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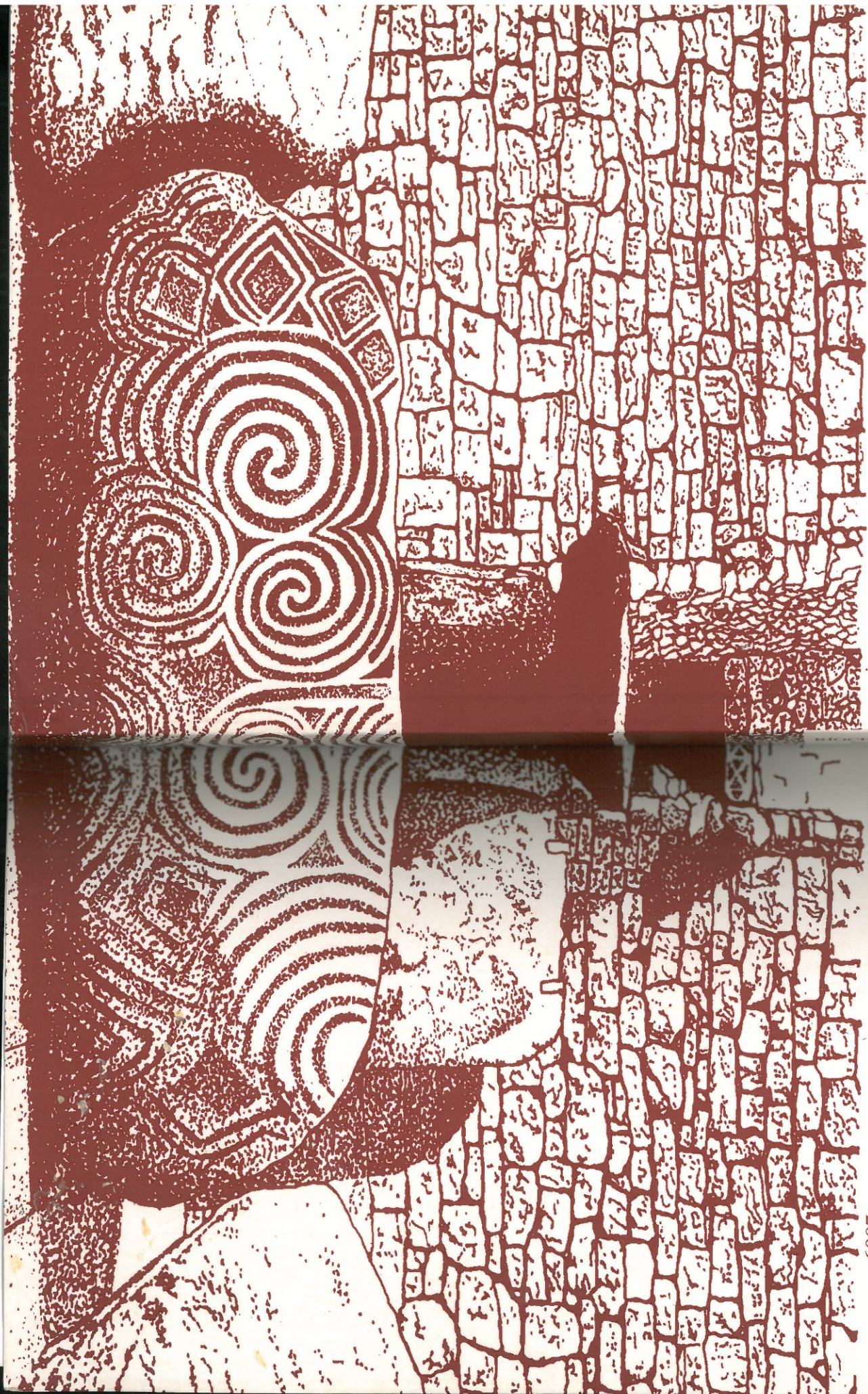
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References

- Eogan, G. 1984. *Excavations at Knowth 1*. Dublin: Royal Irish Academy.
 O'Kelly, M.J., Lynch, F. and O'Kelly, C. 1978. Three Passage-Graves at Newgrange, Co. Meath. *Proceedings of the Royal Irish Academy* 78C, 249-352.
 O'Kelly, M.J. and O'Kelly, C. 1983. The Tumulus of Dowth, Co. Meath. *Proceedings of the Royal Irish Academy* 83C, 135-90.

Revealing hidden details of the ancient landscape at Newgrange, Brugh na Bóinne World Heritage Site, Co. Meath

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(*The Brugh na Bóinne Research Project*)
 September 2008

Abstract

The Brugh na Bóinne Research Project has initiated an extensive programme of topographical and geophysical survey on, and in the vicinity of a sub-rectangular earthwork situated in the townland of Newgrange, Co. Meath. In addition to mapping the extant remains of the earthwork, this work has revealed the presence of a significant complex of sub-surface archaeological features which was entirely unknown prior to the current research. These results would suggest that a number of successive monuments were built and rebuilt at this location in order to exploit the strategic advantages of this elevated spur of ground overlooking a fording point on the River Boyne at Rossnaree.

Introduction

The Brugh na Bóinne Research Project has completed its first five-year programme of archaeological field research on, and in the vicinity of a sub-rectangular earthwork (SMR: ME019-065), situated in the townland of Newgrange, Co. Meath. The project is part of an ongoing research initiative designed specifically to address the nature and function of selected monuments within the broader landscape of the Brugh na Bóinne World Heritage Site through the exclusive use of non-invasive survey techniques. This project also serves as a vehicle for the instruction of postgraduate students of archaeology, undertaking studies at the National University of Ireland, Galway, in the use and application of scientific survey techniques and associated software.

The current project builds on our previous research in the Brugh na Bóinne area over many years and more particularly on the remarkably successful results of the integrated micro-topographical,

magnetic susceptibility, electrical resistance and magnetometer surveys which have been conducted on and in the vicinity of this enclosure since 2004. The successive results of this research have been detailed in three previous reports submitted to the Department of the Environment, Heritage and Local Government and to The National Museum of Ireland (Fenwick *et al.* 2005a, 2005b, 2008).

Site location and description

This unclassified 'enclosure site' (SMR: ME019-065) is located in the townland of Newgrange, some 900m to the south and 1200m to the west of the Knowth and Newgrange passage tomb complexes respectively (Fig. 1). It is prominently located on an elevated spur of ground (between the 40m and 50m contours) overlooking the River Boyne and immediately to the west a fording point/weir at Rosnaree (Pl.1). Its elevated location affords the site commanding views both upstream and downstream along the river valley, to the northwest and southwest respectively.

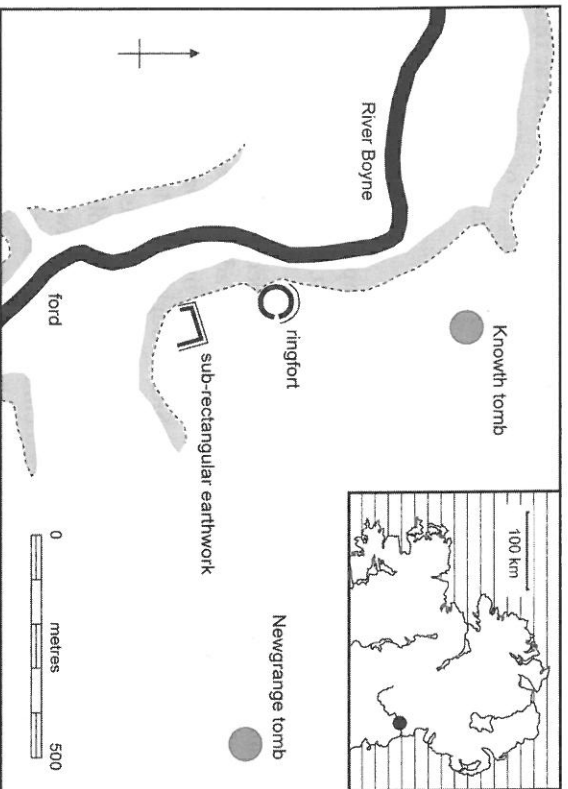


Fig. 1. A location map showing the position of the sub-rectangular earthwork in relation to the River Boyne and the passage tomb cemeteries of Knowth and Newgrange, to the north and east respectively.



Pl. 1 A view looking northeast (from the grounds of Rosnaree house) towards the elevated spur of ground on which the sub-rectangular earthwork is sited (on the opposite, northern, bank of the River Boyne).

Though the field in which the monument is situated is currently under pasture, the earthwork appears to have been significantly degraded by the cumulative effects of cultivation over the centuries. The remains of post-medieval broad ridge cultivation cover the whole site, including much of the steep slopes of the scarp which descends to the river. Today the monument's outline can be observed under favorable lighting conditions as the partial remains of low-relief, sub-rectangular earthwork (Swan & Condit 2000).

The northern part of the enclosure can be traced as a broad, low earthen bank, c.90m long, with a shallow external ditch visible along its northern side (Fig. 2). Much of the western side of the enclosure is demarcated by a partially scarped bank, without obvious external ditch, which follows the natural break of slope at the point where the ground descends sharply towards the flood-plains of the river valley below. This side of the enclosure can be traced as a surface feature for approximately 50 metres south of its northwestern corner before it blends imperceptibly into the natural topography. The bank and external ditch defining the eastern side of the enclosure, is more difficult to discern except under the most favorable lighting

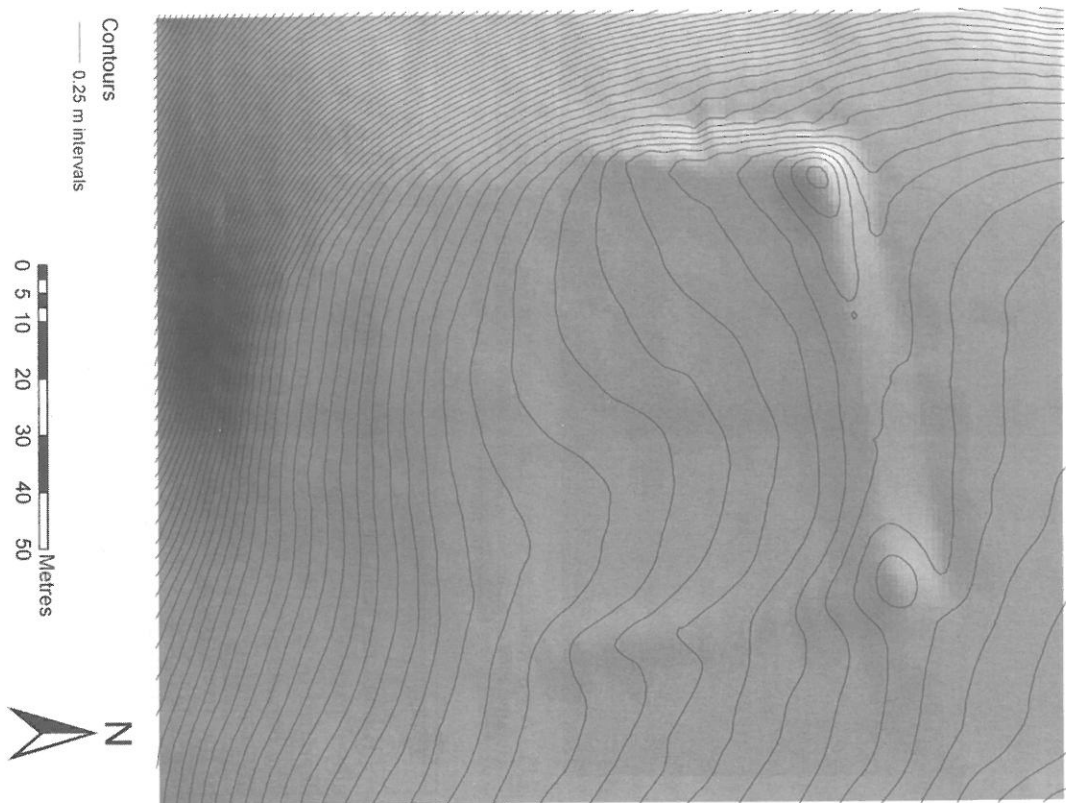


Fig. 2 A surface-shaded digital terrain model of the sub-rectangular earthwork with topographical contours at 0.25m intervals. The survey area measures 140m east-west by 160m north-south.



Pl. 2 A view looking southwest towards the raised northwestern corner of the sub-rectangular enclosure (SMR: ME019-065) with Rossnaree House visible in the distance, on the opposite side of the river valley.

conditions. This too becomes progressively less pronounced from north to south before fading into the background contours some 70m from the northeastern corner. The northwestern and northeastern corners of the enclosure are noticeably higher than the adjoining banks, but this is as one would expect on account of the greater quantity of up-cast produced at the angle (Pl.2).

The southern limits of the site cannot be defined with any degree of certainty on the basis of topographical evidence alone, though it is assumed that the monument, if completed, was originally quadrilateral in plan. In support of this is the fact that the ground begins to shelve away sharply to the south and southwest, as it does along the western flank of the site. It should be noted, however, that there are subtle traces of a break in the natural slope which occurs just a little uphill from where the ground begins to descend more noticeably towards the flood-plains below: hinting that the original earthwork may possibly have been sub-square in plan. The maximum external dimensions of the remaining visible extant earthwork are approximately 100m east-west by 80m north-south.

Geophysical survey grid and topographical base-map

A 'floating' geophysical survey grid of 20m x 20m survey panels, aligned approximately to magnetic north, was set out with the aid of a Nikon DTM-322 total station. This instrument was also used to conduct a 3-D micro-topographical survey of the extant remains of the earthwork and its immediate environs in order to provide an accurate base-map for the geophysical survey. The topographical survey was confined to rectangular area measuring 140m east-west by 160m north-south within the geophysical grid (Fig. 2). The resulting map is generated from a total of 843 individual spot-height measurements.

Geophysical survey, employing magnetic susceptibility, magnetic gradiometry and electrical resistance techniques, have also been deployed over most of the site and an extensive portion of surrounding ground in order to investigate the nature and extent of sub-surface archaeological remains (Fig. 3). The preliminary results of this fieldwork are detailed below.

Magnetic susceptibility survey

A Bartington MS₂ with MS2D search-loop was employed for the purposes of the magnetic susceptibility survey. In this instance the measurements were taken in the field at 2m intervals along parallel north-south transects set 2m apart in order to detect general trends in the magnetic susceptibility of surface soils across the site. The survey covered an area measuring 100m north-south by 80m east-west and was largely confined to the western interior of the sub-rectangular earthwork to include part of the northern rampart and a small area of 'external' ground to its north (Fig. 4).

The magnetic susceptibility exhibited a significant degree of variation across the site, with enhanced values along the western bank and within the western half of the enclosure in marked contrast to those of its eastern sector. It is also notable that the enhanced magnetic susceptibility values appear to be confined within the interior of the sub-rectangular earthwork and do not extend beyond the limits of northern bank. The relatively high susceptibility values noted in the surface soils of this part of the site are most likely related to anthropogenic factors associated with episodes of intensive burning - for domestic, industrial or ritual purposes (Dearing 1999). The relatively dispersed nature of magnetically enhanced material in the topsoil can be explained as a consequence of subsequent disturbance by later farming activities.

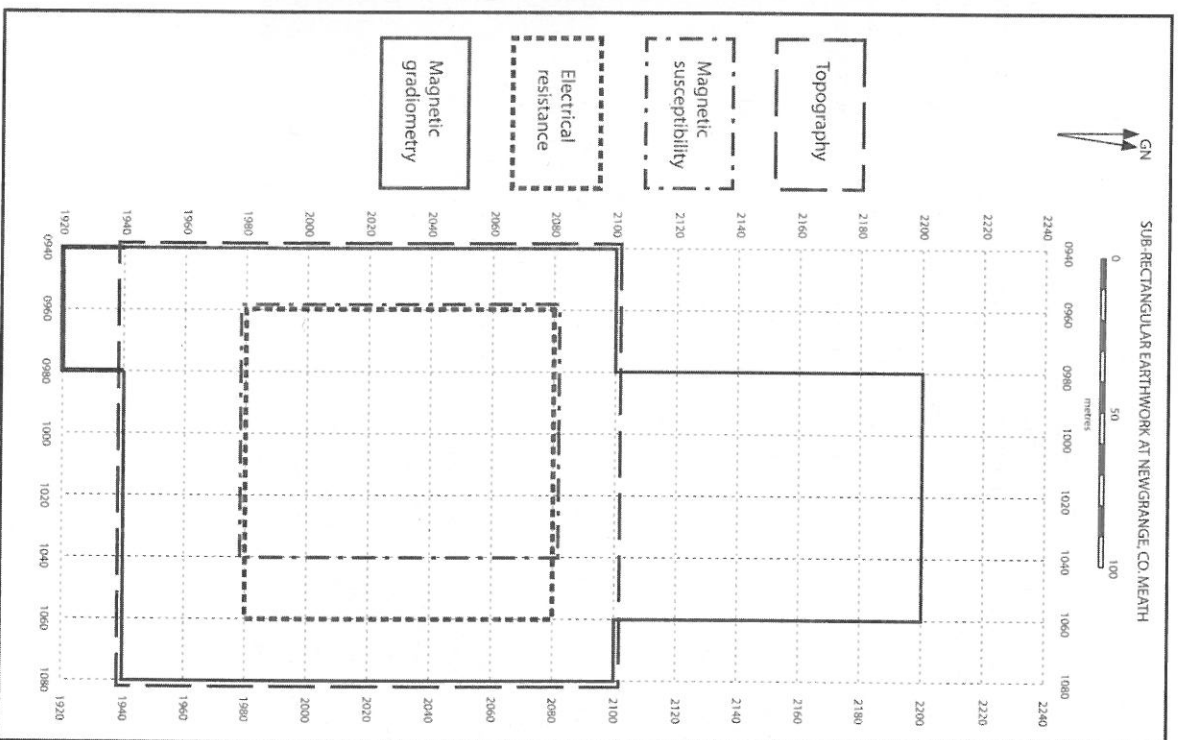


Fig. 3 The outlined limits of areas covered by topographical, magnetic susceptibility, electrical resistance and magnetic gradiometry survey techniques (2004-'07). Each survey panel measures 20m x 20m.

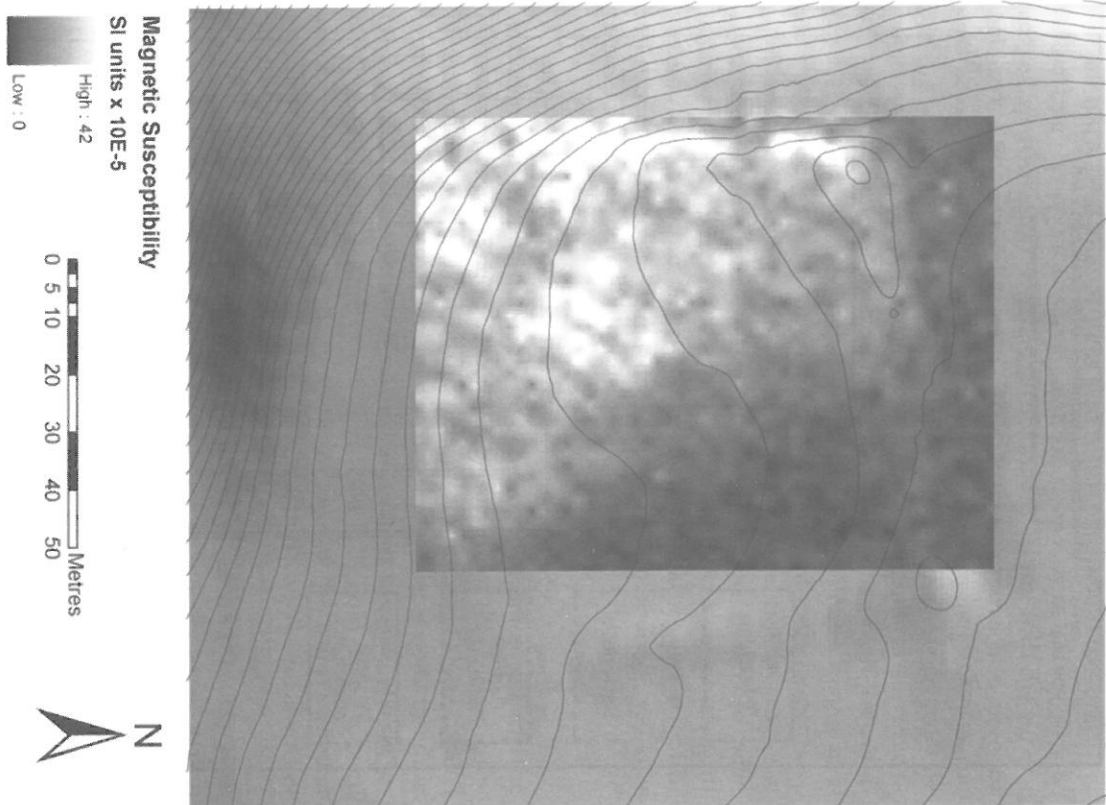


Fig. 4 A grey-scale magnetic susceptibility image superimposed on a surface-shaded digital terrain model over which topographical contours, at 0.5m intervals, have been overlaid.

Electrical resistance survey

A Geoscan RMU instrument employing a twin-probe array (with electrode 'a-spacing' of 0.5m) was used for the electrical resistance survey (Gaffney & Gater 2003). Measurements were taken at 1m intervals, in zig-zag mode, along parallel north-south transects set 1m apart. An area measuring 100m x 100m, set-out to include the extant remains of the sub-rectangular earthwork, was completed over the course of three fieldwork seasons. The resulting image, therefore, is a composite of three episodes of field survey conducted under differing weather and ground moisture balance conditions (a 60m by 60m area to the northeast conducted in 2004, a 40m by 60m area to the southeast conducted in 2005 and a 100m by 40m area to the west conducted in 2007). As a result, it has not been possible to seamlessly edge-match these individual survey areas as one uniform block (Fig. 5). Despite these challenges, and the relatively narrow range of electrical resistance values across the site, it is possible, nonetheless, to trace the enclosing rampart for much of its circuit.

The external ditch, visible only as a low-relief depression along parts of the northern and eastern sides of the enclosure, registers as a narrow, c. 4m wide, band of relatively low resistance values. The bank, however, displays a less clearly defined signature, possibly due to the fact that it has been heavily disturbed and largely ploughed-out by agricultural activity over the years. The bank defining the eastern side of the enclosure appears to correlate with a band of higher electrical resistance values, approximately 5m wide. Curiously, the broad earthen bank defining the northern side of the earthwork displays a markedly different electrical resistance signature. In this instance only the outer, northern edge of the bank displays as a narrow band of higher resistance values, with the bank proper displaying no appreciable electrical contrast to the variable background values. The scaped bank defining the western side of the enclosure displays only a very subtle high resistance anomaly. Sub-surface evidence of an enclosing rampart to the south, are not apparent in the electrical resistance image. It will be necessary, therefore, to extend the electrical resistance survey further south in order to explore the possibility that the southern limits of the sub-rectangular earthwork lie somewhere beyond that area thus far investigated.

Similarly, the electrical resistance image displays no readily apparent features of potential archaeological significance within the interior of the earthwork. It must be noted, however, that the

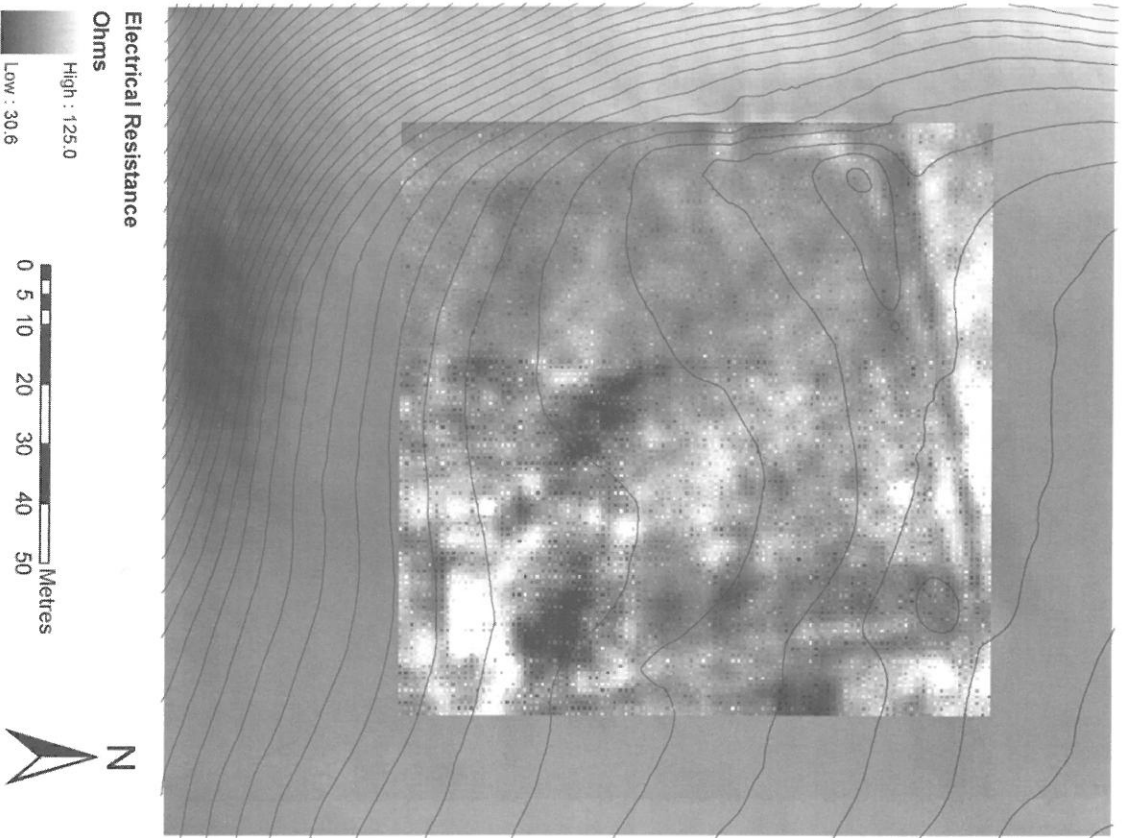


Fig. 5 A grey-scale electrical resistance image superimposed on a surface-shaded digital terrain model over which topographical contours, at 0.5m intervals, have been overlaid.

irregular patterns of high and low electrical resistance, though in part due to natural variations, may also reflect the disturbed nature of the underlying sediments as a result of past human activity. There appears, however, to be a distinct lack of any significant electrical resistance contrasts between the natural background soils and the sediment-filled archaeological features which are so clearly evident in the magnetometer survey.

Magnetometer survey

The magnetometer survey employed two survey instruments, a Bartington Grad601 single sensor and Bartington Grad601 dual-sensor magnetic gradiometers. Readings of magnetic gradient using the single-sensor magnetometer were taken in parallel mode at 0.25m intervals along parallel south to north transects set 0.5m apart. The single-sensor gradiometer survey area (Fig. 6) covers a rectangular area measuring 160m north-south by 140m east-west (i.e. precisely the same area as that covered by the topographical survey – Fig. 2). This survey area was later expanded 20m to the south (to resolve an archaeological issue) with the addition of two 20m by 20m survey panels at its southwestern corner. The dual-sensor magnetometer survey was conducted as part of a field-trial by Discovery Programme personnel and in this instance readings were taken at 0.25m intervals along south-north traverse lines set 1m apart. This survey was confined to a rectangular area, measuring 100m north-south by 80m east-west, situated to the north of the sub-rectangular earthwork and adjoining that area covered by the single-sensor magnetometer survey. In total, the combined magnetometer survey covers an irregular area of some 3 hectares, with maximum dimension of 280m north-south by 140m east-west (Fig. 7).

The magnetometer survey has revealed the presence of an extraordinary complexity of archaeological features and these are likely to represent the cumulative sub-surface remains of a series of overlapping archaeological monuments and human activity on this site over a considerable period of time. Curiously, the ramparts defining the rectangular enclosure display only a very weak, almost imperceptible, magnetic anomaly and the southern limits of the enclosure have not been resolved with any degree of certainty by this technique. A number of broad linear features of positive magnetic gradient, however, can be observed running roughly parallel (east-west) at various distances (c. 55m, 85m and 115m) to the south of the

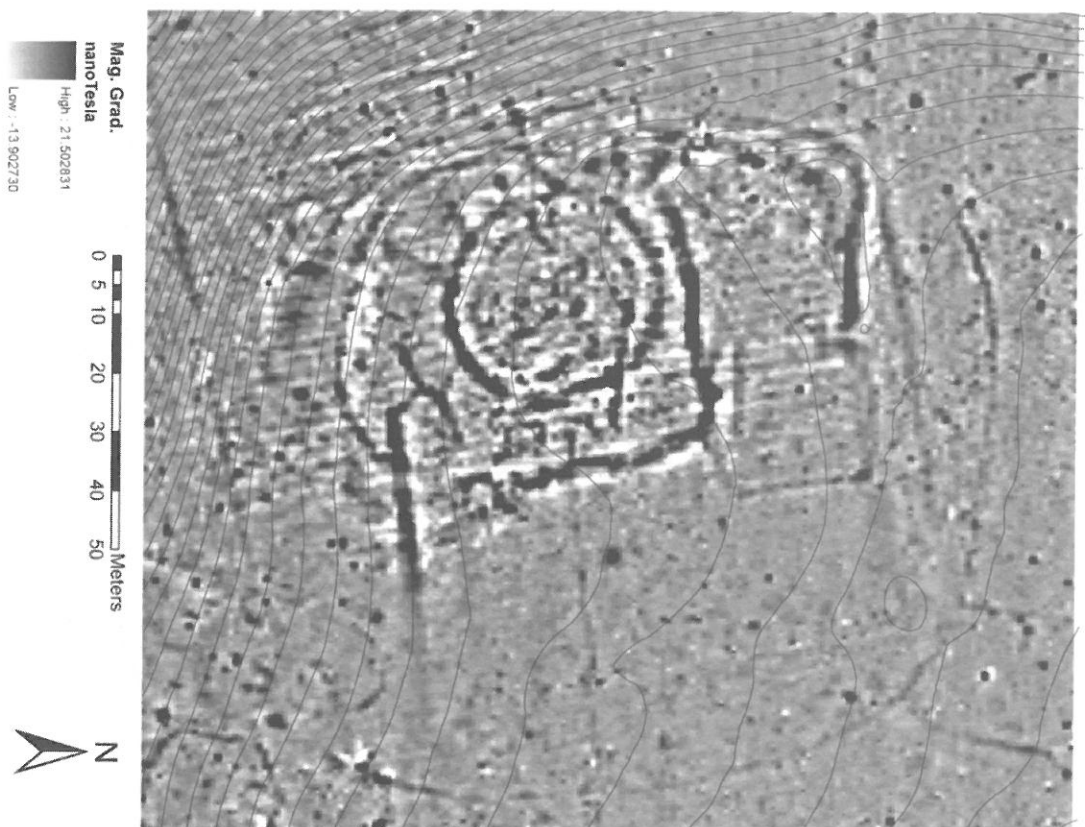


Fig. 6 A grey-scale magnetic gradiometer image on which topographical contours, at 0.5m intervals, have been overlaid.

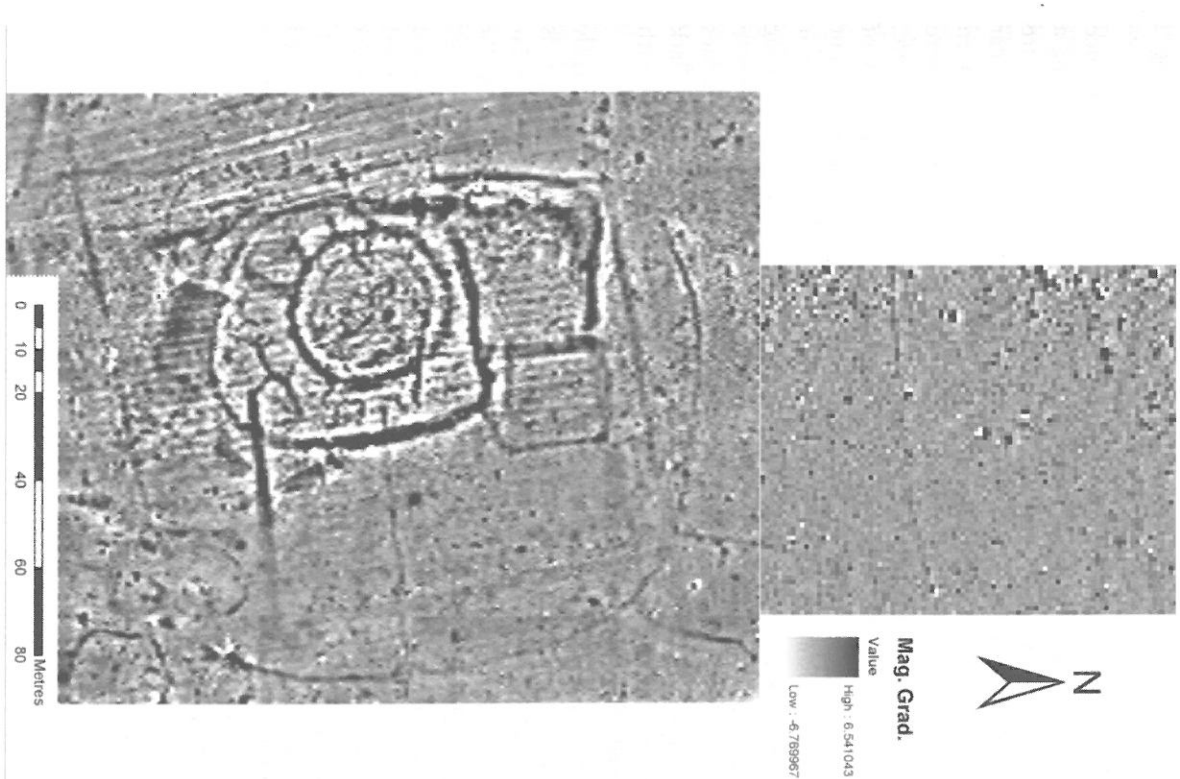


Fig. 7 The combined magnetic gradiometer survey area, measuring 280m north-south by 140m east-west.

bank defining the northern side of the sub-rectangular earthwork – some, or all of which may be related to this monument.

The magnetometer image, however, is dominated by the presence of a cluster of distinct circular and curvilinear anomalies, forming a series of concentric and interconnected enclosures. These are concentrated largely within the western sector of the sub-rectangular earthwork and overlap partially with its northern and western ramparts. These features display no surface expression and were entirely unknown prior to the current geophysical survey. They are, however, likely to represent the sub-surface remains of a series of negative features (i.e. features such as ditches, slot trenches or pits cut into the subsoil) that were subsequently back-filled, ploughed over or simply silted-up over time. It is likely, on the basis of the strong magnetic response, that the sediments contained within these features incorporate a significant proportion of topsoil or the residues of burnt material from domestic, industrial or ritual activities (Clark 1996; Gaffney & Gater 2003). This would appear to agree broadly with the results of the magnetic susceptibility survey.

There is little doubt too, that agricultural activities are largely responsible for razing all surface evidence of these features as it is responsible for degrading the ramparts of the sub-rectangular earthwork. Indeed, there is clear evidence of ridge-and-furrow (or spade-cultivation) evident in the magnetometer imagery which appears as alternating bands of positive and negative magnetic gradient aligned approximately north-south. The pattern is particularly pronounced across the enclosures where the associated soils display an enhanced magnetic susceptibility. This episode of agricultural activity, however, displays only as faint undulations on the surface of the grass-covered field. Despite this disturbance, the unambiguous clarity of the cluster of features evident in the magnetic gradiometer imagery – the most clearly defined elements of which are discussed below – suggests that these survive relatively undisturbed beneath the plough-zone.

Centrally positioned within the cluster of conjoined enclosures is a particularly distinct circular feature composed, in fact, of two concentric circles – a broader band, 38m in diameter, defining the outer circle and a narrower band, 27m in diameter, defining the inner circle (Fig. 6). This circular feature is set within the north-western corner of a large D-shaped enclosure, measuring c. 65m north-south by 58m east-west, and whose rounded side faces southwards. Curiously, a possible entrance to this enclosure occurs in its south-western quadrant at a

point where the gradient is particularly steep. Adjoined to the north and northeast of the D-shaped enclosure are two smaller sub-rectangular enclosures. The larger of the two, to the north, measures approximately 32m north-south by 38m east-west. It has an entrance gap at its northeastern corner, possibly also serving as the main entrance to the entire complex of conjoined enclosures as there is another potential gap in its southwestern corner allowing communication between this and the D-shaped enclosure. Its northern and western sides appear to coincide, to an extent, with the ramparts defining the northern and western sides of the sub-rectangular earthwork. The sequence of constructional phases here, however, is difficult to determine on the basis of the geophysical evidence alone. A smaller rectangular enclosure is positioned to the northeast of the D-shaped enclosure and this measures approximately 29m north-south by 25m east-west. Access to its interior appears to be via its larger counterpart to the west, through a gap in its southwestern corner.

The remains of a significantly larger, possibly circular enclosure, defined as a narrow, sweeping arcuate band of positive magnetic gradient, can be observed circumscribing the sub-rectangular earthwork to its north and east. It measures approximately 140m in maximum external dimension (northwest-southeast) and, if projected, would appear to enclose an area of approximately 160m in diameter (c. 2 hectares).

A number of additional features of potential archaeological significance can also be identified beyond the confines of this 140m enclosure. Two linear anomalies, for example, appear to radiate in a north-northeasterly direction from its northeastern quadrant (Fig. 6). In addition, immediately to the southeast of the 140m enclosure are other linear and curvilinear features, possibly the sub-surface remains of yet another enclosure; the full extent of which, however, lies beyond the limits of the survey area. Another narrow linear anomaly of positive magnetic gradient can be observed running east-west (though bowing slightly to the south) some 50m to the north of the sub-rectangular earthwork (Fig. 7). This too extends beyond the limits of the magnetometer survey.

Archaeological interpretation

In addition to recording the surface remains of the sub-rectangular earthwork, the geophysical survey has identified extensive evidence of sub-surface archaeological features which were unknown prior to the

present field research. It appears that the cluster of concentric and conjoined enclosures occupying the western side of the sub-rectangular earthwork represent an entirely separate phase of construction to that of the earthwork, as the two appear to overlap or coalesce along their western and northern sides.

All of these archaeological features have been disturbed and truncated by later agricultural activities but it is clear that significant archaeological contexts lie undisturbed below this plough-zone. Only the northern quarter and part of the eastern and western ramparts of the sub-rectangular earthwork remain evident as low-relief topographical features and, to date, the geophysical survey has failed to identify conclusively the southern limits of this enclosure. This raises the intriguing possibility that the earthwork was abandoned prior to its completion. Indeed, such a scenario can be indirectly supported by the results of the magnetic susceptibility survey (Fig. 4). Here, it is notable that the surface soils that display enhanced magnetic susceptibility values appear to be associated exclusively with the cluster of enclosures occupying the western half of this earthwork while those values within its eastern sector display little appreciable contrast to soils external to the earthwork. This might suggest that the interior of the sub-rectangular earthwork was otherwise unoccupied.

It is also telling that the zone of enhancement magnetic susceptibility associated with the conjoined enclosures does not extend north of the bank demarcating the northern side of the sub-rectangular earthwork and therefore it is reasonable to assume that these soils, and their associated activities, were contained within the earthwork. This observation may suggest that the conjoined enclosures were broadly contemporary with the sub-rectangular earthwork if it were not for the apparent overlap along western and northern sides. It is notable too that the magnetic signature of the conjoined enclosures remains clearly defined and largely undisturbed despite its apparent overlap with the earthwork (Fig. 6). It is a possibility, therefore, that the conjoined enclosures were constructed as some stage subsequent to the sub-rectangular earthwork; perhaps deliberately reusing or incorporating part of the extant bank. In support of this is the fact that the conjoined enclosures also appear to be confined within that area defined by the external ditch of the sub-rectangular earthwork. It is curious, however, if this is the case, that there is no surface evidence of the conjoined enclosures given that the sub-rectangular earthwork still remains partially extant.

It is possible too that the 140m enclosure circumscribing the sub-rectangular earthwork is broadly contemporary with the conjoined enclosures as these appear to be located centrally within its projected circuit. On the basis of geophysical evidence alone, however (without the benefit of clearly defined stratigraphy or radio-carbon dates) it can be difficult to establish the sequence of constructional phases or the relationship between individual features with certainty.

Discussion

A limited programme of field-based research will be required to investigate further the area lying immediately to the south of the extant remains of the sub-rectangular earthwork in an attempt to establish the relative chronology between it and the conjoined enclosures. Additional electrical resistance survey will be applied to investigate if the sub-surface remains of a southern rampart can be identified – if, indeed, one ever existed. It will also be necessary to conduct a more extensive magnetic susceptibility survey on and around the earthwork in order to define the limits of the zone of enhanced susceptibility and also to examine other potential areas of archaeological interest in the immediate surroundings which were identified in the magnetic gradiometry and electrical resistance surveys. Some additional high-resolution magnetic gradiometry survey may also be required to resolve some details of the existing survey, in addition to reconfirming select features around the periphery of the present survey area.

The nature, date, function and significance of the archaeological remains which have been identified and mapped during the course of fieldwork is one that is also currently being addressed in the final phase of our research of this site. A number of suggestions have been proposed regarding the somewhat enigmatic remains of the sub-rectangular earthwork, positioned, as it is, in a conspicuously strategic location overlooking the River Boyne. These range from a Late Bronze Age / Iron Age hillfort, a *viereckschanze* (an Iron Age ritual enclosure), a Roman fort, a medieval moated site and even a seventeenth century fortification or gun emplacement. Although such suggestions raise intriguing possibilities they also raise problems. For example both the suggested *viereckschanze* and Roman fort, are, according to conventional opinion, alien to the Irish archaeological record, while the suggestions of moated site or seventeenth century fortification have no direct historical records to support them. It

should be noted, however, that the 'grange' element of the townland name 'Newgrange' reflects the fact that these lands were once part of the estate farmlands of the early Cistercian foundation at Melifont (Stout 2002, 86-8). The potential presence of a moated site or other agriculturally-related medieval monument in this townland, therefore, cannot be ignored.

The cluster of conjoined enclosures, identified in the magnetometry survey, present a similar dilemma as these also present few diagnostic features that can be readily compared to the standard categories of Irish archaeological field monuments. It is interesting, however, that this cluster of unusual enclosures bear some similarity with a high-status settlement of Early Historic date at Baronstown, Co. Meath - excavated in advance of the M3 motorway construction (Linnane & Kinsella 2007). This site, situated centrally within the royal demesne of Tara and mid-way between the hills of Tara and Skryne, appears to be strategically placed in an important corridor of communication through the Gabhra Valley. It may be no coincidence, therefore, that the cluster of conjoined enclosures discovered at Brugh na Bóinne lies within sight of the large mound at Knowth (which served as the royal stronghold of the kings of Northern Brega, the *Sil nÁedo Sláine*, during the Early Historic period) and is strategically located to overlook a navigable stretch of the River Boyne at a significant fording point joining Rossnaree and Newgrange (Byrne 1968).

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References

- Byrne, F.J. 1968 Historical note on Ongha (Knowth). In E. Eogan, Excavations at Knowth 1962-65. *Proceedings of the Royal Irish Academy* 66(C), 383-400.
- Clark, A.J. 1996 *Seeing beneath the soil, prospecting methods in archaeology* (second edition). London.
- Dearing, J.A. 1999 *Environmental Magnetic Susceptibility: using the Bartington MS2 System*. Kenilworth.
- Fenwick, J., Newman, C. & Warner R. 2003a *A Preliminary report on the geophysical survey of a sub-rectangular enclosure (SMR: ME 019-065) at Newgrange, Boyne Valley, Co. Meath. Consent Number: 04R131* Unpublished Report. Department of Archaeology, NUI, Galway.
- Fenwick, J., Warner, R., Newman, C. & Eogan, G. 2003b *Second report on the geophysical survey of a sub-rectangular enclosure (SMR: ME 019-065) at Newgrange, Brugh na Bóinne, Co. Meath. Consent Number: 05R069* Unpublished Report. Department of Archaeology, NUI, Galway.
- Fenwick, J., Warner, R. & Eogan, G. 2008 *A third report on the geophysical survey of a sub-rectangular enclosure (SMR: ME 019-065) at Newgrange, Brugh na Bóinne, Co. Meath. Consent Number: 07R151* Unpublished Report. Department of Archaeology, NUI, Galway.
- Gaffney, C. and Gater, J. 2003 *Revealing the buried past: geophysics for archaeologists*. Stroud.
- Linnane, S. & Kinsella, J. 2007 Fort Baronstown? exploring the social role of an impressive ringfort on the M3. *Seanda* 2, 57-59.
- Stout, G. 2002 *Newgrange and the bend in the Boyne*. Cork University Press, Cork.
- Swan, L. & Condit, T. 2000 New enclosure at Bria na Bóinne. *Archaeology Ireland* 14(4), 24-27.