NORTHAMPTONSHIRE COUNTY COUNCIL

NORTHAMPTONSHIRE ARCHAEOLOGY

JULY 2004

GEOPHYSICAL SURVEY ON A11 FIVEWAYS TO THETFORD ROAD IMPROVEMENTS SCHEME, NORFOLK/SUFFOLK

MAY 2004

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QUALITY CONTROL

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OASIS REPORT FORM

PROJECT DETAILS		
Project title	GEOPHYSICAL SURVEY ON A11 FIVEWAYS TO THETFORD ROAD IMPROVEMENTS SCHEME, NORFOLK	
Short description (250 words maximum)	A geophysical survey was carried out by Northamptonshire Archaeology over 7.5ha of land on parts of the proposed A11 road improvement scheme. Most fields surveyed identified no archaeological activity. Two possible archaeological linear ditches were located. Second World War defence features were identified on the heathland One field contained a single, large anomaly indicating a probable backfilled clay quarry. Putuative circular features were identified at the east end of the route. A high pressure gas main traversed the same area.	
Project type	Geophysical Survey	
Previous work	Fieldwalking survey was carried out by the Norfolk Unit.	
Future work	To be decided	
Monument type and period	-	
Significant finds		
PROJECT LOCATION		
County	Norfolk/Suffolk	
Site address	A11 Fiveways to Thetford	
Easting (use 2-letter 100km grid square no.)	5753	
Northing	2879	
Height OD	10m – 40m (SW-NE)	
PROJECT CREATORS		
Organisation	Northamptonshire Archaeology	
Project brief originator	Norfolk Archaeology	
Project Design originator	Northamptonshire Archaeology (NA)	
Director/Supervisor	Adrian Butler	
Project Manager	For NA, Adrian Butler	
Sponsor or funding body	Highways Agency	
PROJECT DATE		
Start date	May 2004	
End date	July 2004	
ARCHIVES	**Location (Accession no.)**	**Content (eg pottery, animal bone etc)**
Physical		
Paper		
Digital	Northants Archaeology	Geophysical Data, CAD/GIS
BIBLIOGRAPHY	Journal/monograph, published or forthcoming, or unpublished client report (NA report)	
Title	Geophysical survey on A11 Fiveways to Thetford Road Improvement scheme, Norfolk/Suffolk	
Serial title & volume		
Author(s)	Adrian Butler & Stephen Morris	
Page numbers		
Date		

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GEOPHYSICAL SURVEY ON A11 FIVEWAYS TO THETFORD ROAD IMPROVEMENTS SCHEME, NORFOLK/SUFFOLK JUNE 2004

Abstract

A geophysical survey was carried out by Northamptonshire Archaeology over approximately 7.5ha of land on parts of the proposed A11 road improvement scheme. In the majority of fields surveyed no archaeological activity was identified. One field contained a possible linear ditch, in another field a single, large anomaly indicating a probable old backfilled clay quarry was detected. Several linear features were identified on Weather Heath, probably the remains of Second World War defences and a former boundary. Putative circular features were identified at the east end of the route. A high pressure gas main traversed the same area. The survey may have identified variation in the local drift geology along the route.

1 INTRODUCTION

A geophysical survey was undertaken on land proposed for the A11 Fiveways to Thetford, road improvement scheme, Norfolk (NGR: TL 879 753, Fig 1) by Northamptonshire Archaeology on behalf of Norfolk Archaeology Unit. The work formed Phase 2 of the archaeological investigation, as part of an updated Specification issued by Oxford Archaeology (OAU 2003d). The project was carried out for the Highways Agency as part of the programme of road improvements along a 14 km stretch of the existing A11 that runs between the Fiveways junction in Suffolk to Thetford in Norfolk.

1.1 Topography and Geology

The proposed development consists of a single carriageway partly adjacent to the present A11 and across open country. The development corridor lies in a predominately rural landscape comprising mainly agricultural fields and woodland, this includes woodland belts utilised as field boundaries and roadside verges. Two areas of Sites of Special Scientific Interest (SSSI) are also traversed by the proposed road development, these are Weather and Horn Heaths. The height of the proposed development at the Fiveways junction at the south-western end was approximately 10m AOD, rising to approximately 40m at its north-eastern extent near Thetford.

The underlying geology is believed to consist of a solid basement of cretaceous chalk with overlying drift deposits of boulder clay and morainic drift in the mid-section of the A11 and lacustrine clays silts and sands laterally east and west, towards Thetford and Mildenhall (BGS).

The surveyable area initially consisted of five blocks of geophysical survey, GS1 - GS5. GS1 and GS2 were merged into one area consisting of six adjoining agricultural fields adjacent to the south side of the A11, and one area of rough grass and woodland on the north side of the road (Fig 2).

GS3 was located on Weather and Horn Heaths, both areas of Site of Special Scientific Interest (SSSI), on the north and south sides A11 respectively. Horn Heath was not surveyed due to heavy growth of heather and brier. The vegetation on Weather Heath was relatively lower due to the grazing of farm stock and was surveyed (Fig 2).

As farming methods made the surfaces unsuitable for traversing, the fields of GS4 were not surveyable. GS5 was located in a single open agricultural field aligned to the north of the A11 (Fig 3).
The total surveyable area including GS 1, 2, and 5 was approximately 7.5 hectares (Figs 2 & 3).

1.2 Archaeological Background

A Cultural Heritage report produced by Oxford Archaeology in November 2000 and up dated 2003 identified a series of potential sites that lie adjacent to, or are likely to be impacted by the proposed road improvement scheme. The sites identified include find spots, earthworks and cropmarks identified by aerial survey. The sites are indicative of occupation and settlement dating from the prehistoric through to the post-medieval period. Included with these sites there is the Scheduled Ancient Monument of How Hill Tumulus and a Grade II Listed 1920's war memorial at the eastern extent of Weather Heath (OAU 2003a).

An archaeological monitoring and recording exercise undertaken in 2002 during geo-technical survey identified a few undated features, which may represent ditch or pit remains in the vicinity of How Hill Tumulus and other known sites of prehistoric and Roman activity. Significant flint scatters have been identified throughout much of the length of the proposed road route, indicating potential prehistoric activity (OAU 2003c).

2 METHODOLOGY

The survey was undertaken according to the submitted project specification and as detailed below.

2.1 Fluxgate Magnetic Gradiometer Survey

Previous research has shown that fired, or cut and backfilled archaeological features such as kilns and hearths, ditches and pits often have an anomalously higher 'magnetic susceptibility' than the surrounding subsoil due to burning and biological processes. Differences in magnetic susceptibility within the subsoil and archaeological features can be detected as changing magnetic flux by an instrument such as a fluxgate gradiometer (Gaffney et al 2002). Data from this may be mapped at closely spaced regular intervals, to produce an image which may be interpreted to locate buried archaeological features (Clark 1996).

Detailed gradiometer survey was carried out utilising Geoscan Research fluxgate gradiometers - FM256 and FM36 with ST1 sample trigger. Prospection was carried out in grids of 20m x 20m along parallel traverses spaced at 1m intervals. Data points were recorded at 0.25m intervals (a total of 1600 points in each grid) to the maximum instrument sensitivity of 0.1nT in accordance with English Heritage Guidelines (EH 1995). The grids were surveyed in the 'zig-zag' style (traverses walked alternately south-north/north-south) in blocks. The data was downloaded to a notebook computer for storage and assessment.

Data manipulation took place utilising Geoscan Research Geoplot v.3 software. Following the survey the data was pre-processed to account for instrument drift over time. The mean level of each traverse of data was reduced to zero and all grids matched so that there are no differences between background levels. Processing included the removal of extreme data values, such as those associated with the measurement of sporadic ferrous debris. The data was analysed 'on-screen' using a variety of viewing parameters and styles and the most useful of these saved as a bitmap image and manipulated using Corel Draw software. A digital map of the survey area was constructed in MapInfo using client supplied Ordnance Survey Landline data. The greyscale image of the survey results were then overlaid onto digital mapping (Figs 4-12) and interpretation diagrams generalised from the results (Figs 5-13).

3 RESULTS

The results of the gradiometer survey in each area are shown at scale 1:2500 in greyscale within a linear range of -2.0nT to +2.0nT, white-black. An interpretative diagram has been overlain on a second plot in each case.

3.1 Geophysical Survey Area 1 & 2 (GS1 &GS2)

GS1 and GS2 was the most westerly part of the survey, extending approximately 400m to the west of How Hill Tumulus and 1.4km to the east.

This area divided into seven adjoining fields on the south side of the A11, consisting of from east to west, Field 338 (Gibson South), Field 336 (40 Acres), Field 334 (Deal, divided East & West), an un-numbered, un-named field (No-Name), Field 325 (King Carlos, divided East & West) and Field 324 (Crossroads). The only survey area on the north side was Field 200 (Mill Sail). The surveys in these fields were 20m wide approximately parallel to the road, as near as practical to the line of the proposed road widening.

Field 324 Crossroads *(Figs 4 & 5)*

This field sloped gently to the west to an overall length of 360m, with a 0.5m high crop. The How Hill Tumulus was located on the north side of the road almost opposite the east end of the survey area. The survey results showed no anomalies that relate to archaeological features. A number of broad intense negative and positive anomalies were located, forming a rough 'figure-of-eight' pattern on the south side of this survey towards the eastern extent. The anomaly was approximately ellipsoidal with a diameter of between 20 to 25m. This feature may relate to a former backfilled clay pit, that can be located on the 1890-1891, 1st edition map of Ordnance Survey, (www.oldmaps.co.uk Accessed 19/05/04). Negative readings occurred along part of the northern edge in the eastern part of the survey and were caused by the close vicinity of a barbed wire fence on the field boundary.

Field 325 King Carlos (West) *(Figs 4 & 5)*

King Carlos (west) is the west side of Field 325, 120m long. The How Hill Tumulus was located on the north side of the road opposite the west end of the survey area and as such was expected to be a core area for archaeological activity. This part of the field also

identified no anomalies relating to archaeology, but displayed a similar ripple effect of low readings of 1-2 nT, considered to be the effect of either geological change or ploughing in this area.

Field 325 King Carlos (East) *(Figs 4 & 5)*

This field sloped gently to the west, 200m in length, with a 0.5m high crop. No archaeological features were identified in this part of the field. The west end of the area displayed a 'ripple' effect of low readings of less than +1nT and were probably the effect of the geology or ploughing. An intense negative reading located at the very east end of the survey area was likely the effect of a nearby ferrous pipeline, beyond the field boundary.

No-Name Field *(Figs 4 & 5)*

This was a roughly grassed, level field, with a survey area of 200m in length. No anomalies relating to archaeology were observed. The 'ripple' effect (see above) at the west end had low readings of 1-2nT, which probably relate to underlying geology.

Field 334 Deal (West) *(Figs 6 & 7)*

Deal (West) is the west part of Field 334, 180m in length. No anomalies indicating archaeology were located in this part of the field. An uneven textural effect occurred within +1.0-2.0nT readings at the western end of the survey, which were probably indicative of underlying geological variation.

Field 334 Deal (East) *(Figs 6 & 7)*

Deal (East) is the east part of Field 334 which was a 260m long level field with a low crop. Two low intensity linear positive anomalies (not illustrated) run parallel from the west end to the centre of the survey area, but these are likely caused by the effect of crop alignment or farm vehicle tracks on survey instrumentation position.

Field 336 40 Acre *(Figs 6 & 7)*

Field 336 was a 500m long level field with a low crop. No archaeological features were identified in the survey of this field. The east end of the survey area shows a minor textured ripple effect of approximately 1.0nT change in intensity, which may relate to the underlying geological variation.

***Field 200 Mill Sail Figs** (6 & 7)*

Field 200 was located on the north side of GS1 and GS2, opposite 40 Acre (Field 336). This survey area was located partially over woodland, with the west end situated across rough but level area of grass which was surveyable. A length of 240m was surveyed, but avoiding where the woodland encroached on the north side. The survey results showed a single narrow linear positive anomaly. This anomaly may be archaeological, aligned northeast-southwest with a length of approximately 12m. Negative readings occurred along part of the south edge of the survey, probably relating to the close vicinity of a barbed wire fence on the field boundary.

***Field 338 Gibson South** (Figs 8 & 9)*

The survey area in this field was 300m in length with occasional undulations and a low crop. A single small intense negative anomaly occurred towards the east end of the survey area, which probably relates to a buried ferrous object. The west end of the survey shows a slightly disturbed area relating to a patch of rough ground between a pond and the corner of the field. A second small ferrous target was detected in that area. The survey results indicated no anomalies that relate to archaeological features.

3.2 Geophysical Survey Area 3 (GS3)

GS3 was the central part of the survey, consisting of two areas of Weather and Horn Heath (SSSI) located on the north and south sides of the A11 respectively. Both areas of heath consisted of heather cover with patches of briar and occasional trees. Horn Heath had the most developed vegetation making it unsurveyable. However, due to stock grazing the vegetation on Weather Heath was at a much reduced level and was surveyed. The survey area on Weather Heath was located to the west of the scheduled War Memorial and extended 560m to the west to where trees prevented further surveying. The survey in this area was 20m wide, approximately parallel to the road, across generally level ground, with the occasional linear earthworks feature traversing the area.

***Weather Heath** (Figs 10 & 11)*

Several linear anomalies were identified, which relate to predominant standing earthworks across the survey area. These features are of likely probable recent construction, and may be part of the Second World War defences located on Weather Heath.

At the most westerly end of the survey a roughly linear +2nT anomaly was detected approximately orientated east-west and 40m long. At the east end of the linear anomaly, a discrete intense, ferrous anomaly was located. These appear to be a section of partially backfilled trenches and dugout, which may be part of defences connected to a standing Second World War pillbox, *c.*40m to the north-west.

Approximately 130m north-east along the Weather Heath survey corridor there was a partially infilled ditch, aligned north-west – south-east and extending north-west into the Heath. The readings were between +1.0nT - +2.0nT, but contained two typically ferrous responses within the feature or in the spoil heaps either side. This feature was also probably part of the Second World War defences on the heath and has been reported as an anti-glider ditch.

The feature may be one of four such anti-glider ditches identified within the survey area, all aligned in a similar north-west – south-east direction, all with comparable low readings. The other ditches are located 240m and 400m, respectively from the west end, with one at the very east extent.

At approximately 30m from the east end of the area, a curvi-linear anomaly was located with low positive readings of +1-3nT. The anomaly was aligned approximately east-west, but curving slightly to the north. This feature can be identified on the ground as a shallow ditch curving out across the Heath, but does not appear to be related to the other ditches. This ditch may relate to a boundary that can be located on the Ordnance Survey 1890-1891 1st edition map (www.oldmaps.co.uk, accessed: 19/05/04).

3.3 GEOPHYSICAL SURVEY AREA 5 (GS5)

Milestone Elveden *(Figs 12 & 13)*

This survey area was located across an open, level field with a low crop, approximately 300m from the A11. The survey area was 400m in length and 40m wide and aligned approximately east-west. No anomalies were identified as archaeological features within the survey area, but a buried high pressure gas main traversing the east of the survey area produced very high readings. This had the effect of subduing the more subtle anomalies within the general magnetic area affected by the pipe. However, suggestions of circular shapes can be seen as weak positive anomalies to the north of the pipeline. These anomalies could be true magnetic reactions to buried circular features or unfortunate data artefacts from computer processing near the huge pipe anomaly.

4 CONCLUSIONS

In the overall survey by gradiometer there was a low rate of identification of archaeology. A single linear feature may have been detected in the survey area of Field 200 - Mill Sail. Several linear features identified in the survey of Weather Heath, could be related to the remains of standing earthworks of Second World War defences and a possible earlier boundary crossing the heathland.

In Field 324 - Cross Roads, a large feature was identified as a backfilled clay pit and probably dates to the post-medieval period. A large magnetic disturbance was created in Field Milestone by an underlying high pressure gas pipeline. This may have masked archaeology in the pipelines vicinity, as there was an indication of possible circular features which may either have been hidden by the intense magnetism of the pipeline or caused by the heavy processing actions taken to account for said magnetic fields.

Note has been made of a textured 'rippled' magnetic effect in low levels of the magnetic data in parts of survey areas GS1 and GS2 in fields King Carlos north-east to 40 Acre. It is considered that this may be the zone where the lacustrine clay, silt and sand drift changes to boulder clay and morainic drift (see 1.1 above).

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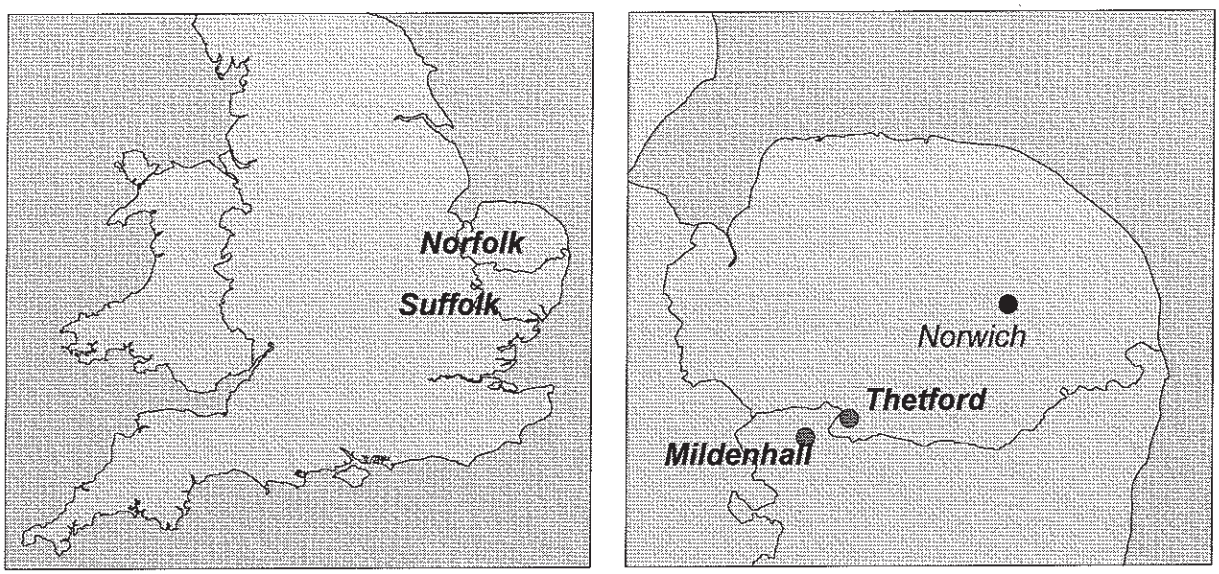

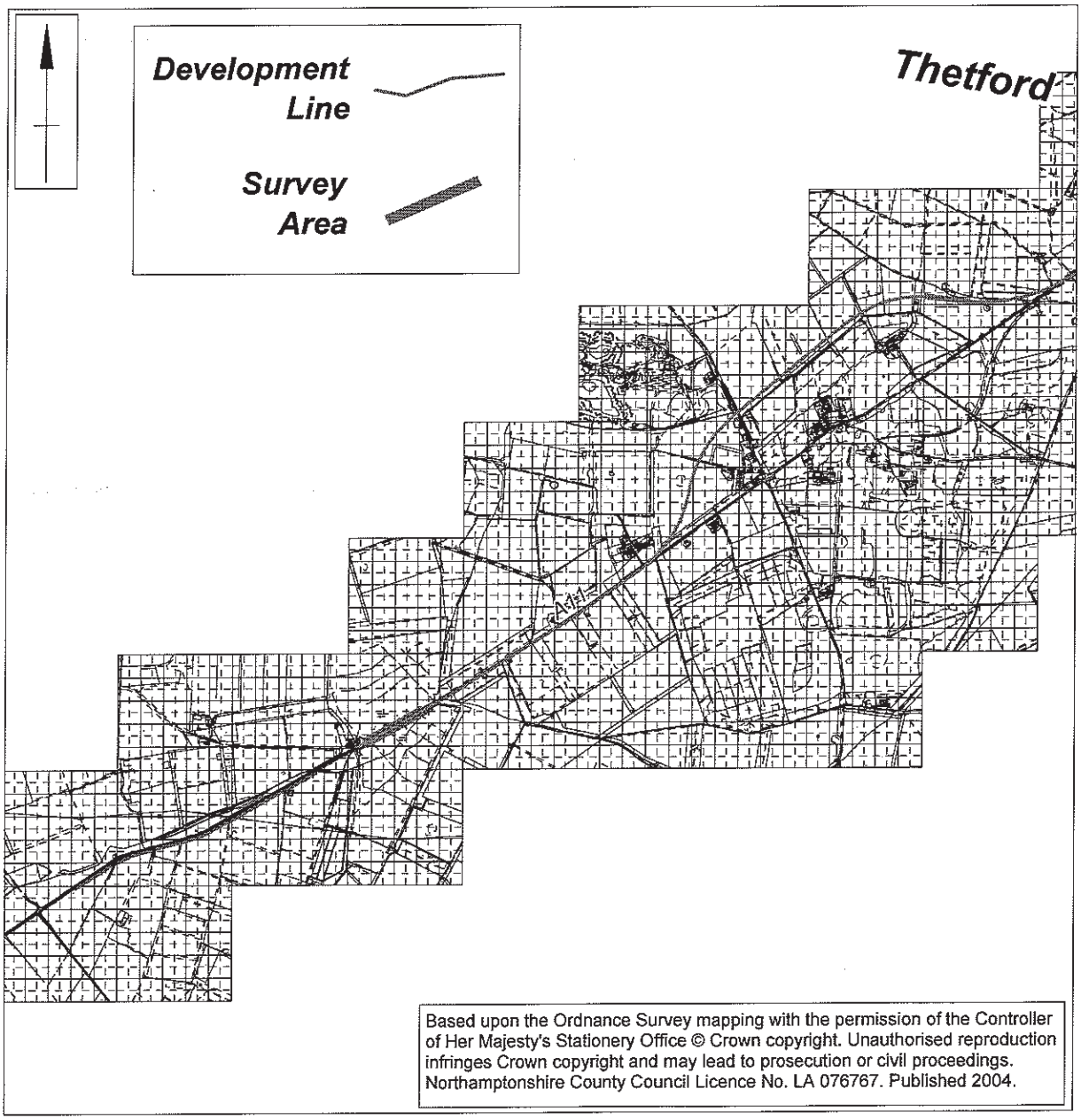

Figure 1: Site Location