Geophysical Survey Report

Mallard Pass Solar Farm DCO,

Essendine, Rutland

For

Cotswold Archaeology

Magnitude Surveys Ref: MSTF1136A

OASIS Number: magnitud1-516470

April 2021

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Issue Date:

14 April 2022

Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c. 690ha area of land at Essendine, Rutland, East Midlands. A fluxgate gradiometer survey was successfully completed across the available survey area. The results indicate the presence of probable and possible archaeological features, interpreted as relating most likely to Late Prehistoric and Roman settlement, agriculture and burial practices. Anomalies further relating to the historical and modern agricultural use of the landscape are also evident across the survey area in the form of ridge and furrow cultivation regimes, modern ploughing trends, mapped former field boundaries and field drains. A number of geological variations have been detected across the survey area, particularly in the northwest where they may indicate the presence of former paleo channels and stream beds. In addition, a number of anomalies have been classified as undetermined. These are of uncertain date and origin and have little supporting context. Magnetic Interference from modern sources such as extant fencing and buried services is limited but locally significant. The survey has also identified a spread of green waste to the west. This spread of enhanced material may be concealing anomalies of anthropogenic origin, if present.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by Cotswold Archaeology to undertake a geophysical survey over a c. 690ha area of land at Essendine, Rutland (TF 05660 12468).

1.2. The geophysical survey comprised quad-towed and 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 Written Scheme of Investigation (WSI) produced by MS (Dyulgerski, 2021).

1.5. The survey commenced on 23/12/21 and was completed on 15/2/22, taking 33 days of survey and 54 calendar days to complete.

2. Quality Assurance

2.1. Magnitude Surveys is a Registered Organisation of the Chartered Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, and a corporate member of ISAP (International Society for Archaeological Prospection).

2.2. The directors of MS are involved in cutting edge research and the development of guidance/policy. Specifically, Dr Chrys Harris has a PhD in archaeological geophysics from the University of Bradford, is a Member of CIfA and 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 (CIfA Geophysics Special Interest Group); Dr Paul Johnson has a PhD in archaeology from the University of Southampton, is a Fellow of the Society of Antiquaries of London, 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 was to assess the subsurface archaeological potential of the survey area.

4. Geographic Background

4.1. The survey area consists of 53 arable and pasture fields measuring c. 690ha. The survey area which is centred around the village of Essendine consists of five main parcels of land.

4.2. Parcel A (Areas 1, 2, 3a & 3b) is located c. 2km from Essendine (Figure 1). A gradiometer survey was undertaken across four fields under arable cultivation. The survey area was south of the Little Warren wood, west of the B1176, north of 'The Drift' road, and east of further agricultural land (Figure 2). Approximately 3.48ha were not surveyed due to dense crop and steep inclines.

4.3. Parcel B (Areas 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 & 16) is located c. 50m northwest of Essendine to c. 2.3km northwest of Essendine (Figure 1). A gradiometer survey was undertaken across fourteen fields, thirteen of which were under arable cultivation and one of which was pasture. Most of the survey areas were east of the B1176 apart from Area 4, and all the survey areas were west of Essendine railway (Figure 2). The rest of the survey areas were north of the A6121 and south of the hamlet of Aunby (Figure 2). Approximately 7.6ha were not surveyed due to overgrown vegetation used as bird cover, steep slopes, a soil heap, and a ditch.

4.4. Parcel C (Areas 18, 19, 20, 21, 22, 23, 24 & 25) is located c. 1.1ha west of Ryhall (Figure 1). A gradiometer survey was undertaken across eight fields under arable cultivation. The survey area was east of Essendine Road, west of Essendine railway, north of an unnamed road, and south of the A6121 (Figure 2). Approximately 0.6ha were not surveyable due to tall vegetation and a pile of aggregate located within the survey area.

4.5. Parcel D (Areas 27, 29, 30, 31, 32, 33, 34, 35 & 36) is located from c. 200m east of Essendine to c.1.6km east of Essendine. A gradiometer survey was undertaken across eight fields under arable cultivation. The survey area is south and east of the A6121, north of Essendine railway, and west of further agricultural land (Figure 2). Approximately 6.3ha were not surveyable due to dense vegetation used as bird cover.

4.6. Parcel E (Areas 45, 46, 47, 48, 49, 50, 51, 52 & 53) is located c. 1.6km southeast of Ryhall. A Gradiometer survey was undertaken across nine fields, eight of which were under arable cultivation and one of which was pasture. The survey area was located east of Newstead Lane, south of an unnamed road, west of the Essendine railway, and north of School Lane (Figure 2). Approximately 4ha were not surveyable due to dense vegetation used as bird cover, hay bales, and other farm equipment.

4.7. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	The survey area consisted of an arable field containing young crop. There was a slight slope from south to north.	The survey area was bordered on all sides by hedgerows. An area of tall dense crop was identified within the south-eastern edge of the survey area which could not be surveyed.
2	The survey area consisted of an arable field containing young crop. There was a slight slope from the west to the east.	The survey area was bordered on all sides by hedgerows. Powerline cables were identified within the east of the survey area running from north to south. Dense crop was identified within the west of the survey area which could not be surveyed.
3a	The survey area consisted of an undulating arable field containing young crop.	The survey area was bordered on all sides by hedgerows. Two areas within the northwest

		and centre of the survey area could not be surveyed due to steep inclines.
3b	The survey area consisted of an arable field containing young crop gently sloping down towards the north.	The survey area was bordered on all sides by hedgerows.
4	The survey area consisted of an arable field containing young crop, the southern section of which sloped from north to south.	The survey area was bordered on all sides by hedgerows. A hedgerow also dissected the field up the middle to just below the northern boundary. A water tower was present near the northern end of the central hedgerow. A pylon was present in the centre of the east section of the area, with overhead cables running from north to south.
5	The survey area consisted of an undulating arable field containing young crop.	The survey area was bordered to the north, east, and west by hedgerows, beyond which were roads. The B1176 was present on the eastern side, a lane extending west from Essendine High Street on the northern, and Pickworth Road to the west. The southern border consisted of an open boundary to the next fields with a raised area dividing the fields.
6	The survey consisted of an arable field that sloped to the east.	The survey area's north and eastern border consisted of a treeline, the western border consisted of a hedgerow, the southern border had no physical boundary. A large area in the western half of the survey area was not surveyed due to environmental crop and an area on the western half of the southern border was not surveyed due to a soil heap.
7	The survey area consisted of an undulating arable field.	The survey area was bordered on all sides by hedgerows. A small area to the east was not surveyed due to overgrown vegetation used as bird cover.
8	The area consisted of an arable field gently sloping from the east to the centre of the field.	The survey area's was bordered to the southeast and by trees, and by hedgerows to the centre-south and northwest. The northeast boundary followed an agricultural track.
9	The survey area consisted of an undulating arable field.	The survey area's north, south, west and part of the eastern border consisted of a hedgerow. The north and western borders also contained metal fencing, with the eastern and southern borders containing environmental crop.
10	The survey area consisted of undulating pasture.	The survey area's north-eastern border had no physical boundary, the eastern border consisted of trees and long grass, the southern border consisted of a hedgerow and long grass and the western border consisted of a partial hedgerow and existing crop. A line of wooden poles ran north-south across the centre of the survey area and an earthen mound was located

		on the north- eastern border. A stone path ran across the southern and part of the eastern border.
11	The survey area consisted of an arable field containing young crop.	The survey area's south and eastern borders consisted of a hedgerow, and the north and western borders consisted of a treeline. The southern border also consisted of a drystone wall. A metal signal tower was located in the southern half of the eastern border.
12	The survey area consisted of an arable field.	The survey area was bordered on all sides by a hedgerow. The northern border contained a metal fence, and the eastern border contained a ditch. A metal gate was located in the north-western corner of the survey area. A public footpath was present in the north-western corner of the survey area. A Pylon was present in the centre of the western border with overhead cables running from northwest to southeast.
13	The survey area consisted of an arable OSR field that sloped to the northwest.	The survey area's northern border consisted of a ditch, hedgerow and metal fence, the eastern border consisted of a track, the south and western border consisted of a hedge and treeline. A small section was not surveyed in the northern end of the survey area due to a ditch.
14	The survey area consisted of an arable field that sloped steeply to the west.	The survey area's north, east and southern borders consisted of a hedgerow, the western border consisted of hedges and trees. A pylon was present in the centre of the survey area with overhead cables running from northwest to southeast. A small portion of the survey area on the western half of the survey area was not surveyed due to the slope being too steep.
15	The survey area consisted of an undulating arable field.	The survey area's north and eastern border consisted of a hedgerow and the south and western border consisted of a ditch. Areas on the north, eastern and centre of the survey area were not surveyed due to vegetation. A mud track ran north south from the northern border through the survey area. A pylon was present in the centre of the western half of the survey area. Overhead cables ran from northwest to southeast.
16	The survey area consisted of an undulating arable field containing young crop.	The northern and southwestern boundaries of the field consisted of unsurveyable areas of overgrown grass used for game bird cover.
18	The survey area consisted of an arable field containing young crop and sloping to the northeast.	The survey areas northern border consisted of a hedgerow, the eastern border consisted of overgrown grass, the south and western border consisted of a hedgerow and ditch. Overhead

		cables ran northeast to southwest across the western end of the survey area.
19	The survey area consisted of an arable field that sloped to the northeast.	The survey area's northeast and eastern border consisted of a treeline, and the southern and western borders consisted of a hedgerow. A pile of aggregate was located on the southern border of the survey area.
20	The survey area consisted of an arable field containing young crop.	The survey area's northern border consisted of metal fencing, the east, south and western borders consisted of trees and a ditch. A trainline ran adjacent to the northern boundary.
21	The survey area consisted of an arable field containing young wheat crop, gently sloping from the south to the north.	The survey area was bordered to the north by a grass verge and overgrown vegetation, to the east by a ditch, to the southeast by dense vegetation, trees and a metal fence, to the southwest by a hedge and to the west by trees.
22	The survey area consisted of an undulating arable field.	The survey area's southern border consisted of a track and ditch, the east and western borders consisted of a hedgerow, and the northern border consisted of a metal wire fence.
23	The survey area consisted of an arable field.	The survey area's eastern, southern, and western borders consisted of hedgerows and trees, and the northern border consisted of a track and ditch. Telegraph poles and overhead cables ran southeast to northwest across the southern half of the survey area.
24	The survey area consisted of an undulating arable field containing young crop.	The survey area was bordered to the east by a ditch and stream, to the north by a ditch, and by no physical boundary to the south. In the west, the survey area was bordered by a hedge and metal fencing to the south, metal fencing to the north and a hedge to the west. A strip along the eastern boundary and a section in the northwest was unable to be surveyed due to tall vegetation.
25	The survey area consisted of an arable field containing young cereal crop, gently sloping from the west to the east.	The survey area was bordered to the north and south by hedgerows, to the northeast by tall crop, to the southeast by a wire fence and trees and to the west by trees. Car collision debris was located within the northwest of the survey area.
27	The survey area consisted of a steeply sloping arable field containing young crop.	The survey area was bordered by of a mix of hedgerows and no physical boundaries to the north and east. To the west the survey area was bordered by a metal and wood fence and treeline, and to the south by metal and concrete pillar fencing. Telegraph poles and overhead cabled ran along the southern boundary. A gas pipeline indicator was present on the southern boundary. An area in the

		northeast contained recently cut crop with stubble present. A thin strip along the western boundary was unable to be surveyed due to tall vegetation and fallen branches. Deep animal burrows were present in the south of the area.
29	The survey area consisted of a sloping arable field containing young crop.	The survey area was bordered by hedgerows to the north and west, and by a ditch to the south-east. There was no physical boundary to the northeast. Telegraph poles and overhead cabled ran along the southern boundary. A gas pipeline indicator was present on the northern boundary. An area in the southwest contained recently cut crop with stubble present and an area in the northeast was unable to be surveyed to tall vegetation.
30	The survey area consisted of an arable field, which gently sloped from northwest to southeast.	The survey area was bordered to the north, south, and west by hedgerows. The boundary to the east was a track. A telephone pole was present to the southeast of the field with overhead cables running down towards the centre of the southern boundary.
31	The survey area consisted of an arable field, the bottom section of which gently sloped from northwest to southeast.	The survey area was bordered to the east, south, and west by hedgerows. A hedgerow also dissected the field up the middle to just below the northern boundary. The boundary to the northwest consisted of a road. Two telephone poles were also present on the northern boundary with overhead cables. To the northeast the boundary was trees.
32	The survey area consisted of an arable field containing young cereal crop sloping from the north to the south.	The survey area was bordered to the north and southwest by a hedgerow, to the east by a ditch and to the south by a metal and concrete fence. A railway line is present to the south adjacent to the survey area.
33	The survey area consisted of an arable field containing young crop.	The survey area's northern border consisted of a road, the east and western border had no physical boundary, and the southern border consisted of a treeline and environmental crop.
33	The survey area consisted of an undulating arable field.	The survey area's east, south and western borders consisted of a ditch, the northern border consisted of a partial open boundary and a hedgerow, The western border consisted of a hedgerow in its northern half and no physical border in the southern half. A pile of haybales and farm buildings were located in the centre of the western border. Ditches ran east-west across the centre of the survey area. Overhead cables and telegraph posts ran northeast-southwest across the northern half of the survey area.

35	The survey area consisted of an undulating arable field containing young crop and wheat stubble.	The survey area's boundaries consisted of a mix of hedgerow and no physical boundary to the north and east. The survey area was bordered by a ditch to the west, and metal and concrete pillar fencing to the south.
36	The survey area consisted of an undulating arable field.	The survey area's north and southern borders consisted of hedgerows, the eastern border consisted of a partial hedgerow and a treeline, the western border consisted of trees in its southern extent, hedges and a ditch in its centre and a footpath for the northern half. Wooden telegraph poles ran east-west and north-south across the northern end of the survey area. A section in the centre of the eastern border was unsurveyable due to crop cover.
45	The survey area consisted of pasture sloping from the northwest to the southeast.	The survey area was bordered by a ditch to the northwest, to the northeast, south and west by trees and to the east by a farm track. An area of dense vegetation was identified within the western edge and could not be surveyed.
46	The survey area consisted of a flat arable field containing oil seed rape.	The survey area was bordered to the north by hedgerows, to the east and west by trees and to the south by a ditch. An area within the south could not be surveyed due to the presence of an air canon.
47	The survey area consisted of an arable field gently sloping from the centre to the north.	The survey area was bordered by hedgerows to the east, south, and west and was bordered by a forest to the north. A small area in the south was not surveyed due to the presence of hay bales and farm equipment.
48	The survey area consisted of an arable field containing winter wheat crop and gently sloping from the south to the north.	The survey area was bordered by trees to the north, east, southwest and west. The field continued to the southeast beyond the survey area. A pylon and powerline cables were identified within the centre of the survey area running north to south. Two areas of dense vegetation located within the southwest and southeast edges of the survey area could not be surveyed.
49	The survey area consisted of an arable field containing winter wheat and gently sloped from the west to the east.	The survey area was bordered to the north, northeast, southeast and west by trees and hedgerows, the field continued to the east beyond the survey area and was bordered to the south by a ditch. Powerline cables and telegraph poles were identified within the centre of the survey area running northeast to southwest. Dense vegetation was identified within the south-eastern edge of the survey area and could not be surveyed.

50	The survey area consisted of an arable field containing winter wheat, gently sloping from the west to the east.	The survey area was bordered to the north by a ditch, to the northeast by trees and to the southeast, south and west by hedgerows. A concrete footpath was identified along the southern border running east to west. Dense vegetation was identified within the northeast edge of the survey area and could not be surveyed.
51	The survey area consisted of a flat arable field.	The survey area was bordered to the east, south, and west by hedgerow, and to the northwest by a forest and to the northeast by no boundary. A road and metal fence were also present on the southern boundary.
52	The survey area consisted of an arable field containing young oil seed rape, gently sloping from the west to the east.	The survey area was bordered on all sides by hedgerows. Overhead powerline cables were identified within the southwest corner running northwest to the southeast. Deep tractor tracks were identified along the northern and southern edges and within the centre of the survey area. An area of dense vegetation was identified within the south and could not be surveyed.
53	The survey area consisted of a flat arable field containing young cereal crop.	The survey area was bordered by hedgerows and ditches to the north, southwest and west, a ditch to the east and trees to the southeast. A substation and train crossing were identified adjacent to the survey area from the northeast. A large area of dense vegetation was identified along the western edge of the survey area and could not be surveyed.

4.8. The underlying geology consists of Upper Lincolnshire Limestone Member across Areas 2, 3a, 3b, 5, parts of 6, 7, 8, 9 & 12. Area 1 is the only survey area which consists of Lower Lincolnshire Limestone Member. Sections of Areas 6, 10, 11, 13, 14, 18, 19, 21, 23, 24, 27, 29, 31, 34, 35 consist of Rutland Formation, Argillaceous Rocks with subordinate sandstone and limestone. The lower sections of Areas 10, 11, 13 & 14, as well as Area 15 consists of Blisworth Limestone Formation. Areas 29, 30 & 31, as well as parts of Areas 18, 22, 23, 24, 25, 27, 34, 35, 48, 49 & 53, also consist of Blisworth Limestone Formation. The majority of Areas 16, 33, 49 & 53, and all of Areas 45, 46, 47, 50, 51 & 52, consist of a mix of Cornbrash Formation Limestone and Blisworth Clay Formation. Small areas of Area 51 and 52, and half of Area 36 consist of a mix of Kellaways Clay Member (mudstone) and Kellaways Sand Member (sandstone and siltstone).

4.9. Superficial deposits are recorded for Area 24 and the east of Areas 20, 21, and 25 as Alluvium and River Terrace deposits (sand and gravel). The River Terrace deposits extend into Area 22 and a small part of Area 18. The band of River Terrace deposits running through Area 22 and Area 18 becomes Head (clay, silt, sand and gravel). Small sections of Area 18 and Area 8 are recorded as having Glaciofluvial deposits (mid-Pleistocene sand and gravel). Areas 2, 3, and 13 also have areas which have Glaciofluvial deposits. The east of Area 23 has Head recorded as the

superficial deposit. Within Areas 15 and 16 the recorded superficial deposit is Diamicton Till (British Geological Survey, 20222023). The rest of the survey area have no superficial deposits recorded.

4.10. In Areas 24 and the northern part of Area 20 and 21, the soils consist of loamy and clayey floodplain soils with naturally high groundwater. In all remaining areas, the soil consists of shallow lime-rich soils over chalk or limestone (Soilscapes, 20222023).

5. Archaeological Background

5.1. The following is a summary of Historic Environment Record (HER) information produced by Cotswold Archaeology (Cotswold Archaeology 2021).

5.2. Multiple cropmarks forming enclosures, trackways and ring ditches have been identified throughout the survey area, Rectilinear cropmarks have also been identified within Areas 15, 20, 24, 25, 35, 50a, and 51. There are also identifiable cropmarks within 1km of the survey area including a ring ditch cropmark c. 490m north-west of Area 29, and linear cropmarks c. 220m west of Area 24.

5.3. Small prehistoric finds have been located both within the survey area and within 1km of the survey area. Prehistoric flints [MLI34799] were recorded within the south of Area 36. A later Palaeolithic handaxe [NKE6068] located in Area 35, and a Mesolithic/Neolithic flint scatter [MLE23219] were located c. 230m southwest of Area 27. A possible Late Bronze Age/Early Iron Age site [MLE24138] has also been recorded c. 300m southwest of Area 19. Within Area 6 multiple possibly prehistoric enclosure features, pits and settlement evidence visible as cropmarks have been identified. Within Areas 32 and 35 there are cropmarks evidencing ring ditches. While in Area 52 prehistoric enclosure and boundary have been identified from cropmarks. including an Iron Age site within Area 18 [MLE23218], and another Iron Age site c. 230m southwest of Area 27 [MLE22618].

5.4. Iron Age and Romano-British evidence have been recorded within and in the vicinity of the survey area. Two Iron Age sites were recorded within Area 18 [MLE23218] and c. 230m southwest of Area 27 [MLE22618]. Roman finds are located within multiple parts of the survey area, for example Roman pottery was found within Areas 24 and 36 [MLE5221; MLI34814] and unspecified Roman finds [MLE10400] were located c. 270m west of Area 27. Roman pottery [MLE10398] was also recorded c. 270m northwest of Area 27. A statuette of Mercury [MLI33595] was recorded as a stray find c. 1km north-east of northern most edge of the survey area.

5.5. Two settlements are located within 1km of the survey area, Carlby and Essendine, in which medieval settlement evidence has been discovered including a medieval refuse pit found in Carlby c. 700m north of Area 28 [MLI33594], and a medieval church located in Essendine [MLE5245]. A probable medieval cropmark is located opposite Uffington Old Wood in Area 49. Within Area 29 there is evidence of a medieval field system, as well as it being the site of 13th century deer park and 15th century woodland which also continues into Areas 30, 33 & 34. Approximately 400m northwest of Area 3a there are the remains of the medieval manorial site and ringwork known as Castle Dike [MLI30058].

5.6. These settlements developed further into the post-Medieval period. One example of use into the post-Medieval period is a find of pottery located in the south of Area 36 [MLI34891], as well as the many post-medieval farms and buildings within, and around, 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 quad-towed cart system and hand-carried GNSS-positioned system.

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

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

6.1.4.3. A navigation system was integrated with the RTK GPS, which was used to guide the surveyor. Data 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 European Archaeological Council (EAC) and Historic England guidelines for 'minimally enhanced data' (see Section 3.8 in Schmidt *et al.*, 2015: 33 and Section IV.2 in David *et al.,* 2008: 11).

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

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

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

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

6.3.Data Visualisation and Interpretation

6.3.1. This report presents the gradient of the sensors' total field data as greyscale images, 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 (Figures 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59, 62, 65, 68, 71, 74, 77, 80, 83, 86, 89, 92, 95, 98, 101, 104, 107, 110, 113, 116, 119, 122, 125, 128, 131, 134, 137, 140, 143, 146, 149, 152, 155, 158, 161, 164, 167, 170, 173, 176, 179, 182, 185 & 188). 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 (2023) 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 mapping provided by the client.

7. Results

7.1.Qualification

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

7.2.Discussion

7.2.1. The geophysical results are presented in combination with satellite imagery and historical maps (Figures 4, 7, 10, 13, 16, 19 & 22).

7.2.2. A fluxgate gradiometer survey was carried out over c. 690ha at Essendine, Rutland, East Midlands. An area of c. 21.9ha could not be surveyed due to dense vegetation, steep slopes and the presence of agricultural equipment. The survey has generally responded well to the environment of the survey area. Areas of magnetic disturbance from modern activity is present at the edges of the survey areas, along the routes of buried services, and underneath overhead cables and pylons, this type of interference is isolated but locally significant. Areas which are covered with green waste have also been identified in the west of the survey areas. It is possible that the disturbance caused by the green waste could have obscured further anomalies of probable and possible archaeological origin.

7.2.3. The survey has identified several foci of probable archaeological activity. A general later prehistoric/early Roman date is suggested for many of these enclosures based on their morphology, proximity to small finds or the available cropmark data (see Section 5).

7.2.4. Within Parcel D a number of linear, curvilinear, sub-rectilinear anomalies forming multiple enclosures with internal divisions and trackways have been identified. Most of these anomalies have a similar alignment and appear to be positioned upon higher elevation ground above the valley of the West Glenn River. In the southwestern extent of the parcel, the survey has also identified two probable ring-ditches. These anomalies which are located to the south of a recoded tumulus on the OS mapping, have a morphology characteristic of Bronze Age round barrows.

7.2.5. Further probable archaeological activity has been identified within Parcel C. A settlement complex of likely Romano-British date has been identified within Areas 21 and 24. Within this complex, small probable enclosures with discrete, positive anomalies, indicating internal divisions and pits have been identified. Immediately to

the south of this complex, a potential field system has been identified running southwards. Several enclosures have been identified as extending from this axis, both to the east and west. These have been interpreted as a mixture of potential field systems and possibly domestic enclosures. To the north and northwest of the settlement further partial enclosures, trackways and field systems have been recorded. These anomalies are partially truncated by former field boundaries and do not form as clearly identifiable features as identified in the south and southeast. However, due to their consistent magnetic signal and differing alignments they have been interpreted as probable settlement structures and field systems.

7.2.6. Within the centre of Parcel E, a third foci of archaeological activity have been identified. This comprises of a settlement, tentatively interpreted as Prehistoric in date based on the morphology of the anomalies. This settlement appears to consist of a large trapezoidal enclosure, with several smaller partial enclosures to the east and northeast. Further linear and curvilinear anomalies have been identified to the east, west and south. These anomalies have not been previously recorded on the historical OS mapping or the available cropmark database, however their morphology is suggestive of enclosures and field systems of unknown date.

7.2.7. To the north of the survey area in Area 5, a series of curvilinear anomalies have been identified. These anomalies have an enhanced magnetic background and appear to cut across the natural sinuous anomalies. These do not appear to correlate with any of the identified features on the OS mapping. Due to their consistent magnetic signal and their alignment along the topographical slope they have been interpreted as historical drainage features of unknown date.

7.2.8. Anomalies exhibiting atypical properties of anthropological activity have been detected throughout the survey area as 'possible archaeology'. These anomalies are mostly linear or curvilinear and appear representative of cut features with magnetically enhanced infill. Although these anomalies are most likely archaeological, a clear origin cannot be determined through the morphology and signal of these anomalies alone. Immediately to the west and south of this settlement a series of linear and curvilinear anomalies that form probable and possible partial enclosures and field systems.

7.2.9. Former field boundaries have been identified across Areas 2, 3, 4, 9, 11, 17, 21, and 24. These are identified as faint, linear anomalies and as spreads of more magnetically enhanced material, some of which align with features marked on 2nd Edition OS mapping. The more magnetically enhanced anomalies are likely to represent former field boundaries that have been infilled with ferrous material. Those that do not collocate with known former boundaries present a similar magnetic signal or follow a similar alignment, and it is likely that these are unmapped former field boundaries.

7.2.10. Groups of parallel sinuous linear anomalies occur across almost the whole of the survey area and are typical of ridge and furrow cultivation. These have multiple different orientations and differences in spacing and morphology suggest they are from different periods of agricultural use. Some of these appear to cross probable archaeological anomalies and may obscure smaller or weaker anthropological evidence.

7.2.11. Numerous linear anomalies have been identified across the survey area which are characteristic of field drains. Other weak, closely spaced, linear anomalies are present across all survey areas which align with modern ploughing visible in satellite imagery.

7.2.12. The magnetic data have also detected geological and topographical variations across the area, which appear to primarily reflect changes in superficial deposits and the accumulation of material in natural undulations and possible former water courses. Evidence for (undated) exploitation of the natural resources has also been identified, where the backfilling of gravel and limestone extraction pits has created detectable (in some cases, strong) contrasts between the fill and its surroundings

7.2.13. Discrete anomalies have been classified as undetermined when isolated and lacking any diagnostic archaeological shape or pattern. These anomalies, which do not correspond to any features recorded on historical or satellite imagery have a strong inverted dipolar signal that might suggest a burning event. These anomalies are likely the result of modern or agricultural activity; however, a possible archaeological origin cannot be excluded.

7.3.Interpretation

7.3.1. General Statements

7.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.

7.3.1.2. **Data Artefact** – Data artefacts usually occur in conjunction with anomalies with strong magnetic signals due to the way in which the sensors respond to very strong point sources. They are usually visible as minor ‘streaking’ following the line of data collection. While these artefacts can be reduced in post-processing through data filtering, this would risk removing ‘real’ anomalies. These artefacts are therefore indicated as necessary in order to preserve the data as ‘minimally processed’.

7.3.1.3. **Ferrous (Spike)** – Discrete dipolar anomalies are likely to be the result of isolated pieces of modern ferrous debris on or near the ground surface.

7.3.1.4. **Ferrous/Debris (Spread)** – A ferrous/debris spread refers to a concentration of multiple discrete, dipolar anomalies usually resulting from highly magnetic material such as rubble containing ceramic building materials and ferrous rubbish.

7.3.1.5. **Magnetic Disturbance** – The strong anomalies produced by extant metallic structures, typically including fencing, pylons, vehicles and service pipes, have been classified as ‘Magnetic Disturbance’. These magnetic ‘haloes’ will obscure weaker anomalies relating to nearby features, should they be present, often over a greater footprint than the structure causing them.

7.3.1.6. **Undetermined** – Anomalies are classified as Undetermined when the origin of the geophysical anomaly is ambiguous and there is no supporting contextual

evidence to justify a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes, although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally distinct from those caused by ferrous sources.

7.3.2. Magnetic Results - Specific Anomalies

7.3.2.1. **Probable Archaeology (Strong & Weak) (Parcel D)** – Within Area 36 multiple rectilinear, curvilinear, and discrete anomalies have been identified that appear to form two main foci of archaeological activity to the north and south (See figure 88-92). The anomalies have a consistent positive magnetic signal characteristic of cut features with magnetically enhanced fill. To the south of Area 36 a large rectilinear anomaly [**36a**], with clear rectangular sub-divisions have been identified. The full extent of this anomaly is difficult to identify due to limited extent of the survey area and the immediate presence of a buried service to the west. In the north of Area 36 further positive linear, rectilinear and curvilinear anomalies [**36b**] on similar alignment to [**36a**] have been identified. The anomalies appear to form a series of abutting enclosures with breaks in the magnetic signal to the west, indicating the presence of entrances [**36b**]. These types of anomalies have distinct morphological shape that is usually associated with a ladder-type enclosures of Romano-British origin. Bordering the northern extent of Area 36 further linear and curvilinear anomalies have been identified. These anomalies, which are demarcated by a buried service to the west and ridge and furrow regimes to the east, have a weaker magnetic signal and lack any distinctive morphological shape. They have been interpreted as possible partial enclosures or field systems associated with the enclosures [**36b**] to the south. Around and between these foci of archaeological activity further, linear and curvilinear weak anomalies of probable and possible archaeological origin have been identified. They do not match any of the recorded cropmarks or historical features identified on the OS mapping. As such they have been interpreted as ditch-like anomalies forming possible field systems and enclosures of unknown date.

7.3.2.2. **Probable Archaeology (Strong & Weak) (Parcel D)** – Within the southern extent of Areas 27 and 35 three main foci of archaeological activity have been identified (Figure 91, 112, 115, 127 and 139). The first two foci of activity consist of several strong positive rectilinear and curvilinear anomalies that form multiple enclosures with internal features and associated trackways [**27a, 27b** and **35b**]. The identified trackways are positioned along the topographical slope and run towards the river valley of the River Glenn. The enclosures which have been recorded on the available cropmark data are situated on higher elevation away from the flood plain fields identified on the historical mapping (Figure 19). The trackway leading away from [**35b**] also appears to lead in the direction of a ford depicted on the OS Mapping. There is possibility that this trackway might have extended further southwards before the construction of the Essendine Rail line. Within the south-eastern corner of Area 35, two strong positive annular [**35a**] anomalies have been identified (Figure 139). The southernmost

of the two, which measures c. 28m in diameter has a distinctive concentric morphology typical of a Bronze Age round barrow. To the north a second penannular anomaly has been identified at the edge of the modern field boundary and interpreted as a second barrow. Even though, this anomaly appears to be truncated, the available cropmark data suggest that it extends into the northeast beyond the limit of the geophysical survey.

7.3.2.3. **Probable Archaeology (Strong & Weak) (Parcel D)** – Within Parcel D further linear, curvilinear and rectilinear anomalies **[31a, 32a, 32b** and **33a]** of variable magnetic signal have been identified in Areas 31, 32 and 33 (Figure 85, 89, 91, 94, 97, 99, 103, 106, 109, 115 and 118). It is difficult to establish the full extent of these anomalies as they are mostly located near the edges of the survey areas or are truncated by current or former field boundaries. The anomalies also do not appear to correspond with any features identified on the historical mapping or the available cropmark database, with the exception of [**31a**]. Nevertheless, due to the strong consistent magnetic signal and their morphology suggesting an anthropological origin, these anomalies have been interpreted as enclosures, field systems and trackways of probable archaeological origin.

7.3.2.4. **Possible Archaeology and Undetermined (Strong & Weak) (Parcel D)** – In the centre west of Area 35 a number of curvilinear and discrete anomalies [**35c**] of variable magnetic signal have been identified (Figure 118 and 130). The anomalies lack any distinct morphology and appear randomly spread across the immediate area. However, the strong dipolar magnetic signal might suggest a zone of debris likely caused by the recorded quarrying immediately to the west of the survey area (Figure 19). In the north-western corner of Area 32, a series of positive discrete anomalies [**32c**] forming a linear alignment have been identified (Figure 114). This anomaly which is truncated by a former field boundary have a morphology similar to a number of anomalies interpreted as possible services in Areas 29, 30 and 31. However, [**35c**] does not have such consistent magnetic signal and straight morphology. Even though this anomaly could be of modern origin, an archaeological interpretation such as a pit alignment cannot be discounted.

7.3.2.5. **Probable Archaeology (Strong & Weak) (Parcel C)** – In Areas 21 & 24 a series of linear, curvilinear and rectilinear anomalies [**21a** and **24a**], forming a complex of enclosures have been identified. The anomalies appear to be aligned along a rectilinear enclosure located in Areas 21 and 24 and measuring c. 74 by 77m (Figure 145). Along its eastern extent a series of linear rectilinear anomalies have been identified. Where larger or individually distinct anomalies can be discerned, they have been classified based on confidence with strong/weak categories assigned accordingly. To the west, in Area 24, the further parallel curvilinear anomalies [**21a**] aligned along the direction of the slope appear to form possible historical agricultural features. To the south of [**24a**], further enclosures and linear anomalies [**25a** and **25b**] have been identified running in

the same north/south alignment (Figure 148). These anomalies, which do not correspond to any of the identified historical filed boundaries have been interpreted as enclosures and historical field systems. Overall, the majority of the anomalies in Areas 21, 24 and 25, appear to have a similar magnetic enhancement and alignment, which might suggest a similar time period for these anomalies rather than a multiphase landscape. Even though, magnetic data could not be used to date these anomalies, the presence of Roman pottery just south of [**24a**] might suggest a Romano-British origin for these anomalies.

7.3.2.6. **Probable Archaeology (Strong & Weak) (Parcel C)** – Throughout the remainder of Parcel C, several anomalies in Areas 18-22, have been identified which have the potential to reflect archaeological features (Figure 133 and 136). Much of these occur in isolation, and whilst they demonstrate signals suggestive of an archaeological origin, they lack the contextual evidence in their immediate surroundings required for a more confident interpretation. Nevertheless, the volume of more confidently attributed archaeological anomalies [**21a**, **24a**, **25a** and **25b**] in the vicinity along with a lack of contradictory information from historical mapping or satellite imagery, suggest an archaeological origin is very likely.

7.3.2.7. **Probable Archaeology (Strong & Weak) (Parcel B)** – Areas of probable archaeological interest have been identified in Areas 5, 10, 14, 15. These mostly consist of disconnected linear and curvilinear anomalies (Figure 49, 64, 70, 76 and 82). These anomalies appear against a general magnetic enhancement of the background likely caused by colluvial processes such as the deposition of enhanced superficial deposits in the bottom of the slope. In Area 5, within this geologically enhanced area, the survey has identified a number of broad, strong curvilinear anomalies [**5a** and **5b**] aligned in a direction running across the identified natural anomalies (Figure 49). These anomalies [**5a** and **5b**], which do not correspond with any historical features recorded on the OS mapping have a strong consistent magnetic signal suggestive of ditches filled with magnetically enhanced fill. [**5a** and **5b**] alignment in line with the topographical slope is suggestive of probable drainage channels filled with anthropogenically enhance material. This interpretation is supported by the location of the northernmost anomalies [**5a**], which appear to be located immediately south of a recorded quarry site.

7.3.2.8. **Probable and Possible Archaeology (Strong & Weak) (Parcel B)** – To the north in Area 4, the survey has identified further positive linear and curvilinear anomalies (Figure 43 and 46). The most pronounced of these is a partial D-shaped enclosure [**5a**] located in the southeast corner. Within this enclosure, a number of weak linear anomalies have been identified. These anomalies might represent internal divisions within [**5a**], however, due to their truncation by historical field boundaries and the presence of a dipolar halo caused by an electric pylon, they have been interpreted to be of possible rather than probable origin. To the north, south and west further weak linear anomalies

have been identified. These anomalies do not correspond to any features identified on the historical OS mapping and satellite imagery. As such they have been interpreted as historical field systems of unknown date and interpreted to be of possible archaeological origin.

7.3.2.9. **Probable Archaeology (Strong & Weak) (Parcel E) –** A series of linear, rectilinear and curvilinear anomalies identified along the eastern edge of Area 49 and extending into the western side of Area 50 (Figure 166) suggests a series of ditched enclosures and possible settlement activity. The most clearly defined of these is [**49a**] a trapezoidal enclosure with a double ditch on its western extent. Further to the east a number of abutting enclosures have been identified. Although the anomalies are bisected by former and extant field boundaries these enclosures contain discrete anomalies suggestive of pits and internal divisions. As well as this settlement area, additional anomalies that have not been recorded on the available HER data and cropmark database have been identified in Areas 45, 47, 48, 49, 50, 51, 52 (Figures 154, 157, 160, 163, 166, 169, 172, 184 and 187). These anomalies, which exhibit similar morphology and magnetic signal to [**49a**], have been interpreted as probable historical field systems and enclosures of unspecified date.

7.3.2.10. **Probable Archaeology (Strong & Weak) (Parcel E) –** Additionally, to the previously interpreted field systems and settlement complexes the survey has also identified four annular and penannular anomalies in Areas 45, 48 and 53 (Figure 157, 160 and 187). The anomalies, which exhibit strong positive magnetic signal have diameters between c.14-21m and are positioned at various elevations. These anomalies also have a differing geophysical context. For instance, the two ring ditches in Area 43 and 48 are located near probable enclosures and field systems and could likely be interpreted as possible enclosures or settlement features. While the two anomalies in Area 53 have a larger internal diameter and appear to be isolated from any probable archaeological anomalies. Due to this and the presence of probable burial mounds in Area 53, these two ring-ditches could potentially have funerary origins.

7.3.2.11. Probable and Possible Archaeology (Strong & Weak) (Parcel A) – Even though the majority of Parcel A have been affected by the spread of green waste, linear and curvilinear anomalies of probable and possible archaeological origin have been identified in Areas 3a and 4b (Figure 25, 28 and 34). In the centre of Area 3a, a strong positive curvilinear anomaly has been detected that exbibits the characteristics of a cut feature with magnetically enhanced fill. This anomaly, which is positioned at the highest part of the topographical slope forms a partial enclosure that has not been previously recorded on historical OS mapping or the cropmark data base (Figure 4). To the east and west further curvilinear anomalies have been recorded. These anomalies have a strong positive consistent magnetic signal and follow the topographical slope. These anomalies

exhibit similar morphology to the probable ditched anomalies identified in the north of Area 5 and could potentially have a similar origin (Figure 49).

7.3.2.12. **Possible Archaeology (Strong & Weak)** – Throughout the remainder of the survey area, several anomalies have been identified which have the potential to reflect archaeological features. Much of these occur in isolation, and whilst they demonstrate signals suggestive of an archaeological origin, they lack the contextual evidence in their immediate surroundings required for a more confident interpretation.

7.3.2.13. **Agricultural (Strong, Weak; Former Field Boundaries)** – Linear and curvilinear anomalies in Areas 4, 5, 6, 11, 15, 16, 21, 25, 29, 31, 32, 34, 35, 36, 49, 50, 51, 52, 53 are interpreted as relating to former field boundaries. The majority of these align with features marked on historical maps (Figures 4, 7, 10, 13, 16, 19 & 22). The linear anomalies in Area 6, and some of the anomalies in Areas 25, 35 and 51, are not marked on available OS maps. Nevertheless, they do appear to have similar magnetic signal and fit well with the wider pattern of historical land division. In Areas 49, 50 and 53 the survey has identified linear and curvilinear anomalies that corelate with the former boundary of Uffington Forest, recorded on the OS mapping. The anomalies in Area 49 in particular consist of three parallel curvilinear anomalies which might suggest the presence of a trackway running along the side of the forest boundary.

7.3.2.14. **Ridge and Furrow (Trend)** – Numerous parallel linear and curvilinear anomalies have been identified as Ridge and Furrow cultivation across the survey area. The anomalies are aligned in various orientations, and with different spacing and shape, possibly indicating multiple historical land divisions. Many of these anomalies do not respect the boundaries of the probable and possible archaeological anomalies, suggesting that these agricultural practices likely succeed the archaeological anomalies.

7.3.2.15. **Agricultural (Trend)** – This category has been used to indicate faint linear anomalies attributed to the effects of modern ploughing and possible drains. For clarity, only a representative sample of modern plough effects, which are faint and mainly apparent as part of the background 'texture', has been drawn.

7.3.2.16. **Agricultural (Spread)** –A series of faint dipolar amorphous anomalies have been identified in the south-eastern part of Area 49 and north-eastern corner of Area 50 (Figure 19 and 22). The anomalies, which lack a distinctive shape are delineated by the former boundaries of the Uffington woods that have been identified by the survey. As such these anomalies have been interpreted as areas of tree removal. The dipolar magnetic signal is likely caused by the accumulation of enhanced magnetic material within the tree voids left after the removal.

7.3.2.17. **Ferrous Spread (Spread, Green Waste) (Parcel A)** – Within the majority of Areas 2, 3a and 3b, the survey has identified a spread of strongly enhanced magnetic material (Figures 28 and 31). This spread has been interpreted as a green waste.

'Green Waste' refers to organic garden waste which is composted and sold as soil fertiliser. Green waste is often contaminated with metal and other domestic waste, and so can impact the effectiveness of a magnetic survey, as this material can exhibit a strong magnetic signal which introduces noise across the results. Due to the strong magnetic enhancement of green waste, it is possible that weaker more ephemeral anomalies may have been masked including archaeological anomalies, if present.

7.3.2.18. **Drainage Features** –Numerous parallel linear trends exhibiting a weak positive and weak dipolar signal have been identified throughout the survey area. Where a more certain identification can be made, based on anomaly form and characteristic layout, this category has been used to indicate probable buried drains. In Area 45 there are five strong drains which were previously identified as cropmarks.

7.3.2.19. **Possible Extraction** – Broad amorphous anomalies exhibiting a diffused positive magnetic signal have been identified throughout the survey area. These anomalies which are most visible on the Total field plots (Figures 4, 7, 10, 13, 16, 19 & 22) exhibit the characteristics of possible areas of extraction. The positive magnetic signal is considered to be caused by the presence of enhanced material that naturally filled in these possible quarries. This interpretation is also supported by the immediate presence of gravel quarries identified within and around the survey area. In certain cases, such as to the south of Area 36, the areas of extraction might be truncating possible archaeological anomalies (Figure 109).

7.3.2.20. **Natural (Zone, Spread & Weak)** – Bands of natural anomalies across the survey area indicate changes in the composition and depth of the superficial sediments and bedrock. In places, this has produced a clear contrast (Figures 52, 55, 69 and 88), where the sinuous edge of the magnetic change follows the contour and corresponds with a mapped sand and gravel deposits. Elsewhere, contrasts are subtler, but correspond with the likely accumulation of sediments in slight gullies and depressions.

7.3.2.21. **Undetermined (Weak)** – In general, this category has been used when discrete or weak linear anomalies cannot be confidently attributed to a specific cause. These anomalies appear in relative isolation with little or no supporting context to support a more confident interpretation. These may have an archaeological origin, although they may also reflect recent agricultural activity or underlying geological processes.

7.3.2.22. **Undetermined (Strong and Weak) –** Within the north of Area 21, a number of strong positive anomalies appear to cut across an area of natural variation positioned at the bottom of the topographical slope (Figures 136 and 145). The linear anomalies may relate to the archaeological complex [**21a** and **24a**] to the south, however their straight morphology and strong magnetic signal might

suggest a modern origin such as drainage features. As such these anomalies have been to be of undetermined origin.

7.3.2.23. **Undetermined (Strong and Weak) –** In the north-eastern corner of Area 49, a number of discrete magnetic anomalies have been identified (Figure 154). These anomalies which are located within the boundary of the former Uffington Forest have a strong dipolar signal. The high magnetic signal might be caused by modern ferrous anomalies; however, they may also relate to areas of intensive burning such as probable kilns.

7.3.2.24. **Services** – Buried services have been detected in Areas 4, 19, 22, 27, 29 & 36. These linear anomalies, comprising repeating strong bipolar anomalies, are characteristic of data collected over metal pipes; their strength and spread has contributed to the obscuring of probable archaeological anomalies in places. In Areas 29, 30 and 31 the survey has identified a number of positive discrete anomalies in a linear alignment have been identified crossing the survey area (Figure 115 and 118). These anomalies, which do not exhibit the typical dipolar signal appear to follow the current pattern of land division. Due to this and their straight and consistent morphological alignment they have been interpreted as possible services. However, this type of unique magnetic signal might require further evaluation.

7.3.2.25. **Overhead Cable Effect** – Across Areas 2, 12, 14, 15, 30, 34, 36, 48 and 52, a change in the magnetic background has been detected most visible on the TF plots (Figures 9 and 12). This type of specked dipolar background correlates with presence of overhead electric cables crossing over the survey area. This type of magnetic interference may mask more ephemeral anomalies of anthropogenic origin, if present. In Areas 29, 30 and 31 the survey has identified a number of positive discrete anomalies in a linear alignment have been identified crossing the survey area. These anomalies, which do not exhibit the typical dipolar signal appear to follow the current pattern of land division. Due to this and their straight and consistent morphological alignment they have been interpreted as possible service. However, this type of unique magnetic signal might require further evaluation.

8. Conclusions

8.1. A fluxgate gradiometer survey was successfully undertaken over c. 690ha of land at Essendine, Rutland. A further c. 21.9ha was not able to be surveyed due to unsuitable ground cover. Magnetic interference from modern sources was largely confined to field perimeters and the immediate vicinity of extant structures and buried services. The survey has also identified areas of green waste to the west of the survey area. Some of this disturbance may have prevented the identification of more ephemeral anomalies of anthropogenic origin, if present. Nevertheless, good magnetic contrast with the natural background resulted in the identification of extensive anomalies indicative of archaeological activity across the entirety of the survey area.

8.2. A series of rectilinear and curvilinear enclosures and partial enclosures, which are grouped into possible settlement areas, have been identified across the survey area. These areas comprise anomalies indicative of probable cut features, containing anthropogenically enhanced fill. The features include ditched enclosures, ring ditches, trackways, former field systems and discrete pits. These have been interpreted as a probable multiphase settlement activity, of potential Late Prehistoric to Romano-British date, with an associated agricultural hinterland extending across the survey area. Several pronounced annular anomalies might also suggest the presence largescale burial practices

8.3. Agricultural activity has been identified across the survey area in the form of ridge and furrow regimes, modern ploughing trends, and drains. Mapped former field boundaries were also identified within the survey area. In the south the boundary of Uffington Forest has also been identified.

8.4. Exploitation of the superficial deposits is evident in several parts of the survey area, where strong anomalies indicate the extent of gravel extraction pits marked on historical maps. Possible locations of gravel or clay extraction have also been identified in areas where magnetic signals correlate with minor surface depressions on LiDAR.

8.5. Natural variations have been detected across the survey area, but particularly as strong paleo channels in the northwest. These may be paleochannels or they may relate to the nearby river. There are further variations in the superficial and bedrock geology which are also identifiable across the survey area.

8.6. Anomalies of undetermined origins have also been detected. It has not been possible to definitively determine whether these anomalies are the result of archaeological, agricultural or modern practices.

9. Archiving

9.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This stores the collected measurements, minimally processed data, georeferenced and un-georeferenced images, XY traces and a copy of the final report.

9.2. MS contributes reports to the ADS Grey Literature Library upon permission from the client, subject to any dictated time embargoes.

10. Copyright

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

11. References

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12. Project Metadata

MS Job Code	MSTF1136A
Project Name	Essendine Solar Farm
Client	Cotswold Archaeology
Grid Reference	TF 0566 12468
Survey Techniques	Magnetometry
Survey Size (ha)	690ha (Magnetometry)
Survey Dates	23-12-2021 to 20-01-22
Project Lead	Krasimir Dyulgerski BA MRes
Project Officer	Krasimir Dyulgerski BA MRes
HER Event No	N/A
OASIS No	magnitud1-516470
S42 Licence No	N/A
Report Version	1.0

13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Lead to Review	PFP	KD	07 March 2022
0.2	Draft after project lead corrections	KD	FPC	9 March 2022
0.3	Report Submitted for Director Sign Off	KD	FPC	11 March 2022
1.0	To address corrections from client	KD	EB	14 March 2022