DATA APPRAISAL & CONFIDENCE ASSESSMENT

- 7.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is variable. The results from this survey indicate the presence of a partial rectilinear enclosure, along with numerous responses of uncertain origin, former field boundaries and effects from agricultural cultivation; as a consequence, there is no *a priori* reason why archaeological features would not have been detected.

8 CONCLUSION

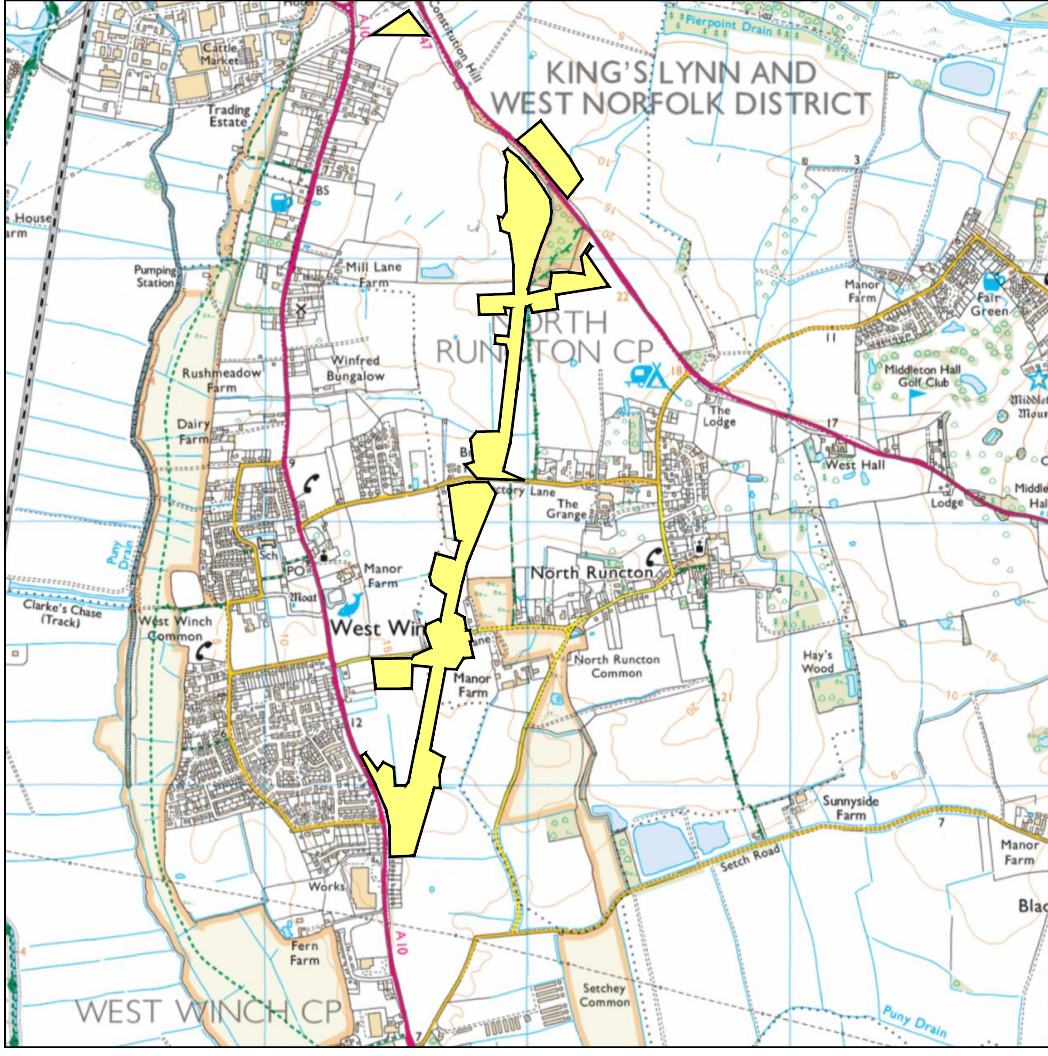
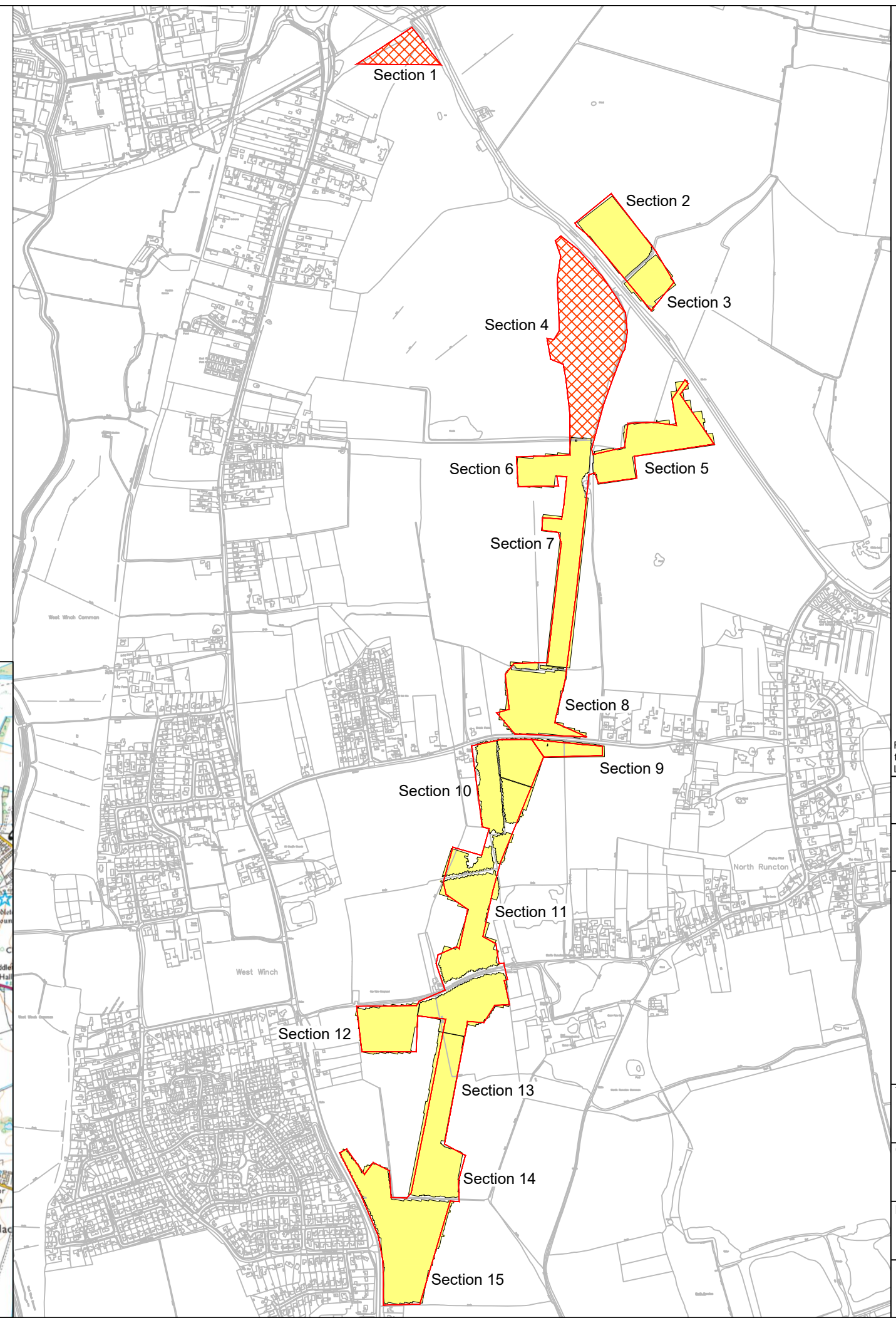
- 8.1 The magnetometer survey at West Winch has identified a partial rectilinear feature, along with further ditch-type anomalies and discrete responses which could be of archaeological interest. The responses lie approximately 300m east of a scatter of Roman pottery sherds, tentatively suggesting that the responses could indicate an enclosure and area of former settlement activity. Linear, curvilinear and discrete responses of uncertain origin have been detected across the survey area; they could have an archaeological, agricultural or natural explanation. Several former field boundaries have been mapped, five of which can be corroborated with historic Ordnance Survey maps of the site while one remains conjectural. Former ridge and furrow cultivation and modern ploughing effects are visible in the results, along with possible land drains, a former marsh area and underground pipes.

9 REFERENCES




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Amended https://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_3.pdf
2020
- CU 2023 The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed 18/04/2023] *website*: <http://mapapps2.bgs.ac.uk/ukso/home.html>
- EAC 2016 *EAC Guidelines for the Use of Geophysics in Archaeology*, European Archaeological Council, Guidelines 2.
- EH 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage, Swindon (now withdrawn, but used for evaluating suitability of soil types)
- WSP 2022 *West Winch Housing Access Road (WWHAR) – Written Scheme of Investigation for an archaeological geophysical survey*. WSP; unpublished report.

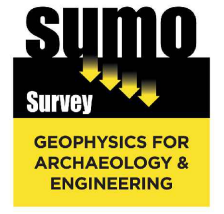
10 ARCHIVE

- 10.1 The minimally processed data, data images, XY traces and a copy of this report are stored in **SUMO Geophysics Ltd.'s** digital archive, on an internal RAID configured NAS drive in the Midlands Office. These data are also backed up to the Cloud for off-site storage.
- 10.2 The Grey Literature will be archived with OASIS and the relevant HER within a period of 12 months.

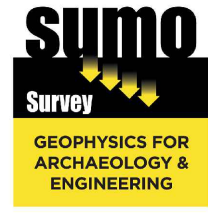
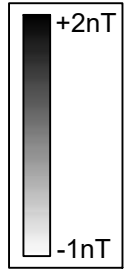


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	Survey Areas	N 
	Unsurveyable	



Title:	Site Location	
Client:	WSP	
Project:	08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk	
Scale:	NOT TO SCALE	Fig No: 01



Title: Magnetometer Survey - Greyscale Plots - Overview

Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

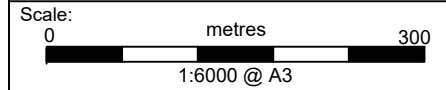
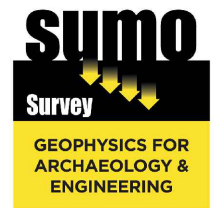
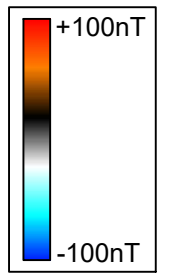


Fig No: 02



Title: Magnetometer Survey - Colour Plots - Overview

Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

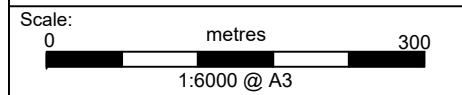
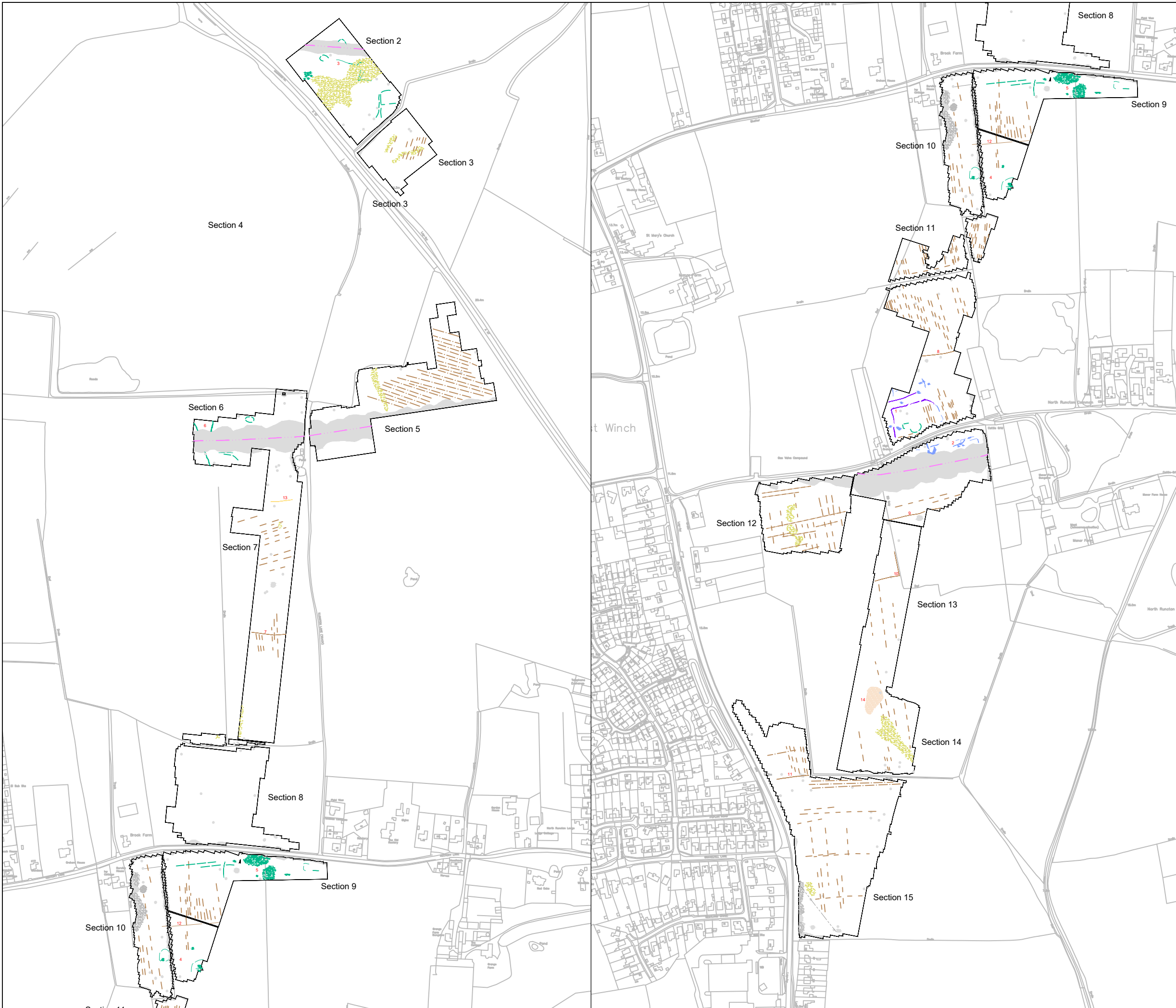
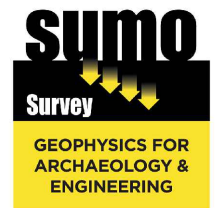


Fig No: 03



KEY

	Probable archaeology (discrete anomaly / trend)
	Possible archaeology (discrete anomaly / trend / enhanced response)
	Uncertain Origin (discrete anomaly / trend / enhanced response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Natural (e.g. geological / pedological)
	Former marsh (corroborated)
	Magnetic disturbance
	Service
	Ferrous



Title: Magnetometer Survey - Interpretation - Overview

Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

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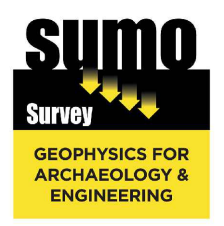
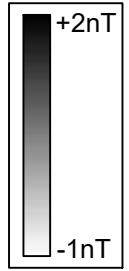
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Section 2

Section 3

Section 3



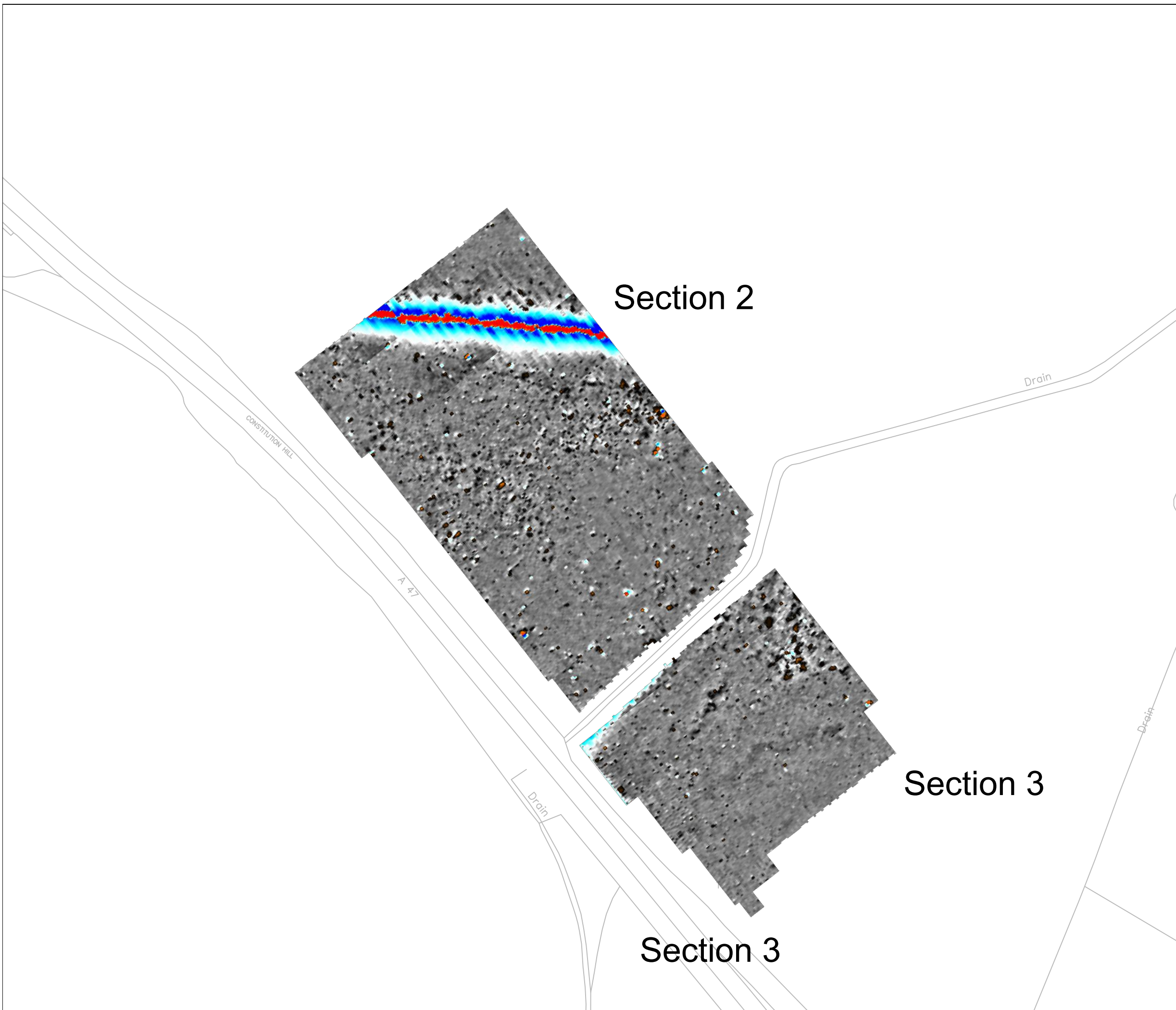
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Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

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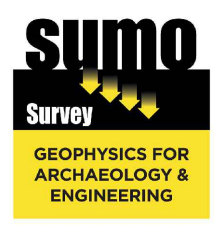
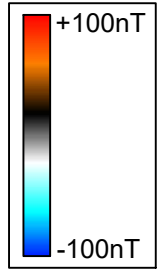
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Section 2

Section 3

Section 3



Title: Magnetometer Survey - Colour Plots - Sections 2 and 3

Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

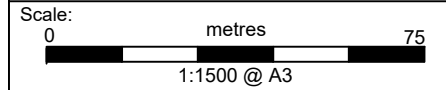
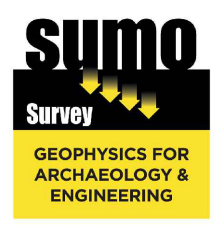


Fig No: 06



KEY

	Uncertain Origin (discrete anomaly / trend)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Service
	Ferrous



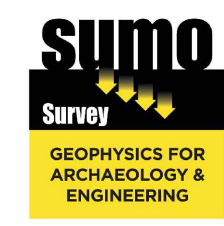
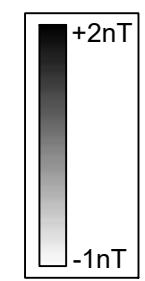
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Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

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Fig No: 07



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Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

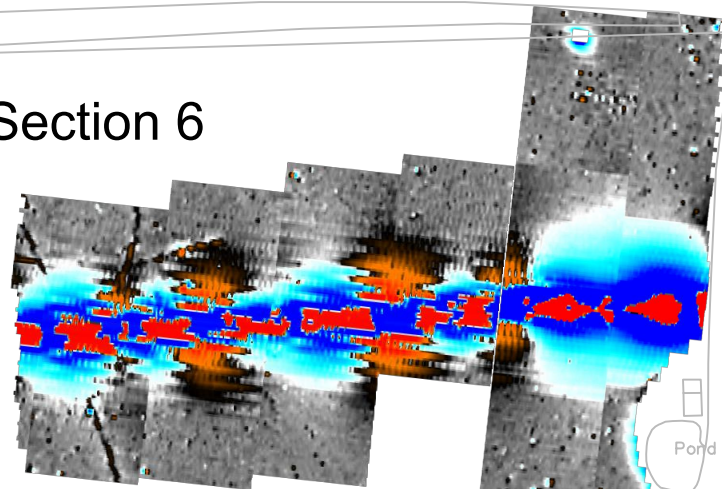
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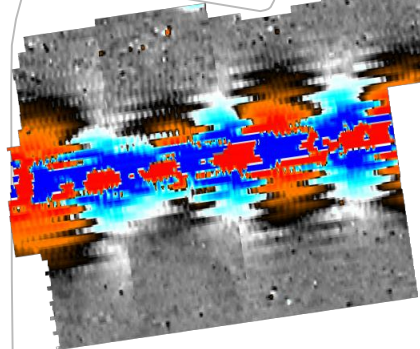


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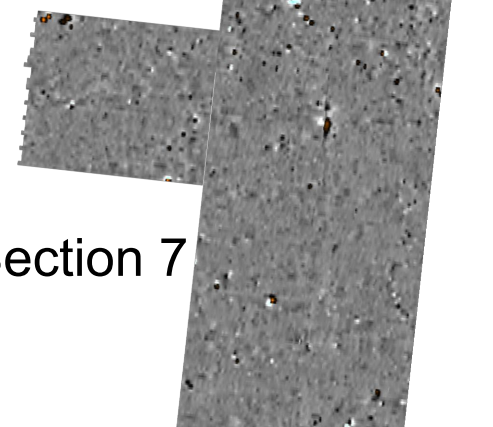
Section 6



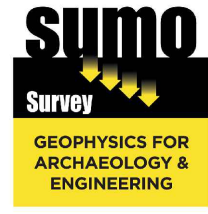
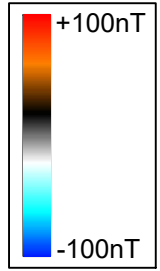
Section 5



Section 7



Pond



Title: Magnetometer Survey - Colour Plots - Sections 5 and 6

Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

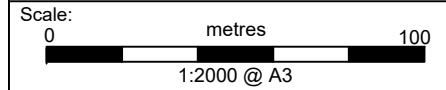


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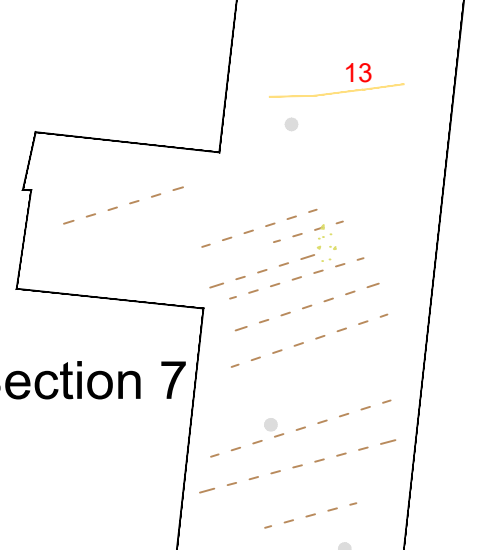
Section 6



Section 5



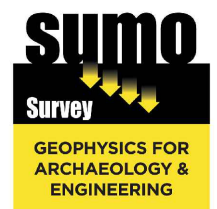
Section 7



Pond

KEY

	Uncertain Origin (discrete anomaly / trend)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Service
	Ferrous



Title: Magnetometer Survey - Interpretation - Sections 5 and 6

Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

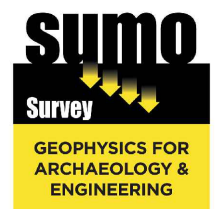
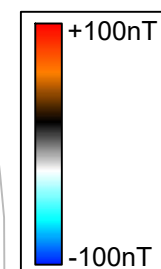
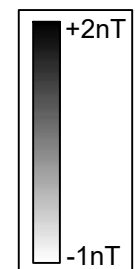
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Fig No: 10



Section 7

Section 7



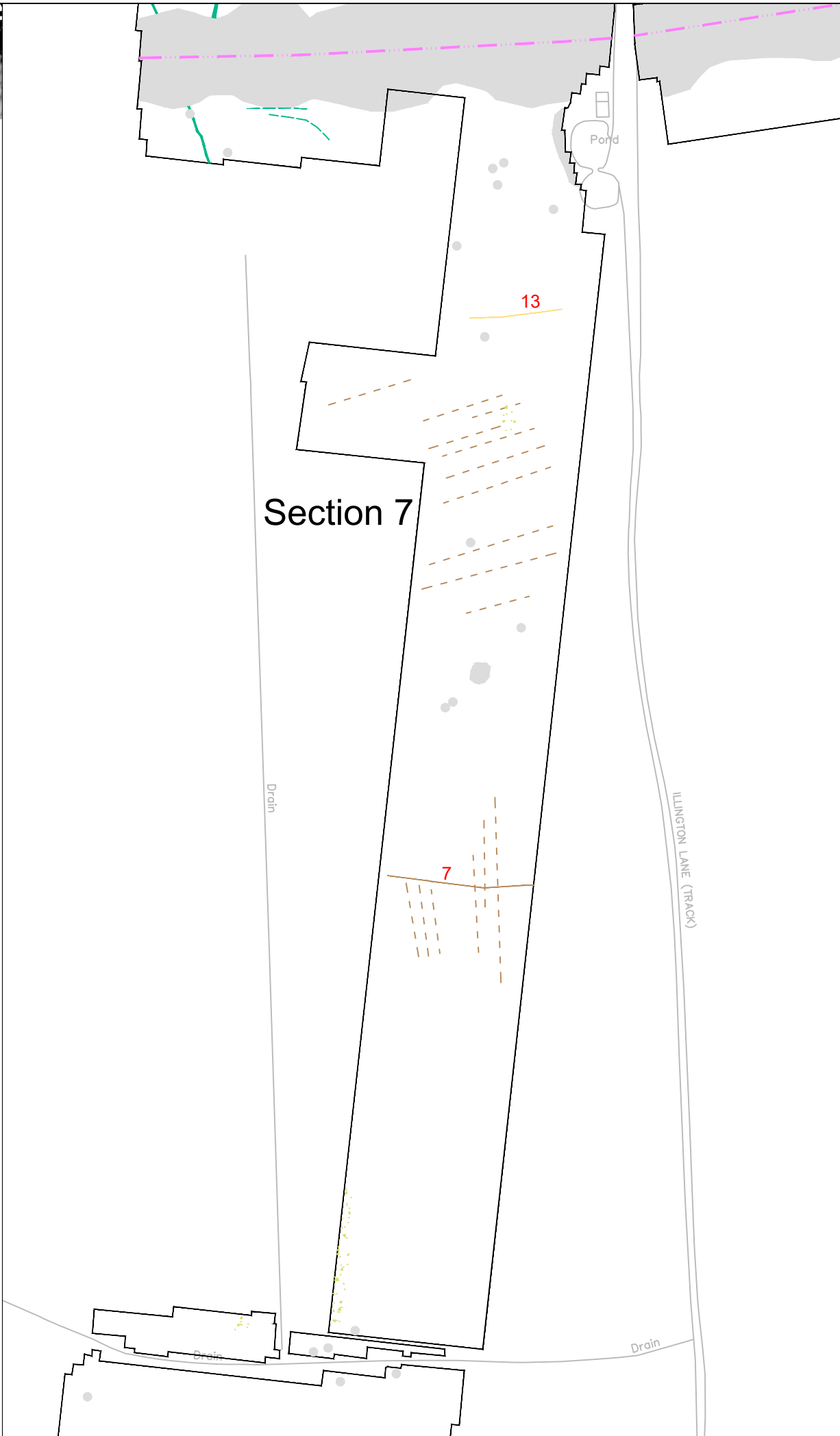
Title: Magnetometer Survey -
Greyscale and Colour Plots - Section 7

Client: WSP

Project: 08501 - West Winch Housing Access Road
(WWHAR), Kings Lynn, Norfolk

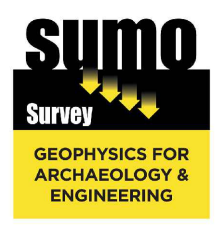
Scale: 0 metres 100
1:2000 @ A3

Fig No: 11



KEY

	Uncertain Origin (discrete anomaly / trend)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Service
	Ferrous



Title: Magnetometer Survey -
Greyscale Plots and Interpretation - Section 7

Client: WSP

Project: 08501 - West Winch Housing Access Road (WWHAR), Kings Lynn, Norfolk

Scale: 0 metres 100
1:2000 @ A3

Fig No: 12