

BAYFIELD CHURCH : RESISTIVITY SURVEY 1998

By Peter Camell and John Wright

One of the members of the Blakeney Area Historical Society, Dr Peter Carnell, has recently developed an expertise in resistivity surveying and has agreed to help the Society to survey selected local sites. This report records the first such survey and demonstrates that though the actual survey is relatively straightforward, interpretation of the findings is rather more difficult. At Bayfield Church the resistivity readings show various archaeological features which cannot be identified precisely but which provide an excellent focus for further study.

INTRODUCTION

The Location

The resistivity survey was carried out at the ruined church of Bayfield St Margaret (TG 0495 4049) which lies in the valley of the River Glaven some five kilometres from the north Norfolk coast. The former parishes of Bayfield and neighbouring Glandford are now contained within the civil parish of Letheringsett. The church is within the emparked Bayfield estate, close to the present Hall, and there is no public access.

The Site

At Bayfield the Glaven runs north towards Cley and the church lies on the eastern side. The site slopes steadily down from east to west, and immediately beyond the west wall of the nave slopes very steeply to the terrace on which stands the Hall. The surroundings are maintained as mown grass although to the south there is one tree with a substantial root (or fallen trunk) some 6 metres from the chancel wall. In the nave is the low stump of a large cedar tree and some shrubs have been planted adjacent to some of the outer walls. In the chancel (at the time of the survey) there was stone work lying on the ground, much of it known to be extraneous. There is no sign of a churchyard.

The Church

Although the church is now roofless, a substantial amount of walling survives, some of it to full height (principally the west wall, still surmounted by a two-bay bellcote, and the chancel arch). The present structure consists of a chancel and a slightly wider nave, with no sign of a tower, and with total outer dimensions of c.18m by 6m. There are opposing doorways in the nave, towards the western end, and a further opening in the nave south wall. Outside the church and close to the northern doorway there is a small (relatively recent) retaining wall at right angles to the nave wall. The structure is in good condition with repairs recently carried out under a programme established by Norfolk County Council.

Site History

The former village of Bayfield was one of the smallest in Holt Hundred at the time of Domesday with 13 recorded adults, mostly freemen, which might indicate a total of some 50 to 60 people. In 1329, not long before the Black Death, there were 27 taxpayers, which

suggests some increase in population, but by 1429 there were fewer than 10 households and in 1524 only two people paid tax. By 1603 there was only one house in the parish. The Hall is Elizabethan in origin with later alterations and additions, including the south front of c.1740.¹ The Park was begun before 1781. The site of the former village is not known nor whether there was any extensive landscaping in the vicinity of the church.

Church History

The structural history of the church has been studied most recently by Stephen Heywood, whose conclusions were published in 1995.² He suggests that the earliest building of which traces remain was Romanesque, consisting of a chancel with an apsidal east end and a nave some 3m shorter than the present one. In the 14th or 15th century the apse was replaced by the current chancel and the nave extended. There is also good evidence for the construction of a chapel on the southern side of the chancel. In the post-medieval period the chancel arch was blocked and the side chapel demolished. The church is known to have been in use in 1603 but was probably abandoned soon after; Faden's map published in 1797 shows the church as a ruin. Some of its features make it an important building but it is not a Scheduled Ancient Monument.

Heywood comments that the simple Romanesque two-cell chapel with apse was a common sight in East Anglia until the end of the 12th century, when many were expanded with the addition of towers and aisles. At Bayfield, however, the side chapel is unusual in being on the same eastern plane as the chancel. The size of the chapel is not known and "it may be that a simple geophysical survey would establish it."

Previous Fieldwork

In the Sites and Monuments Record (SMR) held by Norfolk Landscape Archaeology at Gressenhall there is no record of fieldwork on site except for an excavation undertaken in 1956 by D.R.Howlett of the Castle Museum, Norwich. This is said to have uncovered the base of the font and some tiles in the nave and tile impressions on the chancel step but, to date, no contemporary report of this excavation has been located.

Survey Objectives

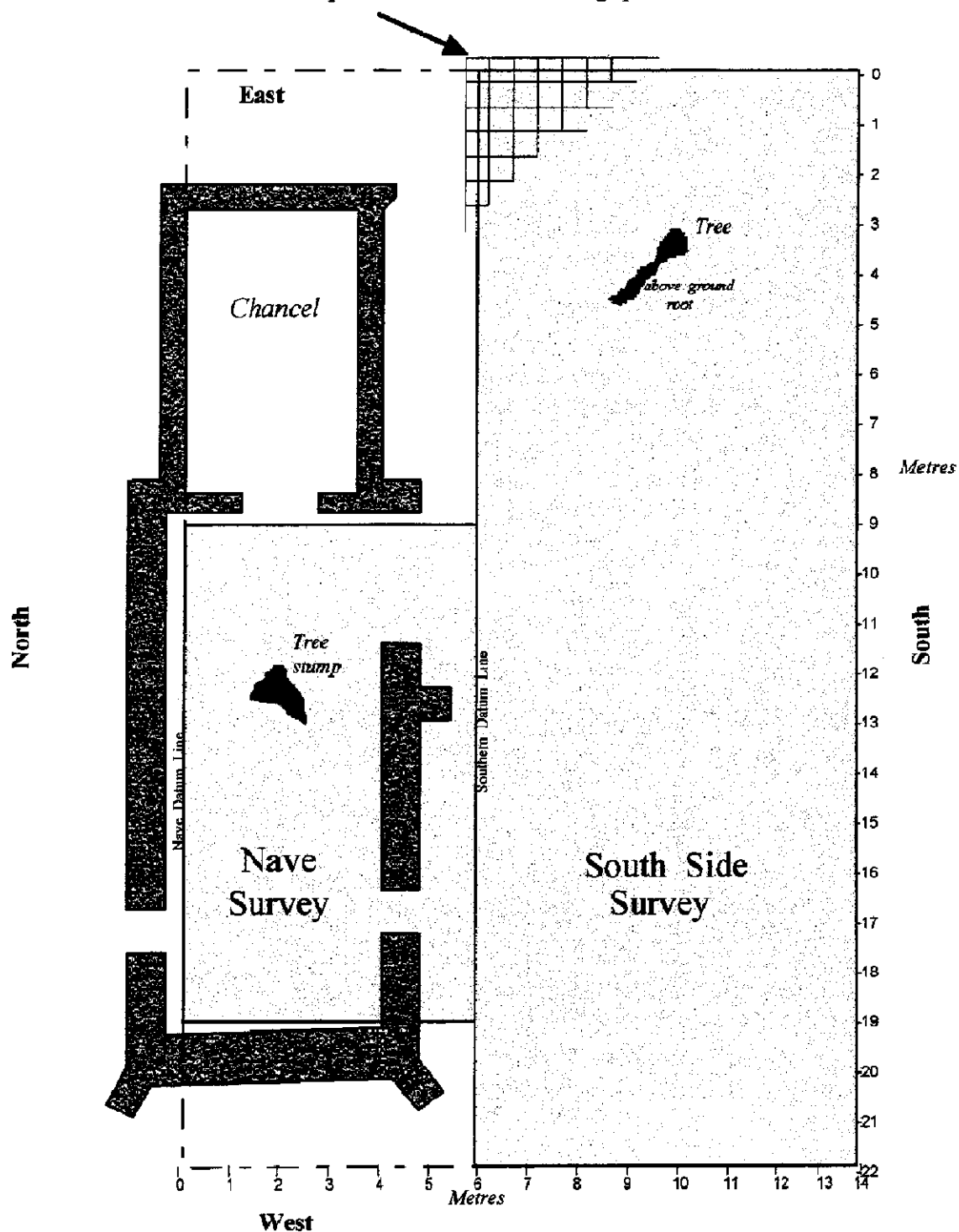
The survey was organised by the Blakeney Area Historical Society and led by one of its members, Dr Peter Carnell, who had practical experience of building and using resistivity equipment. Bayfield Church had been one of several sites under consideration for resistivity surveys: there were possible features to be located for which resistivity techniques would be appropriate, and site conditions were suitable. Having received the support of the landowner, the Society decided to initiate the survey and two specific objectives were selected: to locate the side chapel and the position of the earlier western wall. Any further work, and the selection of appropriate techniques, would be considered in the light of the survey findings.

Survey Extent

Two contiguous surveys were planned: one inside the nave and one immediately to the south of the church. The inner survey was to cover the whole of the nave. The outer survey was designed to exceed slightly the whole length of the church from east to west, and to extend away southwards from the church for as far as could be achieved during the half-day period of

Two adjacent resistivity surveys were conducted as shown. The plan of the church is for location purposes and does not represent an architectural survey.

The readings were taken at 0.5m spacings.
They are represented by coloured or grey squares on the succeeding plans.



Plan 1. The relationship of the resistivity surveys to the church walls.

survey. It was considered that covering such an area would provide a good contrast between any constructional features associated with the church and the more natural conditions to be expected elsewhere.

THE SURVEY

Date

The survey was carried out on Saturday, 4th April 1998 between midday and 4.0 pm.

Society members were augmented by others with more experience of resistivity surveying and a total of 12 people were present on site during the day, organised in two teams.

Weather

There had been some rain in the previous few days and during the morning of the survey but drying conditions prevailed while the survey was in progress. Temperatures had remained above freezing during the previous night.

Grid Location

Two parallel and contiguous grids were established, one for each of the two surveys (Nave and South Side). The first grid was laid out in the nave with an origin at the NE corner. A datum line was set out 50cm from the north wall starting 10cm from the wall incorporating the chancel arch. A rectangle (of the maximum size possible in half metres) was marked out in the nave based on a triangulated right angle at the origin.

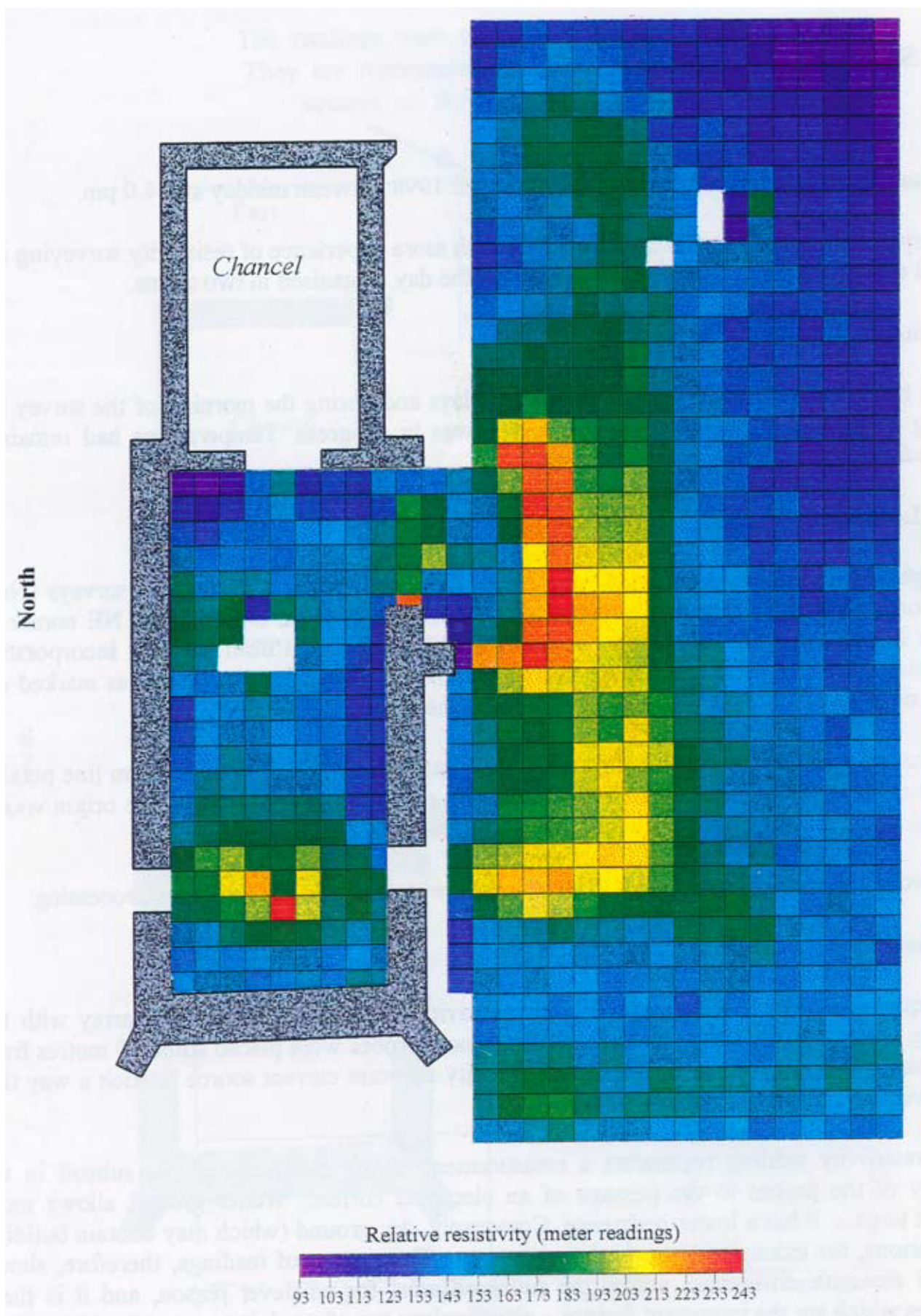
The second grid, for the South Side survey, was established by means of a datum line parallel to that of the nave grid and close to the outer side of the south wall. Again, the origin was at the NE corner where a right angle was set out by triangulation.

The two grids are shown on Plan 1. The surveys were combined for computer processing.

Instruments

The equipment used was a purpose-built resistivity meter and a twin-probe array with the moving electrodes set 50cm apart. The static remote probes were placed some 60 metres from the church. The meter used an alternating polarity constant current source in such a way that resistivity was displayed directly in millivolts.

Each resistivity reading represents a measurement of the resistance of the subsoil in the vicinity of the probes to the passage of an electrical current. Wetter ground allows more current to pass: it has a lower resistance. Conversely, dry ground (which may contain building foundations, for example) has a higher resistance. The pattern of readings, therefore, shows subsoil moisture differences across the surveyed area, for whatever reason, and it is these changes which are the important feature – actual values are of much less consequence.



Plan 2, The data as recorded. The colour range, as shown in the key, represents a value range extending from the highest (243) to the lowest (93) recorded.

Readings

Single readings were taken at 50cm intervals over the whole of the two grids, except where structures or trees intervened (specifically the nave south wall and the tree stump in the nave). Within the nave, all transits were made from East to West, with a final transit grazing the inner side of the south wall. This first survey was then completed by two partial transits within the south wall opening and a final complete one outside the south wall, adjacent to the first transit of the South Side survey. For this second survey transits were made alternately from East to West and from West to East.

In the Nave Survey 217 readings were taken, a further 35 being prevented by the south wall and the tree stump; in the South Side survey 762 readings were taken, omitting 3 because of a tree, making 979 in all. The gross area covered by the two surveys was 60 sq m and 176 sq m, a total of 236 sq m.

The readings were recorded manually on prepared data sheets at a fixed control table, and were later keyed into a computer and processed with a statistical package (MATHCAD).

Although the readings are taken at points, they represent ground moisture conditions in a volume of soil and are better shown as areas. Plan 1 shows that any presentation of points as 0.5m squares will mean that the data display will cover an area slightly larger than the actual survey grid.

RESULTS

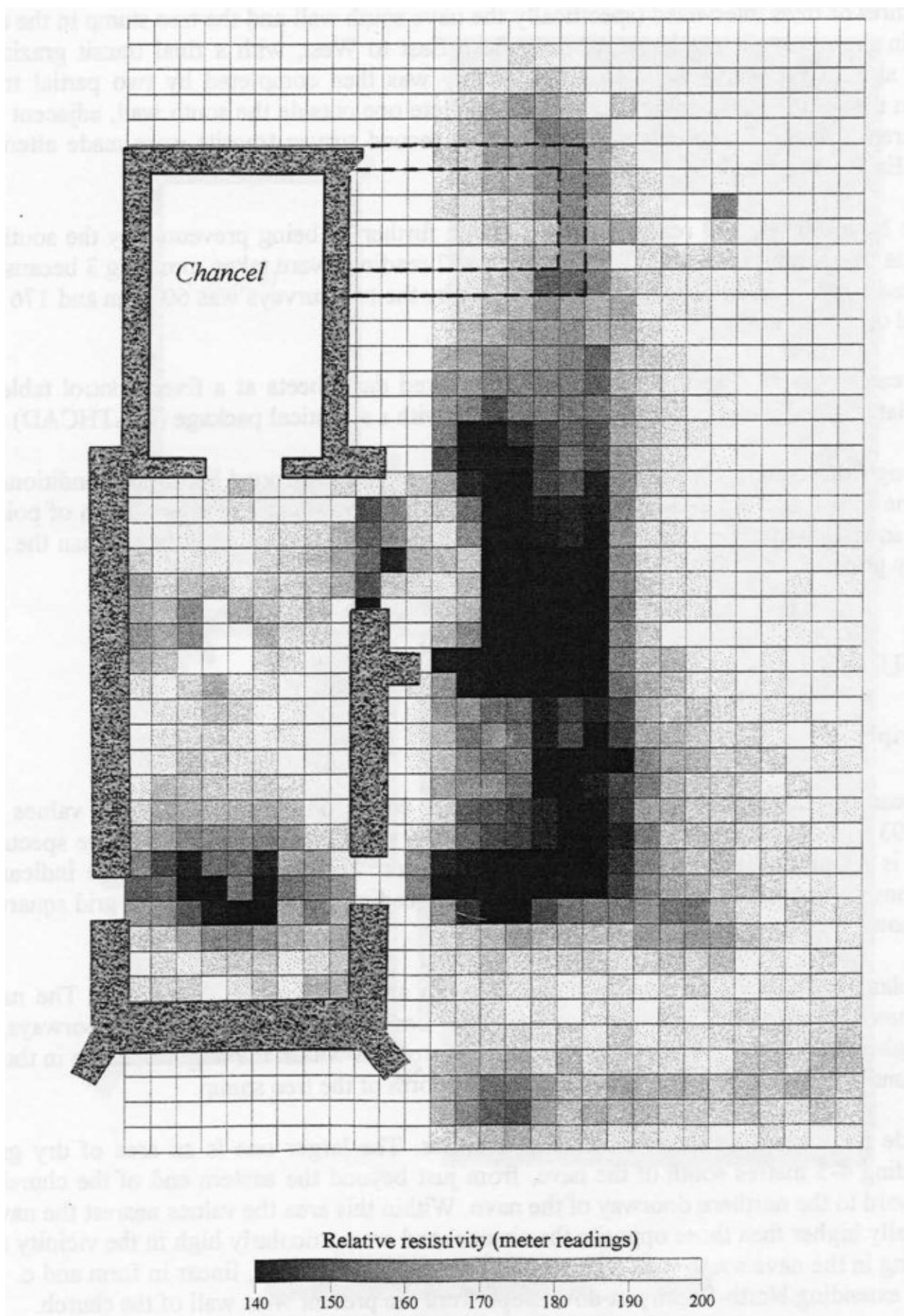
Description

The readings taken over the site are displayed in colour on Plan 2. The actual values range from 93 to 243 and each is shown correctly in the appropriate colour within the spectrum – there is no grouping into pre-determined categories. The figures on the scale indicate the relationship between value and colour. Where no readings could be taken the grid squares are shown uncoloured.

The plan shows clear patterns in both the Nave and the South Side surveys. The nave is dominated by an area of high resistivity (ie drier conditions) between the two doorways, with the highest values in the middle. A second drier area lies within the larger opening in the nave wall, and a third, less intense, around and to the north of the tree stump.

Outside the church lie two well-defined features. The larger one is an area of dry ground extending 4-5 metres south of the nave, from just beyond the eastern end of the church and westward to the northern doorway of the nave. Within this area the values nearest the nave are generally higher than those opposite the chancel and are particularly high in the vicinity of the opening in the nave south wall. The second feature is a drier area, linear in form and c.1.5m wide, extending North-South just downslope from the present west wall of the church.

In the areas away from these two features there is a steady downward drift in values (ie wetter conditions) towards the South-East.



Plan 3. Enhanced data. The grey scale range, as shown in the the key, represents a value range extending from <140 to >200.

INTERPRETATION

The Nave Survey

Plan 2 shows a particularly high (ie dry) reading in a half-metre (red) square equidistant between the two doorways of the nave. This is in the area where Hewlett reported finding the base of a font in 1956. The SMR entry records that the font soakaway was discovered in the form of a hole one metre in diameter and filled with glacial flints, and partly covered by glazed tiles in an arrangement indicating an octagonal font. A small sketch of this appears in the guidebook to Letheringsett church but the details are by no means clear.

Plan 3 is a higher contrast, grey scale, version of Plan 2: the value range has been restricted to 140-200 so that all values outside that range are shown as either 140 or 200. The font area shows up more clearly here as a dry area surrounding a sub-rectangular, wetter area c. 1 metre square. These findings cannot be interpreted more precisely but they appear to be consistent with the reported findings of Hewlett's excavation.

Heywood's suggestion that the nave was extended to the west implies that traces of the earlier western wall should exist below ground – locating such a feature was one of the main objectives of the survey. If this feature is present in Plan 3 then it probably lies directly between the two doorways, although interpretation is complicated by the superimposition of the font, and possibly by disturbance during the excavation.

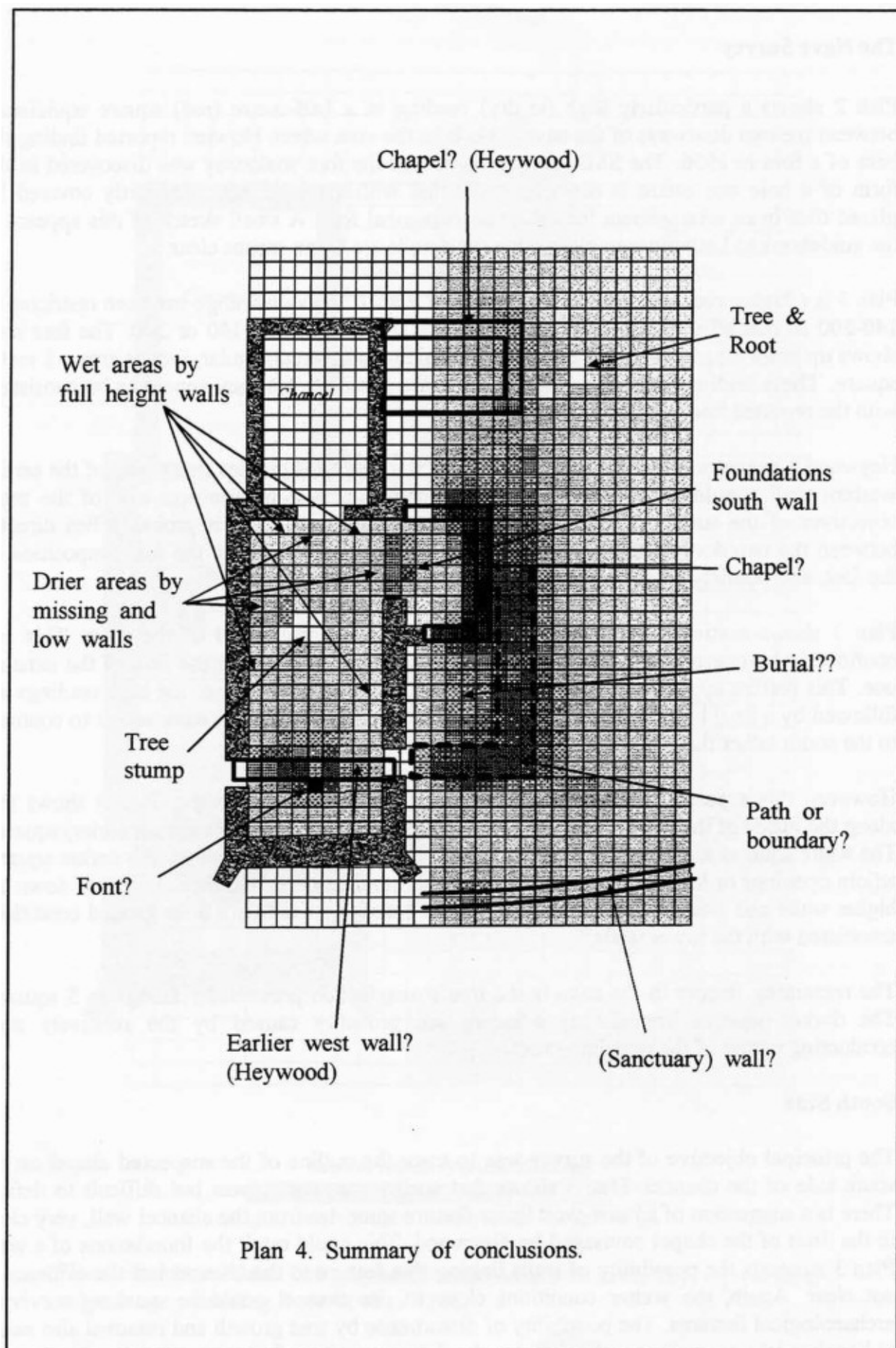
Plan 3 shows a strong linear feature in the gap in the south wall of the nave. This can confidently be interpreted as the base of the former wall continuing the line of the existing one. This feature appears not to connect with the east wall of the nave: the high readings are followed by a final low one (and to the casual eye the east wall of the nave seems to continue to the south rather than return to the west).

However, this apparent 'gap' almost certainly has another interpretation. Plan 3 shows that along the inside of the nave walls are groups of both white (wetter) and darker (drier) squares. The white squares are adjacent to the highest of the remaining walls, while the darker squares adjoin openings or lower sections of walling. The implication is that more rain runs down the higher walls and creates wetter conditions at the base compared with drier ground conditions associated with the lower walls.

The remaining feature in the nave is the tree stump which prevented readings in 5 squares. The darker squares immediately adjacent are probably caused by the relatively non-conducting nature of the remaining roots.

South Side

The principal objective of the survey was to trace the outline of the suspected chapel on the south side of the chancel. Plan 3 shows that such traces are present but difficult to define. There is a suggestion of an east-west linear feature some 4m from the chancel wall, very close to the limit of the chapel envisaged by Heywood. This could mark the foundations of a wall. Plan 3 suggests the possibility of walls linking this feature to the chancel but the evidence is not clear. Again, the wetter conditions close to the chancel could be masking surviving archaeological features. The possibility of disturbance by tree growth and removal also needs to be taken into account as early photographs show a number of trees close to the church.



To the south of the supposed chapel, three readings were omitted because of a tree and a large surface root. Immediately adjacent is a particularly high reading which, as shown by the stump in the nave, is more likely to be due to the existence of the tree than to some archaeological feature.

Elsewhere on the southern side of the church are archaeological features best seen in Plan 2. Although there is a definite pattern it is not clear how many features are present. The most striking is the 'arc' of high readings opposite the gap in the nave wall. The values are the highest on the site and are likely to represent solid material such as brick or flint. The values here are much higher than those clearly indicating the continuation of the nave south wall.

Although a possible interpretation is rubble from the collapsed nave wall, the regularity of the feature and the contrasting wetter conditions within suggest otherwise. It is probably significant that the east-west 'wall' some 3m from the nave has a western return which aligns with a 'buttress' on the nave wall. Those who have studied the church previously appear not to have wondered why this buttress should be the only one or why it should be in this position. Plan 2 shows that the possibility of the buttress being the remaining section of a wall needs to be considered. The return on the east side aligns with the east wall of the nave. The findings are therefore consistent with the construction of a 'chapel', or some other structure, associated with the present church.

Outside this feature is another characterised by moderately high readings, bounded by relatively sharp edges (at right angles) on the south and east, and with a 2m square of lower readings within. The southern boundary of the feature is 4.5m from the nave wall. The western arm aligns with the doorway in the nave and although it could represent a hardcore path going right through the church, for example, the alignment could be coincidental. Similarly, the possible alignment with the earlier western wall of the nave would not necessarily indicate a functional relationship. The possibility of another building cannot be ruled out but there is no evidence to suggest its date or purpose. The 2m square of 'wetter' readings is a convenient size to suggest the possibility of a burial. The eastern boundary of any such building is unclear, as the traces become much less strong east of the central point of the 'arc'. If an eastern boundary is indicated at this point then a path through some notional doorway in the 'arc' remains a possibility. Alternatively, the feature might extend eastwards to join up with the chancel chapel.

A further feature on the south side, showing up most clearly on Plan 3, is the shallow curve just to the west of and downslope from of the church. The appearance is consistent with the remains, or foundations, of a wall, probably buried by the downhill movement of topsoil. In this position it is more likely to be a boundary wall for the church than one associated with landscaping in the park.

CONCLUSIONS

Summary

The survey was successful on several counts. The readings obtained were all considered valid – none had to be discarded as implausible – and the computer-based analysis produced some clear images. Yet the two main objectives of the survey, to find the outlines of the chapel and

the earlier western wall, met with only tentative success. On the other hand, the survey provided evidence consistent with the font base already excavated and, more particularly, produced evidence for features not hitherto suspected. Their interpretation has given rise to much discussion (and some change of views) but ultimately a resistivity survey is not definitive: a full account needs complementary evidence from other sources.

The main findings of the survey are summarised on Plan 4.

Further Action

In order to take further the interpretation of the findings some additional evidence is needed. This might be supplied by documentary records relating to the estate, by those already expert in church history or, ultimately, by test excavations. It might also be worth undertaking further resistivity surveys in order to explore particular aspects of the site such as:

- the boundary wall and its possible extension beyond the bounds of the present survey
- the north side of the church where other structures might be found
- a vertical resistivity sounding to determine the depth of features, distinguishing, for example, between shallow paths and deeper foundations.

These points will be considered by the Society in due course and a proposal for further work may well be prepared.

Peter Camell founded and managed a major computer technology company, and has recently developed and applied geophysics equipment for archaeological investigations. John Wright is a retired town planner who worked most recently for Norfolk County Council.

Acknowledgements

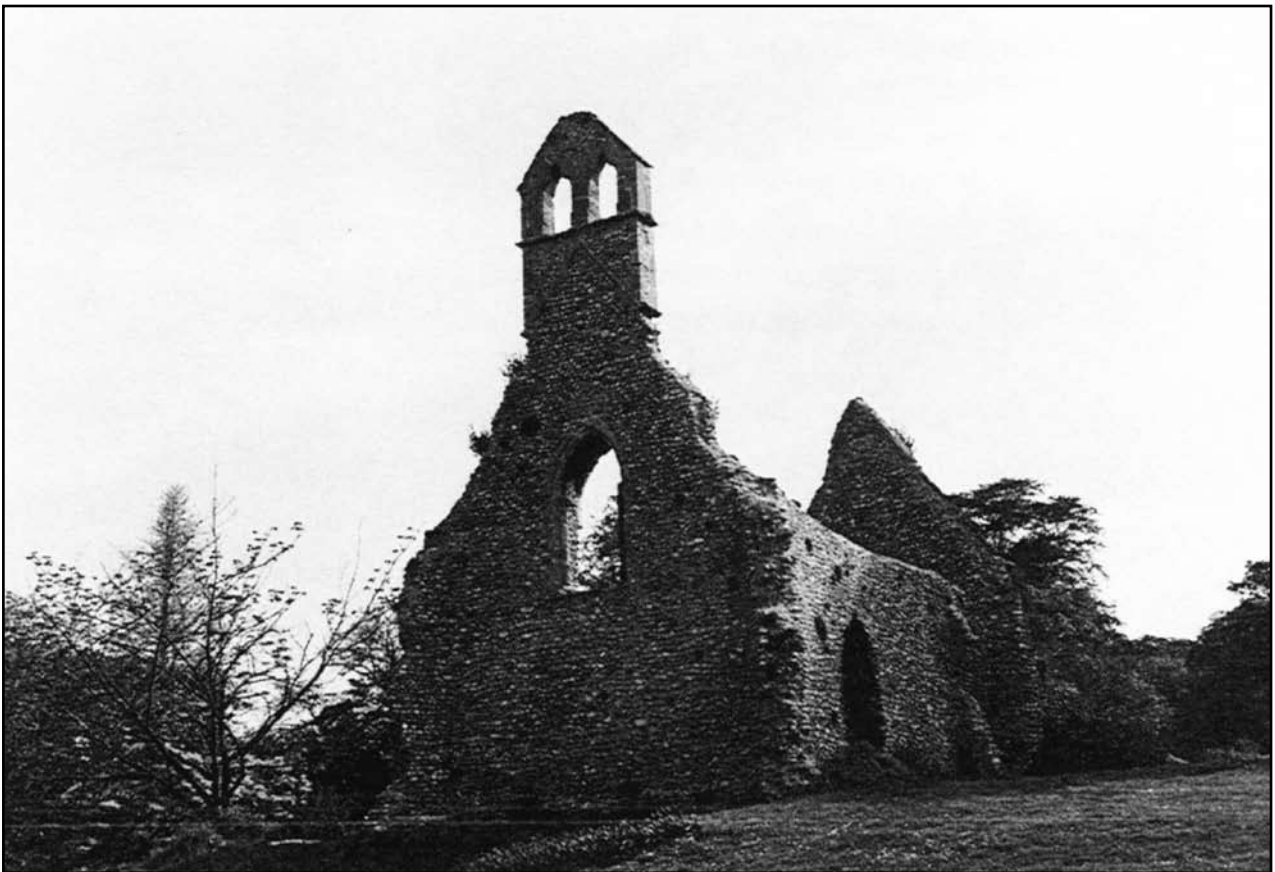
The Society wishes to thank Mr and Mrs R. Combe for permission to work on the site and for their encouragement and practical support.

Notes

- 1 N.Pevsner and B.Wilson, *The Buildings of England - Norfolk 1: Norwich and North East*, Penguin, 2nd edition, 1997.
- 2 S.Heywood and J.Ayton, "Three Ruined Churches", *NAHRG Annual No. 4*, 1995.
- 3 C.L.S.Lumell, *Letheringsett-with Bayfield: Church and Parish*, 1952 (with subsequent editions).



The church from the north-east



The church from the south-west



The chancel from the south



The nave and chancel from the south