ASUD 874

Traprain Law Environs Project, East Lothian, Scotland

Phase 1: geophysical survey interim report

by
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ASUD Report 874
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1. Summary

The project

1.1 This report presents the preliminary results of an exploratory programme of geophysical surveying in the East Lothian coastal plain, comprising Phase 1 of the Traprain Law Environs Project. The project is directed by Professor Colin Haselgrove (Department of Archaeology, University of Durham) and Professor Leon Fitts (Dickinson College, Pennsylvania, USA) and has involved field investigations by Archaeological Services, University of Durham (ASUD). The overarching aim of the project is to investigate aspects of the archaeological landscape around Traprain Law in order to permit the analysis of economy and society during the 1st millennia BC and AD.

1.2 Geophysical surveys have so far been undertaken over a sample of 30 cropmark sites around Traprain Law, East Lothian. The sample of sites includes multi-vallate, rectilinear and curvilinear enclosures, as well as two ring-ditches and a possible building cropmark.

Results

1.3 The results of the first 11 surveys have been partially described in Hale *et al*. (2001) and ASUD (2001). In the majority of cases (23 out of 30), the surveys have confirmed the presence of the enclosures shown on aerial photographs, often with very clear results, many with internal and/or external features and some with evidence for more than one phase of activity. A comprehensive report incorporating interpretative plans and air photographic evidence will be produced in due course.

2. Project background

Location (Figure 1)

2.1 The study area comprises a sample of landscape measuring 15km east-west and 10km north-south, approximately centred on Traprain Law in East Lothian, Scotland (Ordnance Survey 1:10,000 map tiles NT 57 NW/SW/NE/SE and 67 NW/SW). This area was selected following analysis of the aerial photographic (AP) cropmark evidence held at the National Monuments Record of Scotland (NMRS).

Objectives

2.2 Since excavation of enclosed Iron Age sites elsewhere in southern Scotland has shown that this type of site often had earlier or later unenclosed phases of occupation, or formed part of more extensive complexes that do not show as cropmarks, it was felt appropriate to begin this project with an exploratory programme of surface survey designed to establish whether this is also true of sites in the area immediately around Traprain Law (Phase 1). The aim of the initial phase of work was therefore to determine the nature, extent and potential degree of preservation of a representative sample of cropmark sites by means of geophysical survey. 30 sites were selected for survey, based broadly upon the density of site distribution and the proportions in which different site types appear in the AP record. This sample comprised 2 multi-vallate, 12 rectilinear and 13 curvilinear enclosures, as well as 2 ring-ditches and 1 possible building cropmark. The results of the first 11 surveys were described in interim reports issued when the outbreak of Foot and Mouth Disease in February 2001 caused the survey programme to be suspended for 8 months (ASUD 2001; Hale *et al*. 2001).

2.3 The overarching aim of the Traprain Law Environs Project is to investigate aspects of the archaeological landscape around the fortified hilltop site of Traprain Law in order to permit the analysis of economy and society during the 1st millennia BC and AD.

Standards

2.4 The surveys have been undertaken in accordance with English Heritage (1995) Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation*; the Institute of Field Archaeologists (1991) Technical Paper No.9, *The use of geophysical techniques in archaeological evaluations*; and the Archaeology Data Service (2001) *Geophysical Data in Archaeology: A Guide to Good Practice*.

Dates

2.5 The fieldwork was undertaken in two stages (before and after the 2001 Foot and Mouth Disease outbreak): August to November 2000 and October 2001 to January 2002. This report was prepared between January and March 2002.

Personnel

2.6 All personnel involved with the surveys are employed by Archaeological Services, University of Durham (ASUD). The fieldwork was conducted by Jamie Armstrong, Paul Dungey, David Graham, Duncan Hale, Andy Platell, Alan Rae, Daniel Still and Barry Taylor. This report was prepared by Duncan Hale and Colin Haselgrove, with illustrations by Linda Bosveld and David Graham. The ASUD Project Manager was Duncan Hale.

2.7 The project is directed by Professor Colin Haselgrove (Department of Archaeology, University of Durham) and Professor Leon Fitts (Dickinson College, Pennsylvania, USA).

Acknowledgements

2.8 The project team would like to thank all the landowners and farmers who have kindly allowed access to their fields; staff at Historic Scotland, in particular Ms Olwyn Owen (Inspector of Ancient Monuments, East Lothian) and Mr Patrick Ashmore; and staff of the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) and the National Monuments Record of Scotland (NMRS), Edinburgh.

2.9 The work was financed by generous grants from Historic Scotland, the Special Research Projects Fund of the University of Durham, and Dickinson College, Pennsylvania.

Archive

2.10 The paper and digital archives are currently held at Archaeological Services, University of Durham. It is anticipated that the data archive will be transferred to the Archaeology Data Service in due course and copies of each of the surveys will be deposited in the NMRS.

3. Archaeological and historical background

3.1 The fortified hilltop site at Traprain Law, which dominates the East Lothian coastal plain, comprises one of the best known and most complex archaeological sites in Scotland, though it is currently little understood. Excavations in 1914-1923 demonstrated that the site was in use from the Neolithic period to the Roman Iron Age, during which time Traprain Law was clearly a major political and religious focal point for the region and probably the capital of the *Votadini*. Although a two-year programme of archaeological investigation on the summit of the Law has recently finished (see Armit *et al*. 1999; 2000), the Traprain Law Environs Project is the first to investigate the dates and functions of some of the many neighbouring cropmark sites.

3.2 Since the 1950s, aerial survey by various bodies including the RCAHMS has revealed that Traprain Law lies in a densely settled landscape: 98 cropmark enclosures are recorded in the vicinity, as well as a cursus, ring-ditches, pit alignments and over 100 sites of less certain character. The enclosures include curvilinear and more unusually rectilinear form, some of which have multiple

ditches, of types normally dated to the Iron Age. None of these sites has however yet been excavated, to ascertain their date, character or potential relationship to Traprain. From work on similar sites elsewhere, it is considered likely that the enclosed sites around Traprain differed from each other in their function and status, and had varying patterns of occupation.

3.3 With the exception of Sled Hill (NMRS no. NT 57 SE 103), each of the surveys was undertaken over a Scheduled Ancient Monument (SAM) and consequently each was undertaken with Scheduled Monument Consent, granted by the Scottish Ministers under Section 42 of the Ancient Monuments and Archaeological Areas Act 1979.

4. The sites - landuse, topography and geology

4.1 Phase 1 of the project has comprised the geophysical survey of 30 cropmark sites near Traprain Law, totalling *c.*36ha (2001/02 surveys are shown in bold):

SAM no.	NMRS no.	Site name	Site type	NGR	Survey size (ha)
3310	NT 57 SW 031	Begbie	Multi-vallate	5001 7079	3.08
4169	NT 57 NE 017	East Linton	Multi-vallate	5851 7655	2.40
4070	NT 67 NW 019	Knowes	Rectilinear	6140 7755	2.56
5927R	NT 57 SW 046	Stevenson Mains	Rectilinear	5465 7385	0.36
5928	NT 57 SE 016	East Bearford	Rectilinear	5545 7410	1.16
5961	NT 57 NE 016	Overhailes	Rectilinear	5651 7597	1.68
5963	NT 57 SE 037	Cairndinnis 1	Rectilinear	568 742	0.96
5965	NT 57 SE 079	Standingstone	Rectilinear	5788 7402	1.40
5995	NT 57 SE 018	West Mains	Rectilinear	5763 7194	1.00
6022	NT 57 SW 095	West Bearford	Rectilinear	5448 7346	0.72
6024	NT 57 SE 041	Tanderlane	Rectilinear	5775 7091	2.76
6025	NT 57 SE 039	Garvald 1	Rectilinear	5825 7060	1.56
6394	NT 57 SW 077	Haddington	Rectilinear	5006 7358	0.80
8776	NT 57 SE 104	Nunraw Barns	Rectilinear	5888 7021	0.48
4108	NT 67 NW 020	Hedderwick	Curvilinear	6322 7752	1.36
5823	NT 57 NW 030	Sixpence Strip	Curvilinear	5030 7835	1.44
5862	NT 57 NW 041	Foster Law	Curvilinear	5066 7855	2.40
5865	NT 57 NW 035	Kilduff	Curvilinear	5236 7760	1.20
5866	NT 57 NW 038	Newmains	Curvilinear	5157 7870	1.00
5927C	NT 57 SW 047	Stevenson Mains	Curvilinear	5459 7375	0.48
5940	NT 57 SE 050	Northrig	Curvilinear	553 730	0.96
5941	NT 57 SE 091	Coldale 1	Curvilinear	5571 7344	0.88
5942	NT 57 SE 056	Coldale 2	Curvilinear	561 735	0.76
6021	NT 57 SW 050	Mitchell Hall 1	Curvilinear	5308 7262	0.48
6023	NT 57 SE 027	Chesters Quarry	Curvilinear	5714 7108	0.80
6050	NT 57 SE 045	Standingstone	Curvilinear	5659 7325	0.60
6067	NT 67 SW 015	Whittinghame Castle	Curvilinear	6004 7300	0.84
5868	NT 67 NW 018	Preston Mains	Ring-ditch	603 783	0.60
5874	NT 67 NW 016	Tyninghame 1	Ring-ditch	6060 7992	0.80
-	NT 57 SE 103	Sled Hill	Building	5770 7005	0.36

SAM 3310 Begbie

4.2 The site occupies a relatively level terrace at an elevation of *c.*60m AOD, *c.*2.5km south of Haddington. The land slopes away gently to the north and Westfield Farm. At the time of survey the field contained a young cereal crop.

SAM 4169 East Linton

4.3 The site occupies a relatively level spur of land at an elevation of 65-70m AOD, *c.*1km south-west of East Linton village. Immediately to the south of the site is a narrow gorge containing the River Tyne. Immediately north of the site the ground falls away less steeply to the present A1(T) road. At the time of survey the field contained cereal stubble.

SAM 4070 Knowes

4.4 The site occupies a level terrace of land immediately north of the existing A1(T), *c.*2km due east of East Linton, at an elevation of *c.*20m AOD. At the time of survey the field contained a young cereal crop.

SAM 5927 (R and C) Stevenson Mains

4.5 The extent of this scheduled area encompasses two cropmark enclosures, one rectilinear and one curvilinear, which, for the purposes of this report, are referred to as SAM 5927 R and SAM 5927 C respectively. Both sites occupy predominantly level ground at *c.*60m AOD, *c.*2km due east of Haddington. In each case the enclosure is located on a terrace with the land falling away gently to the north. SAM 5927 R comprised cereal stubble while 5927 C comprised recently ploughed-in oilseed rape stubble.

SAM 5928 East Bearford

4.6 This site occupies the top of a terrace at *c.*55m AOD, 100m east of Bearford Burn, 500m south-south-west of East Bearford farm and 2km west of Traprain Law. At the time of survey the field carried a young cereal crop.

SAM 5961 Overhailes

4.7 This area occupies a south-east-facing slope above the River Tyne, 2.5km south-west of East Linton, at *c.*65m AOD. At the time of survey the field carried a young cereal crop.

SAM 5963 Cairndinnis 1

4.8 This site occupies a north-west-facing slope, *c.*1km south-west of Traprain Law, at *c.*80m AOD. At the time of survey the field carried a young cereal crop.

SAM 5965 Standingstone

4.9 This site occupies a south-east-facing slope, *c.*0.5km south of Traprain Law, at *c.*95m AOD. At the time of survey the field carried a young cereal crop.

SAM 5995 West Mains

4.10 This site lies on the lower north-eastern facing slope of Whitelaw Hill, at 145-150m AOD, *c.*6km east-south-east of Haddington. At the time of survey the field had just been ploughed.

SAM 6022 West Bearford

4.11 This area lies *c.*300m south of SAM 5927, 2km east of Haddington. The site occupies a level terrace at a height of *c.*70m AOD, with the land again falling away gently to the north. The ground conditions comprised recently ploughed-in oilseed rape stubble.

SAM 6024 Tanderlane

4.12 This area lies *c.*300m south-west of Tanderlane between the B6370 road and Ninewells Burn. The site occupies a terrace above a gentle north-facing slope at a height of *c.*145m AOD. At the time of survey the field carried a young cereal crop.

SAM 6025 Garvald 1

4.13 This site lies *c.*500m south-west of Garvald village and *c.*500m south-east of SAM 6024, Tanderlane. The site occupies the north-eastern shoulder of Sled Hill at a height of *c.*165-170m AOD. The ground conditions comprised a young cereal crop.

SAM 6394 Haddington

4.14 This area occupies a gentle south-east-facing slope, 40m west of St Laurence House Burn, on the south-western outskirts of Haddington. The mean elevation of the site is *c.*60m AOD. At the time of survey the field carried a young cereal crop.

SAM 8776 Nunraw Barns

4.15 This site lies some 600m south of Garvald village, occupying a terrace at *c.*185m AOD. At the time of survey the land was used for cutting silage.

SAM 4108 Hedderwick

4.16 This area occupies a very gentle north-facing slope *c.*4km due east of East Linton village, with the existing A1(T) along the north of the field and the railway along the southern edge. The mean elevation of the field is *c.*20m AOD. At the time of survey the field carried cereal stubble.

SAM 5823 Sixpence Strip

4.17 This site occupies a very slight west-facing slope at *c.*50m AOD, *c.*4km north of Haddington and 400m west of the multi-vallate earthwork enclosure known as 'The Chesters' (which is in HS guardianship). At the time of survey the field carried cereal stubble.

SAM 5862 Foster Law

4.18 This site occupies a small hill at *c.*65m AOD, *c.*4km north of Haddington. 'The Chesters' lies 200m to the south and Sixpence Strip (SAM 5823) lies

400m to the south-west. Part of the hilltop was removed by small-scale quarrying during the 1970s; this is now part-filled by building rubble and other debris. At the time of survey the field carried a silage crop.

SAM 5865 Kilduff

4.19 This site occupies a spur of land with commanding views on the eastern side of Kilduff Hill at *c.*90m AOD, *c.*3km north of Haddington. At the time of survey the field carried cereal stubble.

SAM 5866 Newmains

4.20 This site lies at *c.*45m AOD on a slight rise within a field of undulating topography, immediately west of Newmains and 800m north-east of 'The Chesters'. At the time of survey the field carried cereal stubble.

SAM 5940 Northrig

4.21 This site lies at *c.*70m AOD on a spur of land between Bearford Burn and Morham Burn, *c.*4km east of Haddington. SAMs 5941 and 5942 lie just to the north-east of this site. At the time of survey the field had just been ploughed.

SAM 5941 Coldale 1

4.22 This site lies at 65-70m AOD on a slight north-west-facing slope, opposite a minor road junction south-east of Coldale, *c.*4km east of Haddington. SAMs 5940 and 5942 lie just to the south-west and north-east of this site. At the time of survey the field had just been ploughed.

SAM 5942 Coldale 2

4.23 This site lies at 75-80m AOD on a north-west-facing slope, in the same field as SAM 5941, *c.*4km east of Haddington. The survey was undertaken immediately west of an existing pond. At the time of survey this part of the field was in set-aside.

SAM 6021 Mitchell Hall 1

4.24 The site occupies relatively level ground at *c.*80m AOD, 1.5km south-east of Haddington. At the time of survey the field contained cereal stubble.

SAM 6023 Chesters Quarry

4.25 This area lies *c.*1.5km west of Garvald village, on level ground at *c.*145m AOD, to the south of Ninewells Burn. The land was set-aside at the time of survey.

SAM 6050 Standingstone

4.26 This area occupies a gentle west-facing slope at *c.*110m AOD, 2km south-west of Traprain Law. The land was set-aside at the time of survey.

SAM 6067 Whittinghame Castle

4.27 The site occupies land at *c.*115m AOD, immediately north of a steep-sided ravine housing Whittinghame Water, 200m south-west of Whittinghame Tower and 2.5km south-east of Traprain Law. The survey area covered three

different types of landuse: cereal, set-aside and a former seed orchard, now pasture.

SAM 5868 Preston Mains

4.28 This area occupies a very gentle south-west-facing slope at *c.*15m AOD, 1km east of East Linton. At the time of survey the field carried oilseed rape stubble.

SAM 5874 Tyninghame 1

4.29 This cropmark occupies a slight rise at *c.*20m AOD within a field of undulating topography between Lawhead Hill and the A198 road, 2km north-east of East Linton. At the time of survey the field carried cereal stubble.

NMR no. NT 57 SE 103 Sled Hill

4.30 This unscheduled cropmark is situated near the summit of Sled Hill at *c.*175m AOD, 100m south-west of a scheduled cropmark enclosure site, SAM 6026. The land was set-aside at the time of survey.

Solid geology

4.31 The solid geology of the study area is complex. Traprain Law itself is a phonolite laccolith, a mass of igneous rock that has risen in a molten condition and bulged up the overlying strata to form a dome (McAdam and Tulloch 1985). Radiometric age-determination of the pear-shaped intrusion has provided a minimum age of 322 ± 2 Ma (de Souza 1974). Erosion has subsequently revealed the original form of the laccolith by stripping away the soft sedimentary cover. Until relatively recently, the north-eastern part of the intrusion was quarried for roadstone.

SAM 3310, 4070, 4108, 5927 (R+C), 5940, 6021, 6022 and 6394

4.32 These sites all lie on Calciferous Sandstone Measures of the Carboniferous era.

SAM 6024, 6067, 8776 and SE 103

4.33 These sites all lie between the Dunbar-Gifford Fault and the Lammermuir Fault, on Devono-Carboniferous Upper Old Red Sandstone.

SAM 4169, 5868, 5874, 5961 and 5965

4.34 These sites are situated on Carboniferous extrusive basalts and tuffs, which form part of the Garleton Hills Volcanic Rocks.

SAM 5823, 5862, 5865, 5866, 5928, 5941, 5942, 5963, 5995 and 6050

4.35 These sites are all situated on Carboniferous extrusive trachyte, which forms part of the Garleton Hills Volcanic Rocks.

SAM 6023 and 6025

4.36 These sites lies just south of the Dunbar-Gifford Fault, on intrusive igneous rock of the Carboniferous era (McAdam and Tulloch 1985, Davies *et al*. 1986).

Drift geology

4.37 The most recent glaciation, the Devensian, obliterated evidence of all earlier glaciations and interglacials and deposited an extensive till (boulder clay) across much of the study area. The till mantles most of the low-lying areas north of the Lammermuir Fault, and is up to 10m in thickness. In the areas of volcanic rock, however, the till is thinner and less widespread. Subsequent, Flandrian, deposits include river terrace and flood-plain alluvium, with limited peat and lake deposits. The alluvial deposits consist of interbedded gravels, sands, silts and clays, in constantly varying proportions (McAdam and Tulloch 1985).

5. Geophysical survey

Technique selection

5.1 In order to assess the suitability of a geomagnetic survey technique in this complex and part-igneous geological environment, a small sample area was initially surveyed by fluxgate gradiometry. The survey demonstrated that significant magnetic susceptibility contrasts could be recorded over both the igneous and sedimentary strata and that the resulting anomalies in the vertical component (i.e. gradient) of the Earth's magnetic field almost certainly reflected archaeological features. This technique has therefore been used for each of the surveys undertaken so far.

Field methods

5.2 A 20m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using either tapes or a Wild T1000 total survey station instrument and SDR33 datalogger.

5.3 Measurements of vertical geomagnetic field gradient were determined using a Geoscan FM36 fluxgate gradiometer fitted with an ST1 sample trigger to enable automatic logging of the data. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was set to 0.1nT, the sample interval to 0.5m and the traverse interval to 1.0m, thus providing 800 sample measurements per 20m grid unit.

5.4 Data were downloaded on-site into a RM NoteBook computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

5.5 InSite v.3 software was used to process the geophysical data and to produce continuous tone greyscale images of the raw data. The results are shown in Figures 2-31. In each Figure, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.6 The following basic processing steps have been applied to the gradiometer data):

DeSpike replaces isolated spikes in the data with the mean of near-neighbours. Such spikes typically arise due to the presence of near-surface ferrous litter.

DeDrift corrects for a linear drift in instrument calibration with time.

DeStripe reduces an apparent striping artefact in magnetometer data collected along zig-zag traverses.

DeShear corrects for apparent shear in geomagnetic anomalies surveyed by zig-zag traversing.

Match adjusts for differences in mean data level between adjacent grids.

Merge interpolates and combines grid data to form one array of regularly-spaced data at 0.25 x 0.25m intervals.

Interpretation: anomaly types

5.7 Three types of geomagnetic anomaly have been distinguished in the data:

Positive magnetic	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures (such as pits and ditches) in areas of sedimentary geology, or concentrations of high magnetic susceptibility rock in areas of igneous geology
Negative magnetic	regions of anomalously low or negative magnetic field gradient, which may be associated with low magnetic susceptibility sedimentary stone structures, or soil-filled rock-cut structures in areas of igneous geology
Dipolar magnetic	paired positive-negative magnetic anomalies, which typically reflect ferrous debris and/or fired structures such as kilns or hearths

Interpretation: features

SAM 3310 Begbie (Figure 2)

5.8 This survey has confirmed the presence on the ground of the multi-vallate, 'fort' previously identified from cropmarks to the north of Begbie Wood. The most prominent magnetic anomalies comprise curvilinear bands of high magnetic susceptibility material, which reflect the soil-filled ditches of the enclosure. The survey confirms the indications from the cropmarks that the innermost ditch is considerably more substantial than the others, measuring 4-6m in width. The outer ditches appear to measure between 1-2m in width, and as such may be palisade trenches. Three outer ditches have been detected on the western side of the fort, of which only traces have been identified on the eastern side. The maximum extent of the interior of the enclosure is approximately 120m by 95m.

5.9 The survey has detected two causewayed entrances across the main ditch on the eastern side of the enclosure, as shown on APs. No causeways have been detected across other parts of the main ditch.

5.10 A number of anomalies have also been detected within the enclosure. Many of these anomalies are weak and discontinuous, making interpretation difficult, but they appear to reflect the remains of internal features such as ring-ditches.

5.11 A weak magnetic 'texture' is evident across the whole survey area, aligned broadly east-west. This texture reflects the current plough regime.

SAM 4169 East Linton (Figure 3)

5.12 The survey has confirmed the location on the ground of the multi-vallate enclosure known as East Linton fort, as previously identified on aerial photographs. The underlying presence of extrusive basalts and tuffs has not had an adverse affect on the magnetic survey. The maximum extent of the enclosure is approximately 185m by 100m. The enclosure occupies an escarpment edge location, with the steep-sided gorge of the River Tyne forming the south-eastern side of the enclosure.

5.13 The most apparent anomalies in the data comprise three curvilinear bands of high magnetic susceptibility material, which reflect the soil-filled ditches of the enclosure. The innermost ditch appears to be the most substantial, measuring up to 4m in width. The two outer ditches measure up to 3m in width. Although not clear on the AP, there are causewayed entrances at two locations on the western side of the enclosure. No causeways have been detected across other parts of the main ditches.

5.14 Another high susceptibility, positive magnetic lineation has been detected aligned north-south within the eastern half of the enclosure. This almost certainly reflects another soil-filled ditch, of maximum width 2m, which is also crossed via a causeway. The ditch, which turns eastward at its northern end but is then obscured by more intense anomalies, effectively distinguishes this part of the site from the rest of the fort interior and, like the main enclosure ditches, has a west-facing entrance. There are hints of a possible continuation of this ditch outside the main enclosure, which if confirmed, would indicate that the ditch belongs to a different phase of the site.

5.15 Within the interior of the multi-vallate enclosure there are indications of intense archaeological activity, including several possible circular structures, particularly towards the west end of the site.

5.16 Two hemispherical concentrations of intense dipolar magnetic anomalies have been detected in the eastern part of the site, the more northerly of the two obscuring the ditch described above. These areas broadly correspond to slightly darker patches on the AP. The anomalies almost certainly reflect concentrations of either near-surface ferrous materials or highly magnetic, igneous rocks. Each spreads across the area of the three outer ditches and so is unlikely to represent material contemporary with the fort. It is apparent that

this material was deposited some time after the ditches had been infilled. Further along the ramparts to the west, there are indications of a circular building, *c.*10m in diameter on the line of the outermost ditch, set within a possible enclosure. These features also suggest that several phases of activity may be represented by the geophysical anomalies.

5.17 Some 20m north-west of the main enclosure, at the edge of the survey area, there is another concentration of intense, dipolar magnetic anomalies. These anomalies could reflect archaeological debris associated with some industrial activity, but could equally reflect more recent ferrous debris or igneous rock.

5.18 A scatter of small dipolar magnetic anomalies has been detected across the whole of the survey area. These anomalies similarly reflect near-surface ferrous litter or igneous rocks.

5.19 A weak magnetic 'texture' is evident across parts of the survey area, aligned north-south. This texture reflects the current plough direction.

SAM 4070 Knowes (Figure 4)

5.20 The survey has confirmed the presence and location of a rectilinear enclosure, of maximum dimensions 55m by 55m. The enclosure ditch is evident as a particularly intense positive magnetic anomaly for most of its course and measures *c.*4m in width. The south-eastern corner of the ditch is less apparent but survives as a weak positive magnetic anomaly. A causewayed entrance is evident, midway along the eastern side of the enclosure.

5.21 The remains of at least two ring-ditches are evident within the enclosure, measuring approximately 14m and 7m in diameter. A concentration of small, intense anomalies, possibly reflecting hearths, and an area of enhanced magnetisation are also evident.

5.22 A number of magnetic anomalies have been detected outside the enclosure ditch. In particular, a large positive magnetic anomaly, measuring 18m by 14m, has been detected 30m north of the enclosure. This reflects an area of enhanced magnetic susceptibility, probably representing a large soil-filled pit, and is also clear on the aerial photograph. Several linear anomalies, almost certainly reflecting soil-filled ditches, are also evident. The chronological relationships between these features and the enclosure are not clear.

5.23 The current ploughing regime is reflected in the data as a north-south aligned texture.

SAM 5927 (R) Stevenson Mains (Figure 5)

5.24 The survey has confirmed the presence and location of a rectilinear enclosure, of maximum dimensions 50m x 50m. The magnetic anomalies which reflect the enclosure are, however, very weak and it has not been possible to identify any entrances. Possible internal, ditched features may be present, as indicated by further very weak positive magnetic anomalies.

SAM 5928 East Bearford (Figure 6)

5.25 Despite the extrusive trachyte geology of this area, the survey has confirmed the presence and location of a very regular, rectilinear enclosure. The magnetic susceptibility contrasts between the materials within the enclosure ditch and the surrounding soils are sufficiently high that a very clear image of the enclosure has been produced.

5.26 The enclosure is evident as a strong positive magnetic anomaly, measuring approximately 75m by 65m, with rounded corners. The anomaly reflects high magnetic susceptibility materials, such as organic-rich sediments or igneous rocks, within a ditchfill. The ditch appears to vary in width, being only *c.*2m across on the western side of the enclosure and up to 4m across on the eastern side. A causewayed entrance is clearly visible in the eastern side of the enclosure. The negative magnetic anomalies evident either side of the main positive anomaly could either be a shadow effect associated with the strength of the positive anomaly, or could reflect the remnants of a bank and outerscarp.

5.27 Within the enclosure there is evidence for internal features, represented by both positive and dipolar magnetic anomalies. These anomalies may reflect both cut, soil-filled features such as pits and gullies, and hearths or ferrous/fired materials respectively. A probable roundhouse is situated in the north-eastern corner of the enclosure; other possible roundhouses are located in the southern half of the enclosure.

5.28 Additional weak positive magnetic lineations have also been detected outside the main enclosure, which do not appear on the APs. These anomalies almost certainly reflect the remains of more ditches. The most apparent of these ditches is aligned parallel to, and 20m north of, the northern enclosure ditch, forming a possible annex. Other ditch features are evident on both the southern and eastern sides of the enclosure, including possible structures outside the south-east corner. To the west of the main enclosure the land falls away fairly steeply to Bearford Burn. Without excavation it cannot be determined whether the external ditches are contemporary with the main enclosure, or if they represent the remains of earlier or later features.

5.29 The survey has also detected a series of very weak magnetic lineations, aligned broadly east-west. These lineations are interpreted as reflecting a former plough direction.

SAM 5961 Overhailes (Figure 7)

5.30 This survey has confirmed the presence and location of a rectilinear enclosure, measuring approximately 65m by 50m, in an area of igneous, basaltic geology. The whole enclosure has not been identified either geophysically or by aerial photography, perhaps due to truncation by ploughing. The anomaly reflecting the western side of the enclosure ditch is unusual in that it changes polarity halfway along its length. The southern part of this ditch feature is evident as a positive magnetic anomaly, while the northern part has been detected as a negative magnetic anomaly. Electrical resistivity survey of this enclosure by

the Edinburgh Field Archaeology Society may help with the interpretation of these anomalies.

5.31 Geological drift maps show that the irregularly-shaped feature underlying the southern part of the enclosure (on both the geophysical plot and the aerial photographs) is in fact a near-surface basalt intrusion, from which the overlying boulder clay has been eroded.

SAM 5963 Cairndinnis 1 (Figure 8)

5.32 This survey has provided weak evidence for the presence and location of a rectilinear enclosure, measuring approximately 75m by 65m. The form and size of this enclosure is remarkably similar to that of SAM 5928 at East Bearford, which lies 1.5km due west of this site. Only parts of the main enclosure ditch have been identified in this survey. Some of the larger and more intense magnetic anomalies here probably reflect underlying geological features.

SAM 5965 Standingstone (Figure 9)

5.33 This survey has not detected evidence for the relatively small rectilinear enclosure recorded on aerial photographs. Several magnetic anomalies have been detected, some of which could reflect archaeological features though these are not evident on the APs.

5.34 A very broad, curvilinear positive magnetic anomaly, *c.*16m in width, almost certainly reflects relatively high magnetic susceptibility materials, perhaps an increased depth of soil. A narrow, curvilinear, positive magnetic anomaly to the south of this broad feature is more likely to reflect the remains of a former field boundary. Also detected in this area are the possible remains of a ring-ditch, measuring *c.*20m in diameter.

SAM 5995 West Mains (Figure 10)

5.35 This survey has confirmed the presence and location of a rectilinear enclosure with rounded corners, measuring approximately 75m by 60m. The main ditch is evident as a very strong positive magnetic anomaly, indicating that the ditch is cut through drift deposits rather than the underlying igneous rock. The maximum width of the ditch has been recorded as *c.*4m.

5.36 The southern side of the enclosure does not appear to be ditched on either the geophysical survey or aerial photographs, and the clearly defined ditch terminals on the south side may indicate that this has always been the case. As with several other of the sites surveyed, it appears that a natural escarpment here has formed the remainder of the enclosure.

SAM 6022 West Bearford (Figure 11)

5.37 This survey has confirmed the presence and location of a relatively small rectilinear enclosure, measuring approximately 35m by 35m. The enclosure is evident as a negative magnetic anomaly, reflecting materials of low magnetic susceptibility, which, given its location on Sandstone Measures, could indicate that stone wall-footings are present adjacent to the ditch, or that the ditch is

filled with rubble as opposed to a soil-filled ditch. Although the anomaly is rather weak it appears that there may be an entrance on the eastern side of the enclosure, as indicated by the AP evidence. There is no definite geomagnetic or AP evidence for internal features; a possible linear feature passes the enclosure on an east-west alignment, *c.*60m to the north.

SAM 6024 Tanderlane (Figure 12)

5.38 This survey has confirmed the presence and location of a large, irregularly-shaped rectilinear enclosure, measuring approximately 150m by 130m. The enclosure is evident as a discontinuous negative magnetic anomaly, reflecting materials of low magnetic susceptibility, which, given its location on Upper Old Red Sandstone, could indicate that stone wall-footings or revetments are present adjacent to the ditch, or that the ditch is filled with rubble as opposed to soil. While the survey has mapped the northern, western and southern sides of the enclosure, the eastern side is largely undetected. This is evident on aerial photographs as a curvilinear feature.

5.39 Identification of internal features has been hampered by the presence of numerous other magnetic anomalies and features of more recent origins; these include ferrous service pipes and drains and a 9m wide field boundary. A broad curvilinear anomaly, which traverses the survey area on a north-south alignment, probably reflects a former stream course.

SAM 6025 Garvald 1 (Figure 13)

5.40 This survey has confirmed the presence and location of a large rectilinear enclosure, measuring approximately 100m by 80m. Two sides of the enclosure are evident in the survey. As at East Linton and Whittinghame (SAMs 4169 & 6067), the south-eastern side of the enclosure is not ditched, but comprises a steep drop, in this case down to Papana Water.

5.41 The soils at this location are underlain by intrusive igneous rock and are presumed to be highly magnetically susceptible. This is borne out by the survey data, which exhibit strong anomalies and show the material of the enclosure ditch to be less magnetically susceptible than the surrounding materials. The ditch is evident as a clear negative magnetic anomaly, which, given the geology at this location, could indicate that it is cut into the underlying igneous strata; the soil fill of the ditch being considerably less magnetic that the surrounding rock into which the ditch is cut. The ditch measures *c.*3m in width; no causeway has been identified in the survey.

5.42 Many other magnetic anomalies have been mapped by the survey. It is likely that some of these reflect underlying geological features.

SAM 6394 Haddington (Figure 14)

5.43 This survey has confirmed the presence and location of a sub-rectangular enclosure, measuring approximately 35m by 35m. The main enclosure ditch has been detected as a positive magnetic anomaly, reflecting high magnetic susceptibility materials within its fill. As on the APs, the north-eastern part of the enclosure ditch is not as clearly defined as the other sides. An entrance

causeway is evident near the northern end of the western side. Another possible causeway has been identified at the south-western corner of the enclosure.

5.44 Two concentrations of intense magnetic anomalies have been detected within the enclosure, and also 20m to the south-west of the enclosure. These concentrations are interpreted from APs as soil-filled features. It cannot be determined from the survey if these features are contemporary with the enclosure, but they could reflect concentrations of domestic or industrial waste; the site is only just beyind the limits of the built-up area of Haddington.

5.45 A number of magnetic anomalies have also been detected outside the scheduled enclosure. A probable double-ditched trackway is evident on the northern side, as a negative magnetic anomaly flanked on both sides by positive magnetic anomalies; these reflect the track and the ditches, respectively. Anomalies around the northern, western and southern sides could also represent the remains of a larger enclosure ditch. A possible roundhouse ditch, measuring *c.*16m in diameter, has been identified within this larger, potential enclosure.

SAM 8776 Nunraw Barns (Figure 15)

5.46 This survey was undertaken over the site of a possible sub-rectangular, double-palisaded enclosure noted on an AP from 1977 and recently scheduled. The geophysical survey has shown the area to be magnetically noisy, but parts of two parallel features have been identified, evident as chains of positive magnetic anomalies. These almost certainly represent the remains of palisade trenches forming the eastern side of the enclosure.

5.47 Two more intense positive magnetic lineations, which have been detected to the south of the palisades, correspond to the locations of field drains as interpreted from aerial photographs.

SAM 4108 Hedderwick (Figure 16)

5.48 This survey has produced very clear evidence for an incomplete oval enclosure. As on the available aerial photographs, the enclosure exists as a horseshoe-shaped ditch, with no evidence for the ditch continuing around the southern end. The maximum dimension of the surviving enclosure is 35m. On both the geophysical survey and the APs, there is a suggestion of an internal palisade. The survey has also detected an internal, weak positive magnetic anomaly typical of a roundhouse, measuring 14m in diameter. A larger semi-circular ditch has been identified to the south of the enclosure, which could be part of a larger unenclosed settlement, for which there is also AP evidence.

5.49 A narrow, linear positive magnetic anomaly has been detected to the south of the enclosure, aligned north-west/south-east. This anomaly appears to reflect the presence of a narrow trench, perhaps for a water supply pipe.

SAM 5823 Sixpence Strip (Figure 17)

5.50 This survey has confirmed the presence and location of a curvilinear enclosure, of maximum diameter 65m. The main enclosure ditch measures 3-4m in width and has a causewayed entrance to the west. The survey has also detected evidence for an internal palisade, confirming the AP evidence. The magnetic data for this site are relatively 'noisy', due to its location on igneous strata and the presence of igneous rocks within the soil. However, it has been possible to discern a tentative ring-ditch within the enclosure, measuring *c.*13m in diameter, as well as indications of at least one other.

5.51 A few linear anomalies have also been detected outside the enclosure. These do not appear to be contemporary with the enclosure and probably reflect more recent drains.

SAM 5862 Foster Law (Figure 18)

5.52 This survey has also clearly confirmed the presence and location of a curvilinear enclosure over igneous substrata. Two ditch circuits have in fact been detected; these are on slightly different alignments, and overlap to some extent, indicating at least two separate phases of occupation at the site. It has not been possible to determine from the geophysical data which of the two enclosures is the earlier.

5.53 The eastern ends of the enclosures have been removed by small-scale quarrying at the top of the law during the 1970s, however, the maximum dimensions of the enclosures are estimated at *c.*80m and *c.*100m east-west. The main ditches vary between 2-4m in width. Both enclosures have an entrance to the west, and one has an additional entrance on its northern side. Probable internal features have been detected, however, it is difficult to distinguish these given the background noise from igneous rocks in the soil.

SAM 5865 Kilduff (Figure 19)

5.54 It has not been possible to identify this curvilinear enclosure in the geophysical survey data. A reticulate pattern of anomalies has been detected, similar to that recorded on aerial photographs, which may reflect soil-filled fissures in the igneous rockhead. AP transcription of features here may help to distinguish between these and the soil-filled ditch of the enclosure.

SAM 5866 Newmains (Figure 20)

5.55 This site lies *c.*1km north-west of the Kilduff site, and is situated on the same geological formation. Similarly, a number of curvilinear magnetic anomalies have been detected, however, without AP transcription it is not clear which of these anomalies might reflect the enclosure ditch. A faint linear anomaly running approximately north-north-west/south-south-east on the western edge of the survey area might represent one arm of a probable double pit alignment apparent on the APs, but this cannot be considered certain; the presence of the modern farm just beyond the pit alignment having restricted the possibilities of work here.

5.56 A chain of intense dipolar magnetic anomalies, aligned broadly east-west, almost certainly reflects the presence of a ferrous service pipe.

SAM 5927 (C) Stevenson Mains (Figure 21)

5.57 This survey was undertaken *c.*100m west of SAM 5927 R (para. 5.24, above), being the other enclosure in this scheduled monument area. The geophysical survey has confirmed the presence and location of a small curvilinear enclosure, measuring approximately 35m by 25m. The enclosure is evident as a positive magnetic anomaly, reflecting the high magnetic susceptibility soil of the ditchfill. The APs for the site provide evidence for an entrance on the eastern side of the enclosure and this is also confirmed by the magnetic data. The discontinuous remains of a ditch heading east from the entrance are represented as another positive magnetic anomaly.

5.58 Considerably more anomalies have been detected within the enclosure than in the surrounding land. It is likely therefore that these anomalies reflect activities, possibly small-scale industrial, which were being carried out inside the enclosure.

SAM 5940 Northrig (Figure 22)

5.59 This survey has confirmed the presence and location of a curvilinear enclosure, of maximum diameter 75m. The maximum detected width of the enclosure ditch is *c.*3m. The detected anomalies correspond well with those recorded on aerial photographs. Two ditches are present on the northern side of the enclosure, however, the relationship between these is not clear. Evidence for internal features has been recorded both in the geophysical survey and the APs. These features may include at least one ring-ditch and an area of burning.

SAM 5941 Coldale 1 (Figure 23)

5.60 The geophysical survey has not detected clear evidence for this curvilinear enclosure. This is partly as a result of the presence of a strong anomaly which runs through the area of the north-eastern sector on the enclosure ditch, which appears to be a drain or water pipe. It is possible that part of the north-western arc of the enclosure ditch has been detected, although anecdotal evidence gathered during fieldwork suggests that the ground in this corner of the field has been mechanically removed since the original air photographs were taken, and replaced with spoil from elsewhere. Inside, a faint semi-circular anomaly *c.*15 m in diameter, might mark the site of a circular building.

SAM 5942 Coldale 2 (Figure 24)

5.61 This survey has confirmed the presence and location of a curvilinear enclosure, of maximum diameter 55m. The maximum width of the main ditch is *c.*3m. At least two causewayed entrances are apparent, on the eastern and western sides of the enclosure. Arcuate positive magnetic anomalies within the enclosure, one of which is evident on aerial photographs, probably reflect ring-ditches for roundhouses. Another probable curvilinear ditch heads north from the enclosure. A number of broad, diffuse magnetic anomalies in this area are interpreted as reflecting geological features.

SAM 6021 Mitchell Hall 1/East Lodge (Figure 25)

5.62 This survey was undertaken over the site of a probable curvilinear enclosure. AP evidence suggests the presence of two concentric ditches, the larger measuring some 75m in diameter and the inner one approximately 40m. Unfortunately the magnetic susceptibility contrasts in this area are very low and the survey has only detected the faintest hint of a circular feature measuring c.40m in diameter. This anomaly could reflect the inner ditch of the enclosure, however, this remains tentative and the survey has not detected any evidence for the outer enclosure ditch.

SAM 6023 Chesters Quarry (Figure 26)

5.63 This survey has confirmed the presence and location of an oval enclosure, of maximum diameter 75m. The soils at this location are underlain by intrusive igneous rock, the same strata as beneath SAM 6025 Garvald 1, and are presumed to be highly magnetically susceptible. This is again borne out by the survey data, which exhibit very strong anomalies and show the material of the enclosure ditch to be less magnetically susceptible than the surrounding materials. The ditch is evident as a clear negative magnetic anomaly, which, given the geology at this location, could indicate that it is cut into the underlying igneous strata; the soil fill of the ditch being considerably less magnetic that the surrounding rock into which the ditch is cut. The ditch measures up to 5m in width and a broad entrance, measuring *c.*12m in width, is clearly located in the western part of the enclosure.

5.64 It has not been possible to identify internal archaeological features with the exception of one tentative ring-ditch. This curvilinear, weak positive magnetic anomaly has been detected in the northern part of the enclosure and would produce such a signal if cut through soil rather than the underlying rock. The anomaly has a diameter of *c.*12m and could well reflect the remains of a roundhouse, for example, or other such shallow-cut feature.

5.65 Several lineations evident on the APs have also been detected magnetically, as strong negative magnetic anomalies. In this geological environment the anomalies could reflect soil-filled fissures in the rockhead.

SAM 6050 Standingstone (Figure 27)

5.66 The survey here has confirmed the presence and location of a curvilinear enclosure, measuring *c.*50m in diameter. The APs show approximately three-quarters of an enclosure and this is confirmed by the geophysical data. Although the site is located over extrusive trachyte rock, the upper boundary of the bedrock appears to be at a greater depth than the enclosure ditch, since this appears as a positive magnetic anomaly which almost certainly reflects an earth-cut, soil-filled ditch as opposed to a rock-cut one. An alternative interpretation for the main anomaly here is that it reflects local, high magnetic susceptibility rock used as wall-footings. However, this is considered unlikely given the low intensity of the anomalies compared with the surrounding soil. A curvilinear negative anomaly to the north and east of the enclosure may reflect the remains of another, larger enclosure.

5.67 A very weak, circular positive magnetic anomaly has been detected in the centre of the enclosure ditch. This is also interpreted as a ditch feature, perhaps associated with a roundhouse.

5.68 Several other relatively intense, diffuse geomagnetic anomalies have been detected outside the area of the enclosure and are interpreted as being geological in origin.

5.69 There is a high concentration of small positive and dipolar magnetic anomalies in the interior of the enclosure. These anomalies probably reflect soil-filled pits and ferrous/fired materials respectively, and could indicate the presence of some small-scale industrial activity at the site.

SAM 6067 Whittinghame Castle (Figure 28)

5.70 This survey has also confirmed the presence of a curvilinear enclosure, located on the edge of a steep ravine. AP evidence indicates that the western quadrant of the enclosure comprises two ditches, the inner ditch being considerably broader than the outer ditch. These features are evident to some extent in the geophysical survey as two concentric negative magnetic anomalies, the outer one being a weaker and more diffuse anomaly; the inner feature can now be confirmed as continuing into the adjacent pasture area to the east, where the cropmark evidence was not forthcoming.

5.71 Since this is an area of sedimentary, sandstone geology the low magnetic susceptibility values recorded over the enclosure would appear to indicate the presence of stone rubble or wall-footings, rather like SAM 6022 at West Bearford.

5.72 An arcuate, positive magnetic anomaly has been detected just to the west of the scheduled enclosure, which could indicate the presence of a soil-filled ditch intersecting with the main enclosure ditches. This may have formed part of an earlier enclosure at the site as it appears to be overlain in part by the negative magnetic anomaly of the scheduled enclosure.

5.73 To some extent the identification of features at this site has been hindered by the presence of many small, intense dipolar magnetic anomalies which obscure weaker anomalies of possible archaeological origin. The dipolar anomalies almost certainly reflect near-surface ferrous litter. One possible internal feature is represented by a positive magnetic anomaly in the eastern part of the enclosure, which could reflect a substantial soil-filled pit.

SAM 5868 Preston Mains (Figure 29)

5.74 This survey does not appear to have detected evidence for the small ring-ditch evident on aerial photographs. Several anomalies have, however, been detected and AP transcription may help in determining if any of these reflect the ring-ditch.

SAM 5874 Tyninghame 1 (Figure 30)

5.75 This survey has detected evidence for a small ring-ditch, evident on aerial photographs. The ditch is evident as a weak positive magnetic anomaly, measuring *c.*12m in diameter. A number of other anomalies, which are also interpreted as soil-filled features, have been detected. One of these may also reflect a ring-ditch, in the eastern part of the survey.

NT 57 SE 103 Sled Hill (Figure 31)

5.76 This survey was undertaken over an unscheduled cropmark of a possible timber building, *c.*100m south-west of a scheduled enclosure SAM 6026. The survey has detected two parallel, positive magnetic lineations, 10m apart and continuing for 28m, which probably reflect the beam slots or other foundations for the building. The spacing of the anomalies corresponds to the width of the building as recorded on aerial photographs. It has not been possible to discern definite internal features or subdivisions within the building, although some are apparent on the APs, but the main wall line does seem to step in slightly *c.*7m from the east end of the building, as with many early medieval timber hall plans. The survey of this site is characterised by the presence of many small, intense dipolar anomalies, which have obscured the identification of weaker, quite possibly archaeological, features, at least one of them curvilinear. AP transcription will help with the interpretation of anomalies here.

6. Conclusions

6.1 Geomagnetic surveys have been carried out over a sample of 30 cropmark sites in the vicinity of Traprain Law, comprising Phase 1 of the Traprain Law Environs Project.

6.2 In the majority of cases (23 out of 30), the surveys have confirmed the presence on the ground of the enclosures shown on aerial photographs, often with very clear results. In a number of cases, the surveys have produced evidence of probable internal and/or external features which were not immediately visible on air photographs, while in other cases, the presence of these additional features has been confirmed. Several of the sites investigated appear to represent more than one phase of archaeological activity.

6.3 In the 7 cases where cropmark sites have not been readily identified, this appears to be due to a number of factors. In only one instance does the underlying igneous geology appear to be the main factor; while in several cases, anomalies not immediately relatable to the previous cropmarks were detected and might well prove be of archaeological significance. In addition, there is every reason to suppose that the programme of aerial photographic transcription which has been initiated by RCAHMS for the sites which have been surveyed during Phase 1 of the project will in due course allow some of the poorly-defined anomalies to be related to the cropmark evidence.

6.4 The work reported here brings to a conclusion Phase 1 of the Traprain Law Environs Project. In Phase 2, (2002-2004), it is intended to area excavate a sample of three enclosures in order to obtain detailed archaeological and

environmental data bearing on the character of settlement in the region in the 1st millennia BC and AD. The three sites have been chosen from amongst the 30 sites where geophysical surveys have been carried out: (1) as representing the principal enclosure types and locational preferences seen in the region; and (2) as having multiple phases of occupation and the potential to be able to provide information on change over a period of time.

6.5 Site-specific objectives will include the validation of specific archaeological anomalies revealed by the magnetometer surveys, which have also informed the placement of the main areas to be excavated. In 2002, the escarpment edge site at Whittinghame Castle (SAM 6067) is to be investigated; in 2003, the curvilinear enclosure at Standingstone (SAM 6050); and in 2004, a rectilinear enclosure, either Knowes (SAM 4070) or East Bearford (SAM 5928), depending on the results of evaluations planned for autumn 2002). The intended order of work is dictated by land use.

6.6 Further survey and analysis of cropmark evidence in the study area will continue, during Phase 2, focusing particularly on morphology, siting and survival. A limited number of additional targeted evaluations will be undertaken to assess preservation and validate specific anomalies at other surveyed sites.

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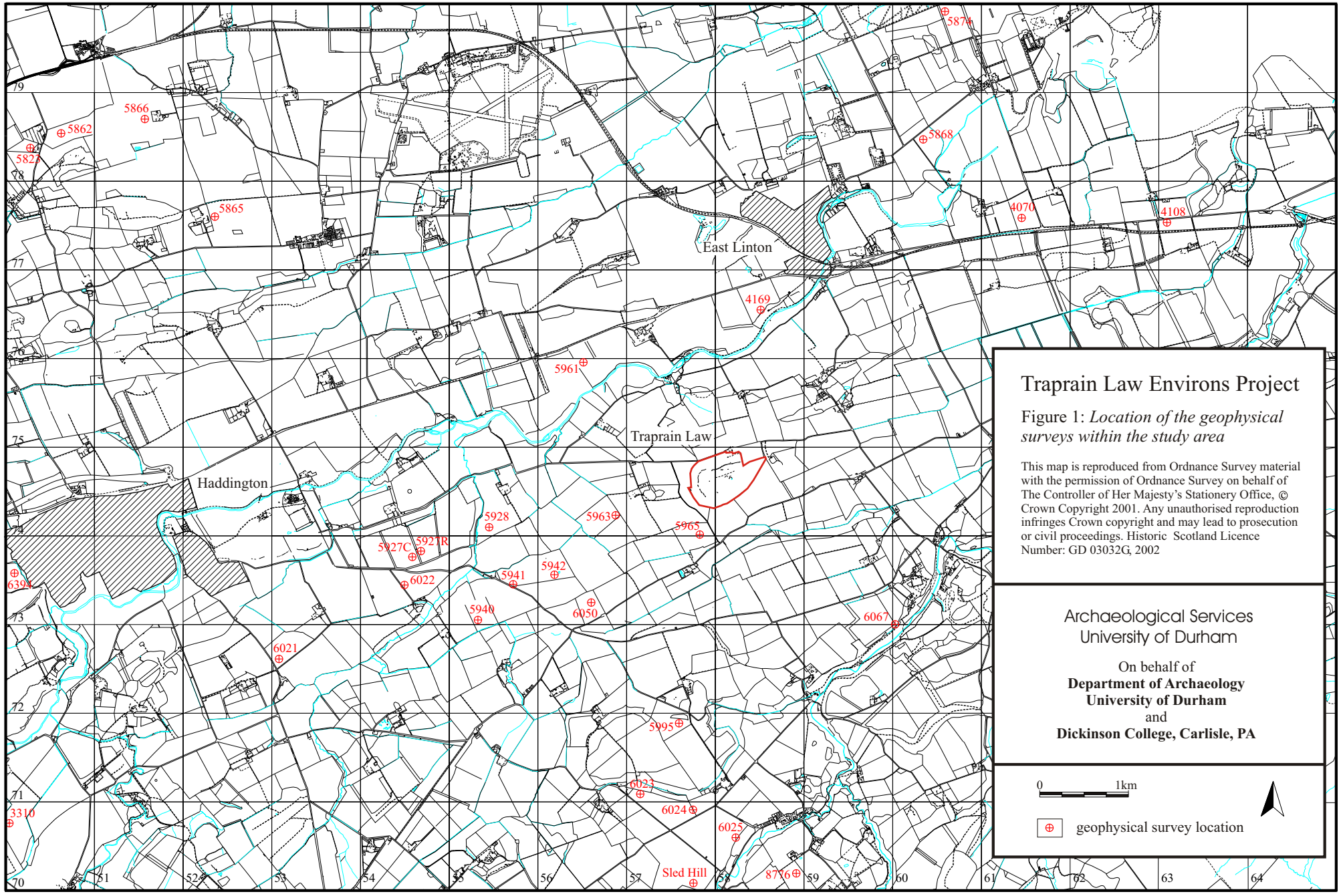

Traprain Law Environs Project

Figure 1: *Location of the geophysical surveys within the study area*

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Archaeological Services
University of Durham

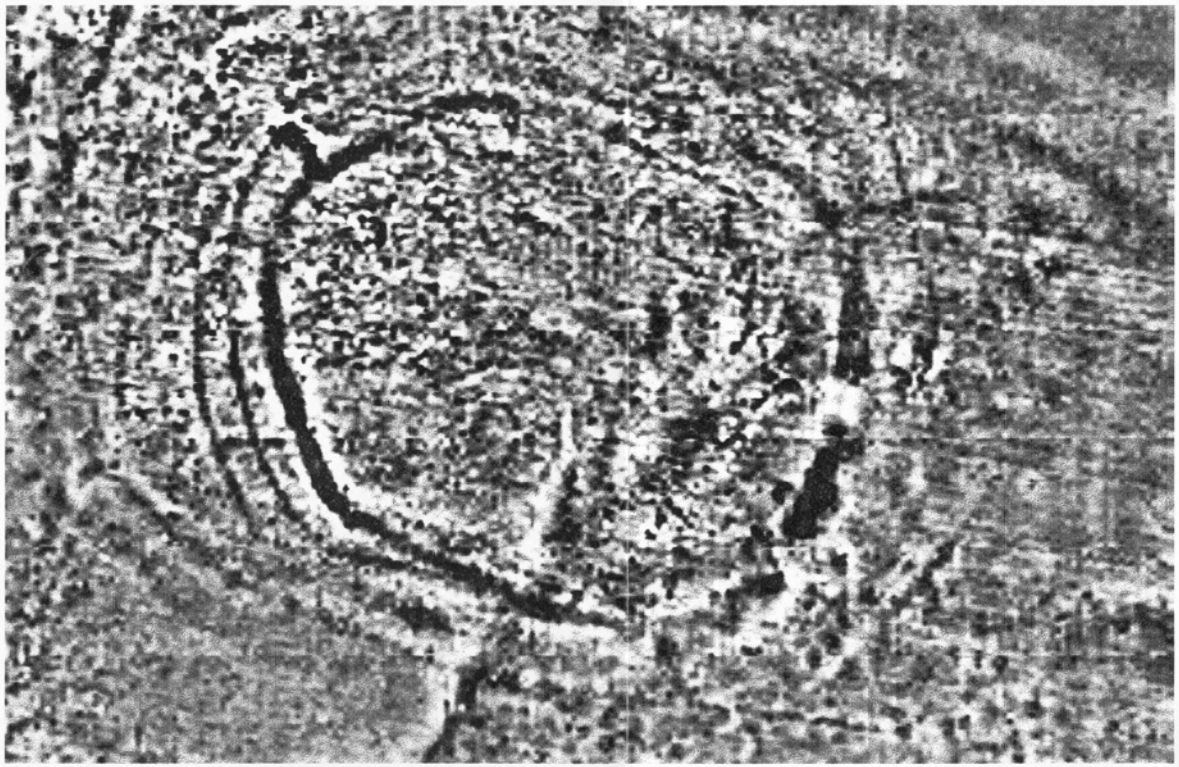
On behalf of
Department of Archaeology
University of Durham
and
Dickinson College, Carlisle, PA

0 1km

⊕ geophysical survey location

SAM 3310 Begbie fort - Traprain Law Environs Project

Geomagnetic survey, 1:1000



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SAM 4169 East Linton - Traprain Law Environs Project

Geomagnetic survey, 1:1000

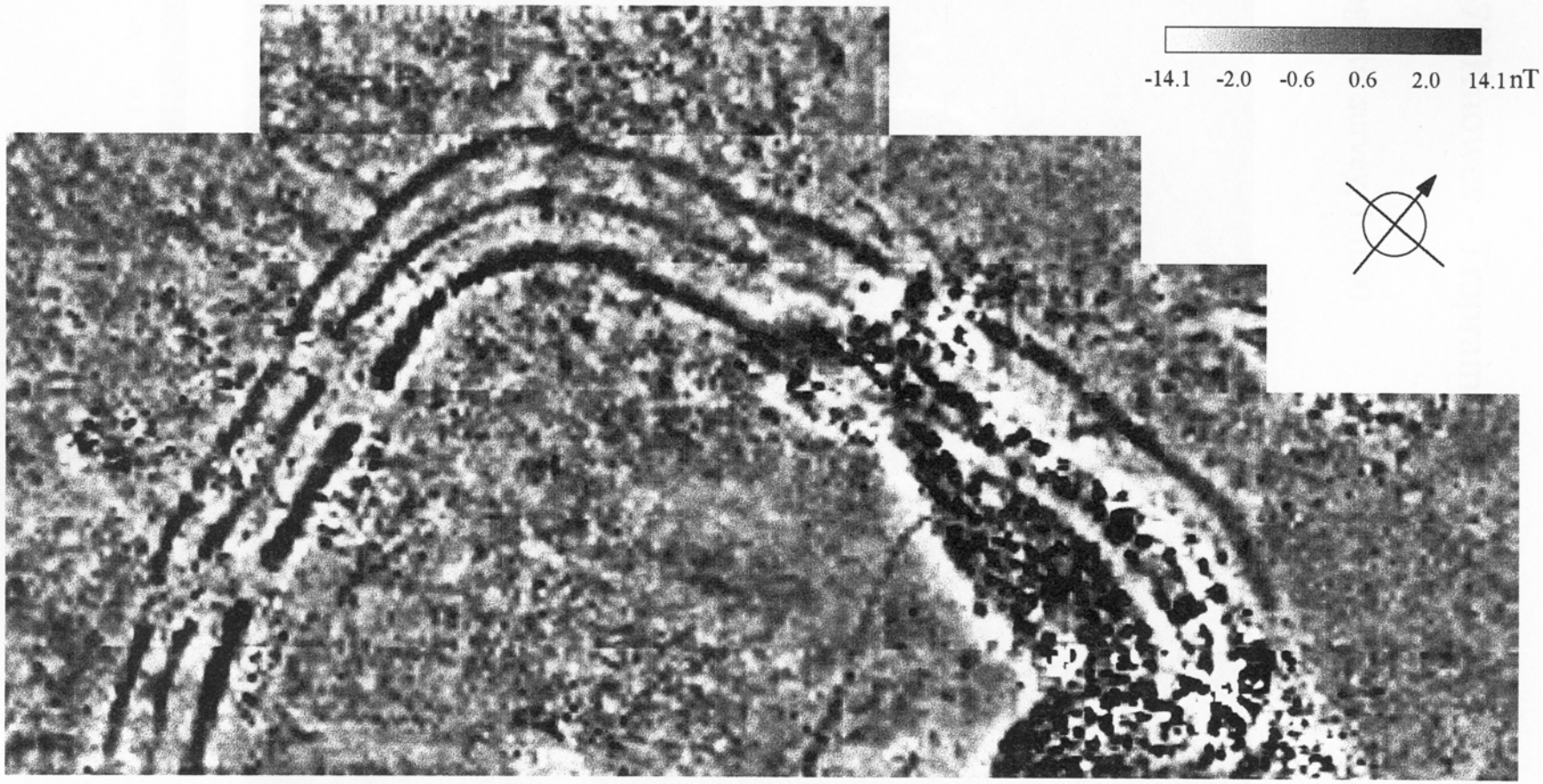
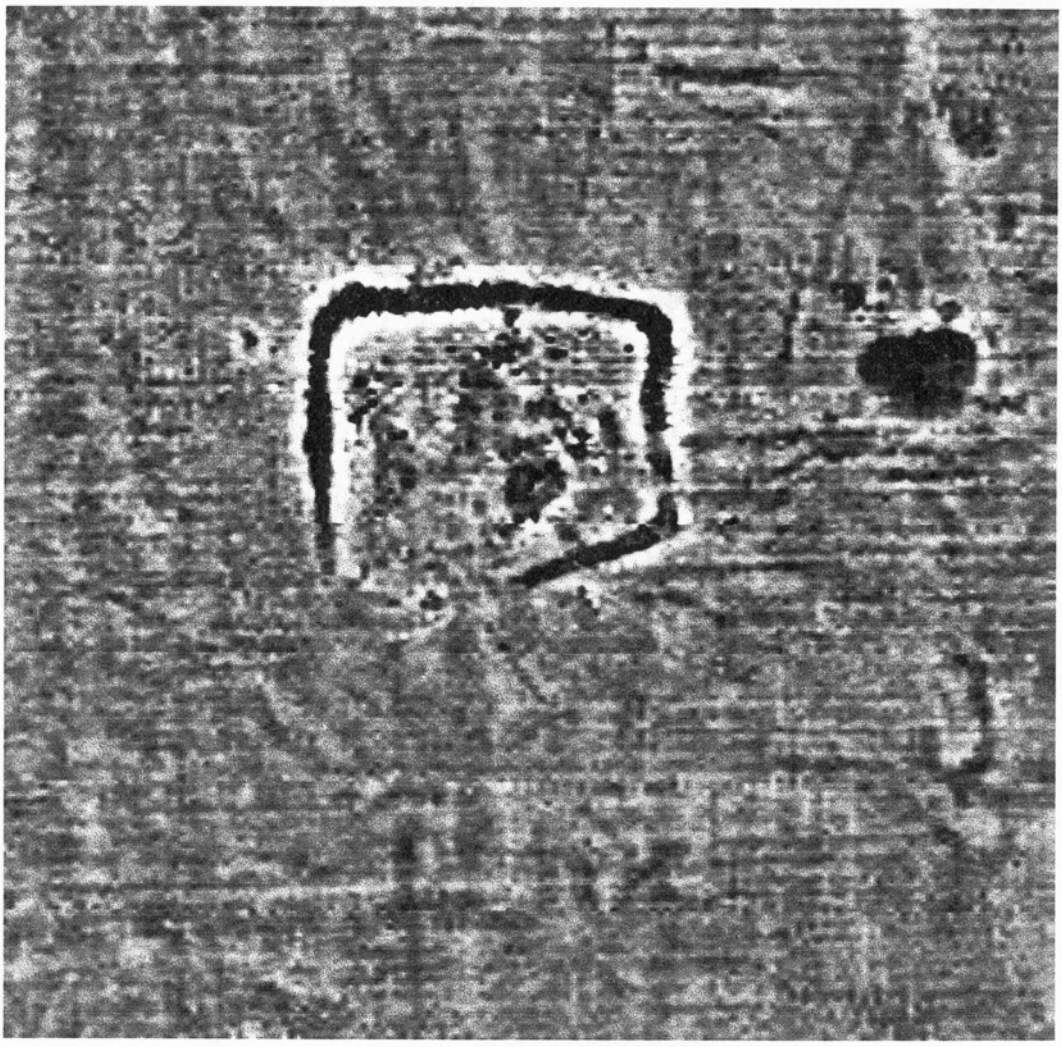


Figure 3

SAM 4070 Knowes - Traprain Law Environs Project

Geomagnetic survey, 1:1000



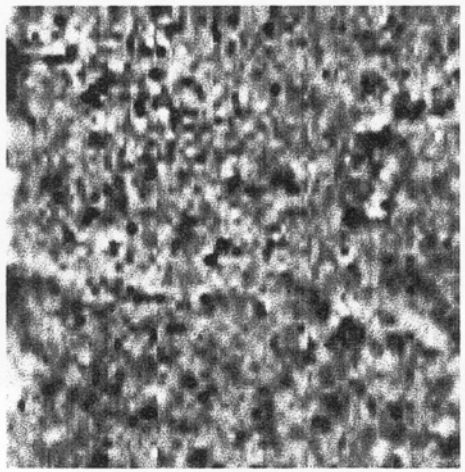
-16.5 -2.3 -0.7 0.7 2.3 16.5 nT

0 10 20 30 40 50m

Figure 4

SAM 5927(R) Stevenson Mains - Traprain Law Environs Project

Geomagnetic survey, 1:1000



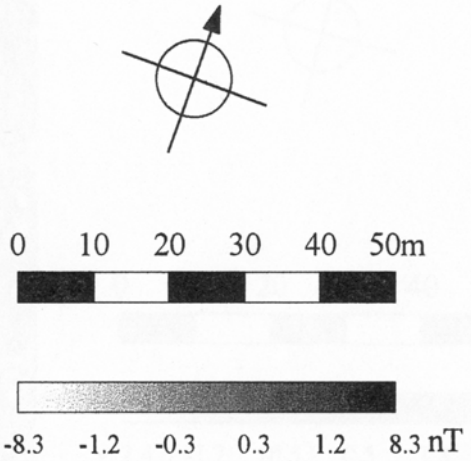
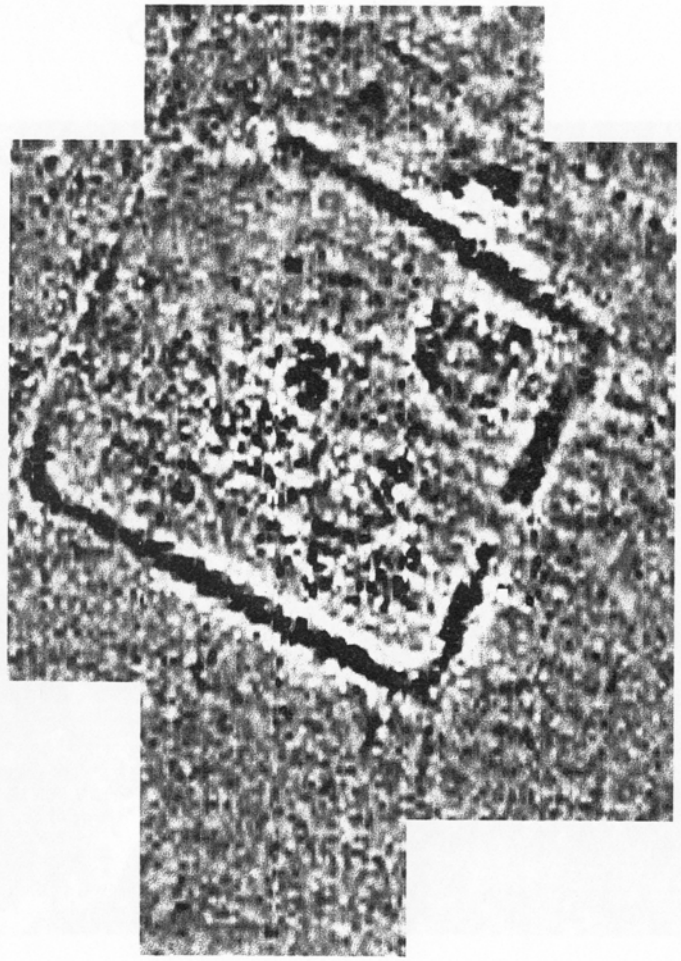


Figure 5

SAM 5928 East Bearford - Traprain Law Environs Project



Geomagnetic survey, 1:1000

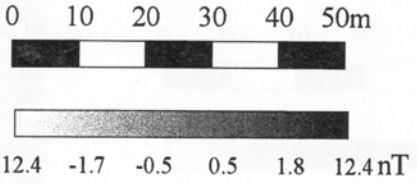
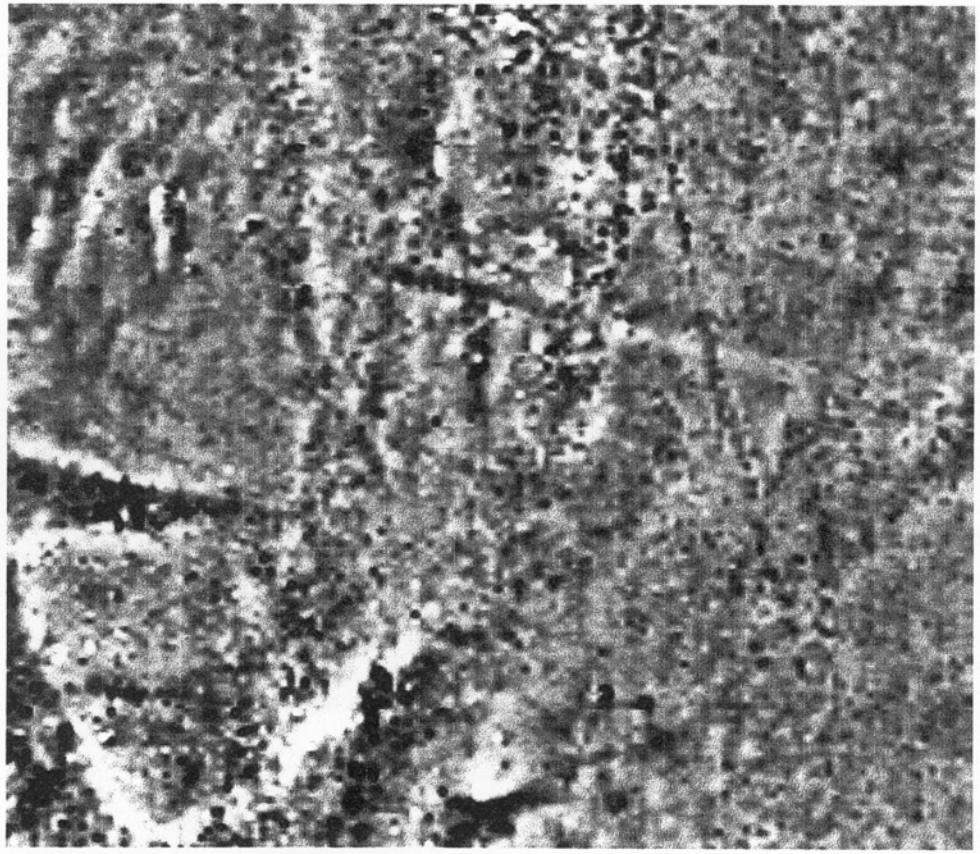


Figure 6

SAM 5961 Overhailes - Traprain Law Environs Project

Geomagnetic survey, 1:1000



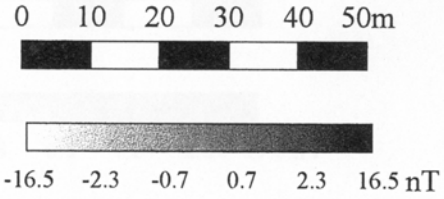
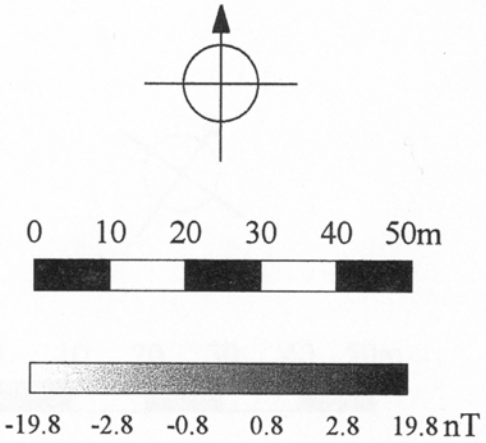


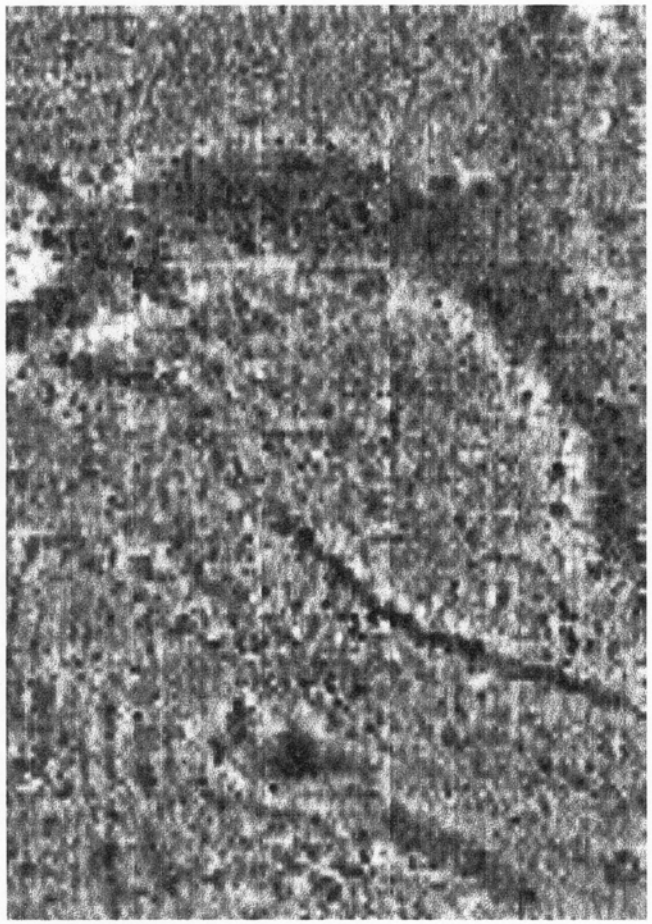
Figure 7

SAM 5963 Cairndinnis 1 - Traprain Law Environs Project

Geomagnetic survey, 1:1000



SAM 5965 Standingstone - Traprain Law Environs Project



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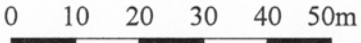
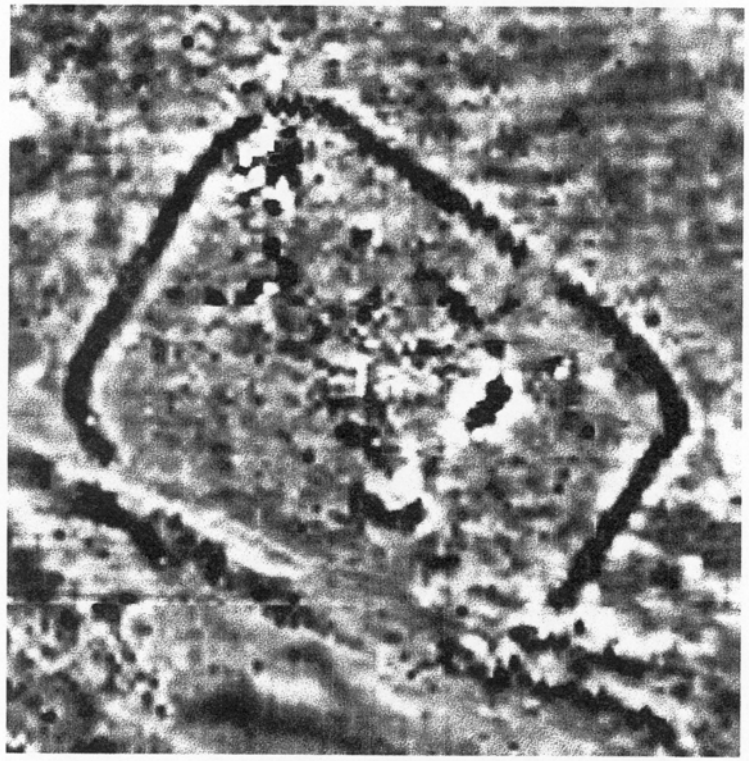


Figure 9

SAM 5995 West Mains - Traprain Law Environs Project

Geomagnetic survey, 1:1000



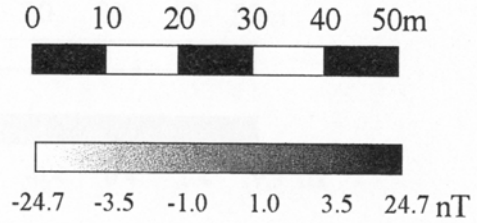
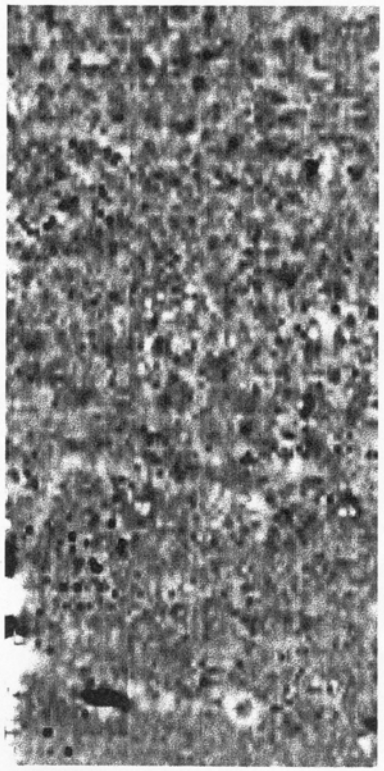


Figure 10

SAM 6022 West Bearford - Traprain Law Environs Project

Geomagnetic survey, 1:1000



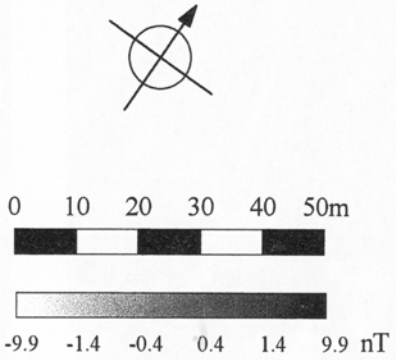


Figure 11

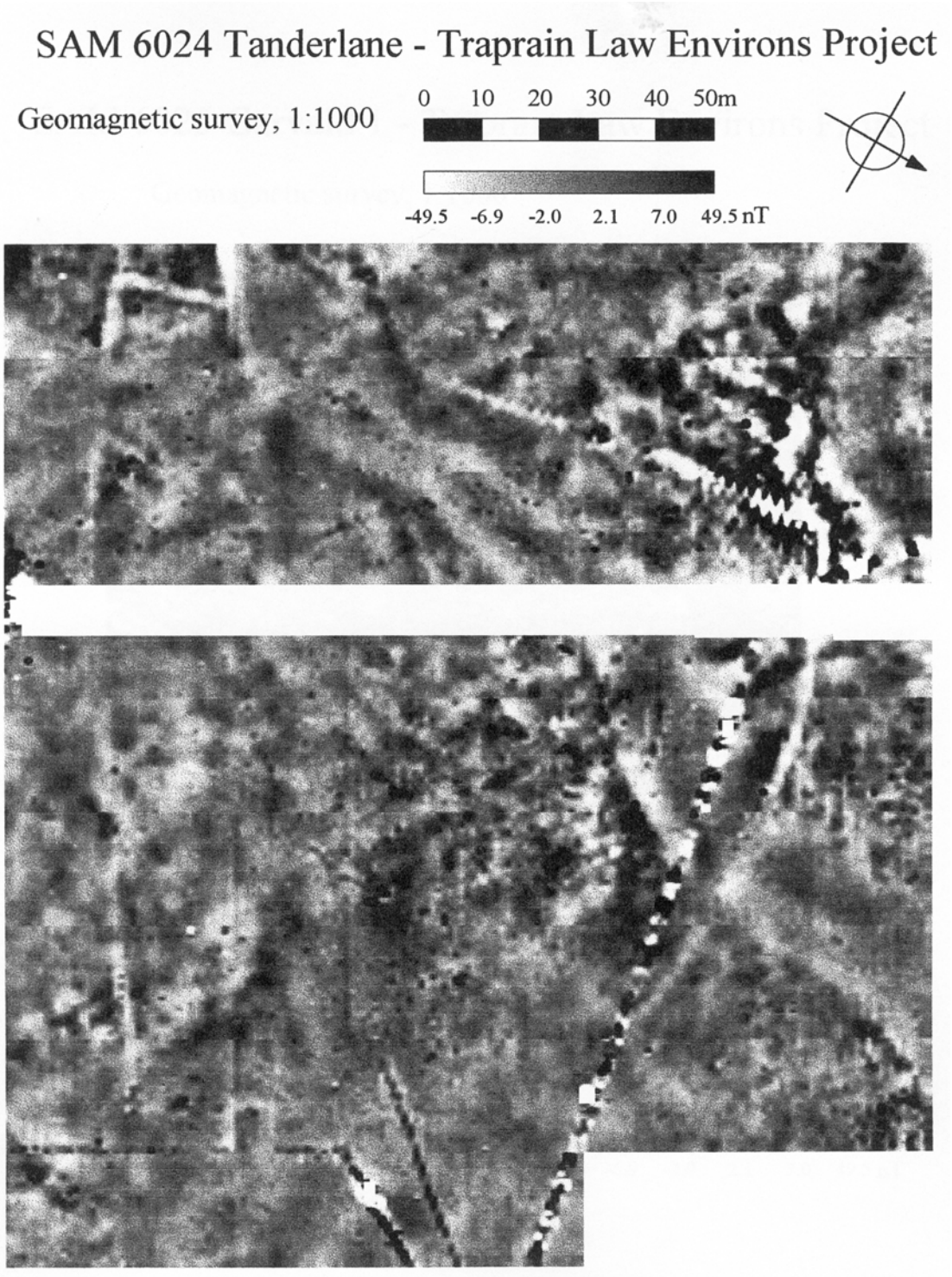

SAM 6024 Tanderlane - Traprain Law Environs Project
Geomagnetic survey, 1:1000
0 10 20 30 40 50m
-49.5 -6.9 -2.0 2.1 7.0 49.5 nT

Figure 12

SAM 6025 Garvald 1 - Traprain Law Environs Project

Geomagnetic survey, 1:1000

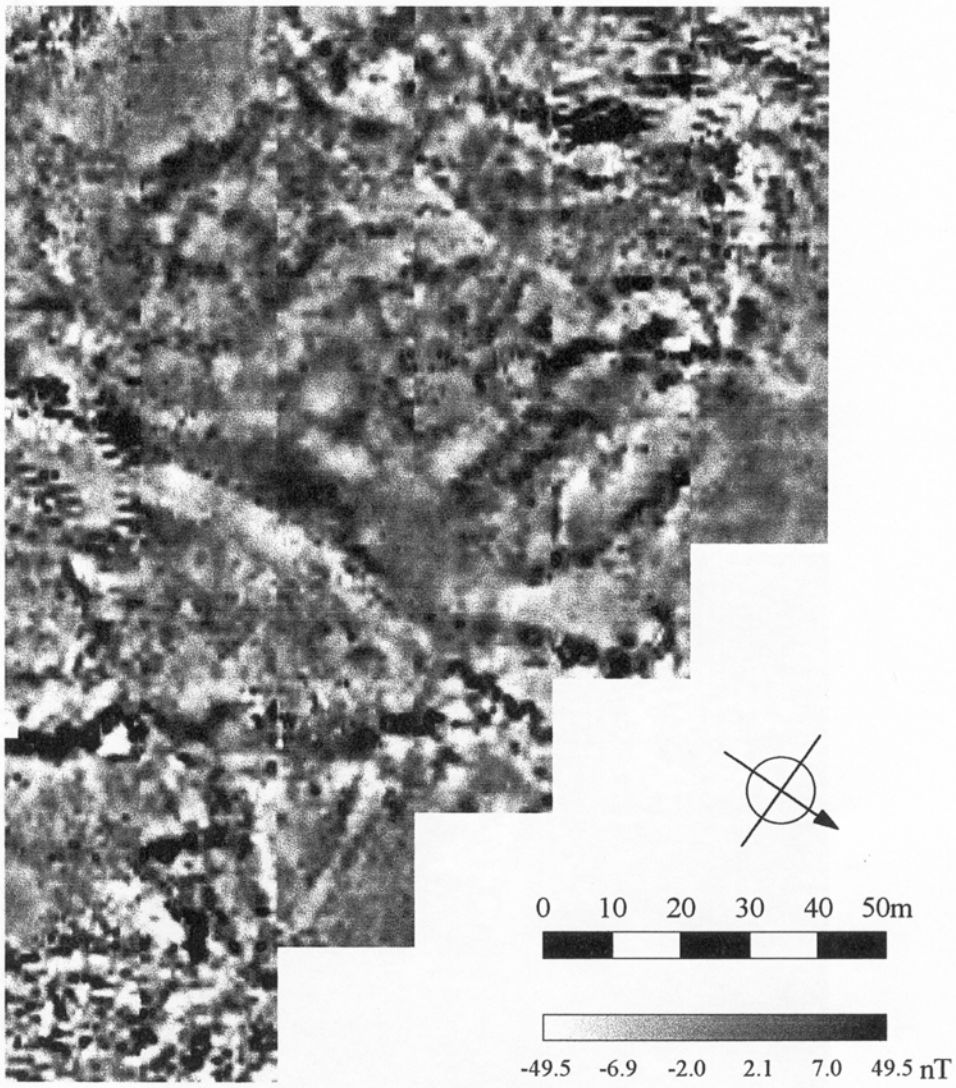


Figure 13

SAM 6394 Haddington - Traprain Law Environs Project

Geomagnetic survey, 1:1000

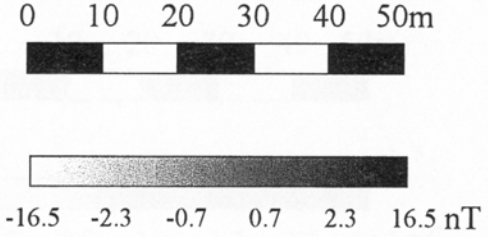


Figure 14

Sam 8776 Nunraw Barns - Traprain Law Environs Project

Geomagnetic survey, 1:1000

Figure 1:

SAM 4108 Hedderwick - Traprain Law Environs Project

Geomagnetic survey, 1:1000

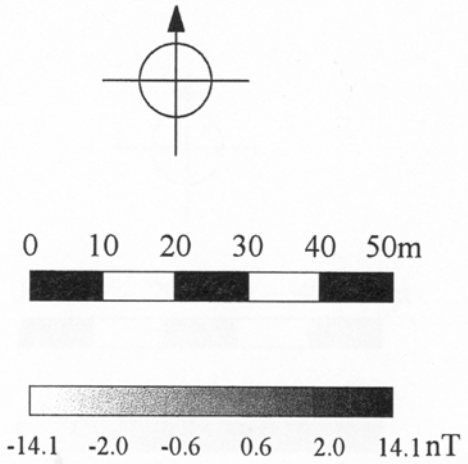


Figure 16

SAM 5823 Sixpence Strip - Traprain Law Environs Project

Geomagnetic survey, 1:1000

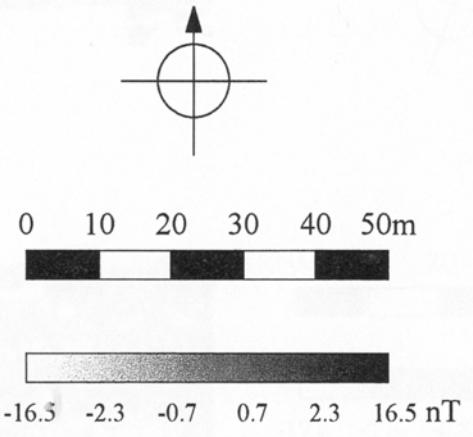


Figure 17

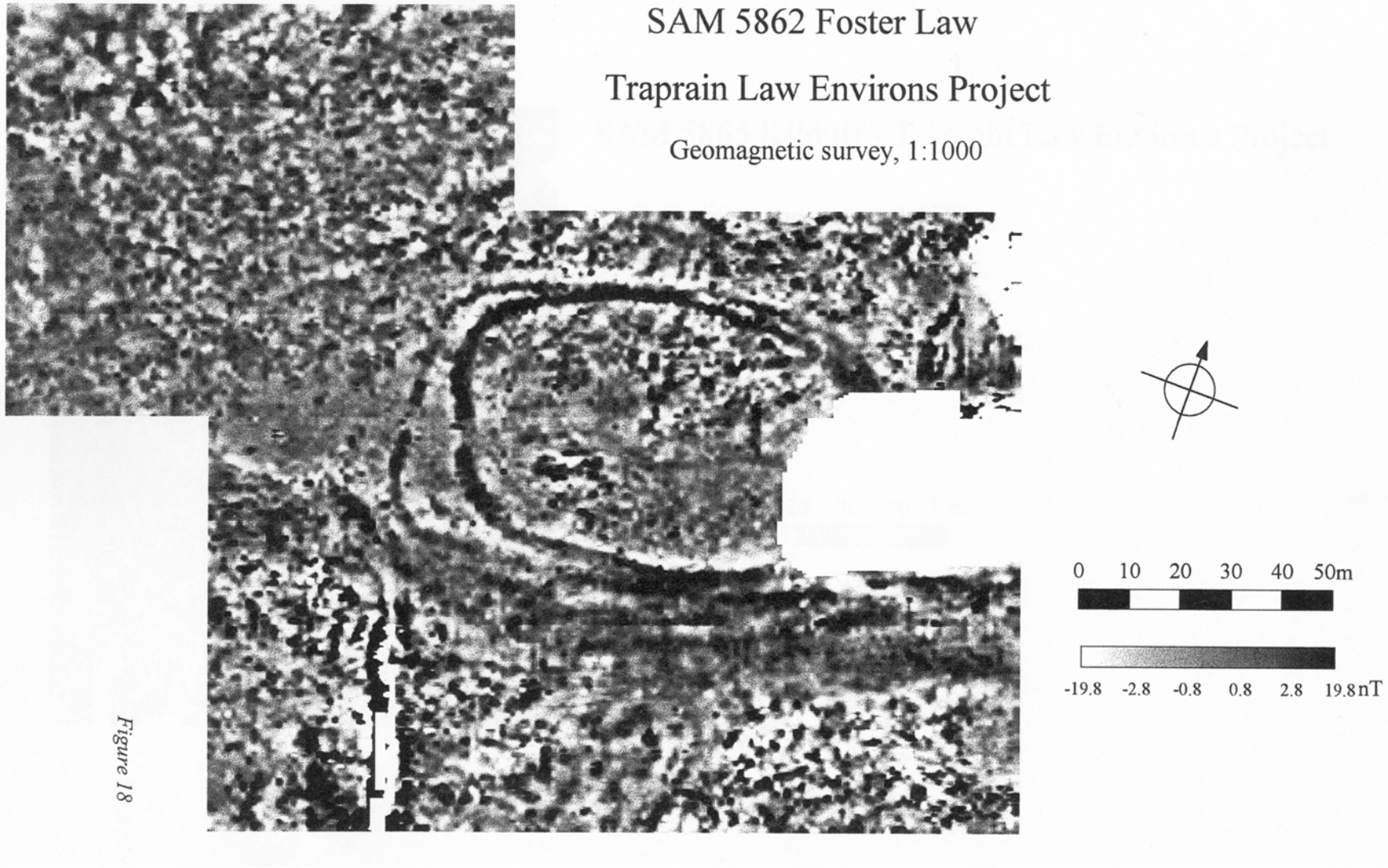
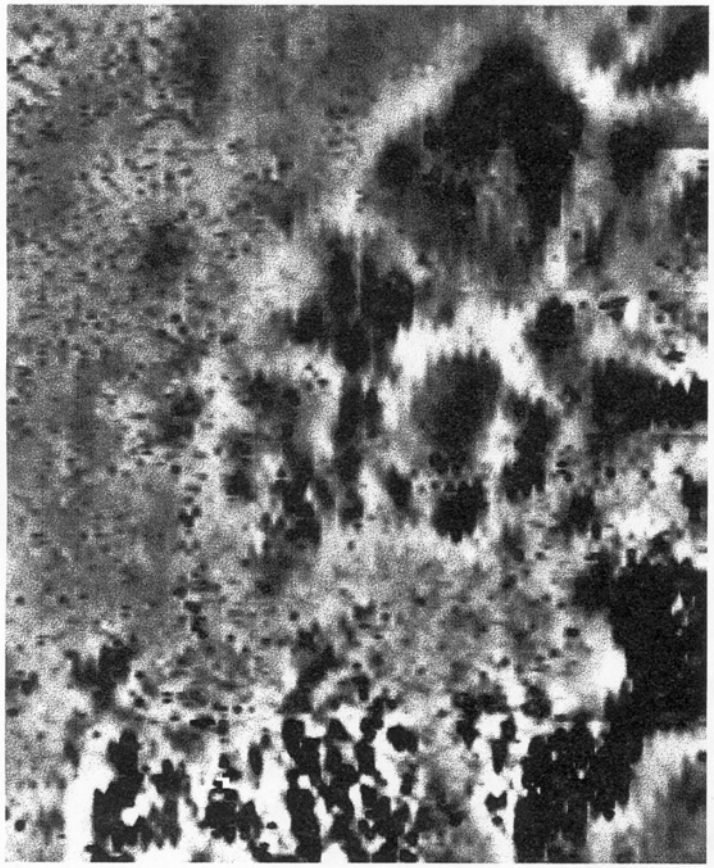
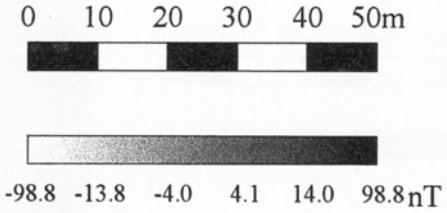

SAM 5862 Foster Law
Traprain Law Environs Project
Geomagnetic survey, 1:1000
0 10 20 30 40 50m
-19.8 -2.8 -0.8 0.8 2.8 19.8nT

Figure 18



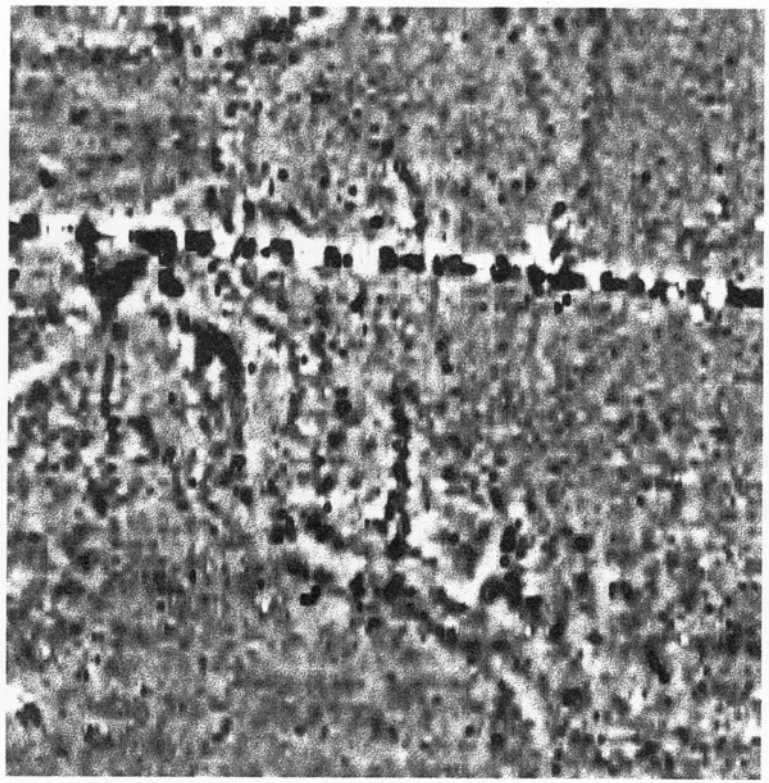
SAM 5865 Kilduff - Traprain Law Environs Project

Geomagnetic survey, 1:1000



Figure

SAM 5866 Newmains - Traprain Law Environs Project



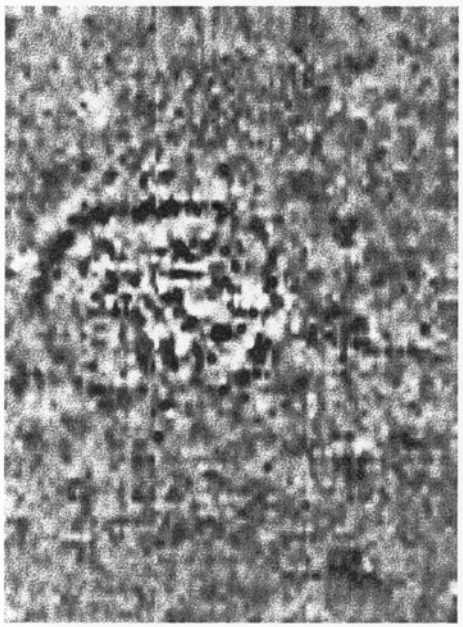
Geomagnetic survey, 1:1000

0 10 20 30 40 50m

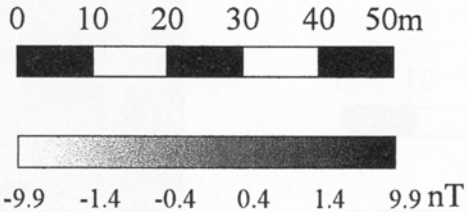
-16.5 -2.3 -0.7 0.7 2.3 16.5 nT

Figu

SAM 5927 (C) Stevenson Mains - Traprain Law Environs Project

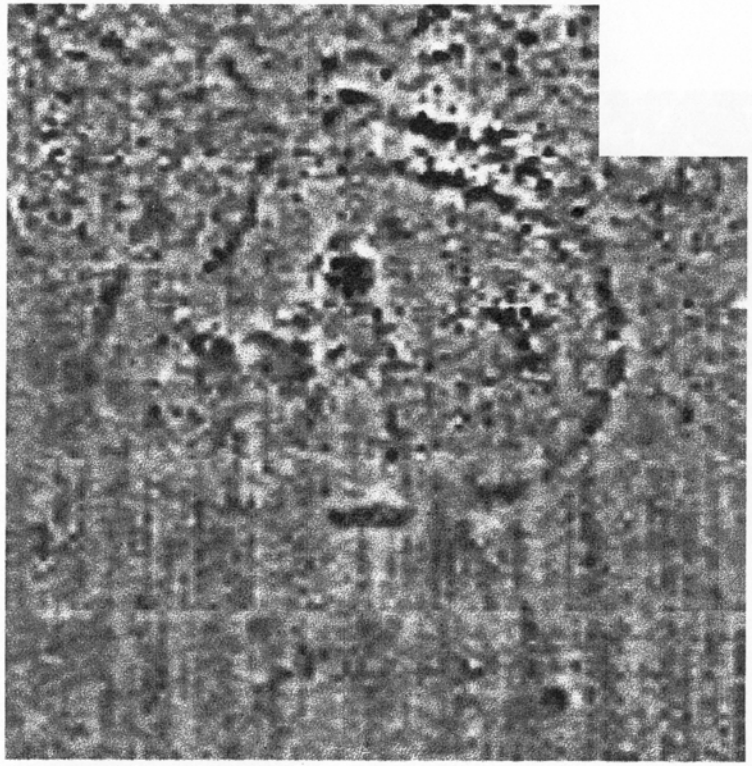


Geomagnetic survey, 1:1000



SAM 5940 Northrig - Traprain Law Environs Project

Geomagnetic survey, 1:1000



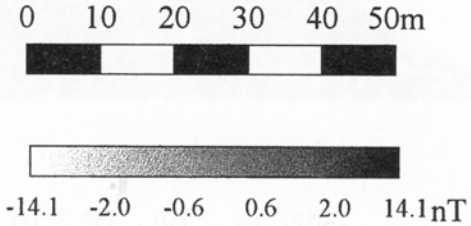
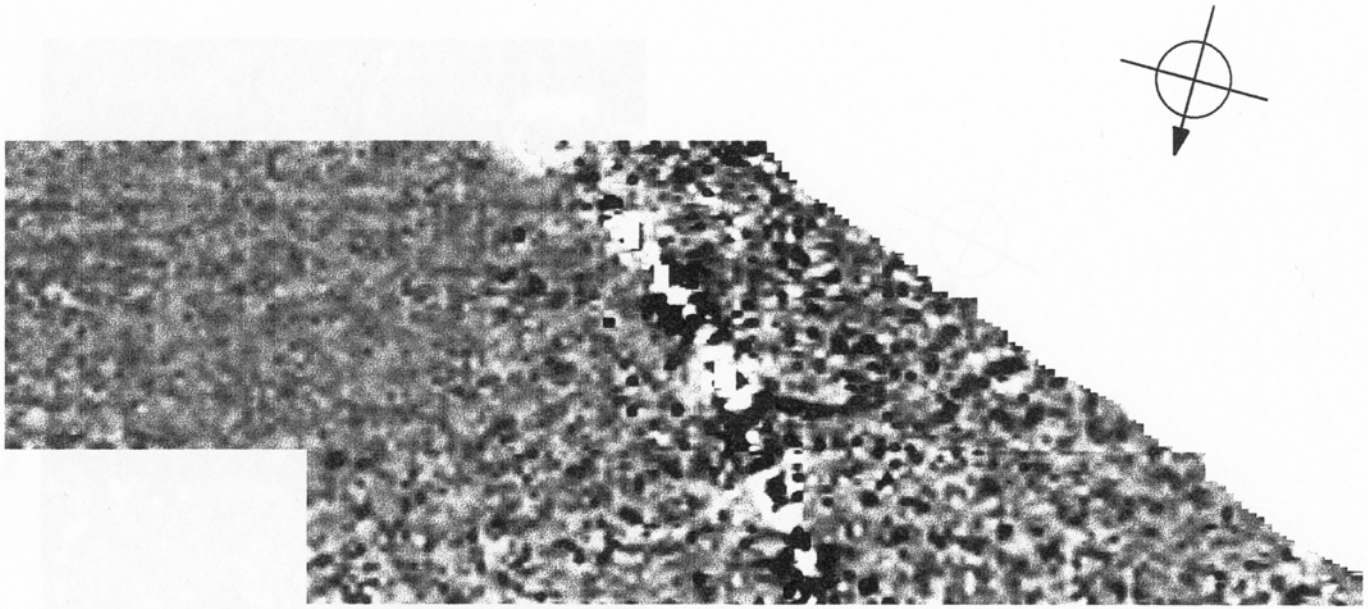


Figure 22

SAM 5941 Coldale 1 - Traprain Law Environs Project

Geomagnetic survey, 1:1000



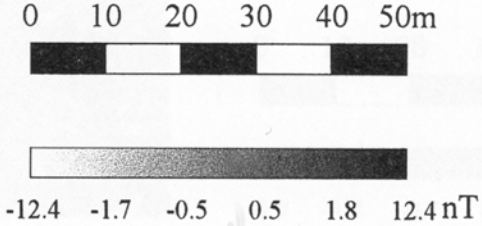
-14.1 -2.0 -0.6 0.6 2.0 14.1 nT

0 10 20 30 40 50m

Figur

SAM 5942 Coldale 2 - Traprain Law Environs Project

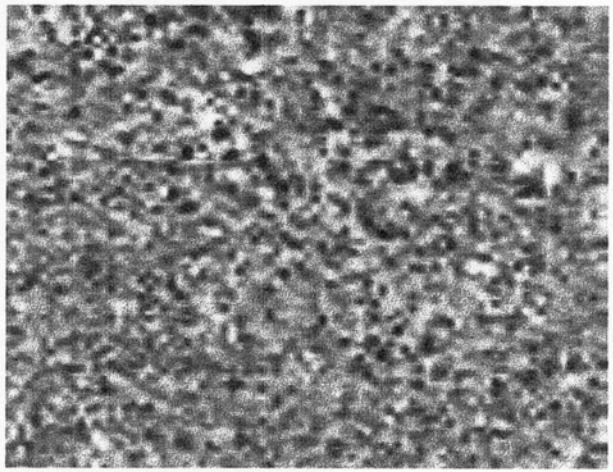
Geomagnetic survey, 1:1000

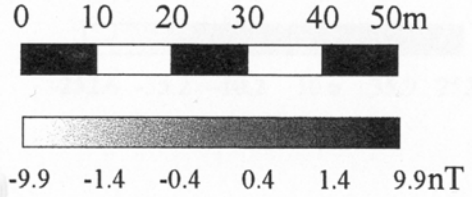


Figure

SAM 6021 Mitchell Hall 1/East Lodge - Traprain Law Environs Project

Geomagnetic survey, 1:1000

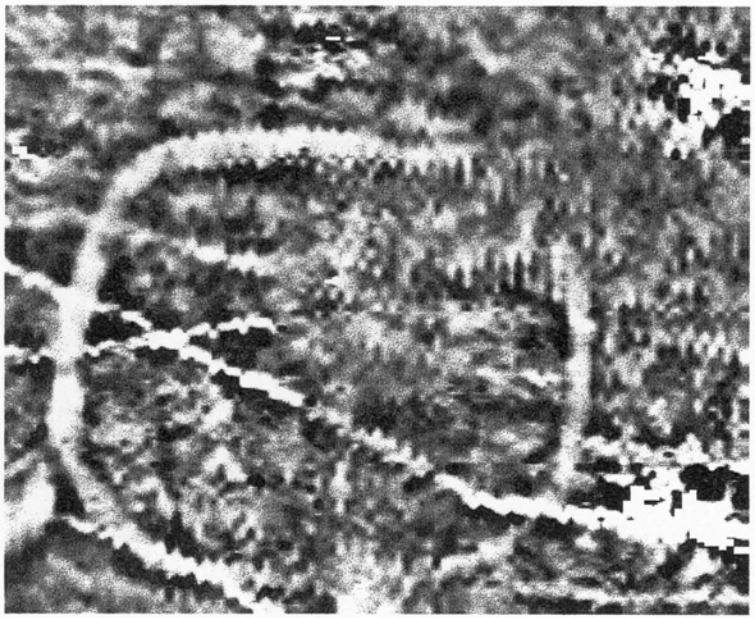




Figure

SAM 6023 Chesters Quarry - Traprain Law Environs Project

Geomagnetic survey, 1:1000



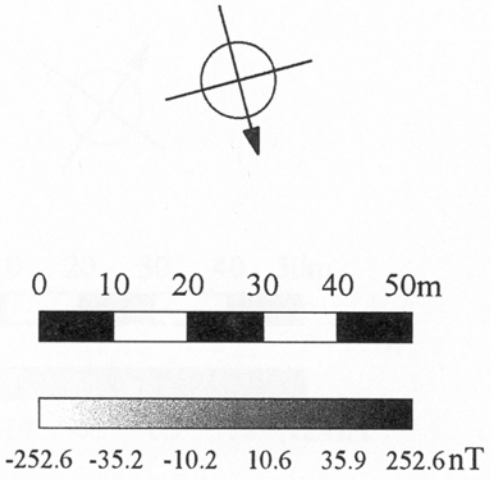
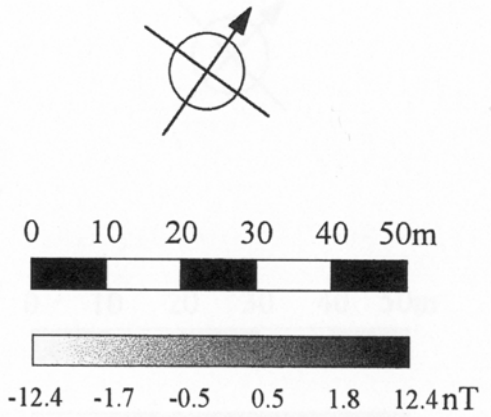


Figure 26

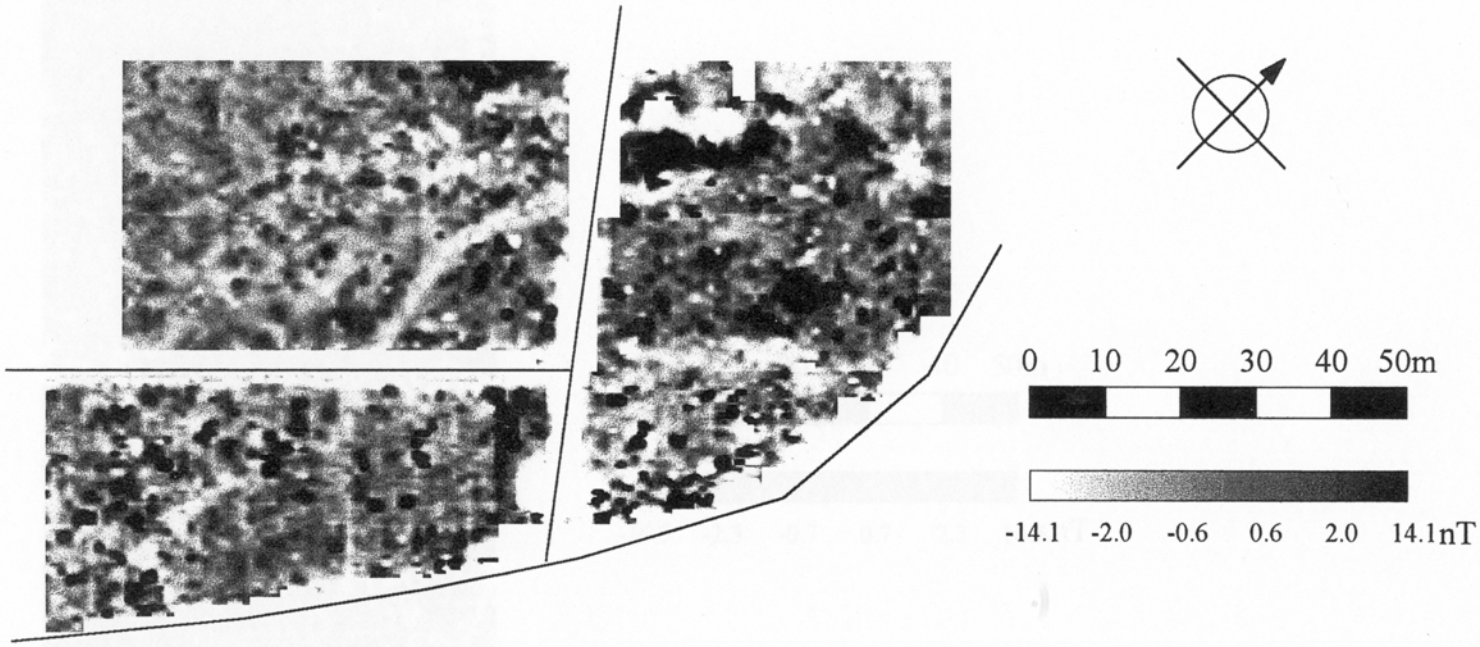
SAM 6050 Standingstone - Traprain Law Environs Project

Geomagnetic survey, 1:1000



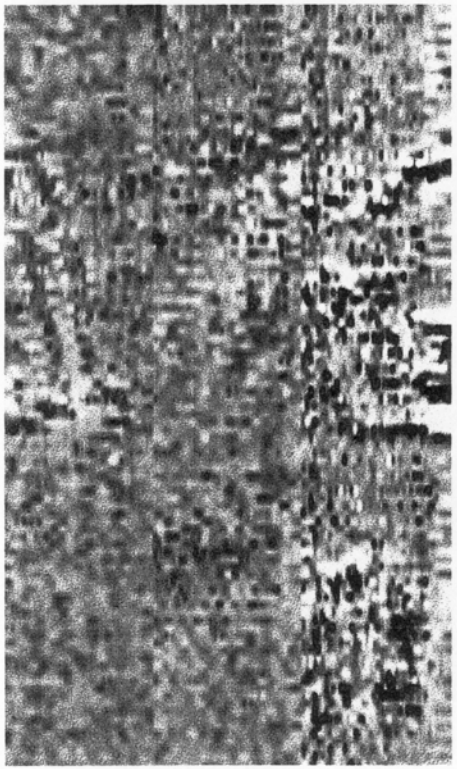
SAM 6067 Whittinghame Tower - Traprain Law Environs Project

Geomagnetic survey, 1:1000



SAM 5868 Preston Mains - Traprain Law Environs Project

Geomagnetic survey, 1:1000



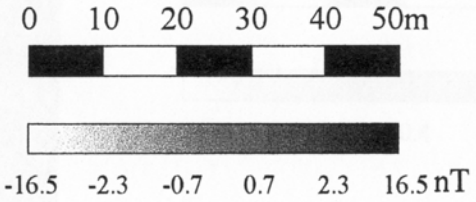


Figure 2

SAM 5874 Tyninghame 1 - Traprain Law Environs Project

Geomagnetic survey, 1:1000

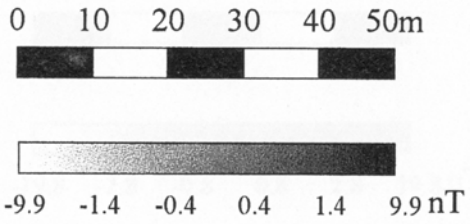


Figure 30

SE 103 Sled Hill - Traprain Law Environs Project

Geomagnetic survey, 1:1000