

Horsey Levels, Somerset Geophysics Report

Client: SMITHS GORE

AB Heritage Project No: 10411

Date: 31/10/2014

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1. INTRODUCTION

1.1 Site Location & Description

- 1.1.1 The proposed development site (hereafter referred to as the site) is located approximately c.2.5km to the north east of the town of Bridgewater, within a rural environment at centre point NGR NY 331680 140400.
- 1.1.2 The site is c.40ha in size and consists of three fields of varying sizes, each of which is bounded by hedgerows. The site is bounded to its north by the Kings Sedgemoor Drain and to the west by Junction 23 of the M5 Motorway, which runs fully along the western boundary of the site.
- 1.1.3 The field in the south of the site is currently used for arable cultivation, while the two fields in the north of the site are under pasture for grazing of live stock.

1.2 Geology & Topography

- 1.2.1 The site is situated on a relatively flat area with an average height of 5m 7m Above Ordnance Datum (aOD).
- 1.2.2 The current OS maps of the site do record a range of banks, which are situated next to the eastern and western boundary of the site; the banks were also visible on the ground at the time of survey.
- 1.2.3 Previous field boundaries/ditches that are marked on the site location map (Figure 1) in the northern field exist as filled in ditches making the field in the north into one large field. A remaining boundary still exists being located in the centre of the northern field, and runs in an east to west direction.
- 1.2.4 To the north of the site the topography changes in relation to flood defences that run alone the southern bank of King Sedgemoor Drain, which rise up to an average height of c. 7m aOD.
- 1.2.5 The underlying bedrock geology throughout the majority of the site is undifferentiated Triassic mudstone, siltstone and sandstone, overlain by deposits of alluvial clay, silt and sand. The Triassic units are part of the Lias group, which are deposited during the Jurassic and Triassic periods (BGS, 2014). Alluvial Geology has the potential to mask some of the underlying archaeological features.

2. AIMS & METHODOLOGY

2.1 Aims of Works

- 2.1.1 Geophysical survey is a programme of non intrusive archaeological work. The aims of this geophysical survey were to:
 - Identify any geophysical anomalies of possible archaeological origin within the specified survey area;
 - Accurately locate these anomalies and present the findings in map form; and
 - Provide recommendations for any further archaeological work(s) necessary to contribute to the mitigation of the impacts of proposed development on these potential features.
- 2.1.2 The results of the geophysical survey are provided in this report, along with an interpretation of findings.

2.2 Methodology of Works Summary

Site Specific Information

- 2.2.1 A magnetometry survey was undertaken across the site of proposed development from, Monday the 13th of October to Thursday the 23rd of October 2014, covering an area of c.40 hectares (ha).
- 2.2.2 The AB Heritage staff members utilised over the course of the works were Glenn Rose (Senior Project Archaeologist), Sam O'Leary (Archaeological Technician), John Pykett (Archaeological Technician), Grace Preston (Archaeological Technician) and Alex Monks (Archaeological Technician). The weather conditions for the work were mainly dry and with periods of rain throughout the survey; this would have had no material impact on the survey.
- 2.2.3 The work was undertaken and concluded within 9 days, with all data capture downloaded periodically on site for a data quality check.

Equipment

2.2.4 The magnetic survey equipment used was one Bartington Grad-601 (fluxgate magnetometer). Please see Appendix A which contains a detailed methodology for the works undertaken; however briefly, Table 1, below, shows site specific information on how the magnetometer was set up:

Table 1: Setting Parameters of Magnetometer

Grid Size	30x30 metres
Data Capture Distances	0.25
Sensors	2
Sensitivity	0.1nT

2.2.5 A GPS was used to setup and reference the survey site using a Trimble GeoXR which has a sub-centimetre accuracy.

2.3 Known Constraints

- 2.3.1 The site is bounded by hedgerows and in some areas metallic fences; these are likely to create an area of magnetic disturbance of up to c.1-2m from the site boundary.
- 2.3.2 The southern field had recently been ploughed (see Plate 1), which caused difficulty in traversing, and may create a level of staggering in the data collated.



Plate 1: View of North West Corner of the Southern Field C

- 2.3.3 At the centre of Field B is a pond with feeding troughs, which may create an area of magnetic disturbance surrounding it. In addition, there is a flood bank running along the northern limits of the site that may also have created interference as that part of the site was traversed.
- 2.3.4 In the south west corner of Field B there is a sheep pen, which is enclosed by metallic fences (Plate 2). This is likely to have cause magnetic disturbance within the data collated within 4m 5m of the feature.



Plate 2: Sheep Pen in South West Corner of Field B

3. RESULTS & INTERPRETATIONS

3.1 Results

3.1.1 The results of the Horsey Levels survey are documented on Figures 2 – 5. Of these, Figures 2 and 3 show the raw and processed geophysical data respectively, while Figures 4 and 5 show the interpretations made from the results. The [AB] numbers provided in this section refer to numbers correlating to Figures 4 and 5.

Possible Archaeological features [AB 1]

3.1.2 Within the site there is one possible Archaeological feature [**AB 1**], this measures c. 350m in length with a width of c. 5m. Located within the southern end of Field C, it runs in a north west to south east direction, following a similar line to the southern boundary of the site.

Other Features [AB 2 - 7]

- 3.1.3 Large areas of positive disturbance [**AB 2**] have been identified to run through the northern half of the site, this follows the line of a small visible bank that is marked on modern OS mapping. The feature is up to c. 25m in width and is a curvilinear feature that measures c. 800m in length.
- 3.1.4 Spread out across the site the survey also recorded multiple areas of magnetic disturbance [AB 3 & AB 4], with the majority of magnetic disturbance found in the western side of Field C.
- 3.1.5 Other features identified include [**AB 5**] smaller negative linear features that lie equidistantly spaced c. 25m from one another, running in a north west to south east direction with an average length of c. 300m.
- 3.1.6 Multiple negative linear features have also been identified [**AB 6**] within Field B, which run from the line of previous boundaries/ditches [**AB 7**].
- 3.1.7 A pond located within the centre of Field A has three negative linear features [**AB 7**] that run in different directions away from it; to the north, south, east and west, these features are also identified on modern OS Mapping.

3.2 Interpretation

- 3.2.1 Interpretation of the results of geophysical survey is based on professional judgement as to the likely/probable cause of an anomaly or reading. For example, strong dipolar discrete anomalies of small size are often associated with ferrous debris or similarly magnetic debris.
- 3.2.2 In addition, where a positive linear anomaly is recorded, which has a negative anomaly associated alongside either side of it, is often likely to relate to the line of a modern service.

Table 1: Interpretation of Geophysical Anomalies

AB No	Description	Potential Cause	
AB 1	Possible Archaeology	Cut/ditch	
AB 2	Large Negative and positive area	Former Flood Bank	
AB3	DI-Polar (Positive with associated negative)	Magnetic Debris	
AB4	Negative area	Magnetic disturbance	
AB 5	Negative disturbed Linear	Field Drains/agricultural	
AB 6	Negative equidistant linears	Field Drainage	
AB 7	Negative and Positive linear	Infilled Ditches containing possible debris and utilities	

- 3.2.3 The only possible archaeological feature [**AB 1**] recorded within the site is likely to be related to a previous field boundary or ditch, due to its shape/form, and the fact it follows the line of the southern boundary of the site.
- 3.2.4 The site has in the past been known to contain previous flood banks [AB 2], with a range of Medieval/Post Medieval flood banks being recorded in the Somerset Historic Environment Record (SHER 27792). There is now a modern flood bank located along the northern boundary of the site, which has likely removed the need for the previous system to survive within the site. All of these features show up clearly within the geophysical data with a high magnetic field created.
- 3.2.5 The area appears to have been extensively disturbed through modern agricultural use, with multiple areas of magnetic disturbance [AB 3 & 4] highlighted, some of which are also likely to relate to modern utilities within the site and metallic fences along its boundaries.
- 3.2.6 Due to the low lying nature of the site there has obviously been a historic drainage requirement and the geophysical survey recorded obvious signs of field drain systems [AB 5 & 6]. In addition to this, former field boundaries/ditches [AB 7] were recorded, the line of which can still be seen on site in the form of shallow earthworks. The geophysical survey identified the line of what is believed to be the former locations of the field boundaries, although they are now flat and are likely to have been filled in.
- 3.2.7 It should be noted that, recorded on the 1889 1890 OS Map of the site is a Rifle Range [SHER 16544]. The site work did not pick up any physical elements of this feature in the landscape and the geophysical data recorded no anomalies, which would appear to relate to the archaeological survival of the rifle range or its use.

4. CONCLUSION

- 4.1.1 A geophysical survey was undertaken by AB Heritage Limited at Horsey Levels, Somerset, on Monday the 13th of October to Thursday the 23rd of October 2014. The purpose of this was to understand the potential for any archaeological remains to survive undisturbed and, where possible, identify the form, function and extent of any potential remains.
- 4.1.2 The results of the survey identified one possible linear archaeological feature [AB 1] within the site, located adjacent to the southern boundary in Field C. The majority of the remaining features identified in the northern half of the site appear to relate to the previous flood management systems [AB 2] that survived across this area, and which are recorded on the Somerset Historic Environment Record [SHER 17051 & 27792].
- 4.1.3 No features recorded within the geophysical survey suggest the archaeological survival of a Rifle Range [SHER 16544] identified on the OS Map of 1889-1890, or indeed strong evidence of the survival of evidence related to its use (e.g. concentrations of metal shot seeding field). Where DI-Polar anomalies and magnetic disturbance [AB 3 & 4] are identified it appears, from their location and form, which they are most likely to relate to the presence of modern utilities and magnetic debris, with no correlating pattern suggestive of a gun range.
- 4.1.4 Extensive drainage systems [AB 5 & 6] are situated throughout the site, improving the drainage on what would have been a low lying, Somerset 'wet' site. Previous boundaries/ditches [AB 7] marked on modern OS Maps within Field B have possibly been filled, along with another field boundary marked on an earlier OS Map (1889-1890) located on the western side of Field C.
- 4.1.5 Based on the results of this survey it is concluded that there is a no to low potential for the survival of complex / significant below ground archaeology to survive within the limits of proposed development.

5. ARCHIVE

5.1.1 The Site Archive will contain the following, as a minimum:

Table 2: Site Archive Data

Archive	Format	
Raw Geophysical Data files	XYZ and Text	
Processed geophysical data files	JPEG, BMAP	
Archaeological Interpretation	Shape Files ARC GIS	
Final Report	PDF	
Final Images	PDF	

5.1.2 A physical and digital archive will be stored in a suitable format at AB Heritage Limited offices in Taunton, Somerset.

6. REFERENCES

BGS (British Geological Society) 2014. *Geology of Britain viewer*.http://mapapps.bgs.ac.uk/geologyofbritain/home.html.

EH (English Heritage) 2014. The National Heritage List for England.http://www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england/

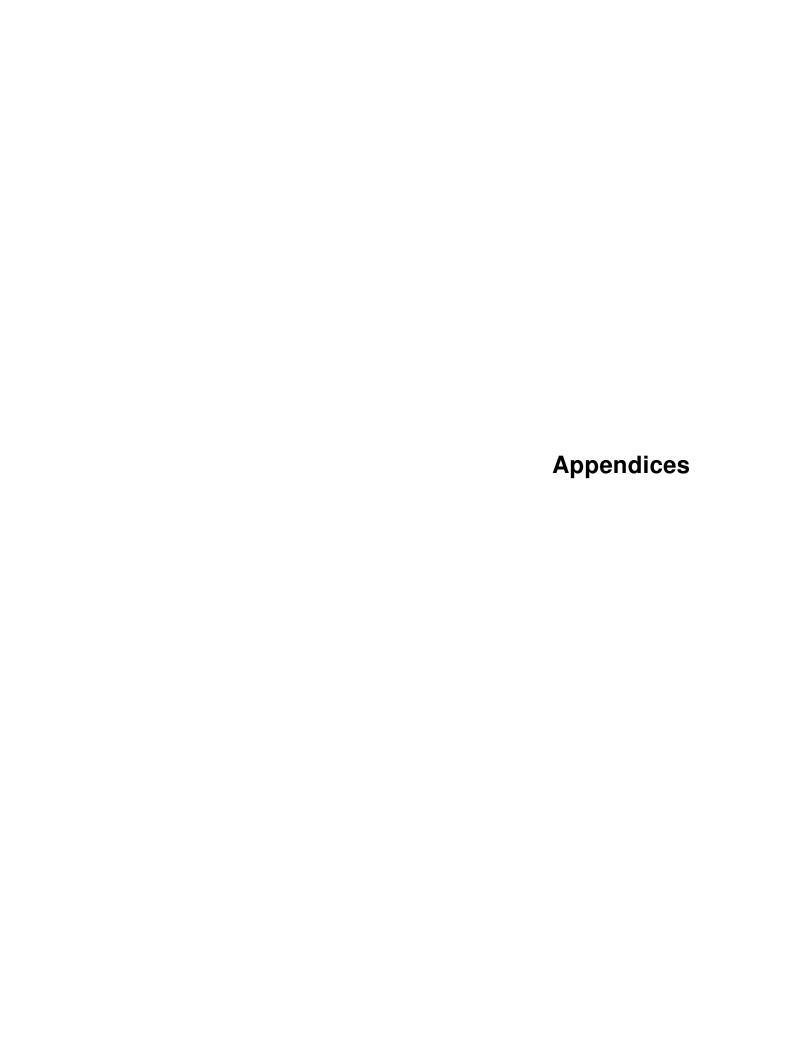
IFA, 2011. Standard and Guidance for archaeological geophysical survey. IFA

Jones D.M. 2008. Geophysical survey in Archaeological Field Evaluation. English Heritage.

Schmidt, A 2002. Geophysical Data in Archaeology: a Guide to Good Practice. Oxford. Oxbow.

Wells, Tom. 2014. Land at Horsey Levels, Puriton, Somerset. Archaeological Desk Based Assessment. Wessex Archaeology.

1889-1890 Ordnance Survey Map, Horsey Levels



Appendix 1 Technical Information on Geophysical Survey

FLUXAGTE MAGNETOMETRY SURVEY

The magnetic survey is carried out using a fluxgate gradiometer, which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field, whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

Survey equipment

The Bartington Grad 601-2 dual magnetic gradiometer is capable of surveying to an accuracy of 0.1 nanotesla (nT).

Sample interval and depth of scan

The magnetometer data is collected in 30mx30m grids at a resolution of 1m x 0.25m. This sample density is recommended for site evaluation (English Heritage, 2008). This equates to 3600 points per 30mx30m grid. The magnetometer has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects are buried within the site.

Data capture and processing

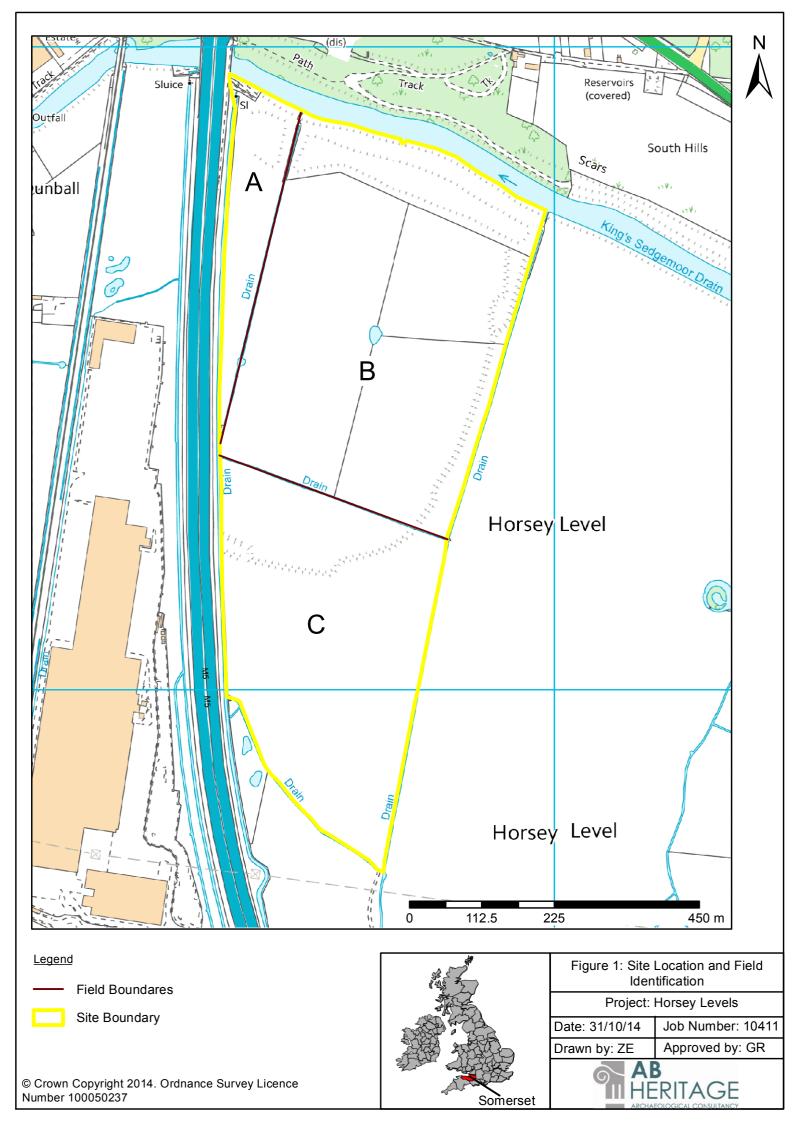
The readings are logged continually by the data logger during the survey, which is then downloaded on site to a site laptop. At the end of each job, data is transferred to the office PC's for processing and presentation.

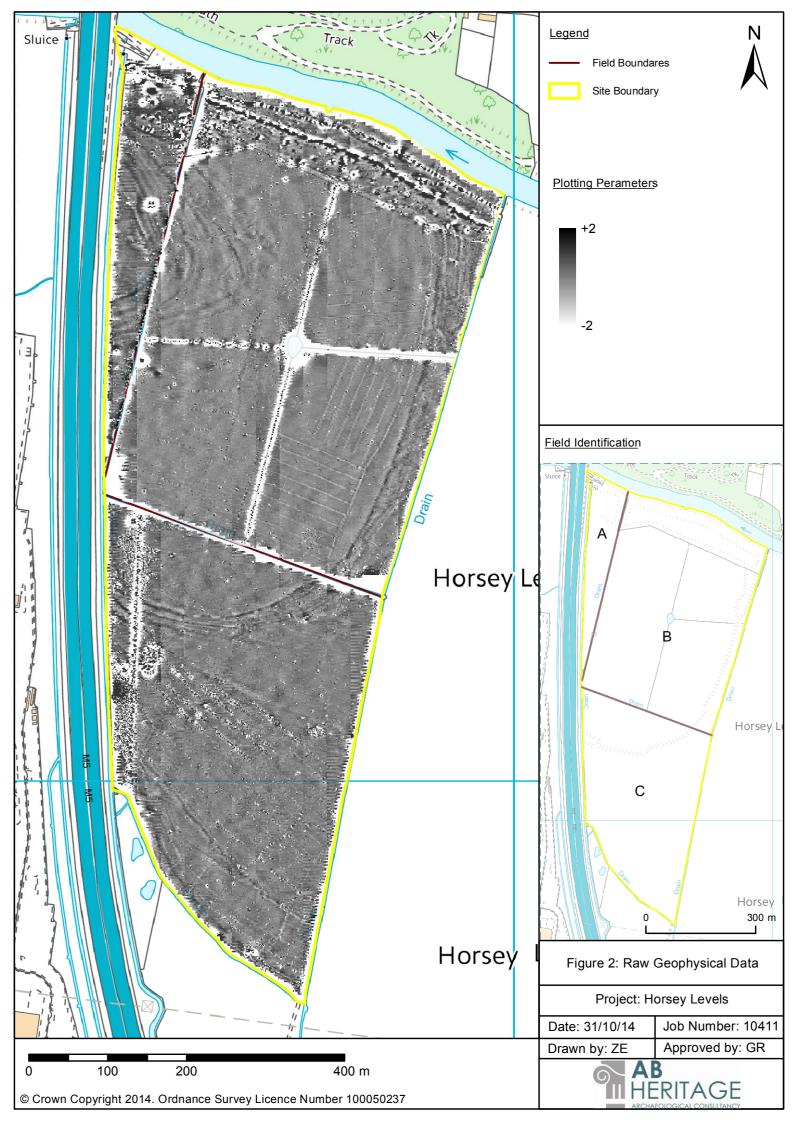
This 'regular xy' data is then downloaded into specialist data processing software, at user defined sample intervals (in this case 1 m by 0.25 m). This is processed as standard magnetometer data.

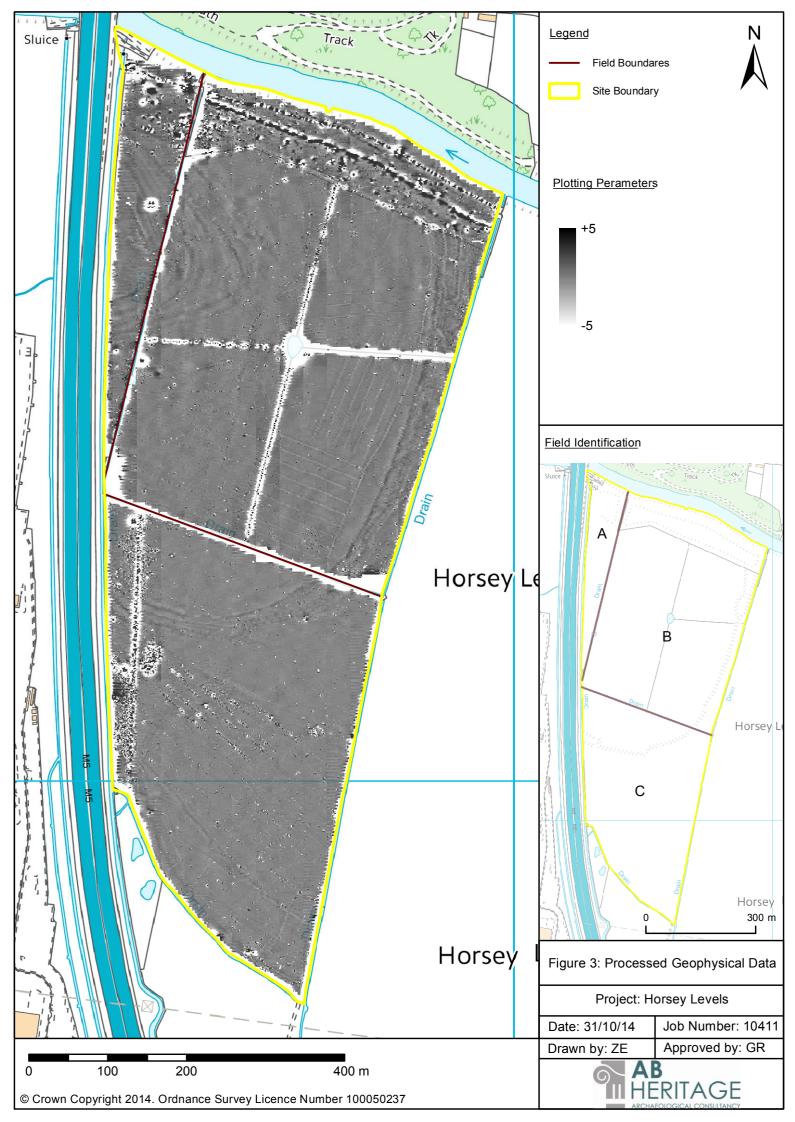
GPS METHODOLOGY

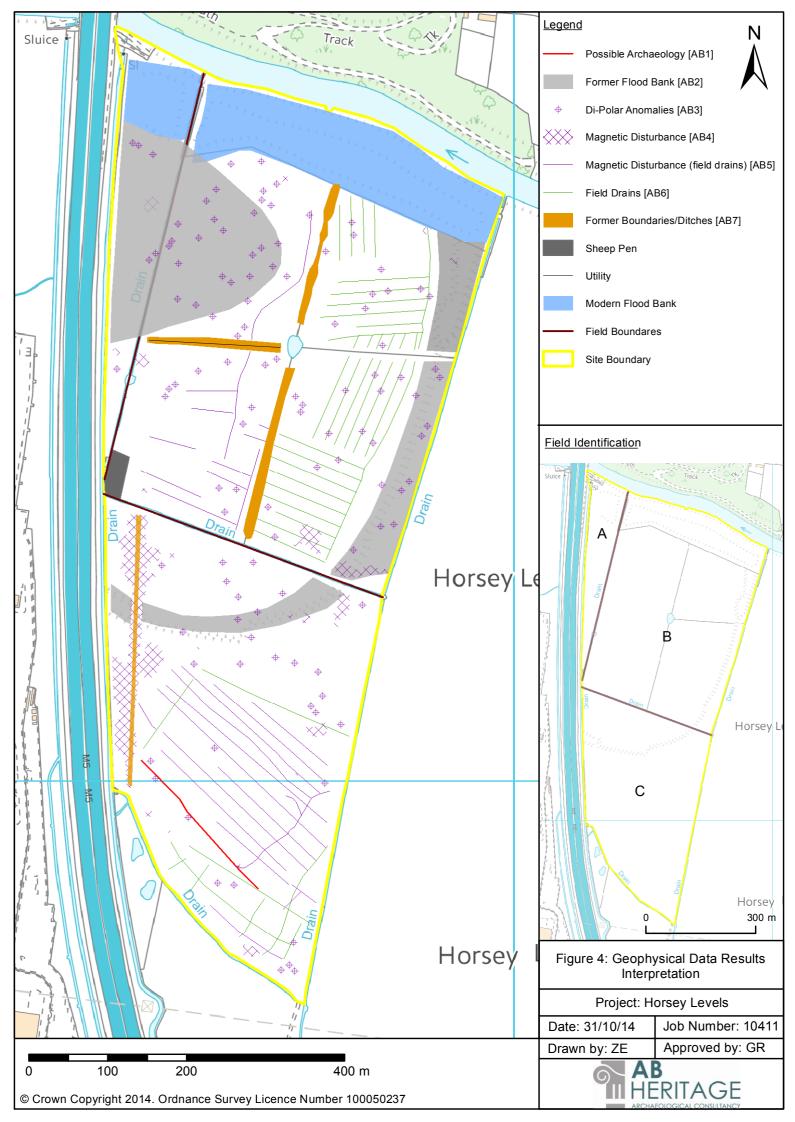
An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to sub-cm accuracy, a far greater accuracy than a standard GPS unit. An RTK system uses a base station receiver and a number of mobile units (rovers). The base station takes measurements from satellites in view and then broadcasts them along with its known position to the rover receivers. The rover receiver also collects measurements from the satellites in view and processes them with the base station data. The rover then computes its location relative to the base.

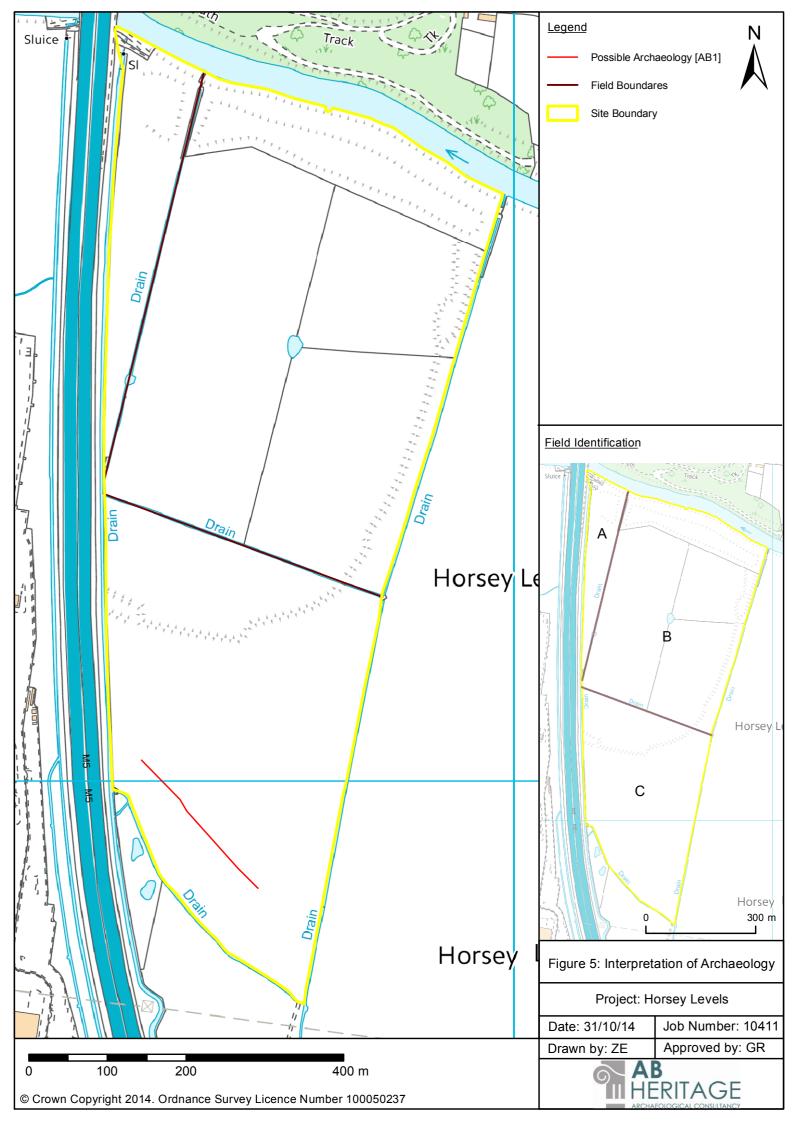
During such a survey a Trimble GeoXR Differential Global Positioning System (dGPS), capable of Real Time Kinematic (RTK) is used to set out a nominal grid prior to the survey. This increases the accuracy and efficiency of the survey. The data is then downloaded from the unit on the day, using a USB stick.













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