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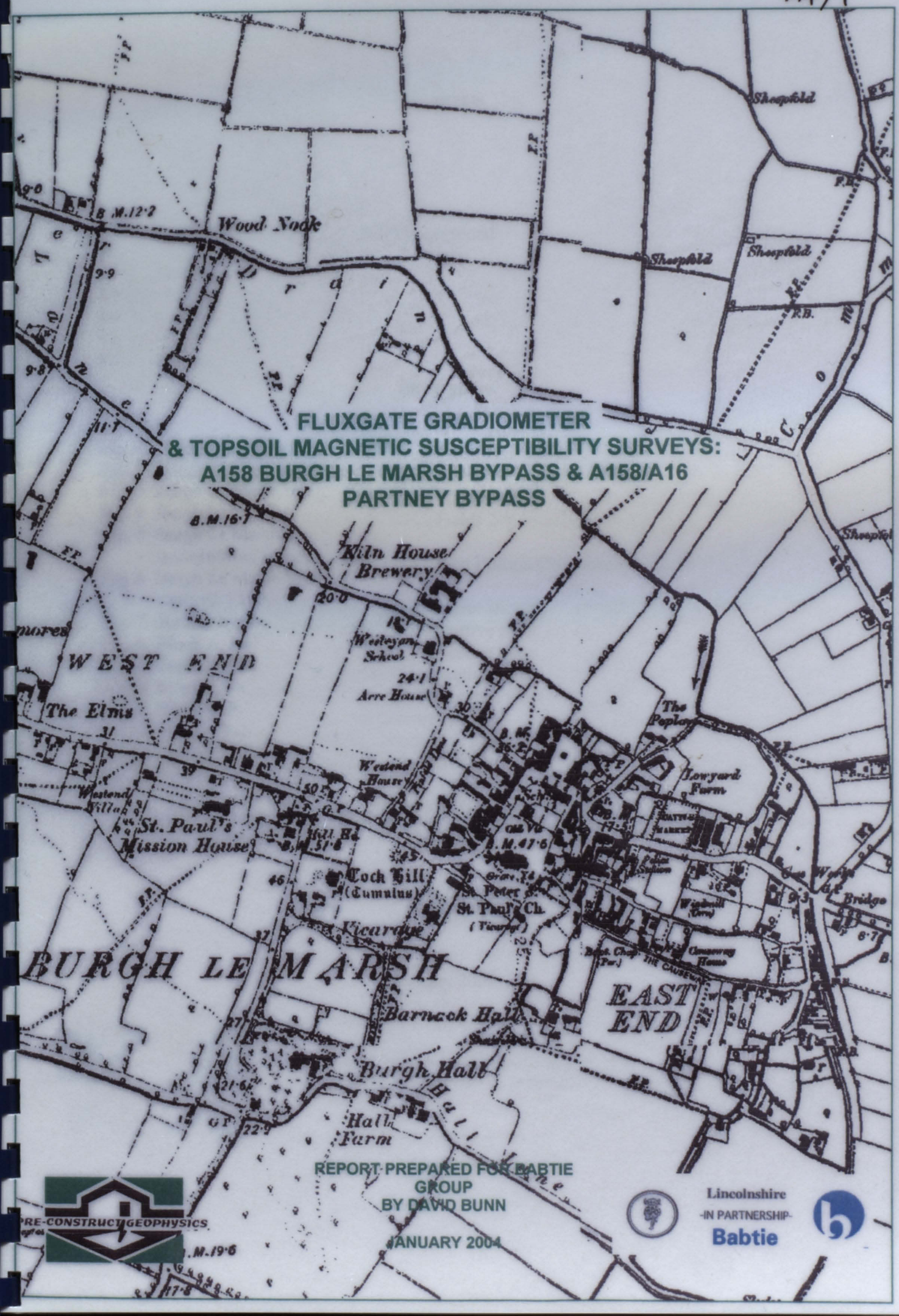

FLUXGATE GRADIOMETER & TOPSOIL MAGNETIC SUSCEPTIBILITY SURVEYS: A158 BURGH LE MARSH BYPASS & A158/A16 PARTNEY BYPASS

REPORT PREPARED FOR BABTIE GROUP
BY DAVID BUNN

JANUARY 2004

PRE-CONSTRUCT GEOPHYSICS

Lincolnshire
-IN PARTNERSHIP-
Babtie

EVENT: L15867 - Burgh le Marsh
L15868 - Partney
} INTERVENTION: L19945

negative
CON: L17489

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Illustrations

Report prepared for Babtie Group
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PRE-CONSTRUCT GEOPHYSICS

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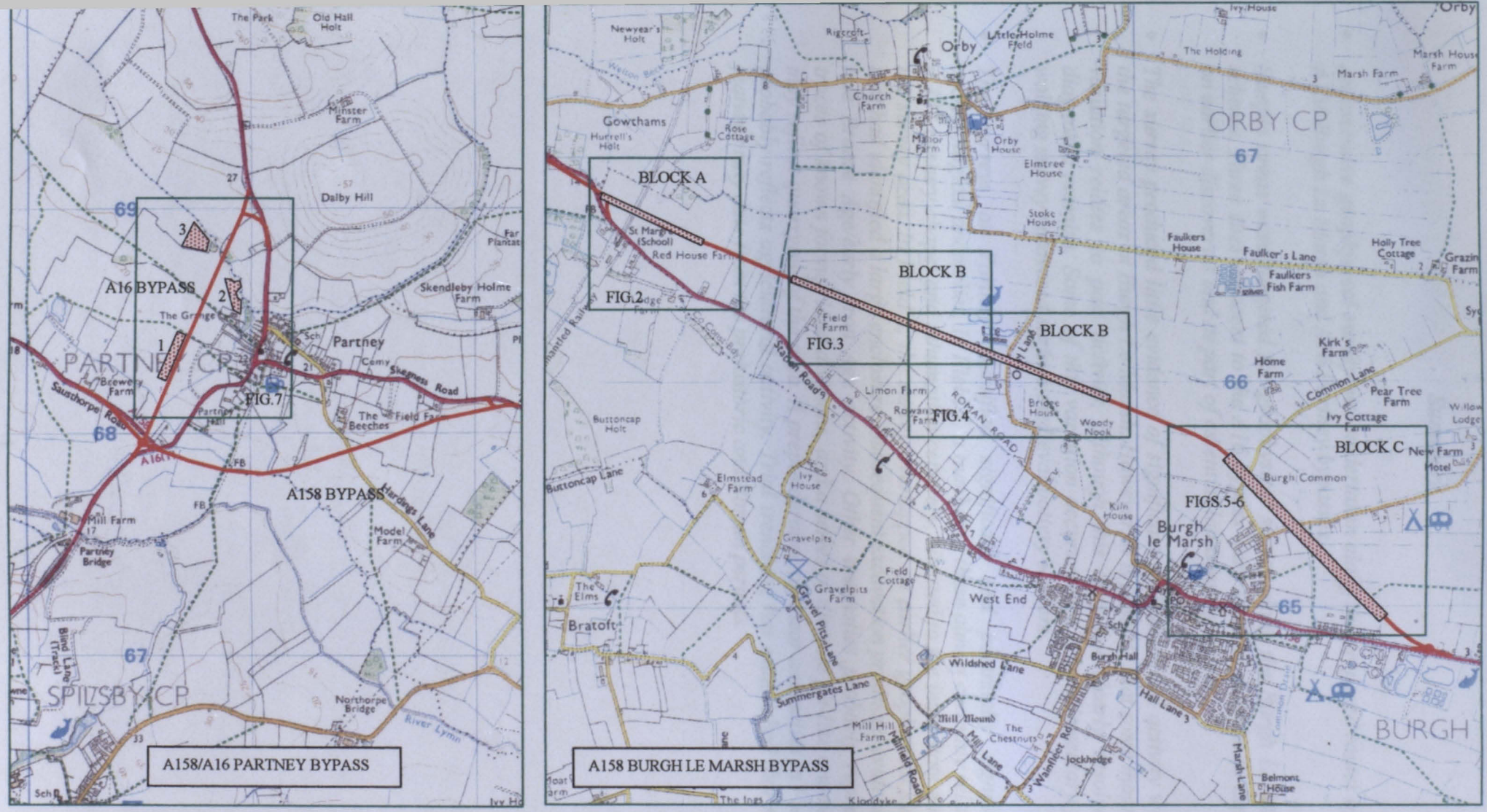

Fig. 1: Location of surveys (scale 1:25,000)

Summary

- *An extensive geophysical survey was undertaken along the proposed routes of the A158 Burgh Le Marsh and A16 Partney bypasses.*

- *Sample areas were targeted for geophysical survey along the Burgh Le Marsh scheme. Three sites adjacent to the A16 bypass were selected in order to expand on earlier discoveries and as part of essential landscaping works.*

- *The survey produced little evidence of significant archaeological activity within the targeted areas at Burgh Le Marsh. However, it is possible that some magnetic variation relates to past activity, although this does not clearly resolve as diagnostic remains. Some of this variation occurs where a complementary field walking survey recovered surface medieval pottery scatters.*

- *The surveys at Partney identified significant and potentially significant archaeological anomalies. In Field 1, a number of these almost certainly relate to a 13th century chapel and inhumation cemetery, situated to the immediate east of the survey area. In Field 2, the survey overlapped an earlier geophysical survey that had identified a large enclosure. Subsequent excavation produced evidence of late Bronze Age/early Iron Age activity. Other anomalies probably represent traces of known former land divisions, and a series of discrete pit-like anomalies may reflect quarrying of the area. A preponderance of linear anomalies in Field 3 probably reflects agricultural activity. Trial trenching has established that some features may date from the prehistoric and Roman periods.*

1.0 Introduction

Babtie Group, acting on behalf of Lincolnshire County Council, commissioned Pre-Construct Geophysics to undertake fluxgate gradiometer and magnetic susceptibility surveys along sections of the proposed bypass routes of Burgh Le Marsh and Partney, Lincolnshire. This work was undertaken as part of an archaeological evaluation of the proposed schemes.

The survey methodology was based upon guidelines set out in the English Heritage document *'Geophysical Survey in Archaeological Field Evaluation'* (David, 1995).

2.0 Location and description (Figs. 1-7)

Sections 2 and 3 include information extracted from a specification provided by Babtie Group (Babtie Group, 2003).

2.1 Burgh Le Marsh bypass.

Burgh Le Marsh is situated approximately 5km to the east of Skegness. The core of the historic settlement lies on an island of glacial sand and gravels.

The current route of the A158, which passes through the centre of the town, constitutes a major access to the east coast, particularly Skegness. The proposed bypass commences close to Gunby Hall and skirts to the north of Burgh Le Marsh to rejoin the existing A158 to the east of the town.

Current land use is predominately arable, with intermittent areas of pasture.

2.1.1 Survey Areas (Figs. 1-6, 8-11)

Three sections (Blocks A-C) of the route were surveyed. In Blocks A and B, detailed gradiometer surveys were undertaken along a 30m wide corridor based on the centre line of the proposed route. Topsoil magnetic susceptibility survey was undertaken along a 50m wide corridor in Block C.

Block A: TF 54762 36683- TF54778 36674. Survey length-500m across two fields (A1-A2). Commences close to the western end of the route, to the east of Gunby Park, and is bisected by a dismantled railway line.

Block B: TF 54845 36649- TF54982 36596. Survey length-1.5km across ten fields (B1-B10). This block lies in the central part of the route and is bisected by the Roman road from Lincoln to Burgh Le Marsh. The route also crosses Orby Lane.

The geology in Blocks A and B comprises chalk-rich sandy gravely clay of glacial origin (Till). This overlies c.15-25m of Tealby mudstones and clays (British Geological Survey, 1996).

Block C TF 55042-36566 TF55108 36496. Survey length-0.8km across four fields (C2-C5). This section lies at the eastern end of the route, and extends across Common

Lane and Ingoldmells Road. Field 1 was not surveyed, due to the disruptive presence of a herd of bullocks.

Drift deposits within this section comprise predominately marine silts and clay (Terrington Beds). These overlie Cretaceous (Roach Formation) deposits of ferruginous oolitic clays and limestone (British Geological Survey, 1996).

2.2 Partney bypass.

Partney is situated on the south-eastern edge of the Lincolnshire Wolds at the junction of the A16 and the A158. The settlement lies on the south-facing slope (20-25m OAD) of a gravel hill that overlooks the Lymn Valley.

Two bypass routes have been proposed: diversions of the A158 and A16, to the south and west of the village respectively.

Surveys were undertaken within the A16 bypass study area. Previous geophysical survey and trenching had identified significant archaeological remains (see Section 3.2). The surveys were designed as an aid to the archaeological mitigation works and to establish the archaeological potential of zones that have been subsequently incorporated into the scheme as landscaped areas.

2.2.1 Survey Areas (Figs. 1, 7, 12-14)

Three areas were surveyed.

Field 1: survey centred on TF 54065 36835. This site lies to the west of the village, and runs parallel to and to the immediate west of the route. The survey area comprises c.0.88ha of arable land on a slight south-facing slope.

Field 2: survey centred on TF 54090 36860. It comprised an area of c. 0.75ha pasture to the immediate north of The Grange.

Field 3: survey centred on TF 54074 36888. A c.1ha area of arable land to the northwest of the village, to the west of the route.

The geology of the area comprises Jurassic deposits of Spilsby Sandstone; pale grey-brown weathering pebbly sandstone. These overlie Kimmeridge clay formations (British Geological Survey, 1995).

3.0 Archaeological and historical background

3.1 Burgh Le Marsh.

Evidence of prehistoric activity within the study area is sparse. However, former salt marshes, which lie to the east of the village, may have supported early salt making.

There is evidence to suggest that a series of salterns, exposed during the construction of the Burgh Le Marsh, Orby, Addlethorpe and Ingermells Rising Main, were

predominately of Romano-British origin. Further evidence of Roman occupation of the area includes possible settlement remains at Burgh Le Marsh itself, and the Roman road that extended from Lincoln to the coast. This road bisects the proposed route where it skirts to the north of the village, probably in the western part of Block B (Fig.1).

Anglo-Saxon settlement remains can be elusive to archaeological detection, where funerary vestiges tend to be more common. Cock Hill, a mound at Burgh Le Marsh, possibly marks the site of a 6th or 7th century barrow internment.

Records within the Domesday Book indicate that the village was an important settlement by the end of the 11th century. The name Burgh derives from the Old English *burh*, meaning fort or fortified place. It is not known whether this refers to a Roman or later fortification.

3.2 Partney.

This sub-section includes information extracted from a specification prepared by Babtie Group (Babtie Group, 2003).

Partney is situated at the south-east edge of the Lincolnshire Wolds, an area rich in archaeological remains, including settlement and funerary monuments. Despite an apparent scarcity of early prehistoric settlement sites, more than 60 Neolithic long barrows have been identified within the Wolds and Cliff. The location of the site on the fringes of the uplands may represent a true reflection of an apparent absence of early remains, although it is possible that the higher ground to the north of the village (e.g. Dalby Hill) was more attractive to early communities.

In 2002, a detailed desk-based assessment by Babtie Group highlighted a number of known or potential sites of archaeological interest. A staged programme of geophysical survey and targeted trial excavation was carried out along and adjacent to both bypass routes. The work identified a multi-phase Romano-British field system along the route of the A158 as well as traces of ridge and furrow and discrete clay extraction features. The results along the A16 route are more significant, and include a large multiphase Bronze/Iron Age enclosure to the northwest of the village and a mid-13th century chapel and cemetery. The latter lies to the west of the village, within the footprint of the proposed development. These discoveries have formed the basis for some of the work detailed in this report.

4.0 Methodology

Magnetic variation that is detectable within soils can often determine the nature and extent of past human activity. At British latitudes, the earth's magnetic field is approximately 50,000 nanoteslas (The nanotesla is the unit of magnetic flux, used in gradiometry to measure magnetic variation in relation to the Earth's magnetic field). Against this background, most archaeological features produce an enhancement of around 5-30 nanoteslas (nT). The strength of this magnetic variation depends largely on the composition of the geology. For example, limestone and chalk exhibits low

magnetic susceptibility, and contrasts well against soils: conversely, strongly magnetic igneous rocks can mask subtle anomalies completely.

For the most part, soils tend to be more responsive to magnetic remote sensing than the geologies over which they lie. Ferrous oxides occur naturally in many drift deposits, particularly those derived from, or containing elements of, igneous rocks. Organic decomposition within topsoils can supplement the level of ferrous compounds, a process amplified by agricultural activities.

The fills of ditches and pits tend to increase soil depths, and hence magnetic strengths, relative to surrounding soils. The converse also applies.

Ferromagnetic substances such as iron induce a very high response to magnetic surveys, and are thus easier to identify. Perhaps of more significance to the archaeological prospector are the weaker ferrous oxides; the randomly orientated magnetic fields of these materials produce minimal magnetic variation in their natural state. Geology and soil type can determine this variance (see above). Specifically, clay soils are ferrous oxide rich, hence their characteristic red colouration. Clay has literally been a fundamental building block in human social development: firing increases its versatility, but also enhances the magnetic properties of its ferrous content. For kilns, this may be in the order of 1000-5000 nT. Similar processes occur during the formation of igneous rocks.

Invariably, most surveys detect discrete anomalies, either in groups, or randomly scattered across a site. In the absence of intrusive investigation, the nature and origin of these anomalies is often difficult to establish. Strongly magnetic dipolar anomalies usually reflect ferrous objects, such as ploughshares and horseshoes. Weaker examples may indicate ceramic materials such as brick and tile, often introduced onto the site during manure spreading. The strength of the magnetic variation derives from permutations of the size and depth of the feature/object and the magnetic susceptibility of the surrounding soil. Pit-like anomalies, usually positive, can be identical to naturally occurring depressions, and the potential of these can only be estimated when they are examined in context with other factors, such as the proximity of definite, or suspected archaeological remains.

The use of magnetic surveys to locate sub-surface ceramic materials and areas of burning, as well as magnetically weaker features, is well established, particularly on large green field sites. The detection of magnetic anomalies requires the use of highly sensitive instruments, in this instance the Bartington 601 Dual Fluxgate Gradiometer. This must be accurately calibrated to the mean magnetic value of each survey area. Two sensors, mounted vertically and separated by 1m, measure slight localised distortions of the earth's magnetic field. Cumulative readings can be stored, processed and displayed as graphic images.

The zigzag traverse method of survey was used across 30m x 30m grids, at 0.25 m sample intervals along 1.0m wide traverses.

The survey data was analysed using Geoplot v.3.0 (Geoscan 2000). The data was processed using algorithm to remove magnetic spikes, thereby reducing extreme

readings sometimes caused by stray iron fragments. It was then clipped to enhance the magnetic response of potentially significant remains.

The results are presented as greyscale and traceplot images, along with an interpretative plan (Figures 8-14).

Although the gradiometer can be used for rapid scanning on large sites, its effectiveness is limited, and detailed area surveys always produce less subjective results. Additionally, the gradiometer is a 'passive' instrument, measuring magnetic susceptibility by its effect on the earth's magnetic field. Only magnetically *anomalous* features will be detectable. For example, the local magnetic distortion induced by thin archaeological horizons may not be sufficient to produce anomalous readings. This problem can exist within topsoils subjected to generations of disturbance (e.g. ploughing). Magnetic discontinuities in the topsoil are often more readily identified by an 'active' instrument, such as the Bartington Magnetic Susceptibility Meter. This instrument temporarily magnetises the ground by creating a low intensity, alternating magnetic field. It then measures the response. The susceptibility is measured in SI volume susceptibility units (x 10^{-5}). The usefulness of this system is confined to the top few centimetres of topsoil, but its wider range (measurement intervals of up to 30m) enables rapid coverage of large areas. This is, of course, at the expense of detailed resolution, and is recommended primarily as a preliminary prospecting technique used to highlight areas for detailed gradiometry. However, on sites where archaeological features have been completely ploughed out, magnetic susceptibility measurement may produce the only clear evidence of earlier activity.

Readings were recorded at 10m intervals. The data was inputted into Geoplot v.3.0 for analysis and plotting. It was despiked and processed using a median filter in order to remove 'noise' and create a smoother appearance. The results are presented as a colour scale plot (Fig. 5).

The surveys were undertaken by Peter Heykoop and David Bunn during November 2002 and September 2003.

5.0 Results (Figs.2-14)

5.1 Burgh Le Marsh Bypass (Figs. 1, 2-6, 8-11)

5.1.1 Block A: Gradiometer survey, Fields A1-A2 (Figs. 1, 2, 8)

Field 1. Survey baseline: NGR 547624 366834-547767 366751

The survey recorded zones of strong magnetic disturbance that correspond to electricity poles and tension cables (Fig.8: 1). The eastern boundary (incorporating a wire fence) produced a similar response (2). Anomaly group 3, which occurs at the western edge of the field, probably reflects modern debris, including material within and adjacent to the verge of the current A158.

The enhanced data revealed a number of extremely diffuse linear anomalies. Some align in parallel fashion and appear to indicate traces of cultivation, probably of

relatively recent origin (shown as brown). Others do not easily resolve as definitive features, but may reflect traces of cultivation or geological inconsistencies (boxed in green).

Field 2. Survey baseline: NGR 547768 366730-547778-366735

The survey recorded the strong magnetic disturbance of two electricity poles (boxed in pink), which are situated c.10m and c.100m from the western edge of the field.

A number of linear and discrete anomalies were detected in the western end of the field. An archaeological origin is possible, although their significance has not been fully established by the survey. Some possibly reflect land drains (shown as blue): the topography of the field (a slight west-facing incline) would dictate the direction of drainage towards the railway. This interpretation is offered tentatively - no open drain is visible, and it is not known whether one existed prior to the construction of the railway.

To the east of these putative buried drains, a series of linear (for the most part, parallel) anomalies may reflect cultivation scars (shown as brown).

A group of amorphous and magnetically weak anomalies were detected in the mid part of the survey (boxed in green). Nothing was recovered from the topsoil when this area was fieldwalked (Clay 2003), and these features appear to be of natural origin. Similar patterns of variation, though more extensive, were recorded in the eastern half of the survey. This was detected on higher ground, where the soil was more friable and sandy, and may indicate an interface of glacial till and sands/gravels (the original settlement of Burgh Le Marsh developed on an island of glacial sands and gravels, which often display higher magnetic susceptibility).

A fragmented and relatively strong linear feature extends across the field at the eastern end of the survey (shown as yellow). This appears to correspond with a former boundary (as depicted on 1st edition O.S. map of 1890-92).

5.1.2 Block B: Gradiometer survey, Fields B1-B10 (Figs.1, 3- 4, 9-11)

The former Roman road that linked Lincoln and the east coast bisects the route in this area, probably in field 3 and/or fields 1-2.

Field 1. Survey baseline: NGR 548453 366408-548590 366408 (Figs.3, 9)
Field 2. Survey baseline: NGR 548601 366407-548639 366395 (Figs.3, 9)

The presence of ferrous services (green line) compromised the survey in these fields. As such, potential archaeological remains, including the Roman road, have not been identified. The construction of the services would almost certainly have damaged any archaeological remains in this area.

Field 3. Survey coordinates: NGR 548663 366414/548818 366318 (Figs.3, 9)
Field 4. Survey baseline: NGR 548721 366389-548883 366326 (Figs.3, 9)

Strong magnetic variation at the western end of field 3 relates to the services referred to above. Similar, though less extreme variation was recorded along the boundary with field 4. This reflects a stranded wire stock fence (pink line). The remaining area is relatively unaffected by the strong magnetic disturbance and a number of less extreme anomalies were recorded. None appear to represent traces of the Roman road, which probably ran to the south of the survey. A discrete anomaly at the western end of field 3 may reflect an area of burning/burnt materials (circled in red). This could be a modern feature (e.g. bonfire), although the close proximity of the Roman road perhaps enhances its archaeological potential. The field is currently pasture, which predisposed any surface observation.

A series of parallel curvilinear anomalies were recorded in the eastern half of the survey. Some appear to extend into field 4 and are indicative of ridge and furrow ploughing (shown as orange). This implies that the current boundary is of relatively recent origin (?Enclosure).

In field 4, controlled fieldwalking of the area identified a moderate spread of predominately medieval pottery sherds (*ibid*). The presence of artefacts enhances the potential significance of discrete anomalies (examples circled), although the lack of visual evidence in field 3 (pasture) has handicapped this interpretation.

Field 5. Survey baseline: NGR 548888 366325-549039 366268 (Figs.3, 10)

Linear anomaly (1) appears to align with, and is probably contemporary with, the suggested ridge and furrow in field 4. It could therefore be a similar feature, or possibly a former land boundary (not shown on 1st Edition Ordnance Survey Map). In the eastern half of the field, other similarly aligned linear anomalies (possibly diffuse traces of ridge and furrow) may date from the same period.

Other linear anomalies in the area cannot be conveniently correlated with (1). One (depicted in blue) shares an alignment with the current southern boundary of the field (2). This could imply a recent origin, possibly as a land drain (another possible drain is also shown).

On the north edge of the survey, west of centre, a discrete zone of pit-like anomalies was recorded (3). However, it should also be noted that the fieldwalking survey identified few artefacts in this field, and none within the area of (3) (*ibid*).

A magnetically depleted linear anomaly was recorded close to, and parallel with, the eastern edge of the field (shown as brown). This probably indicates a very recent (buried) plough furrow. Strong variation to the east of this reflects a wire fence (shown as pink).

Field 6. Survey baseline: NGR 549041 366269-549107 366243 (Figs.3, 10)
Field 7. Survey baseline: NGR 549112 366242-549301 366168 (Figs.3, 10)

The fieldwalking survey recovered substantial quantities of predominately medieval and post medieval pottery from both fields. Some of this material possibly relates to a linear anomaly (yellow) that was detected in the eastern part of field 7 (a former track,

as depicted on the 1st edition OS Map, dated 1890-92 and reproduced on back cover of report).

An area of magnetic variation (1) (circled in red) along the northern edge of the survey corresponds with the position of another former land division (based on the 1st Edition OS Map). Diffuse linear anomaly (2) (yellow) also appears to represent the former boundary. The location of anomaly group (1) in relation to the latter may be coincidental, and an alternative origin should be considered, given the preponderance of medieval pottery in this field. Similar zones of variation were also recorded close by, and in field 6 (circled in red). Additionally, a diffuse curvilinear anomaly was detected in the mid-part of the field (3). All of these could potentially be of archaeological significance, although this cannot be resolved using magnetic data alone.

The survey recorded a series of near-parallel linear and curvilinear anomalies that extend along the western edge of the field. These could reflect traces of former cultivation, possibly ridge and furrow (they align with similar features in fields 3-5).

Modern boundary features feature as strong magnetic variation (shown pink).

Field 8. Survey baseline Area **A**: NGR 549319 366131-549365 366115 (Figs.4, 11)
Survey baseline Area **B**: NGR 549366 366114-549439 366113 (Figs.4, 11)

A number of pit-like anomalies and one curvilinear anomaly were detected in the western half of the field (A).

In Area B, the survey identified a faint group of linear anomalies (red). These display some regularity, but are extremely diffuse. They could be modern, for example land drains, although a more significant origin should not be discounted.

Field 9. Survey baseline: NGR 549459 366102-549656 366027 (Figs.4, 11)

At the time of survey, field 9 had been unevenly ploughed, which impeded progress. Most of the field was surveyed, but the eastern end was considered unsuitable for efficient and safe data gathering.

Strong magnetic variation was recorded along the western edge of the field, reflecting ferrous materials associated with the boundary.

Much of the magnetic variation was recorded in the eastern half of field 9. Dense areas of discrete anomalies could reflect pit-like features or possibly ceramic materials in the plough zone. Diffuse linear anomalies were also recorded in this area (shown as red). These could indicate buried ditches, although little surface material was recorded during the fieldwalking of this area. A public footpath extends across the field at this point (broken yellow line). This pathway is historical (See 1st Edition OS Map, reproduced on back cover of report), and may have originated along a former boundary.

Field 10. Survey baseline: NGR 549738 365997-549826 365961 (Figs.4, 11)

The survey did not detect clearly defined archaeological anomalies in field 10 (pasture). Some of the magnetic variation may be of natural origin (sample area boxed in green).

Scatters of discrete anomalies could be indicative of ceramic or ferrous materials in the plough zone. Some appear to be grouped. For example, an area of magnetic variation at the eastern end of the field resolves in linear fashion (shown yellow) and this probably reflects traces of a former boundary (See 1st Edition Map).

5.1.3 Block C: Magnetic susceptibility survey, Fields C2-C5 (Figs.1, 5, 6)

The survey identified four areas of magnetic enhancement. Two of these are situated at the northern corner of field 2 (Fig. 5: 1, 2). Their archaeological significance has not been determined by the survey, although the westerly element of the enhancement (1) could relate to a road (Common Lane), which lies to the immediate west. Due to the grass cover in this area, the presence/absence of surface remains could not be established. This field is adjacent to Common Lane and to the south of land that was known as Burgh Common (OS, 1890-92). It is feasible that field 2 is included within this area, which presumably would not have been subject to direct occupation since its foundation as common land.

A zone of enhancement (3) at the northern corner of field 4 almost certainly reflects traces of a former building, as depicted on the 1st edition OS Map (Fig.6: 4). Fieldwalking of this area identified a dense spread of medieval (and later) ceramic material in this area.

Raised susceptibility levels were recorded at the eastern end of the survey (5). This enhancement lies close to existing field boundaries and probably represent traces of an earlier continuation of one of these boundaries (OS, 1890-92).

5.2 Partney Bypass (Figs.1, 7, 12-14)

5.2.1 Field 1: Gradiometer survey, (Figs.1, 7, 12)

This block lies to the immediate west of the proposed route (Fig 7). A previous geophysical survey along the route at this point identified potentially significant magnetic anomalies, and excavation revealed that these relate to a 13th century chapel and inhumation cemetery (Babtie 2003; Mr A Scruby, Babtie Group *pers.comm.*).

A number of linear features recorded by the initial survey continue into the current area. Most appear to represent boundary features, such as ditches. Some correspond to the locations of known former land divisions (shown as yellow, and depicted on the 1st Edition OS Map, see fig. 12). It should be noted that the greyscale images have not been rectified in order to compensate for the foreshortening effect introduced by the south-facing topography of the site. As such, although linear 1 appears to lie to the south of a former boundary, in reality it probably actually reflects this feature.

For the most part, other linear anomalies in field 1 (shown as red) appear to share spatial relationships with the former boundaries. This suggests that, collectively, they could constitute elements of a more complex enclosure system, possibly related to the known chapel site. For example, linear anomaly 2, which extends across the northeast corner of the survey (and parallel to an adjacent hedge), may reflect traces of a ditch that formed part of Monk's Lane (Fig. 7: 1st Edition OS Map); the name of which may be a clue to its former use. The current boundary to the northeast of the site is the truncated northern edge of Monk's Lane.

A group of relatively strong anomalies (circled in red) are almost certainly of archaeological origin, possibly reflecting areas of burning/burnt material. These lie within 30m of the chapel site, and could therefore be associated (see also Fig.7).

A broad zone of magnetic variation, incorporating linear and curvilinear anomalies, was detected to the north of these (boxed in broken red line). The survey has not clarified the precise character of the variation, although is possible that some of it reflects building remains. Again, these features may be associated with the known monastic remains.

5.2.2 Field 2: Gradiometer survey, (Figs.1, 7, 13)

The survey is characterised by a series of linear features, most of which occur towards the northern half of the site. The northernmost examples (anomaly group 1) represent a continuation and/or overlap of anomalies that were detected during an earlier survey. The results of the latter indicated that these were elements a large prehistoric enclosure system. Subsequent excavation produced evidence of late Bronze Age and early Iron Age activities (Babtie, 2003).

Three SSE-NNW aligned parallel linear features traverse the northern half of the survey. Despite the close proximity of the prehistoric enclosure to these features, it seems likely that the latter are more recent. The northernmost (2, 3) correspond to a track (which extended between Partney Grange and Partney Cottage) and a boundary that appears on the 1st Edition OS Map. The third linear anomaly (4) occurs along a slight depression, which has been identified by excavation as a probable medieval hollow-way (Mr A Scruby, *pers. comm.*).

A variety of ditch and pit-like features occur between anomalies 3 and 4. It is not clear whether a collective relationship exists, or if they represent separate phases of activity. It is possible that the creation of the boundary and hollow-way has truncated earlier ditches. Some of the anomalies (linear and pit-like) could reflect areas of quarrying; excavation of anomaly 5 (in the mid part of the survey, where similar linear and discrete anomalies were recorded) has produced evidence of this (*ibid*).

Two linear anomalies (6, 7) at the southern end of the survey align with, and can be extrapolated to meet, existing boundaries (Fig.7).

5.2.3 Field 3: Gradiometer survey, (Figs.1, 7, 14)

The remains of a wire fence along the southern boundary produced strong magnetic variation (1).

The survey detected a number of magnetically strong discrete anomalies (circled in pink). Some of these probably represent ferrous objects, such as ploughshares and horseshoes. Others may have greater archaeological significance (e.g. 2), particularly where they occur close to or coincide with features that are of much greater extent (see below).

A substantial localised area of relatively strong magnetic variation was recorded at the northwestern edge of the survey (3). This could reflect a large expanse of burning/burnt material, or it could alternatively reflect a zone containing brick/tile deposits (possibly forming the fill of a former pond). Similar, though slightly weaker, variation occurs towards the mid-part of the site (4), and excavation of this area revealed a backfilled pond (M. Macdaid, Lindsey Archaeological Sevices, *pers. comm.*).

The survey recorded a number of relatively extensive linear anomalies (shown as red). Some of the linear anomalies appear to resolve as traces of cultivation, possibly ridge and furrow (clearest examples shown as orange). Other ditch-like anomalies (red) appear to represent former field boundaries. Trial trenching confirmed that many were ditches, with the earliest recorded examples (prehistoric) sited along the eastern side of the site (*ibid*). Excavation of linear features in the northern part of the site include ditches that date from the Roman period.

6.0 Conclusions

6.1 Burgh Le Marsh bypass.

The survey produced relatively scant evidence for significant archaeological remains along the proposed route of the Burgh Le Marsh bypass.

Due to the overriding magnetic response of an existing service, the suspected location of a Roman road (at the western end of Block B) was not established by the survey.

Magnetic variation in the central parts of Block B could relate to medieval occupation of the area. However, few anomalies clearly resolve as diagnostic features, and this interpretation is offered partially on the findings of the fieldwalking survey.

An area of raised topsoil susceptibility within Block C (Field 2) does not immediately relate to any known activity and it is possible that this enhancement may be significant.

Overall, the survey results suggest that the route has low to moderate archaeological potential.

6.2 Partney bypass.

With reference to the survey results alone, the potential for archaeological remains is high, particularly in Field 1, where an evaluation of land to the immediate east of the survey uncovered a medieval chapel and inhumation cemetery. It seems likely that

most of the unresolved variation within the current site relates in some way to these remains.

In Field 2, at least four linear anomalies appear to represent known features. Three probably indicate the positions of former field boundaries and one a path or track. A fifth was recorded along the course of a hollow-way. A number of linear anomalies at the northern end of the field correspond to features that were recorded during an earlier survey. Excavation in this area suggests that these probably represent elements of a prehistoric enclosure complex. A series of discrete anomalies appear to indicate pits or ponds, possibly created as a result of quarrying.

At the time of writing, several anomalies in Field 3 had been investigated by excavation. Among those sampled, this work exposed evidence of Roman and earlier occupation of the site. Gradiometry has identified what appears to be an extensive array of former field systems, incorporating elements of medieval ridge and furrow.

7.0 Acknowledgements

Pre-Construct Geophysics would like to thank Babtie Group and Lincolnshire County Council for this commission.

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Fig.2: Burgh Le Marsh bypass
Block A, location of gradiometer survey 1:2500
(See also Fig.8)

Fig.3: Burgh Le Marsh bypass
Block B, Fields 1-7, location of gradiometer survey 1:2500
(See also Figs.9, 10)

Fig.4: Burgh Le Marsh bypass
Block B, Fields 7-10, location of gradiometer survey 1:2500
(See also Fig. 11)

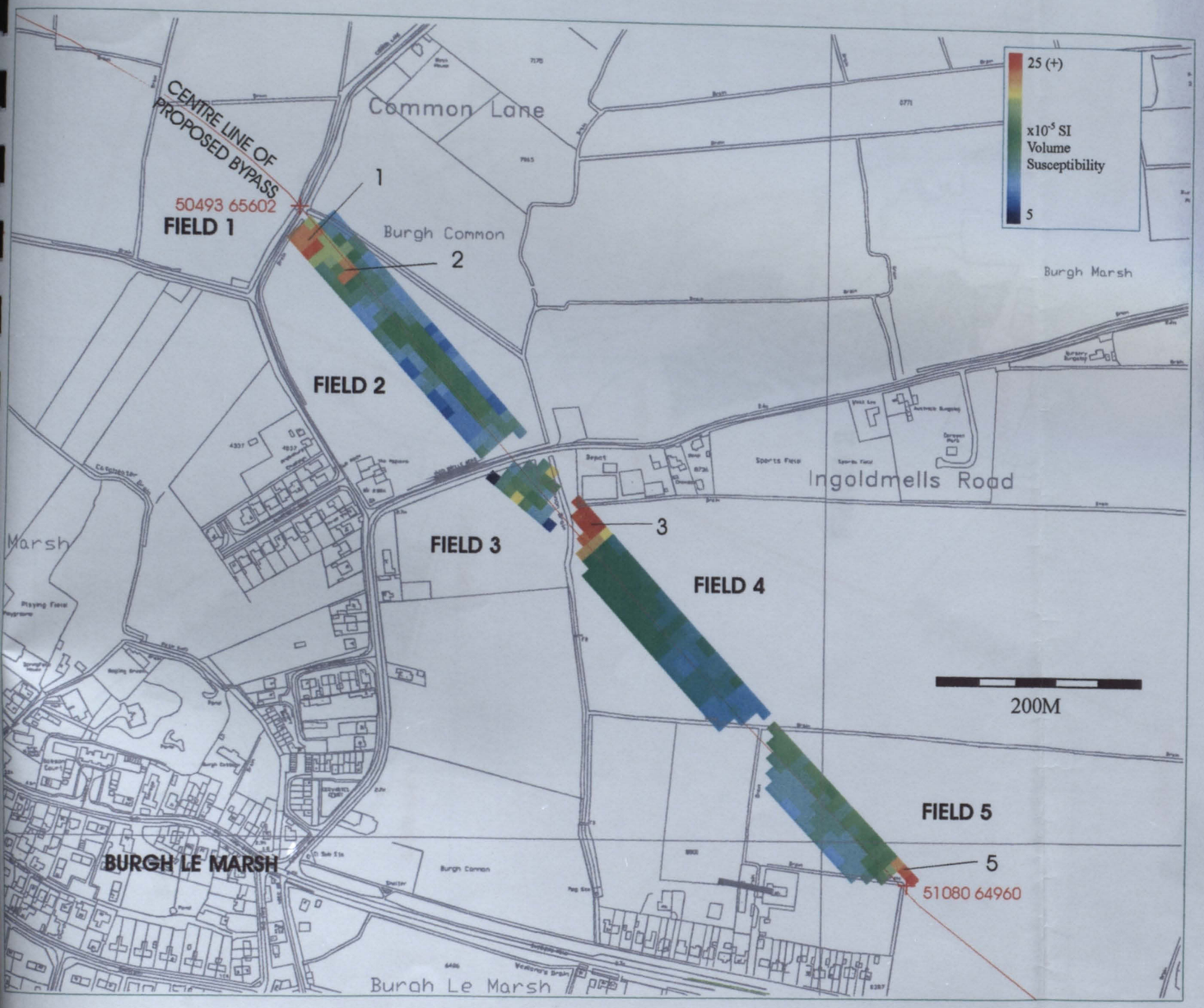
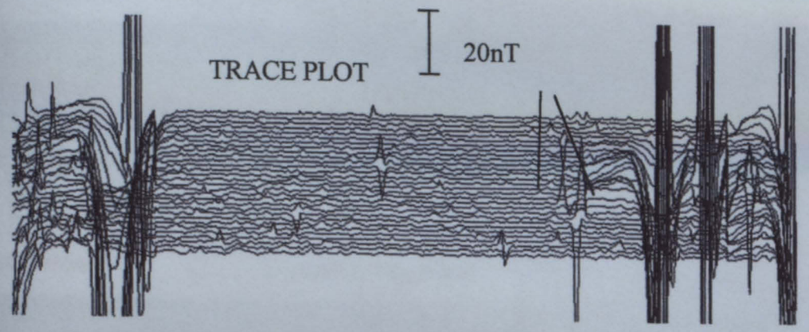
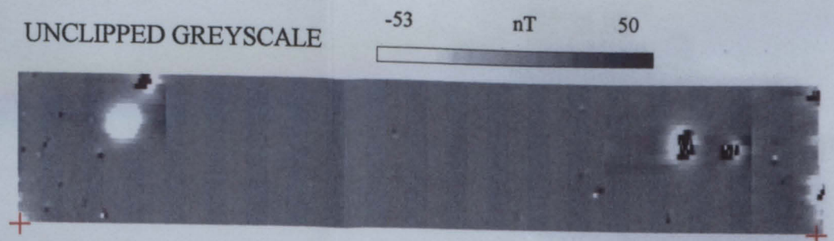


Fig.5: Burgh Le Marsh bypass
Block C, Fields 2-5, location of magnetic susceptibility survey 1:5000

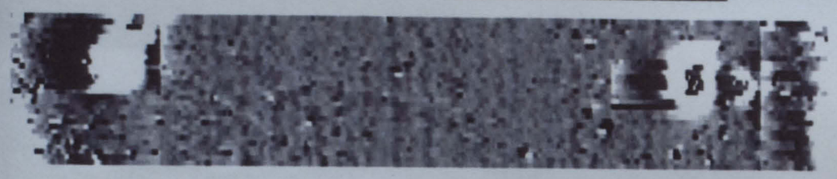
Fig. 6: First Edition Ordnance Survey Map dated 1890-92 1:10000

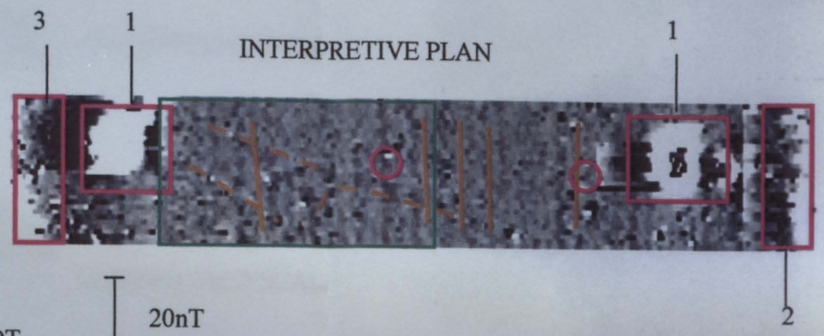
Fig.7: Partney bypass, location of gradiometer surveys 1:2500
(See also Figs. 12, 13, 14)

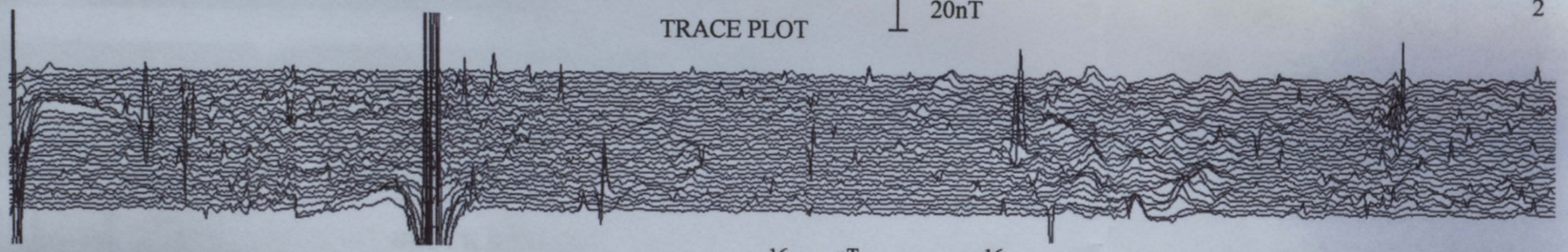


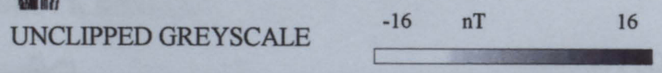


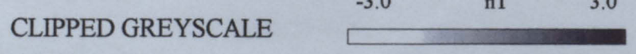
BLOCK A FIELD 1

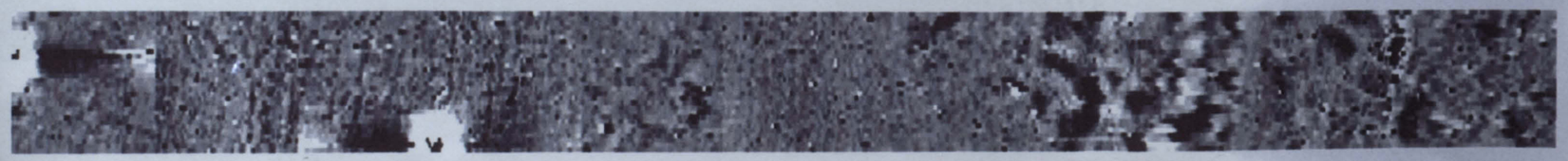


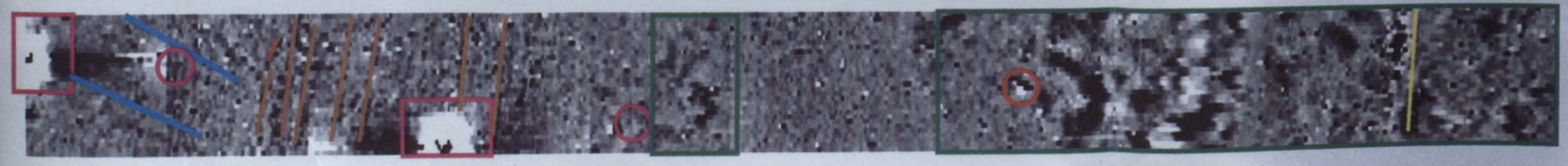












BLOCK A FIELD 2

KEY

- ?NATURAL
- ?LAND DRAIN
- SERVICE
- WIRE FENCE
- FORMER FIELD BOUNDARY
- ?MODERN CULTIVATION MARKS
- ?RIDGE AND FURROW
- ZONE OF MODERN DISTURBANCE
- FERROUS (EG PLOUGH SHARE)
- DITCH-LIKE
- ?PIT-LIKE/BURNING (DISCRETE EXAMPLES)
- GENERAL AREA OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE

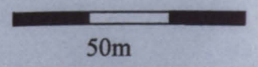
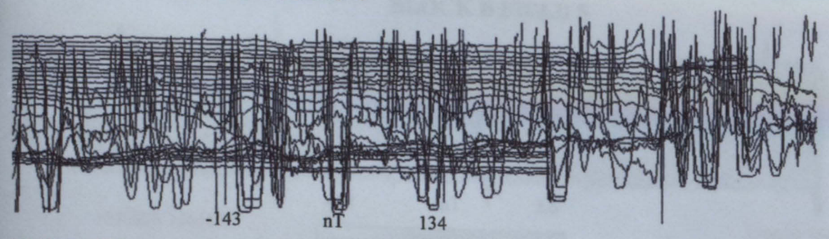


Fig. 8: Block A, Fields 1-2 1:1250
(See Also Fig. 2)

BLOCK B FIELD 1



TRACE PLOT

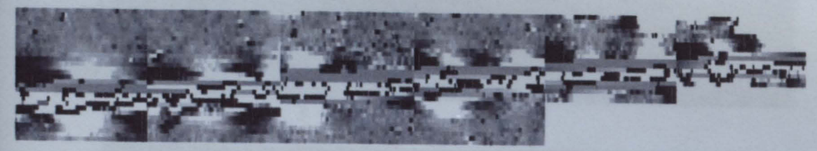
47nT

548453 366408

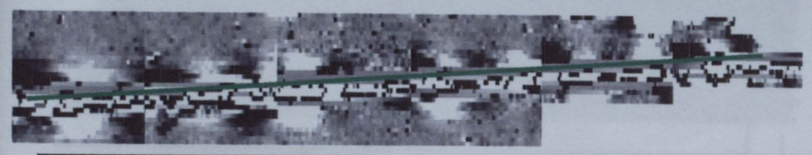
548590 366408

UNCLIPPED GREYSCALE

-3.0 nT 3.0

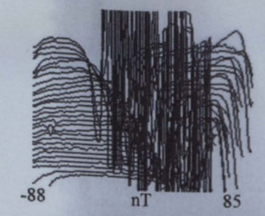


CLIPPED GREYSCALE



INTERPRETIVE PLAN

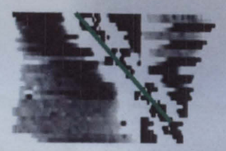
BLOCK B FIELD 2



50nT

548601 366407

548639 366395

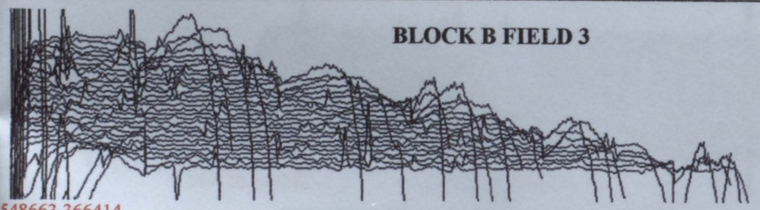


N

KEY

- ?NATURAL
- ?LAND DRAIN
- SERVICE
- WIRE FENCE
- FORMER FIELD BOUNDARY
- ?MODERN CULTIVATION MARKS
- ?RIDGE AND FURROW
- ZONE OF MODERN DISTURBANCE
- FERROUS (EG PLOUGH SHARE)
- DITCH-LIKE
- ?PIT-LIKE/BURNING (DISCRETE EXAMPLES)
- GENERAL AREA OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE

BLOCK B FIELD 3



TRACE PLOT

15nT

548663 366414

-39 nT 37

548818 366318

UNCLIPPED GREYSCALE

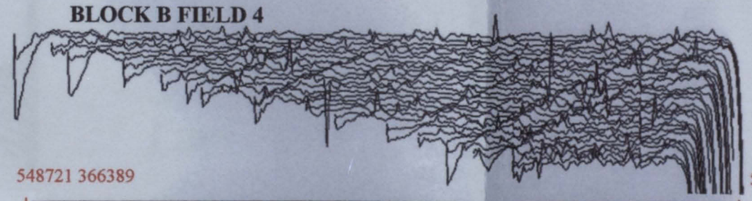
CLIPPED GREYSCALE

-3.0 nT 3.0

INTERPRETIVE PLAN

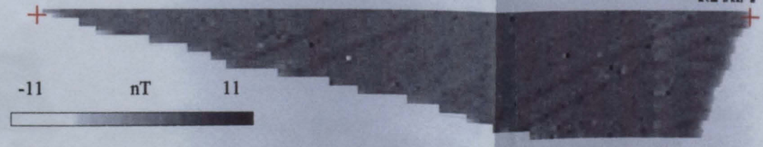
1

BLOCK B FIELD 4

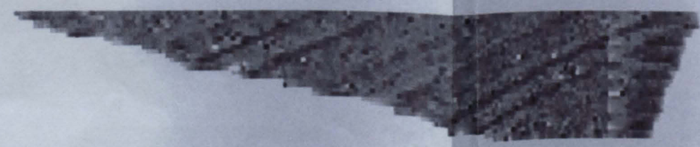


548721 366389

548883 366326

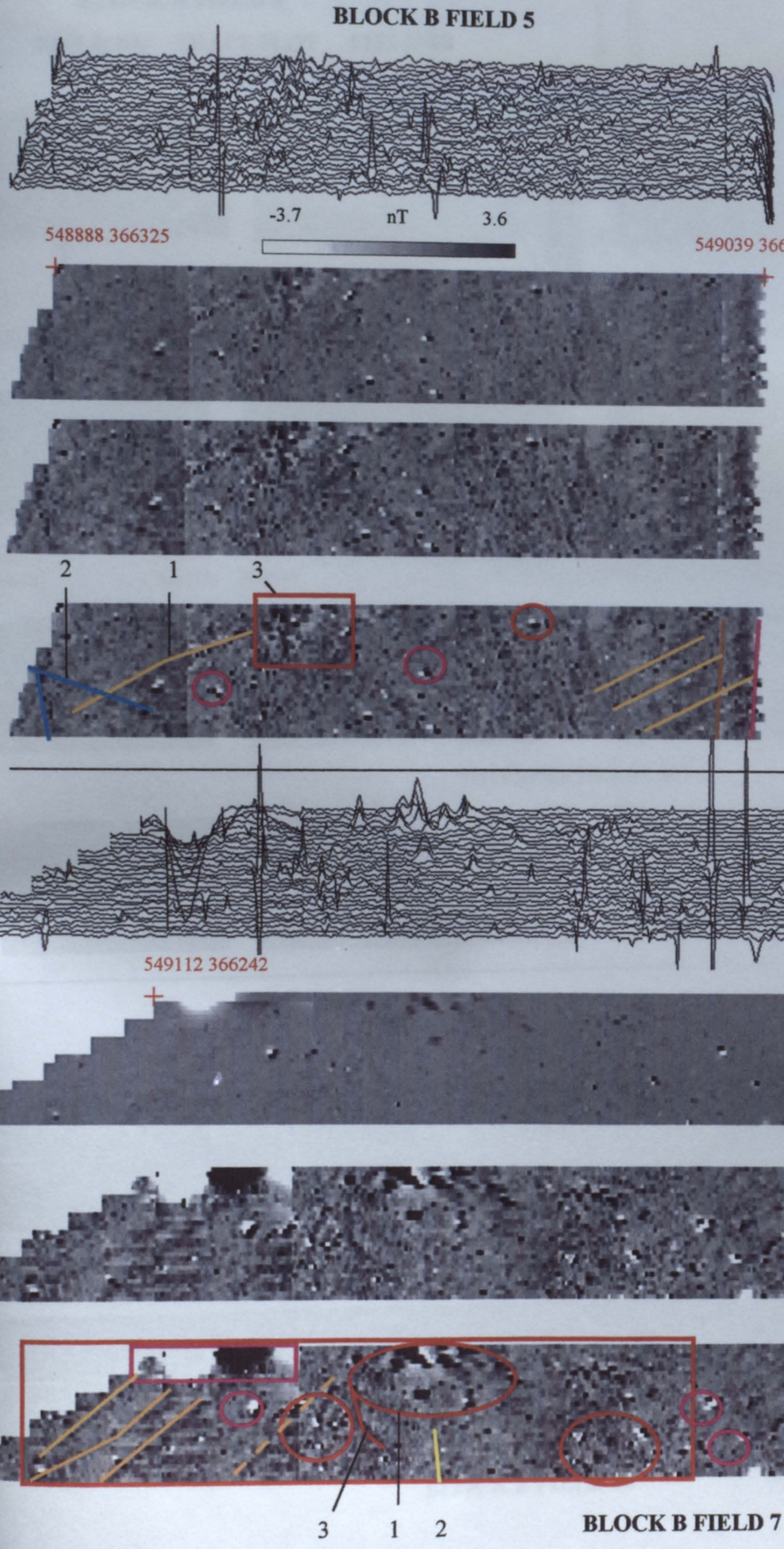


-11 nT 11



50m

Fig. 9: Block B, Fields 1-4 1:1250
(See Also Fig. 3)



TRACE PLOT

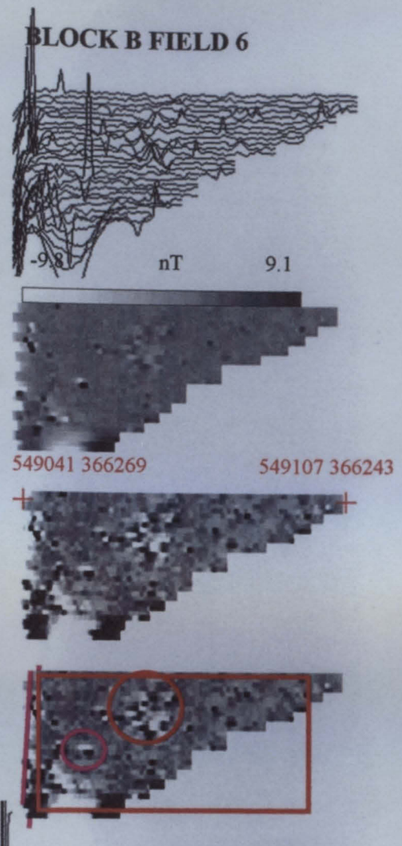
10nT

UNCLIPPED GREYSCALE

CLIPPED GREYSCALE

-3.0 nT 3.0

INTERPRETIVE PLAN



TRACE PLOT

18nT

UNCLIPPED GREYSCALE

-18 nT 18

CLIPPED GREYSCALE

-3.0 nT 3.0

INTERPRETIVE PLAN

KEY

- ?NATURAL
- ?LAND DRAIN
- SERVICE
- WIRE FENCE
- FORMER FIELD BOUNDARY
- ?MODERN CULTIVATION MARKS
- ?RIDGE AND FURROW
- ZONE OF MODERN DISTURBANCE
- FERROUS (EG PLOUGH SHARE)
- DITCH-LIKE
- ?PIT-LIKE/BURNING (DISCRETE EXAMPLES)
- GENERAL AREA OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE

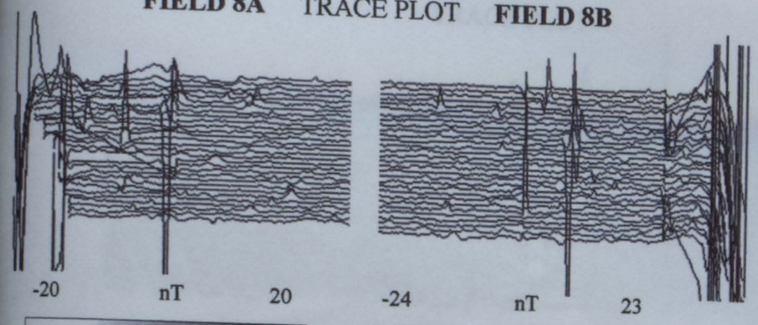
N

50m

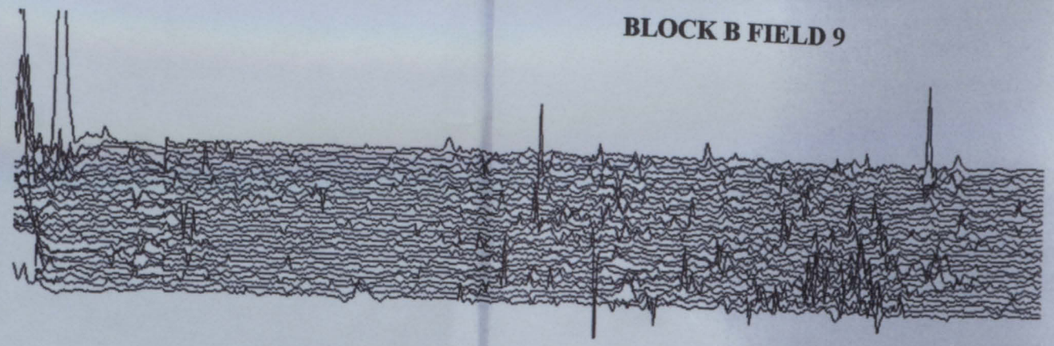
Fig. 10: Block B, Fields 5-7 1:1250
(See Also Fig. 3)

BLOCK B FIELD 8

FIELD 8A TRACE PLOT FIELD 8B



BLOCK B FIELD 9

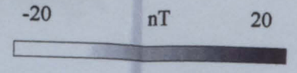


13nT

KEY

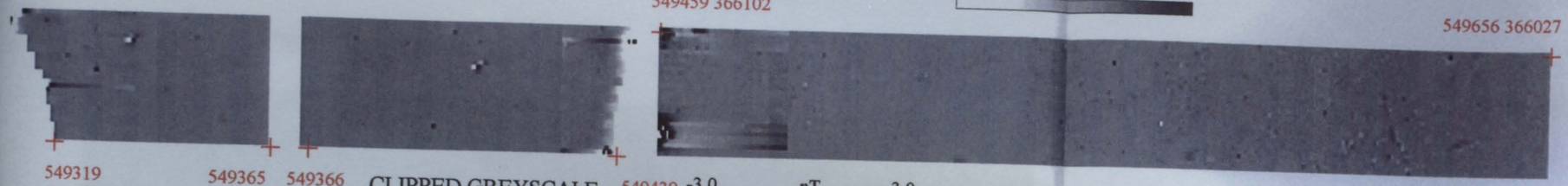
- ?NATURAL
- ?LAND DRAIN
- SERVICE
- WIRE FENCE
- FORMER FIELD BOUNDARY
- ?MODERN CULTIVATION MARKS
- ?RIDGE AND FURROW
- ZONE OF MODERN DISTURBANCE
- FERROUS (EG PLOUGH SHARE)
- DITCH-LIKE
- ?PIT-LIKE/BURNING (DISCRETE EXAMPLES)
- GENERAL AREA OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE

UNCLIPPED GREYSCALE



549459 366102

549656 366027



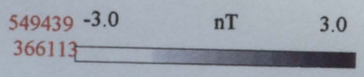
549319 366131

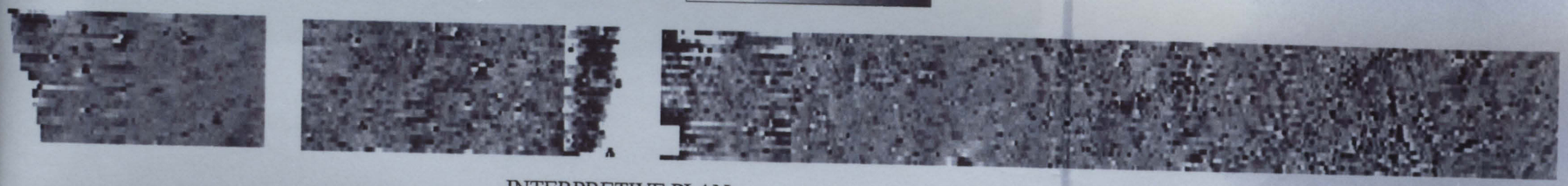
549365 366115

549366 366114

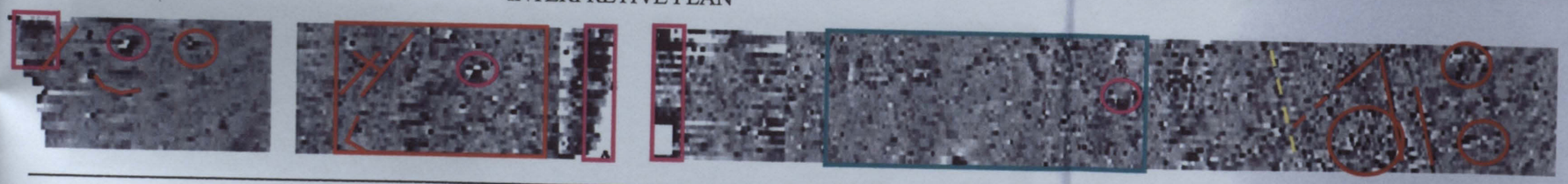
CLIPPED GREYSCALE

549439 366113





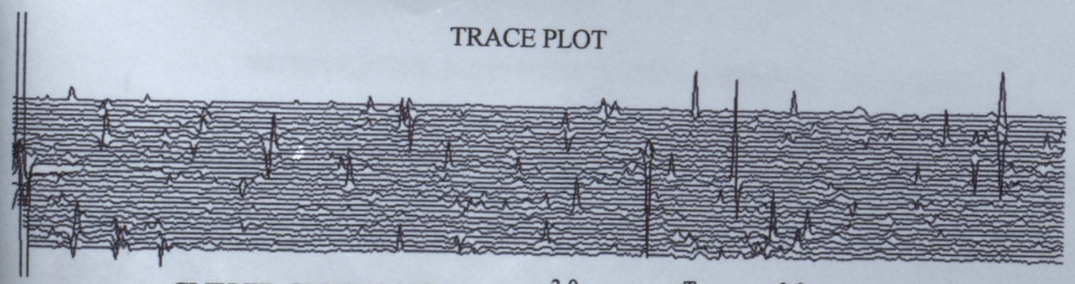
INTERPRETIVE PLAN



50m

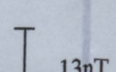
N

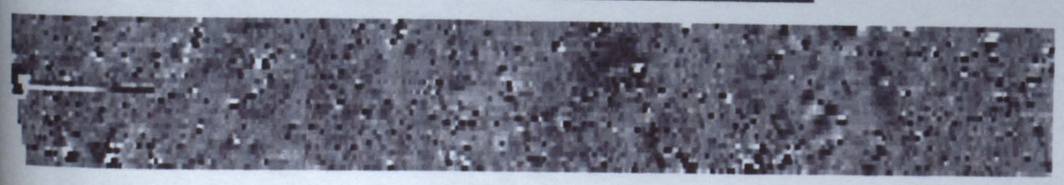
TRACE PLOT



13nT

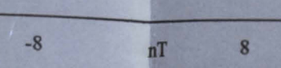
CLIPPED GREYSCALE





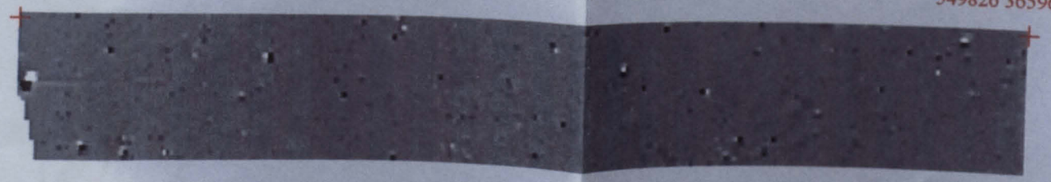
N

UNCLIPPED GREYSCALE

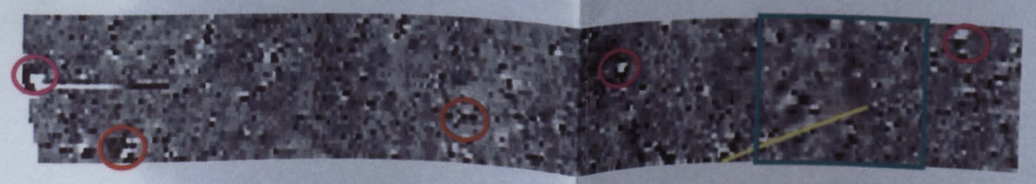


549738 365997

549826 365961



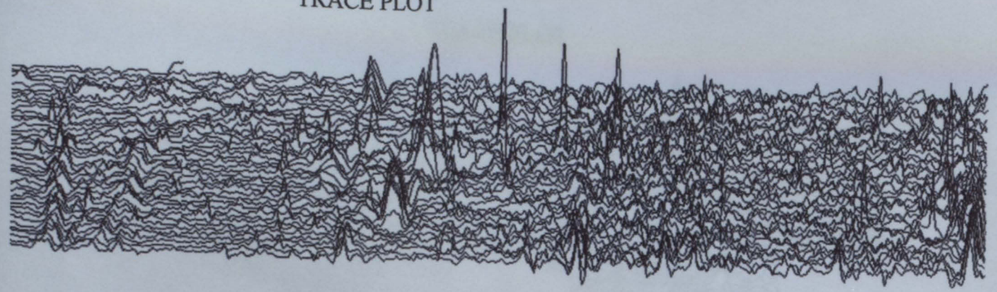
INTERPRETIVE PLAN



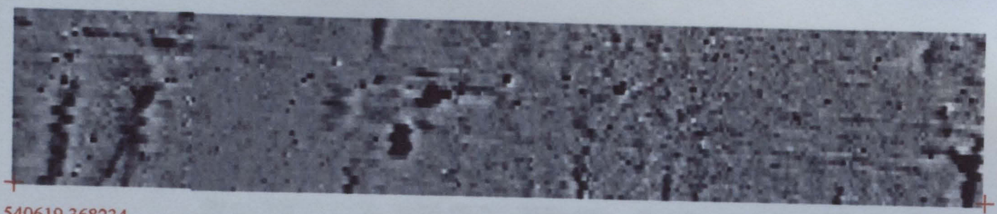
BLOCK B FIELD 10

Fig. 11: Block B, Fields 8-10 1:1250
(See Also Fig. 4)

TRACE PLOT



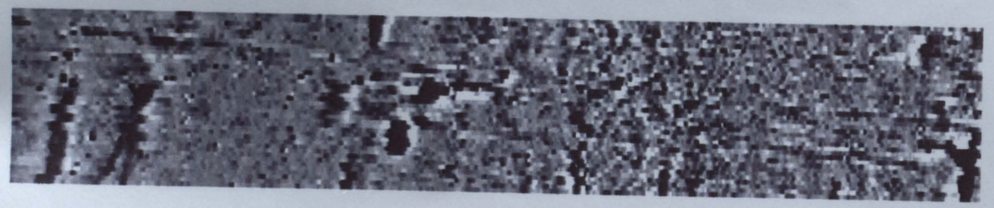
UNCLIPPED GREYSCALE -6 nT 6



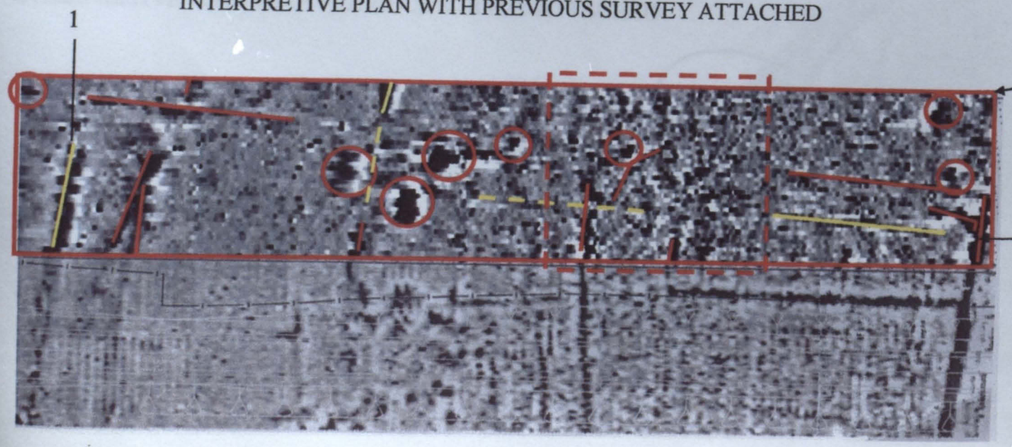
540619 368234

540696 368440

CLIPPED GREYSCALE -3.0 nT 3.0



INTERPRETIVE PLAN WITH PREVIOUS SURVEY ATTACHED



30nT

N

50m

10nT

?NATURAL)

?LAND DRAIN

SERVICE

WIRE FENCE

FORMER FIELD BOUNDARY

?MODERN CULTIVATION MARKS

?RIDGE AND FURROW

ZONE OF MODERN DISTURBANCE

FERROUS (EG PLOUGH SHARE)

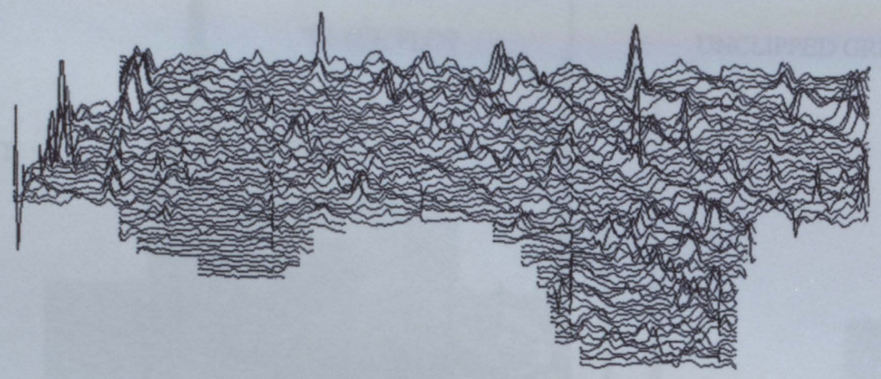
DITCH-LIKE

?PIT-LIKE/BURNING (DISCRETE EXAMPLES)

GENERAL AREA OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE

Fig. 12: Partney, Field 1 1:1250
(See Also Fig. 7)

TRACE PLOT



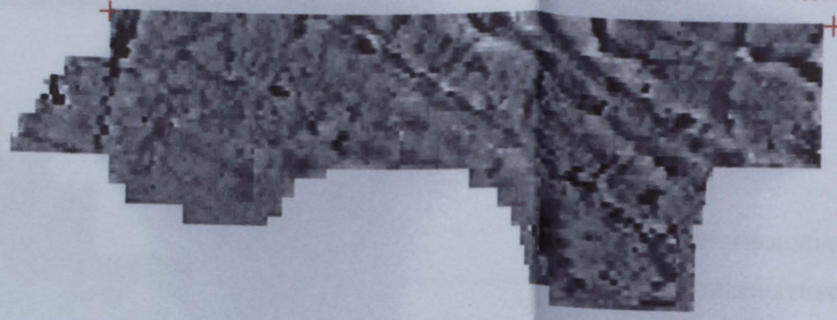
30nT

UNCLIPPED GREYSCALE

-10 nT 10

540916 368546

540874 368699

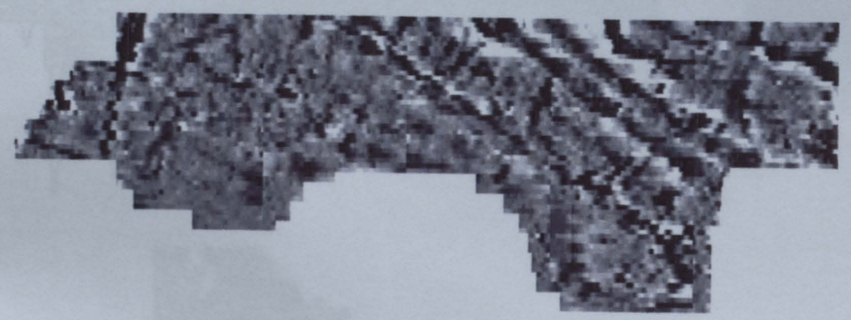


N

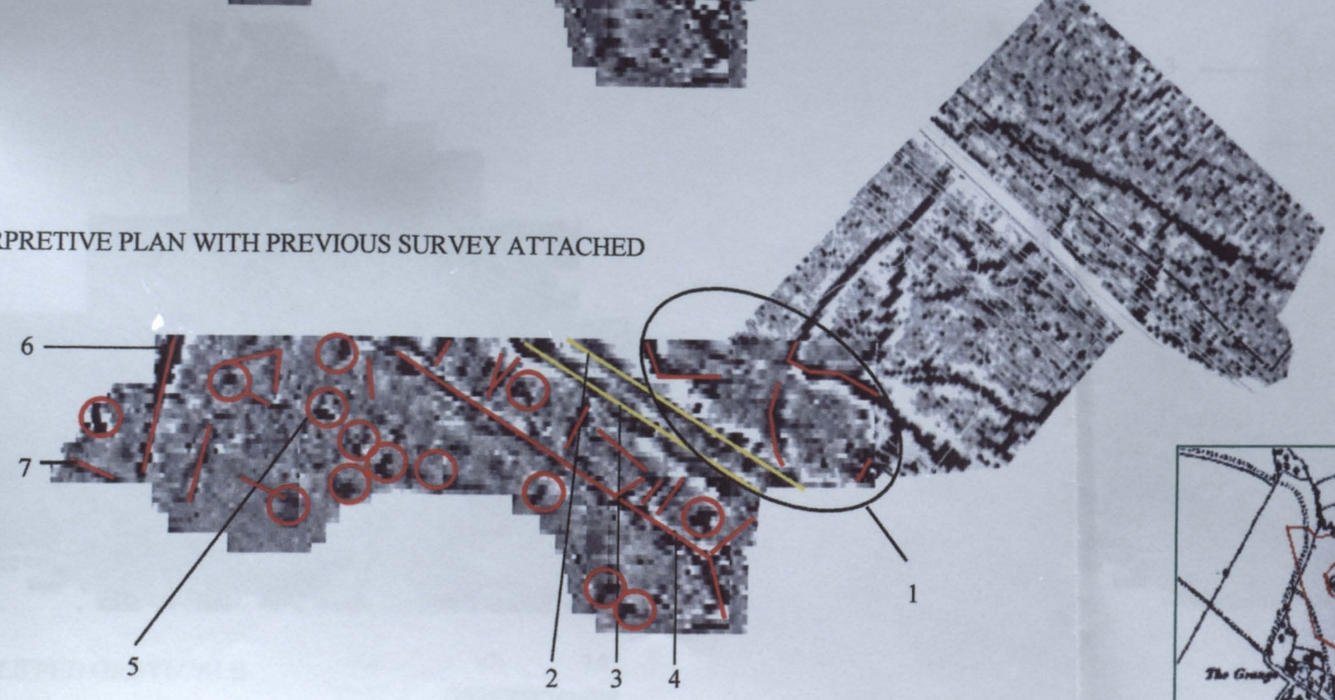
50m

-3.0 nT 3.0

CLIPPED GREYSCALE



INTERPRETIVE PLAN WITH PREVIOUS SURVEY ATTACHED



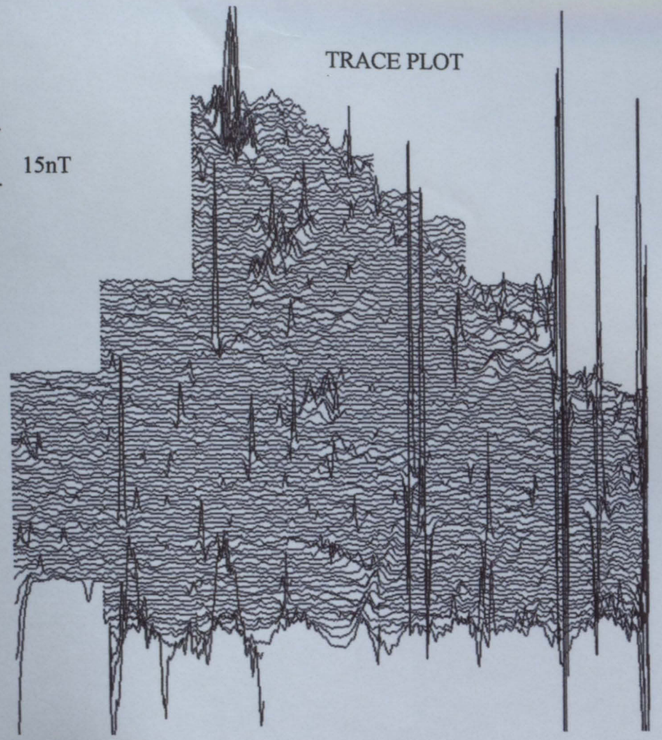
KEY

- ?NATURAL
- ?LAND DRAIN
- SERVICE
- WIRE FENCE
- KNOWN FORMER FIELD BOUNDARY/TRACK
- ?MODERN CULTIVATION MARKS
- ?RIDGE AND FURROW
- ZONE OF MODERN DISTURBANCE
- FERROUS (EG PLOUGH SHARE)
- DITCH-LIKE
- ?PIT-LIKE/BURNING (DISCRETE EXAMPLES)
- GENERAL AREA OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE

Fig. 13: Partney, Field 2 1:1250
(See Also Fig. 7)

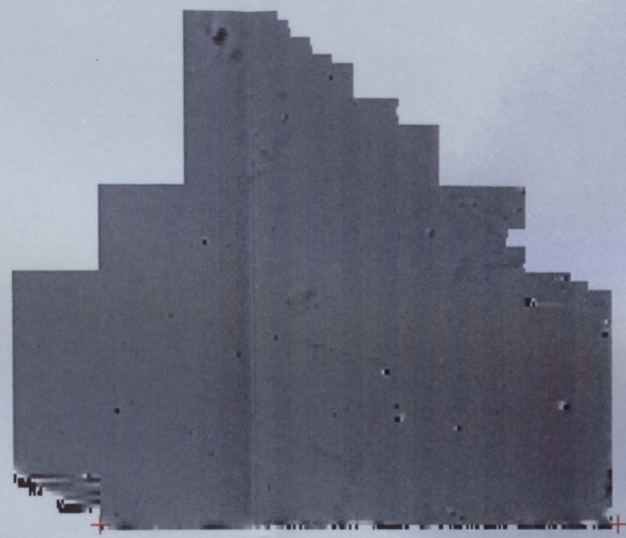
TRACE PLOT

15nT



UNCLIPPED GREYSCALE

-48 nT 48

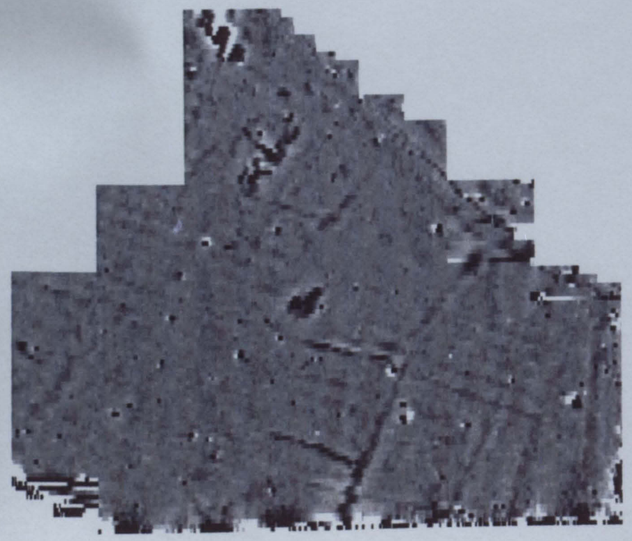


540688 368836

540804 368613

KEY

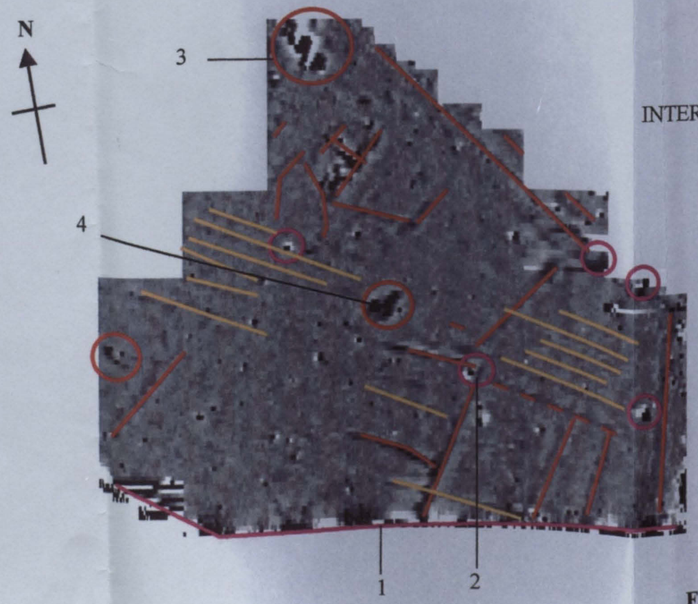
- ?NATURAL
- ?LAND DRAIN
- SERVICE
- WIRE FENCE
- FORMER FIELD BOUNDARY
- ?MODERN CULTIVATION MARKS
- ?RIDGE AND FURROW
- ZONE OF MODERN DISTURBANCE
- FERROUS (EG PLOUGH SHARE)
- DITCH-LIKE
- ?PIT-LIKE/BURNING (DISCRETE EXAMPLES)
- GENERAL AREA OF POTENTIAL ARCHAEOLOGICAL SIGNIFICANCE



CLIPPED GREYSCALE

-3.0 nT 3.0

N



INTERPRETIVE PLAN

50m

Fig. 14: Partney, Field 3 1:1250
(See Also Fig. 7)