

Geophysical Survey Report Site 3C Cedars Park, Stowmarket Suffolk

For

RPS Newark

On Behalf Of Bellway Homes

Magnitude Surveys Ref: MSTM1003 OASIS Number: magnitud1-425377 Parish Code: SKT 140

July 2021



magnitude surveys

Unit 17, Commerce Court

Challenge Way

Bradford

BD4 8NW

01274 926020

info@magnitudesurveys.co.uk

Report By:

Megan Clements BA (Hons) PCIfA

Report Approved By:

Dr Paul Johnson FSA

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Abstract

Magnitude Surveys Ltd was commissioned to assess the subsurface archaeological potential of a c. 2.7ha area of land at Site 3C Cedars Park, Stowmarket, Suffolk. A fluxgate gradiometer survey was successfully completed across the survey area. No anomalies suggestive of archaeological activity have been identified. Anomalies of agricultural origin have been detected. These include two former field boundaries recorded on historical mapping as well as a former footpath. Linear trends in the magnetic background have been identified that likely relate to agricultural practises such as modern ploughing or drainage features. Natural variations in the near surface geology have also been recorded. Anomalies relating to modern sources have been identified around the edges of the survey area and have been attributed to extant field boundaries and a buried service.

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1. Introduction

- 1.1. Magnitude Surveys Ltd (MS) was commissioned by RPS Newark on behalf of Bellway Homes to undertake a geophysical survey over a c. 2.7ha area of land at Site 3C Cedars Park, Stowmarket, Suffolk (TM 0616 5825).
- 1.2. The geophysical survey comprised hand-carried GNSS-positioned fluxgate gradiometer survey. Magnetic survey is the standard primary geophysical method for archaeological applications in the UK due to its ability to detect a range of different features. The technique is particularly suited for detecting fired or magnetically enhanced features, such as ditches, pits, kilns, sunken featured buildings (SFBs) and industrial activity (David *et al.*, 2008).
- 1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England (David *et al.*, 2008), the Chartered Institute for Archaeologists (CIfA, 2020) and the European Archaeological Council (Schmidt *et al.*, 2015).
- **1.4.** It was conducted in line with a WSI produced by MS (Langston, 2021).
- **1.5.** The survey commenced on 8th July 2021 and took one day to complete.

2. Quality Assurance

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

3. Objectives

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

4. Geographic Background

4.1. The survey area was located 1km east from the centre of Stowmarket, Suffolk (Figure 1). Gradiometer survey was undertaken across one field of cut grass. The survey area was bordered to the north by Gun Cotton Way with houses beyond, and industrial buildings to the east, south, and west. The survey area itself was bound by a concrete footpath (Figure 2).

4.2. Survey considerations:

Survey	Ground Conditions	Further Notes
Area		
1	The survey area consisted of a field of cut grass that sloped down towards the south.	The survey area was bordered on all sides by a metal fence. A metal gate was located in the centre of the northern boundary.

- 4.3. The underlying geology comprises sand of the Crag Group. The superficial geology comprises Lowestoft Formation sands and gravels in the northern and southern corners of the survey area, while a band of clay and silt alluvium runs across the centre of the survey area (British Geological Survey, 2021).
- 4.4. The soils consist of lime-rich, loamy and clayey soils with impeded drainage (Soilscapes, 2021).

5. Archaeological Background

- 5.1. The following is a summary of a Desk-Based Assessment produced by Suffolk Archaeology (Craven, Cass & Brooks, 2016) and provided by RPS Newark.
- 5.2. Evidence of Prehistoric activity has been recorded as parallel ditches and gullies located c. 1km north of the survey area. These have been assigned a tentative prehistoric date. A Bronze Age or Neolithic backed flint blade or chisel was recorded c. 533m southeast of the survey area.
- 5.3. A Romano-British settlement has been recorded c. 356m northwest of the survey area. Evaluation and excavation as part of the Cedars Park Phase 3 development revealed remains of a villa, enclosures, and a post-and-slot building. In addition to ovens, wells, field systems and burials. Additional Roman-period features were excavated c. 210m north of the survey area
- 5.4. Excavation as part of Cedars Park Phase 4a, located c. 486m northwest of the current survey area, identified evidence of a medieval settlement. Features excavated included parallel ditches, an enclosure, possible structures, field system ditches, quarry pits, a pond, and a cobbled surface. Pits and ditches have also been recorded c. 657m west of the survey area. Ditches dating between the 12th to 14th centuries along with undated pits/postholes were identified c. 539m to the north. Three medieval ponds and a ditch have been recorded c. 620m north of the survey area. A square moat retaining a smaller moat has been identified c. 620m south of the survey area. Additional evidence of medieval settlement within the landscape has been recorded c. 616m to the northeast with finds including clay-pits and probable medieval land drains. Further quarry-pits, ditches, gullies, two cobbled surfaces, and rubbish pits were excavated as part of Cedars Park Phase 5c located c. 663m west of the survey area.
- 5.5. Post-medieval boundary ditches have been recorded c. 766m to the north, and c. 667m to the west of the survey area. An additional ditch has been located c. 556m to the northwest, with a

post-medieval drainage ditch running parallel to the existing road of Creeting Road East. Revetment and access tracks that were part of a munitions store have been recorded to the east of the A1120, c. 571m east of the survey area.

6. Methodology 6.1.Data Collection

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

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

- 6.1.4. The magnetic data were collected using MS' bespoke hand-carried GNSS-positioned system.
 - 6.1.4.1. MS' hand-carried system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a multichannel, multi-constellation GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The RTK GPS is accurate to 0.008m + 1ppm in the horizontal and 0.015m + 1ppm in the vertical.
 - 6.1.4.2. Magnetic and GPS data were stored on an SD card within MS' bespoke datalogger. The datalogger was continuously synced, via an in-field Wi-Fi unit, to servers within MS' offices. This allowed for data collection, processing and visualisation to be monitored in real-time as fieldwork was ongoing.
 - 6.1.4.3. A navigation system was integrated with the RTK GPS, which was used to guide the surveyor. Data were collected by traversing the survey area along the longest possible lines, ensuring efficient collection and processing.

6.2.Data Processing

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

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

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

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

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

6.3. Data Visualisation and Interpretation

- 6.3.1. This report presents the gradient of the sensors' total field data as greyscale images, as well as the total field data from the lower sensors. The gradient of the sensors minimises external interferences and reduces the blown-out responses from ferrous and other high contrast material. However, the contrast of weak or ephemeral anomalies can be reduced through the process of calculating the gradient. Consequently, some features can be clearer in the respective gradient or total field datasets. Multiple greyscale images of the gradient and total field at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plot (Figure 7). XY trace plots visualise the magnitude and form of the geophysical response, aiding anomaly interpretation.
- 6.3.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against open street maps, satellite imagery, historical maps, LiDAR data, and soil and geology maps. Google Earth (2021) was also consulted, to compare the results with recent land use.
- 6.3.3. Geodetic position of results All vector and raster data have been projected into OSGB36 (ESPG27700) and can be provided upon request in ESRI Shapefile (.SHP) and Geotiff (.TIF) respectively. Figures are provided with raster and vector data projected against OS Open Data.

7. Results 7.1.Qualification

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

7.2.Discussion

- **7.2.1.** The geophysical results are presented in combination with historical maps and satellite imagery (Figure 6).
- 7.2.2. The geophysical survey was successfully completed across the survey area. The fluxgate gradiometer survey has responded well to the environment of the survey area with anomalies of agricultural and natural origin being detected. No anomalies suggestive of archaeological activity have been identified. Magnetic disturbance has minimally impacted the data around the edges of the survey area emanating from extant field boundaries and a buried service.
- 7.2.3. Agricultural activity has been identified in the form of two former field boundaries recorded on historical OS mapping along with a former footpath, reflecting the prolonged agricultural use of the survey area (Figure 6). Further linear anomalies have been interpreted to have agricultural origins, such as modern ploughing or drainage features, because of their morphology.
- 7.2.4. Natural variations in the background geology of the survey area have been detected in the centre and west of the survey area. These variations have been produced by changes in the superficial alluvium deposits, along with difference in the soil composition (see section 4.3 & 4.4).

7.3.Interpretation

7.3.1. General Statements

- 7.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.
- 7.3.1.2. **Ferrous (Spike)** Discrete dipolar anomalies are likely to be the result of isolated pieces of modern ferrous debris on or near the ground surface.

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

7.3.2. Magnetic Results - Specific Anomalies

- 7.3.2.1. Agricultural (Strong, Weak & Trend) Within the survey area two linear anomalies have been identified that converge in the centre of the survey area [1a]. These anomalies display a weak positive magnetic enhancement that becomes a much stronger, dipolar signal where the two anomalies intersect (Figure 4). These anomalies have been found to align with former field boundaries recorded on the 2nd Edition OS Map (Figure 6). Additional weak linear anomalies have been identified in the south of the survey area that correspond to a mapped footpath [1b] (Figure 6). Much weaker trends in the geophysical data have been identified in the east of the survey area and are likely to be related to past agricultural practises, such as ploughing or drainage features because of their morphology.
- 7.3.2.2. Natural (Zone) In the west of the survey area and in the centre surrounding the convergence of the former field boundaries, the magnetic background has been found to be more magnetically enhanced (Figure 3). The anomalies have been produced by natural variations in the background geology and soil composition possibly induced by agricultural practises (see section 4.3 and 4.4).
- 7.3.2.3. Service A linear anomaly with a strong dipolar magnetic signal has been identified running adjacent to the eastern boundary, cutting across the southeast corner of the survey area (Figures 4 & 5). The strong magnetic character of this anomaly is indicative of a buried service.

8. Conclusions

- 8.1. A fluxgate gradiometer survey has been successfully undertaken across the survey area. The geophysical survey has responded well to the environment of the survey area with anomalies of agricultural and natural origin being detected. Anomalies relating to modern activity have been produced by extant field boundaries and the presence of a buried service.
- 8.2. No anomalies suggestive of archaeological activity have been identified.
- 8.3. Agricultural activity has been identified across the survey area. These consist of two recorded former field boundaries and a former footpath. Linear trends in the magnetic data that are likely to have been produced by agricultural activity, such as modern ploughing or drainage features, have also been detected.
- 8.4. Natural variations in the near surface geology have also been detected. These anomalies likely relate to changes in the superficial deposits and soil composition of the survey area.

9. Archiving

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

10. Copyright

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

11. References

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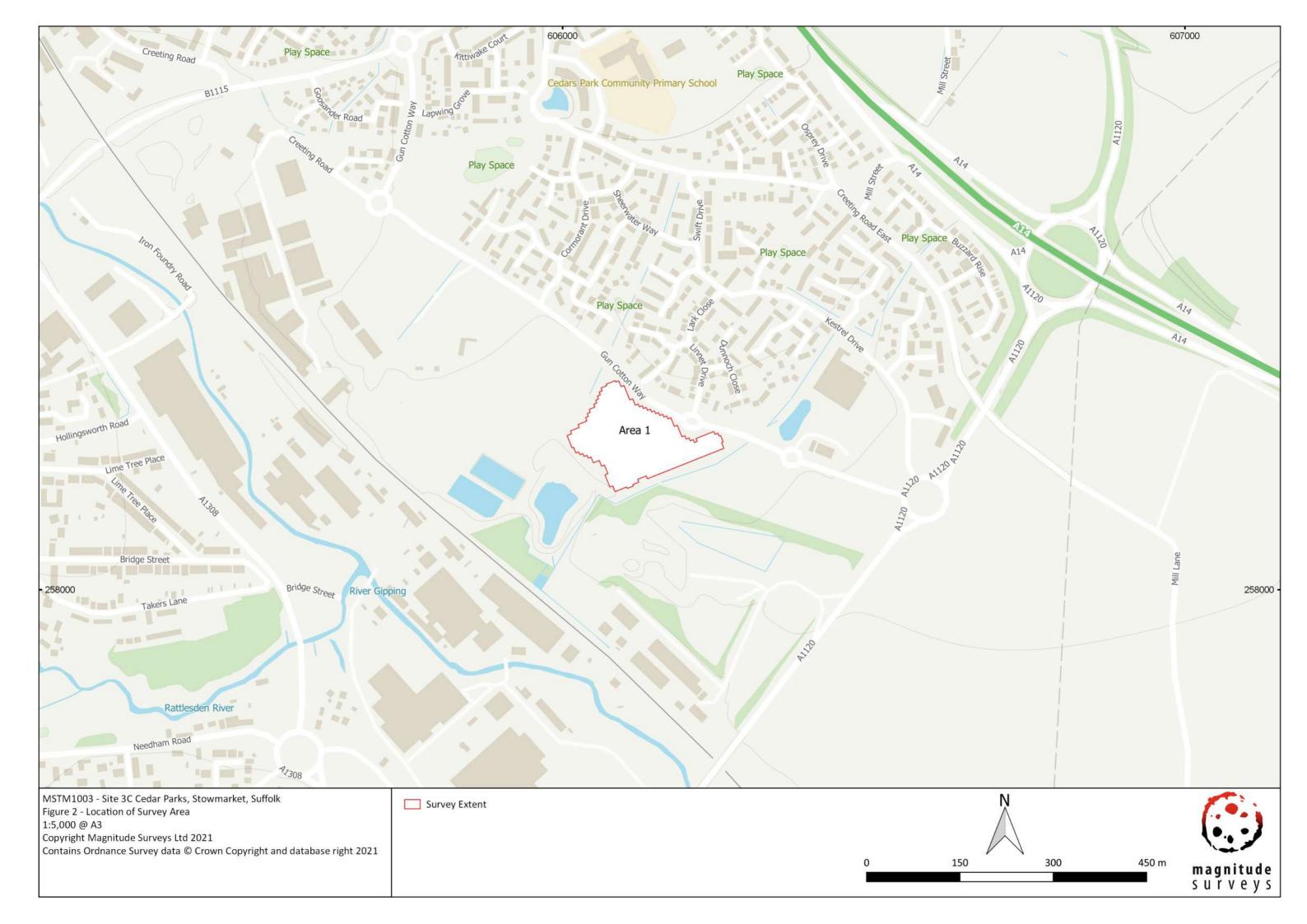
12. Project Metadata

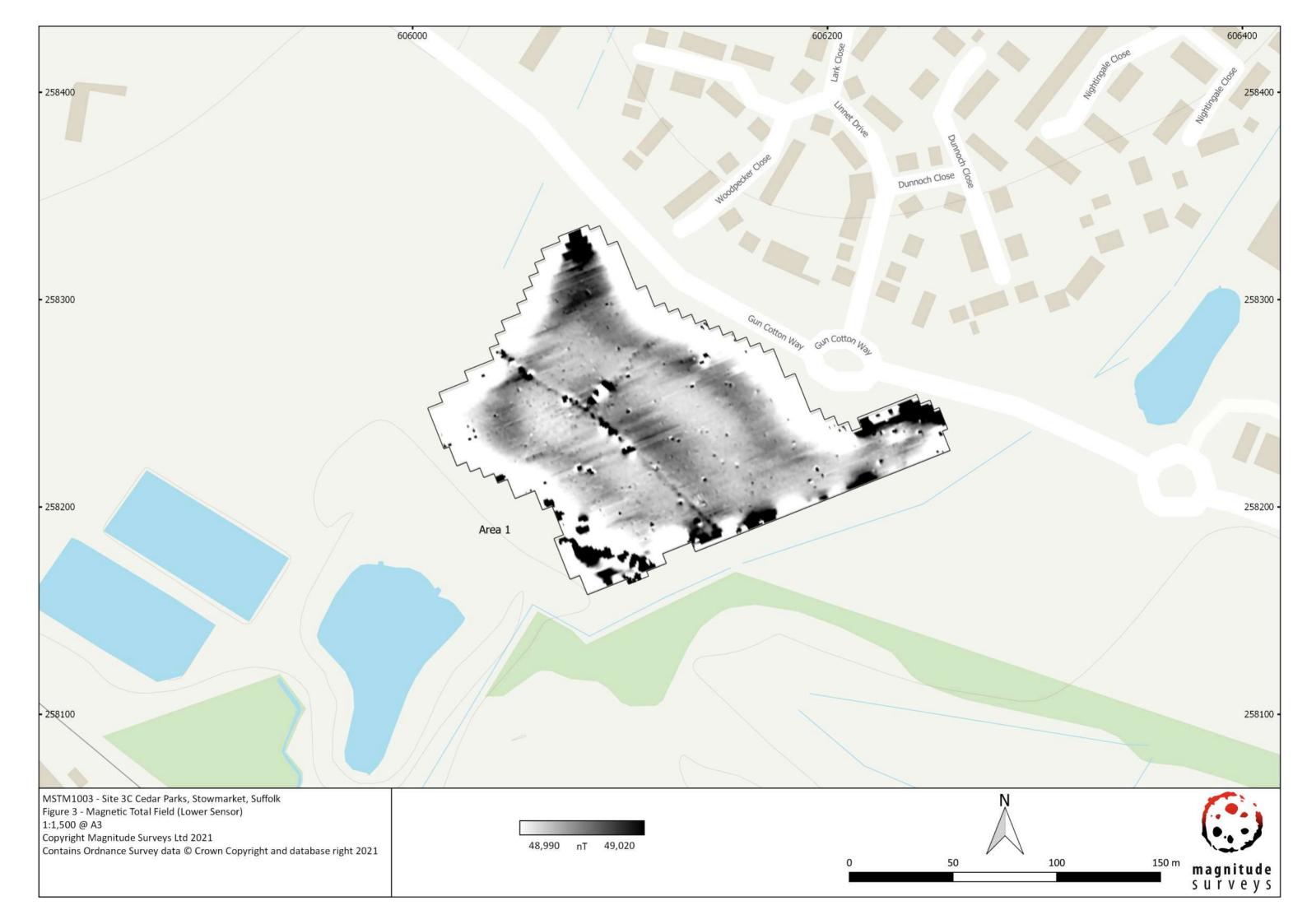
MS Job Code	MSTM1003	
Project Name	Site 3C Cedars Park, Stowmarket, Suffolk	
Client	RPS Newark	
Grid Reference	TM 0616 5825	
Survey Techniques	Magnetometry	
Survey Size (ha)	2.7ha (Magnetometry)	
Survey Dates	08/07/2021	
Project Lead	William Rigby BA MA PCIfA	
Project Officer	N/A	
HER Event No	SKT 140	
OASIS No	magnitud1-425377	
S42 Licence No	N/A	
Report Version	1.0	

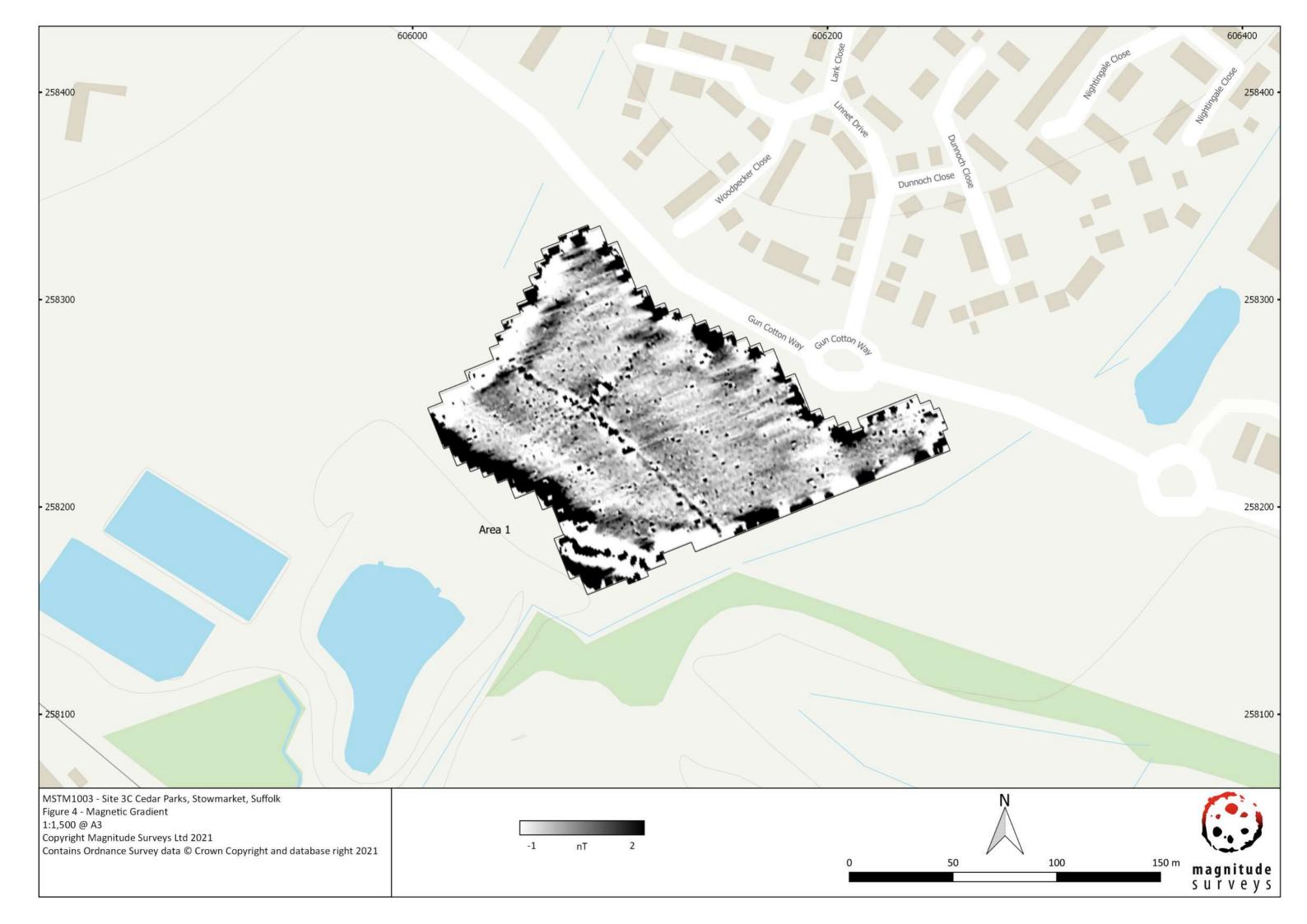
13. Document History

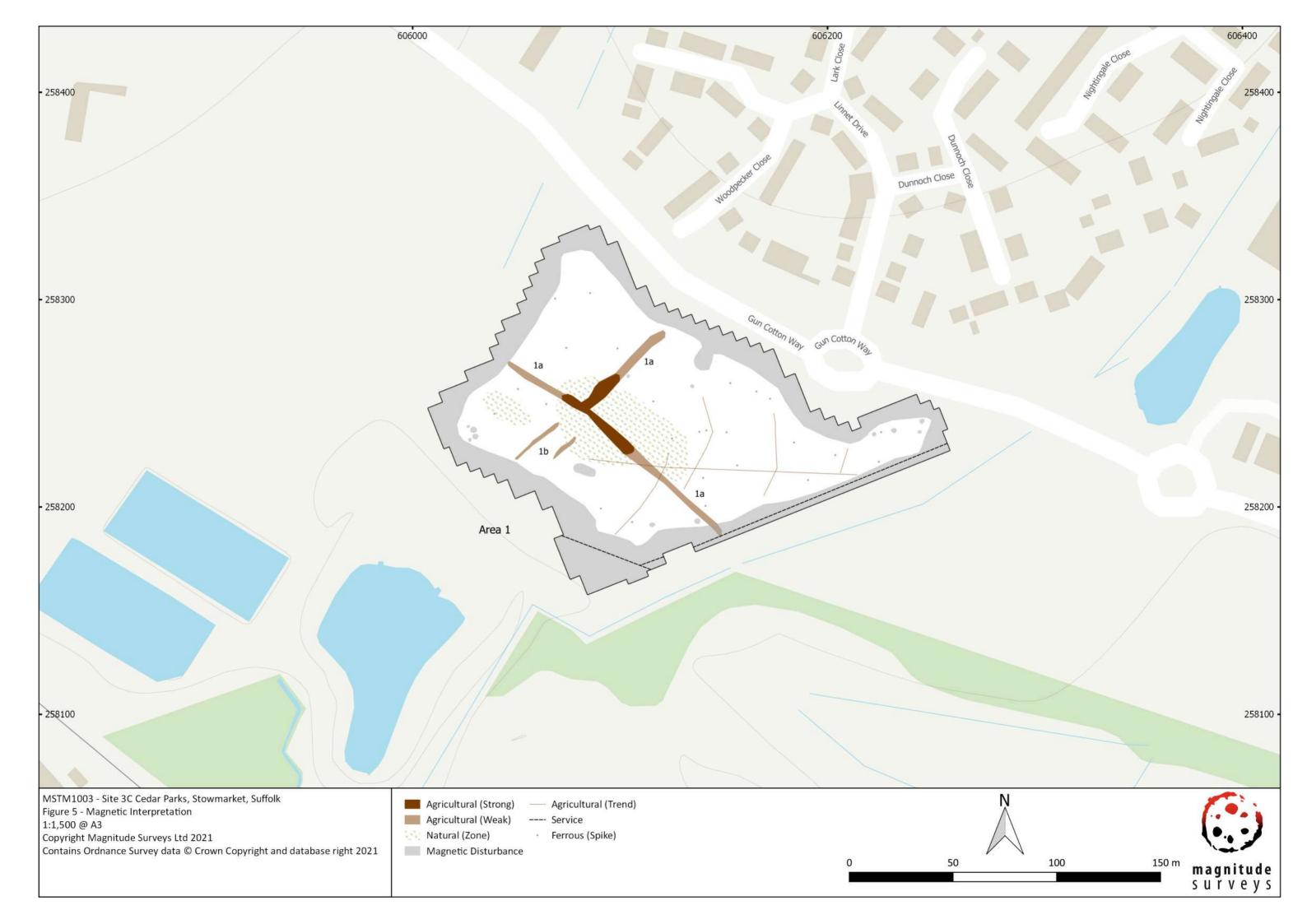
	Version	Comments	Author	Checked By	Date
	0.1	Initial draft for Project Lead	МС	WR	09 July 2021
-		to Review			
	0.2	Dra <mark>ft for Direct</mark> or Approval	MC	PJ	14 July 2021
	1.0	Report Final	WR	WR	04 August
					2021



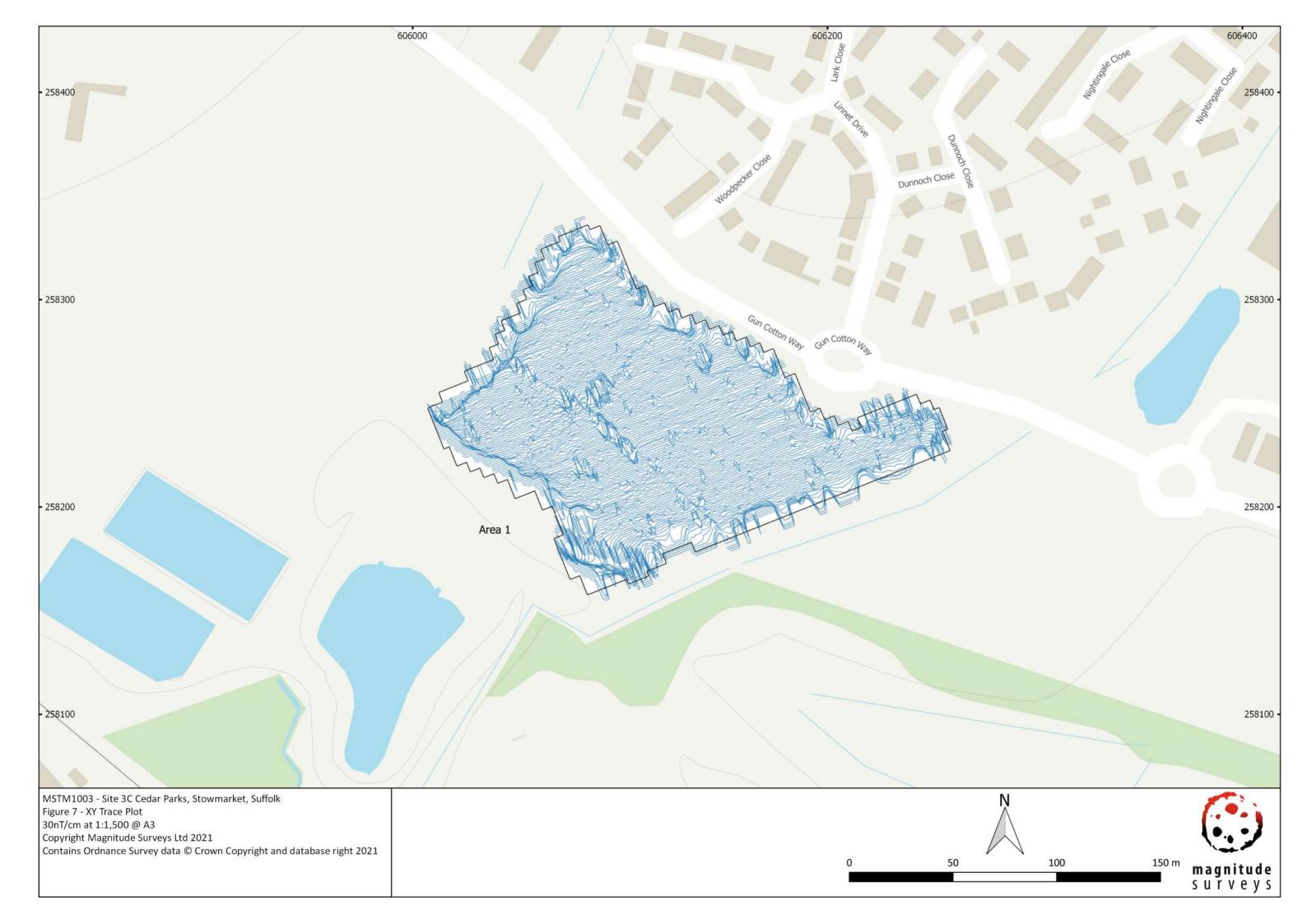








605900 606200 606500 606000 606100 606300 606400 605800 258400 58400 Sewage Farm (Stowmarket U.D. Council) 258300 258300 F.P 258200 Area 1 Works Works Disusea MSTM1003 - Site 3C Cedar Parks, Stowmarket, Suffolk Ν Agricultural (Strong) Magnetic Disturbance Figure 6 - Magnetic Interpretation Over Historical Maps and Satellite Imagery Agricultural (Weak) Agricultural (Trend) 1:2,000 @ A3 Natural (Zone) ---- Service Copyright Magnitude Surveys Ltd 2021 Contains historical mapping © CLS Data 2021: Ordnance Survey, 6" 2nd 50 100 150 m edition c. 1882-1913 magnitude surveys Contains satellite imagery © Bing Satellite 2021



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Printable version

OASIS ID: magnitud1-425377

Project details

Project name	Site 3C, Cedars Park, Stowmarket, Suffolk
Short description of the project	Magnitude Surveys Ltd was commissioned to assess the subsurface archaeological potential of a c. 2.7ha area of land at Site 3C Cedars Park, Stowmarket, Suffolk. A fluxgate gradiometer survey was successfully completed across the survey area. No anomalies suggestive of archaeological activity have been identified. Anomalies of agricultural origin have been detected. These include two former field boundaries recorded on historical mapping as well as a former footpath. Linear trends in the magnetic background have been identified that likely relate to agricultural practises such as modern ploughing or drainage features. Natural variations in the near surface geology have also been recorded. Anomalies relating to modern sources have been identified around the edges of the survey area and have been attributed to extant field boundaries and a buried service.
Project dates	Start: 08-07-2021 End: 04-08-2021
Previous/future work	Not known / Not known
Any associated project reference codes	MSTM1003 - Contracting Unit No.
Any associated project reference codes	SKT 140 - HER event no.
Type of project	Field evaluation
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	NONE None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	Unknown
Position in the planning process	Not known / Not recorded
Solid geology (other)	Sand - Crag Group
Drift geology (other)	Sand and gravels - Lowestoft Formation
Techniques	Magnetometry

Project location

04/08/2021

OASIS FORM - Print view

Country	England
Site location	SUFFOLK MID SUFFOLK COMBS Site 3C, Cedars Park, Stowmarket
Postcode	IP14 5UD
Study area	2.7 Hectares
Site coordinates	TM 0616 5825 52.183400869238 1.016017086458 52 11 00 N <u>001 00 57 E</u> Point

Project creators

Name of Organisation	Magnitude Surveys Ltd
Project brief originator	Consultant
Project design originator	Magnitude Surveys Ltd
Project director/manager	Paul S. Johnson
Project supervisor	William Rigby
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Suffolk HER
Digital Contents	"Survey"
Digital Media available	"GIS","Geophysics","Text"
Paper Archive Exists?	No

Project bibliography 1

	Grey literature (unpublished document/manuscript)
Publication type	
Title	Site 3C Cedars Park, Stowmarket, Suffolk
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Other bibliographic details	MSTM1003
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lssuer or publisher	Magnitude Surveys
Place of issue or publication	Bradford
Description	Digital Report in PDF format
Entered by	William Rigby (w.rigby@magnitudesurveys.co.uk)
Entered on	4 August 2021



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