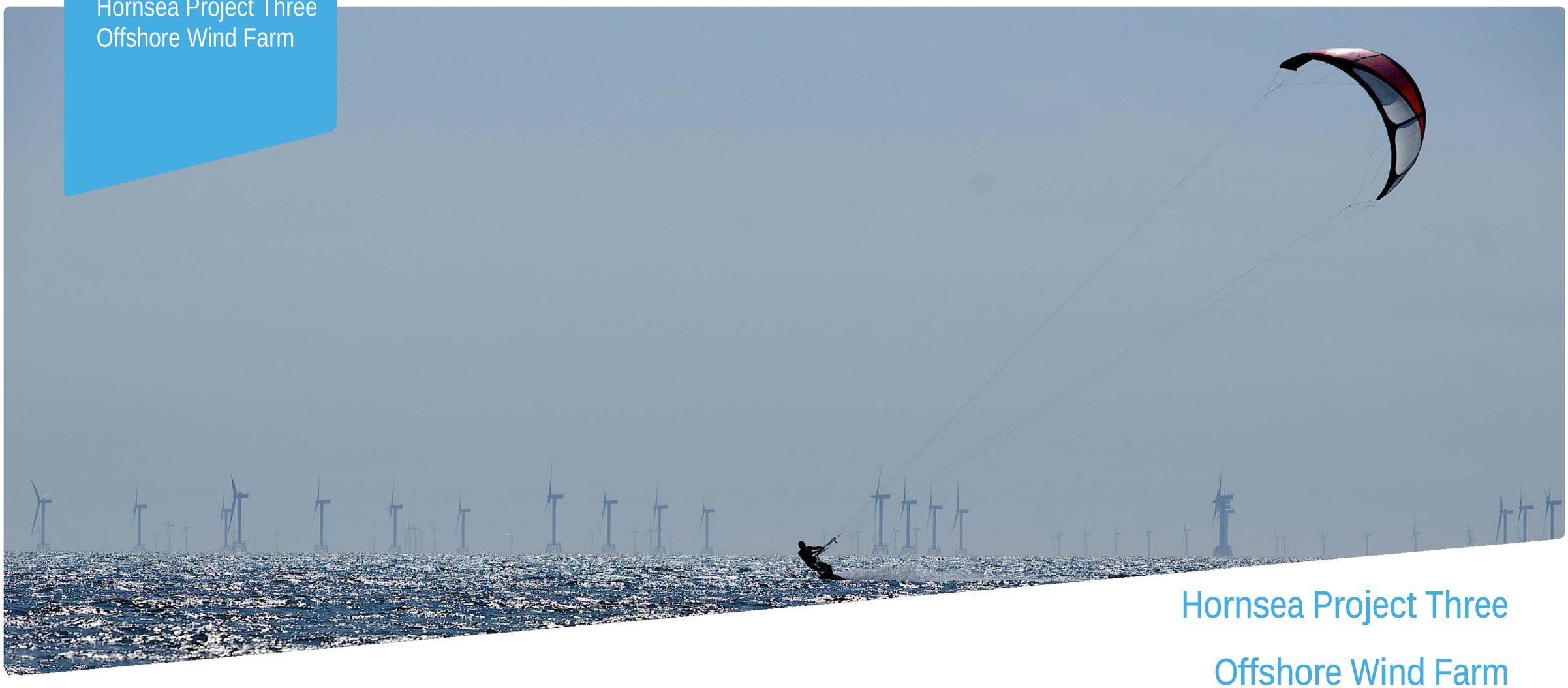
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Environmental Statement
Volume 6, Annex 5.6 – Onshore Geophysical Survey Report

PINS Document Reference: A6.6.5.6
APFP Regulation 5(2)(a)

Date: May 2018

Hornsea 3
Offshore Wind Farm

Ørsted

Environmental Impact Assessment

Environmental Statement

Volume 6

Annex 5.6 – Onshore Geophysical Survey Report

Report Number: A6.6.5.6

Version: Final

Date: May 2018

This report is also downloadable from the Hornsea Project Three offshore wind farm website at:
www.hornseaproject3.co.uk

Ørsted

5 Howick Place,

London, SW1P 1WG

Front cover picture: Kite surfer near a UK offshore wind farm © Orsted Hornsea Project Three (UK) Ltd., 2018.

Hornsea Project Three

Onshore Geophysical Survey Report

May 2018

Client: Orsted Power (UK) Ltd

OA East Report No: 2082
OA Reference No: XNFHNT17
NGR: TG 23956 01617

Client Name:	Orsted Power (UK) Ltd
Client Ref No:.	HOW03
Document Title:	Hornsea Project Three Onshore Geophysical Survey
Document Type:	Geophysical Survey Report
Report No.:	2049
Grid Reference:	Multiple
Planning Reference:	Pre-application
Site Code:	ENF141716 and ENF142802
Invoice Code:	XNFHNS17
OASIS Reference:	oxfordar3-274793
OA Document File Location:	X:\Active Projects_Use KT\Norfolk\XNFHNT17_Hornsea 03\Project Reports
OA Graphics File Location:	X:\Active Projects_Use KT\Norfolk\XNFHNT17_Hornsea 03\Project Data\Graphics
Issue No:	4
Date:	May 2018
Prepared by:	Rebecca Davis (SUMO Services) and Matt Brudenell (Senior Project Manager)
Checked by:	Matt Brudenell (Senior Project Manager)
Edited by:	Aileen Connor (Senior Project Manager)
Approved for Issue by:	Paul Spoerry (Senior Project Manager)
Signature:	

.....

OA South
Janus House
Osney Mead
Oxford
OX2 0ES

t. +44 (0)1865 263 800

OA East
15 Trafalgar Way
Bar Hill
Cambridge
CB23 8SG

t. +44 (0)1223 850 500

OA North
Mill 3
Moor Lane Mills
Moor Lane
Lancaster
LA1 1QD
t. +44 (0)1524 880 250

e. info@oxfordarch.co.uk
w. oxfordarchaeology.com
Oxford Archaeology is a registered Charity: No. 285627

Hornsea Project Three Onshore Geophysical Survey

Geophysical Survey Report

Prepared by Rebecca Davies BSc and Matt Brudenell BA PhD

Contents

List of Figures

List of Tables

Summary

Oxford Archaeology East (OA East) was contracted by Orsted Hornsea Project Three (UK) Limited on behalf of Orsted Power (UK) Limited to undertake a geophysical (magnetometer) survey of a number of areas of potential archaeological interest in proximity to the onshore components of the Hornsea Project Three Offshore Wind Farm (hereafter referred to as 'Hornsea Three'). The survey was undertaken to inform the Environmental Statement (particularly volume 3, chapter 5: Historic Environment) for the Hornsea Three development consent application.

Between February and October 2017, SUMO Services Limited, managed by OA East, conducted a detailed magnetometer survey over approximately 145ha of mixed arable and pastoral farmland. The survey targeted 20 areas between Weybourne (TG 1181 4319) in the north to Swainsthorpe (TG 2186 0194) in the south.

Archaeological anomalies were identified across 12 of the 20 areas surveyed, many of which correspond to cropmarks previously recorded from aerial photography, and documented in the Norfolk Historic Environment Record (NHER).

A total of six possible Bronze Age ring ditches in Salle (TG 1128 2555), Attlebridge (TG 1257 1715), Ringland (TG 1249 1346) and Ketteringham (TG 1808 0368) were identified; all expect one having been previously recorded. A D-shaped enclosure of possible Iron Age date was also identified at Saxthorpe (TG 1072 3093). At Booton (TG 1249 2425) and Swardeston (TG 2106 0350), Roman Roads have tentatively been identified, whilst a series of linear and rectilinear boundaries and enclosures suggestive of Roman-British occupation were recorded at Weybourne.

At Basconsthorpe (TG 1170 3831) a possible medieval building was identified, with further zones of potential medieval occupation registering at Attlebridge and Saxthorpe. A series of medieval agricultural remains have also been identified at Little Melton (TG 1539 0677), with a possible former churchyard boundary recorded at Salle Church (TG 1115 2491).

The surveys at Edgefield (TG 1008 3548), Barningham (TG 1127 3321), Corpusty (TG 1075 3182), Swainsthorpe, Wood Dalling (TG 1002 2776), Little Melton (TG 1519 0663) and two areas in Lower Bodham (TG 1154 3979 and TG 1185 3936) revealed no anomalies of likely archaeological features. Instead, natural responses, areas of modern disturbance and modern ploughing were recorded. The remaining features detected across the other survey areas include evidence of ploughing, former field boundaries recorded on historic Ordnance Survey maps, land drains, underground services and disturbance from nearby ferrous metal objects.

Acknowledgements

OA East would like to thank Jennifer Brack and Sarah Drljaca of Orsted Power (UK) Limited for commissioning the survey and Peter Gaches of GoBe for assistance during the project. Thanks are also extended to Andrew Guyton, Kieran Bell, Henry Burrows and Richard Grist of Orsted Power (UK) Limited, and Joshua Clarke-Davis and Ned Gemmill of Dalcour Maclaren.

The survey project was managed for Oxford Archaeology by Dr Matthew Brudenell, whilst the survey was managed by David Elks and Simona Haddrell of SUMO Services Limited. The day-to-day running of the project was co-ordinated by Rebecca Davies of SUMO Services Limited, supported by field co-ordinators Joe Perry, Olivier Vansassenbrouck, Adam Clark and Jonathan Hunter Thanks are also extended to the SUMO Services field team surveyors, Tom Cockroft, Stephanie Rhodes, James Lorimer, Rebecca Vickers, Jose Almendros Fernandez, Andrew Edwards and David Stockwell. Graphics and geomatics support was provided by Gillian Greer, Gareth Rees and David Brown of OA East.

1 INTRODUCTION

1.1.1 OA East was commissioned by Orsted Hornsea Project Three (UK) Limited on behalf of Orsted Power (UK) Limited to undertake a programme of archaeological geophysical surveying.

1.1.2 The study area for the geophysical survey was initially determined based on a wide search area identified for the Hornsea Three onshore export cable route (the 200 m wide PEIR onshore cable corridor) and multiple HVAC booster station and onshore HVDC converter/HVAC substation option sites. It is noted that during the course of the survey period, the design was refined such that some areas surveyed are no longer within the footprint of the onshore components of Hornsea Three as described in volume 1, chapter 3: Project Description of the Environmental Statement and shown in Fig 1. Where surveyed areas are no longer within the application boundary, this has been identified within this report (Table 1). The survey was carried out by SUMO Services Limited, commissioned and managed by OA East.

1.1.3 Hornsea Three is a Nationally Significant Infrastructure Project (NSIP), which includes an onshore cable corridor approximately 55km in length, linking a landfall site near Weybourne on the north Norfolk Coast to an onshore HVDC converter/HVAC substation site before making grid connection at National Grid's Norwich Main substation, located just south of Norwich City.

1.1.4 The results of the geophysical survey reported in this annex have been used to inform the assessment presented in volume 3, chapter 5: Historic Environment of the Environmental Statement.

1.2 Scope of work

1.2.1 The scope of work for the geophysical survey was set out in a Written Scheme of Investigation by OA East (Brudenell 2017). This was prepared in accordance with the document 'Brief for Archaeological Geophysical Survey' (RPS 2016, revised 2017), with areas selected following the outputs of a fieldwalking survey, documented in volume 6, annex 5.2: Fieldwalking Report of the Environmental Statement. The brief was prepared in consultation with James Albone of the Norfolk County Council Historic Environment Service (NHES).

1.2.2 Twenty areas (GS01-20) within the study area were defined for geophysical survey in January 2017, with an additional six areas (GS21-26) added in September 2017 following design refinement and further consultation with the NHES (Fig. 1, Table 1).

1.2.3 Due to a combination of access issues, crops and livestock, however, the survey was restricted to total of twenty areas, detailed in Table 2 (Fig. 2). These are located between Weybourne in the district of North Norfolk, to Swainsthorpe in South Norfolk District, with the survey conducted in two parts between 20 February-24 March, and the 11-26 October 2017.

1.2.4 Of the areas that could not be surveyed, GS3 is no longer within the footprint of the onshore components of Hornsea Three, whilst GS14, GS15, GS19, GS21 and GS24 are only partly within the footprint.

Table 1. Geophysical survey areas

Survey area no.	Area name	NGR	Size (ha)	Parish	Relationship to footprint of the onshore components
GS01	Weybourne	TG 1181 4319	13.63	Weybourne	Outside
GS02	Baconsthorpe	TG 1170 3831	16.79	Baconsthorpe	Inside
GS03	Hempsted	TG 0952 3779	2.51	Hempsted	Outside
GS04	Edgefield	TG 1008 3548	12.10	Edgefield	Outside
GS05	Barningham	TG 1127 3321	6.99	Barningham	Inside
GS06	Corpusty	TG 1075 3182	17.07	Corpusty	Partly inside
GS07	Saxthorpe	TG 1072 3093	12.73	Saxthorpe	Inside
GS08	Salle	TG 1128 2555	3.17	Salle	Outside
GS09	Salle Church	TG 1115 2491	3.62	Salle	Outside
GS10	Booton Church	TG 1249 2425	2.93	Booton	Inside
GS11	Alderford	TG 1226 1859	3.05	Alderford	Inside
GS12	Attlebridge	TG 1257 1715	21.47	Attlebridge/ Morton on the Hill	Inside
GS13	Ringland	TG 1249 1346	2.26	Ringland	Partly inside
GS14	Easton	TG 1280 1090	0.89	Easton	Partly inside
GS15	Broom Farm	TG 1279 1045	3.08	Easton	Partly inside
GS16	Little Melton	TG 1539 0677	4.17	Little Melton	Outside
GS17	Ketteringham	TG 1808 0368	1.71	Ketteringham	Outside
GS18	Mangreen South	TG 2106 0350	9.98	Swardeston	Inside
GS19	Mangreen Hall	TG 2141 0282	11.31	Swardeston	Partly inside
GS20	Swainsthorpe	TG 2186 0194	16.30	Swardeston	Partly inside
GS21	Kelling	TG 0934 4230	1.91	Kelling	Inside
GS22	Wood Dalling	TG 1002 2776	8.11	Wood Dalling	Partly inside
GS23	Little Melton Church Farm	TG 1519 0663	2.33	Little Melton	Partly inside
GS24	High Kelling	TG 1107 4004	2.16	High Kelling	Inside
GS25	Lower Bodham	TG 1154 3979	3.73	Lower Bodham	Outside
GS26	Pine Farm	TG 1185 3936	1.25	Lower Bodham	Outside
TOTAL	-	-	**185.25**	-	-

Table 2. Areas surveyed

Survey area no.	Area name	NGR	NHES Event no.	Size (ha)	Parish	Area surveyed (ha)
GS01	Weybourne	TG 1181 4319	ENF141716	13.63	Weybourne	12.67
GS02	Baconsthorpe	TG 1170 3831	ENF141716	16.79	Baconsthorpe	13.79
GS04	Edgefield	TG 1008 3548	ENF141716	12.10	Edgefield	11.34
GS05	Barningham	TG 1127 3321	ENF141716	6.99	Barningham	6.73
GS06	Corpusty	TG 1075 3182	ENF141716	17.07	Corpusty	15.71
GS07	Saxthorpe	TG 1072 3093	ENF141716	12.73	Saxthorpe	11.16
GS08	Salle	TG 1128 2555	ENF141716	3.17	Salle	3.59
GS09	Salle Church	TG 1115 2491	ENF141716	3.62	Salle	1.29
GS10	Booton Church	TG 1249 2425	ENF141716	2.93	Booton	2.97
GS11	Alderford	TG 1226 1859	ENF141716	3.05	Alderford	3.01

Survey area no.	Area name	NGR	NHES Event no.	Size (ha)	Parish	Area surveyed (ha)
GS12	Attlebridge	TG 1257 1715	ENF141716	21.47	Attlebridge/ Morton on the Hill	15.86
GS13	Ringland	TG 1249 1346	ENF141716	2.26	Ringland	2.88
GS16	Little Melton	TG 1539 0677	ENF141716	4.17	Little Melton	4.35
GS17	Ketteringham	TG 1808 0368	ENF141716	1.71	Ketteringham	2.18
GS18	Mangreen South	TG 2106 0350	ENF141716	9.98	Swardeston	6.44
GS20	Swainsthorpe	TG 2186 0194	ENF141716	16.30	Swardeston	15.12
GS22	Wood Dalling	TG 1002 2776	ENF142802	8.11	Wood Dalling	8.34
GS23	Little Melton Church Farm	TG 1519 0663	ENF142802	2.33	Little Melton	2.46
GS25	Lower Bodham	TG 1154 3979	ENF142802	3.73	Lower Bodham	3.87
GS26	Pine Farm	TG 1185 3936	ENF142802	1.25	Lower Bodham	1.20
TOTAL	-	-		**163.39**	-	**144.96**

1.3 Characteristics of the survey area

1.3.1 The study area crosses over the Cromer Ridge and through loamy soils of north-west Norfolk, across the Wensum Sands of Low Norfolk and then onto the boulder clay plateau. A summary of the geology, soils and topography of each of the survey areas is given in Table 3 below.

Table 3. Summary of geology, soils and topography of surveyed areas

Survey area no.	Superficial geology (BGS 2017)	Solid geology (BGS 2017)	Soil Association (SSEW 1983)	Topography and landuse
GS01	Sand and gravels of The Briton's Land Sand and Gravel Member	Sand and gravel of the Wroxham Crag Formation	Newport 1 (551d)	Gently sloping, 22-26m OD, arable
GS02	Till/Diamicton of the Weybourne Town Till Member, and sand and gravels of The Briton's Land Sand and Gravel Member	Chalk of the Lewes Nodular Chalk Formation.	Wick 2 (541s)	Gently sloping, 59-65m OD, arable
GS04	Sand and gravels of The Briton's Lane Sand and Gravel Member	Chalk of the Lewes Nodular Chalk Formation.	Newport 4 (551g)	Broadly flat, 84-85m OD, arable
GS05	Till/Diamicton and glaciofluvial sand and gravels	Chalk of the Lewes Nodular Chalk Formation.	Wick 3 (541t)	Gently sloping, 54-57m OD, arable
GS06	Till/Diamicton, glaciofluvial sand and gravels, and alluvium	Chalk of the Lewes Nodular Chalk Formation	Wick 3 (541t)	Sloping toward valley at centre of area, 37-52m OD, arable with floodplain pasture.

Survey area no.	Superficial geology (BGS 2017)	Solid geology (BGS 2017)	Soil Association (SSEW 1983)	Topography and landuse
GS07	Till/Diamicton, glaciofluvial sand and gravels, and alluvium	Chalk of the Lewes Nodular Chalk Formation	Wick 3 (541t), Hanworth (871c)	Sloping toward valley to the south, 31-40m OD, arable
GS08	Till/Diamicton	Chalk of the Lewes Nodular Chalk Formation	Burlingham 1 (572n)	Gently sloping, 35-41m OD, arable.
GS09	Till/Diamicton and glaciofluvial sand and gravels.	Chalk of the Lewes Nodular Chalk Formation	Burlingham 1 (572n)	Gently sloping, 50-45m OD, arable.
GS10	Till/Diamicton	Sand and gravel of the Wroxham Crag Formation	Newport 3 (551f)	Gently sloping, 42-47m OD, arable.
GS11	Sand and gravels of the Sheringham Cliffs Formation	Chalk of the Lewes Nodular Chalk Formation	Isleham 2 (861b)	Sloping towards valley to the south-east, 16-25m OD, arable
GS12	River Terrace Deposits of sands and gravels and Brickearth	Chalk of the Lewes Nodular Chalk Formation	Newport 4 (551g), Adventurers' 2 (1024b)	Sloping toward valley floor, 11-14m OD, arable and pasture
GS13	Sand and gravels of the Sheringham Cliffs Formation	Chalk of the Lewes Nodular Chalk Formation	Newport 4 (551g)	Gently sloping, 34-37m OD, arable
GS16	Diamicton	Chalk of the Lewes Nodular Chalk Formation	Burlingham 1 (572n)	Broadly flat, 37-39m OD, arable
GS17	Sand and gravels of the Sheringham Cliffs Formation	Chalk of the Lewes Nodular Chalk Formation	Burlingham 1 (572n)	Broadly flat, 36-38m OD, arable
GS18	Diamicton	Chalk of the Lewes Nodular Chalk Formation	Burlingham 3 (572p)	Gently sloping, 39-34m OD, arable.
GS20	Diamicton	Chalk of the Lewes Nodular Chalk Formation	Burlingham 3 (572p)	Broadly flat, 28-30m OD, arable
GS22	Sands, gravels and Head depoists of the Sheringham Cliffs Formation	Sand and gravel of the Wroxham Crag Formation	Wick 2 (541s)	Gently sloping, 44-49m OD, arable
GS23	Diamicton	Chalk of the Lewes Nodular Chalk Formation	Burlingham 1 (572n)	Gently sloping, 32-38m OD, arable
GS25	Sand and gravels of The Briton's Lane Sand and Gravel Member	Chalk of the Lewes Nodular Chalk Formation	Newport 3 (551g)	Gently sloping, 60-65m OD, arable
GS26	Sand and gravels of The Briton's Lane Sand and Gravel Member	Chalk of the Lewes Nodular Chalk Formation	Newport 3 (551g)	Broadly flat, 62-64m OD, arable

1.4 Archaeological and historical background

1.4.1 The following section provides a brief description of the known heritage assets within the vicinity of each surveyed area, using data obtained from the Norfolk Historic Environment Record (NHER; Licence numbers 442 and 553, obtained 07/02/2017 and 06/11/2017). The proposed onshore components of Hornsea Three have also been subject to a desk based heritage assessment prepared by RPS (see volume 6, annex 5.1: Desk Based Assessment of the Environmental Statement), and the relevant results are included below.

Area GS01: Weybourne

1.4.2 This survey area falls within a large sub-rectangular field where cropmarks of a possible Bronze Age ring-ditch (NHER 38341), Roman enclosure and ditched boundary systems have been identified (NHER 38342). Field walking of the plot recovered worked flint and post-medieval pottery (NHER 51037; 51038), whilst metal detecting yielded a range of objects, including Iron Age and Roman brooches, Roman, medieval and post-medieval coins, and other Saxon and medieval artefacts (NHER 29808; 29098).

1.4.3 Along the southern edge of the field a watching brief revealed truncated remains of a medieval corn-drying oven and field boundaries, superimposed over the edge of a possible Iron Age settlement (NHER 34702)

Area GS02: Baconsthorpe

1.4.4 This survey area is located in fields immediately west of Baconsthorpe Castle and Baconsthorpe Hall (NHER 6561), crossing three fields and is broadly rectangular. Field walking and previous survey in the east of the area has revealed evidence for a medieval building visible as parchmarks (NHER 32947). Complete medieval bricks, roof tiles, floor tiles, and post-medieval finds have been recovered from the area.

1.4.5 In fields to the west, a complex of cropmarks representing multi-period activity have been recorded. These comprise a possible park boundary, an undated square enclosure and an undated field system (NHER 36425). Field walking to the south recovered a sherd of Roman pottery (NHER 33001).

Area GS04: Edgefield

1.4.6 This survey area falls within a large sub-rectangular field where cropmarks of a rectilinear boundary system and possible enclosure are visible. Stray finds of Neolithic flint work have been recorded to the south of the area (NHER 6645; 3499), whilst pieces of medieval glazed and unglazed pottery were found in fields to the north-west (NHER 12967).

Area GS05: Barningham

1.4.7 This survey area is broadly rectangular and crosses two fields. In the southern field/southern half of the survey area a prehistoric flint flake and a scraper have been recovered (NHER 38157). In the northern field/northern half of the survey area metal detecting has yielded finds dating from the prehistoric to the post-medieval periods (NHER 31861). Artefacts recovered included a prehistoric worked flint, part of an Iron Age horse harness fitting, and Roman, medieval and post medieval coins. Stoke Hall

was located 750m south of the area, the exact date of the origins of this hall is unknown but it was rebuilt in 1852. A number of farm buildings were also associated with this hall.

Area GS06: Corpusty

1.4.8 This linear survey area crosses sections of eight separate fields, all of which have been subject to metal detection, resulting in an array of multi-period finds (NHER 6671; 32727; 33443; 32150; 33386; 31859; 32872; 31877). Collectively, the prehistoric finds include Mesolithic and Neolithic worked flints, a Neolithic polished axehead, and Bronze Age spear head. Roman finds comprise coins, brooches, pottery, a ring and a cosmetic palette, whist Saxon finds include coins, a coptic bowl, brooches, a pendant and buckle. Medieval and later finds include coins, tokens, buckles, mounts and other metalwork.

Area GS07: Saxthorpe

1.4.9 This survey area overlooks the River Bure to the south, and covers two fields. Metal-detecting and field walking within the survey area have yielded multi-period finds including prehistoric worked flints, Roman, Saxon and medieval metalwork including coins, dress accessories, fittings and harness pendants. The quantity and diversity of the medieval finds suggests that this may have been the site of a medieval settlement (NHER 6676; 32962; 37256; 33441).

1.4.10 Multi-period artefact scatters have also been recorded to the north by metal detecting, with finds including prehistoric worked flints, Roman coins and brooches, an Early Saxon coptic bowl and other Saxon metalwork, medieval buckles, coins and a pilgrim badge, and post-medieval coins and metalwork (NHER 33776; 32872; 31877).

1.4.11 Two parallel linear cropmarks are also visible on the area.

Area GS08: Salle

1.4.12 This survey area is located within a large sub-rectangular field, west of Stinton Hall Farm. Aerial photographs have revealed the cropmarks of two adjacent Bronze Age ring ditches within the survey area (NHER 56166). Metal detecting in the field has also recovered a range of objects, including a Roman belt fitting, a Late Saxon stirrup mount, medieval jettons, a seal matrix and a buckle frame (NHER 30972; 39225).

1.4.13 Metal detecting in fields to the east and south-east have yielded a similar range of artefacts, including two Neolithic polished flint axes, Roman, medieval and post-medieval coins, dress accessories, fittings and pottery fragments (NHER 30134; 38911). To the north and north-west, cropmarks of a possible field system have been recorded (NHER 32247; 35934).

Area GS09: Salle Church

1.4.14 This survey area is located between the 15th century church of St Peter and St Paul (NHER 7466) and the western boundary of Salle Park (NHER 30485). Metal detecting within the field of the survey area has yielded a range of objects, including a Neolithic flint core, Roman pottery, Saxon, medieval and post-medieval artefacts including coins, jettons, pottery fragments, a brooch and a finger ring.

1.4.15 Metal detecting and field walking in fields to the north, west and south has recovered prehistoric worked flints, Roman, medieval and post-medieval coins and pottery fragments, Saxon pottery fragments, a medieval brooch pin, harness mount and buckle, and post-medieval tokens (NHER 30134; 52813; 30975).

Area GS10: Booton Church

1.4.16 This survey area lies immediately east of St Michael and All Angel's Church (NHER 7472). Medieval and post-medieval coins and buttons have been recovered from metal detecting in the northern half of the survey area (NHER 50194). The line of a Roman Road is also projected as crossing the area (NHER 2796).

Area GS11: Alderford

1.4.17 This survey area crosses a large rectangular field where a swathe of cropmarks comprising fragmentary ditches belonging to a prehistoric or Roman field system have been recorded (NHER 53472), together with a pair of possible Bronze Age ring ditches and a square enclosure (NHER 53473). A large multi-period finds scatter has also been identified in the field by metal detecting (NHER 17747; 51585; 19642). Finds recovered include prehistoric worked flints, a fragment of a Bronze Age axe, a Roman brooch, and coins and pottery from the Roman, medieval and post-medieval periods. Similar multi-period metal finds, including Iron Age and Saxon artefacts and Roman tesserae, have been recovered from adjacent fields to the south and west (NHER 51584; 33640; 34149).

1.4.18 Other finds in the vicinity include stray finds of Neolithic flint axes and other flint artefacts to the east and south-east (NHER 28515; 7704) and multi-purpose metal detected finds to the north and east (NHER 39623; 51571; 51383; 19015).

Area GS12: Attlebridge

1.4.19 This survey area straddles the River Wensum, and crosses a major cropmark complex. A series of five ring ditches are visible on aerial photographs, indicating the presence of a former Bronze Age round barrow cemetery (NHER 50649; 17657, 21719, 30313, 50621, 50647). The cemetery is positioned to the immediate south of the River Wensum, along the valley floor and possibly on the edge of the river terrace. The cropmarks of a small square-ditched enclosure of possible Iron Age or Roman date has also been recorded within the survey area (NHER 50560). This is located immediately adjacent to one of the ring ditches (NHER 17657). Other cropmarks comprising linear ditches (NHER 50663), field, property and drainage boundaries (NHER 50648; 35933) are recorded; one appearing to divert around one of the ring ditches (NHER 21719).

1.4.20 Metal detecting in the south of the survey area has recovered a range of finds dating from the prehistoric to the post-medieval periods. They include a Neolithic flint blade, a Late Saxon strap end and Roman, Late Saxon, medieval and post-medieval pottery (NHER 29962).

Area GS13: Ringland

1.4.21 This survey area is located with a large triangular field, east of Blackbrek Plantation. A possible Bronze Age ring ditch is located within the survey area (NHER 7803), and sherd of Early Bronze Age pottery was found in its vicinity. Cropmarks of fragmentary

field boundaries and trackways have also been recorded either side of Honingham Lane (NHER 53632). Finds in the area include a large number of prehistoric worked flints and a late Saxon or medieval object (NHER 18054; 20013; 51122).

1.4.22 Immediately south-west of the survey area are World War One to Two date military training features (NHER 50618), including earthworks of gun emplacements, weapons pits, bomb craters and slit trenches.

Area GS16: Little Melton

1.4.23 This survey area is located between All Saint's Church (NHER 9421), which dates back to the 14th century, and a medieval moated site to the south (NHER 9411). Metal-detecting and field walking (NHER 19771; 22746; 22727; 22602) in the field that the survey area crosses have yielded prehistoric worked flints and Iron Age, Roman, Saxon and medieval pottery sherds. Metal finds include an Iron Age coin, Roman brooch, Saxon stirrup, medieval buckle and harness fitting.

1.4.24 Areas of the field were also subject to excavation as part of the Little Melton to Hethersett pipeline project (NHER ENF135278; Haskins 2016). This skimmed part of the northern edge of the survey area opposite All Saint's Church, before turning south along the line of the current field boundary that divides the survey area in two. The excavation revealed prehistoric to medieval remains, with the main phases of activity being Late Saxon to medieval in date. These included a series of boundary ditches aligned north to south and east to west; pits, postholes, a structure and other gullies indicative of occupation.

Area GS17: Ketteringham

1.4.25 This survey area is located within a L-shaped field, west of Cantley lane. A cropmark ring ditch, probably dating to the Bronze Age, is recorded within the area (NHER 18558). Mesolithic and Neolithic worked flints have been recorded in fields to the east and west of the area (NHER 23829; 25513; 22871; 22872).

Area GS18: Mangreen South

1.4.26 This survey area lies within an area rich in archaeological remains. Cropmarks of an undated rectangular enclosure have been recorded from aerial photographs of the area (NHER 11691). Field walking and metal detecting in advance of the Norwich Southern Bypass recovered prehistoric worked flints, a Bronze Age palstave, and Roman and medieval pottery and metalwork. The line of the Roman road from Caistor Roman town to the settlement and temple at Crownthorpe also crosses the survey area (NHER 52027).

1.4.27 To the north there are multi-period cropmarks (NHER 52130), including enclosures and fields of probable prehistoric and Roman date (NHER 9753; 52131, 52133). To the north-west investigations in advance of the construction of the Harford Park and Ride site revealed the presence of pits, ditches and post holes and structures of prehistoric and Roman date (NHER 39268). A large area of Roman settlement with enclosures, fields and an aisled building was also recorded (NHER 9753).

1.4.28 In fields to the south, metal detecting recovered medieval and post-medieval coins, tokens, dress accessories and other finds (NHER 28719).

Area GS20: Swainsthorpe

1.4.29 This survey area crosses a large field where cropmarks of fragmentary ditches and post-medieval field boundaries have been recorded (NHER 52080; 52079). To the south of the area, cropmarked ring-ditches have been identified, together with enclosures, boundaries, and remnants of possible medieval strip fields (NHER 11716; 52082; 52163). Roman pits and possible field boundaries have also been recorded to the north-west (NHER 57922).

Area GS22: Wood Dalling

1.4.30 This survey area traverses a large field north of Crabtree Farm. A cropmark of an undated curvilinear linear ditch has been recorded in the southern half of the area from aerial photography (NHER 35531). The southern tip of the survey area was also subject to previous geophysical, metal detecting and field walking surveys between 2002-2003 as part of the Bacton to King's Lynn pipeline project. Linear anomalies interpreted as the probable remains of a former field system were recorded in the field, and field walking and metal detecting recovered finds dating from the prehistoric to post-medieval periods. This included worked flint, a Bronze Age axe head, a Roman brick fragment, medieval and post-medieval pottery and ceramic building material (NHER 53841).

1.4.31 A similar suite of artefacts has been recovered immediately south of the survey area through a combination field walking and metal detecting (NHER 51507).

Area GS23: Little Melton Church Farm

1.4.32 This survey area is located across two fields on the south side of Great Melton Road opposite a medieval moated site (NHER 9411). Finds of Neolithic worked flint have been made to the south-west of the area (NHER 14533), whilst field walking to the north-east and east have yielded further prehistoric flints as well sherds of Late Saxon, medieval and post-medieval pottery (NHER 22602; 22746).

Area GS25: Lower Bodham

1.4.33 This survey area crosses a large rectangular field plot which has been subject to metal detecting and finds reporting between 2007 and 2015 (NHER 50182). Finds for the field include Roman, medieval and post-medieval coins, jettons and tokens. Iron Age to post-medieval dress accessories have also been recovered including brooches and a finger ring, together with an array of other medieval/post-medieval artefacts and fittings.

1.4.34 The survey area also clips an area of cropmarks comprising a large rectangular enclosure, cut to its west by a ring ditch. The large mark has been interpreted as a Roman signal station, or alternatively a defended Iron age enclosure (NHER 18191).

Area GS26: Pine Farm

1.4.35 This survey area straddles two fields; the western one having been subject to field walking and metal-detecting between 2008 and 2013. This has yielded multi-period finds (NHER 55107). Artefacts recovered include prehistoric worked flints dating from the Late Mesolithic to Early Bronze Age, Roman to post-medieval pottery sherds, a dispersed medieval coin hoard and other medieval/post-medieval metal objects.

1.4.36 A Bronze Age ring-ditch is also located to the west of the survey area (NHER 32229).

2 Survey Aims, Methodology and Data Processing

2.1 Aims

2.1.1 The aims of the geophysical survey were to further determine the presence or absence of archaeological remains within study area, and, as far as possible, determine their nature, extent and quality to enable an assessment of their relative importance in a local, regional and national context.

2.1.2 The specific objectives of the survey, as set out in the Brief (RPS 2017), were to:

i. More accurately assess those remains identified by the desk-based heritage assessment (volume 6, annex 5.1: Desk Based Assessment of the Environmental Statement);
ii. To evaluate the significance of the above evidence, if present, to enable a decision to be made on whether further archaeological investigation may be required; and
iii. To produce a report that sets out the results of the fieldwork in a clear and comprehensive manner.

2.2 Methodology

2.2.1 The geophysical survey was conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage) and the Chartered Institute for Archaeologists (IfA 2002 & CIfA 2014).

2.2.2 Detailed magnetic survey was selected as an efficient and effective method of locating archaeological anomalies. Where suitable site conditions permitted, data was collected using a wheeled cart system. Data from other survey areas was collected using hand-held magnetometers, where it was not possible (due to practical constraints) to use the wheeled cart system (Table 4-5; Fig. 2). More information regarding this technique is included in Appendices A and B.

Table 4. Survey technique and instrument details

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2 (hand held)	1.0m	0.25m
Magnetometer	Bartington Cart (Cart)	1.0m	0.125m

Table 5. Survey instruments employed by area

Survey area no.	Area name	Instrument
GS01	Weybourne	Bartington Cart (Cart) and Bartington Grad 601-2 (hand held)
GS02	Baconsthorpe	Bartington Cart (Cart)
GS04	Edgefield	Bartington Cart (Cart)
GS05	Barningham	Bartington Cart (Cart) and Bartington Grad 601-2 (hand held)
GS06	Corpusty	Bartington Grad 601-2 (hand held)
GS07	Saxthorpe	Bartington Cart (Cart) and Bartington Grad 601-2 (hand held)
GS08	Salle	Bartington Grad 601-2 (hand held)

Survey area no.	Area name	Instrument
GS09	Salle Church	Bartington Grad 601-2 (hand held)
GS10	Booton Church	Bartington Grad 601-2 (hand held)
GS11	Alderford	Bartington Grad 601-2 (hand held)
GS12	Attlebridge	Bartington Grad 601-2 (hand held)
GS13	Ringland	Bartington Grad 601-2 (hand held)
GS16	Little Melton	Bartington Grad 601-2 (hand held)
GS17	Ketteringham	Bartington Grad 601-2 (hand held)
GS18	Mangreen South	Bartington Grad 601-2 (hand held)
GS20	Swainsthorpe	Bartington Cart (Cart)
GS22	Wood Dalling	Bartington Cart (Cart)
GS23	Little Melton Church Farm	Bartington Cart (Cart)
GS25	Lower Bodham	Bartington Cart (Cart)
GS26	Pine Farm	Bartington Grad 601-2 (hand held)

2.3 Data processing and presentation of results

2.3.1 The presentation of the results for each of the 20 surveyed areas involves a grey-scale plot of processed data. Magnetic anomalies are identified, interpreted and plotted onto the 'Interpretation' drawings. Where considered appropriate, specific anomalies have been given numerical labels, e.g. [1] [2], and these appear in the text below, as well as on the figures for reference. Each survey area is discussed in numerical order.

2.3.2 When interpreting the results, several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin (see Appendix A). Where responses can be related to other existing evidence, the anomalies are given specific categories, such as: *Abbey Wall or Roman Road*. Where the interpretation is based largely on the geophysical data, levels of confidence are implied, for example: *Probable*, or *Possible Archaeology*. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification *Possible*.

3 RESULTS

3.1 Area GS01: Weybourne (Figs 3-5)

3.1.1 With the exception of field fringes, all parts of Area GS01 were surveyed (93% of total area).

3.1.2 A series of positive linear and rectilinear anomalies [1] have been detected at the south of the area. These correspond with cropmarks visible on aerial photographs (NHER 38342). It is likely that these are related to a former field system of possible Roman date.

3.1.3 The field system is partially obscured by an area of strong magnetic debris [7] of uncertain origin. It is possible that this area of disturbance relates to an area of industrial activity, associated with the field system, though this interpretation is tentative at best. Given the high amplitude of the response, a modern origin seems more likely.

3.1.4 Several weak positive linear anomalies [2] have been detected to the west, north and south-east of the possible Roman field system. Those to the west and north are on the same orientation as the field system, however the responses are much weaker than those of [1]. It is for this reason that they have been categorised as being of 'possible' archaeological origin.

3.1.5 Three weak linear trends [3-5] have been detected in the centre of the area. These correspond with former field boundaries, visible on available historic mapping. All of the responses [3-5] are visible from 1887 to 1959.

3.1.6 Magnetically weak, parallel linear anomalies are visible across the majority of the area, and are likely to be a result of modern agricultural activity such as ploughing.

3.1.7 A discrete area of strong magnetic debris [6] is visible in the east of the area. This corresponds with a former pond/pit and is visible on available historic mapping from 1887 to 1972.

3.1.8 Amorphous areas of enhanced magnetic response are visible across much of the area. These are likely to be of natural origin, i.e. variations in the underlying geology/superficial deposits. In this instance, the areas of enhanced response correspond with superficial diamicton deposits (BGS 2017).

3.1.9 An area of scattered magnetic debris is visible running adjacent to the eastern boundary of the area. This is likely to be modern in origin, and is characteristic of a spread of ferrous debris (such as small metal objects, bricks or tile). The spread of debris is likely to be a result of modern agricultural activity.

3.1.10 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and their form is best illustrated in the XY trace plots. These responses are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil and are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

3.2 Area GS02: Baconsthorpe (Figs 6-8)

3.2.1 A maize strip covering c. 1ha in the south of Area GS02 prevented survey in this zone. All other areas, excluding existing field boundaries and field fringes were surveyed. In total 82% of Area GS02 was surveyed.

3.2.2 A positive rectilinear anomaly [8] has been detected in the south of the area. Given that Baconsthorpe Castle is situated immediately east of the area, and that a possible medieval building exists within the area (NHER 32947), it is possible that the response is associated with this. The anomaly could be related to a small enclosure, though the size of the anomaly (approximately 9x23m) is more consistent with it being the remains of a building.

3.2.3 Several discrete positive anomalies and area of increased response [9] have been detected immediately adjacent to the small rectilinear feature [8]. Due to their proximity next to the possible former building, a 'possible' archaeological origin has been determined. The responses may be a result of building debris, or an area of small-scale industrial activity.

3.2.4 A series of weak positive linear anomalies [10] can be seen in the west of the area, and are of uncertain origin. They may relate to former cut features, such as ditches or gullies, though they lack any distinct shape or pattern. This lack of pattern, combined with the weak nature of the responses, makes further interpretation difficult.

3.2.5 In the south-east of the western area, a small number of magnetically weak, parallel linear responses have been detected. These are likely to be of modern agricultural origin, and are probably a result of ploughing or tramlines from farm machinery.

3.2.6 A cluster of discrete positive anomalies [11] is visible near the centre of the area. Like Anomalies [10], these have been characterised as being of uncertain origin. It is possible that they relate to small former cut features, such as pits, however, 'natural pitting' similar to this is common across chalk geologies. As such, an archaeological origin cannot be ruled out, though a natural cause seems more likely.

3.2.7 Magnetically weak, dipolar linear anomalies are visible across much of the area. These are related to a series of land drains.

3.2.8 The south-eastern field is largely covered by magnetic debris. This is typical of modern 'green waste' fertiliser which is likely to have been spread across the field.

3.2.9 Several amorphous and sinuous areas of magnetic variation across the areas are likely to be natural in origin, i.e. geological/pedological.

3.2.10 A small number of magnetic 'spikes' are thought to be modern in origin, and likely relate to ferrous debris/rubbish within the topsoil.

3.3 Area GS04: Edgefield (Figs 9-11)

3.3.1 With the exception of field fringes, all parts of Area GS04 were surveyed (94% of total area).

3.3.2 No probable or possible archaeological responses have been detected in Area GS04.

3.3.3 Several linear and sinuous areas of enhanced response have been detected across the area. The form and amplitude of these responses suggests that they are of natural origin, and it is likely that they relate to the underlying deposits of sand and gravel.

3.3.4 Several small ferrous responses (magnetic spikes) can be seen across the area.

3.4 Area GS05: Barningham (Figs 12-14)

3.4.1 With the exception of field fringes, all parts of Area GS05 were surveyed (96% of total area).

3.4.2 No probable or possible archaeological responses have been detected in Area GS05.

3.4.3 Scattered magnetic debris has been detected across the north of the area. This is likely to be modern in origin, possibly a result of green waste fertiliser, or other ferrous debris/rubbish.

3.4.4 Ferrous responses close to boundaries are due to adjacent fences, while smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.5 Area GS06: Corpusty (Figs 15-21)

3.5.1 Sheep pens covering c. 1ha in the centre of Area GS06 prevented survey in this zone. All other areas, excluding existing field boundaries and field fringes were surveyed. In total 92% of Area GS06 was surveyed.

3.5.2 No probable or possible archaeological responses have been detected in Area GS06.

3.5.3 Magnetically weak, parallel linear anomalies can be seen in three areas at the north of the area. These are a result of modern agricultural activity, such as ploughing.

3.5.4 A series of discrete positive responses [12] in the north, and further positive responses [13] in the south are of uncertain origin. The responses may be natural, possibly related to the underlying deposits of diamiction. The orientation of Anomalies [12] in line with current field boundaries also suggests they may have an agricultural origin.

3.5.5 Large areas of weak magnetic disturbance are visible across the survey area. These are likely to have a modern agricultural origin, and are likely a result of small ferrous (i.e. metal, brick, tile) objects within the topsoil.

3.5.6 Small areas of magnetic variation can be seen in central areas of the survey area. These are likely to be natural in origin.

3.5.7 Several small ferrous responses (magnetic spikes) can be seen across the area.

3.6 Area GS07: Saxthorpe (Figs 22-24)

3.6.1 Horse paddocks covering c. 0.8ha in the central and eastern parts of Area GS07 prevented survey in these zones. All other areas, excluding existing field boundaries and field fringes were surveyed. In total 88% of Area GS07 was surveyed.

3.6.2 Two areas of possible archaeological responses have been detected in the south-west and south-east of the area [14-15].

3.6.3 In the south-west, two parallel, positive linear anomalies have been detected. These are indicative of former cut features such as ditches. Within the possible ditches,

several discrete positive responses have been identified. These may be a result of former backfilled pits, though it is possible that they could be natural in origin.

3.6.4 In the south-east, several further linear and discrete responses [15] have been detected. These are similar in form and amplitude to those to the west [14], however these responses are partially obscured by the underground service running through the area. These are also indicative of former cut features such as ditches/pits.

3.6.5 A positive linear anomaly [16] running roughly north-east to south-west in the centre of the area is related to a former field boundary, visible on available historic mapping. The boundary is visible from 1886 to 1958.

3.6.6 Evidence of modern ploughing is visible in the north and south of the area, in the form of magnetically weak, parallel linear anomalies.

3.6.7 In the north-west of the area, a sub-rectangular and linear anomaly [17] have been detected. It is possible that this is related to a former enclosure and ditch, however this interpretation is tentative at best. The response is very weak, and as such makes further interpretation difficult.

3.6.8 Further positive linear responses and trends are visible near to the former field boundary of [16]. These have also been interpreted as being of uncertain origin. It is possible that they are former cut features, perhaps related to the possible settlement activity [14-15], though they may equally be a result of more recent agricultural activity.

3.6.9 Small areas of enhanced magnetic variation are likely to be of natural origin.

3.6.10 A strong, bipolar linear anomaly and associated magnetic disturbance is visible running north-east to south-west through the east of the area. This is related to an underground service, such as a pipe.

3.6.11 Ferrous responses close to boundaries are due to adjacent fences, while smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.7 Area GS08: Salle (Figs 25-27)

3.7.1 All parts of Area GS08 were surveyed (100%).

3.7.2 A weak, positive, circular anomaly [17] containing a small cluster of discrete positive anomalies can be seen in the north-west of the area. The response is characteristic of a ring ditch, containing possible backfilled pits. Within the survey area, cropmarks of two ring ditches are recorded (NHER 56166), and it is likely that the annular response is associated with one of these. The anomaly has been characterised as being of 'possible' archaeological origin due to the weak nature of the response, and that only one of the two cropmark ring ditches has been detected.

3.7.3 A positive linear anomaly orientated approximately north to south [18] is visible immediately west of the possible ring-ditch [17]. This is related to a former field boundary, visible on available historic mapping from 1885 to 1958.

3.7.4 A positive linear anomaly, perpendicular to the former field boundary [18] is likely to be a further boundary, but is not present on available mapping.

3.7.5 A positive linear anomaly [19] has been detected running along the eastern boundary of the survey area, and is of uncertain origin. It is possible that the anomaly relates to a former ditch, though its similar orientation to the former boundary [18] to the west indicates that it may be of agricultural origin.

3.7.6 Two further positive linear anomalies and small discrete responses are also of uncertain origin. These may be archaeological, natural or of agricultural origin.

3.7.7 A sinuous band of enhanced response and further amorphous areas of magnetic variation have been detected. These are likely to be natural in origin, likely related to the superficial deposits of diamicton.

3.7.8 Several small ferrous responses (magnetic spikes) can be seen across the area

3.8 Area GS09: Salle Church (Figs 28-29)

3.8.1 Crops under plastic sheeting covered c. 2.3ha of Area GS09, meaning that only 36% of the area could be surveyed.

3.8.2 A negative linear anomaly with positive responses on either side [20] is seen at the south of the area surveyed. This lies immediately adjacent to St Peter and St Paul Church, and may be related to a former boundary of the churchyard.

3.8.3 Evidence of modern ploughing can be seen across the area, in the form of magnetically weak parallel linear anomalies.

3.8.4 A small series of positive linear and discrete anomalies [21] have been detected in the south of the area. Given that there is a high potential for Anglo-Saxon and medieval remains, an archaeological origin cannot be ruled out, however there is no pattern or form to the responses. As such, an uncertain origin has been determined.

3.8.5 A further linear trend has been identified to the north of the possible former churchyard boundary [20]. This may be related to a former field boundary or ditch, though it may equally be of natural origin.

3.8.6 Small areas of magnetic variation adjacent to the uncertain linear trend are of natural origin.

3.8.7 Several small ferrous responses (magnetic spikes) can be seen across the area.

3.9 Area GS10: Booton Church (Figs 30-31)

3.9.1 All parts of Area GS10 either side of road were surveyed (100%).

3.9.2 No probable or possible archaeological responses have been detected in Area GS10.

3.9.3 Magnetically weak, parallel linear anomalies can be seen across the area. These are a result of modern ploughing.

3.9.4 A very weak, bipolar linear anomaly [22] is visible running north-east to south-west in the southern area. This corresponds with a Roman road which traverses the area (NHER 2796), however the response is not characteristic of a road; hence its interpretation as being of uncertain origin. The response is similar to those detected over land drains, and it is possible that this is the cause of the anomaly.

3.9.5 A further weak linear trend [23] is visible in the northern area. This may be related to a former cut feature, such as a ditch, though it may equally relate to a former field boundary or be a result of modern agriculture. The weak nature of the response makes further interpretation difficult.

3.9.6 Two strong bipolar linear anomalies have been detected running east-west across the area. These are indicative of underground services; such as pipes or cables.

3.9.7 Ferrous responses close to boundaries are due to adjacent fences, while smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.10 Area GS11: Alderford (Figs 32-34)

3.10.1 With the exception of field fringes, all parts of Area GS11 were surveyed (99% of total area).

3.10.2 Two linear anomalies [24-25] aligned north-east to south-west and north-west to south-east are visible in the centre and south of the area. The alignment of the responses suggests that they could be related to former rectilinear field boundaries, though there is no evidence of these on the historic mapping. The alignment does not match that of cropmarks previously recorded in the field, and interpreted as being of possible Iron Age or Roman date (NHER 53472).

3.10.3 A further linear response and discrete anomaly are also of uncertain origin, though they could be agricultural or natural.

3.10.4 Magnetically weak, parallel linear anomalies are visible across the survey area, and are a result of modern ploughing.

3.10.5 Sinuous and amorphous areas of enhanced magnetic response have been detected across much of the area, and they are likely to be of natural origin.

3.10.6 Ferrous responses close to boundaries are due to adjacent fences, while smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.11 Area GS12: Attlebridge (Figs 35-41)

3.11.1 Horse paddocks covering c. 1.2ha between The Street and Fakenham Road (A1067) prevented survey in these zones. All other areas, excluding existing field boundaries, field fringes, drainage ditches and river channels were surveyed. In total 74% of Area GS07 was surveyed.

3.11.2 Several weak circular and sub-circular anomalies [26-28] have been identified in the area. Two of these [26-27] correspond with cropmarks of Bronze Age round barrows (NHER 50649), though their responses are very weak. The sub-circular anomaly [28] is not recorded as a cropmark, however it shows a similar response to those of [26-27] and as such has also been interpreted as being of possible archaeological origin.

3.11.3 Several positive linear and discrete anomalies [29-30] have been identified to the north and south of the possible barrows [26 & 28]. These are likely to be related to former cut features, such as boundary ditches and pits, and provide evidence of possible settlement activity. Many of the linear anomalies correspond with cropmarks (NHER 21719).

3.11.4 Several further linear and discrete responses [31-32] can be seen to the south of the possible settlement activity of [29]. Again, these are likely related to former cut features such as ditches and pits, though these anomalies provide much weaker responses than those to the north [29-30].

3.11.5 Though the discrete responses of [29-32] are indicative of small cut features, such as backfilled pits, it is possible that they are a result of natural pitting, typical across underlying chalk geologies.

3.11.6 Several positive linear anomalies have been detected across the area [33-37]. These all relate to former field boundaries present on available historic mapping. Anomaly [33] is visible from 1882 to 1908, Anomaly [34] from 1882 to 1957, and Anomalies [35-37] are visible from 1882 to 1975.

3.11.7 Several further linear anomalies, on the same orientation as field boundaries [34 & 36] have been detected. Due to having the same orientation as field boundaries nearby, it seems likely that these are a result of additional boundaries that are not visible on available mapping.

3.11.8 Large parts of the survey area contain magnetically weak, parallel linear anomalies. These are a result of modern ploughing.

3.11.9 Moderate strength, straight, linear anomalies [38] adjacent to the watercourse running through the survey area, are thought to relate to former drainage channels. They appear similar in response to some of the natural responses (see below), however the straight nature of the features suggests that they are man-made.

3.11.10 Several areas of enhanced magnetic response are visible across the north of the area. These are typical of natural responses detected near watercourses, and are likely a result of alluvial or other superficial deposits.

3.11.11 Several areas of magnetic disturbance are likely to be modern in origin, and are indicative of small ferrous objects scattered within the topsoil.

3.11.12 A negative linear anomaly in the south of the area is likely to be related to an underground service, such as a pipe or cable.

3.11.13 Ferrous responses close to boundaries are due to adjacent fences, while smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.12 Area GS13: Ringland (Figs 42-44)

3.12.1 All parts of Area GS13 were surveyed (100%).

3.12.2 A positive, sub-circular anomaly [39] has been detected at the south-western edge of the area. This is likely to be related to the probable Bronze Age barrow (NHER 7803).

3.12.3 Immediately to the south of the probable barrow [39], weak, curvilinear anomalies [40] have been detected. The responses are relatively weak, making further interpretation difficult, though their proximity to the probable barrow has led to their categorisation as being of 'possible' archaeological origin.

3.12.4 Closely spaced parallel linear anomalies are present across the area and are a result of modern ploughing.

3.12.5 Very weak positive linear trends [41] are visible to the north of the probable barrow, and are of uncertain origin. These may be archaeological, though could equally be of agricultural or modern origin.

3.12.6 Discrete areas of enhanced magnetic response at the south of the area are likely to be natural, and are typical of responses seen across chalk geologies.

3.12.7 Ferrous responses and smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.13 Area GS16: Little Melton (Figs 45-47)

3.13.1 All parts of Area GS16 were surveyed (100%).

3.13.2 A series of positive linear anomalies [42] can be seen across the north of the area. These have been interpreted as being of possible archaeological origin, with two of the faint north to south aligned anomalies corresponding directly with Late Saxon to Early Medieval ditches excavated at part of the Little Melton to Hethersett pipeline project (NHER ENF135278; Haskins 2016). More broadly, these boundaries appear to form part of a wider medieval field system, though some may also relate to more recent field divisions.

3.13.3 Evidence of modern ploughing can be seen across much of the area, in the form of closely spaced, magnetically weak, parallel linear anomalies.

3.13.4 An area of increased magnetic response near the centre of the area [43] is of uncertain origin. The response is typical of an infilled pond, though there is no evidence of a pond in this location on available mapping; hence its interpretation as being of uncertain origin.

3.13.5 Further small discrete anomalies and a weak linear anomaly have also been characterised as being of uncertain origin. An archaeological explanation for these seems unlikely; they are likely to be natural in origin, or a result of agricultural activity. Those immediately east of the field boundary that bisects the survey area correspond with the route of the Little Melton to Hethersett pipeline.

3.13.6 A few areas of slightly enhanced magnetic response are a result of natural variations in the below geology/superficial deposits.

3.13.7 Several small ferrous responses (magnetic spikes) can be seen across the area.

3.14 Area GS17: Ketteringham (Figs 48-50)

3.14.1 All parts of Area GS17 were surveyed (100%).

3.14.2 A weak sub-circular anomaly [44] has been detected in the centre of the area, corresponding with the location of a cropmark of a ring ditch (NHER 18558). The response is possibly related to a former barrow.

3.14.3 Two weak, positive linear anomalies [45-46] are related to former field boundaries. Anomaly [45] can be seen on available historic mapping from 1882 to 1995, while Anomaly [46] is visible on Google Earth (2017) imagery dating to 1999.

3.14.4 A small number of weak linear anomalies provide evidence of modern agricultural activity on the survey area.

3.14.5 Two bands of magnetic disturbance cover a relatively large proportion of the area. These may be a result of the spread of green waste fertiliser, or other modern scattered magnetic debris.

3.14.6 Several small ferrous responses (magnetic spikes) can be seen across the area.

3.15 Area GS18: Mangreen South (Figs 51-53)

3.15.1 Ploughing around the perimeter of the field and a maize crop along the southern boundary meant that only the central zone of Area GS18 could be surveyed (65% of the total area).

3.15.2 A linear band of 'quiet' data [47] runs east-west across the survey area. This corresponds with the postulated course of the Roman Road from Caistor Roman town to the settlement and temple at Crownthorpe (NHER 52027), and has therefore been classified as being 'probable' archaeology.

3.15.3 A positive curvilinear response [48] in the north of the area corresponds with a medieval parish boundary ditch (NHER 52128), and still forms the parish boundary to this day.

3.15.4 Linear trends [49] in the south-west of the area are of uncertain origin, but could relate to the faint cropmarks of an undated enclosure previously identified from aerial photographs (NHER 11691). However, the weak nature of the responses makes further interpretation difficult.

3.15.5 Magnetically weak, parallel linear responses are a result of modern ploughing.

3.15.6 Several areas of natural pitting and increased response are visible across the survey area. These are typical of responses detected over chalk geologies, and are likely to be of natural origin.

3.15.7 Small ferrous responses (magnetic spikes) are present throughout the data.

3.16 Area GS20: Swainsthorpe (Figs 54-56)

3.16.1 With the exception of field fringes and field boundaries, all parts of Area GS20 were surveyed (93% of total area).

3.16.2 Closely spaced, magnetically weak, parallel linear anomalies are present across the area. These are a result of modern agricultural activity, such as ploughing.

3.16.3 Two positive linear anomalies [50-51] are related to former field boundaries, present on available mapping. Anomaly [50] is visible from 1882 to 1957, while Anomaly [51] is visible from 1882 to 1995.

3.16.4 A small number of weak linear anomalies can be seen across the area. These are of uncertain origin, and may be related to former boundaries or other agricultural activity.

3.17 Area GS22: Wood Dalling (Figs 57-63)

3.17.1 Aside from the northern tip of the field and a cluster of trees, all parts of Area GS22 were surveyed (100%).

3.17.2 A small number of weak linear trends are visible in the north and south of the area. These do not correspond with the current alignment of field boundaries, and as such have been categorised as being of uncertain origin.

3.17.3 Several linear anomalies [52-57] have been detected, all of which are associated with former field boundaries visible on historic mapping from 1885 to 1978.

3.17.4 Further linear anomalies, on similar alignments to [52-57] are visible, and are also likely to be related to former field boundaries, though these cannot be seen on historic maps. The southernmost curvilinear anomaly may correlate with a cropmark previously recorded from aerial photography (NHER 35531).

3.17.5 Weakly magnetic, parallel linear responses are a result of modern agricultural activity, such as ploughing.

3.17.6 An area of strong magnetic debris [58] in the north of the area is associated with a former pond, visible on mapping from 1885 to 1984.

3.17.7 A weak dipolar linear anomaly in the north of the area is indicative of a land drain.

3.17.8 Two strong bipolar linear responses in the south and centre of the area are a result of underground services, such as pipes or cables.

3.17.9 Small ferrous responses (magnetic spikes) can be seen across the area.

3.18 Area GS23: Little Melton Church Farm (Figs 64-66)

3.18.1 Aside from the central field boundary, all parts of Area GS22 were surveyed (100%).

3.18.2 Two positive linear anomalies [59-60] of uncertain origin were identified along the eastern and western fringes of the area. It is possible that they are of agricultural or natural origin.

3.18.3 Evidence of modern ploughing is visible in the form of closely spaced, parallel, linear anomalies.

3.18.4 Ferrous responses and smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.19 Area GS25: Lower Bodham (Figs 67-69)

3.19.1 Aside from two drainage ditches and a small overgrown patch in the south-east corner of GS20, all parts of the area were surveyed (100%).

3.19.2 A number of linear anomalies [61] and an area of increased magnetic response [62] are visible in the east of the area, and are of uncertain origin. Given their proximity to a possible Iron Age enclosure or Roman signal station (NHER 18192) it is possible that they are archaeological, though they could equally be of natural origin.

3.19.3 A weak linear trend [63] in the north-west of the area is related to a former field boundary, visible on historic mapping from 1886 to 1958.

3.19.4 Magnetically weak, parallel linear responses are a result of modern ploughing.

3.19.5 A sinuous band of enhanced magnetic response runs north-south through the survey area, corresponding with a superficial band of clay, silt, sand and gravel.

3.19.6 Ferrous responses and smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

3.20 Area GS26: Pine Farm (Figs 70-72)

3.20.1 With the exception of field fringes, all parts of Area GS26 were surveyed (96% of total area).

3.20.2 Magnetically weak, parallel linear anomalies are visible across the area, and are a result of modern agricultural activity, such as ploughing.

3.20.3 A small, discrete area of enhanced response in the south-west of the area is likely to be of natural origin.

3.20.4 A strong bipolar linear response, running northwest-southeast across the area is related to an underground service, such as a pipe or cable.

3.20.5 Ferrous responses and smaller scale ferrous anomalies ("iron spikes") are present throughout the data.

4 Discussion

4.1 Data appraisal and confidence assessment

4.1.1 The magnetic method has responded well to the environments and conditions of the surveyed area. The culmination of magnetic responses, both weak and strong, suggested that where present, archaeological feature with sufficient magnetic contrast will have been detected by the geophysical survey.

Potential impact of the bedrock and superficial geology

4.1.2 English Heritage Guidelines (2008, Table 4) states that the typical magnetic response over underlying chalk bedrock is generally good, while across sand and gravel it can be variable. Archaeological anomalies have been detected across much of the survey area, suggesting that the underlying geology has not inhibited the survey.

4.1.3 Superficial deposits of sand, gravel, and diamicton also provide variable results for magnetic survey, while alluvial and river terrace deposits have the potential to mask weaker archaeological anomalies. At Attlebridge (Area GS12), archaeological anomalies have been interpreted as 'possible' due to the weak nature of the responses; it is possible that the river terrace deposits and alluvium in this location are limiting the effectiveness of the survey. That being said, features have been successfully detected.

4.1.4 In areas overlain by diamicton, such as at Salle (Area GS08), archaeological anomalies also provide weak responses. It may be possible that the diamicton is limiting the effectiveness of the survey, though archaeological anomalies can still be seen.

Potential impact of green waste, services and modern ferrous debris

4.1.5 Green waste fertiliser, such as that present at in the south-east field at Baconsthorpe (Area GS02) and possibly Barningham (Area GS05), has the potential to have masked weaker archaeological anomalies. This is also true of disturbance from underground services, as seen at Saxthorpe (Area GS07), Booton (Area GS10) and Pine Farm (GS26). In these areas, however, archaeological anomalies have been detected, though further weaker responses may be obscured. Ferrous responses and larger scale ferrous anomalies ("iron spikes") may also partially obscure weaker archaeological anomalies.

Assessment of survey coverage

4.1.6 With the exception of Salle Church (Area GS09, 36% coverage), survey coverage on all areas ranged between 65-100%. Complete survey (100%) was achieved for Booton Church (Area GS10), Ringland (Area GS13), Little Melton (Area GS16), Ketteringham (Area GS17), Wood Dalling (Area GS22), Little Melton Church Farm (Area GS23) and Lower Bodham (Area GS25). Similarly, at Weybourne (Area GS01), Edgefield (Area GS04), Barningham (Area GS05), Alderford (Area GS11), Swainsthorpe (Area GS20) and Pine Farm (Area GS26), only field fringes and existing field boundaries prevented total coverage (93-99% achieved in these instances).

4.1.7 Horse paddocks, sheep pens, areas of rough plough and maize strips used as game cover at Baconsthorpe (Area 2, 82% coverage), Corpusty (Area 6, 92% coverage), Saxthorpe (Area 7, 88% coverage), Attlebridge (Area 12, 74% coverage) and Mangreen

South (Area GS18, 65% coverage) removed between c. 0.8-3.5ha from each survey area. In the case of Baconsthorpe and Corpusty, there is no indication from the surrounding survey results to suggest that additional anomalies will have been missed. By contrast, anomalies are likely to have been recorded in the unsurveyed zones at Saxthorpe, Attlebridge and Mangreen South. At these survey area, however, there is sufficient information from the surrounding results to predict the kinds of anomalies likely to be present, especially at Attlebridge and Mangreen South where there are existing cropmark plots from aerial photographs.

4.1.8 Overall the survey results are considered to be reliable and, with the exception of Salle Church (which is no longer within the footprint of the onshore components of Hornsea Three, see Fig. 1), have provided sufficient coverage to characterise the presence or absence, range and distribution of anomalies in each survey area.

4.2 Interpretation

4.2.1 The survey has identified archaeological anomalies across 12 of the 20 survey areas, many of which correspond with cropmarks previously recorded from aerial photography, and documented in the NHER. The interpretation of archaeological anomalies is given below, with corresponding NHER references notes where appropriate.

Areas with possible settlement evidence

Area GS01: Weybourne

4.2.2 The series of positive linear and rectilinear anomalies recorded in the southern half of Area GS01 are likely to form part of a Romano-British occupation site comprising linked enclosures and associated field system ditches. The results of the survey largely correspond with the cropmark plots created from aerial photographs of the area (NHER 38342). Whilst the survey adds further detail to the existing plots, a previously recorded ring-ditch (NHER 38341) and two other possible enclosures in the cropmark complex in the west of Area 1 did not show up in the geophysical survey results.

Area GS02: Baconsthorpe

4.2.3 The positive rectilinear anomaly identified in the southern end of Area GS02 is likely to be a medieval building/building range, c. 9m wide by 23m long, possibly associated with a spread of building debris or industrial activity at its eastern end. Toward the centre of Area GS02 there is also a cluster of discrete positive anomalies of uncertain origin, but possibly representing a swathe of cut features. At the far western side of Area 2, a series of weak positive linear anomalies of uncertain origin are recorded. These may relate to former ditches or gullies, but lack a distinct shape or pattern.

4.2.4 Green waste in the south-east field of Area GS02 may have masked archaeological anomalies.

Area GS07: Saxthorpe

4.2.5 The survey at Area GS07 has revealed two zones of possible settlement activity. In the east of Area GS07 alongside Croft Lane, a series of weak linear and discrete anomalies have been identified, possibly representing ditch boundaries/an enclosure (c. 35m by

45m) with associated external pitting. The results have been partially obscured by a north-east to south-west aligned service trench, but the anomalies may relate to medieval roadside activity/occupation. Metal detecting across Area GS02 has previously identified a quantity and diversity of medieval finds suggestive of settlement (NHER 37256).

4.2.6 In the north-west of Area GS07 a very weak positive anomaly representing a D-shaped enclosure and linear boundary has been identified. The enclosure measures c. 55m by 60m; the form and size being reminiscent of a later Iron settlement enclosure. This area of the survey area is associated with a multi-period artefact scatter (NHER 32962).

Area GS12: Attlebridge

4.2.7 Area GS12 shows zones of possible settlement activity, as indicated by positive linear and discrete anomalies. Two of the zones are located to the south-west of the A1067, with the third adjacent to The Street. The anomalies are likely related to former cut features such as ditches and pits, though some of the anomalies are fairly weak.

Areas with ring ditches and associated features

Area GS08: Salle

4.2.8 The weak, positive, circular anomaly (c. 23m in diameter) in the north-west of Area GS08 is a ring-ditch, likely to be the remains of a ploughed-out Bronze Age barrow. The ring-ditch surrounds a small cluster of discrete positive anomalies which could be burials.

4.2.9 Aerial photographs have revealed the cropmarks of two adjacent Bronze Age ring-ditches within the survey area (NHER 56166), and it is likely that the annular response is associated with one of these.

Area GS12: Attlebridge

4.2.10 Three weak circular and sub-circular anomalies have been identified to the south of the River Wensum, on the edge of the floodplain. The anomalies are ring-ditches (c. 14m-23m in diameter) that form part of a Bronze Age barrow cemetery previously recorded from aerial photographs (NHER 50649). Two of the three ring-ditches have been previously identified (NHER 50621; 21719). The third, located in the south-east corner of the field between the River Wensum and The Street, is previously unrecorded. Two further ring-ditches identified by aerial photography (NHER 50647; 17657) did not register in the survey.

4.2.11 The ring-ditches in the south of Area GS08 are associated with several positive linear and discrete anomalies. These are likely to be related to former cut features, such as boundary ditches and pits, and provide evidence of possible settlement activity (see 4.2.7).

Ringland: Area GS13

4.2.12 A positive, sub-circular anomaly (c. 25m in diameter) was detected at the south-western edge of Area GS13. The ring-ditch to is likely to be the remains of the possible Bronze Age barrow recorded in the NHER (NHER 7803).

4.2.13 Surrounding the ring-ditch are a series of other weak, curvilinear anomalies, which may be assorted ring-ditches forming part of a barrow cemetery.

Ketteringham: Area GS17

4.2.14 A weak sub-circular anomaly (c. 33m in diameter) was detected in the centre of Area GS17. This corresponds directly with cropmark of a ring-ditch previously recorded from aerial photography (NHER 18558), and is likely to represent a ploughed-out Bronze Age barrow.

Areas with evidence of former field systems, other enclosure boundaries or notable linear anomalies

Area GS09: Salle Church

4.2.15 Whist only a limited section of Area GS9 could be surveyed, a negative linear anomaly with positive responses on either side was recorded along the western edge of the survey area. This lies immediately adjacent to St Peter and St Paul Church (NHER 7466), dating to the 15th century, and probably represents a former boundary of the churchyard.

4.2.16 A small series of positive linear and discrete anomalies were also detected in the south-west corner of Area GS09. This may be evidence for further boundaries or occupation, though the is no pattern or form to the responses.

Area GS10: Booton Church

4.2.17 Although no probable archaeological responses were detected in Area GS10, a very weak bipolar linear anomaly was recorded on a north-east to south-west alignment south of The Street. This broadly corresponds with the projected line of a Roman road (NHER 2796), though the response is not characteristic of such.

Area GS11: Alderford

4.2.18 The alignment of the two linear anomalies in GS11 suggests they could relate to former rectilinear field boundaries, though there is no evidence of these on the historic mapping. The alignment does not match that of cropmarks previously recorded in the field, and interpreted as being of possible Iron Age or Roman date (NHER 53472).

Area GS16: Little Melton

4.2.19 A series of north to south and east to west aligned linear anomalies, likely to represent field boundaries, were identified in Area GS16. Two of the faint north to south aligned anomalies correspond directly with Late Saxon to Early Medieval ditches excavated at part of the Little Melton to Hethersett pipeline project (NHER ENF135278; Haskins 2016). More broadly, the alignment of the boundaries in respect to the road layout and the extant field divisions suggests the wider system may be of medieval origin too. The boundaries do not appear on the Little Melton Enclosure map, but continue on the axis of those depicted.

Area GS18: Mangreen South

4.2.20 The east-west aligned linear band of 'quiet' data recorded in Area GS18 broadly corresponds with the projected course of the Roman Road from Caistor Roman town to the settlement and temple at Crownthorpe (NHER 52027).

4.2.21 The positive curvilinear response in the north of the area also corresponds with a cropmark of a former parish boundary, likely to be medieval or post-medieval in date (NHER 52128).

Areas with no archaeological responses

4.2.22 The surveys of Area GS04 (Edgefield), Area GS05 (Barningham), Area GS06 (Corpusty), Area GS20 (Swainsthorpe), Area GS22 (Wood Dalling), Area GS23 (Little Melton Church Farm), Area GS25 (Lower Bodham) and Area GS26 (Pine Farm) provided no evidence of archaeological features. Instead, natural responses, areas of modern disturbance and modern ploughing were recorded. A small number of discrete and linear responses of uncertain origin have been identified at Area GS06 (Corpusty), Area GS20 (Swainsthorpe), Area GS23 (Little Melton Church Farm) and Area GS25 (Lower Bodham). These, however, are more likely to be of natural or agricultural origin.

4.2.23 The remaining features detected across the other survey areas include evidence of ploughing, former field boundaries recorded on historic Ordnance Survey maps, land drains, underground services and disturbance from nearby ferrous metal objects.

APPENDIX A MAGNETOMETER SURVEY METHOD

Grid positioning

A.1 For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

A.2 Every point that is recorded using the cart system is referenced using a Trimble R* RTK GNSS system. An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station rebroadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of approximately 0.01m.

Instrumentation: Bartington Grad 601-2

A.3 Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths.

A.4 The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each area survey, data is transferred to the office for processing and presentation.

Instrumentation: Bartington Cart

A.5 The Bartington magnetometer cart system collects data at 10Hz which approximates 0.125m. The readings are logged consecutively into the data logger which in turn is daily down- loaded into a portable computer whilst on site. At the end of each area survey, data is transferred to the office for processing and presentation.

Data Processing – Handheld & Cart

A.6 *Zero Mean Traverse*: This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.

A.7 Step Correction (De-stagger): When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

A.8 Display Greyscale/Colourscale Plot: This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Interpretation categories

A.9 In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, Roman Road, Wall, etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

A.10 *Archaeology / Probable Archaeology*: This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.

A.11 *Possible Archaeology*: These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.

A.12 *Industrial /Burnt-Fired*: Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metalworking areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.

A.13 *Former Field Boundary (probable & possible):* Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.

A.14 *Ridge & Furrow*: Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.

A.15 *Agriculture (ploughing):* Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.

A.16 *Land Drain*: Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.

A.17 *Natural*: These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.

A.18 *Magnetic Disturbance*: Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present. They are presumed to be modern.

A.19 *Service*: Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.

A.20 *Ferrous*: This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

A.21 *Uncertain Origin*: Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of Possible Archaeology / Natural or (in the case of linear responses) Possible Archaeology /Agriculture; occasionally they are simply of an unusual form.

A.22 Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

APPENDIX B MAGNETIC THEORY

Magnetic survey

B.1 Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

B.2 Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in magnetic susceptibility and permanently magnetised thermoremanent material.

B.3 Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

B.4 Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

B.5 Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and nonmagnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

B.6 Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

B.7 Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

APPENDIX C REFERENCES

Brudenell, M., 2017, Written Scheme of Investigation, Geophysical Survey, Hornsea Three Offshore Wind Farm, Norfolk, OA East (unpublished)

CIfA 2014, Standard and Guidance for Archaeological Geophysical Survey. Amended 2016. CIfA Guidance note. Chartered Institute for Archaeologists, Reading

English Heritage, 2008, Geophysical Survey in Archaeological Field Evaluation. English Heritage, Swindon

Haskins, A., 2016, Little Melton to Hethersett pipeline: Strip, Map and Sample excavation and watching brief across Prehistoric, Roman and Medieval Norfolk. Post-excavation Assessment and Updated Project Design. OA East Report 1737

IfA 2002, The Use of Geophysical Techniques in Archaeological Evaluations, IFA Paper No 6, C. Gaffney, J. Gater and S. Ovenden. Institute for Archaeology, Reading

RPS 2016, Hornsea Project Three – Brief for Archaeological Geophysical Survey

RPS 2017, Hornsea Project Three – Brief for Archaeological Geophysical Survey

SSEW 1983 Soils of England and Wales. Sheet 4, Eastern England. Soil Survey of England and Wales, Harpenden.

Electronic Sources
BGS 2017 British Geological Survey website:
(http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps)
Geology of Britain viewer [Accessed 21/04/2017].

APPENDIX D OASIS REPORT FORM

Project Details

OASIS Number	oxfordar3-274793		
Project Name	Hornsea Three Geophysical Survey		
Start of Fieldwork	20/02/2017	End of Fieldwork	26/11/2017
Previous Work	No	Future Work	No

Project Reference Codes

Site Code	XNFHNT17	Planning App. No.	
HER Number	ENF141716	Related Numbers	ENG142802

Prompt	Direction from Local Planning Authority
Development Type	Wind Farm
Place in Planning Process	Pre-application

Techniques used (tick all that apply)

☐ Aerial Photography – interpretation	☐ Grab-sampling	☐ Remote Operated Vehicle Survey
☐ Aerial Photography - new	☐ Gravity-core	☐ Sample Trenches
☐ Annotated Sketch	☐ Laser Scanning	☐ Survey/Recording of Fabric/Structure
☐ Augering	☐ Measured Survey	☐ Targeted Trenches
☐ Dendrochonological Survey	☐ Metal Detectors	☐ Test Pits
☐ Documentary Search	☐ Phosphate Survey	☐ Topographic Survey
☐ Environmental Sampling	☐ Photogrammetric Survey	☐ Vibro-core
☐ Fieldwalking	☐ Photographic Survey	☐ Visual Inspection (Initial Site Visit)
☒ Geophysical Survey	☐ Rectified Photography	

Monument	Period	Object	Period
Ditch	Uncertain		
Ring ditch	Bronze Age (- 2500 to - 700)		
Building	Medieval (1066 to 1540)		
Boundary ditch	Post Medieval (1540 to 1901)		
Boundary ditch	Late Prehistoric (- 4000 to 43)		
Boundary ditch	Medieval (1066 to 1540)		

Insert more lines as appropriate.

Project Location

County	Norfolk
District	North and South Norfolk
Parish	Multiple
HER office	Norfolk
Size of Study Area	145 ha

Address (including Postcode)

National Grid Ref	TG 1181 4319- TG 2186 0194	

Project Originators

Organisation	Oxford Archaeology East
Project Brief Originator	James Albone
Project Design Originator	Dr Matthew Brudenell
Project Manager	Dr Matthew Brudenell
Project Supervisor	Dr Matthew Brudenell

Project Archives

	Location	ID
Physical Archive (Finds)	NMAS	ENF141716 and ENF142802
Digital Archive	OA East	XNFHNS17 and XNFHNT17
Paper Archive	NMAS	ENF141716 and ENF142802

Physical Contents	Present?	Digital files associated with Finds	Paperwork associated with Finds
Animal Bones	☐	☐	☐
Ceramics	☐	☐	☐
Environmental	☐	☐	☐
Glass	☐	☐	☐
Human Remains	☐	☐	☐
Industrial	☐	☐	☐
Leather	☐	☐	☐
Metal	☐	☐	☐
Stratigraphic		☐	☐
Survey		☒	☒
Textiles	☐	☐	☐
Wood	☐	☐	☐
Worked Bone	☐	☐	☐
Worked Stone/Lithic	☐	☐	☐
None	☐	☐	☐
Other	☐	☐	☐

Digital Media

Database	☐
GIS	☒
Geophysics	☒
Images (Digital photos)	☐
Illustrations (Figures/Plates)	☒
Moving Image	☐
Spreadsheets	☐
Survey	☐
Text	☒
Virtual Reality	☐

Paper Media

Aerial Photos	☐
Context Sheets	☐
Correspondence	☐
Diary	☐
Drawing	☐
Manuscript	☐
Map	☐
Matrices	☐
Microfiche	☐
Miscellaneous	☐
Research/Notes	☐
Photos (negatives/prints/slides)	☐
Plans	☐
Report	☒
Sections	☐
Survey	☐

Further Comments

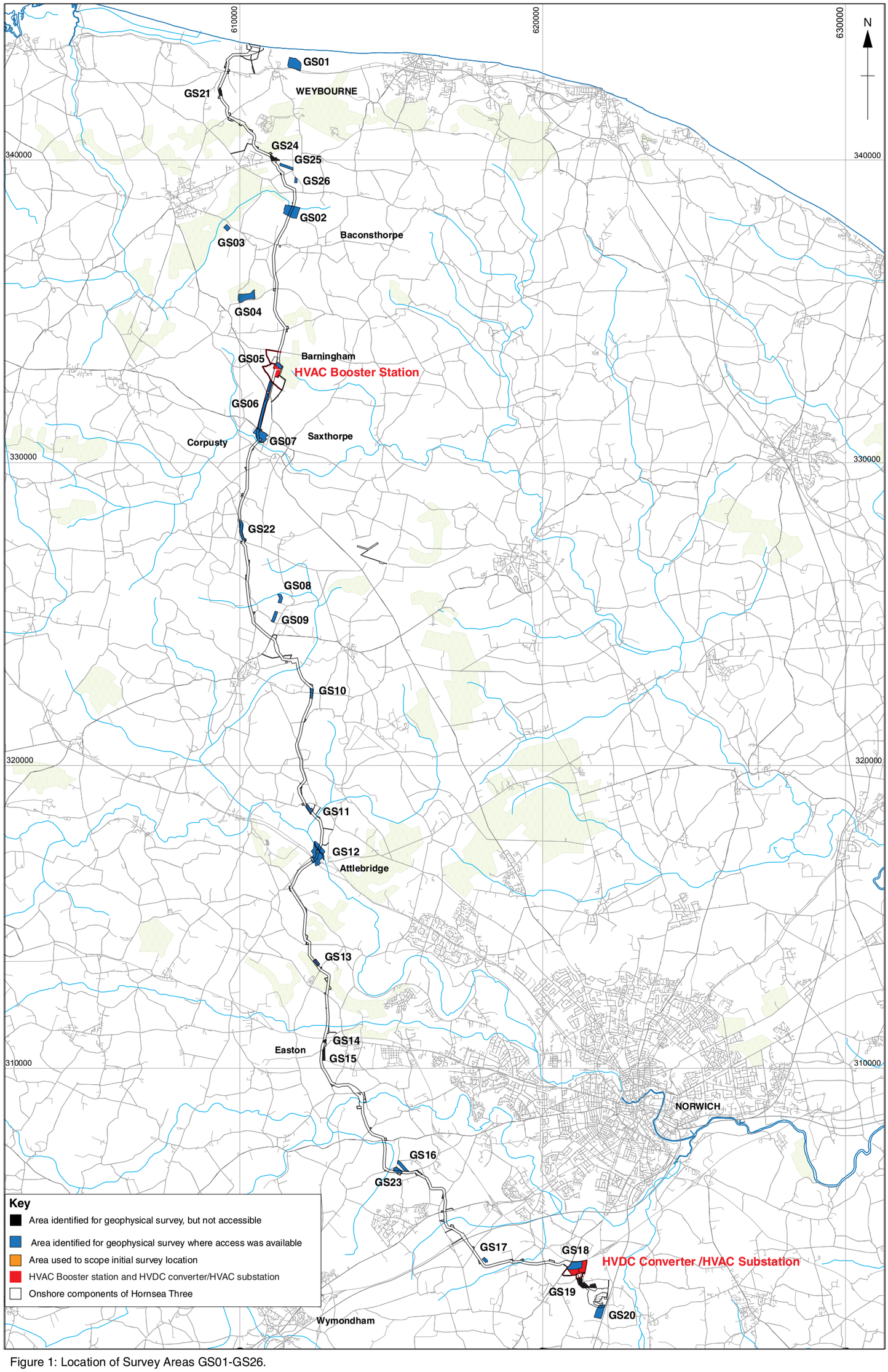


Figure 1: Location of Survey Areas GS01-GS26.

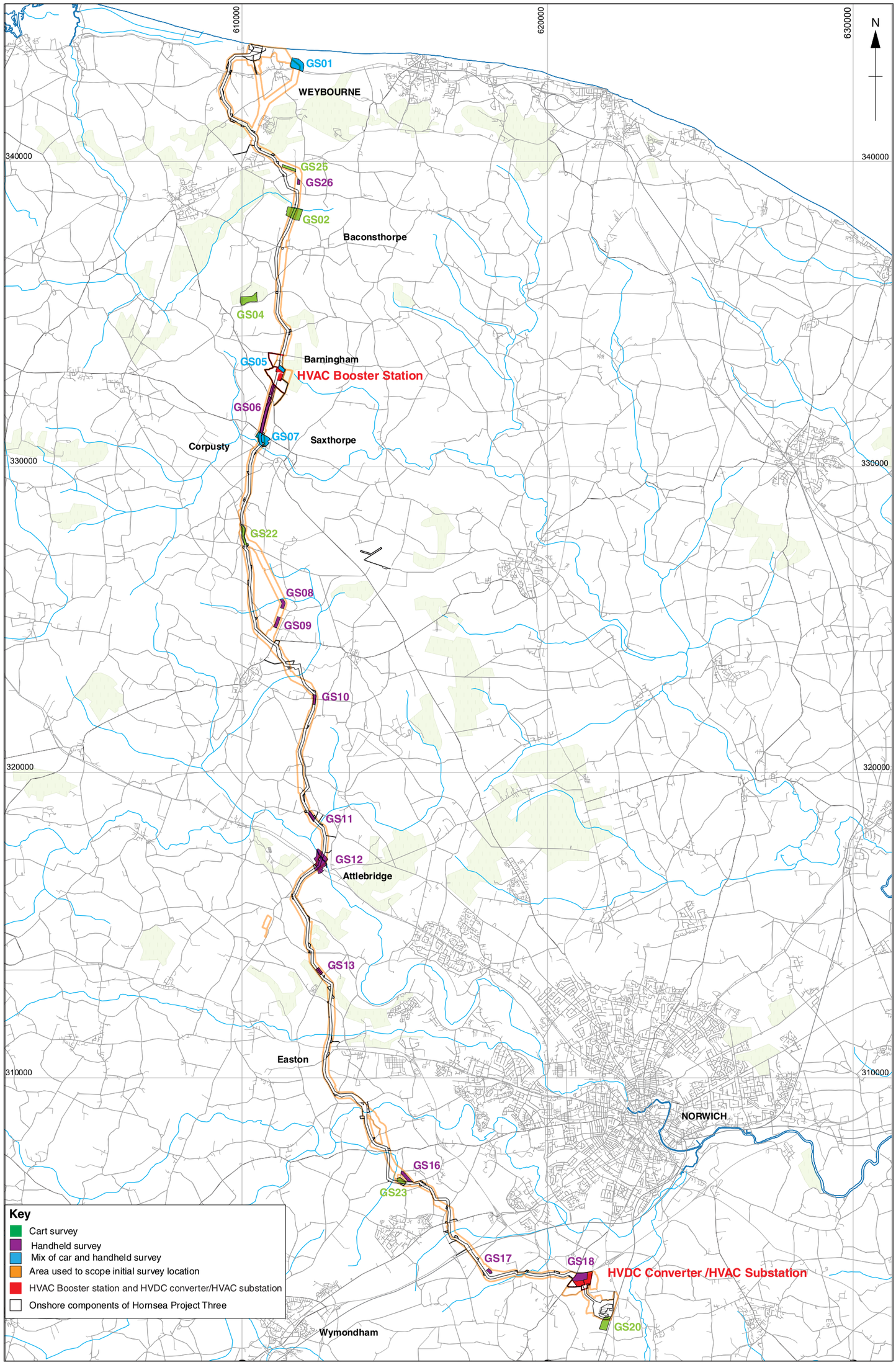


Figure 2: Areas surveyed and method of survey

N

Track

Weybourne Mill

Millpeace

Field House

29.7M

31.1M

Sheringham Road

Cemetery

A 149

A 149

Area used to scope initial survey location

Survey Area (hand-held) - showing 30m grid

Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

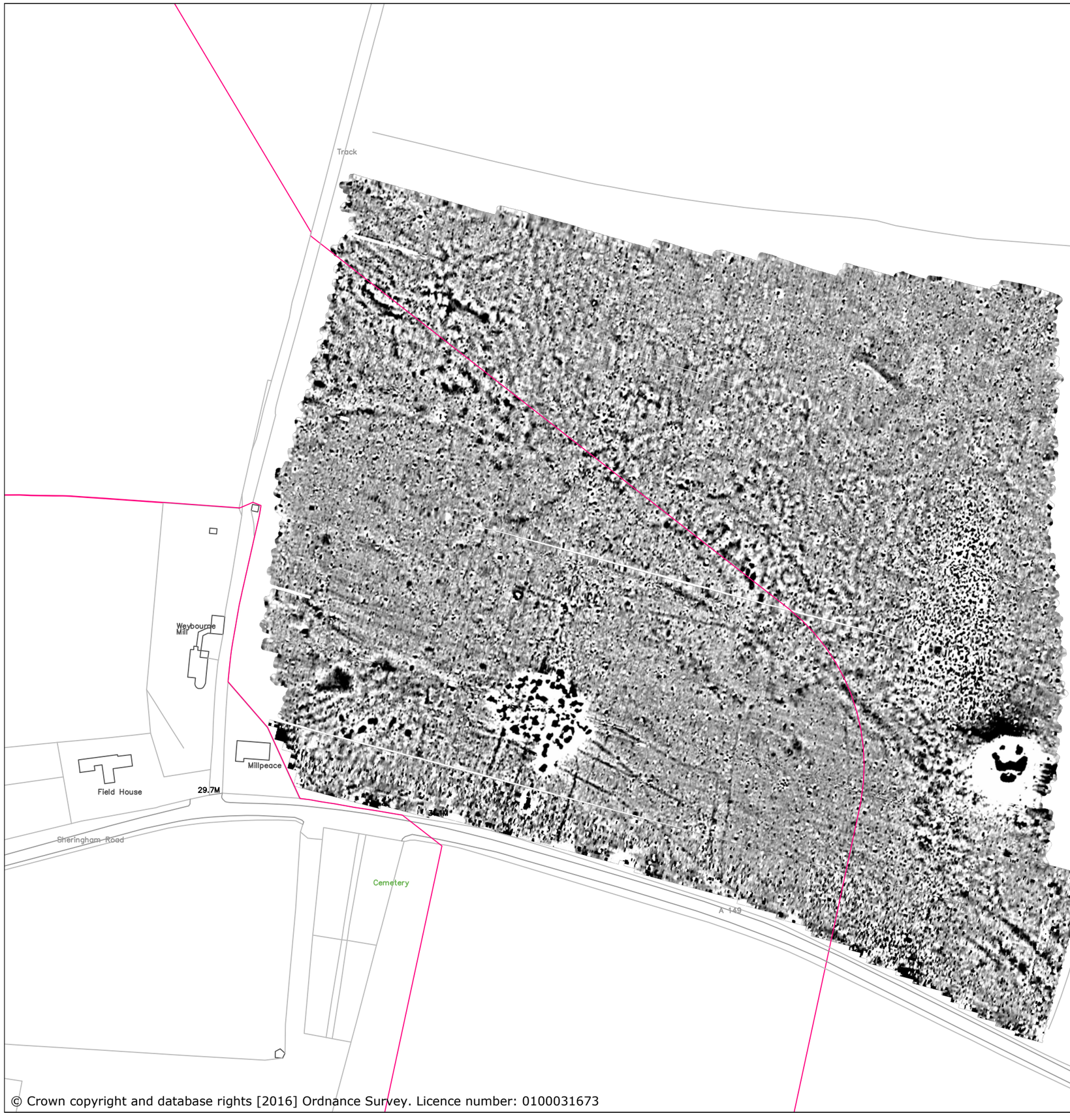
Title:
Location of Survey Area - GS01 Weybourne

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
03



N

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plot - GS01 Weybourne

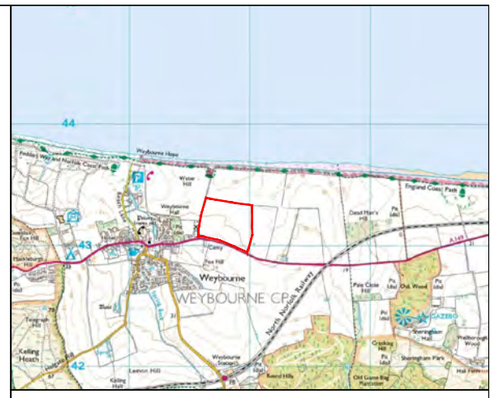
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
04

N



Track

3

6

1

2

5

4

7

1

6

2

Weybourne Mill

Millpeace

Field House

29.7M

31.1M

Sheringham Road

Cemetery

A 149

A 149

KEY

	Probable archaeology (discrete anomaly / trend)
	Possible archaeology (trend)
	Uncertain Origin (area of increased response / trend)
	Former field boundary (corroborated)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Former pond (corroborated)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Ferrous
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

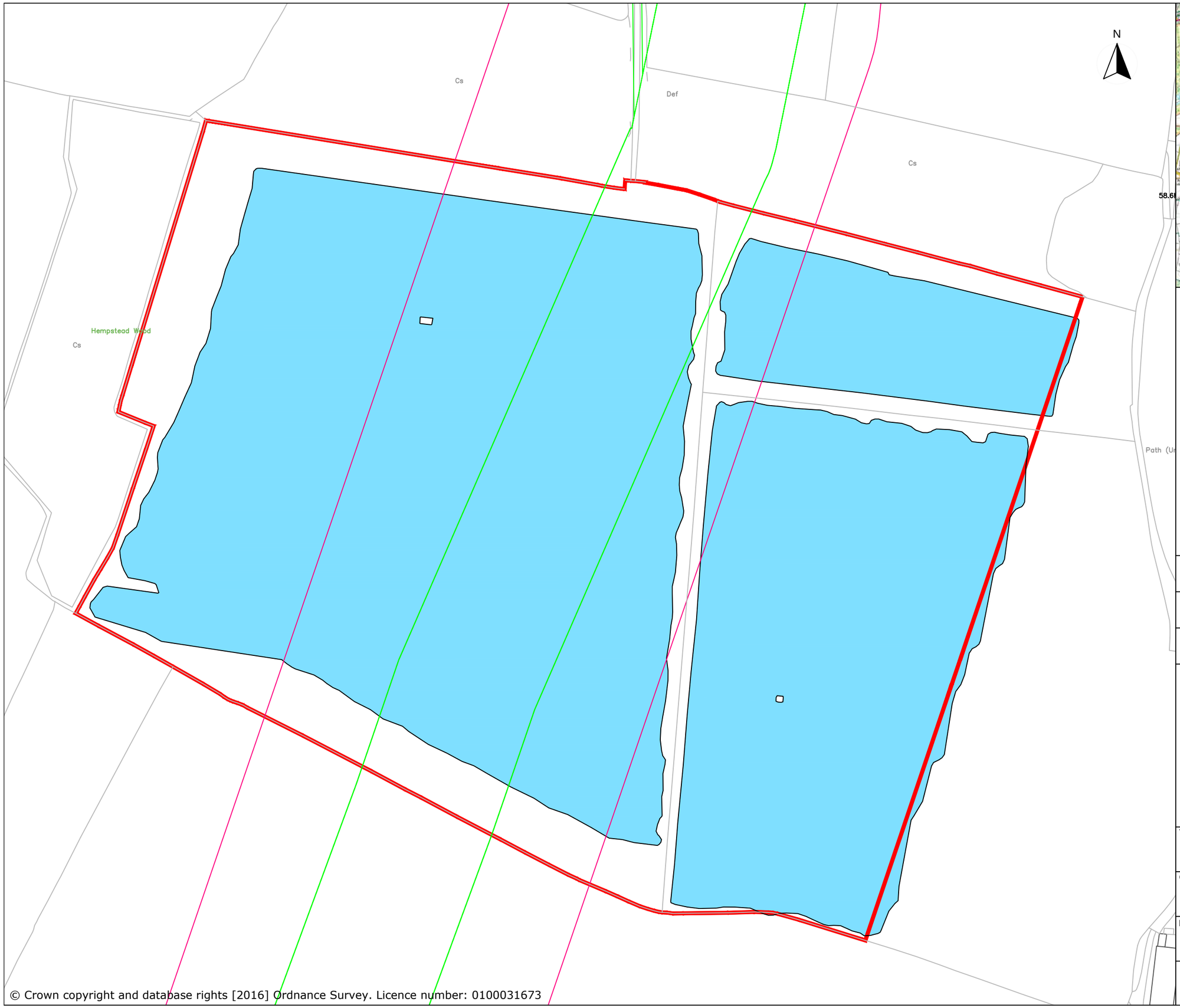
Title:
Magnetometer Survey - Interpretation - GS01 Weybourne

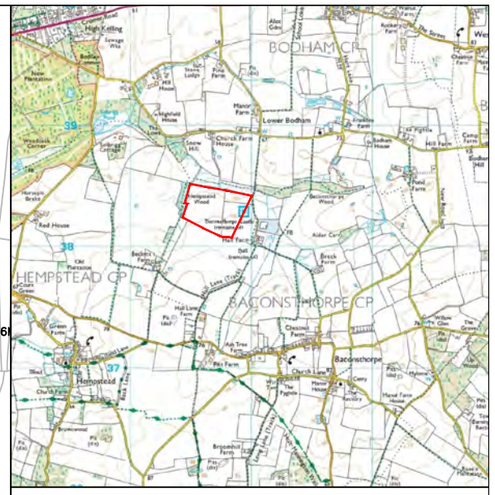
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
05





	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

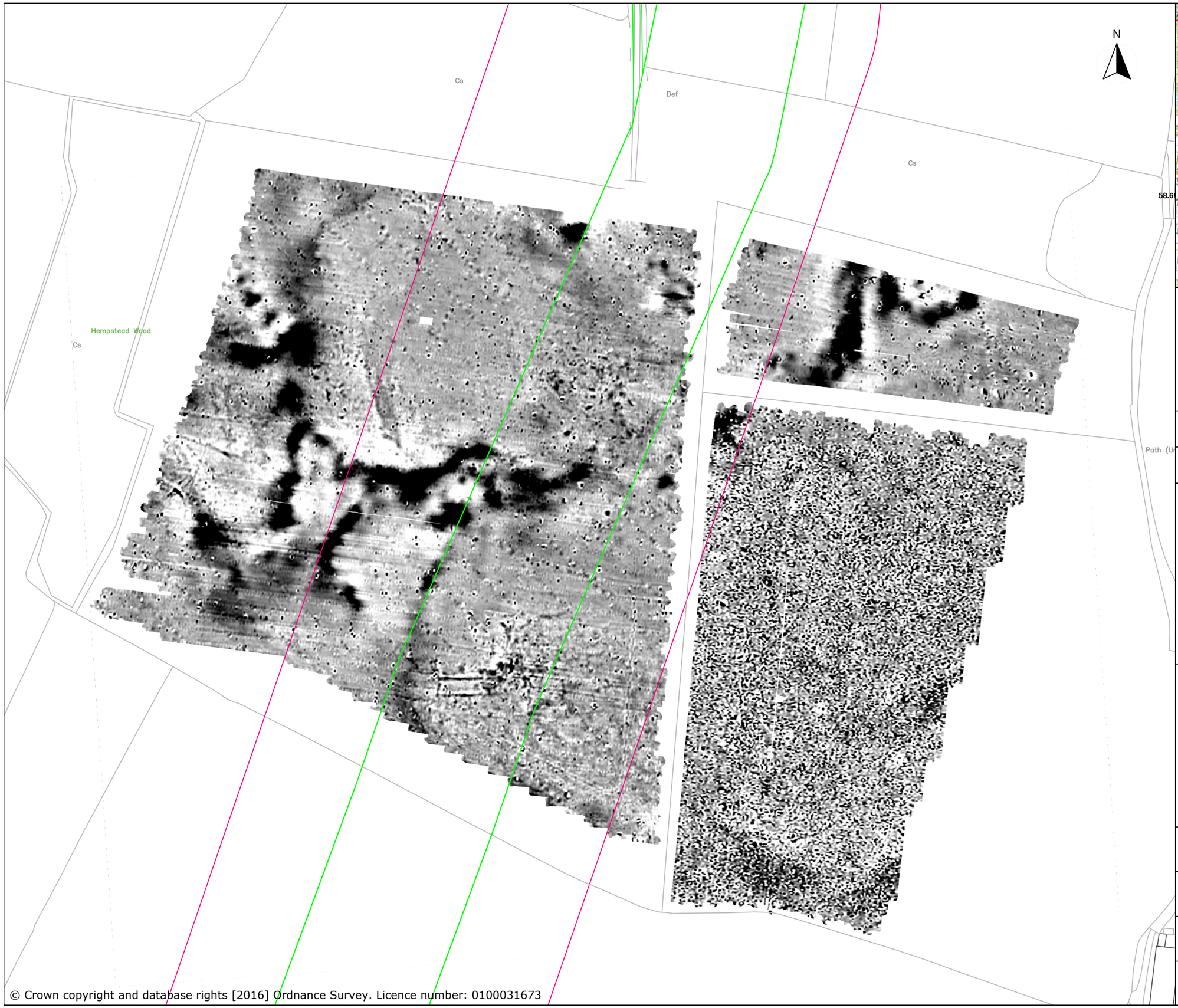
Title:
Location of Survey Areas - GS02 Baconsthorpe

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
06



Onshore components of Hornsea Three

Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

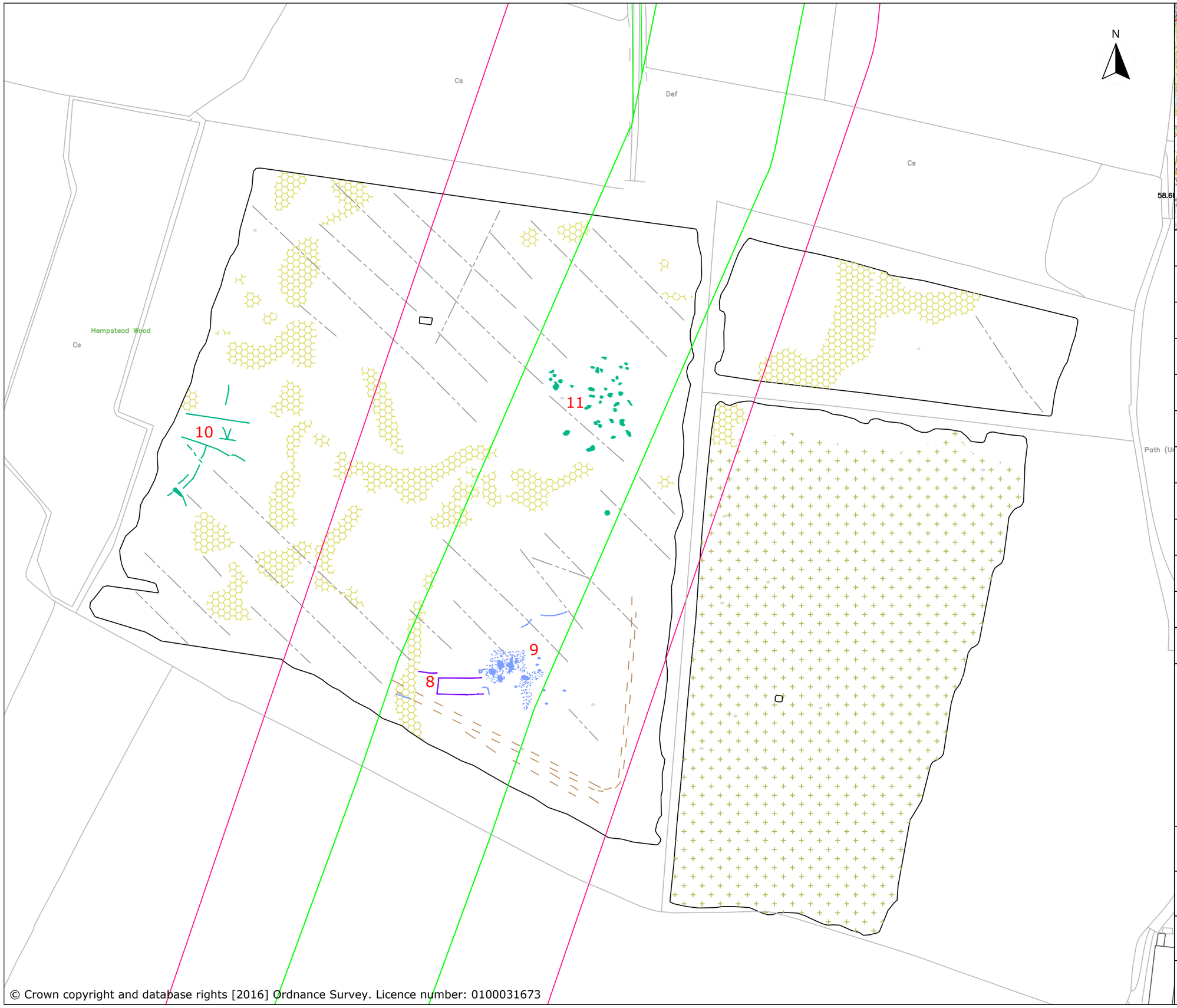
Title:
Magnetometer Survey - Greyscale Plots - GS02 Baconsthorpe

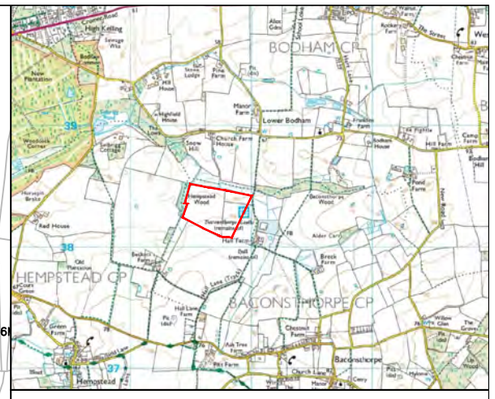
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
07





KEY

	Probable archaeology (discrete anomaly)
	Possible archaeology (discrete anomaly / area of increased response)
	Uncertain Origin (discrete anomaly)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance - green waste
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

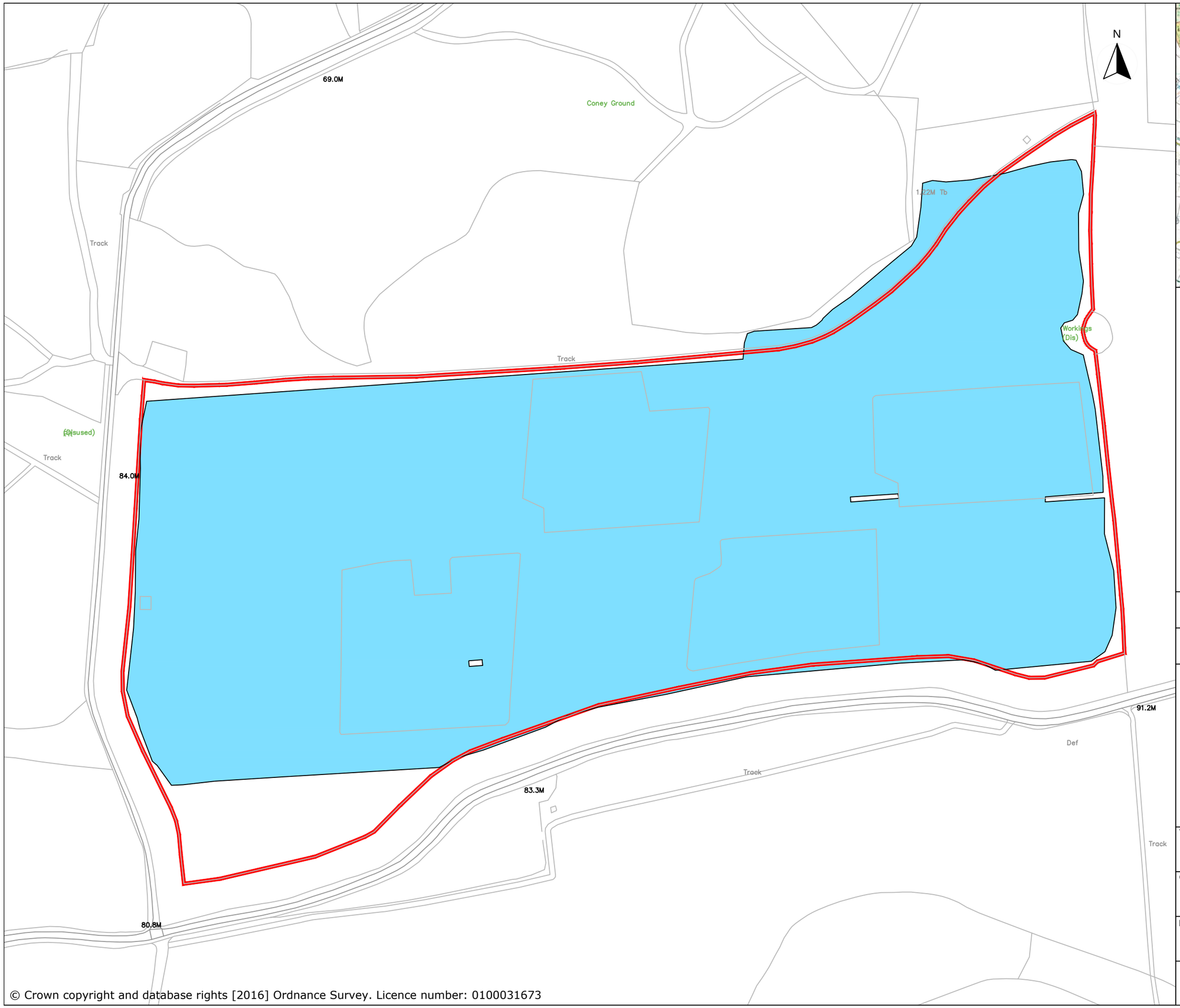
Title:
Magnetometer Survey - Interpretation - GS02 Baconsthorpe

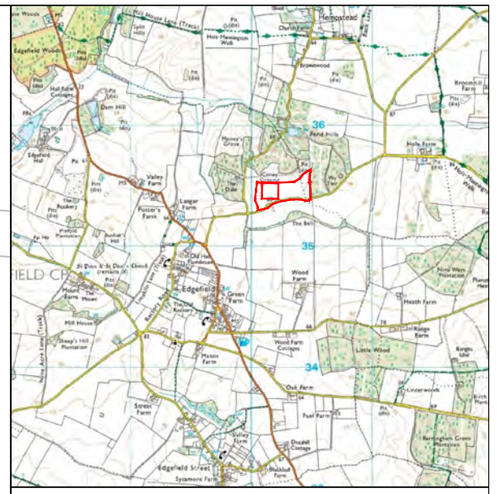
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
08





Area used to scope initial survey location

Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

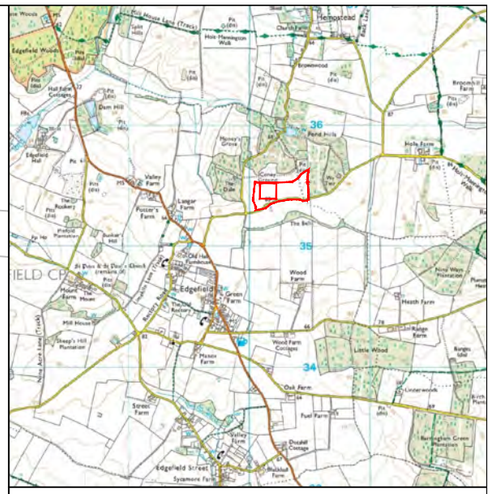
Title:
Location of Survey Area - GS04 Edgefield

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
09



Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

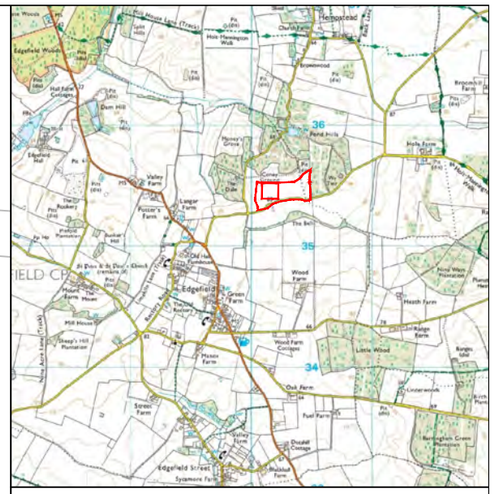
Title:
Magnetometer Survey - Greyscale Plot - GS04 Edgefield

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
10



KEY

	Natural (e.g. geological / pedological)
	Ferrous
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

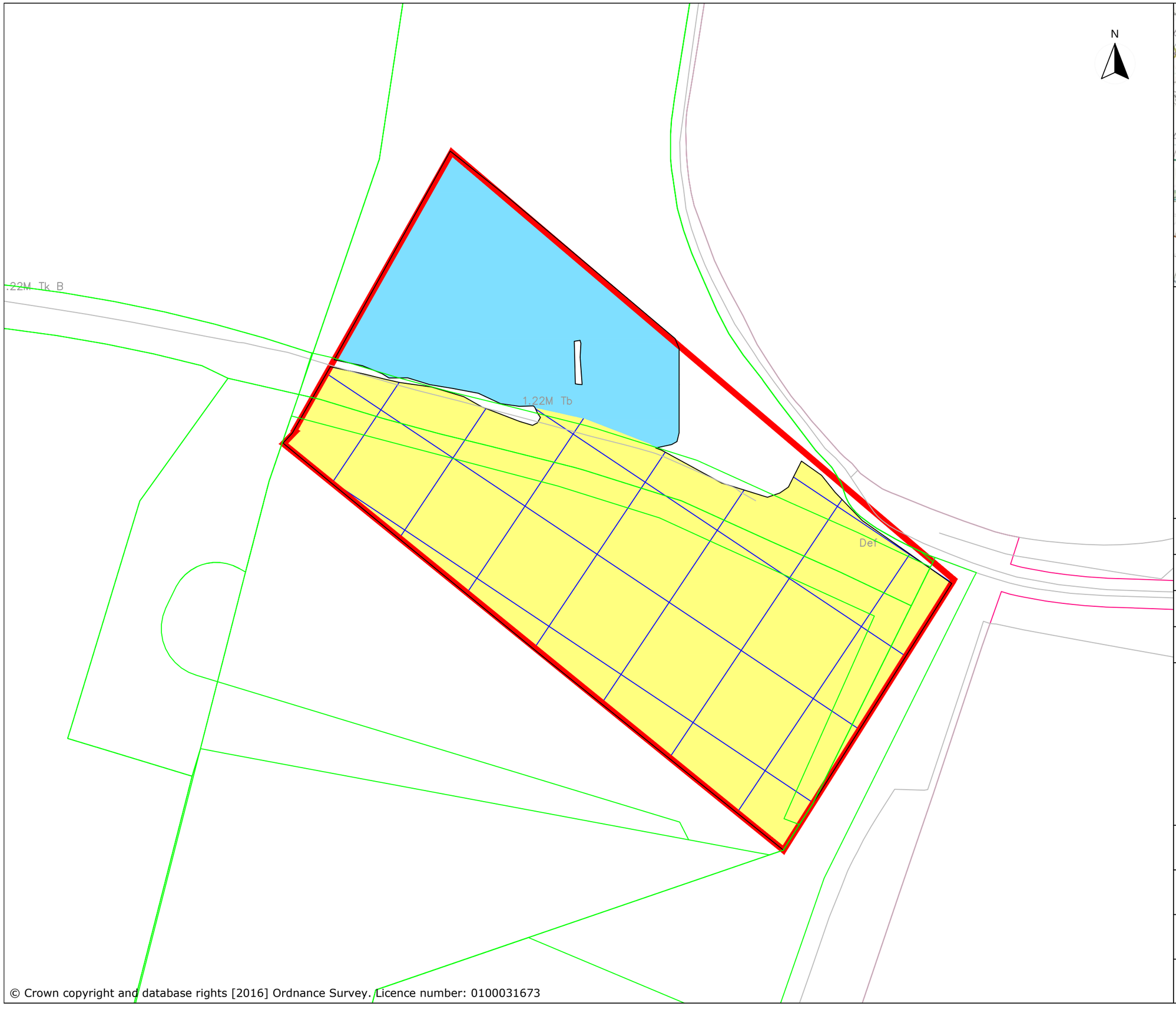
Title:
Magnetometer Survey - Interpretation - GS04 Edgefield

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
11



	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area (hand-held) - showing 30m grid
	Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

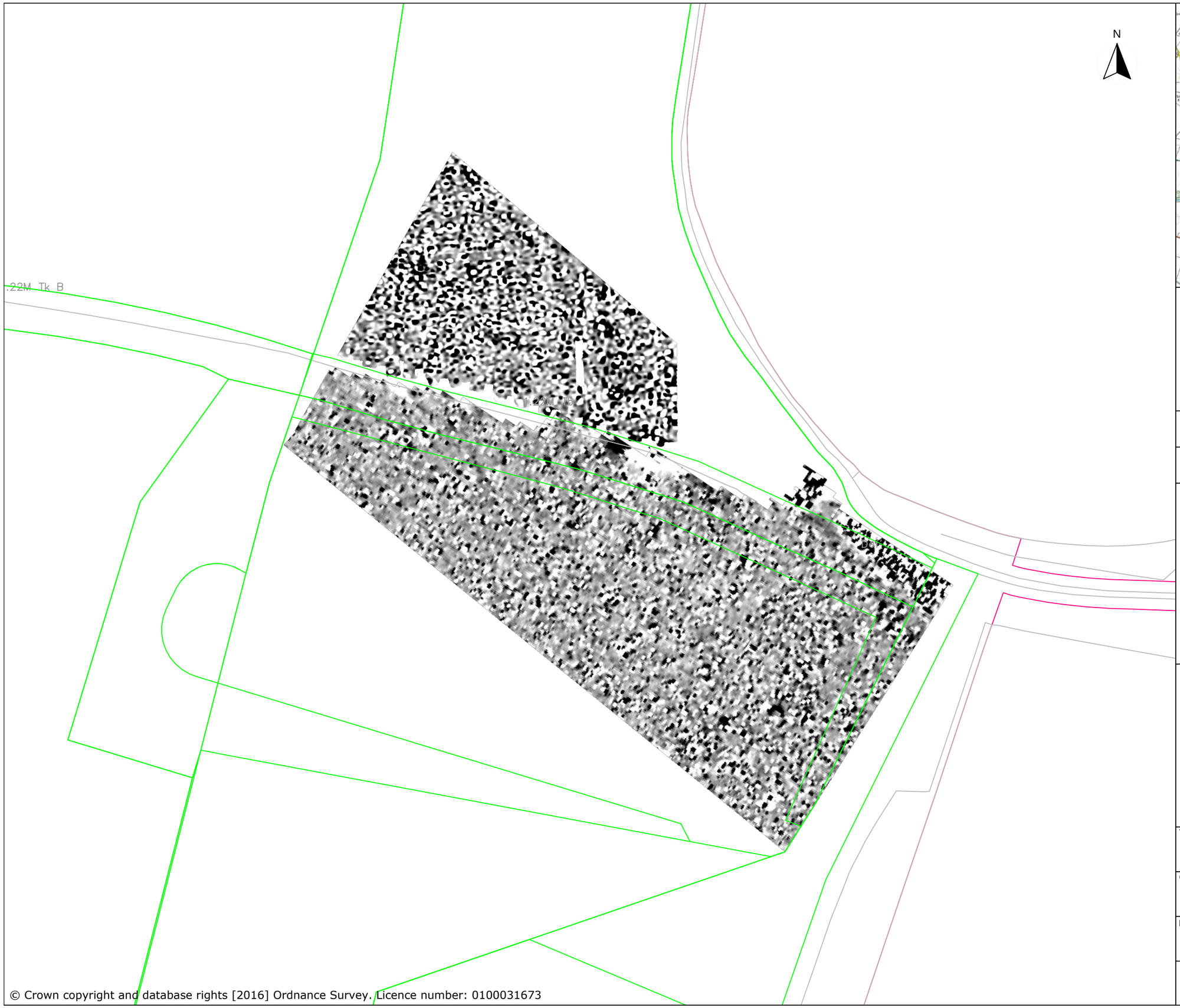
Title:
Location of Survey Area - GS05 Barningham

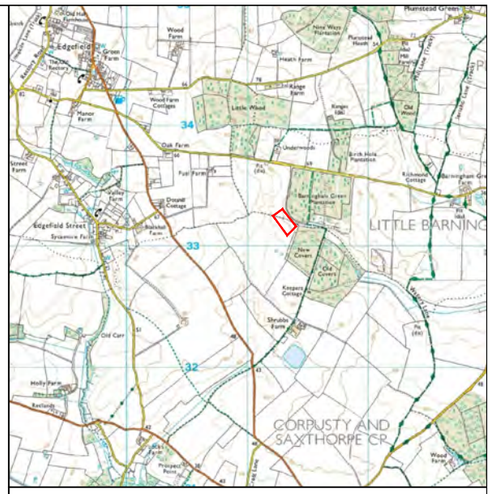
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
12





	Onshore components of Hornsea Three
	Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

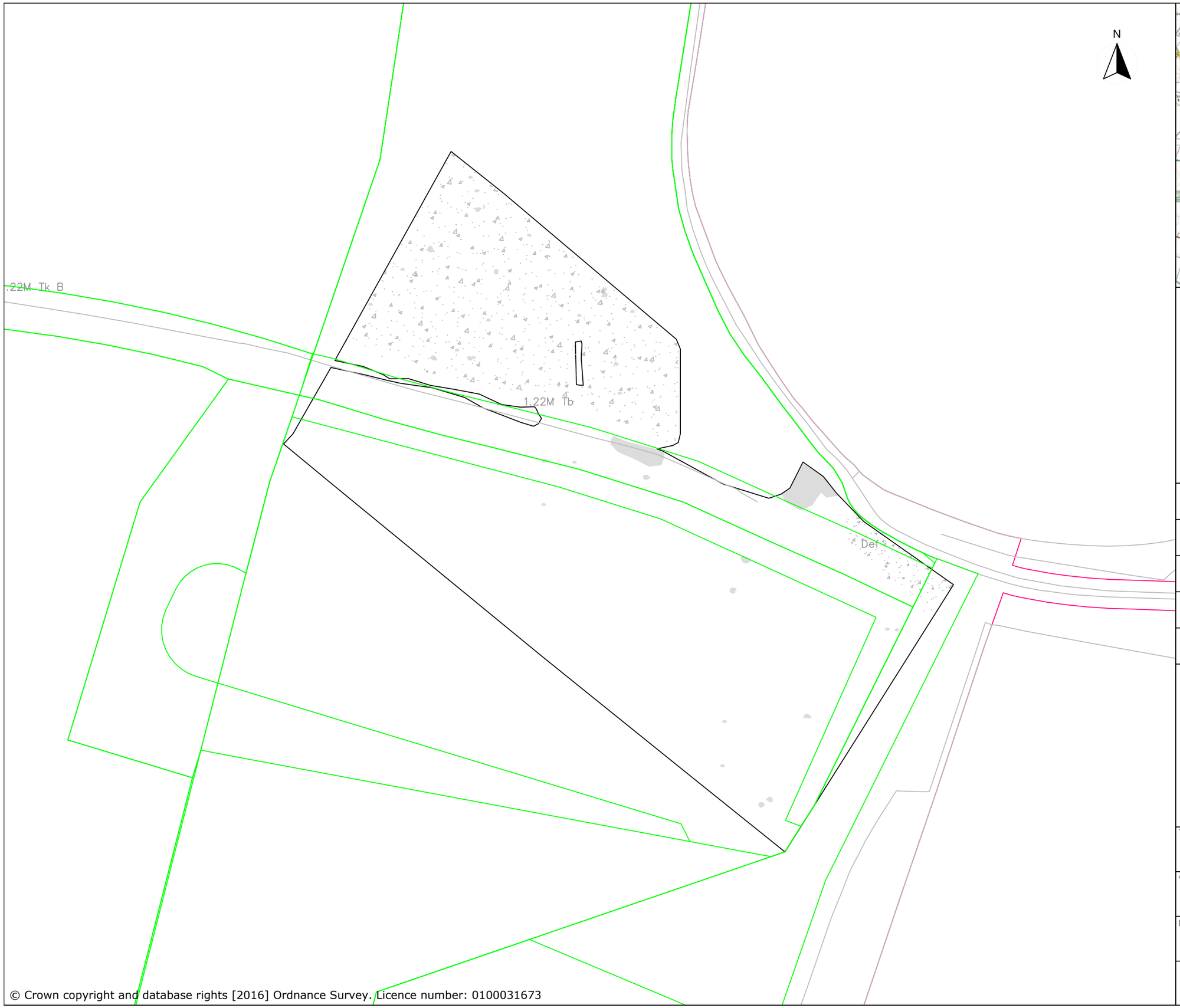
Title:
Magnetometer Survey - Greyscale Plot - GS05 Barningham

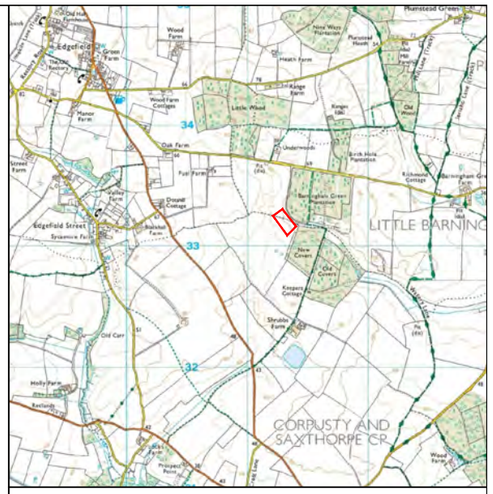
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
13





KEY

	Magnetic disturbance
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

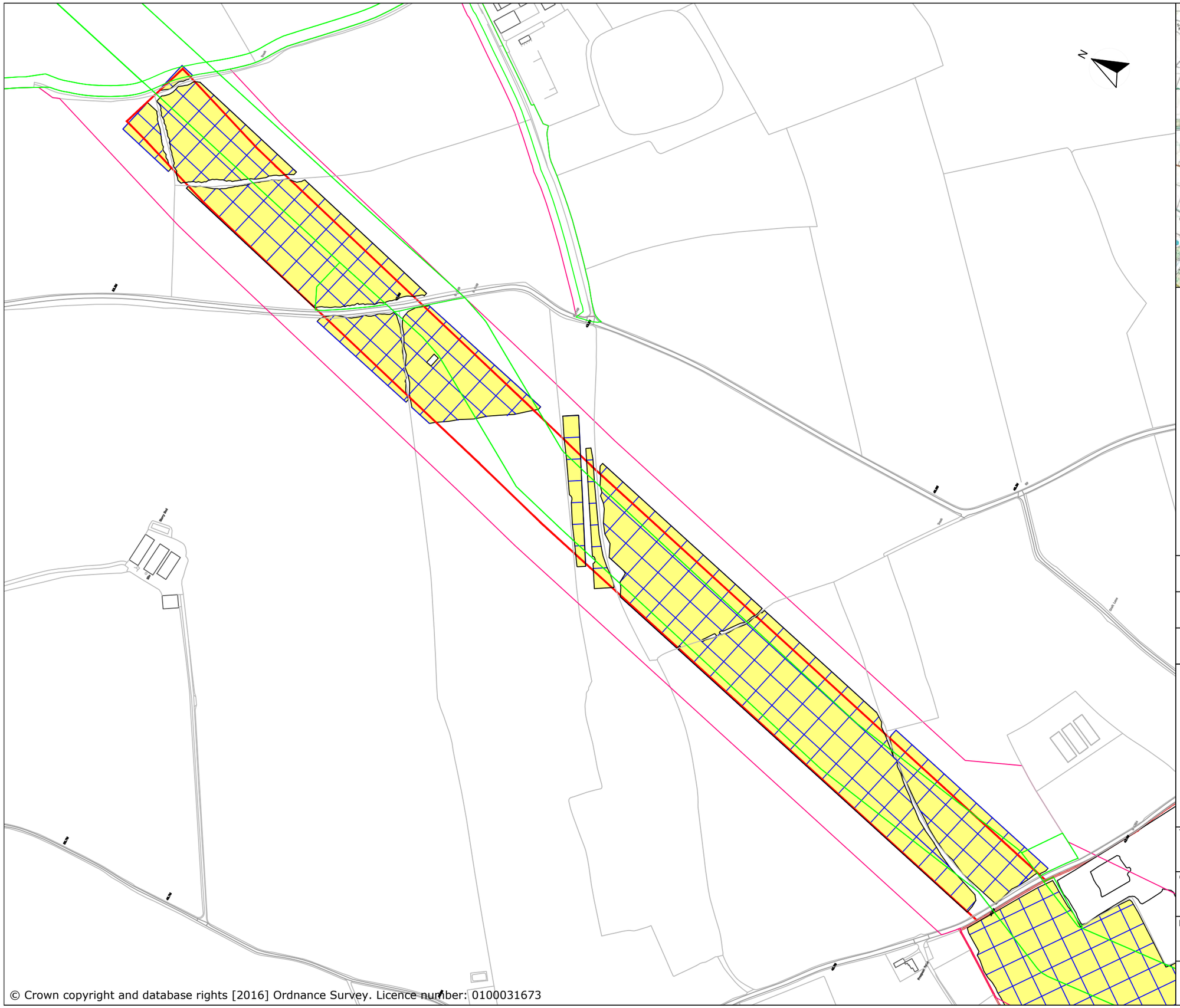
Title:
Magnetometer Survey - Interpretation - GS05 Barningham

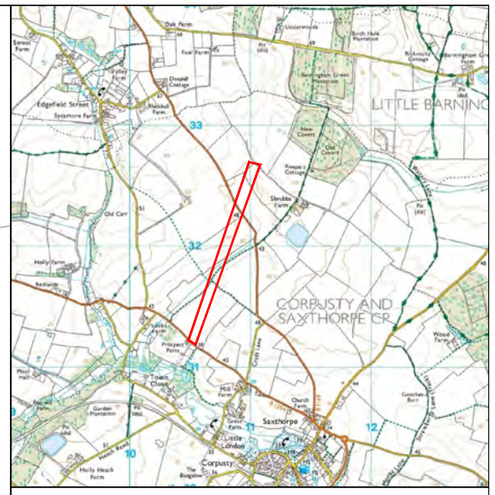
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
14





Onshore components of Hornsea Three

Area used to scope initial survey location

Survey Area (hand-held) - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

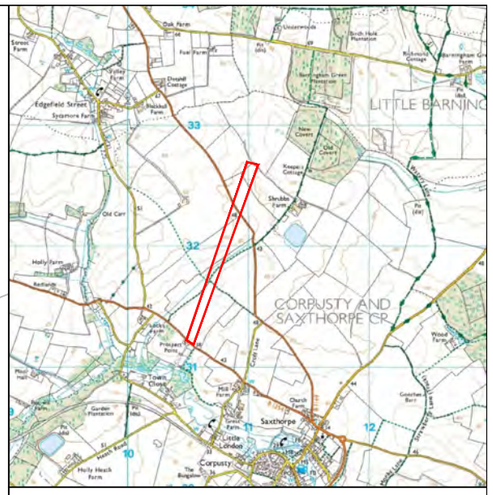
Title:
Location of Survey Areas - GS06 Corpusty

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 250
1:5000 @ A3

Fig No:
15



N

Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

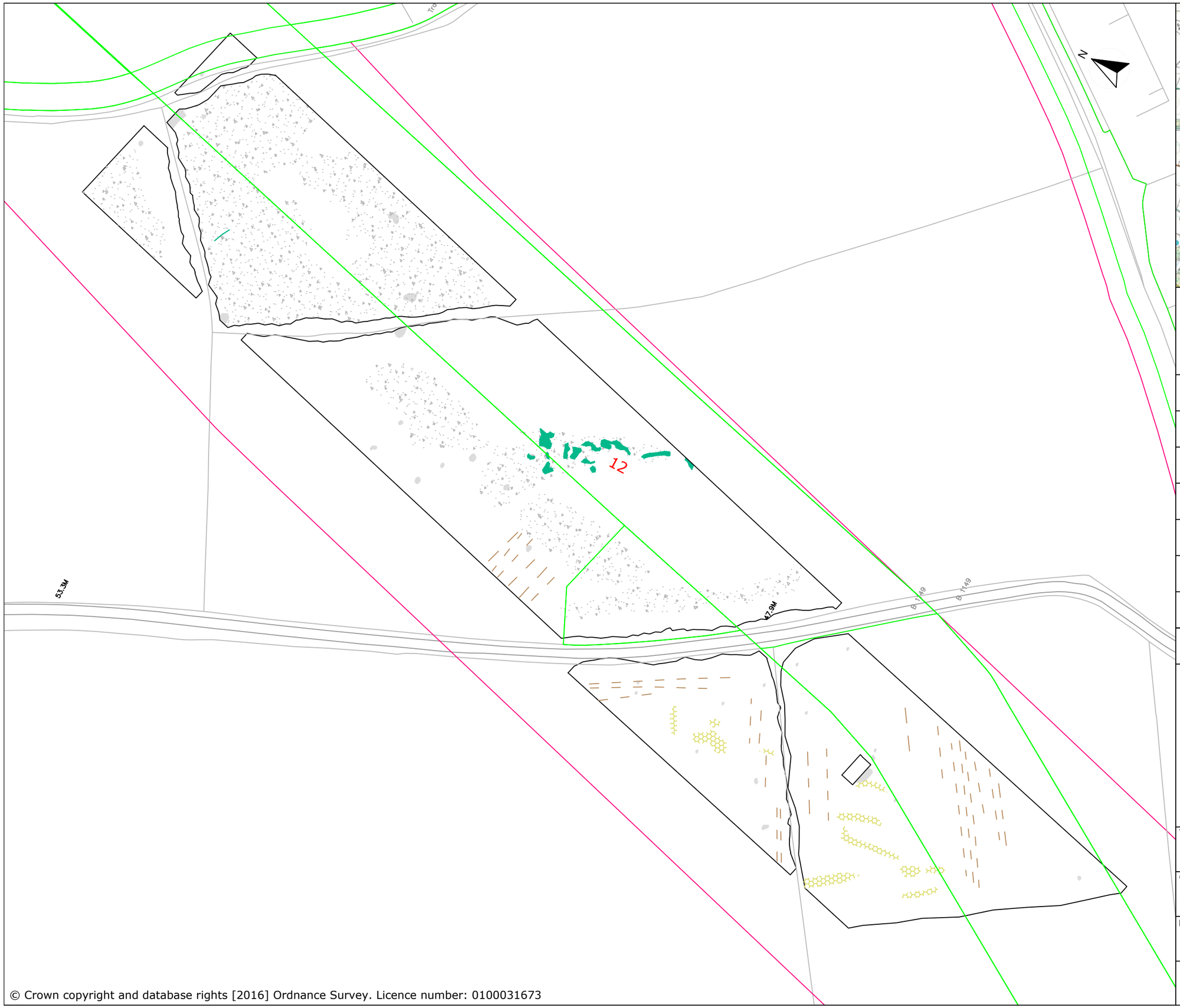
Title:
Magnetometer Survey - Greyscale Plots - GS06 Corpusty - North

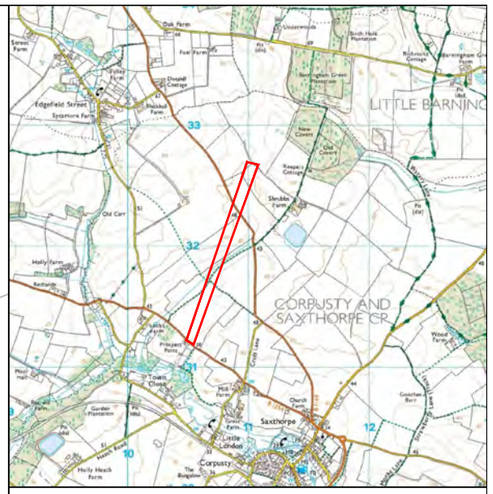
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
16





KEY

	Uncertain Origin (discrete anomaly)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

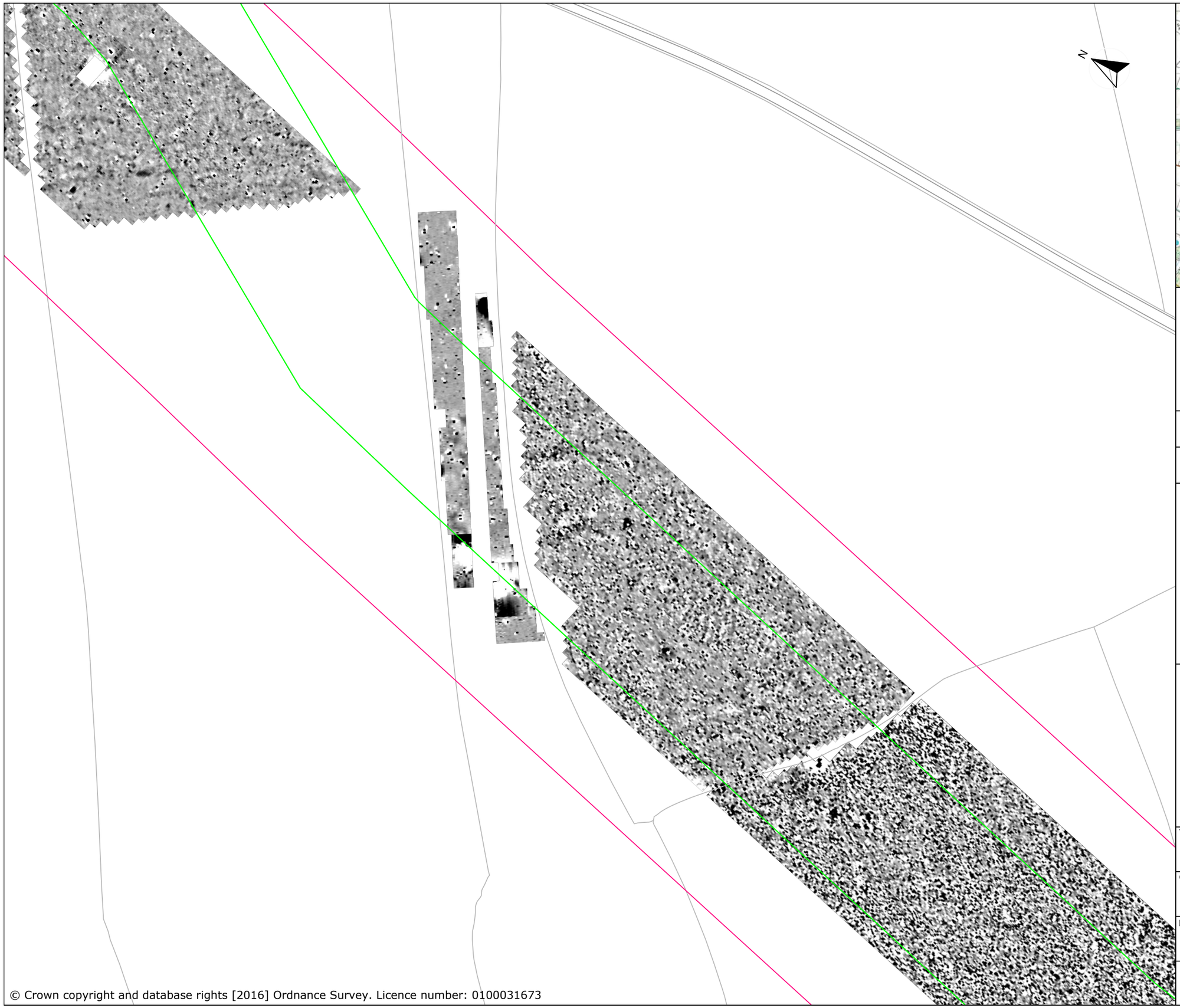
Title:
Magnetometer Survey - Interpretation - GS06 Corpusty - North

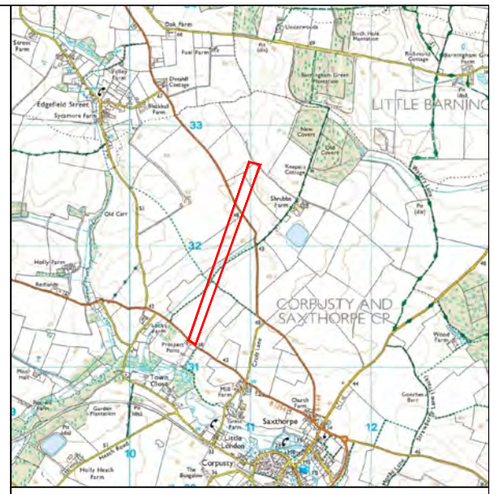
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
17





Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

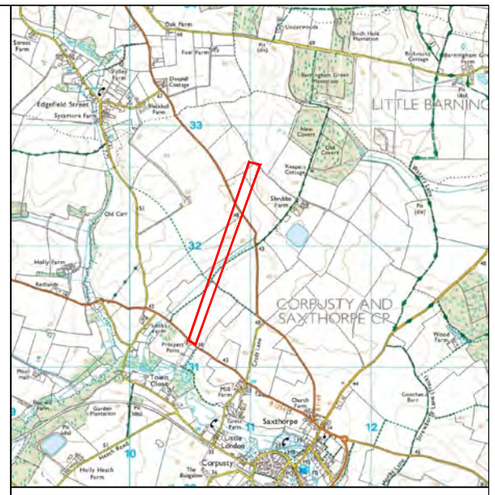
Title:
Magnetometer Survey - Greyscale Plots - GS06 Corpusty - Centre

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
18



KEY

	Uncertain Origin (discrete anomaly)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

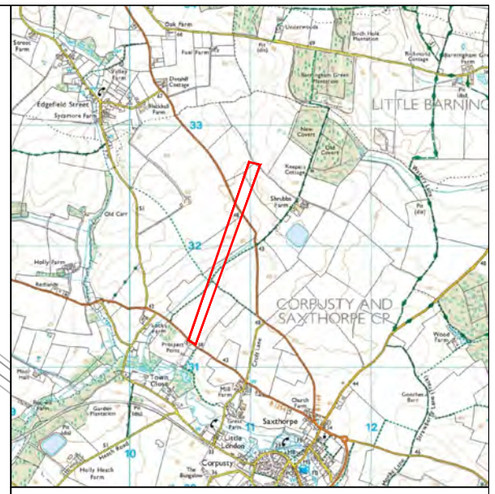
Title:
Magnetometer Survey - Interpretation - GS06 Corpusty - Centre

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
19



Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

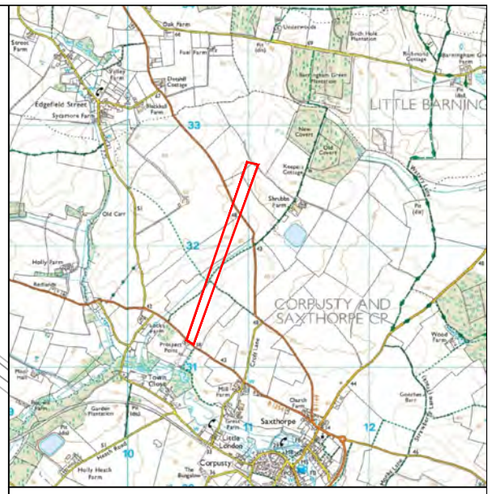
Title:
Magnetometer Survey - Greyscale Plots - GS06 Corpusty - South

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
20



KEY

	Uncertain Origin (discrete anomaly)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

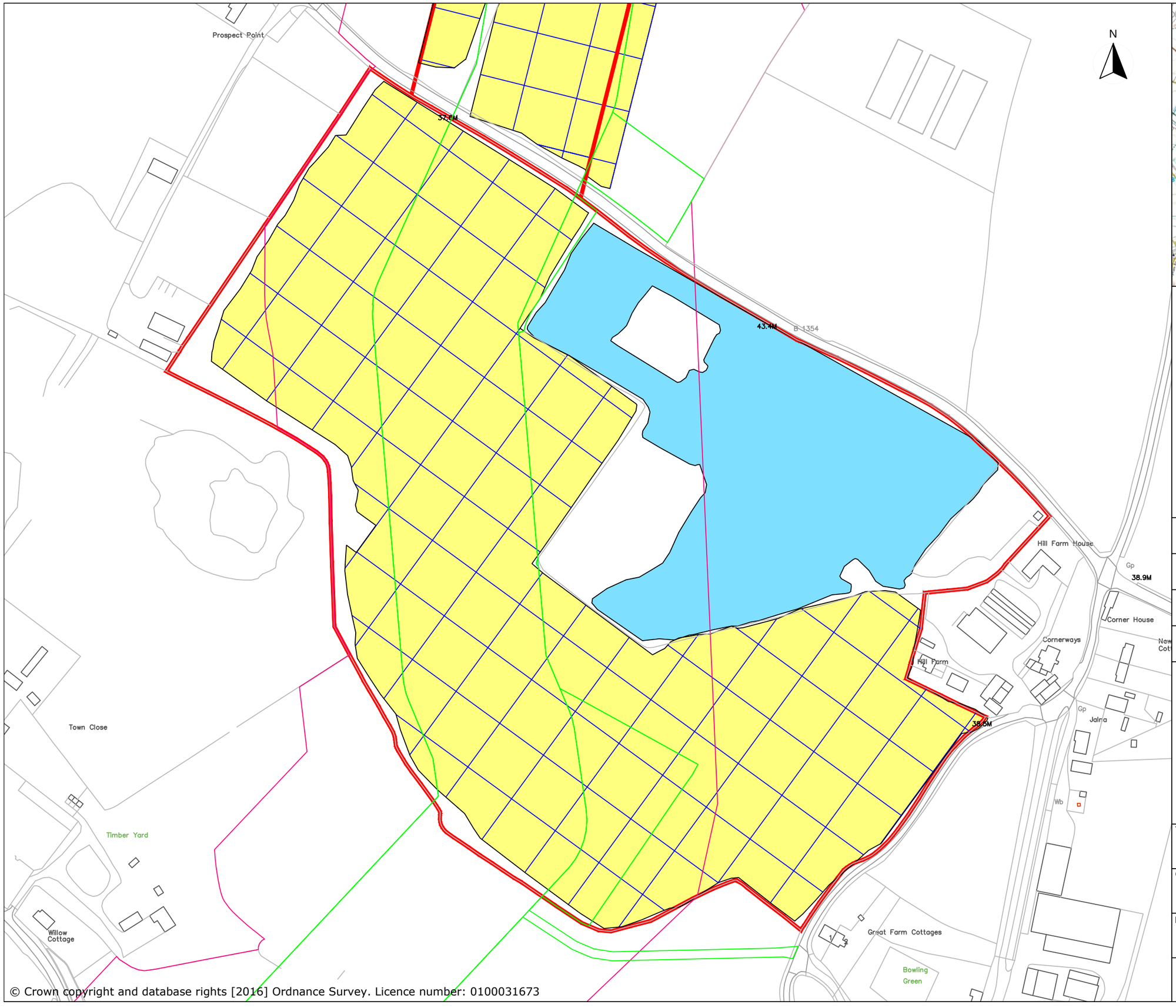
Title:
Magnetometer Survey - Interpretation - GS06 Corpusty - South

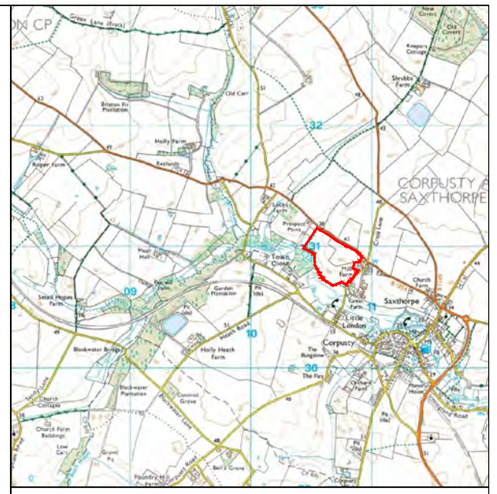
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
21





	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area (hand-held) - showing 30m grid
	Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

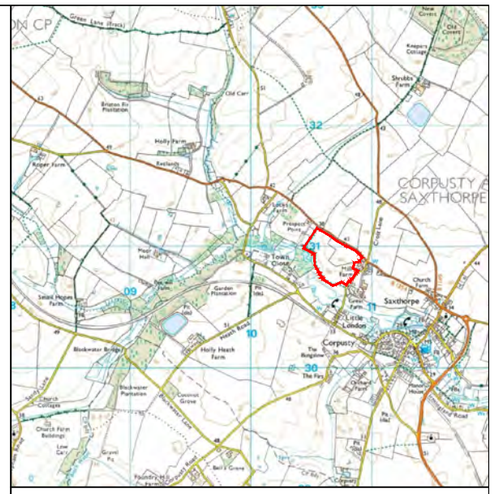
Title:
Location of Survey Areas - GS07 Saxthorpe

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
22



Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

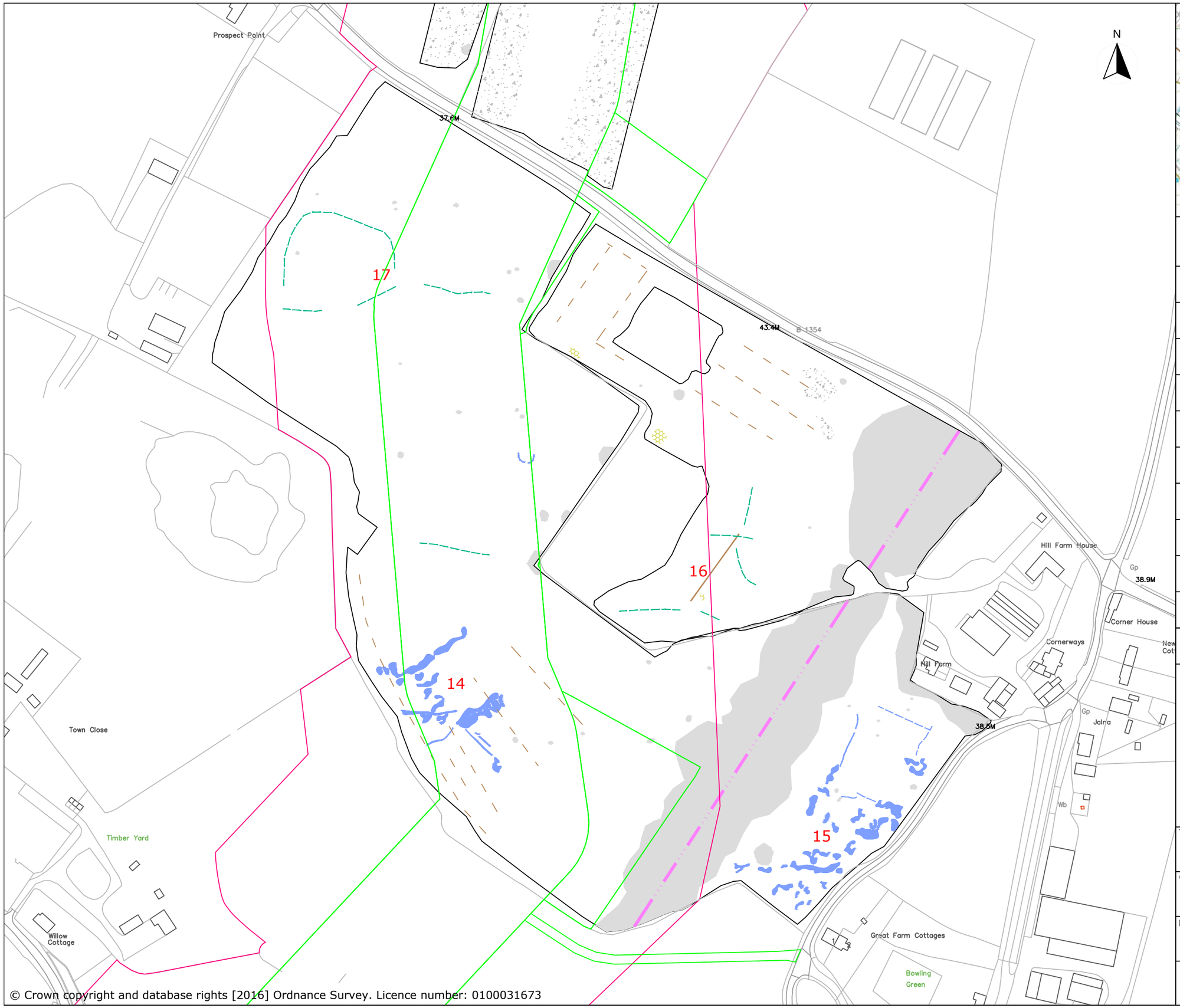
Title:
Magnetometer Survey - Greyscale Plots - GS07 Saxthorpe

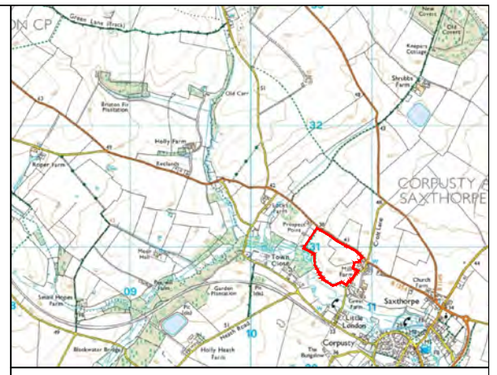
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
23





KEY

	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (trend)
	Former field boundary (corroborated)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

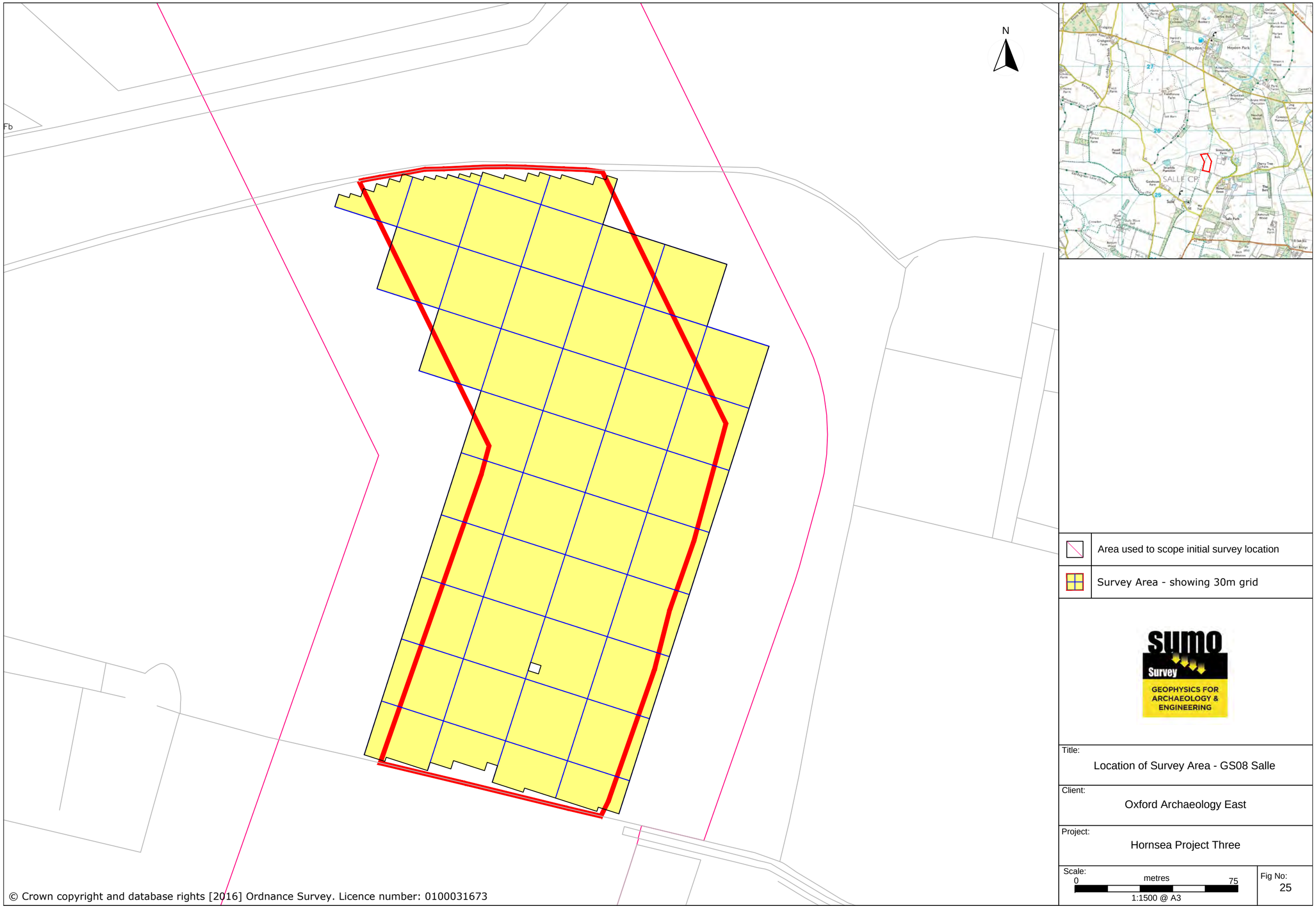
Title:
Magnetometer Survey - Interpretation - GS07 Saxthorpe

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
24



Area used to scope initial survey location

Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Location of Survey Area - GS08 Salle

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
25

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

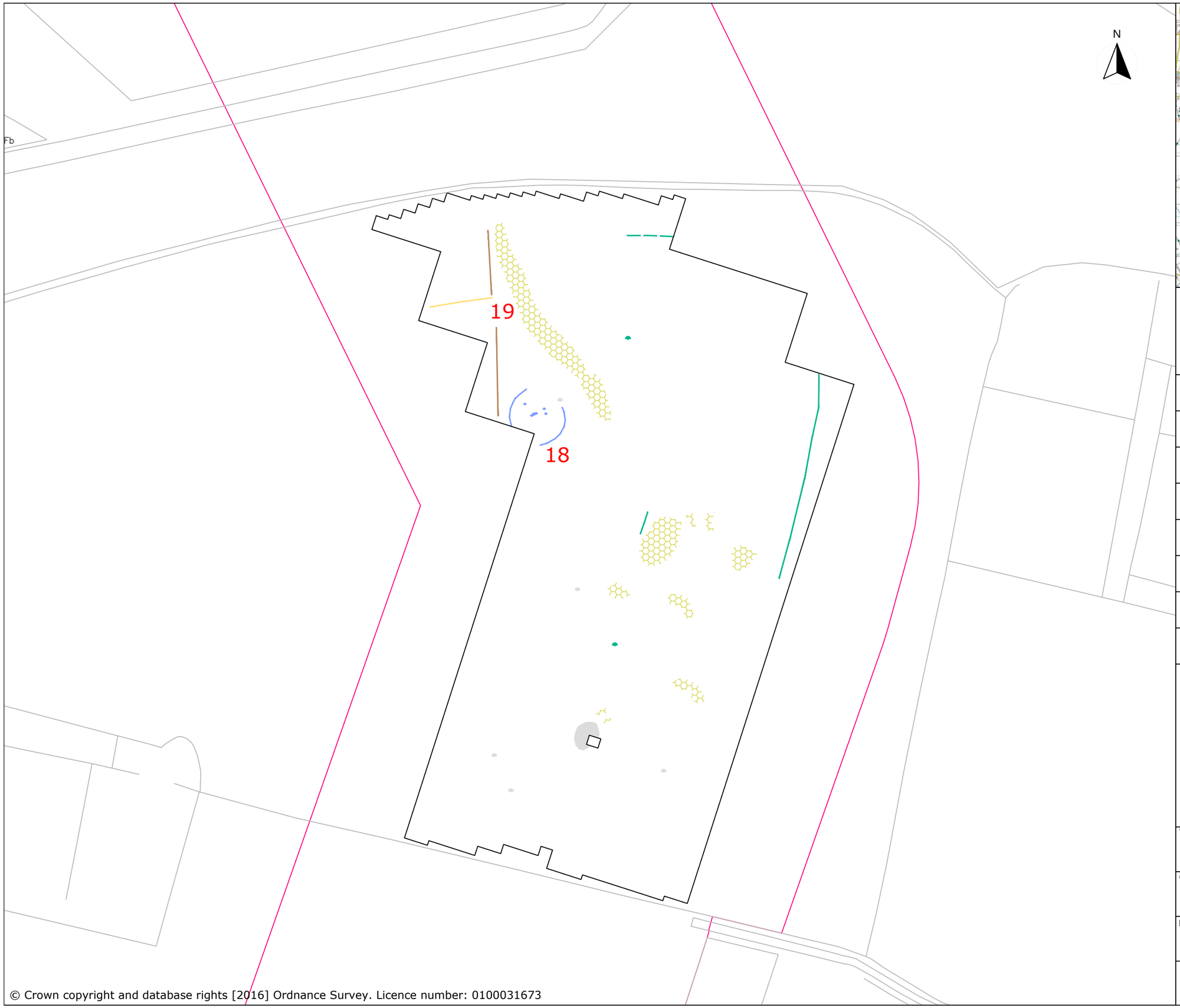
Title:
Magnetometer Survey - Greyscale Plot - GS08 Salle

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
26



KEY

	Possible archaeology (discrete anomaly)
	Uncertain Origin (discrete anomaly / trend)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Natural (e.g. geological / pedological)
	Ferrous
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

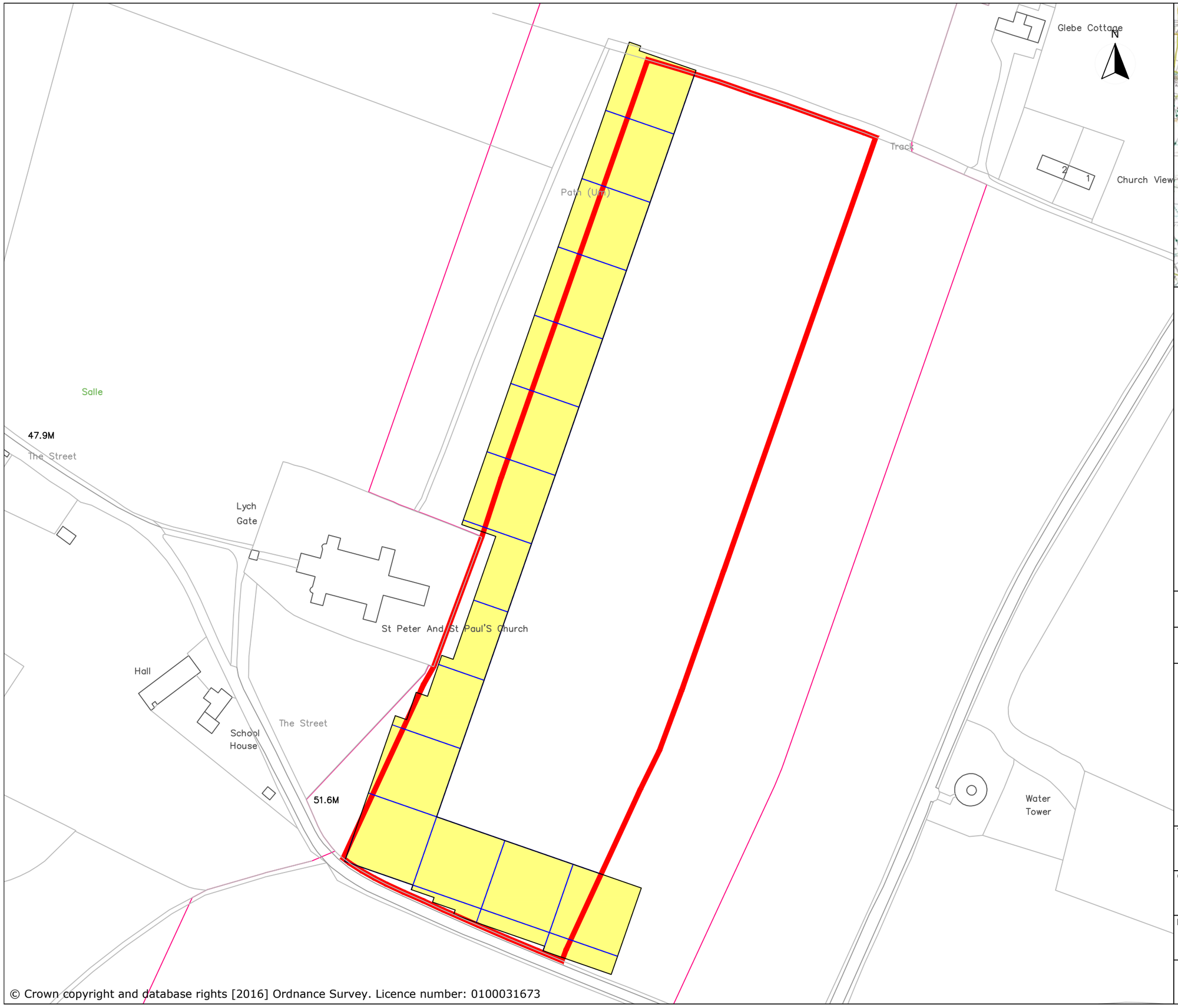
Title:
Magnetometer Survey - Interpretation - GS08 Salle

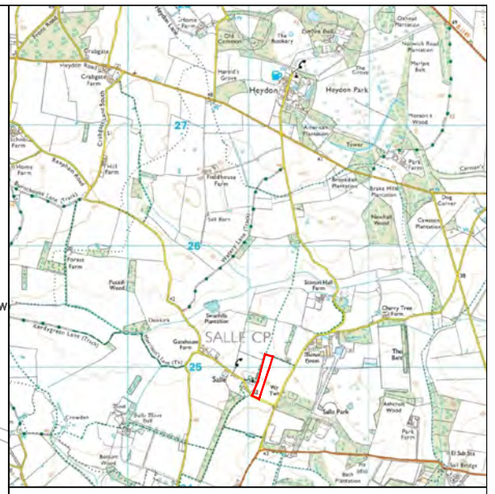
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
27





Area used to scope initial survey location

Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

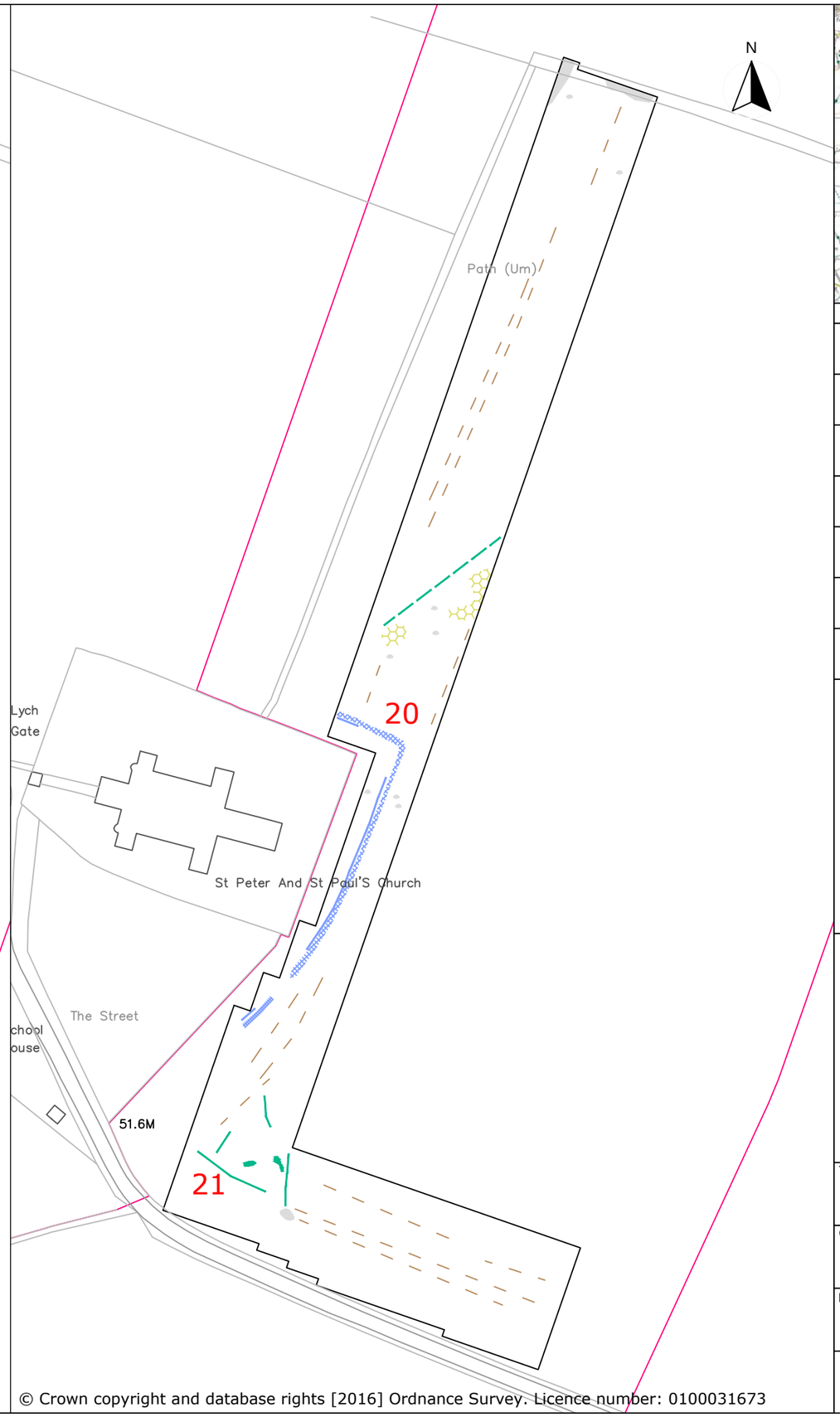
Title:
Location of Survey Area - GS09 Salle Church

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

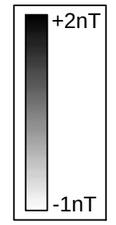
Scale:
0 metres 75
1:1500 @ A3

Fig No:
28



KEY

	Possible archaeology (discrete anomaly / negative)
	Uncertain Origin (discrete anomaly / trend)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Ferrous
	Area used to scope initial survey location



sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

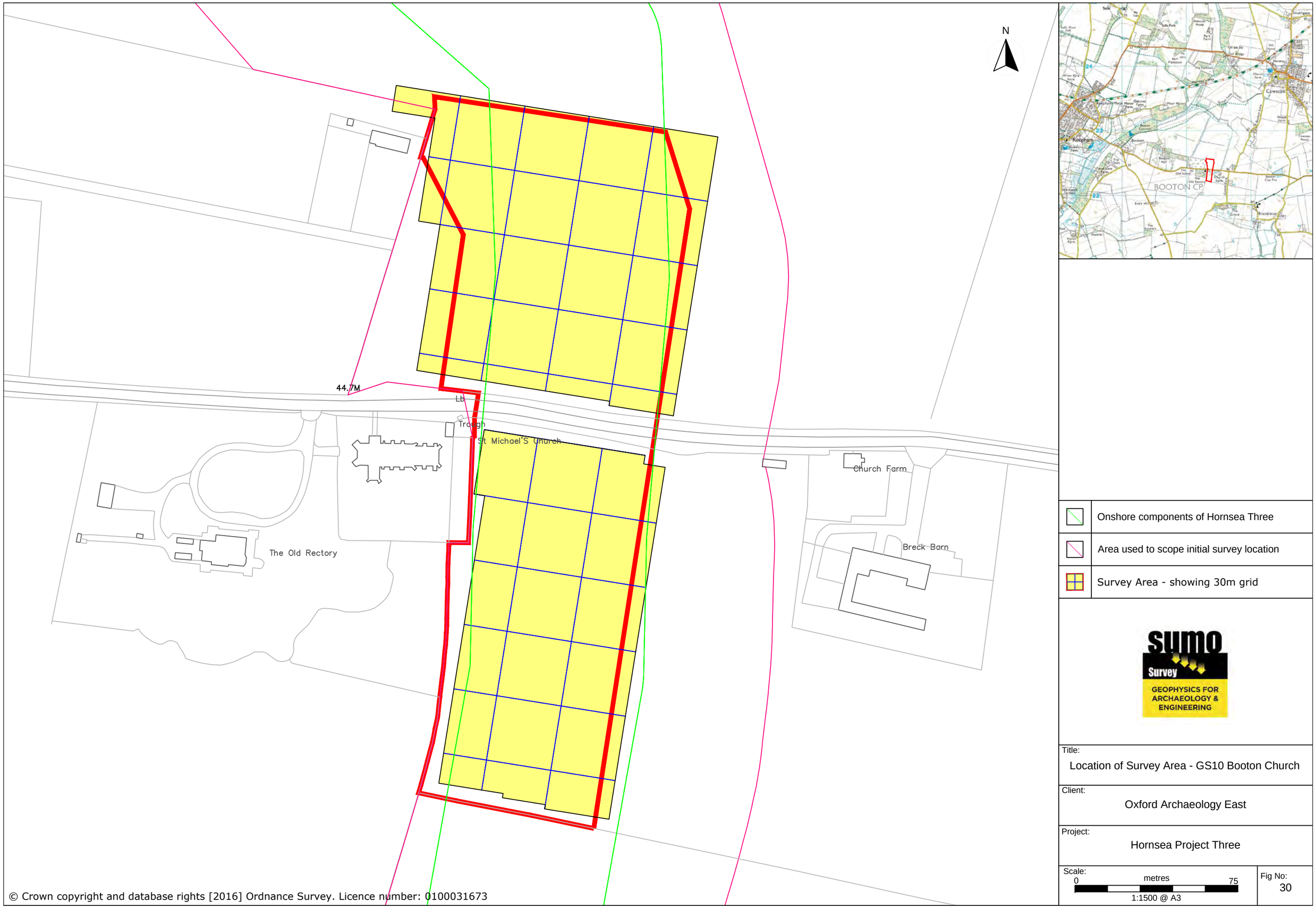
Title:
Magnetometer Survey - Greyscale Plot & Interpretation - GS09 Salle Church

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
29



	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

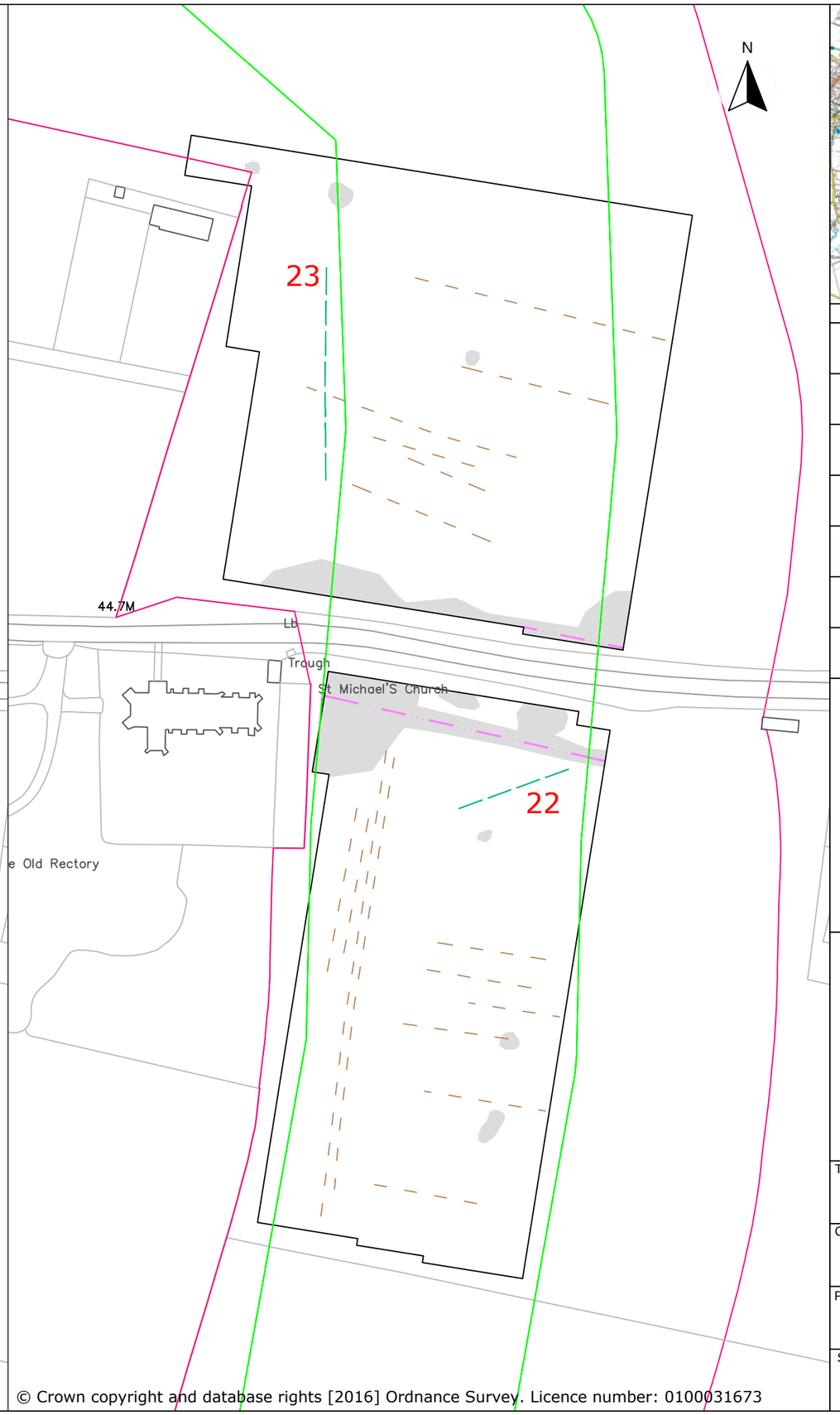
Title:
Location of Survey Area - GS10 Booton Church

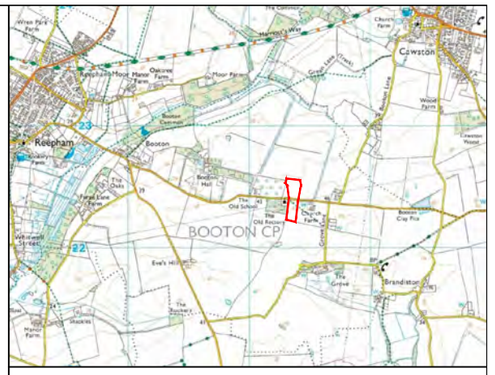
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

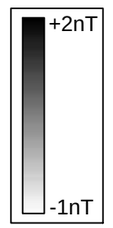
Fig No:
30





KEY

	Uncertain Origin (trend)
	Agriculture (plough)
	Service
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location



sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plot & Interpretation - GS10 Booton Church

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
31

Hall Road Farm

Pyghtle

Road

Hall

St John The Baptist Church

Lodge

Dovecote Barn

17.9M

Church Farm

Track

Etl

HVDC Converter

Onshore components of Hornsea Three

Area used to scope initial survey location

Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Location of Survey Areas - GS11 Alderford

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
32

Hall Road Farm

Pyghtle

Hall Road

St John The Baptist Church

Lodge

Dovecote Barn

17.9M

Church Farm

N

HVDC Converter

Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - GS11 Alderford

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
33

Hall Road Farm

Pyghtle

Road

Hall

St John The Baptist Church

Lodge

Dovecote Barn

17.9M

Church Farm

24

25

Track

Etl

KEY

	Uncertain Origin (discrete anomaly / trend)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous
	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

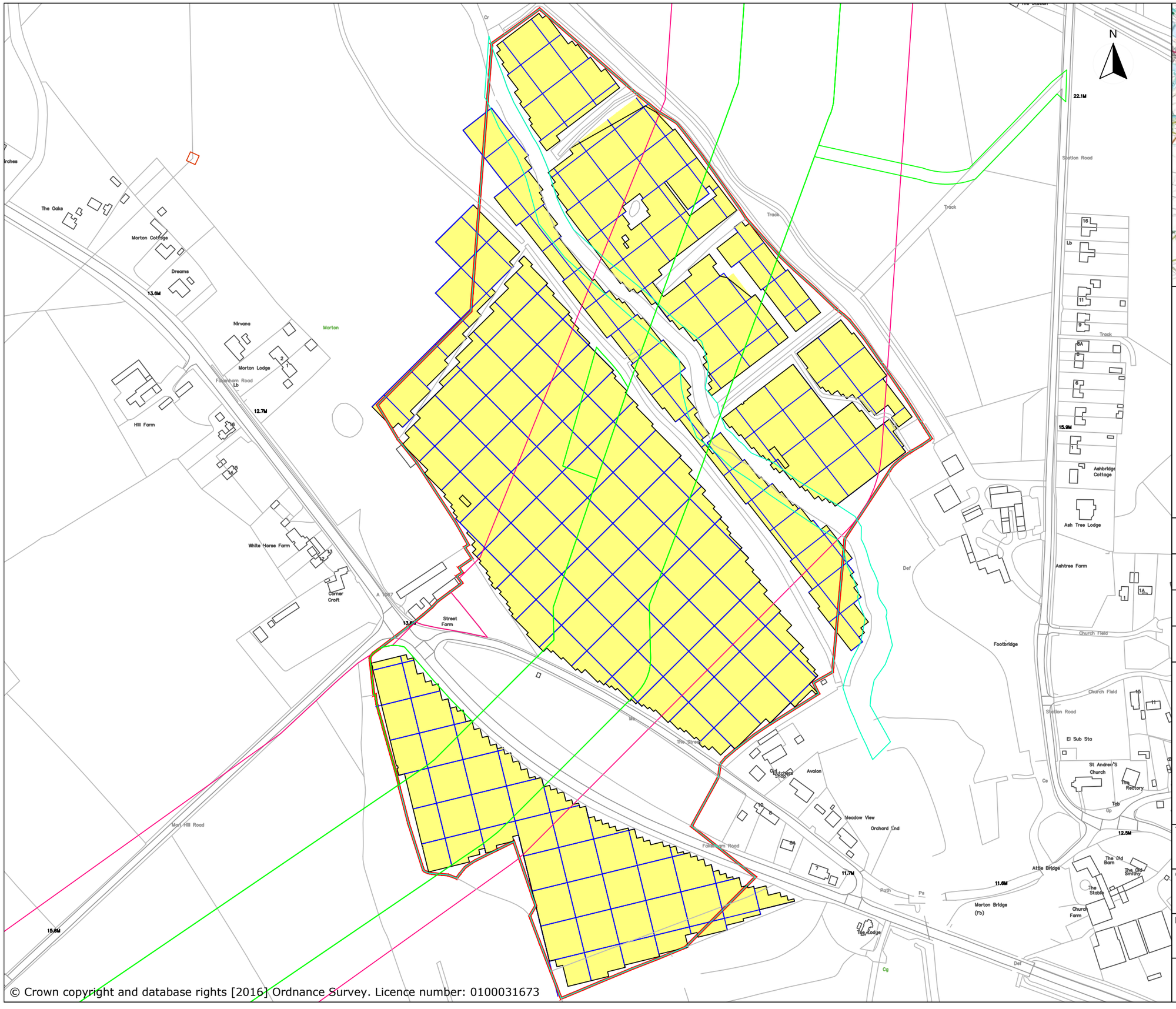
Title:
Magnetometer Survey - Interpretation - GS11 Alderford

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
34



	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Location of Survey Areas - GS12 Attlebridge

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 150
1:3000 @ A3

Fig No:
35

HVDC Converter

Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

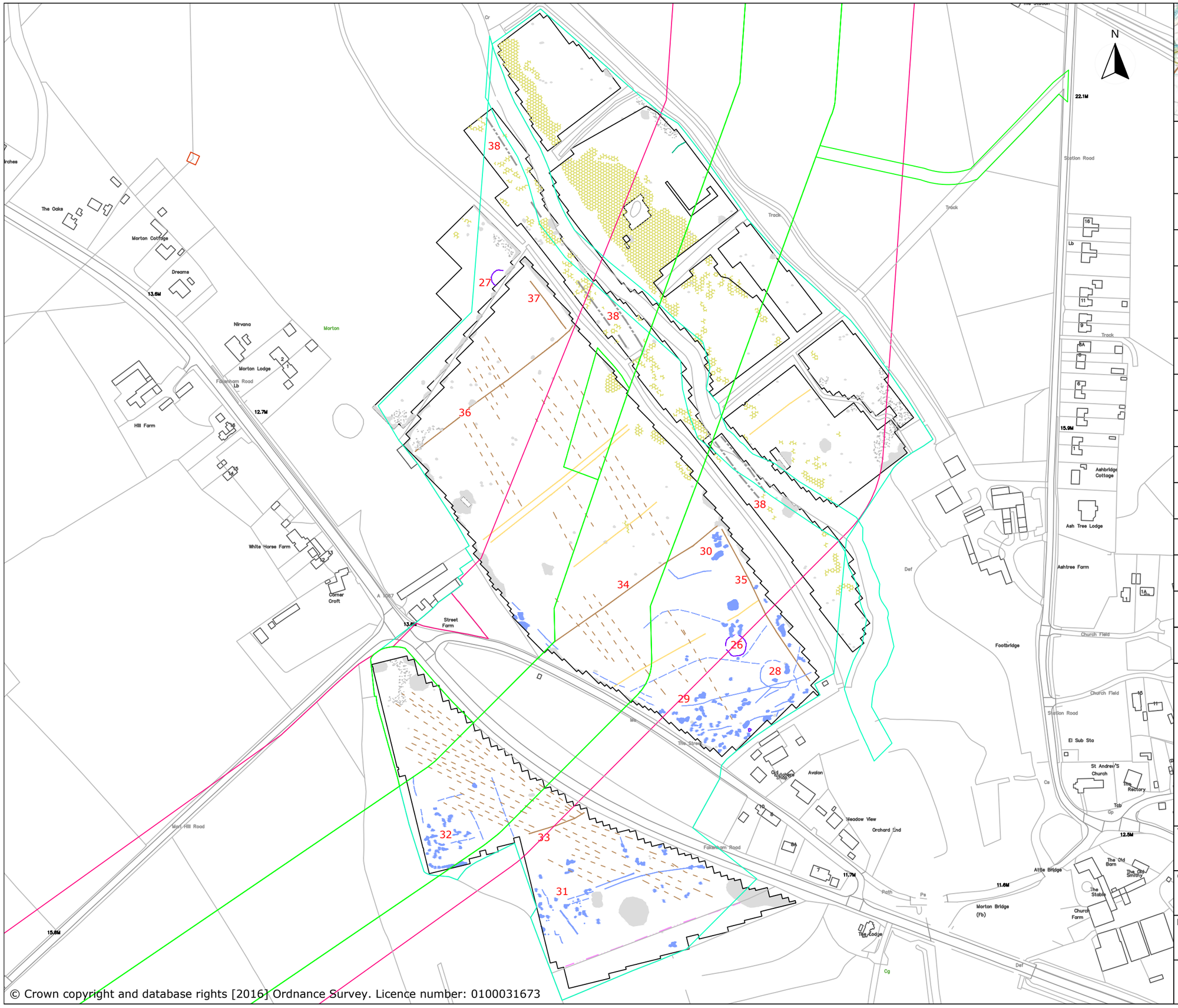
Title:
Magnetometer Survey - Greyscale Plots - GS12 Attlebridge - Overview

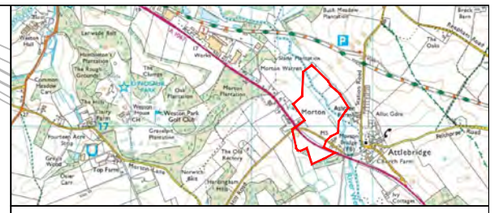
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 150
1:3000 @ A3

Fig No:
36





KEY

	Probable archaeology (discrete anomaly)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous
	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - GS12 Attlebridge - Overview

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 150
1:3000 @ A3

Fig No:
37

Cr

Track

N

HVDC Converter

Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

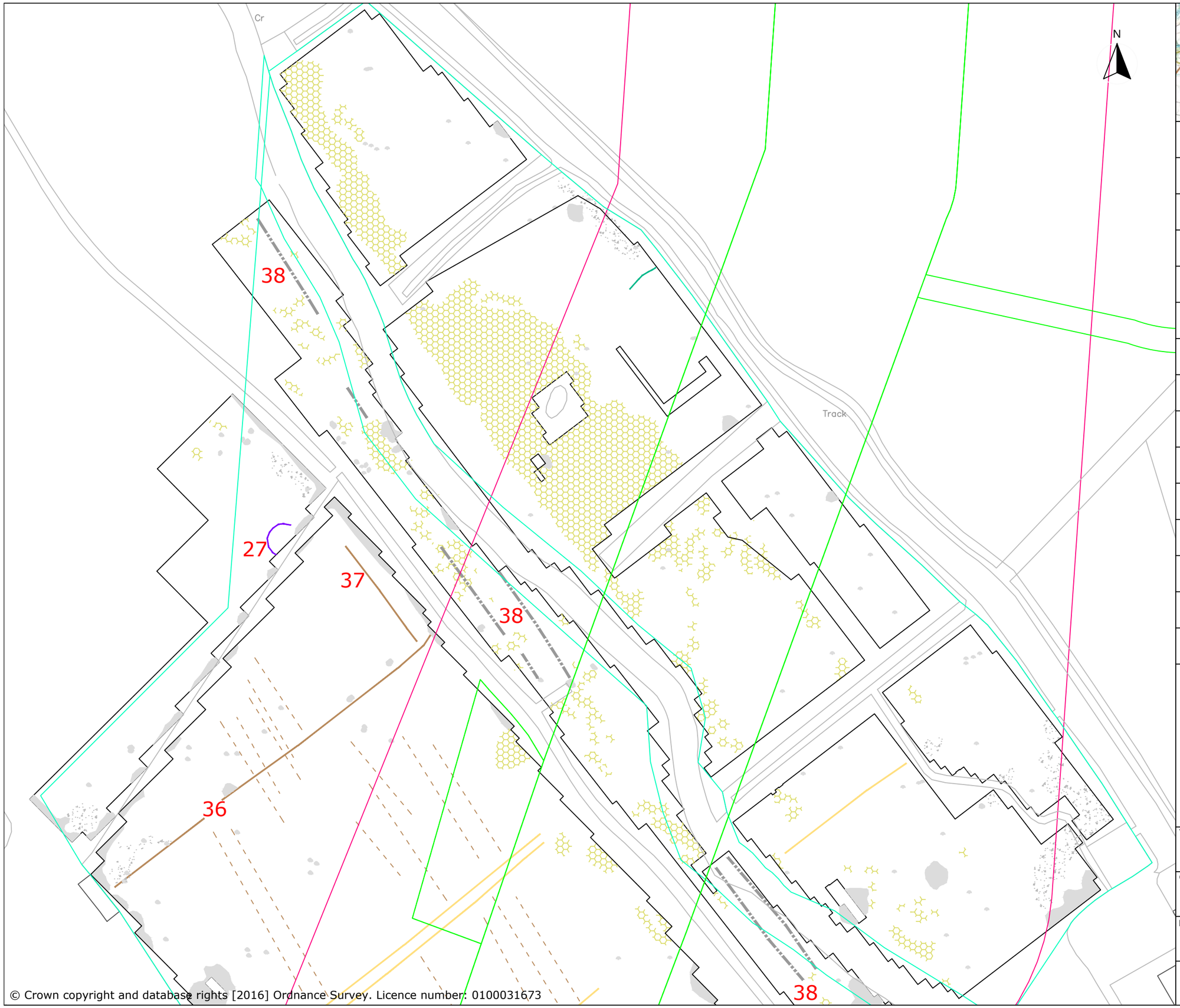
Title:
Magnetometer Survey - Greyscale Plots - GS12 Attlebridge - North

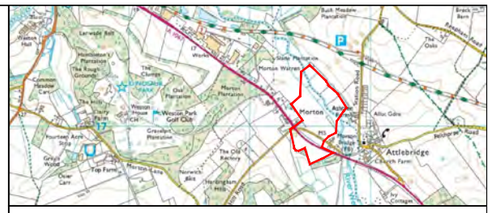
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
38





KEY

	Probable archaeology (discrete anomaly)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous
	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

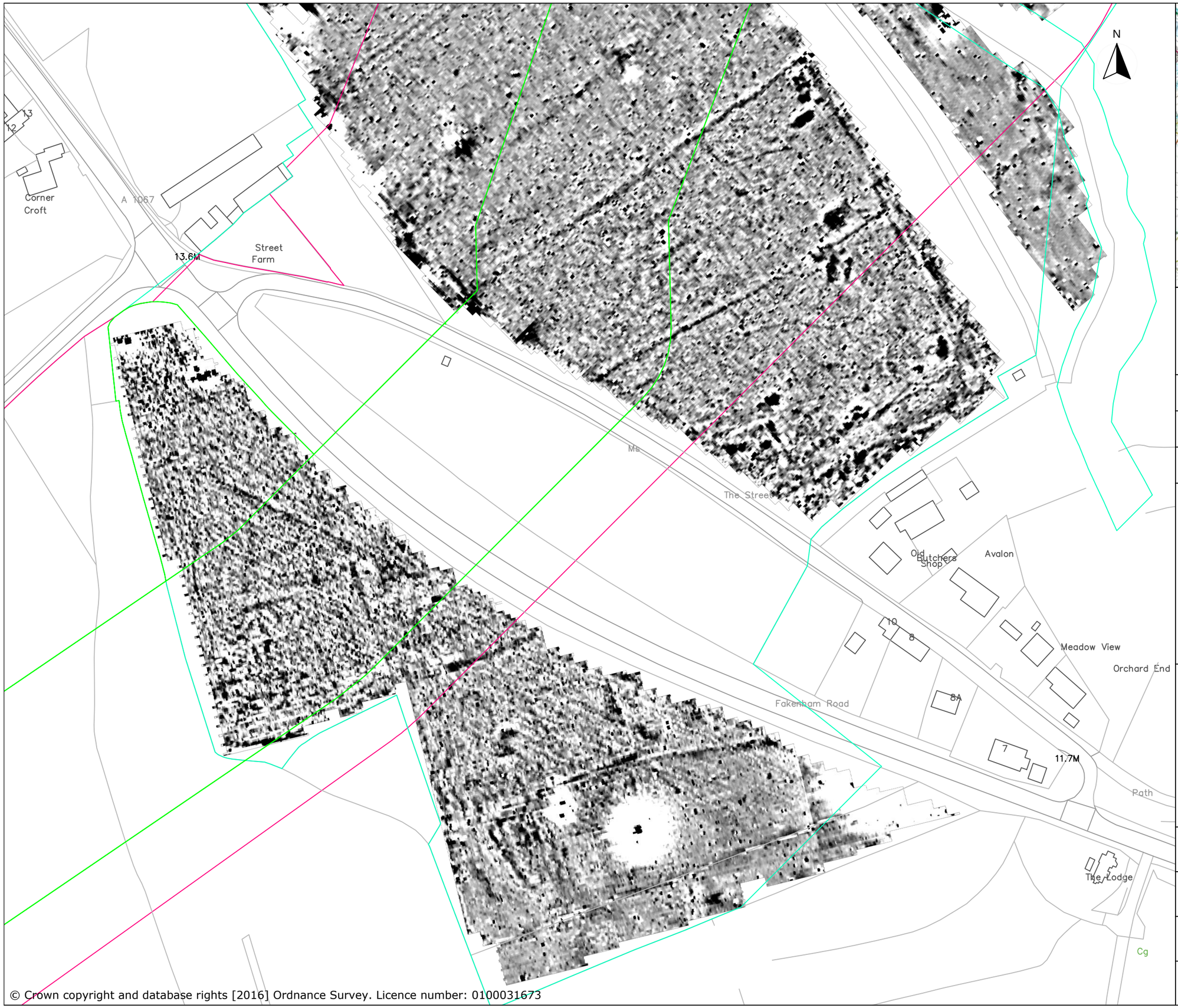
Title:
Magnetometer Survey - Interpretation - GS12 Attlebridge - North

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
39



HVDC Converter

Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

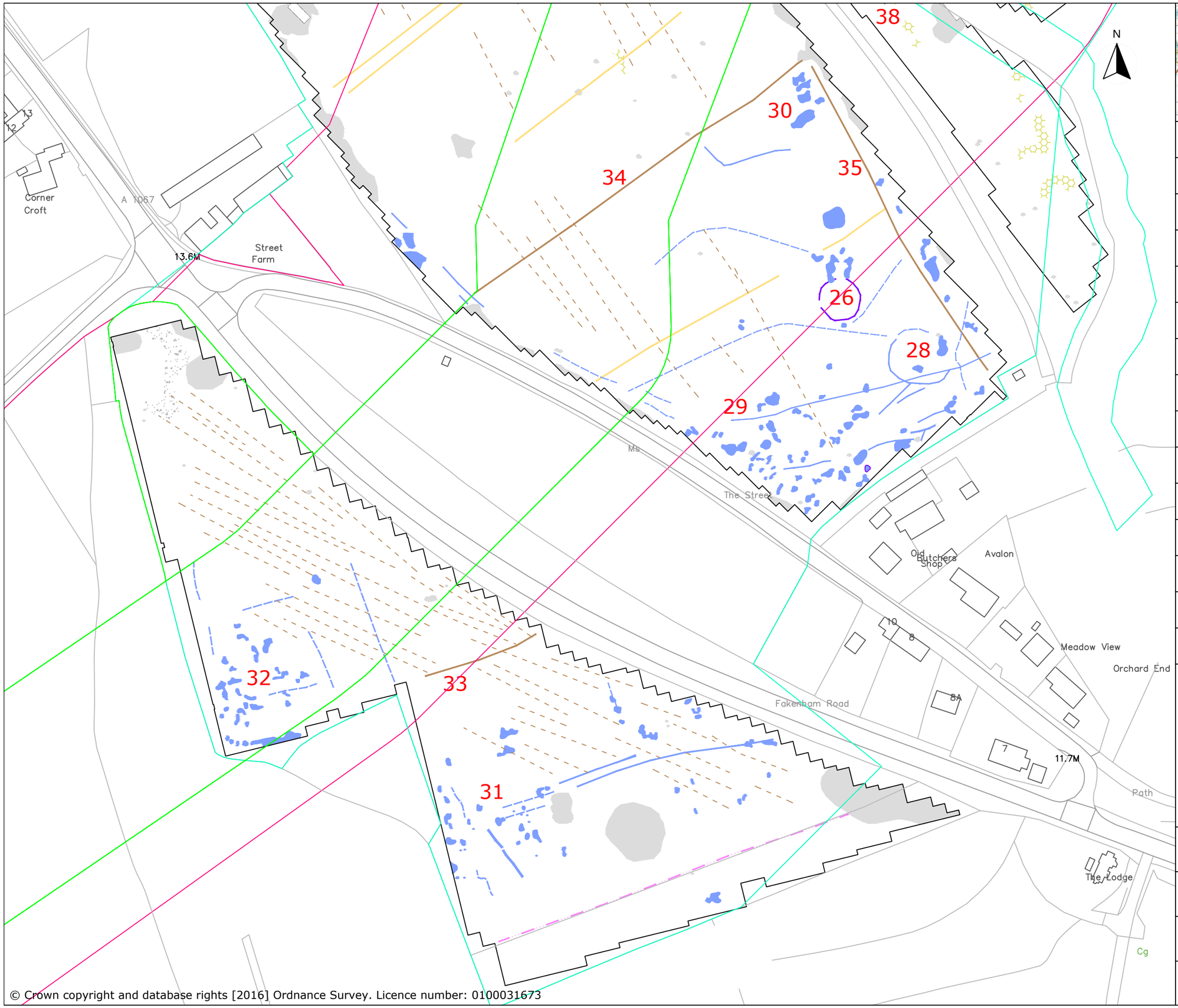
Title:
Magnetometer Survey - Greyscale Plots - GS12 Attlebridge - South

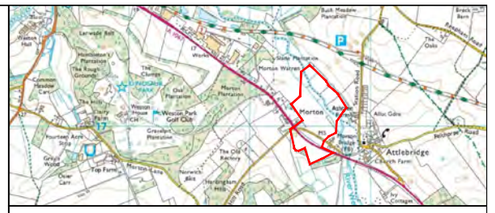
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
40





KEY

	Probable archaeology (discrete anomaly)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous
	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

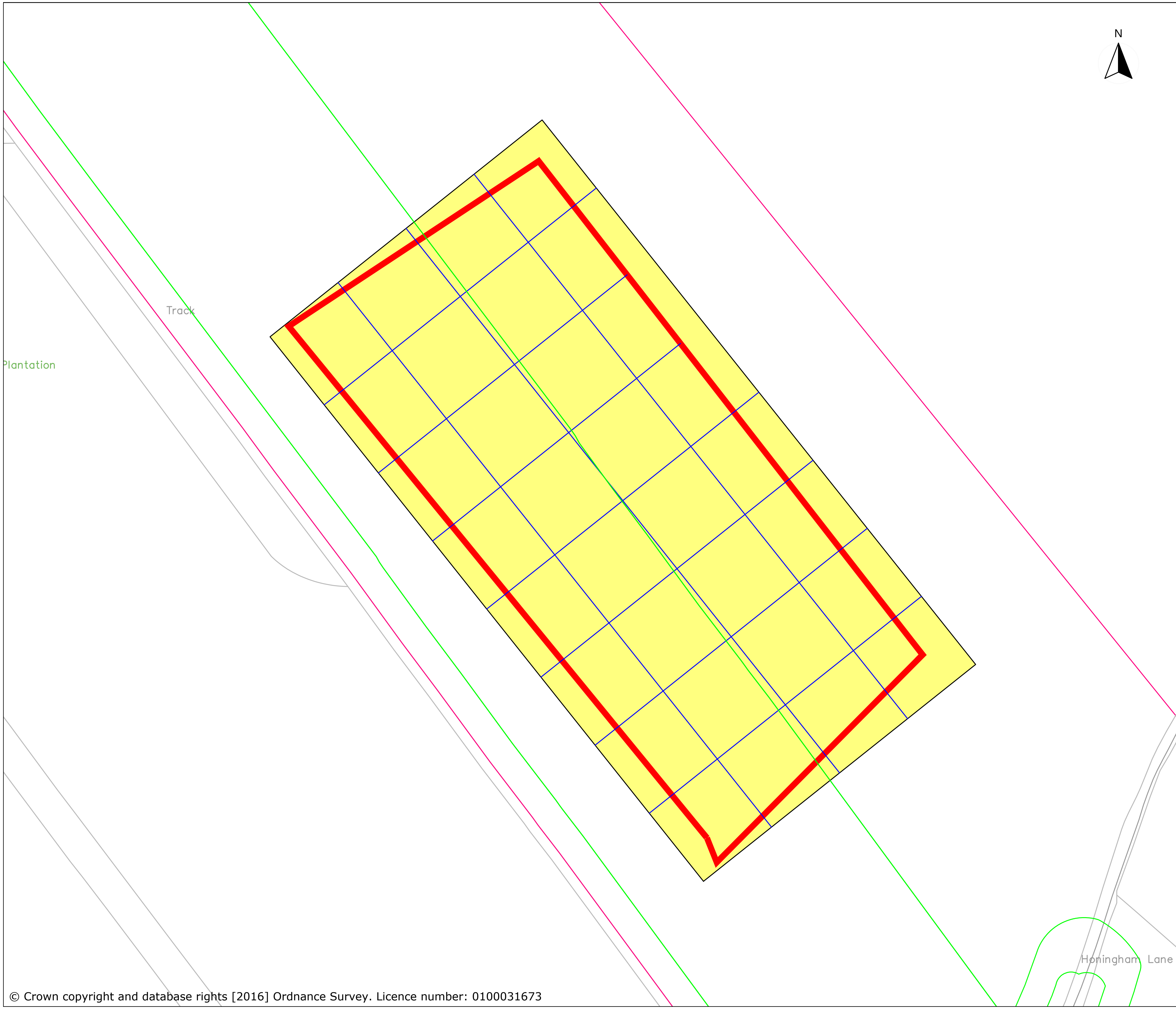
Title:
Magnetometer Survey - Interpretation - GS12 Attlebridge - South

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
41



	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area - showing 30m grid

SUMO Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

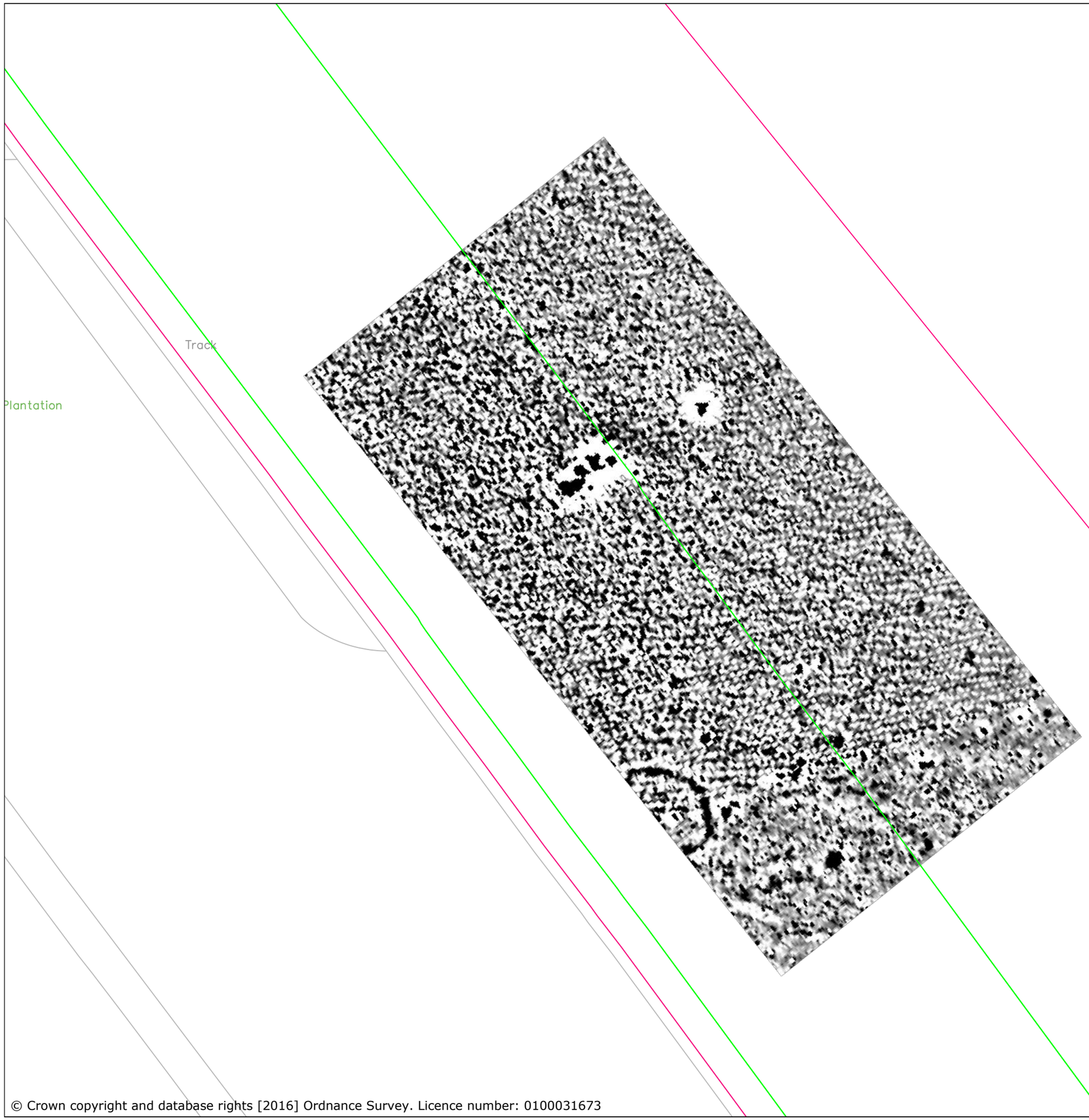
Title:
Location of Survey Area - GS13 Ringland

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
42



N

Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

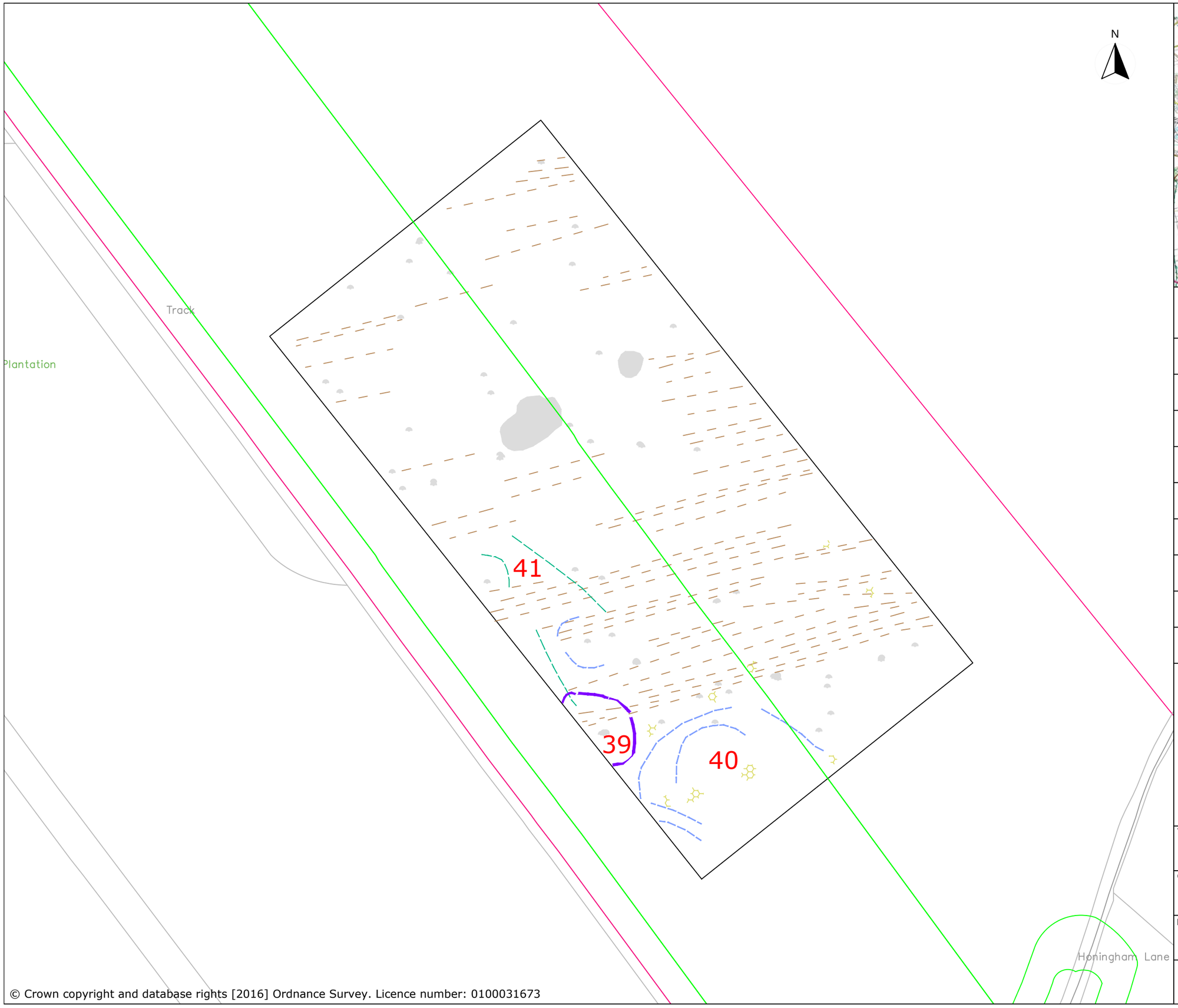
Title:
Magnetometer Survey - Greyscale Plot - GS13 Ringland

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
43



KEY

	Probable archaeology (discrete anomaly)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (trend)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

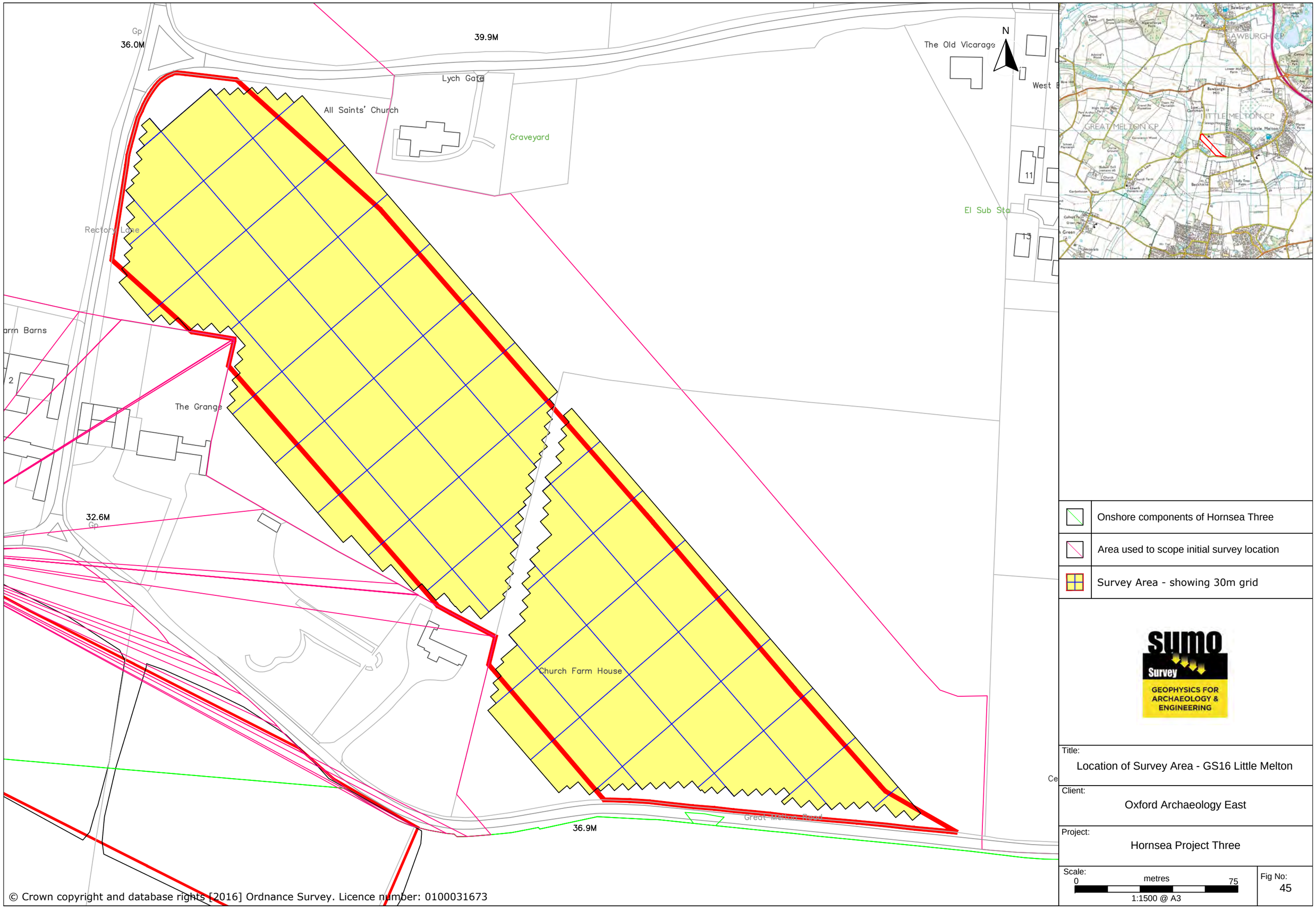
Title:
Magnetometer Survey - Interpretation - GS13 Ringland

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
44



Onshore components of Hornsea Three

Area used to scope initial survey location

Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

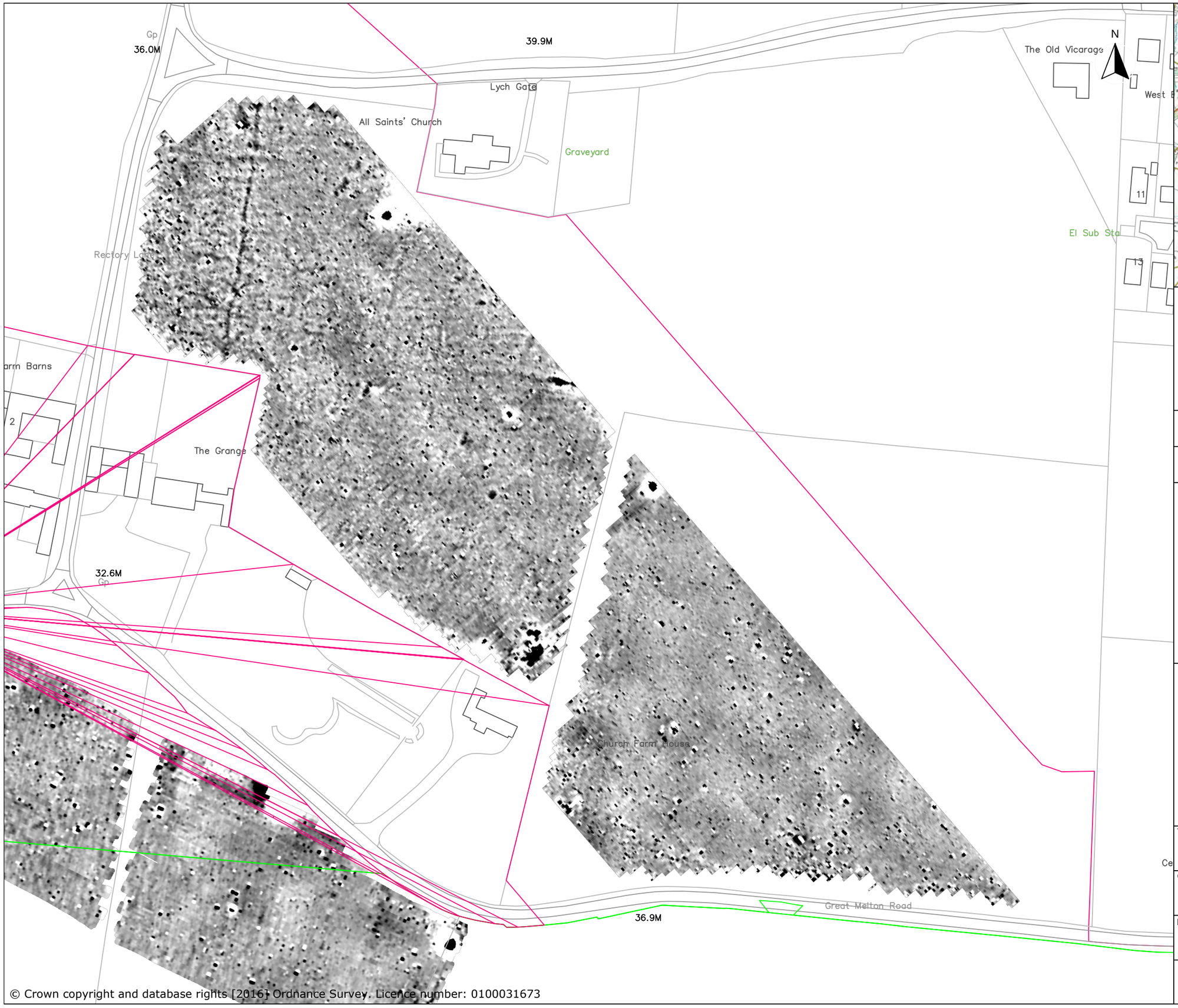
Title:
Location of Survey Area - GS16 Little Melton

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
45



Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

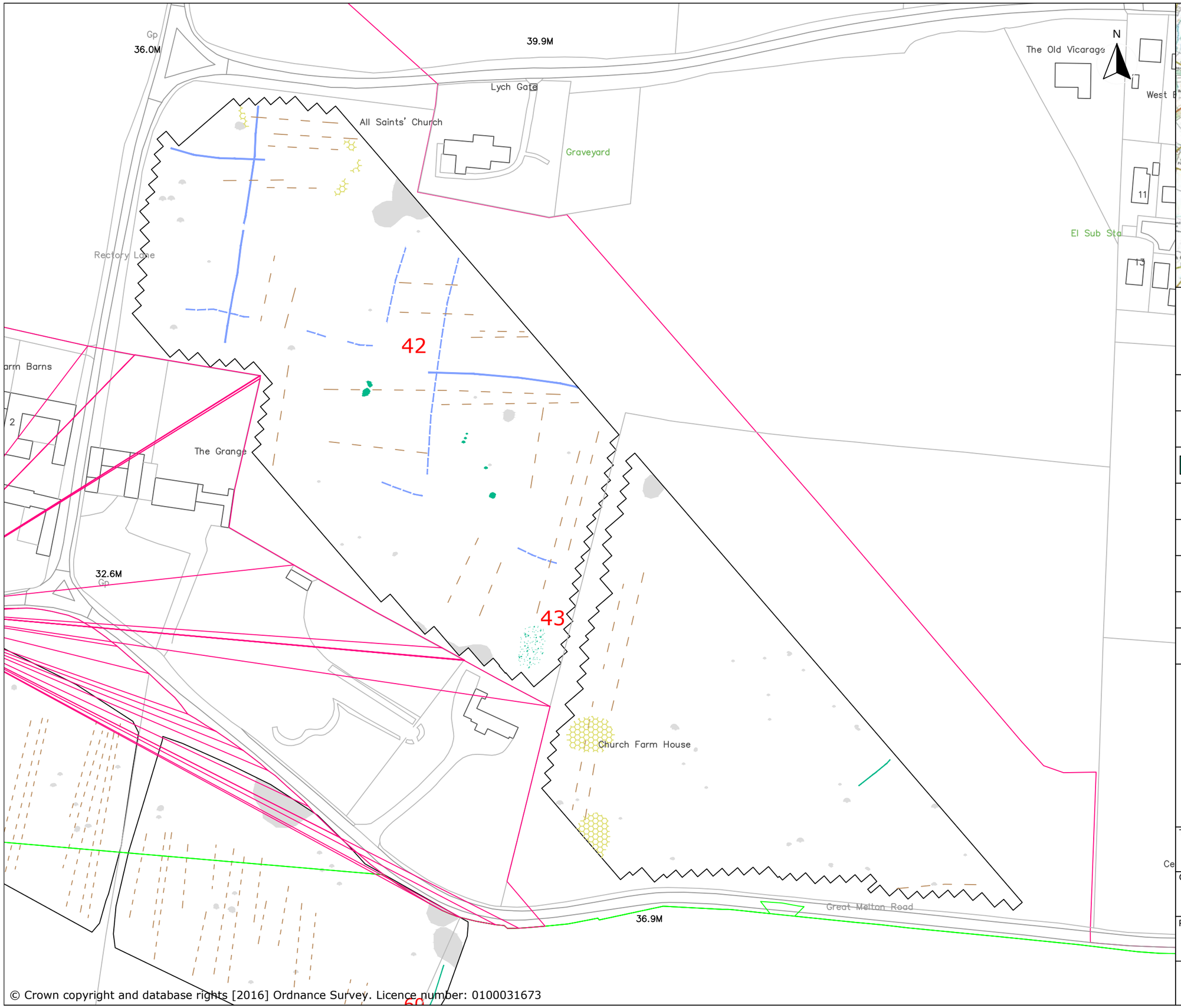
Title:
Magnetometer Survey - Greyscale Plot - GS16 Little Melton

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
46



KEY

	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / area of increased response / trend)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

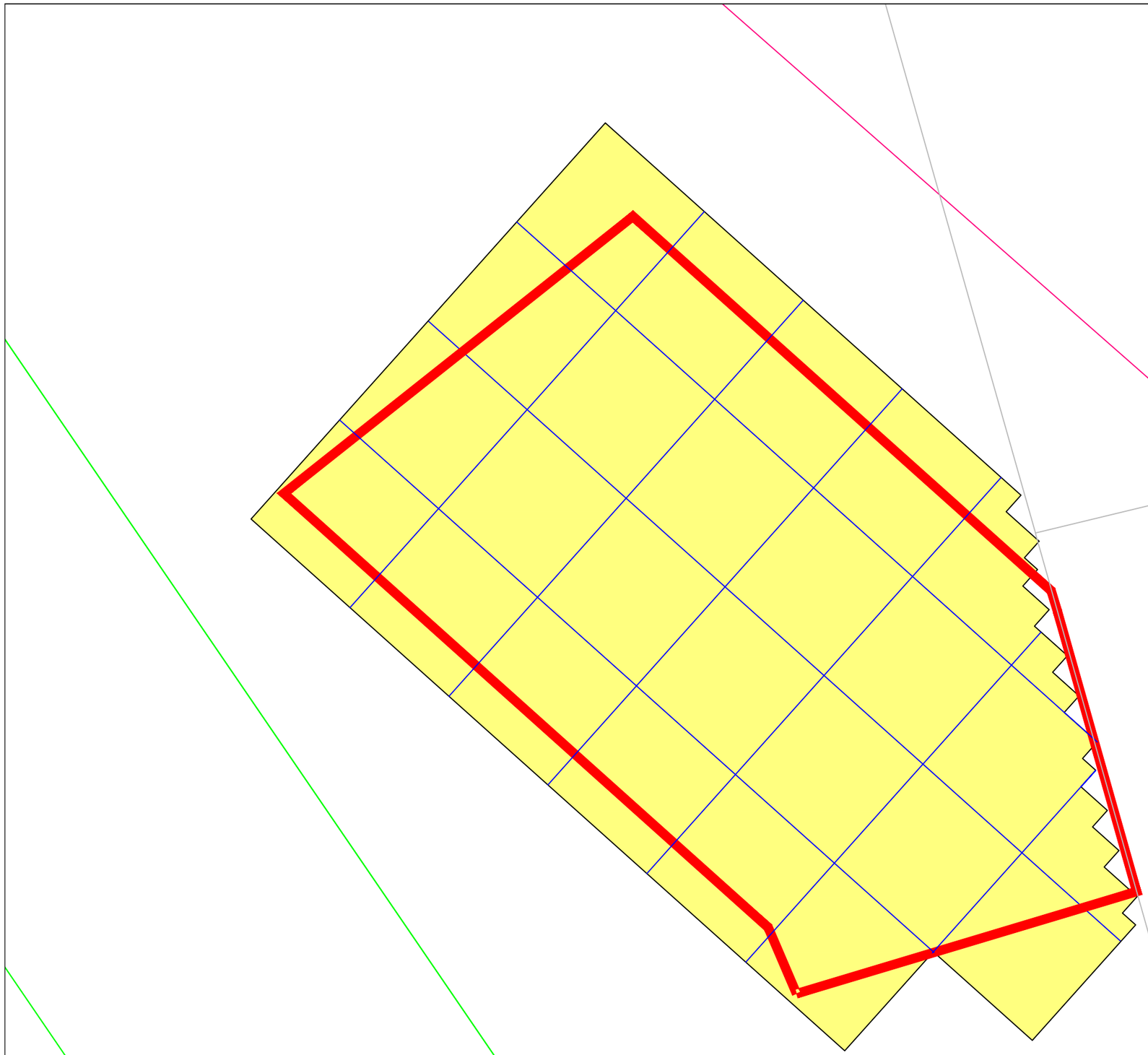
Title:
Magnetometer Survey - Interpretation - GS16 Little Melton

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
47



	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

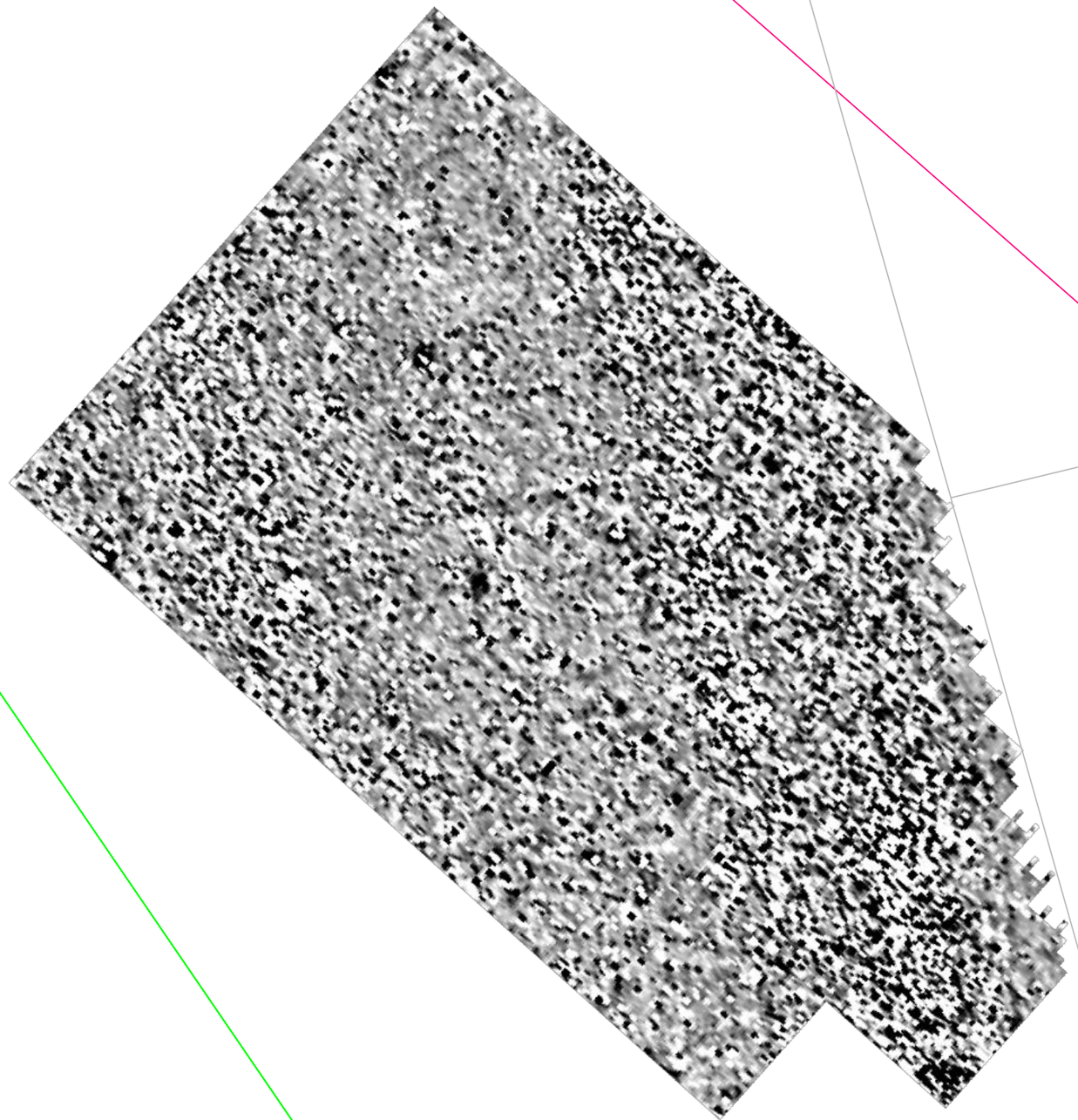
Title:
Location of Survey Area - GS17 Ketteringham

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 50
1:1000 @ A3

Fig No:
48



N

Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

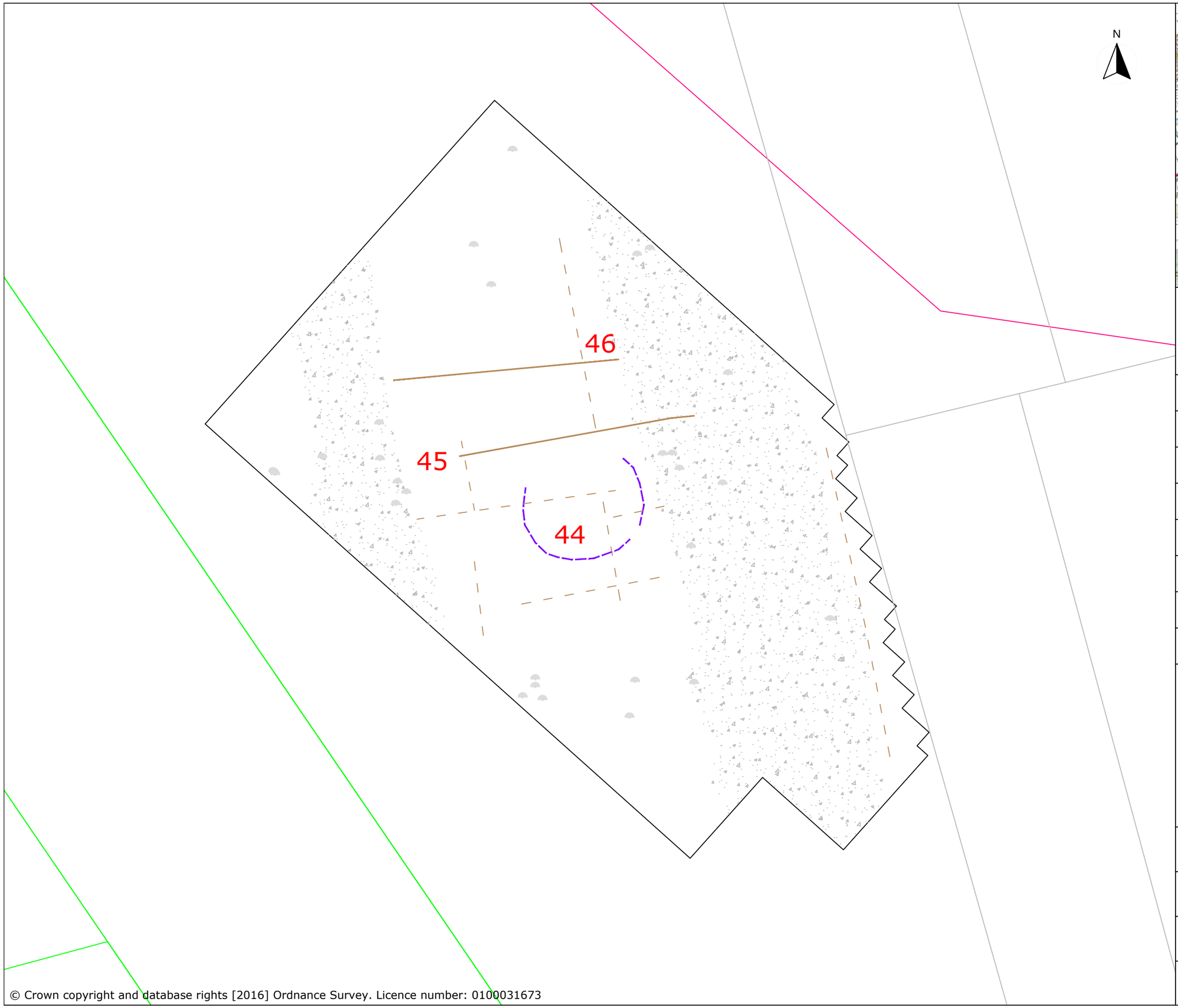
Title:
Magnetometer Survey - Greyscale Plot - GS17 Ketteringham

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 50
1:1000 @ A3

Fig No:
49



KEY

	Probable archaeology (trend)
	Former field boundary (corroborated)
	Agriculture (plough)
	Magnetic disturbance
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - GS17 Ketteringham

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 50
1:1000 @ A3

Fig No:
50

B 1113

24.1M

Eti

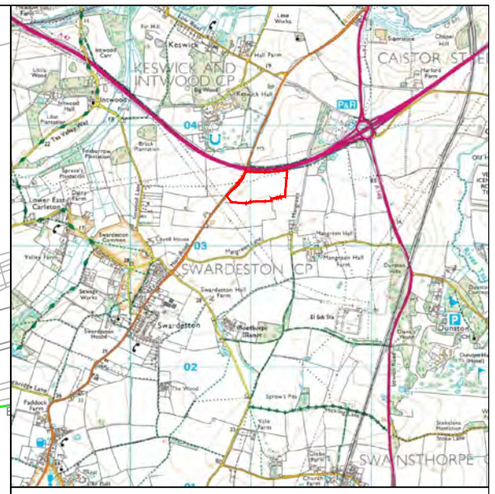
A 47

Und

32.6M

Road

N



	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location
	Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

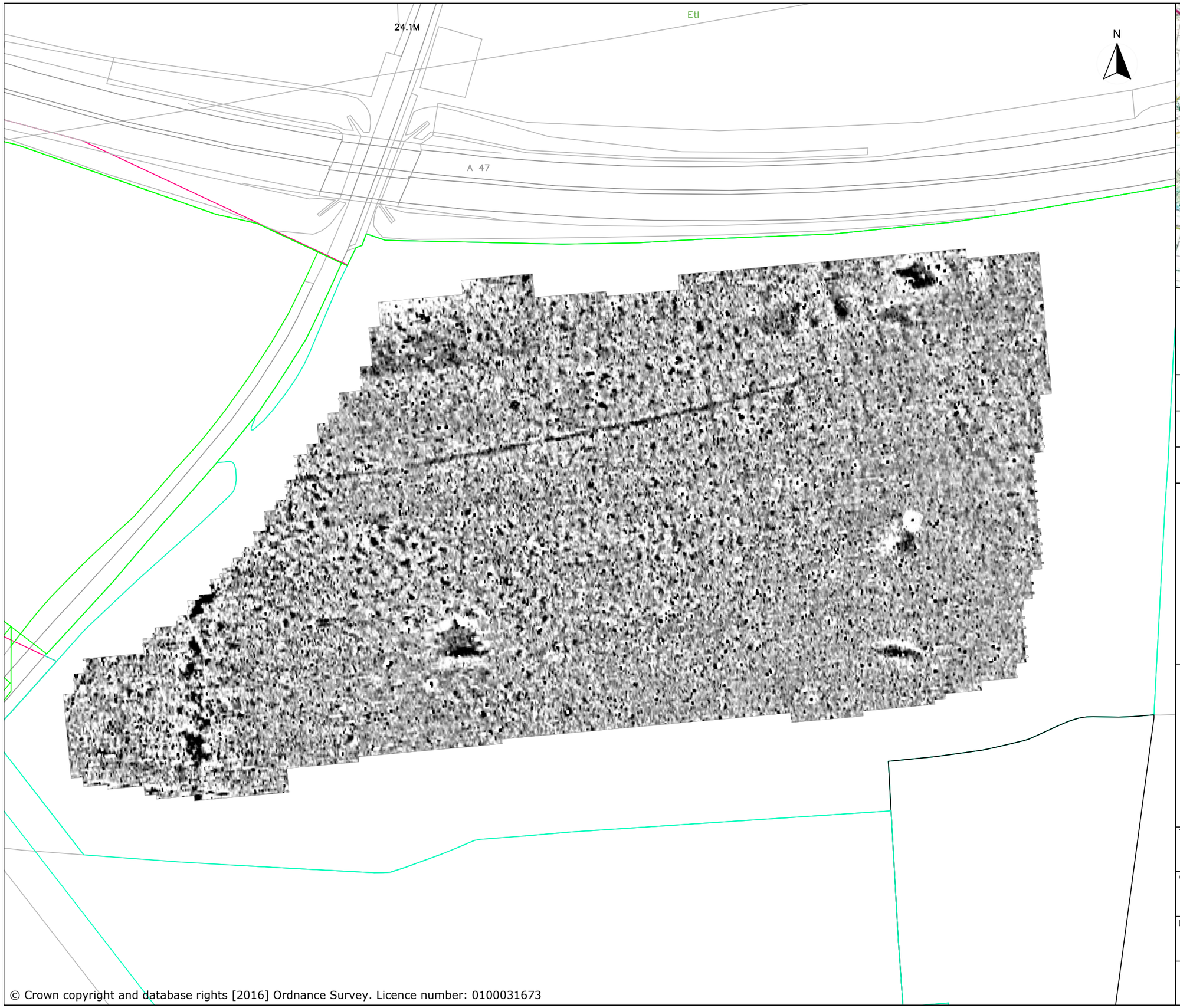
Title:
Location of Survey Area - GS18
Mangreen South

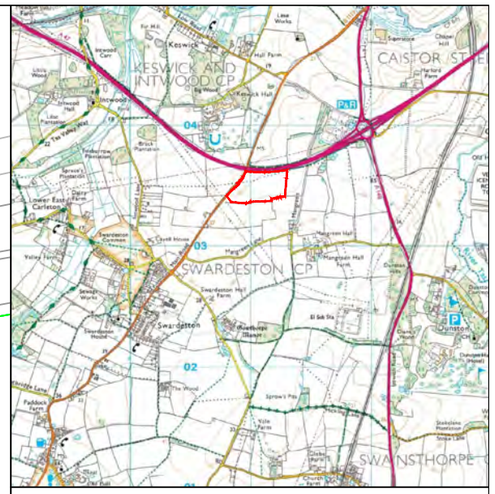
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
51





	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

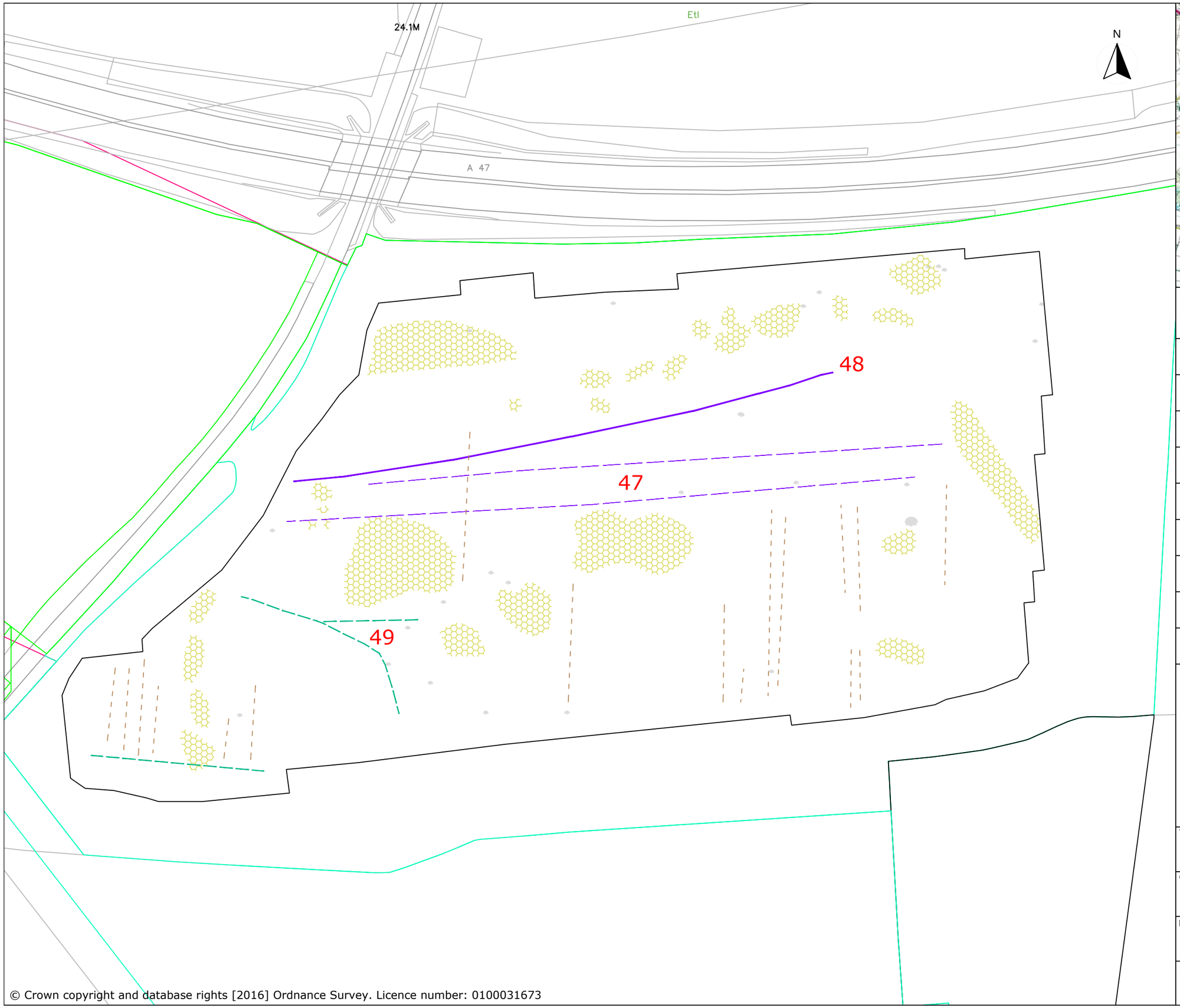
Title:
Magnetometer Survey - Greyscale Plot - GS18 Mangreen South

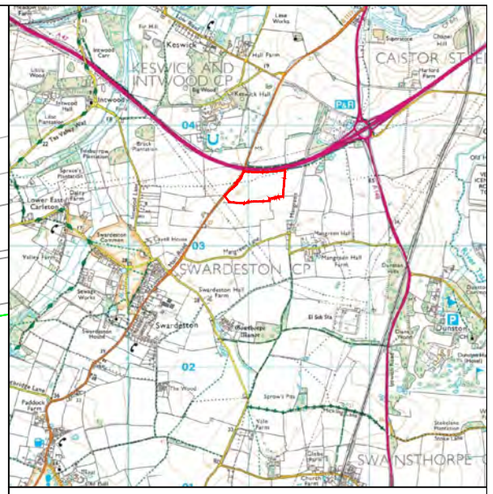
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
52





KEY

	Probable archaeology (discrete anomaly / trend)
	Uncertain Origin (trend)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Ferrous
	HVDC Converter
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

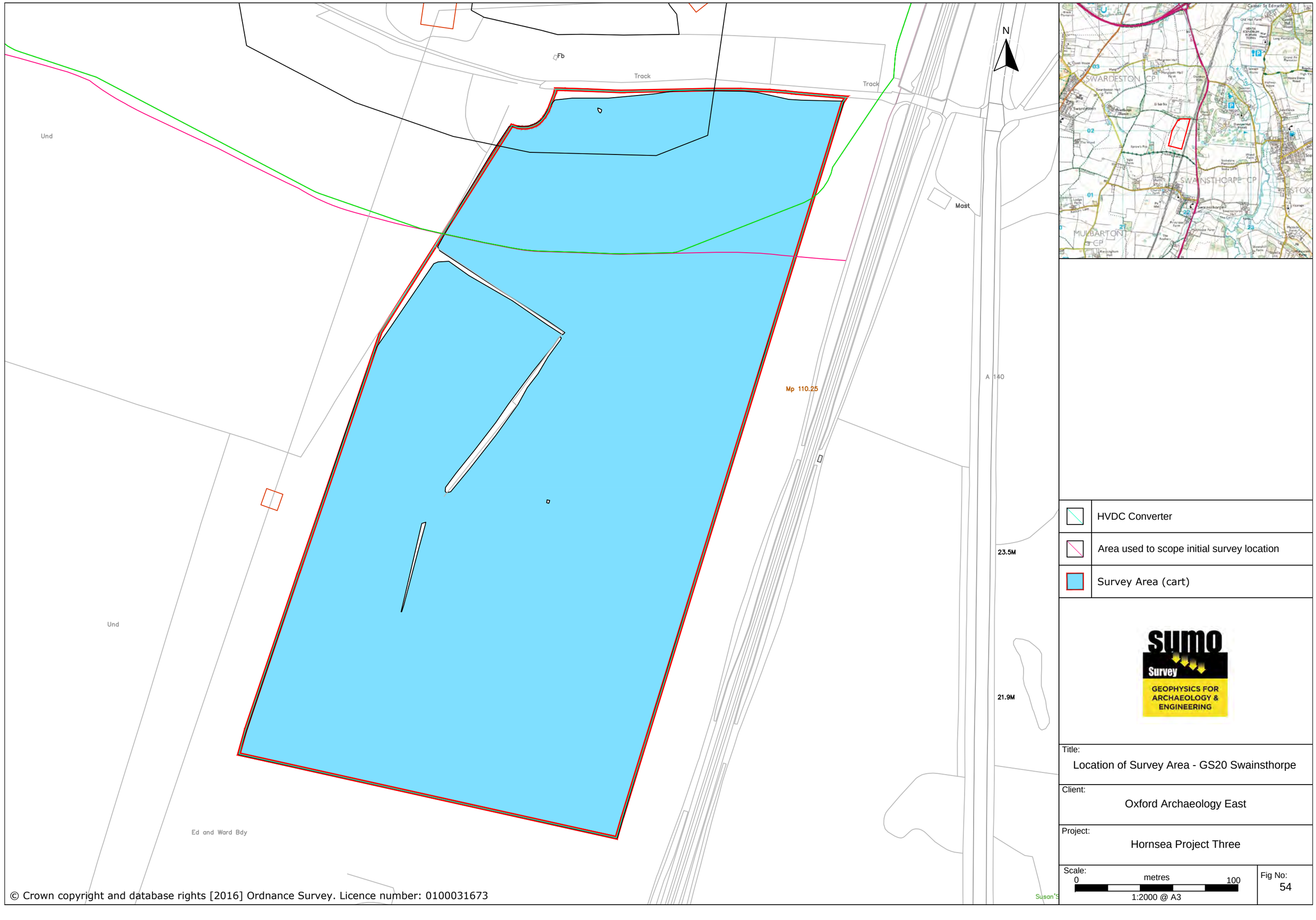
Title:
Magnetometer Survey - Interpretation - GS18 Mangreen South

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
53



HVDC Converter

Area used to scope initial survey location

Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

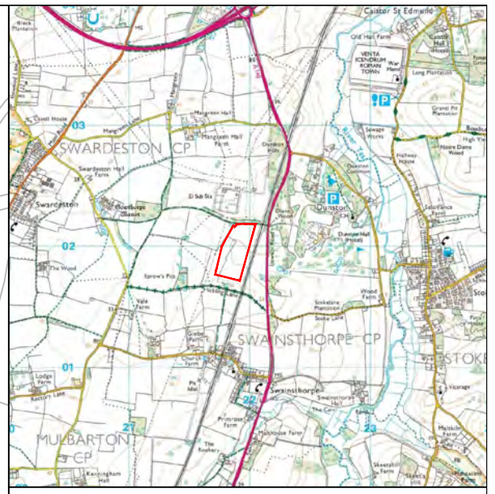
Title:
Location of Survey Area - GS20 Swainsthorpe

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
54



HVDC Converter

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

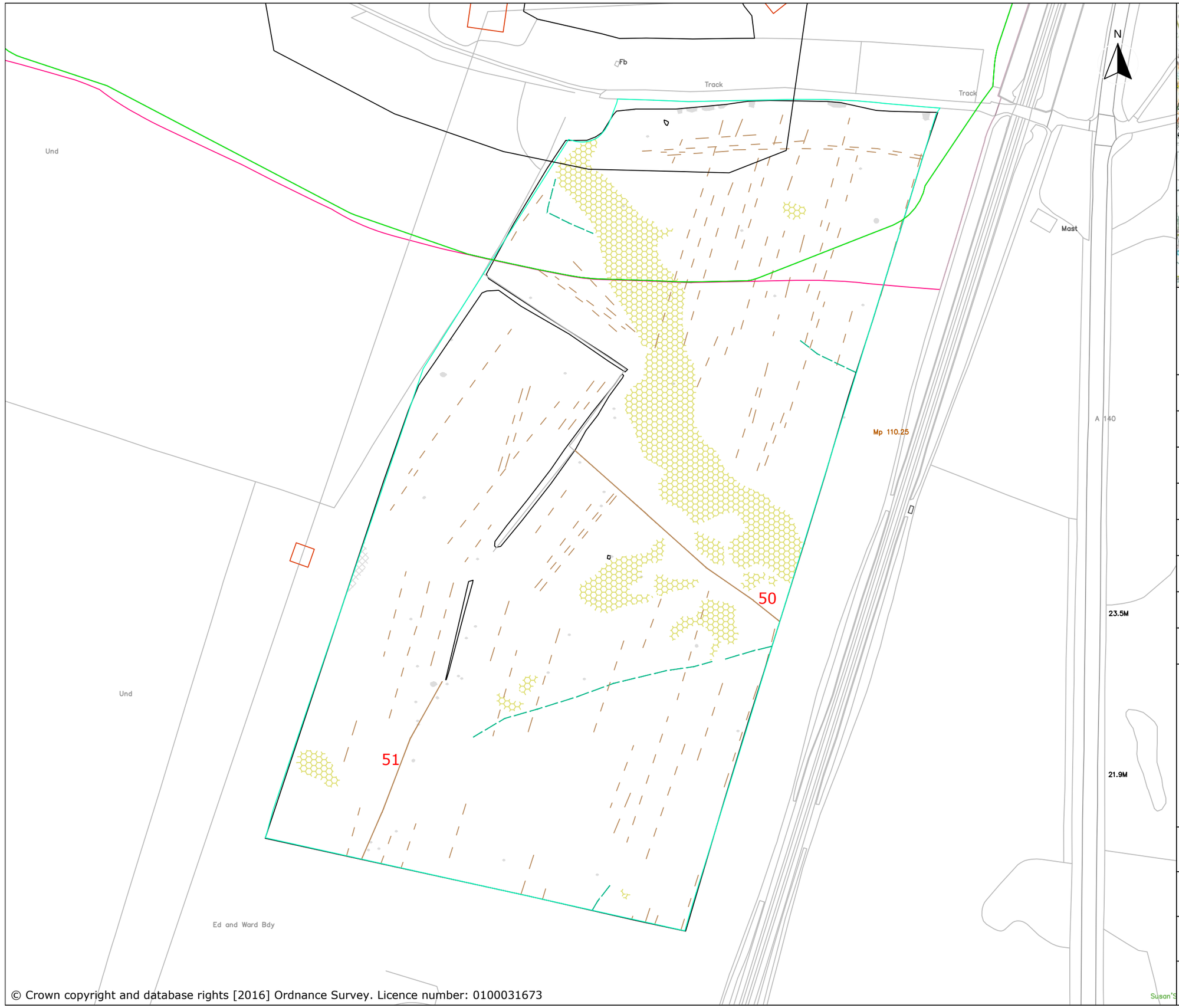
Title:
Magnetometer Survey - Greyscale Plot - GS20 Swainsthorpe

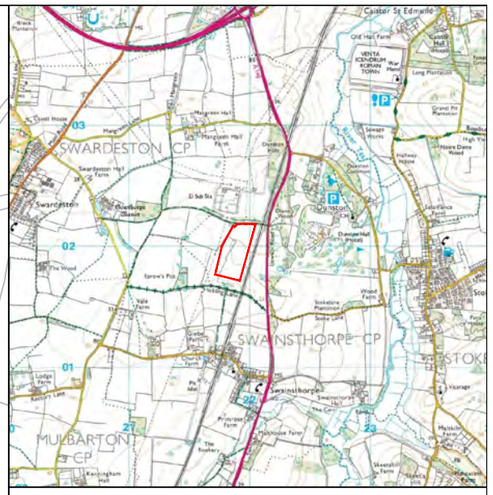
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
55





KEY

	Uncertain Origin (trend)
	Former field boundary (corroborated)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Ferrous
	HVDC Converter
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

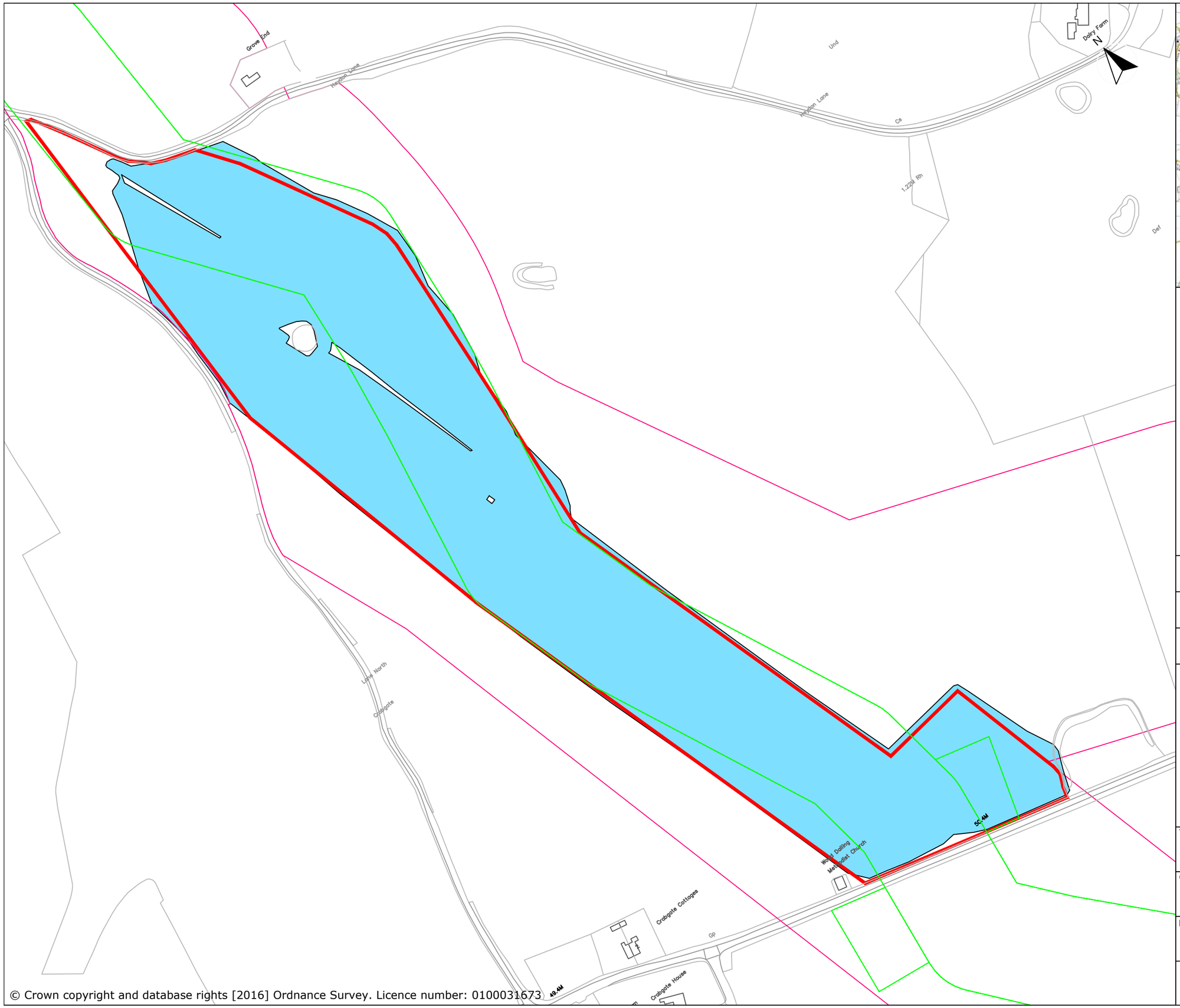
Title:
Magnetometer Survey - Interpretation - GS20 Swainsthorpe

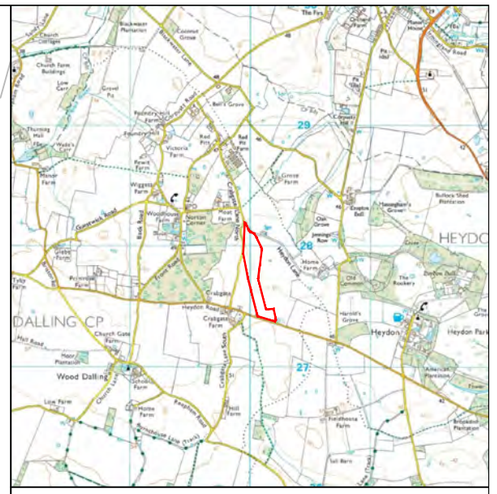
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 100
1:2000 @ A3

Fig No:
56





Onshore components of Hornsea Three

Area used to scope initial survey location

Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

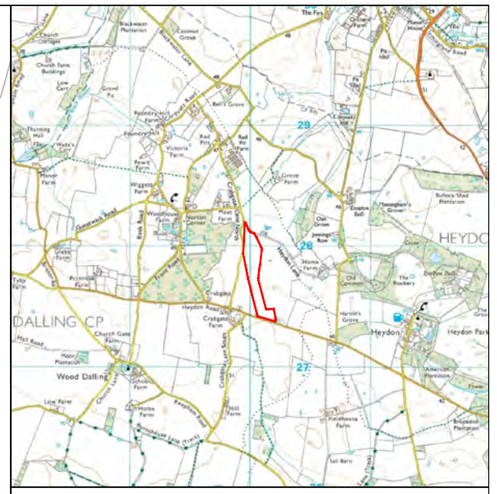
Title:
Location of Survey Area - GS22 Wood Dalling - Overview

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 125
1:2500 @ A3

Fig No:
57



Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

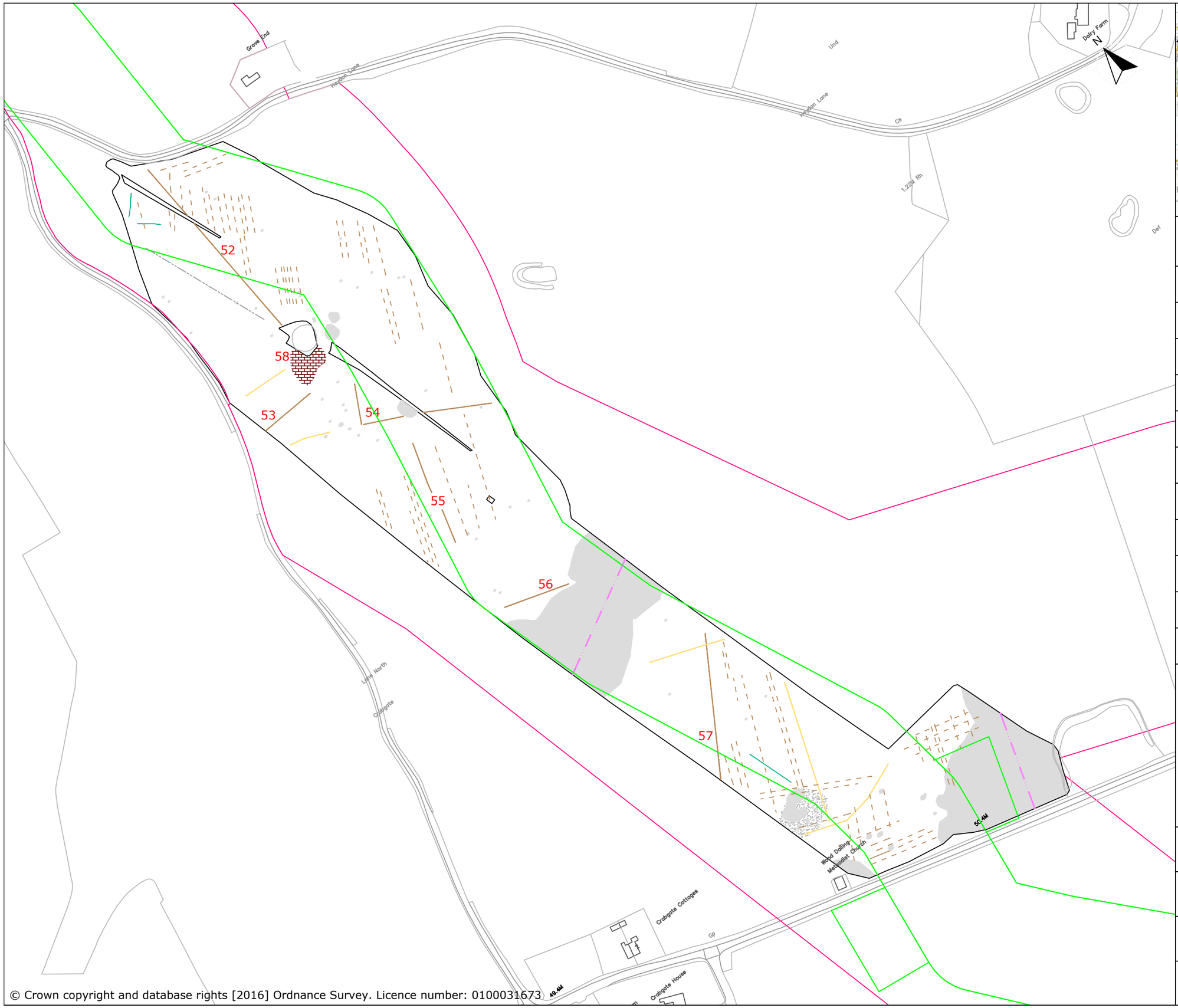
Title:
Magnetometer Survey - Greyscale Plot - GS22 Wood Dalling - Overview

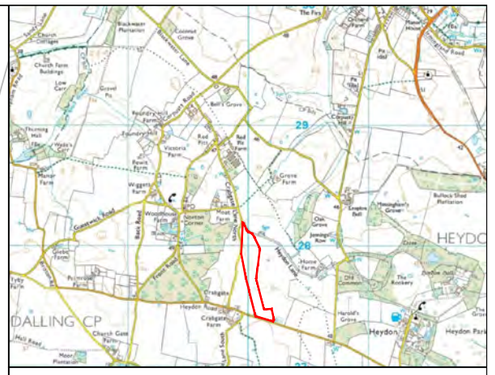
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 125
1:2500 @ A3

Fig No:
58





KEY

	Uncertain Origin
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Land drain
	Former pond (corroborated)
	Service
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

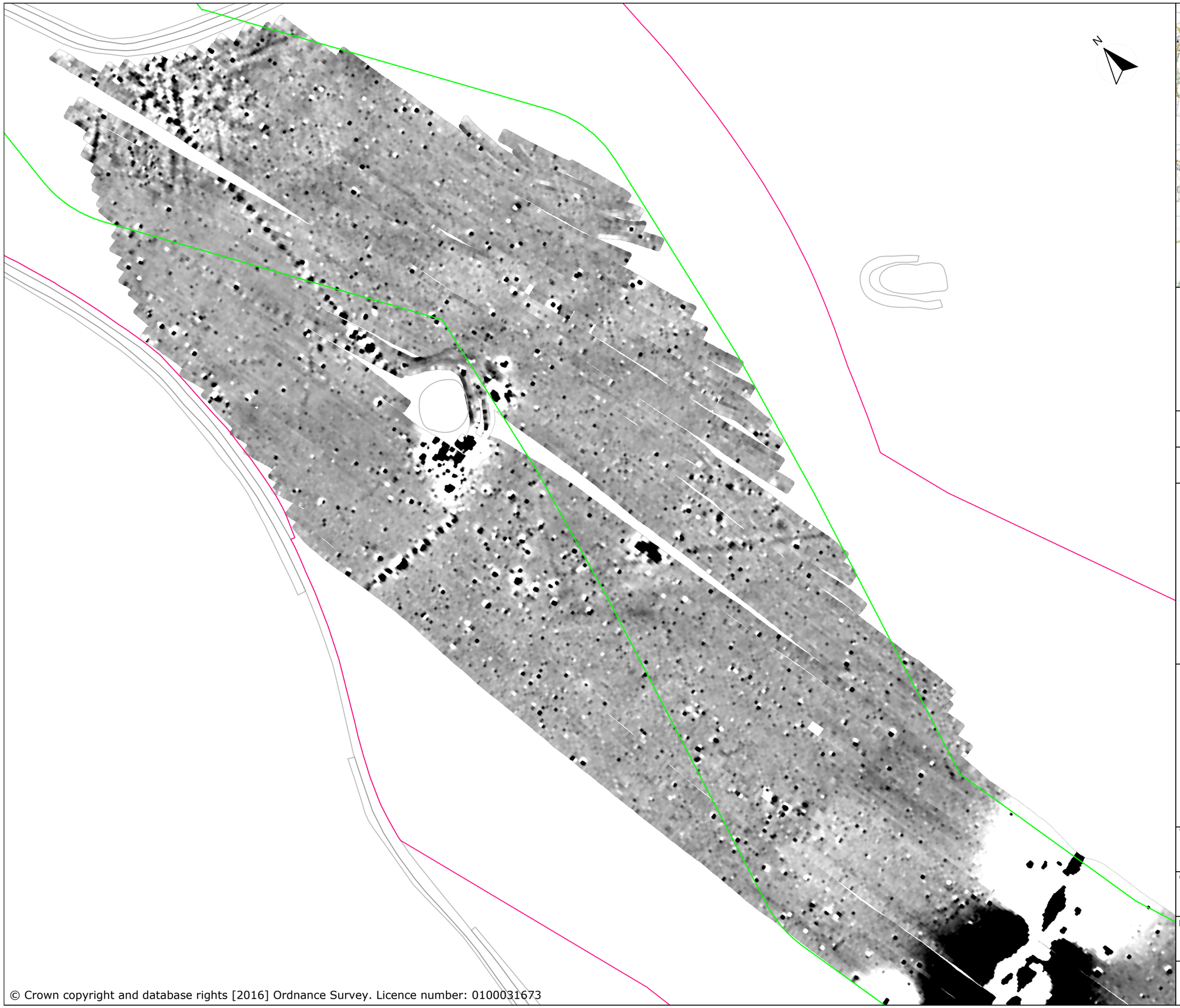
Title:
Magnetometer Survey - Interpretation - GS22 Wood Dalling - Overview

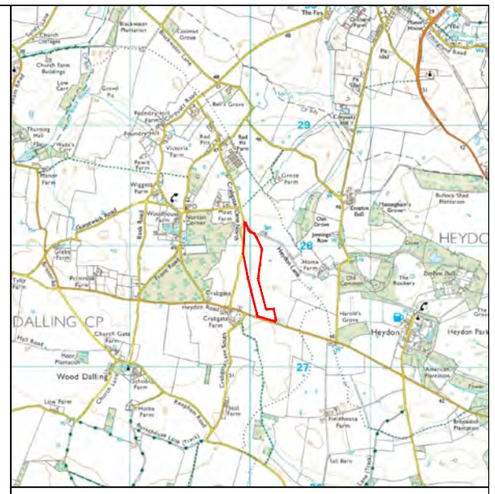
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 125
1:2500 @ A3

Fig No:
59





Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

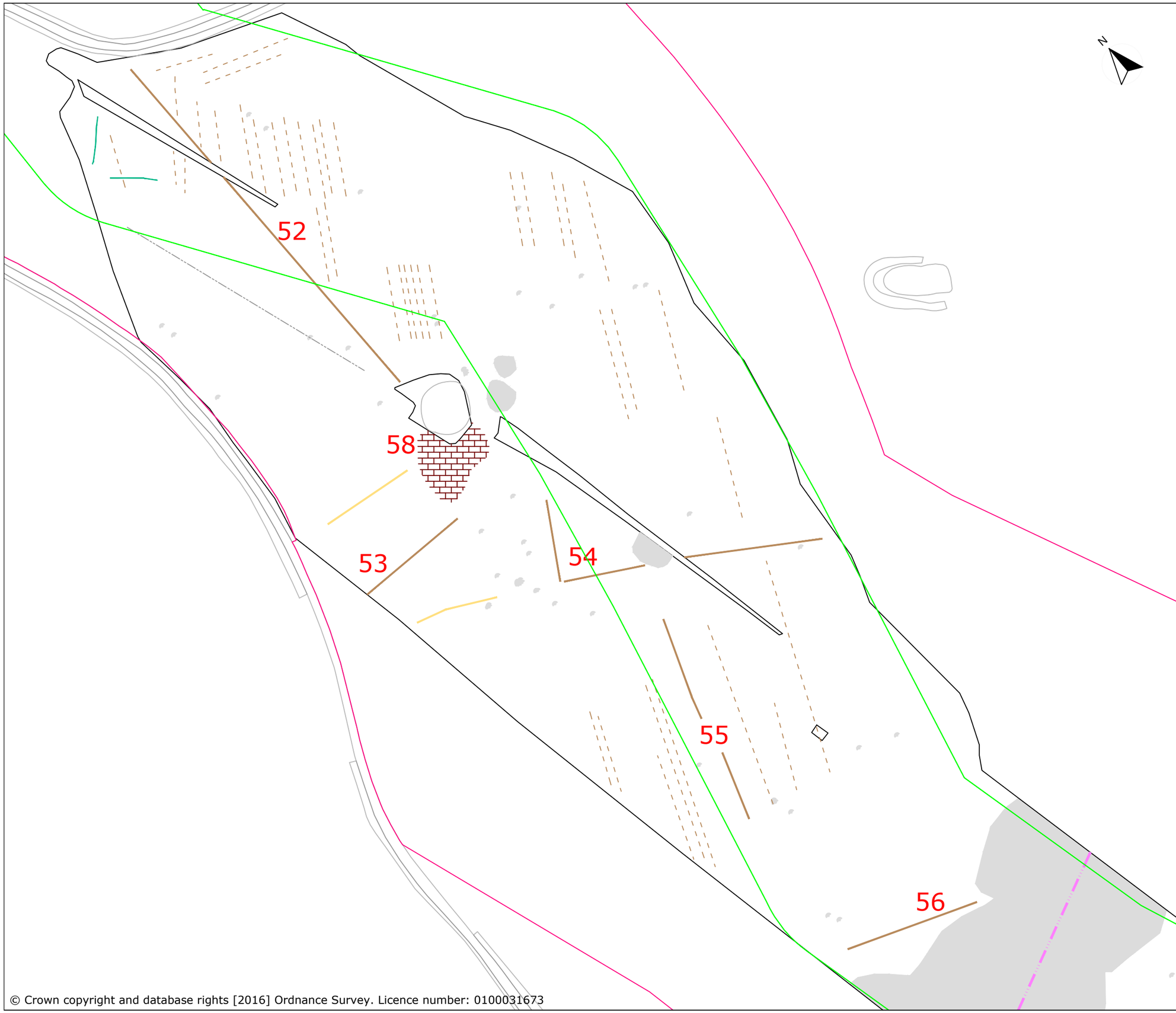
Title:
Magnetometer Survey - Greyscale Plot - GS22 Wood Dalling - North

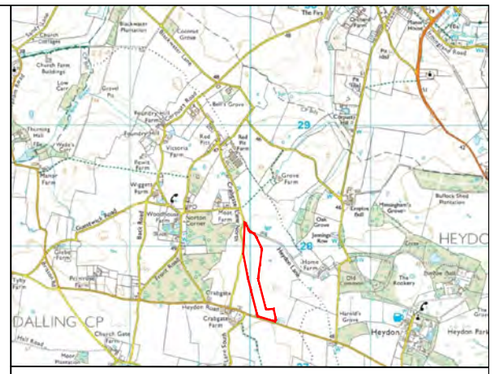
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
60





KEY

	Uncertain Origin
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Land drain
	Former pond (corroborated)
	Service
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

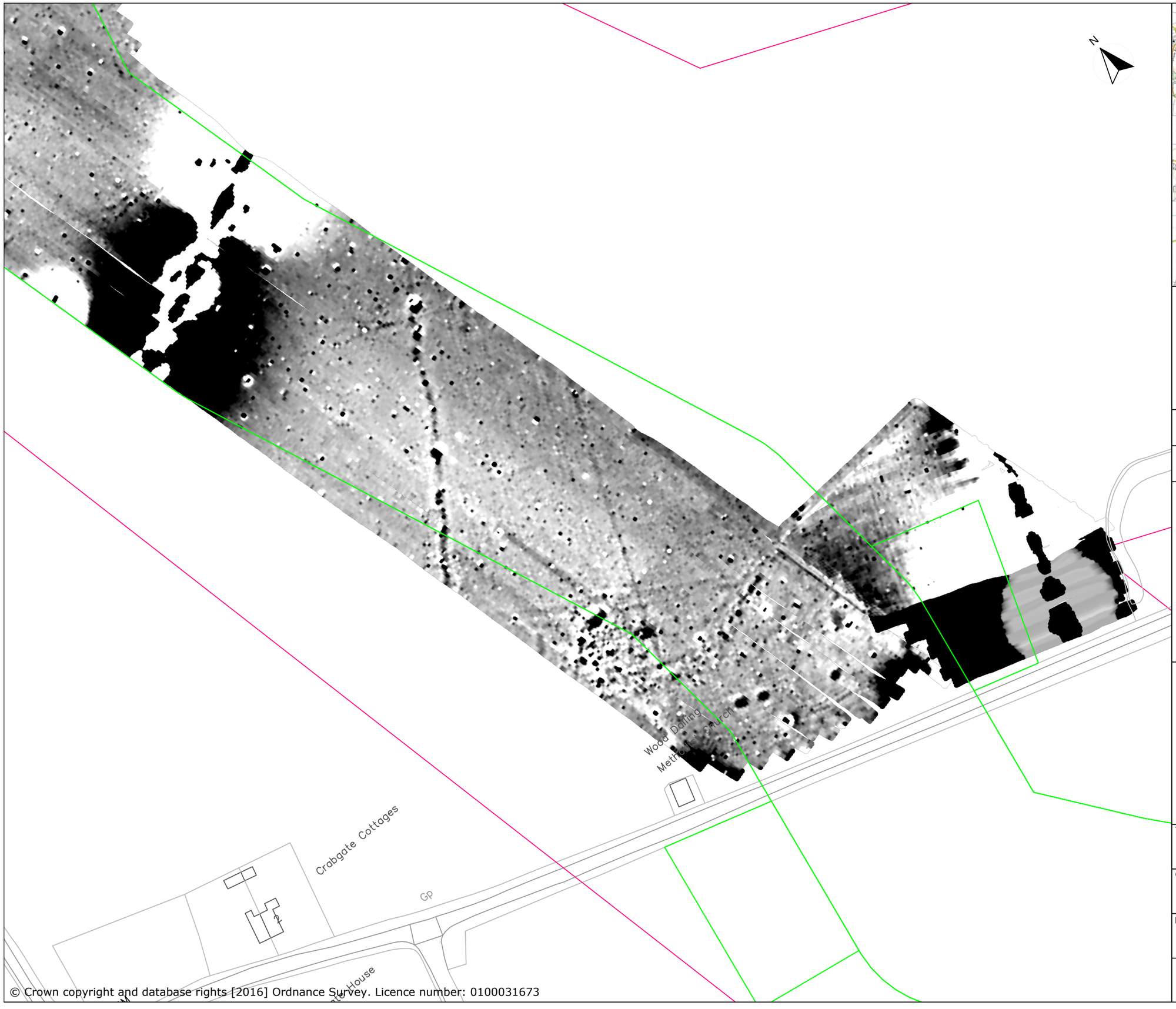
Title:
Magnetometer Survey - Interpretation - GS22 Wood Dalling - North

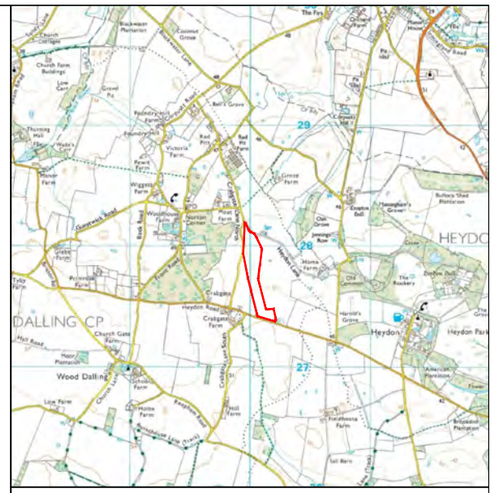
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
61





Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

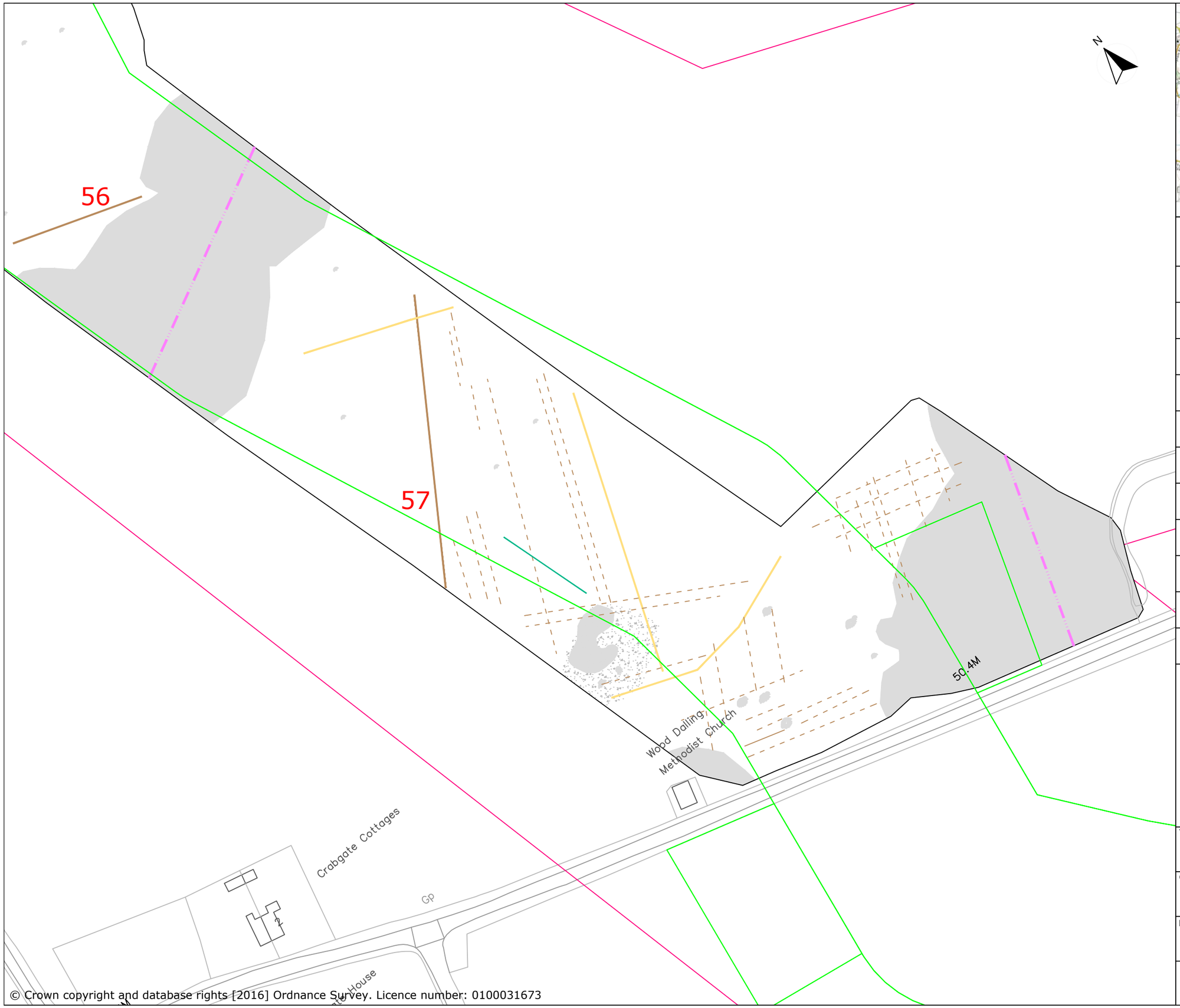
Title:
Magnetometer Survey - Greyscale Plot - GS22 Wood Dalling - South

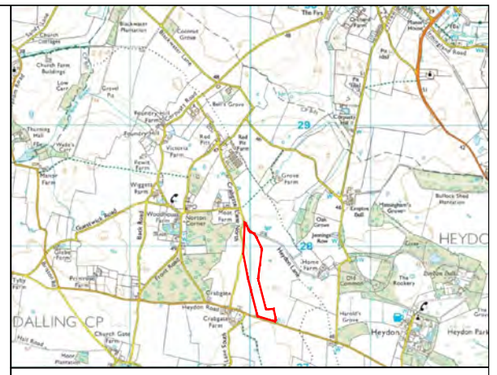
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
62





KEY

	Uncertain Origin
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Land drain
	Former pond (corroborated)
	Service
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

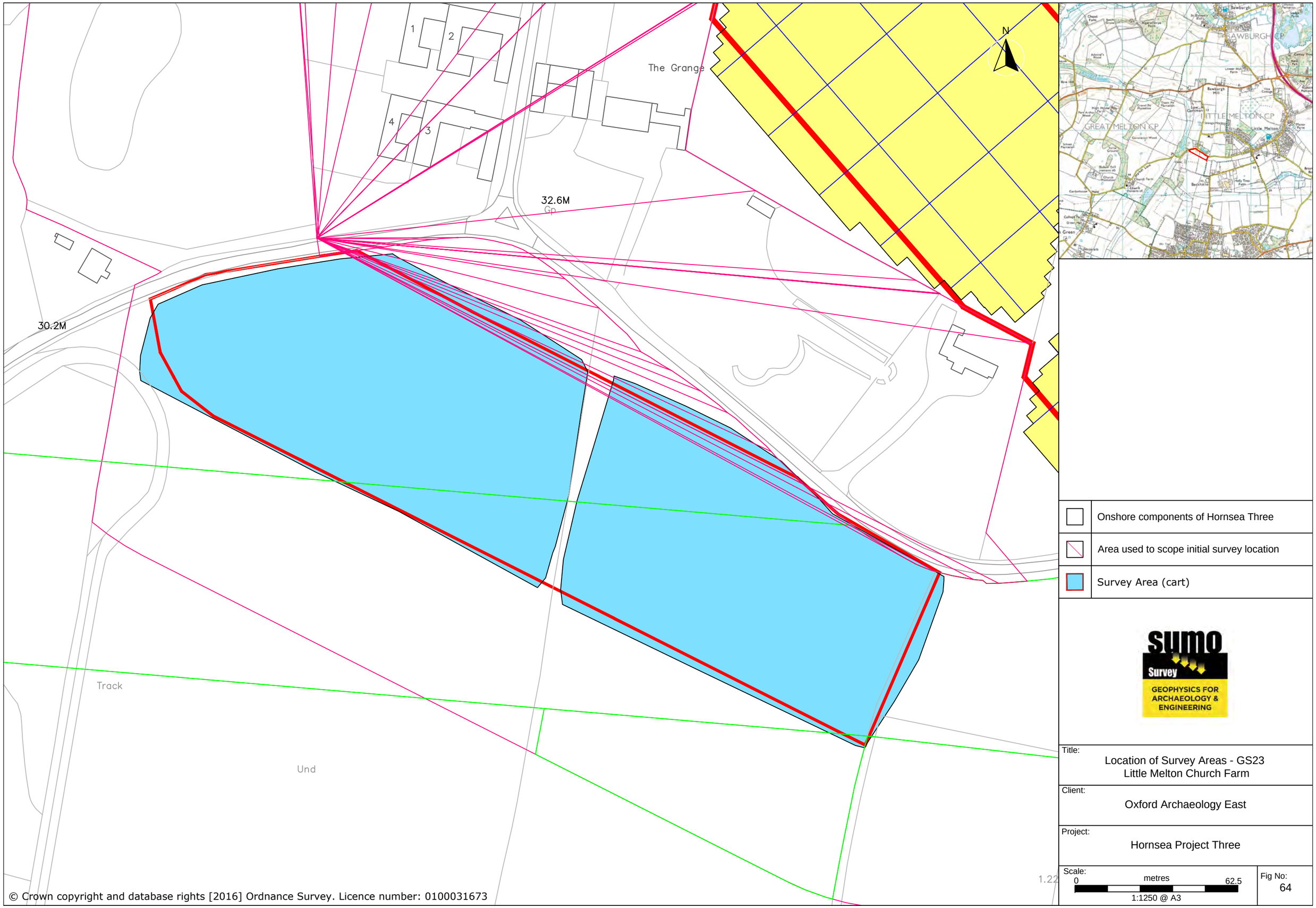
Title:
Magnetometer Survey - Interpretation - GS22 Wood Dalling - South

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
63



Onshore components of Hornsea Three

Area used to scope initial survey location

Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

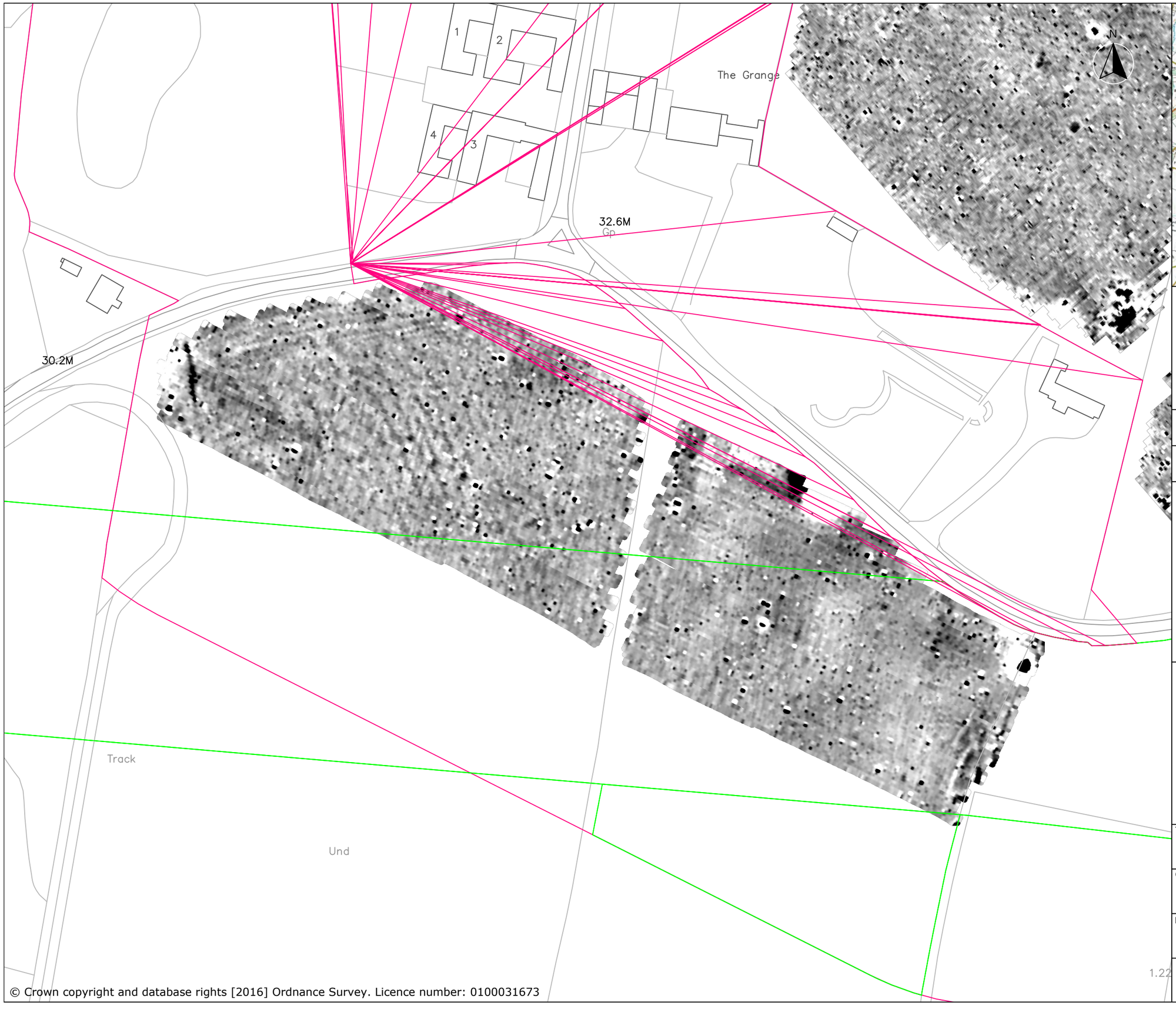
Title:
Location of Survey Areas - GS23
Little Melton Church Farm

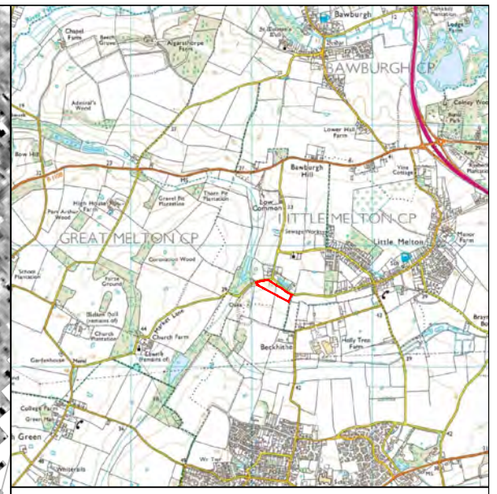
Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
64





Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

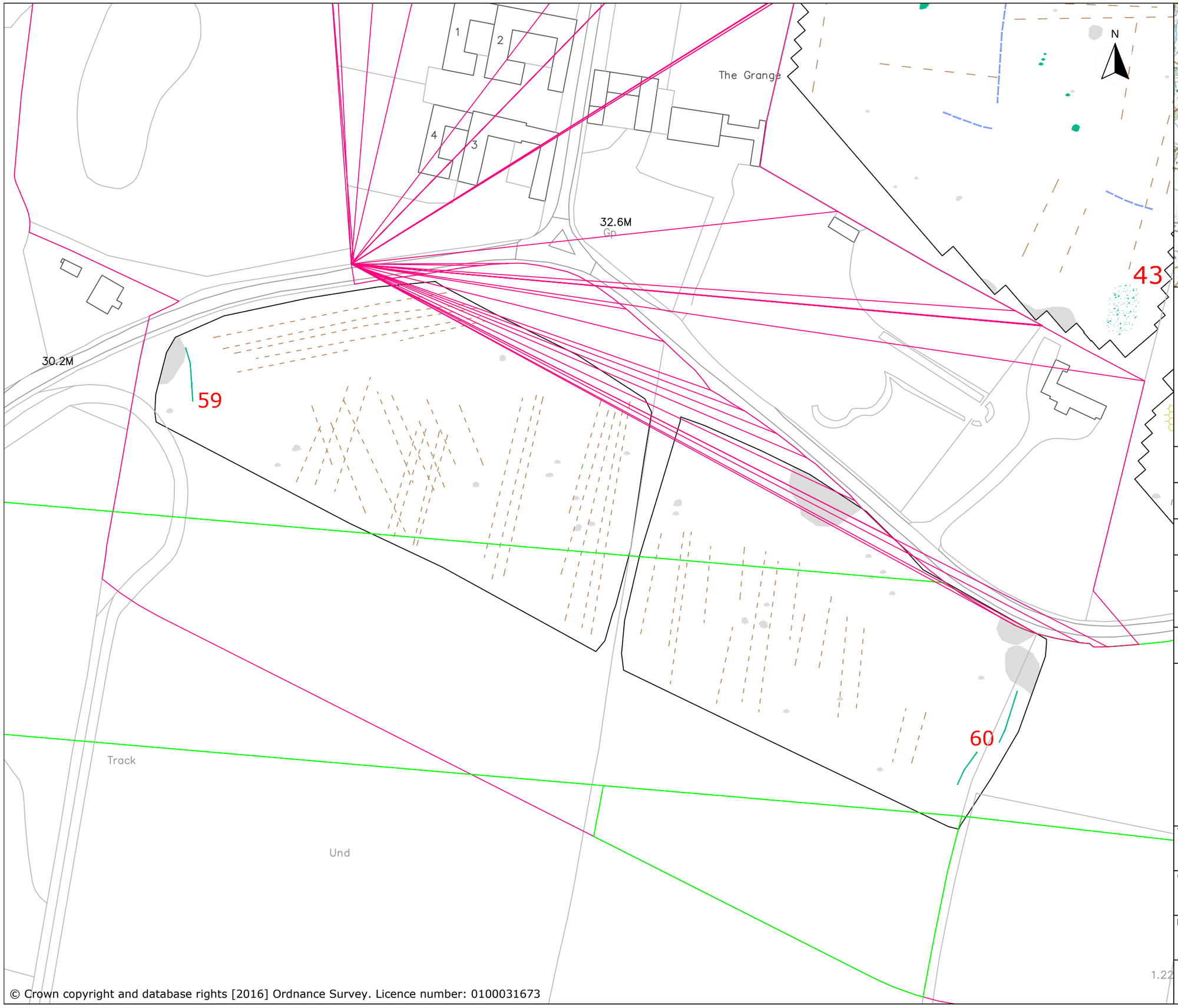
Title:
Magnetometer Survey - Greyscale Plots - GS23 Little Melton Church Farm

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
65



KEY

	Uncertain Origin (discrete anomaly)
	Agriculture (plough)
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - GS23 Little Melton Church Farm

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 62.5
1:1250 @ A3

Fig No:
66

A 148

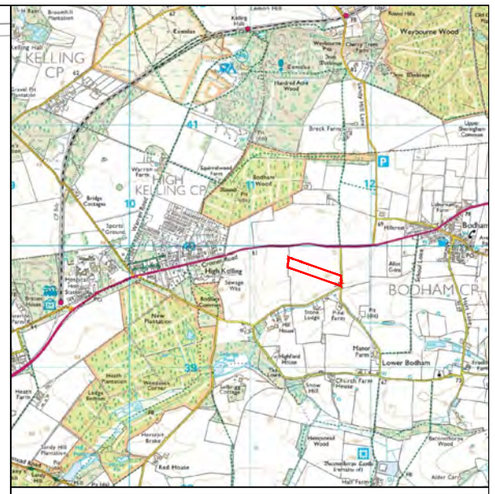
Ms

69.7M

N

Gp

57.8M



Onshore components of Hornsea Three

Area used to scope initial survey location

Survey Area (cart)

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Location of Survey Areas - GS25 Lower Bodham

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
67

A 148

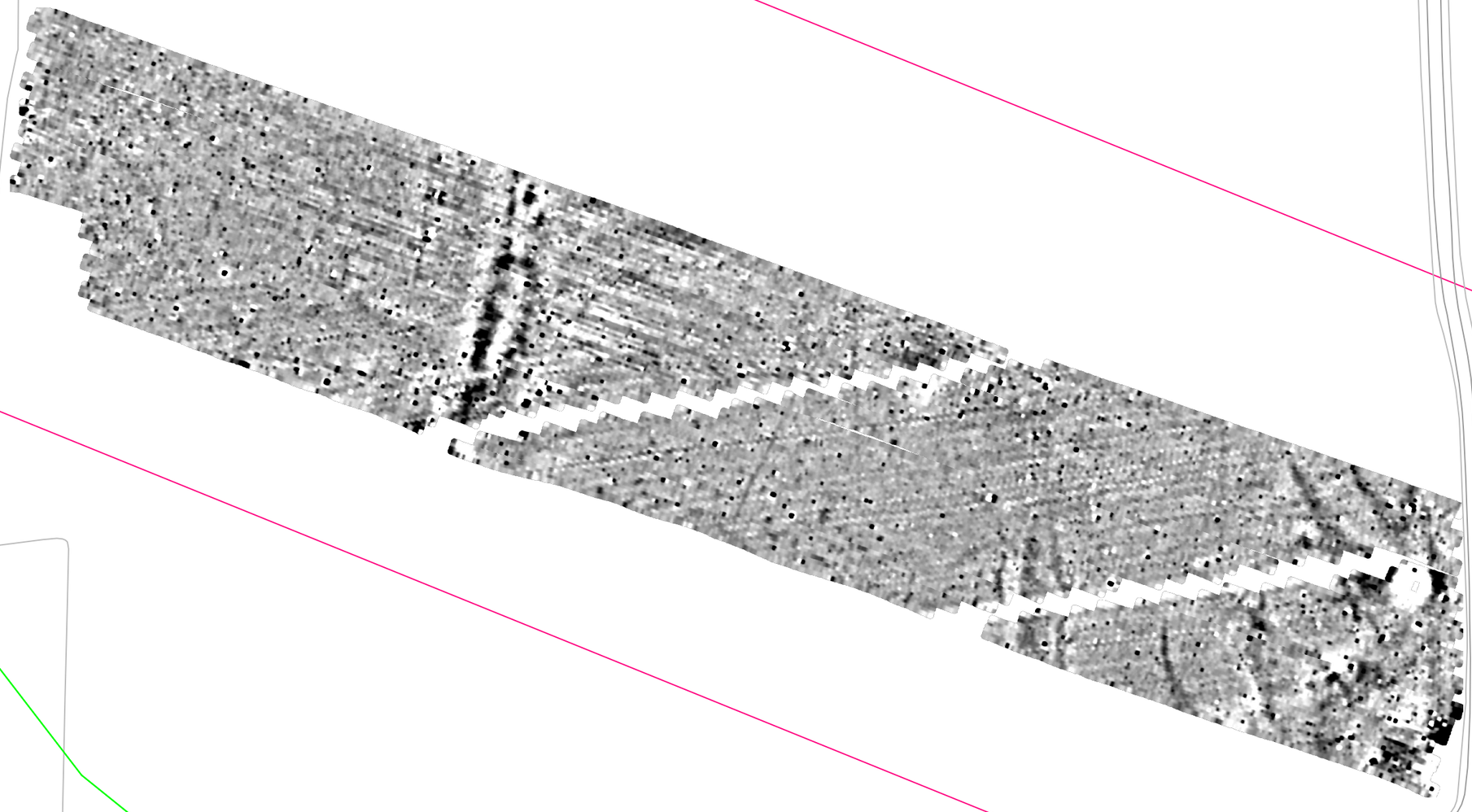
Ms

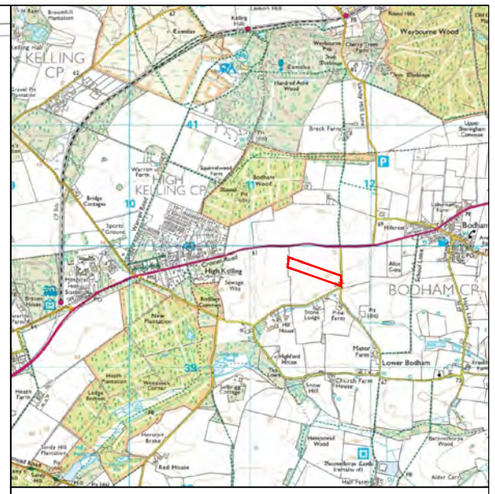
69.7M

N

Gp

57.8M





Onshore components of Hornsea Three

Area used to scope initial survey location

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - GS25 Lower Bodham

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

Fig No:
68

A 148

Ms

69.7M

N

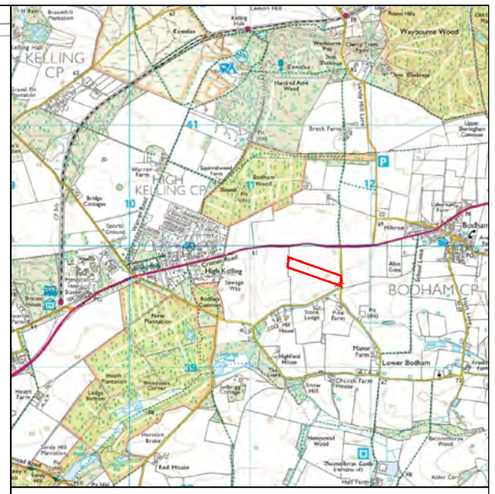
63

62

61

Gp

57.8M



KEY

	Uncertain Origin (discrete anomaly / area of increased response)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Ferrous
	Onshore components of Hornsea Three
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - GS25 Lower Bodham

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 75
1:1500 @ A3

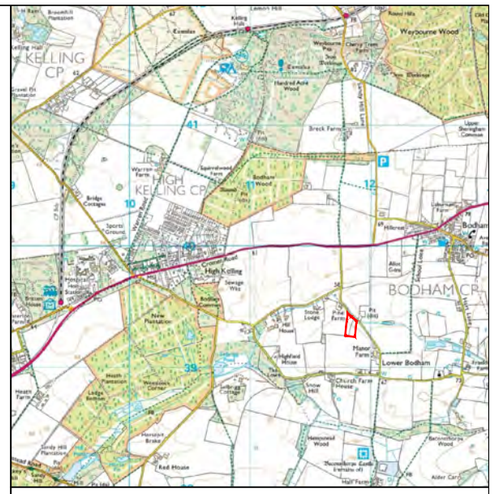
Fig No:
69

Pine Farm

(Disused)

61.5M

N



Area used to scope initial survey location

Survey Area - showing 30m grid

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Location of Survey Areas - GS26 Pine Farm

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 50
1:1000 @ A3

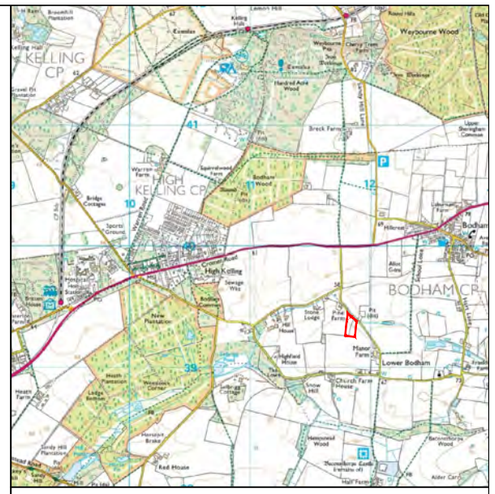
Fig No:
70

Pine Farm

(Disused)

61.5M

N



Area used to scope initial survey location

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - GS26 Pine Farm

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 50
1:1000 @ A3

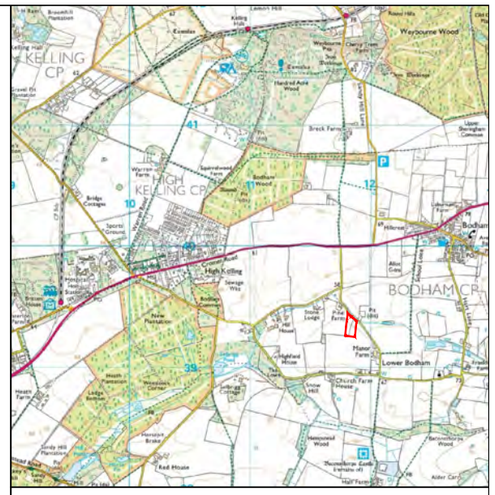
Fig No:
71

Pine Farm

(Disused)

61.5M

N



KEY

	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Service
	Ferrous
	Area used to scope initial survey location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - GS26 Pine Farm

Client:
Oxford Archaeology East

Project:
Hornsea Project Three

Scale:
0 metres 50
1:1000 @ A3

Fig No:
72

Head Office/Registered Office/
OA South

Janus House
Osney Mead
Oxford OX2 0ES

t: +44 (0) 1865 263 800
f: +44 (0) 1865 793 496
e: info@oxfordarchaeology.com
w: http://oxfordarchaeology.com

OA North

Mill 3
Moor Lane
Lancaster LA1 1QD

t: +44 (0) 1524 541 000
f: +44 (0) 1524 848 606
e: oanorth@oxfordarchaeology.com
w: http://oxfordarchaeology.com

OA East

15 Trafalgar Way
Bar Hill
Cambridgeshire
CB23 8SQ

t: +44 (0) 1223 850500
e: oaeast@oxfordarchaeology.com
w: http://oxfordarchaeology.com