Centre for Archaeological Fieldwork

Geophysical Survey Report No. 35

Quoile,

Co. Down

Dr Siobhán McDermott

Contents

List of Figures

List of Tables

Summary of results

Evaluation resolution magnetic gradiometery and electrical resistance surveys were carried out over a total area of 4.5 Ha on a headland at the mouth of the Quoile River, Ballintogher townland. The two survey methods were applied together to try and identify the location of possible Viking period settlement and/or elite burials. In general the magnetic data was poor – probably a result of heavy clay soils. Two clusters of anomalies with archaeological potential were identified in areas A & B. In Area A a series of linear features may represent a cluster of rectangular structures aligned gable to gable which sit with possible associated enclosing features. The form of the possible houses do not conform to recorded Viking architecture elsewhere in the country but would appear to be more similar to modern vernacular settlement. In Area B a group of high magnetic readings could be the geophysical signature of a dock and slipway of an unknown period. The dataset associated with these possible maritime anomalies was very hard to process due to statistical skews created by the high readings.

Site Specific Information

Site Name: Quoile

Townland: Ballintogher

SMR No: N/a

Grid Ref: J 51864 48643

County: Down

Dates of Survey: Thursday 19th March – Wednesday 22nd April

Surveyors Present: Siobhán McDermott, Grace McAlister, Stuart Alexander, Dermott Redmond, Ruth Logue

Size of area surveyed: 4.4 hectares

Weather conditions: Changeable – wintery to sunny and fair

Solid Geology: Sandstone – Hawick/Gala Group

Drift Geology: Diamicton Till/Sand & Silt/Clay

Current Land Use: Farmland

Intended Land Use: None

Survey methodology overview

Technical overview

Survey type

Magnetic gradiometery

Instrumentation:

Bartington Grad601-2 magnetic gradiometer

Probe spacing:

1m

Grid size:

30m x 30m

Traverse interval:

1m

Sample Interval:

0.125m

Traverse Pattern:

Zig-zag

Electrical resistance

Instrumentation:

Geoscan RM85

Probe spacing:

Parallel three probe array (0.5m x2)

Grid size:

30m x 30m

Traverse interval:

0.5m

Sample Interval:

0.5m

Traverse Pattern:

Zig-zag

Lecia TS06-plus total station

Station setup:

Tied into ING using survey grade Lecia 1200 GPS

Survey Accuracy:

Survey grade accuracy (<3cm)

Georeferencing:

The EDM data will be used to georeference the geophysical survey datasets exported from Geoplot v.3 in ArcMap 10.2.

Data processing:

The geophysical data will be processed in Geoplot v. 3 software.

Visualisations:
The datasets will be visualised in Geoplot v.3 using shade, trace, dot density and relief plots. Processed datasets will be imported into ArcGIS 10.2. Once georeferenced the rasters will be statistical analysed in ArcMap 10.2 and interpreted in relation to the historical Ordnance Survey map series and the 2006, 2010 and 2014 orthorectified aerial photographs. Further visualisation and interpretation will carried out in ArcScene 10.2 if necessary.

Digital archive:
The geophysical datasets were collected, processed and archived in accordance with Archaeological Data Services best practice.[1]

[1] Schmidt, A. & E. Ernenwein, 2011, Guide to good practice: Geophysical data in Archaeology [Online] http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc

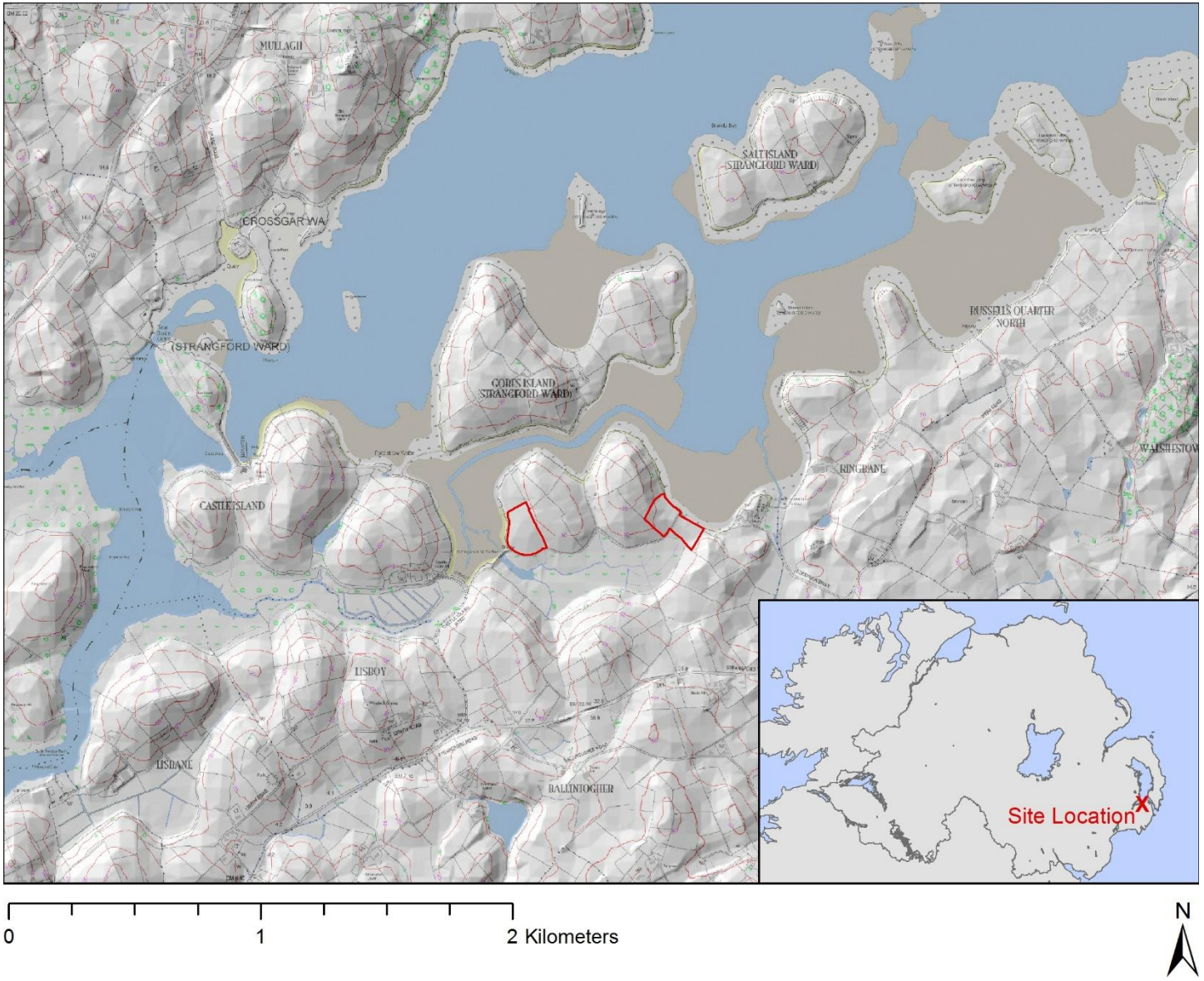

Figure 1 Location and landscape setting of the geophysical survey areas marked in red (OSNI 10km vector data layered over 5km DEM Hillshade)

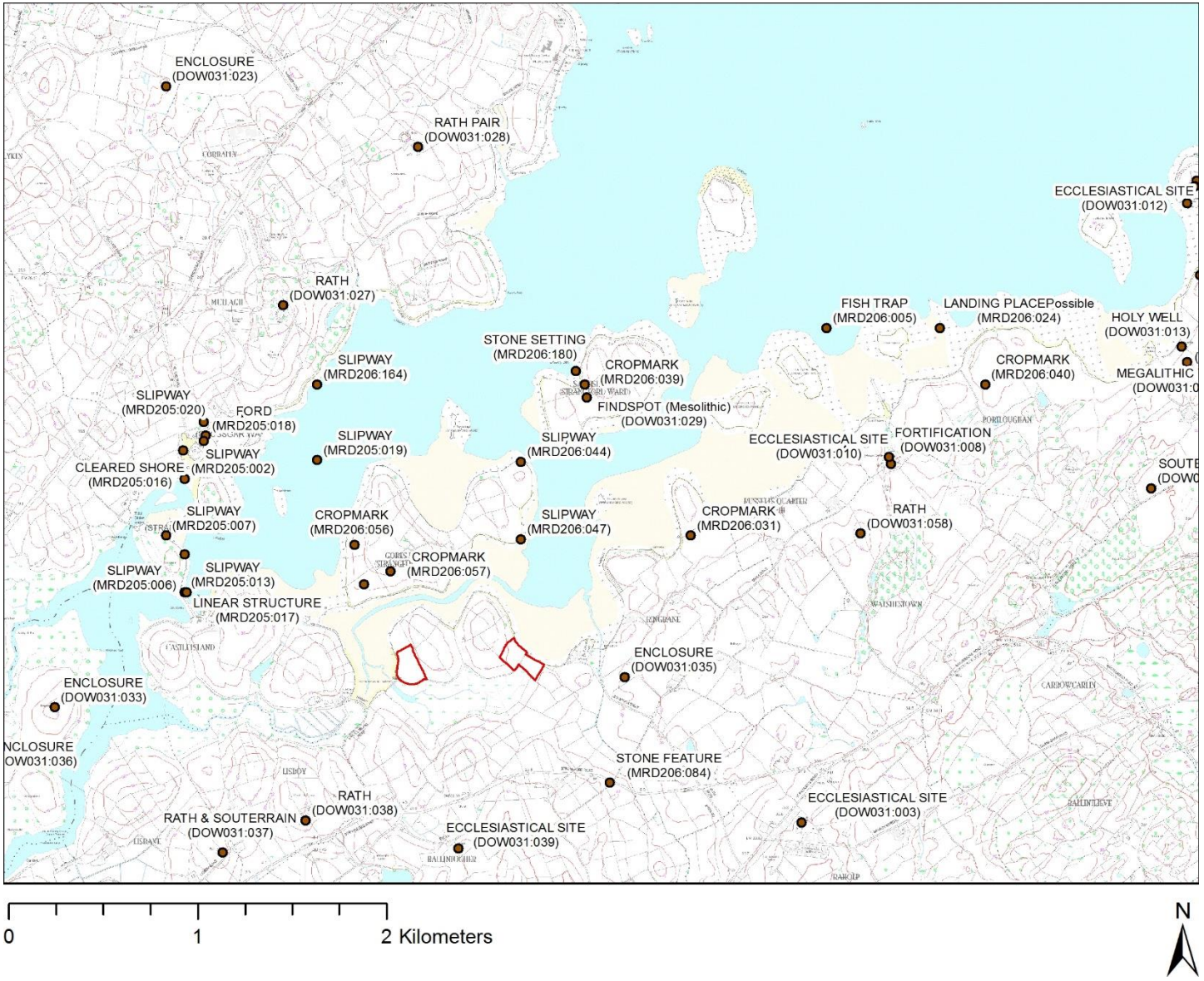

Figure 2 Wider recorded archaeological landscape setting. Geophysical survey area in red with Key NISMR locations noted.

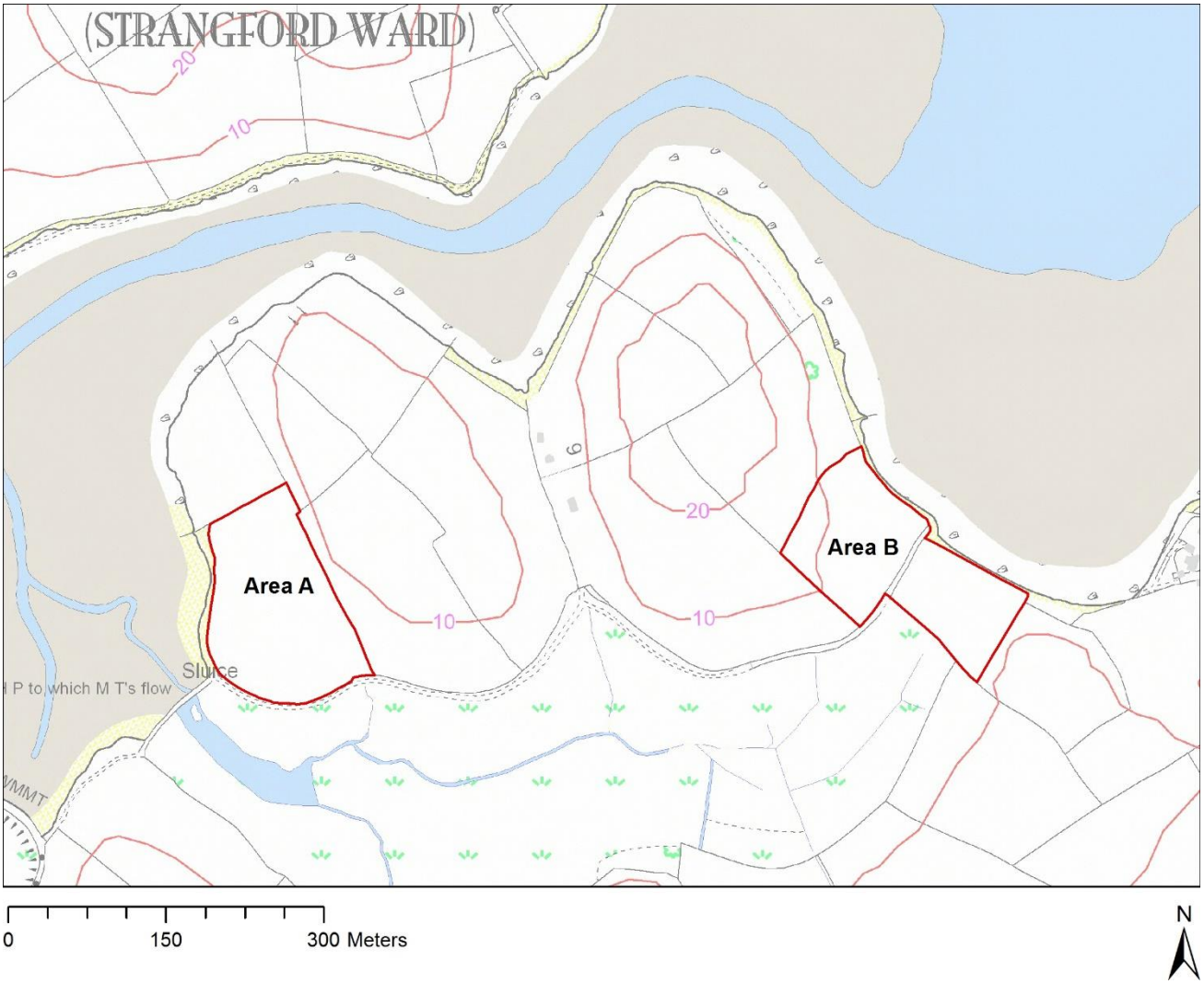

Figure 3 Location of geophysical survey areas.

Introduction

The survey area is located *c.* 6.5km due west of Strangford village and *c.* 5km north-east of Downpatrick on the southern shores of Strangford Lough. Two separate areas were surveyed on a small headland situated at the mouth of the Quoile River estuary. The headland is composed of two drown drumlins typical of the coastal morphology of the western shoreline of Strangford Lough (McErlean *et al*. 2002, 21–2). The soil matrix of the westernmost drumlin was dominated by a heavily compacted, light, orangey, brown sandy-clay. The soil matrix of the easternmost drumlin was darker with evidence of more organic matter and more malleable. The headland is joined to the mainland by a bridge of reclaimed land which is still heavily waterlogged and a narrow strip of dry land in Area B along which a hollow-way runs. A mid-18th-century scheme failed to drain and reclaim a large portion of the Quoile River. The present reclaimed land probably postdates the 1830s (ibid, 35–6). The area is mapped as an island by the 1st Edition Ordnance Survey. To the west of the headland is a human-made causeway which was first mapped by the 3rd Edition Ordnance Survey, *c.* 1899–1904 (Figure 20). This is not the causeway that gives its name to the townland, Ballintoger, which refers to one situated further to the west which connects Castle Island to the mainland.[2] The landscape use is predominately agricultural with many of the surrounding fields ploughed. Field patterns are regular with evidence of significant amalgamation since they were first surveyed by the 2nd Edition Ordnance survey, *c.* 1862 – 3 (Figure 19). Settlement patterns are typical of Irish rural dispersed settlement with the accompanying web of roads.

Two areas, situated 450m apart, were targeted for geophysical survey (Figure 3). Area A, occupies an entire field on the south-westerly drumlin slope of the westernmost drumlin just below the 50m contour mark. The location has good views to the south and west, overlooking the Quoile estuary and a 20th-century causeway which links the headland with the Castle Island Road. It is bounded to the north, east and south with banks and ditches planted with mature hedgerows. The western field boundary is a wire fence running along the shoreline. Recent finds by metal-detectorists highlighted the archaeological potential of the location and warranted its geophysical investigation. The second survey area, Area B, straddles either side of a hollow-way pathway that runs along the southern limits of the easternmost drumlin. This area was extended to cover a series of circular cropmarks (Figure 17) that were visible when the survey was taking place. Although it has good views to the east out over Strangford Lough its aspect is less exposed then Area A with views to the south, west and north limited by drumlin rises. The ground surface to the south of the hollow-way undulates gently while that to the north increases sharply in gradient as you move towards the drumlin peak. Area B was targeted for geophysical survey as prior to the drainage of the land to the south-west this area was a land bridge between the headland the mainland.

Low vegetation cover meant that five circular cropmarks were evident on the eastern drumlin face around the 50m contour mark. The cropmarks were a series of rings of lush growth about 0.5m wide. They ranged in size from the CM_1 (*c.* 15m E–W, 14m N–S) to CM_4 (*c.* 2m E–W, 2m N–S). They follow the 50m contour with the ground surface dropping off steeply to the east. The magnetic gradiometery survey was extended to include these features. Unfortunately they did not have a significant magnetic signal. In morphology and distribution they are similar to a ring-ditch cemetery excavated at Ballydavis, Co. Laois in the mid-1990s (Keely 1995). A complex of four ring-ditches, ranging in size from 6m – 16m, furnaces and a series of pits and

[2] Available online at http://www.placenamesni.org/resultdetails.php?entry=12630

post-holes were excavated. Evidence for Iron Age elite metal working and cremation burials were recovered at Ballydavis. Given that evidence for Iron Age settlement is limited in the Strangford region in general, especially along its south-western shores (McErlean *et al* 2002, 55), the evidence for a possible ring-ditch cemetery along the Quoile estuary is significant.

The formative period for the Strangford area, as we understand it, was the emergence of the Dál Fiatach in the 6th century. They would remain the dominant political influence in the area until the Norman invasion. It was during this formative stage that the major monasteries were also founded. All of them with a strong maritime location (McErlean *et al* 2002, 73) and being in themselves a key focus for later 9th–10th century Viking aggression. "However, probably due to their [the Dál Fiatach] strong control of their coastline and use of naval power, the Vikings were unable to establish a permanent foothold." (ibid, 60). It is the nature of this Viking presence that so concerns the present survey area.

During the mid-9th century a Viking *longphort*, called Linn Sailech, was established somewhere on the coastline of Dál Fiatach. These temporary fortified camps were used as raiding bases which from the 830s onwards were increasingly used for over wintering on the island. They were often located near to important political boundaries or ecclesiastical sites (McCormick *et al* 2013, 121–2) Linn Sailech appears to have been short-lived, perhaps a decade, and remains unlocated (McErlean *et al* 2002, 79). At the end of the 10th-century a Viking settlement was well enough established in the Strangford area to be identified as the 'Vikings of Loch Cuan' in the native Irish chronicles. The Annals of Ulster record the expulsion of this fleet and the capture of their 'island' in 924 (ibid, 79). At least twenty *longphorts* are attested to in the Irish annals among them are references to two sites in Co. Down at Strangford and Narrow Water (ibid, 122). The placename Quoile comes from the Irish word for 'the narrow (water)' *An Caol [an keel]*, although it is unclear if this refers to the same place.

Viking *longphorts* had a distinctive character – they were accessible by water and located on a major navigable river in a position that could be easily defended. Natural defensive features, such as headlands, were further defined by some form of defences such as earthen banks, ditches and palisades. Access to shallow waters, which provided moorage for the fleet, was another important characteristic (Simpson 2012, 94). At Annagassan, Co. Louth, a programme of archaeological field survey identified the 9th-century Viking *longphort* of Linn Duachaill. An artificial ditch, *c.* 5m in width and 3m deep, with internal bank which was used to cut off the headland at its narrowest point (Clinton 2010). The land bridge that Area B focussed on would been the ideal location for any defensive features associated with a Viking *longphort*. In this respect the current pathway which is visible on the 1st Edition Ordnance survey map of the area, *c.* 1835, becomes significant. The pathway (Figure 17) is 1.5m lower than the surrounding fields which it cuts through suggesting that this could be the remnants of a ditch later incorporated into a routeway. The Viking *longphort* excavated at Woodstown, Co. Waterford, was a D-shaped enclosure formed by a series of ditches and a palisade defence on the River Suir (McCormick *et al* 2013, 122–3). There was evidence for extensive ironworking, including the manufacture of items related to ship building, and industrial activities relating to local trade.

Description and interpretation of anomalies (Figure 4 & Figure 5)

General comments:

In general the magnetic data was poor. This is due in part to the compacted, heavy, gravel-rich clay which dominated the survey areas. The magnetic data for Area B1 was very poor. Statistical skews in the higher magnetic feature situated near the shoreline prevented the successful application of Zero Mean Traverse. To facilitate the application of Zero Mean Traverse the grid square of higher readings were extracted from the data set and processed in isolation (Figure 14). There were also notable grid mismatching – not found on either of the other two survey areas (A & B2) – which is usually associated with instrument drift due to poor choice of zeroing location and infrequent balancing of the instrument. Area B1 was surveyed in the same manner as the other two areas and used the same zeroing location as area B2, it is therefore unclear as to why this dataset is so limited. Adverse weather conditions, in the form of high winds, meant that magnetic data collected at the higher resolution (0.5m traverses) was of little use as the instrument operators found it nearly impossible to keep pace and keep the probes aligned.

Table 1 Description and interpretation of magnetic gradiometery anomalies in Areas A & B

Area A

Code	Description	Interpretation
A_m1	Rectangular feature outlined by a series of higher magnetic linear readings in the north-west quadrant of the survey area. The anomaly is marked by very subtle geophysical signal evident after the application of LPF and interpolation. It extends for a distance of *c.* 10m NW – SE, 5m SW – NE, enclosing an area of *c.* 45m^2. There is a possible break, *c.* 3.5m, in the N corner.	The regular form of this feature suggests that it is human-made perhaps slot trenches of a house site. A centrally placed high magnetic circular anomaly may mark the location of a pit which held a supporting roof post. There are concerns that this feature, as well as A_m2 & A_m3, are only evident after the application of LPF and interpolation. The area was surveyed at evaluation resolution in both a NW – SE and NE – SW direction. These features were not evident in the latter dataset. A higher resolution survey of the area did not supply usable data weather conditions made data capture untenable.
A_m2	Two linear anomalies abutting the southern end of A_m1 which may enclose another rectangular feature. They are marked by the same very subtle magnetic signals as A_m1. The northernmost linear can be traced for a distance of *c.* 7m NW – SE abutting the eastern corner of	This would appear to be the partial traces of another rectangular structure abutting the southern gable of A_m1.

	A_m1. The southernmost linear runs parallel to the former and can be traced for a distance of *c.* 12m. It abuts the southern corner of A_m1.	As with the previous anomalies there is concern over the validity of these readings.
A_m3	A_m3 displays the same subtle magnetic signature as A_m1 and A_m2. It abuts the northern corner of A_m1 and is traceable for a distance of *c.* 3m running SE – NW before turning 270 degrees to run NE – SW for a distance of *c.* 6m.	A possible annex on the northern gable of A_m1.
A_m4	A subtle linear running parallel to part of A_m3 and the resistivity anomaly A_r1. A_m4 is traceable for a *c.* 8m running SW – NE at a distance of *c.* 5.6m from A_m3.	Possible enclosing feature associated with A_m1, A_m2 & A_m3.
A_m5	An area of irregular, dipolar readings in the SW corner of survey Area A. It extends beyond the survey area to the east and south. The area measures *c.* 36m NW – SE, 29m E – W. The readings are irregular with no discernible pattern.	Dipolar magnetic churning perhaps related to modern agricultural clearance.
A_m6	An area of irregular dipolar readings to the north and extending beyond the survey area. The area measures *c.* 31m E – W, 26m N – S.	A large irregular dipolar, to the north of A_m6, has a distinctive high magnetic centre and halo of negative readings. This is indicative of burning, perhaps due to modern agricultural clearance.

Area B

B_m1	Negative linear running parallel to part of the hollow-way routeway. The feature is traceable for *c.* 14m along the northern portion of the pathway at a distance of *c.* 6m from it. The anomaly may continue further north but has been obscured by dipolar readings produced by the barbed wire fencing along this portion of the field boundary.	Possible remnants of bank feature associated with the ditch which is now a hollow-way route-way.
B_m2	A pair positive linear features which abut the western limit of B_m3. The anomalies are subtle and evident after the application of LPF. They are broadly parallel running ENE – WSW and appear to taper gently towards each other. The northern linear is traceable for a distance of *c.* 5m, the southernmost *c.* 11m. They are situated *c.* 3m apart.	The high magnetic readings associated with B_m3 made this grid square of data very difficult to process with a number of false anomalies appearing with the passing of Zero Mean Traverse. The grid square was processed in isolation to avoid this. In isolation the passing of a ZMT over the dataset reveals the two positive features which abut the western limits of B_m3. The form of the broadly parallel high

		resistance linear anomalies and their relationship to B_m3 suggests that this could be the remnants of some type of slipway.
B_m3	A roughly oval area of high magnetic readings which extends beyond the NE limits of the survey area – the readings displayed a significant statistically variation from the rest of the dataset, with the consequence that they prevented the successful application of ZMT. Measures *c.* 11m NW – SE. To work around this issue the grid square containing the core of this data was extracted and processed in isolation. The consequence is that the full extent of B_m3 is not easily mapped.	The block of higher magnetic readings display none of the dipolar readings associated with the presence of metallic material or temperatures high enough to significantly change the soils induced magnetism. The readings may, instead, be the consequence of changes brought about by bacterial activity during silting or the breaking down of detritus. If this is a more likely explanation then it is possible that the area represented by B_m3 was once water-logged perhaps as the shoreline retreated further in. This scenario lends itself to the possibly of B_m3 and B_m2 being elements of a human-made harbour, perhaps even associated with a Viking boat noose although it does not share the characteristic form of this site type. The anomaly B_m3 representing a dock and B_m2 the slipway for pulling the boats onto dry land for repairs or over-wintering.
B_m4	Irregular, dipolar anomaly *c.* 2.7m N – S, E – W located on the western portion of crop mark CM_5.	Identified as having possible archaeological significance because of their spatial relationship with crop marks (Figure 5). Could mark the location of cremation or burning.
B_m5	Irregular, dipolar anomaly *c.* 5.7m N – S, 3m E – W located on the western portion of crop mark CM_1.	Same as above.
B_m6	Curvilinear feature defined by subtle positive magnetic readings. Situated *c.* 7m SE of the southern side of the hollow-way pathway. Measures *c.* 17.5m in length.	This anomaly is difficult to interpret but its form does suggest it could be human-made.

Table 2 Description and interpretation of electrical resistance anomalies in Areas A

Code	**Description**	**Interpretation**
A_r1	High resistance linear running SW – NE. Traceable for a distance of *c.* 22m, 1m wide. There is a gap, *c.* 1.5m, to the south.	Possible enclosing element associated with A_m1, A_m2 & A_m3.

Figure 4 Interpretive diagram of Area A.

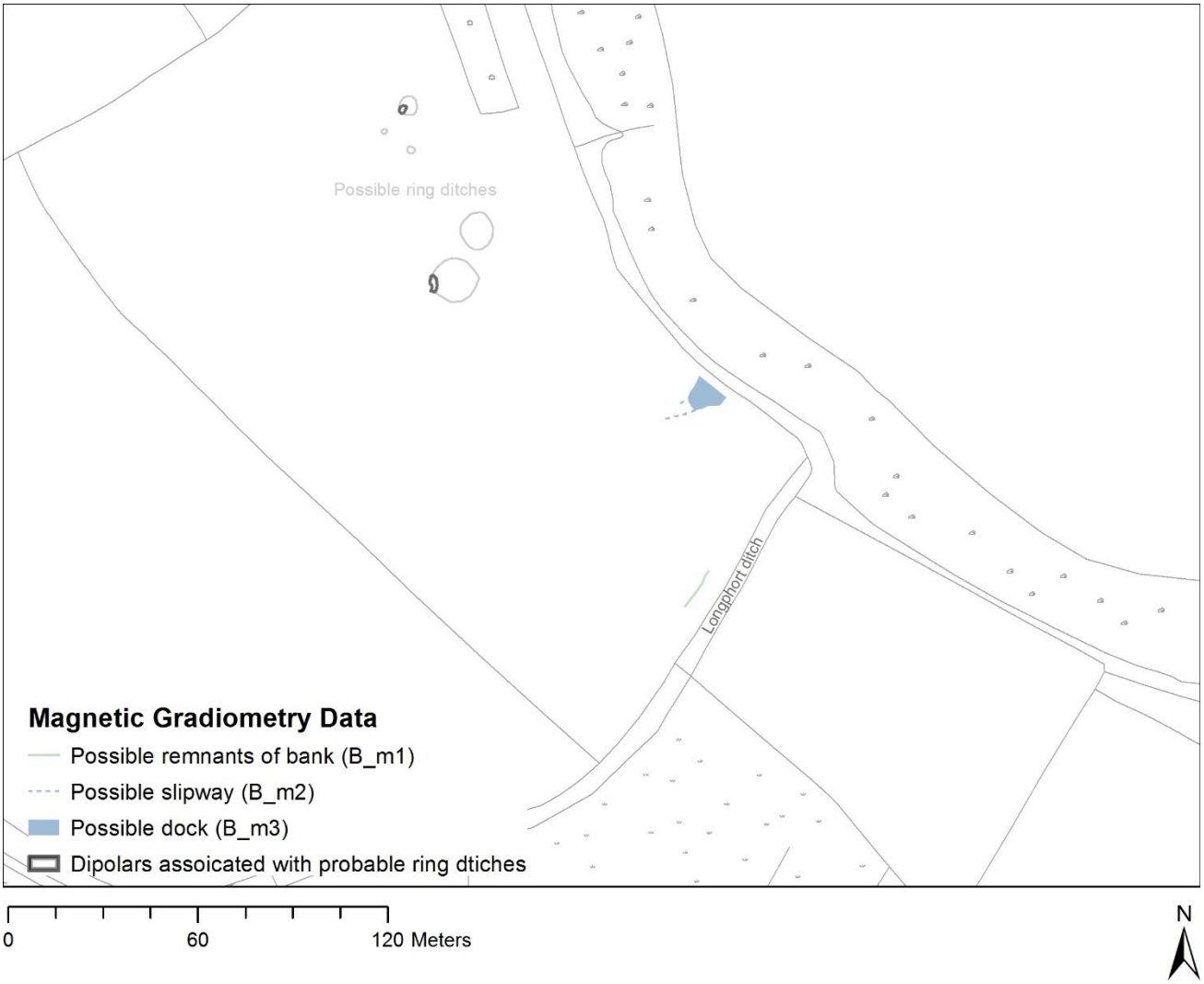

Figure 5 Interpretive diagram of Area B.

Discussion

In general the geophysical survey data returned poor and limited results. The possible house sites (Figure 18) with enclosing elements identified in Area A were located near known Viking metal artefact finds sites. However they do not conform in plan to the type of structure typically associated with Viking settlement on the island – which are usually in urban contexts (Wallace 1992). The gable to gable alignment has more in common with modern vernacular settlement types.

In Area B the current hollow-way pathway which cuts through the centre of the survey area is in the most likely position for any defensive features associated with the Viking *longphort*. This would have been the original land-bridge that linked the headland with the mainland. Earthen banks, ditches and palisades have been excavated at Viking *longphort* sites elsewhere in the country. The negative magnetic anomaly (B_m1) which runs parallel to the hollow-way along its northern section may be a bank associated with these defensive elements. The shallow waters to the east of Area B make a better harbour then those to the west of Area A, which were shallower and more deeply affected by the tides. In general Area A was more exposed then Area B. The landscape position and character of the headland does display many of the characteristics, identified by Simpson (2012, 94), as an indicator of a Viking *longphort*.

It has been argued that the high magnetic readings, which caused so many processing problems in Area B, could perhaps represent a harbour – a dock and slipway. The form of the returns do not appear to argue for the presence of a Viking *naust* – a form of boathouse from which the Scottish *noost* is derived. These have a distinctive c-shape, open at the seaward end, and were roofed. They facilitated boats to be drawn up and over-wintered. They can often be spotted from aerial sources as hollow-ways were picked out of the shingle leading up to them. There is no evidence of such hollow-ways in the aerial sources for the survey area. Without further investigation it is difficult to say if B_m2 & B_m3 are associated with Viking, or more general, maritime activity.

Recommendations

The possible house sites in Area A and the harbour in Area B are potential excavation targets. It is recommended that before excavation a programme of topographical survey be undertaken to firmly ascertain the relationship of the hollow-way pathway with the rest of the headline. Low altitude photogrammetry, flown when floral growth is low, is a cost effective way of gathering this data. Terrestrial 3d laser scanning of the hollow-way in detail would provide another dataset which could be integrated into the DEM created from the photogrammetric flyover. In this manner both the landscape positioning and the physical character of the hollow-way could be accurately recorded and explored.

This topographical data would provide the primary layers for a site GIS which can incorporate excavation data and allow the spatial analysis of the archaeological evidence.

It was noted during fieldwork that a number of the field boundaries were formed by banks and ditches. Field-walking of the survey area, with special attention being paid to the field boundaries, may supply further evidence for settlement activity on the headland. Similarly a methodological analysis of the historical geography of the area, especially the parochial, townland and minor land-holding units might aid our understanding of earlier settlement phases.

It is important that the prehistoric character of the headland be recorded and protected. It is recommended that the possible ring ditch cemetery be entered into in the Northern Irish Sites & Monuments Register.

Bibliography

Clinton, M., [2010] 'Linns, Louth: excavation report (2010:468)' [Online] available at http://www.excavations.ie/report/2010/Louth/0021677/ (Accessed: April 2015).

Gosling, P., MacMahon, B., & Roden, C., 2010 'Nausts, púcáns and 'mallúirs'', in Archaeology Ireland, **24** (3), pp. 30–34.

Keely, V.J., [1995] 'Ballydavis, Laois: excavation report (1995:173)' [Online] available at http://www.excavations.ie/report/1995/Laois/0002015/ (Accessed: April 2015)

McErlean, T., McConkey, R. & Forsythe, W., 2002 *An archaeological survey of the maritime cultural landscape: Strangford Lough.*

Simpson, L., 2012 'The *longphort* of Dublin: lessons from Woodstown, County Waterford and Annagassan, County Lough. In S. Duffy (ed.), *Medieval Dublin XII: proceedings of the Friends of Medieval Dublin symposium 2010*, pp. 94–112.

Wallace, P.F., 1992 'The archaeological identity of the Hiberno-Norse town', in JRSAI, **22**, pp. 35–66.

Acknowledgements

Thank-you to Dr Finbar McCormick, QUB, for raising awareness of the archaeological potential of this site. Thank-you too to those members of the Centre for Archaeological Fieldwork, QUB, who assisted during the survey. Thank-you as well to James Patience, NIEA, who kindly came out to site to tie us into the ING.

Appendix one: Georeferenced geophysical survey grids

Figure 6 Location and ING coordinates of local geophysical survey grids for Area A.

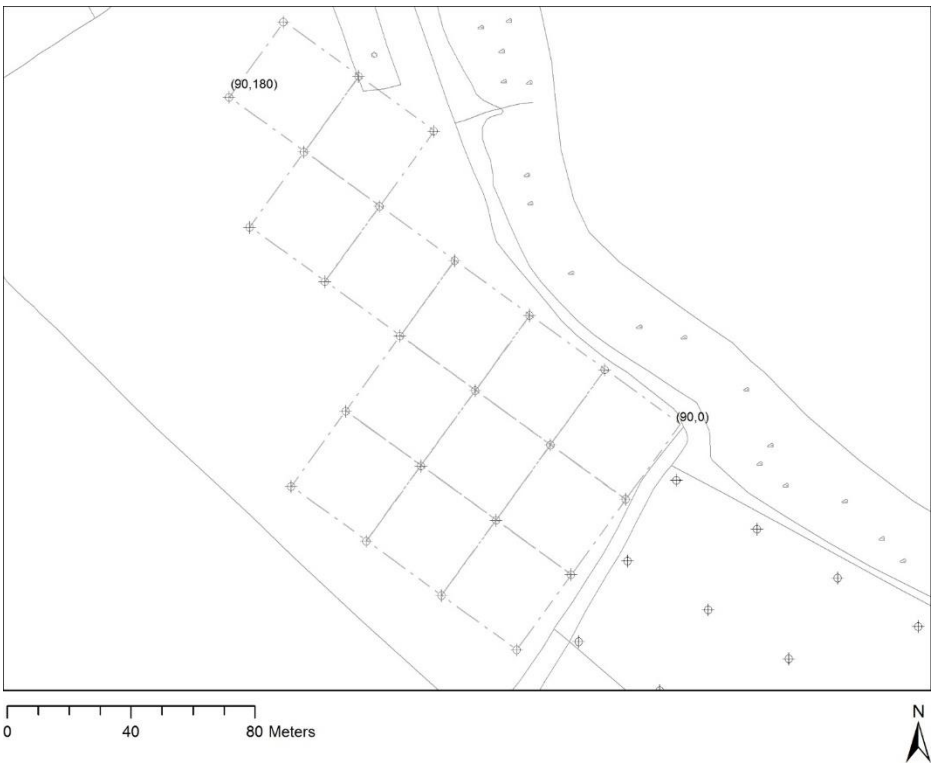

Figure 7 Location and ING coordinates of local geophysical survey grids for Area B1.

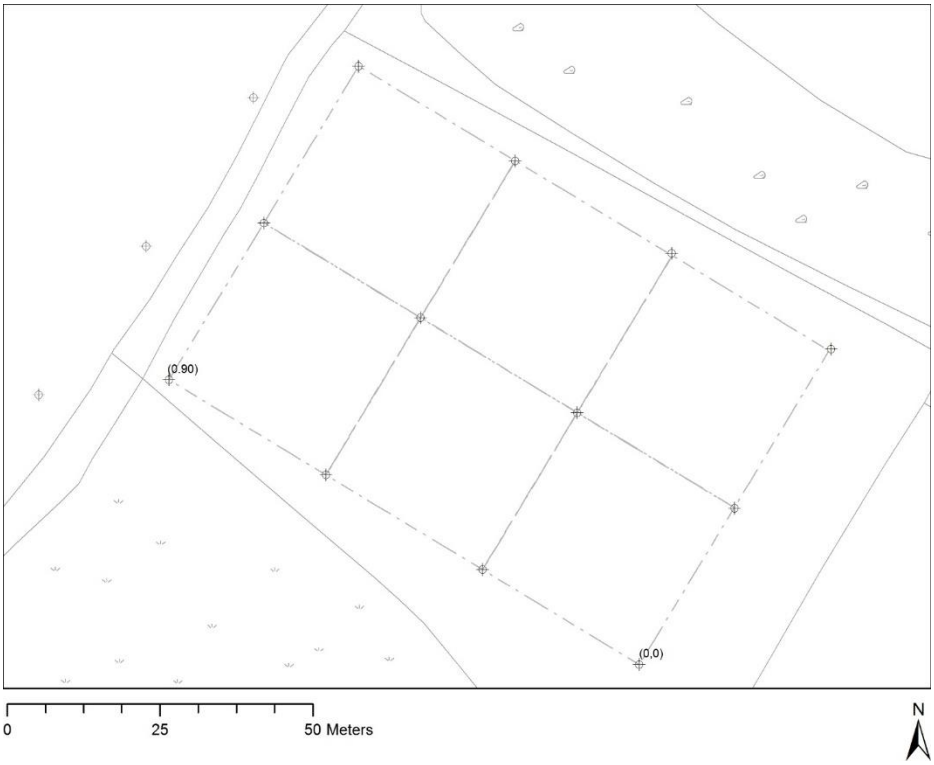

Figure 8 Location and ING coordinates of local geophysical survey grids for Area B2.

Table 3 Table of local and ING coordinates for the two survey areas (three survey grids A, B1 & B2).

Local grid coordiante	**ING coordiantes**
Area A	
0, 0	E 352069.52, N 348654.79
180, 0	E 351991.25, N 348816.96
Area B1	
90, 0	E 352607.40, N 348783.09
90, 180	E 352461.75, N 348888.84
Area B2	
0, 0	E 352653.05, N 348666.46
0, 90	E 352575.83, N 348712.57

Appendix two: Area A raw and processed data plots

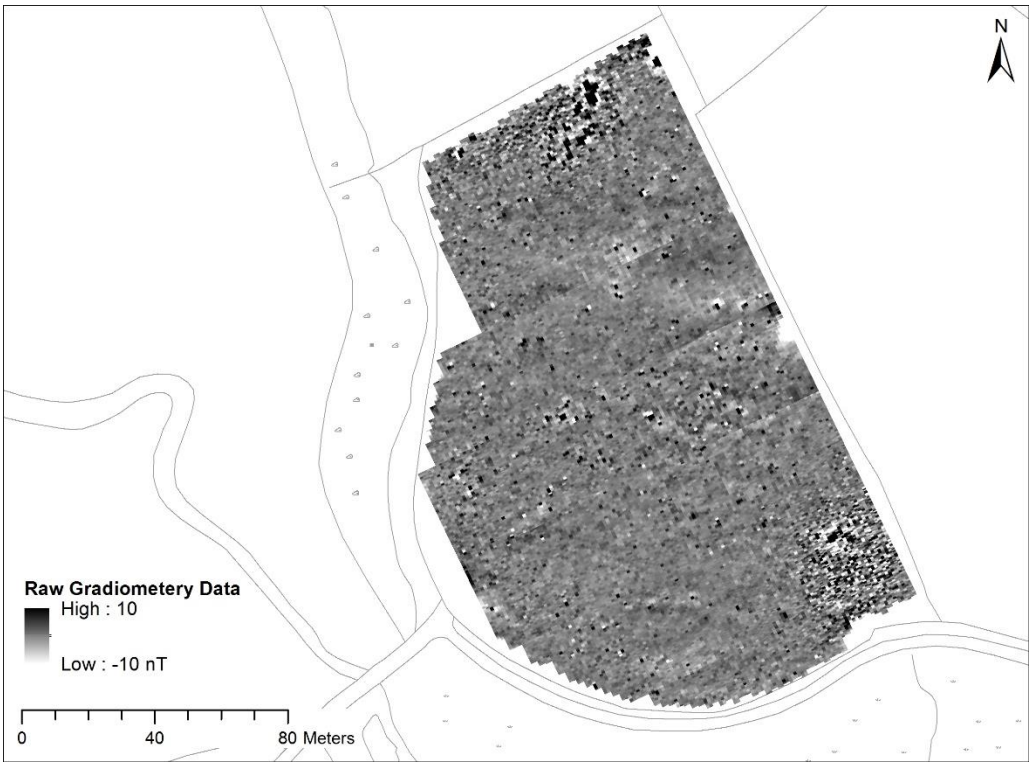

Figure 9 Greyscale plot of Area A raw magnetic data with ZMT and clipped to +/- 10 nT.
Statistics: Mean: -0.05, Std Dev.: 1.64.

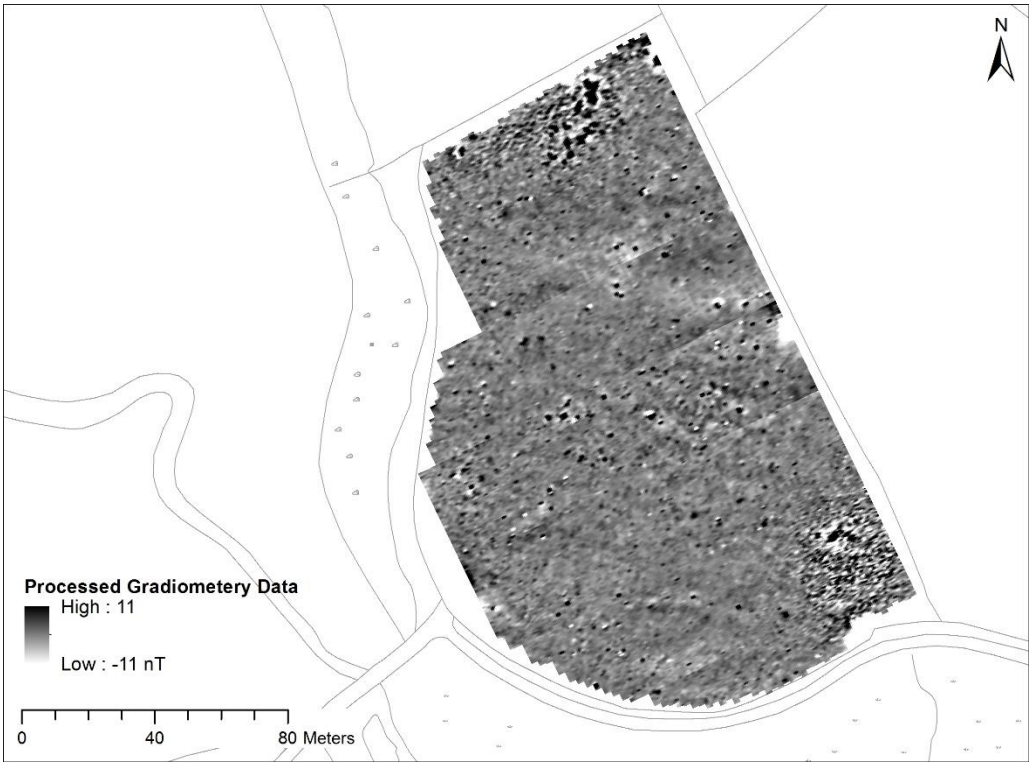

Figure 10 Greyscale plot of Area A processed magnetic data with ZMT applied, despiked, LPF (Gaussian weighting applied x1 on the y-axis), and sin(x)/x interpolation along the y-axis.
Statistics: Mean: -0.03, Std Dev.: 1.59.

Figure 11 Greyscale plot of Area A raw electrical resistance data
Statistics:
Mean: 45.26,
Std Dev.: 12.36.

Figure 12 Greyscale plot of Area A processed electrical resistance data. Clipped to +/- 3 Std. Dev., despiked, HPF (Uniform weighting applied on x- and y-axis), LPF (Gaussian weighting applied on the x- and y-axis), and sin(x)/x interpolation along x- and y-axis.
Statistics:
Mean: 0.01
Std Dev: 4.86

Appendix three: Area B1 raw and processed data plots

Figure 13 Greyscale plot of Area B1 raw magnetic data clipped to +/- 3 Std Dev.
Statistics: Mean: -0.29, Std. Dev. 3.26.

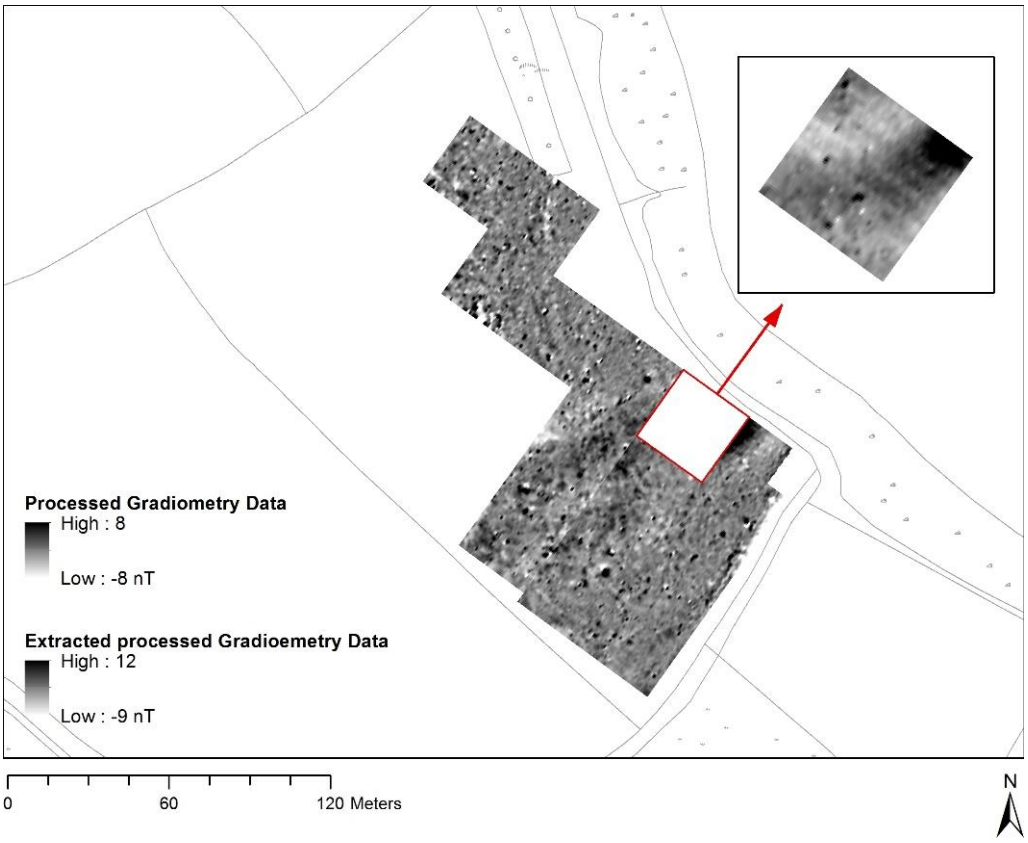

Figure 14 Greyscale plot of Area B1 processed magnetic data. Both datasets had ZMT applied, clipped to +/- 3 Std Dev, LPF (Gaussian weighting applied x1 on the y-axis), and sin(x)/x interpolation along the y-axis.
Statistics:
Mean: -0.03
Std Dev.: 1.59.

Appendix four: Area B2 raw and processed data plots

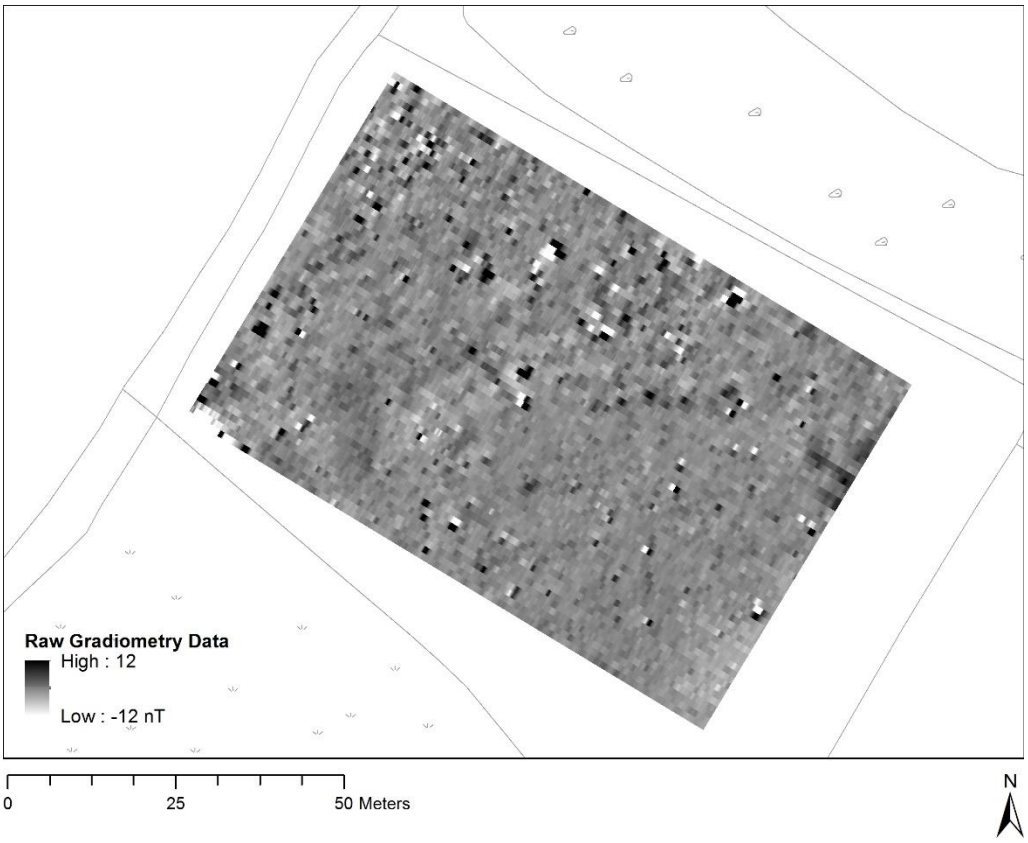

Figure 15 Greyscale plot of Area B2 raw magnetic ZMT applied and data clipped to +/- 12 nT.

Statistics:
Mean: 0.03
Std. Dev. 1.52.

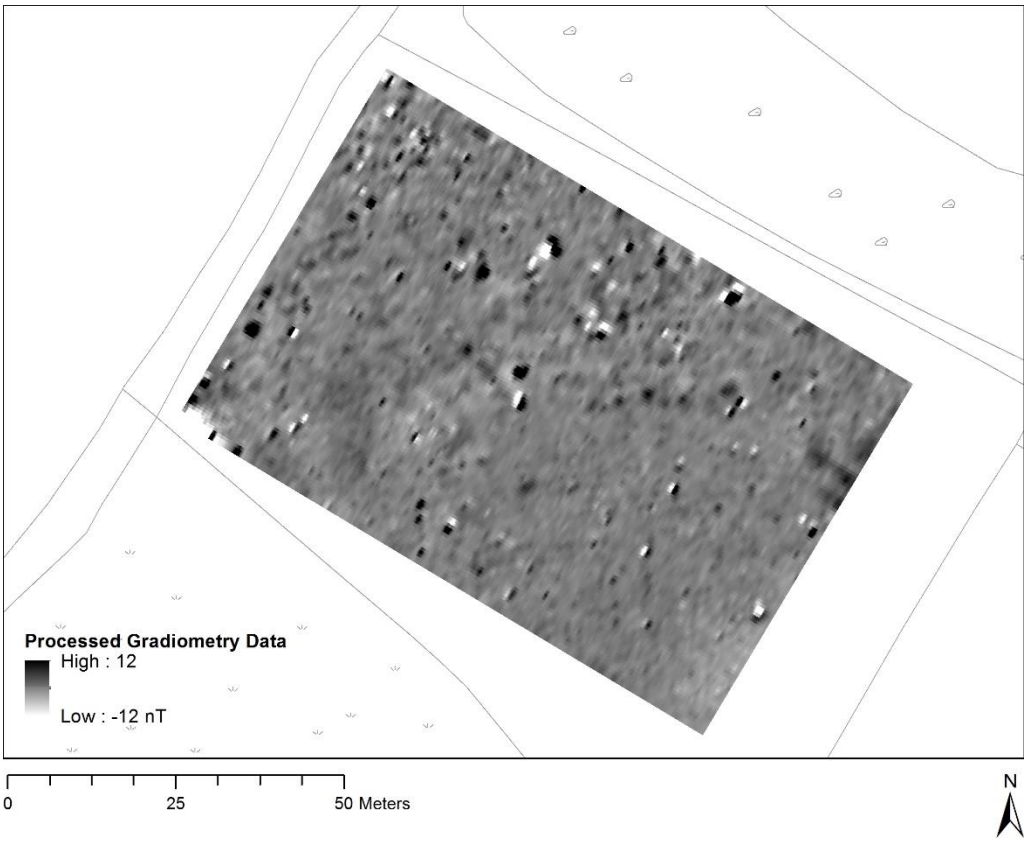

Figure 16 Greyscale plot of Area B2 processed magnetic data. ZMT applied, data clipped, LPF (Gaussian weighting applied x1 on the y-axis), and sin(x)/x interpolation along the y-axis.

Statistics:
Mean: 0.03
Std. Dev. 1.28.

Appendix five: Supporting visualisations

Figure 17 Location of crop marks recorded during survey

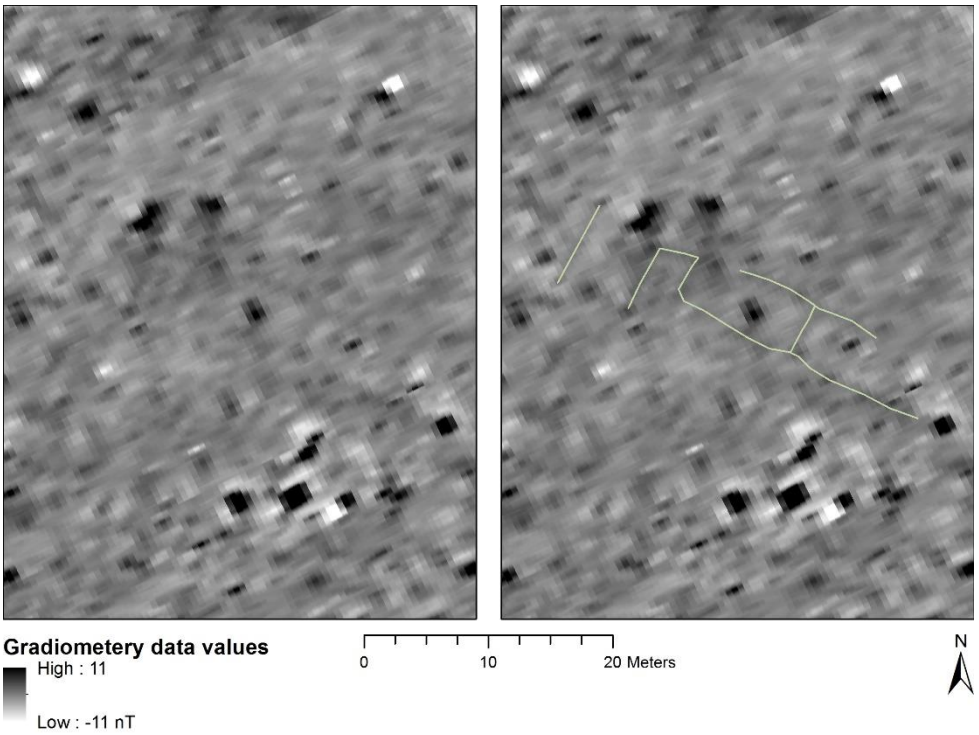

Figure 18 Extract from processed gradiometery data highlighting (right) the possible houses.

Appendix six: Historical mapping

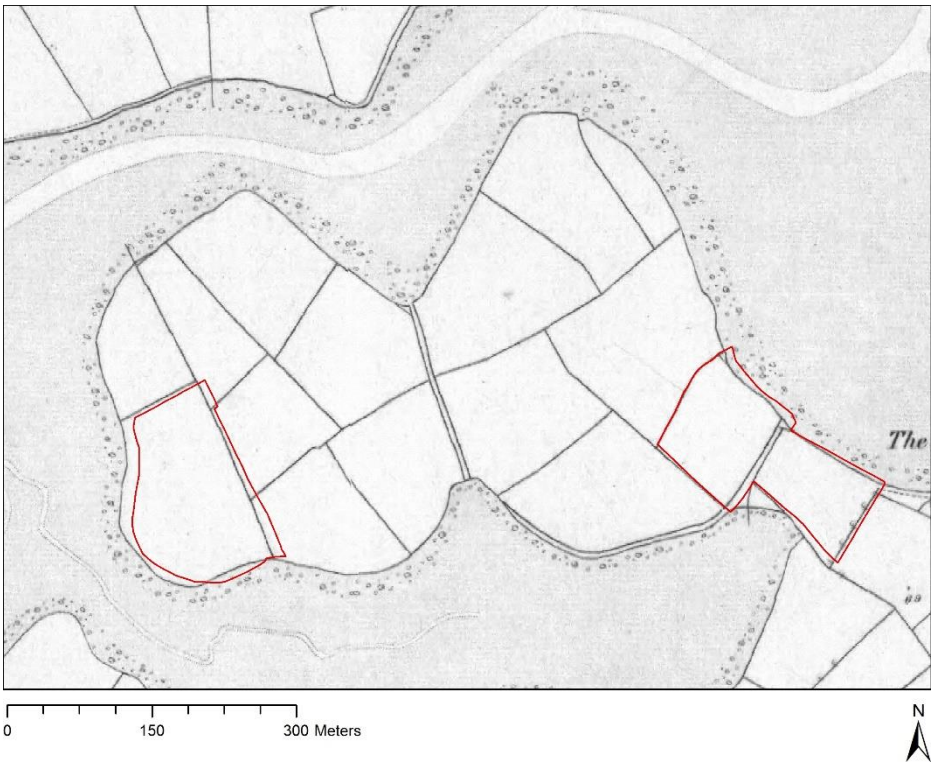

Figure 19 Geophysical survey areas in relation to the Second Edition Ordnance Survey map series, *c.* 1862–3.

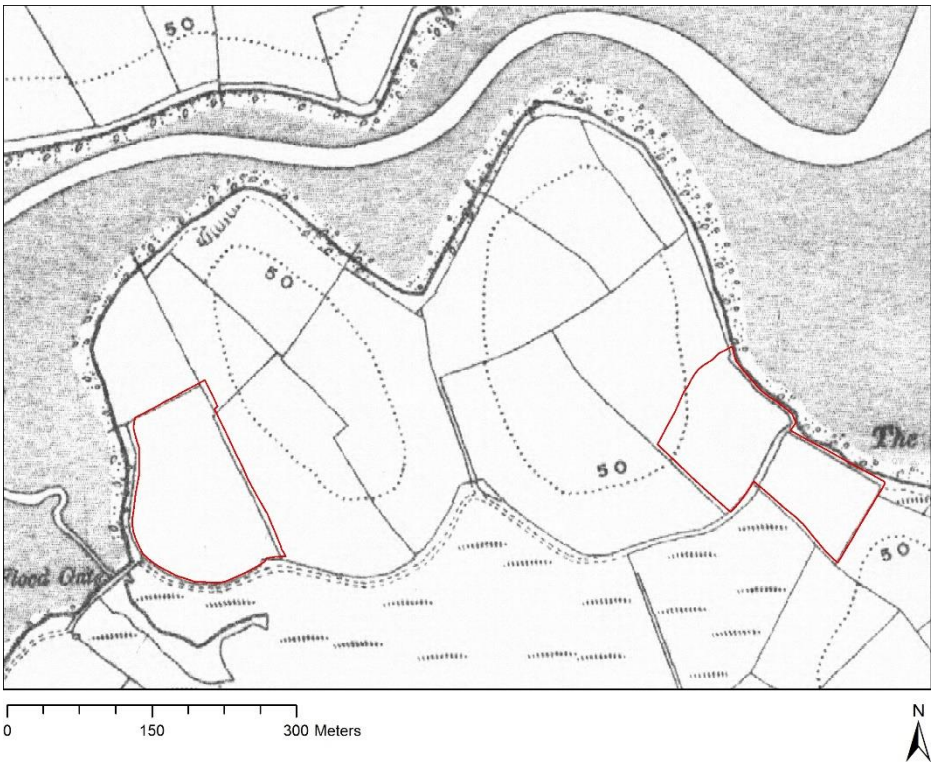

Figure 20 Geophysical survey areas in relation to the Third Edition Ordnance Survey map series, *c.* 1899–1904.

Figure 21 Geophysical survey areas in relation to the 2014 ortho-rectified aerial photographs.

Appendix seven: Photographs

Figure 22 Area A looking west over human-made causeway connecting the headland with the Castle Island road.

Figure 23 Circular cropmarks on the south-east face of the drumlin slope in Area B1.

Figure 24 Hollow-way looking eastwards.

Figure 25 View from Area B2 looking northwards onto Area B1.